ENGLISH ACROSS THE CURRICULUM

EXEMPLAR LESSONS PLANS

GRADE 7-12

basic education
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Basic Education
REPUBLIC OF SOUTH AFRICA

Read to Lead
A Reading Nation is a Leading Nation

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Foreword

English is the language of learning and teaching (LoLT) for the majority of learners in South African schools. Yet the findings of numerous studies cite English as a barrier to learning. Learners, the studies and reports state, are not able to read and comprehend instructions and neither are they able to express their knowledge in response to questions. In order to mediate the challenge cited above, the DBE developed and introduced The Strategy for Teaching English Across the Curriculum (EAC). The strategy was shortly followed by The Manual for Teaching English Across the Curriculum: Book 2, which comprised content subject input on how the strategy should be implemented. Copies of the strategy and the manual were distributed to schools in the provinces with the intention of enhancing implementation of the strategy and thereby strengthening the LoLT.

However, reports on visits undertaken in provinces, as well as audits conducted on the implementation of the strategy, reveal that provinces need assistance with the implementation of the strategy and realising its intended goal. The Department herewith presents an EAC toolkit for teachers comprising a DVD and a booklet featuring scripted lessons developed by subject specialists from provinces and national to demonstrate how the EAC can and should be infused in various content subjects. The toolkit seeks to stimulate teachers' thought processes and creativity in implementing the strategy. The scripted lessons dispel the myth that content subject teachers will spend more time teaching English instead of the subject content. Instead, the lessons strengthen the hand of the content subject teacher who, through addressing the language in the subject, enhances the process of decoding the science in the subject.

Numerous studies affirm the Department's approach in implementing the EAC strategy. Young, Van der Vlugt and Qanya (2005: p.viii), for example, state that 'concepts cannot be understood or used in isolation from the language in which they occur'. This pursuit of strengthening the LoLT is also supported in the study conducted by Thürmann (2017: p.1), who cites one of the major aims Council of Europe´s project "Languages in Education, Languages for Education" as being the devising and supporting of strategies and actions that seek to ensure that 'language awareness becomes a matter of course in content teaching across the curriculum'. Experts in Thürmann's study also came to the conclusion that 'mastering the language of schooling is a key to successful learning across the curriculum and the most reliable track to school success and elevated socio-economic status after graduating from school' (2017: p1).

By turning the LoLT into a carrier of and not a barrier to teaching and learning, we can look forward to improved quality in learner attainment. You are urged to engage with the scripted lessons and to employ your expertise in enhancing learner attainment through strengthening the LoLT. Best wishes.

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Creative Arts: Grade 7

Exemplar lesson 1

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• Reading in the subject.</td></tr>
<tr><td>Pre-knowledge vocabulary</td><td colspan="2">In this lesson, you will be exposed to the following terminology (tick for understanding).</td></tr>
<tr><td></td><td>Monochromatic colours</td><td>Visual Arts:
• Mono means one.
• Chromatic means colour.

Monochromatic means one colour.
Apply one colour with a different intensity or value to yield a darker colour.
For example:
If a black colour is added to a red colour, then red acquires a darker intensity.
Adding a white colour to the red colour will create a lighter intensity.</td></tr>
<tr><td></td><td>Polychromatic colours</td><td>Visual Arts:
• Poly is derived from ancient Greek and means many. It is synonymous to ‘multi’ – which is derived from Latin.

Thus polychromatic means many or multiple colours.
TAKE NOTE: Mono is the antonym (opposite word) of poly.</td></tr>
<tr><td></td><td>Rhythm</td><td>• Rhythm is the variation of strong and weak elements (such as duration, accent) of sounds, notably in speech or music, over time or beat or metre.</td></tr>
<tr><td></td><td>Scale</td><td>Mathematics:
• In maths, the scale is a set of numbers or amounts used to measure or compare levels of something.
Geography:
• The relation between the real size of something and its size on a map, model or diagram.
• Map scale refers to the relationship between a distance on a map and the corresponding distance on the ground.
Visual Arts/ Film:
• Refers to the size of an object in relation to another object.</td></tr>
</table>

		• In art, the size relationship between an object and a human body is significant. That is, in experiencing the scale of an artwork, we tend to compare its size to the size of our own bodies. https://www.sophia.org/tutorials/design-in-art-scale-and-proportion Music: • A scale is defined as a succession of notes, normally, a whole tone/ whole step or semitone/ half step. • A scale is like a staircase or a ladder. As the sound climbs up, the pitch gets higher and as it goes down, the pitch gets lower.
	Montage	• **Montage** is a technique in film editing in which a series of short shots (images) are edited into a sequence to condense space, time and information.
	Common time	Music: • A musical metre marked by four beats per measure/ four beats in a bar (with the quarter note receiving a single beat). • A synonym of 4/4 time. Dance: • Moving to the beat of music in 4/4 time (four beats in a bar) of a piece of music in which a quarter note receives a single beat.
Reference to specific words: new terminology.	**Vocabulary**	**Meaning of words and context of use in the subject**
	Art Elements	The art elements are the basic ***visual building blocks*** that can be observed or experienced in an artwork. Artists use them to compose or order the way we see an artwork. Art elements also convey ideas through their associations. *Victorian Curriculum and Assessment Authority*
	Line	A line is a mark which connects two points on a two-dimensional surface. It has a starting point and an end point.
	Tonal Value	Tonal value adds the illusion of three dimensions on a two-dimensional surface. Tone is how dark or light a part of an image is. Tone is used to show depth, space and atmosphere.
	Colour	Colour consists of hues (the actual name of a colour) and intensity (brightness). The colour wheel includes the primary, secondary and tertiary colours. The colour wheel shows how colours are related. Colour wheels help artists to think about colours and to remember how to mix them.
	Texture	Texture is the surface quality, from smooth to rough, that can either be

		felt or observed (literal or implied). Texture can be simulated or actual. Application of paint with a dry brush suggests roughness while heavy application of paint mixed with impasto (a technique called *impasto'*) can create raised ridges of actual texture. Terms used to describe the use of texture include invented, impasto, rough, smooth, natural, irregular, scratched, polished, gritty, uneven, wrinkled and furry. *Victorian Curriculum and Assessment Authority*
	Shape	Shape is an area contained within an implied line or defined by a change in colour or tone. Shapes have two dimensions: width and breadth. They can be free-form and organic (asymmetrical) or geometric in nature (symmetrical). Terms used to describe the use of shape include non-objective, representational amorphous and irregular. *Victorian Curriculum and Assessment Authority*
	Form	Form describes a three-dimensional area. It can be visual/ depicted or physical. While related to shape, terminology should be specific, i.e. biomorphic, geometric volumes (cube, spherical, pyramid, ovoid).Terms include distorted, elongated, layered and anthropomorphic (human-like). *Victorian Curriculum and Assessment Authority*
	Perspective	The art of representing three-dimensional objects on a two-dimensional surface so as to give the right impression of their height, width, depth and position in relation to each other.
	Design Principles	Design principles are the concepts used to assemble the elements of art. Artists design a strong artwork in a variety of ways and we dissect these ways through understanding the principles of design. The principles are balance, contrast, emphasis, proportion and rhythm.
	Balance	Balance is the distribution of visual weight in a work of art. Elements like shape may be balanced along a visual axis, symmetrically or asymmetrically. The comparative amounts of colours, tones and textures can create a sense of balance within a composition. Points to consider when looking for balance are comparison of elements and objects, and a comparison of stillness and movement. *Victorian Curriculum and Assessment Authority*
	Contrast	Opposites create contrast in size, shape, form, line, tone, texture or colour. Contrast can also be created in the choice of objects in your life. For example, a flower placed next to a motor part will create

		contrast. Contrast adds interest to your image. Contrast creates impact and immediately draws the attention of the viewer.
	Emphasis/ Focal Point	You can create emphasis using any of the art elements – texture, colour, tone, line, shape or form – or the design principles of contrast and proportion. The position of an object in the image, for example, in the centre or on one of the points of power, creates emphasis. Lines or implied lines can lead the viewer's eye to the subject and create emphasis. A certain object could be more brightly lit than the rest of the image. Keep in mind what you want to emphasise as you paint.
	Movement	Can be still, anticipated, kinetic, due to kinetic empathy, suggested by motion, a blur. Pattern – the arrangement of recurring figures/ motifs and modules (3D form) – can create movement. *Victorian Curriculum and Assessment Authority*
	Proportion	Is the size of something compared to something else. The objects that you have selected will be different sizes and will be bigger or smaller in relation to each other. If an object is the wrong size, it can put the entire picture out of balance. Or, for the sake of emphasis, you might *want* an object to be out of proportion to another.
	Repetition (Pattern)	A regularly recurring motif/ shape/ figure creates a pattern. A motif that recurs irregularly is using repetition. These can create a sense of unity, rhythm or movement in a work. For example, a repetition of a line can cause a pattern or suggest movement or a time sequence. *Victorian Curriculum and Assessment Authority*
	Rhythm	Where the use of an element is repeated regularly it can form a pattern. Rhythm creates a sense of movement (think of musical beats) in a pattern, the relationship of parts to the whole. Different types of rhythm include flowing, regular, alternating, progressive and random. *Victorian Curriculum and Assessment Authority*
	Scale	Refers to the comparative size of shapes or forms, use of time, volume of sound in an artwork. Examples could be human, small or large scale. Scale can be a comparison of sizes, as in a ratio. For example, one half of the original. In relation to human figures, scale can be larger than, smaller than or actual life size. *Victorian Curriculum and Assessment Authority*
	Unity	Refers to the similar or uniform use of an element that unifies or ties together a composition. Unity can create a sense of balance in an artwork. Patterns, figures/ motifs and modules (3D forms) can create unity.

	Activity 1: Vocabulary understanding and knowledge (list of words). Copy and give to learners to complete before or during the lesson.
During teaching	**Teaching Guidelines** Learners need to bring a portrait of their own that they find interesting to class. It could be a reproduction or a picture from a book, magazine or the internet. Classroom activity: Discuss an artist of your choice. Learners get together in groups of four or five and spend five minutes discussing each painting. They work through the four steps – description, analysis, interpretation and judgement. Learners must give each person a turn to talk and listen while he/she talks. They must give reasons for the statements they make. Monitor the group discussions and informally assess learners' contributions. Ask each group to choose their discussion about the portrait selected by each group. **At the end of the lesson the learners should be able to:** • Observe, analyse, interpret and judge. • Name the art elements. • Explain what design principles are. • Learn to identify, create and interpret mood in an artwork. • Refer to the art elements and design principles when discussing artwork. **Word bank** **Candid:** informal, not posed, a picture usually taken without the subject being aware of being photographed or drawn, a snapshot. **Idealised:** shown to be perfect, without blemishes or flaws of any kind. **Commission:** hire someone to create an artwork. **Specifications**: a detailed description of how something should be done. In the case of a portrait, for example, the specifications would include the size of the painting, what clothing and jewellery the person should wear and how idealised or realistic the painting should be. **Inspired:** to awaken a creative impulse. **Mixed media:** using more than one kind of medium to create an artwork. For example, using oil paints, charcoal, ink, paper and fabric in the same artwork. **Introduction to the task:** **What is a portrait?** It is an artistic representation, such as a photograph, painting or sculpture, of a person. The image

	usually shows only the face and upper part of the body, so that the personality, mood and facial expression can be captured. A portrait is a careful study of a person, rather than the capture of a **candid** moment, which is a moment in a person's life captured without them knowing. Candid moments can reveal a great deal about a person and can express **mood** and contain all the art elements and design principles. But they are not classified as portraits. In a portrait study, the sitter (that is, the subject of the study) often gazes out of the frame to make eye contact with the viewer. Their eyes draw the viewer in and give him/ her some insight into the personality of the sitter. **Why paint portraits?** The art of portrait painting is many centuries old. Funeral portraits date back to the first century. The Ancient Greeks and Romans created **idealised** portrait sculptures of the powerful and the wealthy, and this tradition continued through centuries. Modern portrait paintings are usually **commissioned**. In other words, the artist is hired to paint the portrait according to certain **specifications**. Such paintings are usually commissioned by governments and large companies, and sometimes by individuals. Often, however, an artist paints a portrait because he/ she was **inspired** by someone, either because the person had an interesting or attractive face or because the person was important to the artist for some reason. Many artists, such as Rembrandt, Vincent van Gogh, David Hockney, Cindy Sherman and Frida Kahlo, painted **self-portraits**. The reason for painting a self-portrait is often quite simple: in him or herself, the artist has a model who is always available and who will sit for as long as the artist needs him or her to sit. Self-portraits are a good way of practising your craft without being worried about others' opinions of your work. In addition, it is an interesting and creative experience to look into your own eyes in the mirror and paint your own portrait. **Resources:** • The pictures of your icon that you have collected.
Post-teaching	**Activity 2 – Matching terminology** **Activity 3 – Case study**

LESSON SCRIPT

Introduction to the topic

What is a portrait?
A description of what a portrait is and the reasons why people paint portraits. A portrait is a careful study of a person. Ask the learners why they think people create portraits. Because most young people have cell phones and all cell phones have cameras, they tend to take photographs of each other. Many of these pictures can be described as portraits. You can use this as a starting point. Ask them why they take portraits of their friends and why they like having their own portraits taken. Usually, people create portraits because:

- They have been commissioned to do so.
- The person has inspired the artist.
- The person has an attractive or interesting face.
- The artist has a connection with the person.

Talk about self-portraits and how useful it is for an artist to use him or herself as a model. All artists, no matter how skilled they are, need to practice and painting or drawing one's own face is a very convenient way to practice.
Discuss a self-portrait

r Life Across My Face (1993), Oil on board

- Discuss the composition. What kind of composition is it? Why would the artist have chosen this composition?
- How does the artist portray herself? Would you say the image is idealised?
- Discuss how the writing adds to the painting. Do you like it? Why? Do you think the artist should not have added it? Why?

Description

Talk:

- The medium the artist used;
- The objects you see in the picture;
- The colours - bright, dark or muted, complementary;
- The shapes - geometric or organic;
- The textures - rough or smooth;
- The use of line - straight, curved, thick or thin;
- Form - whether the artist has used form or flat shapes;
- Tone (or value) - the use of light and dark in the picture.

Remember: you are simply listing the facts at this stage.

Analysis

When you analyse the picture, you talk about how all the art elements work together to create balance, contrast, rhythm, variety, proportion and emphasis. Talk about:

- Balance - symmetrical, asymmetrical or radial;
- Proportion - the size, amount or location of one element in relation to another;
- Contrast - size, texture;
- Unity - repetition, rhythm, theme with variation, proximity;
- Emphasis - contrast, focal point, isolation, placement;
- Rhythm - repetition, scale, contrast.

Interpretation

When you interpret a picture, you express how the picture makes you feel. You discuss what the picture reminds you of and what you think the artist is trying to tell you. Interpreting a picture is more personal and open-ended than describing or analysing a picture. There is no right or wrong point of view. However, you still do not say whether you like the picture or not. You will not know for certain what the artist is trying to tell you but this is not very important. You are giving your own opinion - it is your interpretation.

Judgement

This is finally where you get to say whether you like the picture or not. It might be that the elements and principles are in place but that you simply do not like the picture because you do not like the subject matter or it reminds you of something sad or nasty. It might be that the elements and principles have not been well implemented but there is something about the picture that you like a great deal.

Word bank

Portfolio: a collection of artwork intended to showcase an artist's style or method of work.

Activity 1: Test your vocabulary understanding

Indicate the level of your understanding of the vocabulary provided in the table below by ticking in a box with one of the icons. Provide the definition to show the level of your understanding.

 : I understand the concept.

 : I remember some parts of the definition of the concept.

 : What is this? I still don't understand the concept even after an explanation has been provided.

No	Vocabulary				**This is how well I understand** (feel free to write whatever you remember and thereafter look up the definitions the worksheet provided in the 'New Terminology' section above).
1	**Line**				
2	**Shape**				
3	**Tonal Value**				
4	**Colour**				
5	**Texture**				
6	**Shape**				
7	**Form**				
8	**Design Principles**				
9	**Balance**				
10	**Contrast**				
11	**Emphasis**				
12	**Movement**				
13	**Proportion**				

	Coloumn A		Coloumn B
2.1	Abstract	A	Something looks real.
2.2	Idealised	B	Something is simplified to show its basics
2.3	Naturalistic	C	Something looks like something in nature
2.4	Stylised	D	Something is made to look perfect or better
2.5	Realistic	E	Something is unrecognisable

Activity 3

Read the following case study, look at the image and answer the questions.
Interview with Arlene Amaler- Raviv about her artwork of Nelson Mandela.
"In 1990, before the release of Mandela, from a small black and white photograph, I painted this painting using only ANC colours. It is 140X140 cm, oil on canvas. The image is cropped so that it focusses on the facial features, concentrating on his dignity and strength."

4.1 Who is the subject of this painting? [1]
4.2 Name the artist. [1]
4.3 Why did the artist use big brushstrokes? [2]
4.4 What medium was used by the artist? [2]

Reinforcement: Teaching Language and Reading across the curriculum

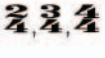
1. Place folded pieces of paper with terminology based on visual literacy vocabulary in a bowl.
2. Learners will be asked to randomly pick a piece of paper from the bowl.
3. Learners will be asked to read aloud the chosen term and explain how it relates to other terms used in the lesson so far.
4. The teacher will confirm the correct usage of the terms provided by learners and provide remedial comments on concepts that have not been correctly understood. This contributes to reading with understanding.

Remediation
Refer to the terminology and definitions in the 'Pre-Knowledge Vocabulary'.

Creative Arts: Grade 8

Exemplar lesson 2

<table>
<tr><th>Subject and grade</th><th colspan="2">Creative Arts: Grade 8</th></tr>
<tr><td>Topic:</td><td colspan="2">Music: Literacy – Duration</td></tr>
<tr><td>Preamble</td><td colspan="2">• Listening to the instructions and responding accordingly.
• Use of words in the arts subjects versus ordinary use of words.
• Reading case studies aloud.</td></tr>
<tr><td>Pre-knowledge vocabulary:</td><td colspan="2">In this lesson, you will be exposed to the following terminology (tick for understanding).</td></tr>
<tr><td></td><td>Duration</td><td>• an amount of time or a particular time interval.</td></tr>
<tr><td></td><td>Note</td><td>• a symbol or annotation;
• a mark or token by which a thing may be known;
• a visible sign;
• a character;
• a distinctive mark or feature.</td></tr>
<tr><td></td><td>Value</td><td>• The quality that renders something desirable or valuable.
• The degree of importance given to something.
• that which is valued or highly esteemed.</td></tr>
<tr><td></td><td>Rest</td><td>• relief from work or activity;
• any relief from exertion;
• a state of quiet or relaxation;
• a state of inactivity;
• a state of little or no motion.</td></tr>
<tr><td></td><td>Time</td><td>• Inevitable progression into the future with the passing of the present events into the past.
• Indefinite continued progress of existence and events in the past, present and future regarded as a whole.
• Physics: A change associated with the second law of thermodynamics.</td></tr>
<tr><td></td><td>Bar</td><td>• A solid, more or less rigid, object with a uniform cross-section smaller than its length.
• a solid metal object with uniform (round, square, hexagonal, octagonal or rectangular) cross-section.
Take note: prefixes: hexa = six sides; octa = eight sides</td></tr>
<tr><td></td><td>Common time</td><td>Music:
• A musical metre marked by four beats per measure/ four beats in a bar (with the quarter note receiving a single beat).
• A synonym to 4/4 time.</td></tr>
</table>

		Dance: • Moving to the beat of music in 4/4 time (four beats in a bar) of a piece of music in which a quarter note receives a single beat.
Reference to specific words: new terminology.	**Vocabulary**	**Meaning of words and context of use in the subject**
	Rhythm	• Rhythm is a **uniform or patterned repetition of a beat**, **accent or occurrences** in time. • The five main features are **repetition**, **gradation**, **transition**, **opposition** and **radiation**.
	Note values	• A **musical notation** that indicates the relative **duration of a note**, using colour or shape of the note head, the presence or absence of a stem and the presence of flags.
	French time names *Ta*	• French time names were developed by the 19th-century lawyer-turned-educator, Aimé Paris (1798–1866). • This **system for learning rhythm** became part of the Galin-Paris-Chevé Method of teaching sight-singing.
	Semibreve 	• Originated from Latin. Prefix *Semi* = half/ partial/ incomplete + *Brevis = a double whole note*. • Semibreve is a note with **four counts or four beats long** in 4/4 time; a whole note (four crotchet beats).
	Minim 	• a **half note,** drawn as a semibreve with a stem; played once but it takes two counts of beats (crotchet beats).
	Dotted minim 	• a **half note with a dot** (a dot after a note increases its duration by half its value), drawn as a semibreve with a stem and a dot; **half of a minim** is a **crotchet**.
	Crotchet 	• A musical note one beat long in 4/4. • Synonym – **quarter note.**
	Quaver 	• A musical note **half a beat** long in 4/4. • Synonym – **eighth note.**
	Rest 	• A pause of a specified length in a piece of music. • A written **symbol** indicating such a pause in a musical score, such as in sheet music. • An **interval of silence** in a piece of music, marked by a **symbol indicating the length** of the pause.
	Time Signature 	• A **numerical sign placed on a stave** to indicate the metre; the **numerator** is the number of beats per bar, the **denominator** represents the value of each beat.

	Duple Time $\frac{2}{4}$	• A *Duple time* has **two beats** in a bar. • It is also known as a marching beat because it follows the same rhythm as a march: **one-two**, **one-two.**
	Triple Time $\frac{3}{4}$	• A *Triple time* has **three beats** in a bar. • It is also known as a waltz.
	Quadruple Time $\frac{4}{4}$	• A *Quadruple time* has **four beats** in a bar. • It is also known as **common time.**
	Common time C $\frac{4}{4}$	Music: • A musical metre marked by four beats per measure/ four beats in a bar (with the quarter note receiving a single beat). • A synonym of '4/4 time'. Dance: • Moving to the beat of music in 4/4 time (four beats in a bar) of a piece of music in which a quarter note receives a single beat.
	Bar lines 	• *Bar lines* divide the stave according to the number of beats of the time signature.
	Double bar line 	• A *double bar* line at the on the right-hand end of the stave shows the end of a piece or section of music.
	Assessment for Learning: **Activity 1 – Vocabulary understanding and knowledge** (list of words). • Copy the definitions/ meanings of terms to a flip chart. • Using **flash cards**, learners paste the term next to the definition/ meaning of the term. • Having finished, the **teacher explains** key terms that will be used in the following lesson.	
During teaching	At the end of the lesson the learners should be able to: • Understand **duration** as one of the **elements of music.** • Understand the **Note Values.** • Apply the appropriate note values and their **rests.** • Apply appropriate knowledge in creating their own **rhythmic patterns** in their chosen **time signature.**	
Post-teaching	**Activity 1–4: Practical demonstration: group and individual** **Activity 5: Practice test on note values** **Activity 6: Writing sentences** **Activity 7: Performance and oral** **Activity 8: Vocabulary understanding**	

Reinforcement: Teaching Language and Reading across the curriculum
Activity 1: Reading and writing
Read the passage in the box below with understanding. Then answer the questions that follow.

You can rest assured that all human beings reap what they sow. This means that you need to work hard for the rest of the year. You are however advised to take a rest if you like. When you sing a song, please observe sections where rests are used. All rests are of specified length in a piece of music. Rests are represented by symbols indicating the various length of a pause. These make music quite interesting, but in the end, we all rest in peace.

Explain the different contexts of the use of the word 'rest' in the paragraph above.

Remediation
Refer to your terminology and definitions in 'Pre-Knowledge Vocabulary'.
The teacher will confirm the correct usage of terms provided by learners and provide remedial comments of concepts that have not been correctly understood. This contributes to reading with understanding.

LESSON SCRIPT
In the previous sessions, you were introduced to the concept of Pitch. You were introduced to two notation systems, which are Tonic Sol-fa and Staff Notation. This session will focus on Duration. What is Duration?

- The term Duration refers to an amount of time or a particular time interval.
  In music, Duration refers to the **Note values:**
  What are Note values?

Note values are:

- **Musical notation** that indicates the relative duration of a note, using colour or the shape of the note head, the presence or absence of a stem and the presence of flags.

The following are note values:

Semibreve 	• Originated from Latin. Prefix Semi = half/ partial/ incomplete + Brevis = a double whole note. • Semibreve is a note with four counts or four beats long in 4/4 time; a whole note (four crotchet beats).
Minim 	• a half note, drawn as a semibreve with a stem; played once but it takes two counts of beats (crotchet beats).
Dotted minim 	• a half note with a dot (a dot after a note increases its duration by half its value), drawn as a semibreve with a stem and a dot; half of a minim is a crotchet.
Crotchet	• A musical note one beat long in 4/4.

	• Synonym - quarter note.
Quaver 	• A musical note half a beat long in 4/4. • Synonym - eighth note.
Semiquaver 	• A musical note a quarter of a beat long in 4/4. • Synonym - sixteenth note.

Table 1 presents the **Note values** together with corresponding **French time names** as well as Tonic Sol-fa Notation.

Table 1: A combination of note values

Name of Note Value	Note Symbol	Values in relation to Semibreve	French Time Names	Tonic Sol-fa	Corresponding names (US)
Semibreve		1	Taa-aa-aa-aa	d : - | - : - |	Whole note
Minim		2	Taa-aa	d : - | : |	Half note
Crotchet		4	Taa	d : | : |	Quarter note
Quaver		8	Ta -te	d.d : | : |	Eighth note
Semiquaver		16	Ta-fa te-fe	d,d,d,d : | : |	Sixteenth note

This leads us to the introduction of rests.
What is a rest?

- A pause of a specified length in a piece of music.
- A written symbol indicating such a pause in a musical score, such as in sheet music.
- An interval of silence in a piece of music, marked by a symbol indicating the length of the pause.

Each of the abovementioned note values has its equivalent rest. Look at the following table.

Table 2: A combination of note values, rests and French time names

Name	Notes and their French Time Names	Rests and their French Time Names	Value in relation to a crochet beat
Semibreve or whole note	 Taa-aa-aa-aa	Saa-aa-aa-aa	4 crochet beats
Minim or half note	 or  Taa-aa		2 crochet beats

		Saa-aa	
Crochet or quarter note	or Taa	Saa	1 crochet beat
Quaver or eighth note	or Ta – te ta - te	Sa-seh	½ crochet beat
Semiquaver or sixteenth note	or Ta-fa te-fe ta-fa te-fe	sa-se	¼ crochet beat

Activity 1: Practical Demonstration: As a group, clap the following rhythmic patterns.

a)

b)

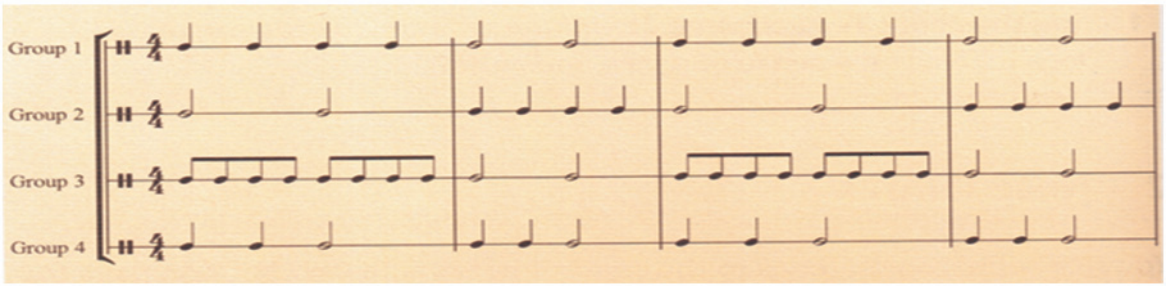
Activity 2: Practical Demonstration: Individually clap the following rhythmic patterns.

a)

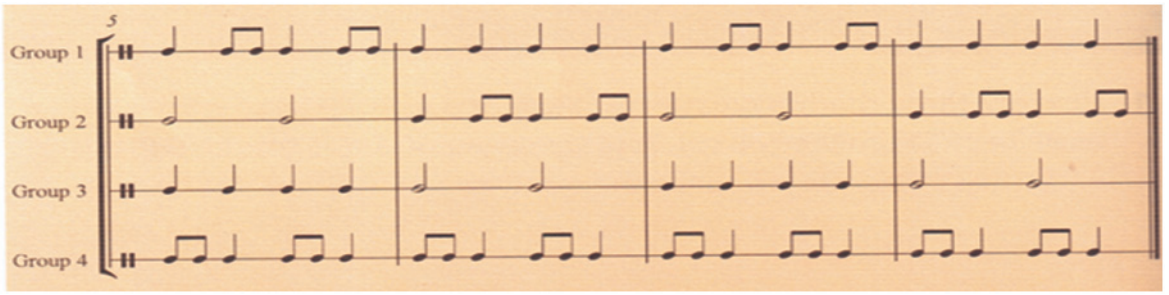
b)

c)

Activity 3: Practical Demonstration: In groups, clap the following rhythmic patterns.



Activity 4: Practical Demonstration: Drum the following patterns.



Activity 5: Practice and test your knowledge of note values by completing the table below. Fill in the correct answers (note that a variation of this activity could include the use of flash cards used to fill in the table).

Fill in the missing notes, words, rests and values:

Note	Name	Rest	Value
i)	Crochet	ii)	1 Crochet beat
iii)	iv)		v)
	vi)	vii)	viii)
ix)	x)		1/2 Crochet beat

You have noticed in activities 2 and 3 that there are numbers (appearing like fractions) at the beginning of each pattern. What are they called? or What do they stand for?
ANSWER: **Time signature**

1. What is a time signature?

The time signature is a notational convention commonly used in Western musical notation to specify how many beats are in each measure or bar and which note value constitutes one beat. In a musical score, the time signature appears at the beginning of the piece, as a time symbol or stacked numerals such as C / $\frac{4}{4}$ or $\frac{3}{4}$, which means **'common time' and 'three four time'**, respectively, immediately following the key signature or immediately following the clef if the key signature is empty. A mid-score time signature, usually immediately following a bar line, indicates a change of metre.
There are various types of time signatures, depending on whether the music follows simple rhythms or involves unusual shifting tempos, including regular-simple time such as $\frac{3}{4}$ or, $\frac{4}{4}$ compound time, e.g. or and irregular-complex time, e.g $\frac{5}{4}$ or $\frac{7}{8}$
Regular time signature has two main groups: **Simple and Compound time signatures.**

Simple Time Signature has three subgroups and its beats can be divided by 2, 4, 8, 16. These subgroups are named simple duple, triple and quadruple time because of the number of beats in each of the subgroups in a single bar.

2. Simple time signatures

Time signatures, including simple time signatures, consist of two numerals, one stacked above the other:

- the lower numeral indicates the note value which represents one beat (the 'beat unit');
- the upper numeral indicates how many such beats there are in a bar.

Simple time: duple $\frac{2}{2}$, triple $\frac{3}{4}$, quadruple $\frac{4}{4}$. The following table summarises Simple Time Signatures:

	Simple duple	Simple triple	Simple quadruple
2/2	𝅗𝅥 𝅗𝅥	3/2 𝅗𝅥 𝅗𝅥 𝅗𝅥	4/2 𝅗𝅥 𝅗𝅥 𝅗𝅥 𝅗𝅥
2/4	♩ ♩	3/4 ♩ ♩ ♩	4/4 ♩ ♩ ♩ ♩
2/8	♪ ♪	3/8 ♪ ♪ ♪	4/8 ♪ ♪ ♪ ♪

Activity 6: Writing

Formulate sentences using the following phrases:

- Numerical sign;
- Duple time;
- Triple time.

Remediation

Refer to your terminology and definitions in 'Pre-Knowledge Vocabulary'.

The teacher will confirm the correct usage of terms provided by learners and provide remedial comments on concepts that have not been correctly understood. This contributes to reading with understanding.

3. Compound time signatures

In compound time signatures, subdivisions of the main beat (the upper number) are split into three, not two, equal parts, so that a dotted note (half again longer than a regular note) becomes the beat unit. Compound time signatures are named as if they were simple time signatures in which the one-third part of the beat unit

is the beat, so the top number is commonly in multiples of 3, e.g. $\frac{6}{8}$, $\frac{9}{8}$ and $\frac{12}{8}$. The lower number is most commonly an 8 (an eighth note).
Compound time: duple $\frac{6}{8}$, triple $\frac{9}{8}$, quadruple $\frac{12}{8}$.

The table below presents compound time signature:

Compound Duple		Compound triple		Compound quadruple	
6/8		9/8		12/8	

Activity 7: Performance

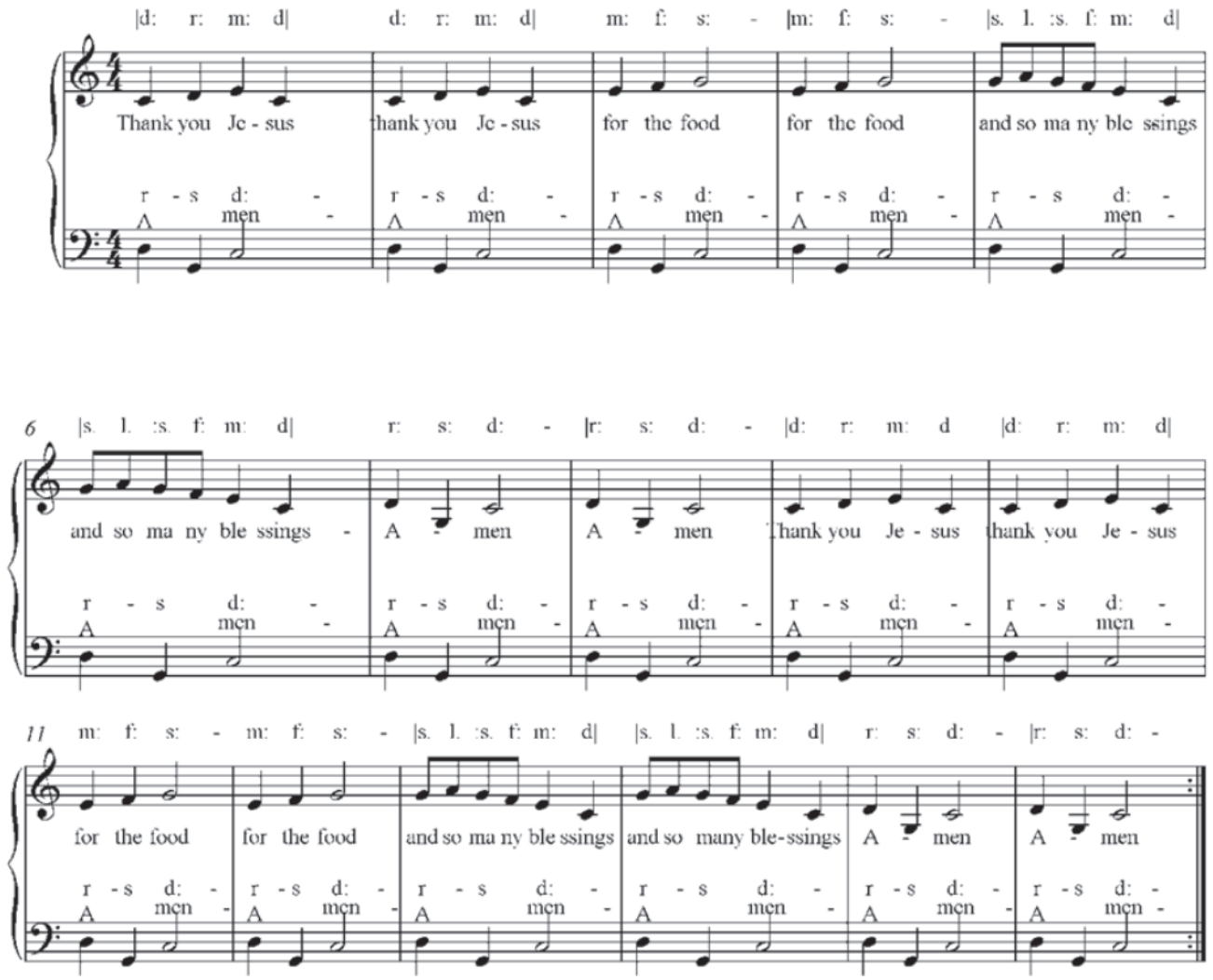
Look at the **time signatures** of the following songs. Let's sing them together.
a)

Thank You Jesus

For PCTT Orientation

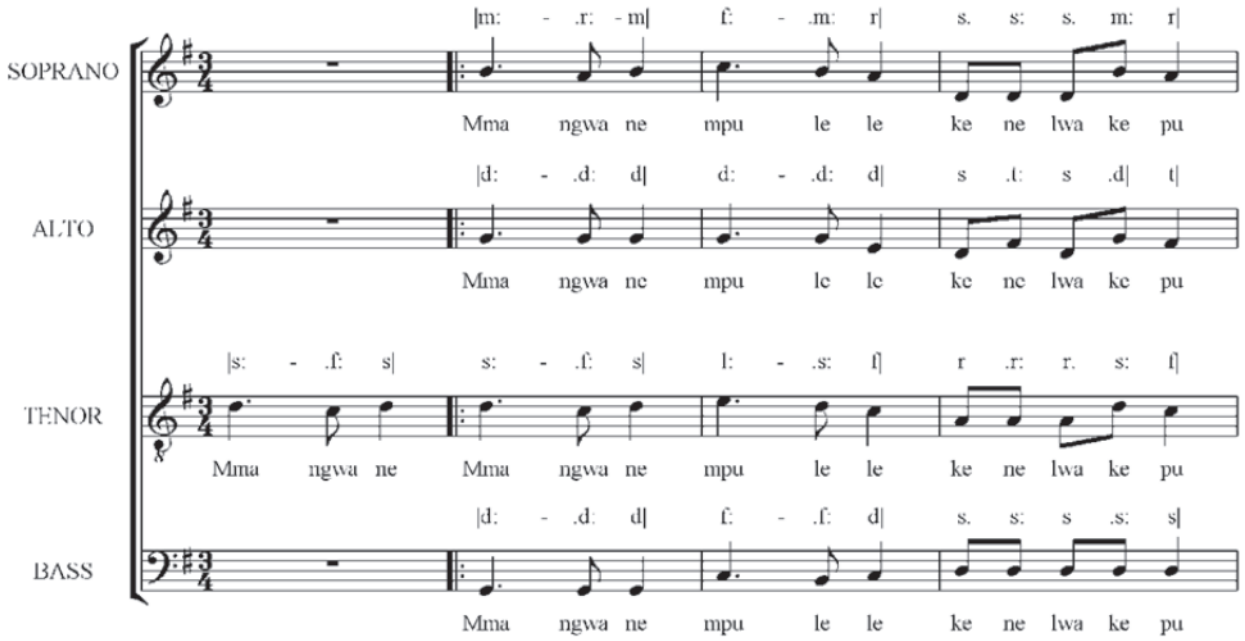
Takalolo (an adaptation)

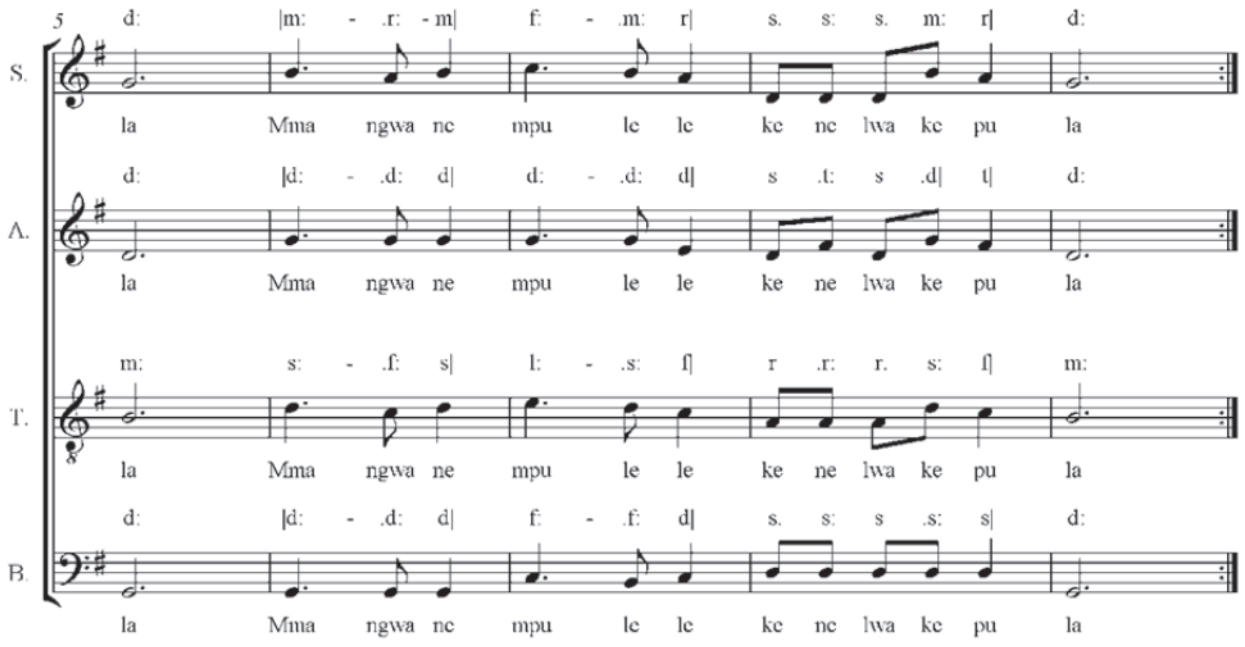
Andante



MMANGWANE

Notated and transcribed by O.J. Mosinki





TASO Music

Questions

1. Mention any three time values used in the piece of music used in the first song (a) above).
2. Mention any three time values used in the piece of music used in the second song (b) above).
3. Give the term for the two numbers appearing at the beginning of each of the songs above.

Activity 8: Vocabulary understanding

Indicate the level of your understanding of the vocabulary provided in the table below by ticking a box with one of the icons. Provide the definition to show the level of your understanding.

 : I understand the concept.

 : I remember some parts of the definition of the concept.

 : What is this? I still don't understand the concept even after an explanation has been provided.

No	Vocabulary				Your meaning of words and context of use in the subject
1	Rhythm				
2	Note values				
3	French Time Names				
4					
5	Semibreve 				
6	Minim 				
7	Dotted minim 				
8	Crotchet 				
9	Quaver 				
10	Rest 				
12	Time Signature 				
13	Duple Time				
14	Triple Time 				
15	Quadruple Time 				
16	Common Time 				
17	Bar Lines				

Memo for Activity 5:

Note	Name	Rest	Value
i) 	Crochet	ii)	1 Crochet beat
iii)	iv) Semibreve or whole note		v) 4 Crochet beats
	vi) Minim or half note	vii)	viii) 2 Crochet beats
ix) 	x) Quaver or eighth note		1/2 Crochet beat

2x10=20

Technology: Grade 7

Exemplar lesson 3

<table>
<tr><td>Subject and grade</td><td colspan="2">Technology: Grade 7</td></tr>
<tr><td>Topic</td><td colspan="2">Simple mechanisms – electromagnetism</td></tr>
<tr><td>Preamble</td><td colspan="2">During the teaching of this topic, the following language aspects will be highlighted:
Meanings of words.</td></tr>
<tr><td>Pre-knowledge vocabulary</td><td colspan="2">Tick whether you understand the following concepts (they were covered in Grade 8):</td></tr>
<tr><td></td><td>Circuit</td><td>• A roughly circular line, route or movement that starts and finishes at the same place.
• A track used for motor racing / horse racing / athletics.
• A district administered by travelling judges.
• A chain of theatres or cinemas one owner or management.</td></tr>
<tr><td></td><td>Diagram</td><td>A simplified drawing showing the appearance, structure or workings of something.</td></tr>
<tr><td></td><td>Symbol</td><td>A mark or character used as a conventional representation of an object.</td></tr>
<tr><td></td><td>Bulb</td><td>• An output device that lights up when heated by a current.
• A rounded underground storage organ present in some plants.</td></tr>
<tr><td></td><td>Switch</td><td>• A control device used to close or open a circuit.
• The act of changing to or adopting one thing in place of another.
• Changing direction, position or focus.</td></tr>
<tr><td></td><td>Buzzer</td><td>An output device that gives off a sound when a current passes through it.</td></tr>
<tr><td>Reference to specific words: new terminology</td><td>Vocabulary</td><td>Meaning of words and context of use in the subject.</td></tr>
<tr><td></td><td>Magnet</td><td>A magnet is a material or object that produces a magnetic field.</td></tr>
<tr><td></td><td>Magnetic Field</td><td>A region around a magnetic material or a moving electric charge within which a force of magnetism acts.</td></tr>
<tr><td></td><td>Iron</td><td>• A mineral present in many foods and added to many foods as a dietary supplement.
• A silver-white, malleable, ductile, magnetic, heavy, metallic element that readily rusts in moist air.
• A handheld, typically electrical implement, with a heated</td></tr>
</table>

LESSON SCRIPT (The following is said by the teacher)

"In our previous lesson, you were introduced to simple electric circuits. The focus was on the components of a simple electric circuit, such as the bulb, the buzzer and the switch. Furthermore, you practically made an electric circuit. Do you remember the meanings of the abovementioned components?"

The teacher will then paste a chart with the symbols of electrical components on the board. The answers will be written on a separate chart and cut into strips. Learners will go to the board and paste the correct answers next to the symbols. Alternatively, the teacher can draw the symbols on the board (see pre-activity below). If the chalkboard is used, the teacher will allow the learners to go to the board and write the correct answers.
The symbols of electrical components are put in the table and the learners are asked to complete the table by giving the names of the electrical symbols and giving the meanings of the symbols. This will be done verbally, wherein the teacher will ask questions and learners will respond to questions.

The teacher will consolidate after each response.
During the lesson: The teacher will write the new concepts on the board and ask the learners to look for the meanings of these concepts in the dictionary or in the textbook. The teacher will then highlight that a single concept might have different meanings depending on the subject or where it is used (e.g. iron). The learners will be given an activity to make an electromagnet. Teachers note: Sometimes when we explain new words to the learners, we may find that there might be words in our explanation that are not understood by the learners. These words can be given to learners, to research their meanings in context. For example, look at the highlighted words used in explaining 'Iron' in the table below.

Iron	A **mineral** present in many foods and added to many foods as a **dietary supplement**. A silver-white, **malleable, ductile**, magnetic, heavy, **metallic** element that **readily** rusts in moist air. Ironing of clothes in the home is done using a handheld, typically electrical implement, with a heated flat steel base.

PRE-ACTIVITY
The chart on the board shows different symbols of a simple electric circuit.
For each symbol, the teacher will ask "What is the name of the electric component?" The teacher will continue and ask the learners to give the meaning or explanation of each component.

SYMBOL	NAME OF THE COMPONENT	EXPLANATION
		

PRE-ACTIVITY

The chart on the board shows different symbols of a simple electric circuit.
For each symbol, the teacher will ask "What is the name of the electric component?" The teacher will continue and ask the learners to give the meaning or explanation of each component.

SYMBOL	NAME OF THE COMPONENT	EXPLANATION
		
		
		
		

Activity 1
Making a simple electromagnet
Follow the following steps and make an electromagnet:

1. Use the wire stripper to strip a small piece of the insulation from both ends of the insulated copper wire.
2. Wrap the insulated wire neatly around the iron nail. Make sure that you keep the wire turning in the same direction. Keep the coils close together.
3. Now connect one of the stripped ends of the wire to the positive terminal of the cell.
4. Connect the other stripped end to the negative terminal of your cell.
5. To test if your electromagnet is working, see whether it can pick up paperclips. If the paperclips are attracted to the iron rod, then your electromagnet is working!
6. Once you have tested your electromagnet, disconnect the wire from one terminal of the cell. Now try to pick up the paperclips.

Activity 2
Answer the following question:

2.1. How can you use the electromagnet to pick up paperclips from one place and then put them in a different place?

Technology: Grade 8

Exemplar lesson 4

<table>
<tr><td>Subject and grade</td><td colspan="2">Technology: Grade 8</td></tr>
<tr><td>Topic</td><td colspan="2">Working drawings techniques</td></tr>
<tr><td>Preamble</td><td colspan="2">During the teaching of this topic, the following language aspects will be highlighted: Meanings of words.</td></tr>
<tr><td>Pre-knowledge vocabulary</td><td colspan="2">Tick whether you understand the following concepts (they were covered in Grade 8)
<table>
<tr><td>Sketch</td><td>• A rough or unfinished drawing or painting often made to assist in making a more finished picture.
• In the Arts, it can be a short humorous play or performance.</td></tr>
<tr><td>Oblique drawings</td><td>• In Technology, Oblique refers to a three-dimensional drawing where the depth of an object is projected at a 45-degree angle to the 2D front view.
• Oblique – Not expressed or done in a direct way.</td></tr>
<tr><td>Graphic communication</td><td>• Communication through graphics and graphic aids. The process of creating, producing and distributing material incorporating words and images to convey data.</td></tr>
<tr><td>Convention</td><td>• A way of showing information on designs or working drawings that is understood and recognised to have a specific meaning.
• A large meeting.
• An international agreement.</td></tr>
<tr><td>Scale</td><td>• In Technology, scale is the representation of the real-life size of an object on paper.
• Thin, horny or bony plates protecting the skin of fish and reptiles.
• An instrument for measuring weight (mass).
• To climb over something high and steep.</td></tr>
<tr><td>Dimension</td><td>• Measurable extent of a particular kind, e.g. length, depth or height.
• To form or shape to a particular measurement.</td></tr>
</table></td></tr>
<tr><td>Reference to specific words: new</td><td colspan="2">
<table>
<tr><td>Vocabulary</td><td>Meaning of words and context of use in the subject</td></tr>
<tr><td>Isometric</td><td>• Iso means the ‘same’ and metric means</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>terminology</td><td><table>
<tr><td></td><td>'measurement'. Isometric refers to a three-dimensional drawing where the lines of sight are set at 30°. The parallel lines are of the same size.</td></tr>
<tr><td>3-Dimensional</td><td>• A pictorial drawing in which three principal dimensions are visible (e.g. length, height and width). Also, the three principal faces are visible in the drawing.</td></tr>
<tr><td>2-Dimensional</td><td>• A flat drawing in which only two principal dimensions (measurements) are visible (e.g. length and height).</td></tr>
<tr><td>Scale</td><td>• It is the representation of the real-life size of an object on paper.</td></tr>
</table></td></tr>
<tr><td>During teaching</td><td>• Learners should understand the terminology used.
• Listen to the educator.
• Write words down.
• Present meanings of words.</td></tr>
<tr><td>Post-teaching and assessment</td><td>• Learners complete Activity 1 - Vocabulary.
• Learners do drawings.</td></tr>
</table>

LESSON SCRIPT (The following is said by the teacher)

"In Grade 7, Term One, you were introduced to Graphic Communication. The focus was on oblique drawing, conventions, sketching and working drawings. Do you remember the meanings of the words (can anyone of you explain any of these concepts?)?"
The teacher will dictate the words to the learners. They then **listen** and **write** the words down. During teaching: The new concepts are put in the table with their meanings mismatched. The learners match the meanings to the new concepts to show that they understand their meanings. The teacher will consolidate and give an activity to the learners where the learners will compare the oblique and isometric drawings. The teacher will give the learners an activity where they will be given an oblique drawing which they must copy using the isometric grid paper.

PRE-ACTIVITY

The teacher dictates the words below to the learners. They then **listen** and **write** the words down.

Sketch	Oblique drawings	Graphic Communication	Conventions	Scale	Dimension

The teacher explains the origin of each word and the different meanings that the words might have in other contexts. Learners write down the meaning of the above words.

Activity 1

You had a discussion of the different meanings of concepts in the vocabulary section. The definitions below are mismatched. Rewrite the correct meanings, as applicable in the Technology subject, next to the words in the spaces given below.

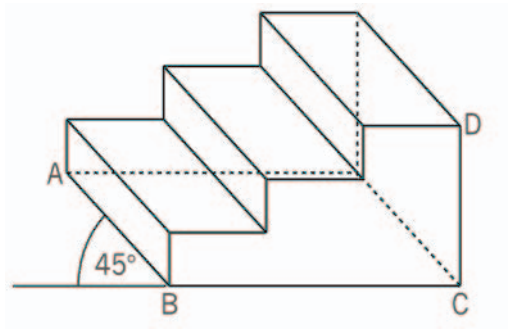
Words	Definitions
Isometric	A flat drawing in which only two principal dimensions (measurement) are visible (e.g. length and height).
3-Dimensional	It is the representation of the real-life size of an object on paper.
2-Dimensional	A pictorial drawing in which three principal dimensions are visible (e.g. length, height and width). Also, the three principal faces are visible in the drawing.
Scale	It is a three-dimensional drawing where the lines of sight are set at 30°. The parallel lines are of the same size.

Words	Definitions
Isometric	
3-Dimensional	
2-Dimensional	
Scale	

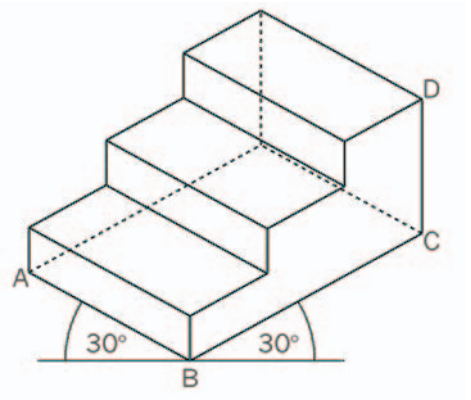
Words	Definitions
Isometric	It is a three-dimensional drawing where the lines of sight are set at 30°. The parallel lines are of the same size.
3-Dimensional	A pictorial drawing in which three principal dimensions are visible (e.g. length, height and width). Also, the three principal faces are visible in the drawing.
2-Dimensional	A flat drawing in which only two principal dimensions (measurement) are visible (e.g. length and height).
Scale	It is the representation of the real-life size of an object on paper.

Activity 2

The differences between a 3D oblique drawing and an isometric drawing are shown in the examples below. Both drawings are of the same object.



Oblique Drawing



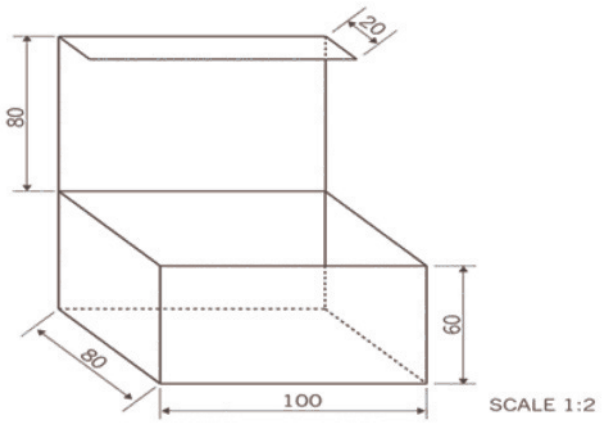
Isometric Drawing

The differences between a 3D oblique drawing and an isometric drawing are shown in the examples above. Both drawings are of the same object. Write down the differences as you see them.

Activity 3

1. Make an isometric drawing of the chalk box below on isometric grid paper. Use a scale of 1:4.

- Show hidden lines.
- Show dimensions.
- Show the scale



Technology: Grade 9

Exemplar lesson 5

<table>
<tr><td>Subject and grade</td><td colspan="2">Technology: Grade 9</td></tr>
<tr><td>Topic</td><td colspan="2">Structures: Properties of materials (forces)</td></tr>
<tr><td>Preamble</td><td colspan="2">During the teaching of this topic, the following language aspects will be highlighted: pronunciation, spelling, writing and reading (pictures explaining the terminology used during this lesson will be on the walls).</td></tr>
<tr><td>Pre-knowledge vocabulary</td><td colspan="2">Tick whether you understand the following concepts (they were covered in Grade 8).</td></tr>
<tr><td></td><td>Tension</td><td>A force that is able to stretch or pull something is called a tension force.</td></tr>
<tr><td></td><td>Compression</td><td>A force that squashes or compresses an object is called a compression force.</td></tr>
<tr><td></td><td>Torsion</td><td>A force that twists an object.</td></tr>
<tr><td></td><td>Shearing</td><td>A force that can change the shape of an object.</td></tr>
<tr><td>Reference to specific words: new terminology</td><td>Vocabulary</td><td>Meaning of words and context of use in the subject</td></tr>
<tr><td></td><td>Force</td><td>• A force is a push or a pull (push and pull are antonyms or opposites).
• In Technology, designers are concerned only with contact forces (e.g. a load) and the effect it has on a structure.</td></tr>
<tr><td></td><td>Static or stationary force</td><td>Static or stationary means ‘not moving’. These words are synonyms
When an object remains still on another object, the force is static.</td></tr>
<tr><td></td><td>Dynamic</td><td>When a moving object exerts a force on another object, the force exerted is dynamic.</td></tr>
<tr><td></td><td>Even load</td><td>A load that exerts an equal force over the whole structure that supports it is called an even load.</td></tr>
<tr><td></td><td>Uneven load</td><td>A load that mainly exerts a force over one part of the structure that supports it is called an uneven load.</td></tr>
<tr><td>During teaching</td><td colspan="2">• Learners should understand the terminology used.
• Listen to the educator.
• learners must demonstrate and present on the action of forces on materials.
• Differentiate in words between static and dynamic forces.</td></tr>
</table>

	• Differentiate between even and uneven loads. • **Write** down an enabling task.
Post-teaching and assessment	• Learners complete Activity 1 – Vocabulary. • Learners do Activity 2 – Worksheet, completed on the differences between the forces. • Assess the two activities informally.

LESSON SCRIPT (The following is said by the teacher)
"We did Forces in Grade 8, Term Two. Do you remember what the focus was? We focused on forces that act on materials (List them). They were tension, compression, bending, torsion and shearing forces. Can anyone demonstrate any of these concepts?" (Pause…Demonstrate all the forces using a sheet of paper).
During teaching: The new concepts are pasted on the wall and explained as part of the list of terminologies. As the lesson progresses, learners give their understanding of each term.

Note to the teacher: Emphasise to the learners that in the mathematics context, the concept of 'even' and 'uneven' will mean something else. For example, even numbers are divisible by two, while uneven (odd) are not divisible by two.

PRE-ACTIVITY
Match the meaning of the words with the correct terminology
An envelope containing the words and the meanings is given to each group. They will then match and present , whereby one learner per group will lift up the word and say it out loud and the next learner will present the meaning out loud (three minutes).
Learner worksheets are prepared along with card cut-outs with the words and meanings (below). Learners will match them (it is a quick check).

tension	A force that twists an object.
compression	A force that can change the shape of an object.
torsion	A force that can stretch or pull something apart.
shearing	A force that squashes or compresses an object.

Activity 1 (during the lesson):
Each group is given one card (concept) and asked to present their current understanding of the content (five minutes).

FORCE - EXPLANATION - (own understanding)
STATIC FORCE - EXPLANATION - (own understanding)
DYNAMIC FORCE - EXPLANATION - (own understanding)
EVEN LOAD - EXPLANATION - (own understanding)
UNEVEN LOAD - EXPLANATION - (own understanding)

(the understanding of the concepts to be consolidated at the end of the lesson)

The teacher explains the content using the pictures and activities

Figure 1. A boy sitting on a chair is exerting a pushing or compression force on the chair. As long as a person sits still on the chair, the force on the chair remains in the same place. This is called a stationary or static force.

Activity 2:

1. Work in pairs. Study the pictures on this page and discuss with your partner how the load acts on each structure.

Figure 2: A man walking on a roof.

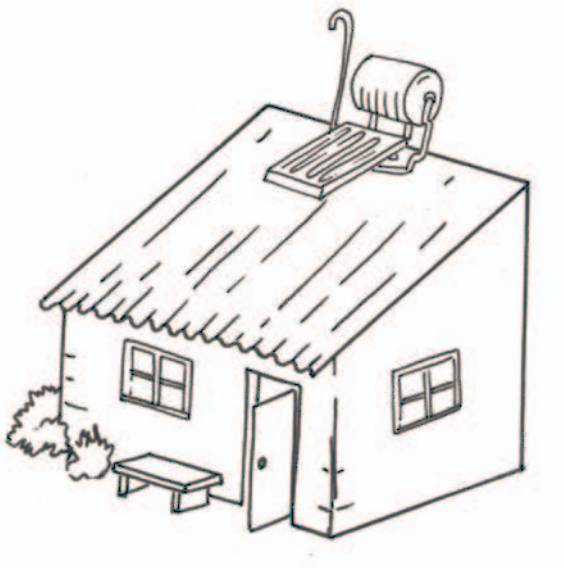


Figure 3: A solar heating system on a roof

2. (a) Is the load on the roof in Figure 2 always in the same place? Why do you say so?

(b) Is the load on the roof in Figure 3 always in the same place? Why do you say so?

Figure 4: Vehicles passing over a bridge

(c) Are the loads on the bridge in Figure 4 always in the same place? Why do you say so?

3. In Figure 4 above, the truck and the car exert forces on the bridge.
Can these forces also be called static? Explain why you say so.

4. When a moving object exerts a force on another object, you can say that the force is dynamic.
In each of the following cases, state whether the force exerted on the table is static or dynamic.
Explain why you say so in each case.

(a) A pot of flowers standing on the table.

(b) A cat walking on the table.

(c) A boy rolling a soccer ball on the table.

(d) A man scrubbing the table.

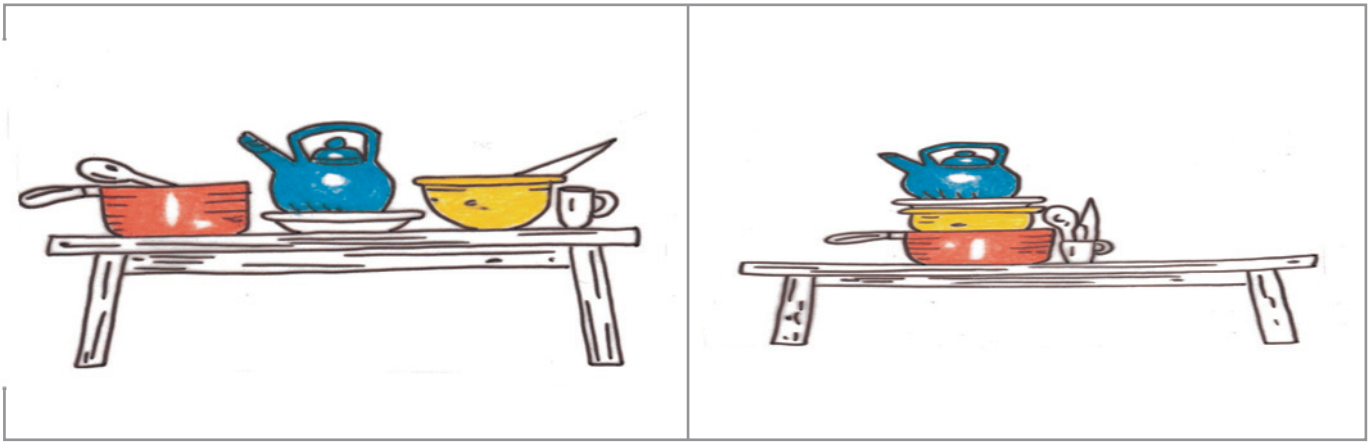


Figure 5: Different ways to place pots on a table.

5. What is the difference between the loads exerted on the two tables in Figure 5 above?

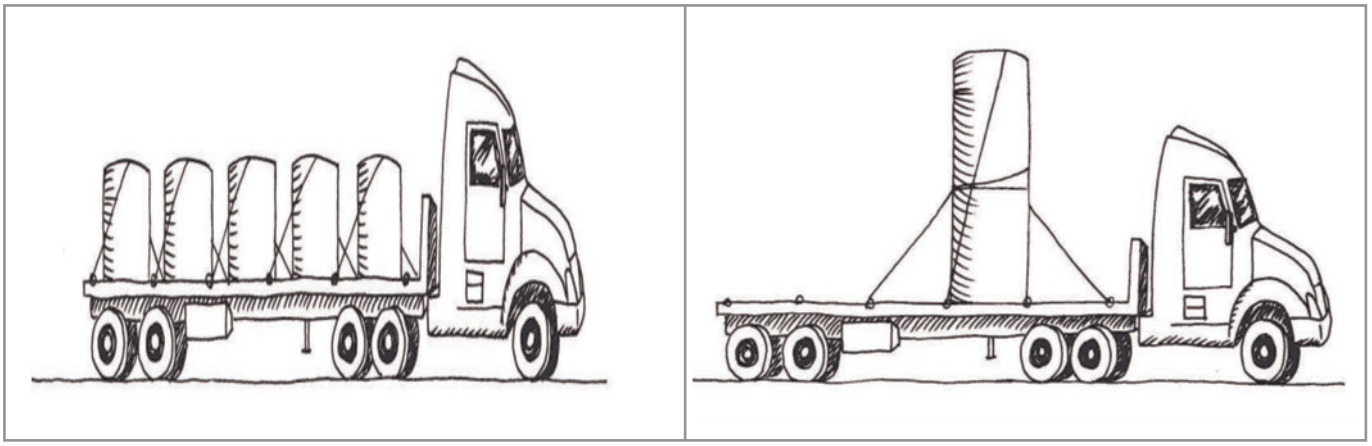


Figure 6: Different kinds of loads on two trucks.

6. Look at the different ways in which the two trucks above are loaded. On the one truck, the drums exert force everywhere on the cargo deck of the truck. On the other truck, the load is just one big drum. The single drum exerts a force on a small part of the cargo deck. A load that exerts an equal force over the whole structure that supports it is called an even load. A load that mainly exerts a force on one part of the structure that supports it is called an uneven load.

Think of a house with a zinc roof and the forces that the sheets exert on the roof structure.

(a) Is the load even or uneven? Why do you say so?

(b) Is the load static or dynamic? Why do you say so?

7. Think of people climbing up and down wooden steps.

(a) Is the load even or uneven? Why do you say so?

(b) Is the load static or dynamic? Why do you say so?

Teacher consolidates the lesson by pasting the vocabulary on the wall.

Engineering, Graphics & Design: Grade 10

Exemplar lesson 6

<table>
<tr><th>Subject and grade</th><th colspan="2">Engineering, Graphics & Design: Grade 10</th></tr>
<tr><td>Topic</td><td colspan="2">Isometric Drawing</td></tr>
<tr><td></td><td colspan="2">• Simple isometric drawings with isometric and non-isometric lines as well as auxiliary views</td></tr>
<tr><td>Preamble</td><td colspan="2">• Explaining EGD-related terminology to strengthen language skills.
• Reading information with understanding to be able to apply acquired drawing skills.
• Drawing on words used in EGD that mean something else in ordinary use or in other subjects (homonyms).</td></tr>
<tr><td>Pre-knowledge and acquired skills</td><td colspan="2">Topics and skills dealt with in the Annual Teaching Plan (ATP) thus far:
• General drawing principles including line work, lettering, annotation, dimensioning, freehand techniques, the correct use of drawing instruments (drawing board and T-square, 30º/ 60º set square, ruler, divider, compass), scale.
• Geometrical construction of regular polygons: triangle, square, pentagon, hexagon, octagon.
o Geometrical construction means the forming or constructing of shapes by only using straight lines and circles.
o Construction (to construct) means to draw shapes, angles and lines accurately
• Drawing orthographic views of castings from a given pictorial drawing: three-dimensional (3D) to two-dimensional (2D) with the focus on third angle orthographic projection (TAOP).</td></tr>
<tr><td>Pre-knowledge vocabulary</td><td colspan="2">In this lesson you will be exposed to the following terminology:</td></tr>
<tr><td></td><td>Draw</td><td>• What you as the learner must do with drawing instruments to answer a specific question.
• To produce a picture using drawing instruments to answer a specific question.</td></tr>
<tr><td></td><td>Convert</td><td>• To change one type of drawing into another specified type of drawing.</td></tr>
<tr><td></td><td>Orthographic view</td><td>• Orthographic view can be a front view, top view, left view or right view of an object.
o Ortho means straight, and graphic means drawing.
o The Greek root words orthos and grapho mean ‘correct’ and ‘to write’ respectively. An orthographic projection would therefore mean a ‘correctly rendered view’.</td></tr>
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<table>
<tr><td></td><td>
<table>
<tr><td>Scaling</td><td>• A standardised method of enlarging or reducing a particular drawing of an object to fit onto a specific drawing area. Drawing to scale.
This is different from the meaning of 'scaling a wall'.</td></tr>
<tr><td>Primary Dimensions</td><td>• Primary dimensions refer to height, width and depth.</td></tr>
<tr><td>Secondary dimensions</td><td>• Dimensions to be added together so as to get the total height, width and depth.</td></tr>
<tr><td>Construction lines</td><td>• Continuous thin lines, used as guiding lines to help you to draw the correct answer. Although these lines do not form part of the final answer, they must not be erased.</td></tr>
</table>
</td></tr>
<tr><td>Words that need to be aligned with an EGD focus</td><td>• Scale: Used to size a drawing of a particular object so that it can be enlarged or reduced to fit into a specific drawing area – not to be confused with a fish scale or a scale used to weigh objects ☺.
• Plane: Refers to a specific place onto which an object is projected. It does not refer to a plane that is used in woodwork to level a piece of wood.
• Hatching: The shading technique used to indicate parts of a drawing that have been sectioned. This has no reference to the hatching of eggs ☺.</td></tr>
<tr><td>Reference to specific words: new vocabulary</td><td>
<table>
<tr><th>Vocabulary</th><th>Meaning of words and context of use in the subject</th></tr>
<tr><td>Isometric</td><td>• Method of graphic representation of three-dimensional objects.</td></tr>
<tr><td>Isometric line</td><td>• A line that lies at 30° or is vertical. Measurements are made on these lines.</td></tr>
<tr><td>Non-isometric line</td><td>• A line that lies neither at 30°nor is vertical. Measurements cannot be made along non-isometric lines.
o Take note: 'Non' gives the clue that it is the opposite (neither…nor) of isometric.</td></tr>
<tr><td>Auxiliary view</td><td>• A way to determine an unknown dimension, through drawing a separate view. This view must be drawn to scale and blocked in, for you to be able to transfer dimensions into an isometric view.</td></tr>
<tr><td>Correct placement</td><td>• The isometric drawing must be placed according to the given views in the multi-view drawing.</td></tr>
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</td></tr>
</table>

	Lowest point	• The point indicated on an orthographic view that needs to correspond with the starting point on the answer sheet.
Drawing activity	• At least **six** different isometric drawings, which primarily consist of Daily Developmental Exercises (DDEs) are recommended for Grade 10. A couple of these DDEs will be marked as Course Drawings (CDs). • Drawing tasks should be sourced directly from EGD textbooks. • To ensure that all isometric drawings comply with test and examination requirements and standards, all isometric drawings must be tasks that are completely redrawn.	
During teaching	At the end of the lesson the learners should be able to: • Understand the terminology. • Use drawing equipment effectively to apply drawing skills. • Be able to use auxiliary views for finding unknown dimensions. • Be able to convert orthographic views into isometric drawings. Reference to available CAPS-compliant textbooks: • HSE: Johan Engelbrecht. • Mind Action Series (Allcopy Publishers): J. van Leeuwen & D. du Plooy. • Benade.	
Post-teaching	Assessment strategy: **Daily Developmental Exercises** (DDEs) • If used as informal drawings, the marker indicates all the mistakes on the drawing so that corrections can be made by the learner (corrective intervention). **Course Drawings** (CDs) • It is recommended that more than one DDE are used to obtain the recorded CD mark. • DDEs that are used as formal drawings are marked with the 7/3 scale rubric or with the multi-view rubric. • CDs provide learner evidence that the topic is covered and form part of the recorded SBA mark. **Class test** • Formal or informal tests are marked with a formal marking guideline (memorandum). **Term Test** • Formal tests are marked with a formal marking guideline.	

	Paper 2 Examination Question • Isometric drawings form part of Examination Paper 2. Examinations are marked with a formal marking guideline.

	Paper 2 Examination Question • Isometric drawings form part of Examination Paper 2. Examinations are marked with a formal marking guideline.

LESSON SCRIPT

Introduction to the topic: Simple isometric drawings with isometric and non-isometric lines as well as auxiliary views.

Explain what isometric drawing is (the method of graphic representation of three-dimensional objects) and where it fits into the EGD curriculum (isometric drawings form part of Examination Paper 2 and therefore information given in any exercise will be given in third angle orthographic projection).

During teaching: The following drawing will be discussed.
A typical drawing question will be given. The provided drawing will be analysed and explained by the following general steps.

Slide 1: The typical layout of any isometric question is given.
The focus here is to read the question and to analyse the given information. That is, what is given and what is required as an answer.
The learner needs to orientate the given orthographic views (to know which view is the front view and which view is the top view), as this is crucial in determining the placement of the isometric drawing.
Slide 2: Start the answer by establishing the three primary dimensions, i.e. height, width and depth. Use this information and draw the block in construction lines. This block represents the parameters in which the answer will fit.
Make sure that the block is orientated so that it starts on the given lowest point of the drawing.
Slide 3: Detailing starts by showing the secondary dimensions in the isometric block.
Slide 4: More detail is added and the front view starts to form.
Slide 5: More detail is added and the top view starts to emerge.
Slide 6: More detail is added and the ribs are formed.
Slide 7: All detailing is complete and the answer can be drawn in continuous dark lines. It is important not to erase any of the construction lines, as this was a requirement stated in the instructions.
Slide 8: The marking guideline is shown.

Engineering, Graphics & Design: Grade 11

Exemplar lesson 7

<table>
<tr><td>Subject and grade</td><td>Engineering, Graphics & Design: Grade 11</td></tr>
<tr><td>Topic</td><td>Isometric Drawing
• Simple to complex isometric drawings with isometric and non-isometric lines as well as auxiliary views and circles.</td></tr>
<tr><td>Preamble</td><td>• Explaining EGD-related terminology to strengthen language skills.
• Reading with understanding to be able to apply acquired drawing skills.</td></tr>
<tr><td>Pre-knowledge vocabulary and skills</td><td>Topics and skills mastered in lower grades:
• General drawing principles including line work, lettering, annotation, dimensioning, freehand techniques, the correct use of drawing instruments (drawing board and T-square, 30º/ 60º set square, ruler, divider, compass), scale.
• Geometrical construction of regular polygons: triangle, square, pentagon, hexagon, octagon.
• Drawing orthographic views of castings and objects from industry from a given pictorial drawing: three-dimensional (3D) to two-dimensional (2D) with the focus on third angle orthographic projection (TAOP).
• Simple isometric drawings with isometric and non-isometric lines as well as auxiliary views.</td></tr>
<tr><td>Pre-knowledge vocabulary</td><td>In this lesson you will be exposed to the following terminology:
<table>
<tr><td>Draw</td><td>• What you as the learner must do with drawing instruments to answer a specific question.
• To produce a picture using drawing instruments to answer a specific question.</td></tr>
<tr><td>Convert</td><td>• To change one type of drawing into another specified type of drawing.</td></tr>
<tr><td>Orthographic view</td><td>• Orthographic view can be a front view, top view, left view or right view of an object.</td></tr>
<tr><td>Scaling</td><td>• A standardised method of enlarging or reducing a particular drawing of an object to fit onto a specific drawing area. Drawing to scale.</td></tr>
<tr><td>Primary Dimensions</td><td>• Primary dimensions refer to height, width and depth.</td></tr>
<tr><td>Secondary dimensions</td><td>• Dimensions to be added together so as to get the total height, width and depth.</td></tr>
<tr><td>Construction lines</td><td>• Continuous thin lines used as guiding lines to help</td></tr>
</table></td></tr>
</table>

		you to draw the correct answer. Although these lines do not form part of the final answer, they must not be erased.
Words that need to be aligned with an EGD focus	• **Scale**: Used to size a drawing of a particular object so that it can be enlarged or reduced to fit into a specific drawing area – not to be confused with a *fish scale.* • **Plane**: Refers to a specific place onto which an object is projected. It has no reference to *a plane that is used in woodwork* to level a piece of wood. • **Hatching:** The shading technique used to indicate parts of a drawing that have been sectioned. This has no reference to the *hatching of eggs.*	
Reference to specific words: new terminology	• **Isometric circle**: construction of the circle using the 4-midpoint method to indicate circles and arcs in the isometric drawing.	
Drawing activity	• Grade 11 requires a minimum of **seven** isometric drawings, which primarily consist of Daily Developmental Exercises (DDEs), of which a couple will become Course Drawings (CDs). • Drawing tasks should be sourced directly from EGD textbooks. • To ensure that all isometric drawings comply with test and examination requirements and standards, all isometric drawings must be tasks that are completely redrawn.	
During teaching	At the end of the lesson the learners should be able to: • Understand the terminology. • Apply drawing skills (effective use of drawing instruments). • Be able to convert orthographic views into isometric drawings. • Be able to use auxiliary views for finding unknown dimensions. • Be able to produce isometric drawings that include isometric lines, non-isometric lines and isometric circles. Reference to available CAPS compliant textbooks: • HSE: Johan Engelbrecht. • Mind Action Series (Allcopy Publishers): J. van Leeuwen & D. du Plooy.	

Post-teaching	Assessment strategy: **Daily Developmental Exercises** (DDEs) • If used as informal drawings, the marker indicates all the mistakes on the drawings so that corrections can be made by the learner (corrective intervention). **Course Drawings** (CDs) • It is recommended that more than one DDE are used to obtain the recorded CD mark. • DDEs that are used as formal drawings are marked with the 7/3 scale rubric or with the multi-view rubric. • CDs provide learner evidence that the topic is covered and form part of the recorded SBA mark. **Class test** • Formal or informal tests are marked with a formal marking guideline (memorandum). **Term Test** • Formal tests are marked with a formal marking guideline. **Paper 2 Examination Question** • Isometric drawings form part of Examination Paper 2. Examinations are marked with a formal marking guideline.

LESSON SCRIPT

Introduction to the topic: Simple to complex isometric drawings with isometric and non-isometric lines as well as auxiliary views and circles.

Explain what isometric drawing is (the method of graphic representation of three-dimensional objects) and where it fits into the EGD curriculum (isometric drawings form part of Examination Paper 2 and therefore information given in any exercise will be given in third angle orthographic projection).

During teaching: The following drawing will be discussed.
A typical drawing question will be given. The provided drawing will be analysed and explained by the following general steps.
Slide 1: The typical layout of any isometric question is given.
The focus here is to read the question and to analyse the given information. That is, what is given and what is required as an answer.

The learner needs to orientate the given orthographic views (to know which view is the front view, which view is the top view and which is the left view) as this is crucial in determining the placement of the drawing.

Slide 2 : Start the answer by establishing the three primary dimensions, i.e. height, width and depth.
Use this information and draw the block in construction lines. This block represents the parameters in which the answer will fit.
Make sure that the block is orientated so that it starts on the given lowest point of the drawing.
Auxiliary views are drawn to the required scale of aspects of the drawing where dimensions are not known.

Slide 3 :Detailing starts by showing the secondary dimensions in the isometric block.

Slide 4 : More detail is added and the front view starts to form.

Slide 5 : More detail is added and the top view starts to emerge.

Slide 6 : More detail is added with the focus on the isometric arcs. The construction of the isometric circle is important (note that the isometric circle construction is not the same as the construction for the ellipse).

Slide 7 : All detailing is complete and the answer can be drawn in continuous dark lines. It is important not to erase any of the construction lines, as this was a requirement stated in the instructions.

Slide 8 : The marking guideline is shown.

Engineering, Graphics & Design: Grade 12

Exemplar lesson 8

<table>
<tr><th>Subject and grade</th><th>Engineering, Graphics & Design: Grade 12</th></tr>
<tr><td>Topic</td><td>Isometric Drawing
• Complex isometric drawings with isometric and non-isometric lines as well as auxiliary views, circles and sections.</td></tr>
<tr><td>Preamble</td><td>• Explaining EGD-related terminology to strengthen language skills.
• Reading information with understanding to be able to apply acquired drawing skills.</td></tr>
<tr><td>Pre-knowledge and acquired skills</td><td>Topics and skills mastered in lower grades:
• General drawing principles including line work, lettering, annotation, dimensioning, freehand techniques, the correct use of drawing instruments, scale.
• Geometrical construction of regular polygons, as well as the construction of isometric circles and arcs.
• Drawing orthographic views of objects from a given pictorial drawing: three-dimensional (3D) to two-dimensional (2D) with the focus on third angle orthographic projection (TAOP).
• Simple to complex isometric drawings with isometric and non-isometric lines, as well as auxiliary views and circles.</td></tr>
<tr><td>Pre-knowledge vocabulary</td><td>In this lesson you will be exposed to the following terminology:
<table>
<tr><td>Draw</td><td>• What you as the learner must do with drawing instruments to answer a specific question.
• To produce a picture using drawing instruments to answer a specific question.</td></tr>
<tr><td>Convert</td><td>• To change one type of drawing into another specified type of drawing.</td></tr>
<tr><td>Orthographic view</td><td>• Orthographic view can be a front view, top view, left view or right view of an object.</td></tr>
<tr><td>Scaling</td><td>• A standardised method of enlarging or reducing a particular drawing of an object to fit onto a specific drawing area.</td></tr>
<tr><td>Primary Dimensions</td><td>• Primary dimensions refer to height, width and depth.</td></tr>
<tr><td>Secondary dimensions</td><td>• Dimensions to be added together so as to get the total height, width and depth.</td></tr>
<tr><td>Construction lines</td><td>• Continuous thin lines, used as guiding lines to help you to draw the correct answer. Although these lines</td></tr>
</table></td></tr>
</table>

		do not form part of the final answer, they must not be erased.
	Isometric circle	• Construction of the circle using the 4-midpoint method, to draw circles and arcs in an isometric drawing.
Words that need to be aligned with an EGD focus	• **Scale**: Used to size a drawing of a particular object so that it can be enlarged or reduced to fit into a specific drawing area – not to be confused with a *fish scale.* • **Plane**: Refers to a specific place onto which an object is projected. It has no reference to *a plane that is used in woodwork* to level a piece of wood. • **Hatching:** The shading technique used to indicate parts of a drawing that have been sectioned. This has no reference to the *hatching of eggs.*	
Reference to specific words: new terminology	• **Cutting plane**: The line used to show where a surface is cut, so that hidden detail is exposed, or for clarity purposes. • **Hatching**: lines to indicate/ shade cut surfaces.	
Drawing activity	• Grade 12 requires a minimum of **eight** isometric drawings, which primarily consist of Daily Developmental Exercises (DDEs), of which a couple will become Course Drawings (CDs). • Drawing tasks should be sourced directly from EGD textbooks. • To ensure that all isometric drawings comply with test and examination requirements and standards, all isometric drawings must be tasks that are completely redrawn.	
During teaching	At the end of the lesson the learners should be able to: • Understand the terminology. • Apply drawing skills (effective use of drawing instruments). • Be able to convert orthographic views into isometric drawings. • Be able to use auxiliary views for finding unknown dimensions. • Be able to produce isometric lines, non-isometric lines, isometric circles and sections. Reference to available CAPS-compliant textbooks: • HSE: Johan Engelbrecht. • Mind Action Series (Allcopy Publishers): J. van Leeuwen & D. du Plooy.	
Post-teaching	Assessment strategy:	

	Daily Developmental Exercises (DDEs): • If used as informal drawings, the marker indicates all the mistakes on the drawing so that corrections can be made by the learner (corrective intervention). **Course Drawings** • It is recommended that more than one DDE are used to obtain the recorded CD mark. • DDEs that are used as formal drawings are marked with the 7/3 scale rubric or with the multi-view rubric. • CDs provide learner evidence that the topic is covered and forms part of the recorded SBA mark. **Class test** • Formal or informal tests are marked with a formal marking guideline (memorandum). **Term Test** • Formal tests are marked with a formal marking guideline. **Paper 2 Exam Question** • Isometric drawings form part of Examination Paper 2. Examinations are marked with a formal marking guideline.

LESSON SCRIPT

Introduction to the topic: Complex isometric drawings with isometric and non-isometric lines as well as auxiliary views, circles and sections.

Explain what isometric drawing is (the method of graphic representation of three-dimensional objects) and where it fits into the EGD curriculum (isometric drawings form part of Examination Paper 2 and therefore information given in any exercise will be given in third angle orthographic projection).

During teaching: The following drawing will be discussed.
A typical drawing question will be given. The provided drawing will be analysed and explained by the following general steps.

Slide 1 : The typical layout of any isometric question is given.
The focus here is to read the question and to analyse the given information: That is, what is given and what is required as an answer.
The learner needs to orientate the given orthographic views (to know which view is the front view, which view is the top view and which is the left view) as this is crucial in determining the placement of the drawing.

Slide 2 : Start the answer by establishing the three primary dimensions, i.e. height, width and depth.
Use this information and draw the block in construction lines. This block represents the parameters in which the answer will fit.
Make sure that the block is orientated so that it starts on the given lowest point of the drawing.
Auxiliary views are drawn to the required scale of aspects of the drawing where dimensions are not known.

Slide 3 : Detailing starts. The isometric circle is constructed.
Slide 4 : More detail is added. The hexagonal pyramid is constructed.
Slide 5 : More detail is added and the top view starts to emerge.
Slide 6 : More detail is added with the focus on the sectioned area.
Slide 7 : All detailing is complete and the answer can be drawn in continuous dark lines. It is important not to erase any of the construction lines, as this was a requirement stated in the instructions.
Slide 8 : Insert the hatching lines to complete the answer.
Slide 9 : The marking guideline is shown.

Religion Studies: Grade 10

GUIDELINES FOR RELIGION STUDIES

The following guidelines will be useful in teaching the exemplar lessons:

- Clarify old terms/ concepts/ words (prior vocabulary) before a new topic is taught.
- List the new vocabulary and clarify it for the learners. This new list of vocabulary could either consist of subject-specific terms or English-specific terms.
- It is always important to highlight that albeit that a word is an English word, it may be used differently from a religious perspective. Examples of this are the following English words: identity, uniqueness, similarity, difference. These words are used within a religious perspective, such as religious identity, religious uniqueness, etc., instead of in general terms.
- All terminology, concepts and words have been highlighted throughout in texts and activity sheets in the exemplar lessons. The expectation is that learners will clarify a term/ concept/ word within the text or question before they move on.
- RS must always be taught from the view of an impartial spectator looking in from the outside to observe the beliefs and practices across the eight prescribed religions.
- Learners encounter various names and terms the various religions use for practices, beliefs or items used. It is critical that these terms and concepts - such as The Golden Rule, Hadith, Muttah, etc. - are clarified throughout the learning and teaching process.
- The teacher has to encourage the use of the dictionary or thesaurus on smartphones to enable learners to build their general and religion-related vocabulary.
- During the teaching and learning process, the teacher needs to be aware of which terms, words or concepts are unfamiliar to the learners. The teacher should ensure that learners are made aware of the different uses and meanings of these words in order to extend their vocabulary.
- Lists of words must be prepared for each topic to assist the learners to either understand words or search for words before the lesson.
- It would also be useful to include word games in the teaching and assessment process.

Religion Studies: Grade 10

Exemplar lesson

Subject and grade	Religion Studies: Grade 10	
Topic	**Variety of religions:** Religions – their beginnings and development.	
Duration	Two weeks (eight periods).	
Preamble	• How to teach language aspects. • Reading and listening in the subject.	
	• Comprehension skills.	
Methodology	• Learner-centred approach (interactive learning). • The teacher is the facilitator.	
New terminology	• **Abrahamic religions**	Judaism, Christianity, Rastafarianism and Islam are called **Abrahamic** because they all regard Abraham as an important founder.
	• **Indian (Dharmic) religions**	These are religions that originated on the subcontinent of India, e.g. Hinduism, Buddhism, Sikhism and Jainism.
	• **Indigenous religions**	These are religions which developed among people who were the original inhabitants of a region or who have lived there for a very long time, and which, if they still exist, are practised only by the originating culture., e.g. religions of the Native Americans, Celtic religions and Aboriginal religions.
	• **African religions**	These are the African traditional religions and African Initiated Churches that developed in different parts of Africa at different times.
	• **Religions of East Asia**	These are religions which originated in East Asia, e.g. Taoism, Confucianism and Shinto.
	• **Missionaries**	A person sent on a religious mission, especially one sent to promote Christianity in another country.
	• **Colonisation**	A process where representatives of one culture establish control over the land, resources and indigenous people of another territory, usually by force.
	• **Archaeology**	The study of human history and prehistory through the excavation of sites and the analysis of artefacts and other physical remains.
	• **Artefact**	An object made by a human being, typically one of cultural or historical interest.
Language skills	• Listening skills; • Reading skills; • Writing and presenting.	
Knowledge	• Explore the clusters of religions in the world. • Trace how each of the religions started. • Discover how the major religions started in South Africa.	

Skills	• Reading and understanding of graphs (analytical skills). • Research skills. • Critical thinking skills, evaluation skills, application skills.
Values	• Religious tolerance. • Respect for diversity. • Respect for uniqueness.

PERIOD 1	
Teacher Activities	**Learner Activities**
Activity 1: Baseline Assessment Ice-breaker: • The teacher will give each learner a copy of **Source A.** • The learners should be given five minutes to move around and complete the list as quickly as possible. • Their responses may have as many names of their peers and religions as they wish. • After the completion of the exercise, the teacher should collate the responses by asking the learners to raise their house if a statement applies to them. **Note to the teacher:** In every block there are new/ unfamiliar words. After the completion of the exercise, the teacher may go through the highlighted words to explain their meaning.	**Activity 1:** • The learners need to complete Source A by asking their peers the questions that are on the activity sheet. • They should jot down the name of the learner and the religion that represents the statement in the block. • On completion of the exercise the learners may shout: DONE!
Activity 2: Brainstorming Prior content knowledge: • Ask the learners to list all the religions that they know in South Africa. • If possible, ask them to mention the main religions and the branches of these religions, e.g. Christianity – Catholicism.	
Activity 3: Individual work	**Activity 3:**

• Teacher distributes **Source B** and mediates the information with the learners. • All words that are written in bold letters within any text or question MUST be clarified for the learner. • Feedback on the activity will be provided in the next period.	• Learners receive Source B and are required to complete the task in class. • The worksheet should be pasted inside their Religion Studies notebook.
PERIOD 2	
Activity 4: • The teacher must guide the learners on the interpretation of the graph. • The teacher has to emphasise that sometimes information will be presented in graph form and the learners will be required to build a story from it. **Note to teacher:** Certain EAC terms were included purposefully in the questions to build vocabulary. These need to be clarified for the learners.	**Activity 4: Individual work** Learners use Source B to complete the task.
PERIOD 3	
Activity 5: Pair work • The teacher will read the **Source C** text aloud to the learners. • The teacher will clarify those words that are unfamiliar to the learners. • There are words that have been highlighted in bold. • The teacher is required to check with the learners if they know the words, if not the teacher has to clarify the words.	**Activity 5:** • The learners will listen and note the words that are unfamiliar. • The learners will try to clarify the words. • Before attempting the task, the learners will work with a partner and read the extract once more to enable them to answer the questions that follow.
PERIOD 4	
Activity 6: Group work (six learners)	**Activity 6:**

Source D Teacher to mediate the content.	• Learners to complete the task in groups. • Learners to present the information to the class. • Posters/ Charts to be pasted on the wall for a gallery walk. • Learners to write notes of the origins of each discussed religion in their RS books.
PERIOD 5	
Activity 7 **Source E** Teacher mediates the task.	**Activity 7** Small groups (four learners). Learners conduct group discussions.
PERIOD 6–7 Revision	
Activity 7 The teacher recaps the content covered.	
PERIOD 8–10 Informal Assessment	
The teacher designs an **informal task** for the learners.	• Learners complete the informal assessment. • Learners assess each other's work.
PERIOD 11 Formal Assessment	
Source F ▪ The teacher designs a **formal task** for the learners. ▪ The teacher assesses the task. NB: Exemplar provided.	• Learners write a short test or complete an SBA activity related to this topic. • Exemplar provided for SBA task.
PERIOD 12 Remediation	
• The teacher conducts a diagnostic analysis of the results and designs and mediates an intervention strategy to remediate the content/ aspects that the learners found challenging.	• Learners who failed the test are given expanded opportunities to grasp the content.

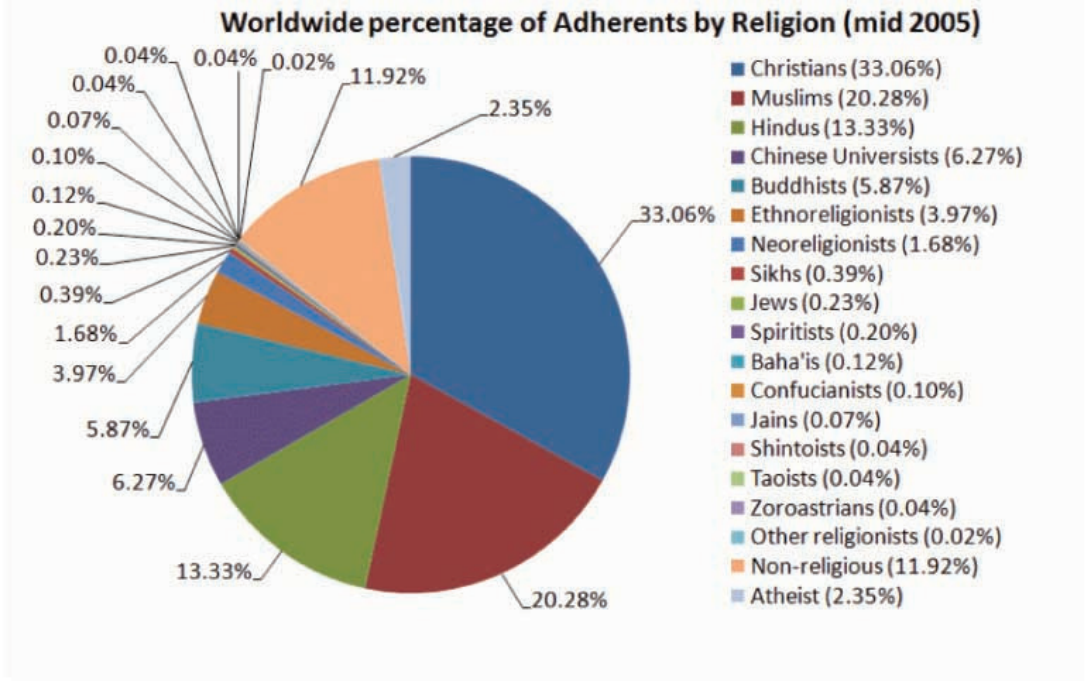
Activity 1: Ice breaker

Source A – Individual activity

Complete the table below by placing the names of as many classmates and religions as possible in a block. When you have completed all the blocks you should shout DONE!

We go to church on a Saturday Religion:	We celebrate the **Passover** Religion:	We **fast** for 40 days every year Religion:	We **confess** our sins to the priest Religion:
Our leader is the Pope Religion:	Our babies are circumcised within the first week after birth Religion:	We conduct our religious services in the veld Religion:	Our religious text is the **Qur'an** Religion:
We believe in the Old Testament Religion:	We call our God **Jehovah** Religion:	We don't eat red meat Religion:	We observe **Ascension Day** Religion:
We receive ashes on **Ash Wednesday** Religion:	We pray in a **mosque** Religion:	We wear **hijab** Religion:	We smoke cannabis and see it as a **holy herb** Religion:
We only eat **halaal** food Religion:	The men wear a **fez** Religion:	We honour the **Sabbath** Religion:	We believe in **ancestors** Religion:
We visit Jerusalem on pilgrimage Religion:	We celebrate **Ramadan** Religion:	We don't know if God exists Religion:	We think science is in a better position to explain creation Religion:

We think religion and the state should be separate Religion:	We throw **libation** Religion:	We pray to **Yahweh** Religion:	We visit Mecca on **pilgrimage** Religion:
Our food must be **kosher** Religion:	Caring for humans is more important than religion Religion:	All wealth should belong to the people – not to the state or religion/ church Religion:	We believe that the world came into being after a big explosion called the **Big Bang** Religion



Source:https://www.google.co.za/search?q=the+spread+of+world+religion+images&tbm=isch&source

Source B: Religions of the world – Individual work

Study the graph above and answer the following questions:

1. Which religion can be viewed as the **predominant** religion in the world? Provide **statistical** evidence

2. List the five religions that have the least followers.
3. The religions of the world are grouped into different clusters. Complete the table below by inserting the above-named religions into the applicable clusters.
4. the world? Provide statistical evidence

Abrahamic religions	Indian religions	Indigenous religions	African religions	Religions of East Asia

5. What is the percentage of non-religious people in the world?
6. Religions are expanding daily. Choose one religion and give a brief account of its expansion process in the last five years?
7. Critically discuss the reasons for the expansion of religions.
8. African Traditional Religions/ Indigenous African Churches are not included in the list above. Critically discuss why this is the case.

Source C: Pair work

Read the text below and answer the questions that follow in your Religion Studies notebook:

Prehistoric religions

Prehistoric religions are the religious beliefs and practices of prehistoric peoples. **Archaeology** has contributed greatly to the understanding of prehistoric religions.

A number of archaeologists have proposed that **Middle Paleolithic** societies such as **Neanderthal societies** may have practised early forms of animal worship.

Intentional burial, particularly with grave goods, may be one of the earliest detectable forms of religious practice since, if people were buried with their tools, food or valuables, it suggests strongly that the people who buried them had some idea of an existence after death. One archaeologist studying **Neolithic** figurines and early art depicting the first women as goddesses and bulls as gods has suggested that they reflect the evolution of **perception** and notions of religion. The structures known as **Circular Enclosures** built in Central Europe during the 5th **millennium BCE** have been interpreted as serving a **cultic function**. Many of these structures had openings aligned with sunset and/or sunrise at the **solstices**, suggesting that they served as a means of maintaining a **lunisolar calendar**. The theory is that the people needed such a calendar to know when to have rituals or similar practices. The construction of Megalithic monuments in

The theory is that the people needed such a calendar to know when to have rituals or similar practices. The construction of **Megalithic monuments** in Europe also began in the 5th millennium and continued throughout the Neolithic and in some areas well into the early Bronze Age. Megaliths have been found in many other places in the world, including Africa. Archaeologists believe many had some purpose connected to time or astronomy and may have been connected to religion. Hints to the religion of Bronze Age Europe include images of **solar barges**, the frequent appearance of the Sun cross, deposits of bronze axes and later **sickles**, so-called moon idols, the **conical golden hats**, the **Nebra sky disk**, and burial in **tumuli**, but also **cremation** as practised by the **Urnfield culture**.

While the Iron Age religions of the Mediterranean, Near East, India and China are well attested in written sources, much of Iron Age Europe, from the period of about **700 BCE** down to the Great Migrations, falls within the prehistoric period. There are scarce accounts of non-Mediterranean religious customs in the records of Hellenistic and Roman-era **ethnography**.

Main source: https://en.wikipedia.org/wiki/Prehistoric_religion

Answer the following questions.

1.1 What is meant by the following:

a. Archaeology;

b. Archaeologist;

c. Archaeological material.

1.2 Provide three examples of archaeological materials.

1.3 When one speaks about **prehistoric eras**, the abbreviations BCE and BC are indicated after the era, e.g. 700 **BCE and** 300 **BC.** What do the following abbreviations mean in relation to historic timelines?

1.3.1 BCE

1.3.2 BC

1.3.3 AD

1.3.4 CE

2.1 From the article it is said that religions existed even in **prehistoric times.** What does the word prehistoric mean?

2.2 Discuss in a short paragraph what evidence has been found that suggests that religions could have existed in earlier times?

2.3 **Lunisolar** calendars were used in the **5th millennium**:

2.3.1 Break down the word **lunisolar** to clarify its meaning.

2.3.2 What timeline does the **5th millennium signify**?

2.4 Modern-day calendars:

2.4.1 Which calendar do we follow? Who developed it?

2.4.2 Discuss briefly how our modern-day calendar **operates/ functions.**

2.4.3 Most religious festivals are determined by either a lunar or solar calendar. Distinguish between these two types of calendars and explain how they impact on the dates of various religious festivals.

Source D:
Group activity.

Instructions:

- Work in religious groupings to complete the table below.
- Those who do not belong to a religion may join a group of their choice.
- The template should be copied onto chart paper.
- A leader must present the task to the class.
- Charts to be pasted on the wall after the presentations.
- Conduct a gallery walk to view each religion's feasts and/ or celebrations.

SECTION A: (Christianity, Islam, Judaism, African Traditional Religions) - Group work

	Feast 1	Feast 2	Feast 3	Feast 4	Feast 5
Name of the feast?					
When each year?					
Its importance?					
Practices?					
Food for the feast?					
Other					

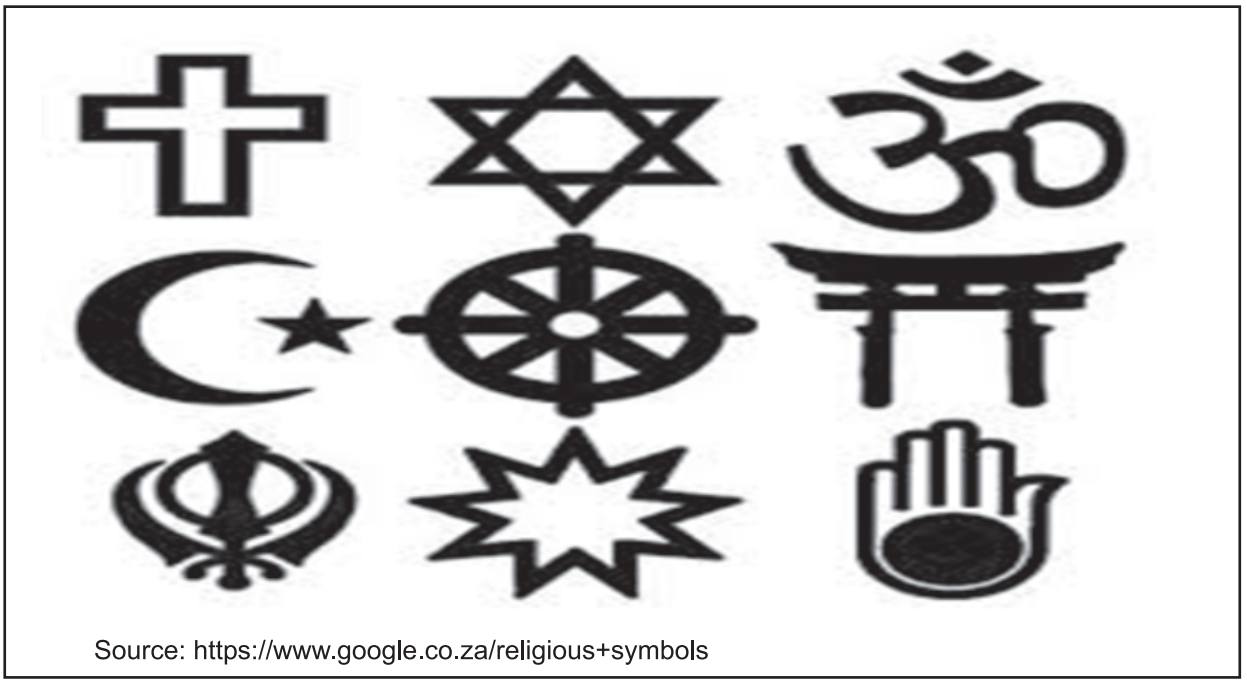
SECTION B: (Buddhism, Hinduism, Taoism, Baha'i) - Individual work

	Feast 1	Feast 2	Feast 3	Feast 4	Feast 5
Name of the feast?					
When each year?					
Its importance?					
Practices?					
Food for the feast?					
Other					

Source E - The origins of religions in South Africa

Instructions:

- Each group (four members) must complete the table below on a poster/ chart paper.
- A leader must be chosen to present the information to the class.
- The headings of the table should be used as a guide.
- Chart paper should be utilised and the charts should be pasted on the wall after the presentation.
- Each group will be assigned one of the religions below. These are religions found in South Africa.



Source: https://www.google.co.za/religious+symbols

In South Africa, the following religions exist: African Traditional Religions, Buddhism, Christianity, African Initiated Churches, Hinduism, Islam and Judaism. In your group discuss the development of religions in South Africa by completing the table below:

Religion	Roots/Origin	Symbol used	Year of inception	Beliefs and practices	Influenced by which other religion?

In your group discuss the following:

a. What impact did the introduction of religion in South Africa have on the indigenous people?
b. Critically evaluate how the effect would have been if religion was never introduced to South Africa.

Source F Formal Assessment

Conduct research in which you trace the development of religions in South Africa over the centuries. In your report you need to focus on:

a. a historical overview of developments;
b. the influence of different cultures with their own religions; and
c. providing pictures of archaeological evidence to support the claim that indigenous people practised various forms of religion before the colonisation period.

Religion Studies: Grade 11

Exemplar lesson 10

Subject and grade	Religion Studies: Grade 11	
Topic	**Common features of religion as a generic and unique phenomenon** Types of rituals and their role in religions.	
Duration	Two weeks (eight periods).	
Resources	• Newspaper clips; • Textbooks; • Poster paper; • Felt-tip pens.	
Preamble	• How to teach language aspects. • Reading in the subject.	
Methodology	• Learner-centred approach (interactive learning). • The teacher is the facilitator.	
Pre-knowledge vocabulary ocabulary:	• **Ritual**	Ceremonial acts in a religion that mark rites of passage.
	• **Rite of passage**	A ceremony or event marking an important stage in someone's life, especially birth, the transition from childhood to adulthood, marriage and death.
	• **Religious ritual**	• A ceremony or action performed in a customary way. Customary ways of celebrating a religion or culture. Different communities have different ritual practices, like meditation in Buddhism or baptism in Christianity.
	• **Mysticism**	Mystics are people who have a strong connection with the divine. These people have removed themselves from the everyday world to devote themselves to their religion.
New terminology	• **Solemn**	Behaviour marked by the invocation (prayer/ supplication/ request) of a religious sanction (approval/ agreement).
	• **Transitional**	Movement, passage or change from one position, state, stage, subject, concept, etc., to another. Example of change: *the transition from adolescence to adulthood.*
	• **puberty**	Puberty is the process of physical changes through which a child's body matures into an adult body capable of sexual reproduction.
	• **Icon**	A picture of a holy figure or symbol.
	• **Shrine**	A sacred place where people come to pray.

	• **Relic**	A piece of bone or another part of the body of a holy person who has died.
	• **Altar**	Flat-topped block or table usually at the front of a sacred place.
Language skills	• Listening skills; • Reading and viewing; • Writing and presenting; • Research skills; • Note-taking skill.	
Knowledge	• Distinguishing different kinds of rituals. • Distinguishing the variety of roles of ritual in religion. • Links between rituals and various religions.	
Skills	• Note-taking skills; • Evaluation skills; • Comparing and contrasting; • Critical thinking skills;; • Summary writing skills.	
Values	• Respect for self/ others; • Religious tolerance; • Respect for diversity.	

Teacher Activities	**Learner Activity**
PERIOD 1	**PERIOD 1**
Activity 1: Brainstorm vocabulary list • The teacher will conduct a baseline assessment to determine prior vocabulary knowledge. • All the difficult words will be clarified by the teacher throughout the teaching process.	**Activity 1:** • Baseline assessment on the learners' understanding of the concepts and terminology stated above.
Activity 2: Baseline Assessment	**Activity 2:**

Prior content knowledge: **Rites of passage** **Listening activity** – Source A • Divide learners into small groups of four. • Provide each group with some questions. • Read a short passage aloud (three times) to the learners about the rites of passage to activate prior content knowledge. • Mediate questions to the learners to ensure that they understand the instructions of the activity. • Provide them with poster paper/ chart paper, pens and Prestik.	• Learners will sit in groups of four as divided by the teacher. • Learners will choose a leader who will lead the discussion. • They will listen attentively to the passage read. • Every group will write their answers on the provided chart to present to the class. • Chart papers will be displayed on the classroom walls. • Learners will be expected to copy the final draft into their RS notebooks.
PERIOD 2	**PERIOD 2**
Activity 3: **Introduction** **Source B** • The teacher introduces the new content on **Rituals.** by explaining what rituals are, why, when, where and by who are they performed. • The teacher will emphasise the **roles** of the rituals and how they are performed. **Pair work use Source B** • The teacher must mediate Source B to the class and pair learners to complete the activity set out in that document.	**Activity 3**: • Learners work in pairs to complete the questions as provided in Source B. • The responses must be noted in the Religion Studies notebooks.
PERIOD 3	**PERIOD 3**
Activity 4: Class debate The teacher introduces the new topic by making the following assertion: "Rituals serve to reinforce discrimination."	**Activity 4: Class debate** • Learners are divided into two groups with one group

• This statement must be written on the board or on chart paper. • Throughout the lesson, the teacher must serve as a facilitator/ mediator. • **The purpose** of this activity is to open debate about **discrimination** within religions and cultural groups.	agreeing with this view and another dissenting.
PERIOD 4	**PERIOD 4**
Activity 5: Group Work **Source C: Rituals in different religions** **Instructions:** Group work: Five groups The teacher: • Divides the class into five groups. • Assigns one religion per group to research the following rituals: birth, marriage, initiation and death. • The teacher mediates the instruction of the activity.	**Activity 5:** The learners: • Work in five groups and research the topic given to them by gathering information about the assigned ritual. • Complete the group task as outlined. Write the summarised information gathered on chart paper • Choose a leader that will present the facts for the assigned religion. • Copy notes from the different presentations and re-write these notes in the RS notebooks.
PERIOD 5: Revision	**PERIOD 5**
Activity 6 • The teacher recaps the content covered.	
PERIOD 6 Informal assessment	
Activity 7 • The teacher designs an informal task for the learners.	**Activity 7** • Learners complete the informal assessment and assess each other's work.
PERIOD 7 Formal assessment: Learners write a	

short test	
• The teacher designs a formal task for the learners. • Teacher assesses the task.	• Learners write a short test/ complete an SBA activity related to this topic.
PERIOD 8 Remediation	
PERIOD 8 • The teacher conducts a diagnostic analysis of the results; designs and mediates an intervention strategy to remediate the content that the learners found challenging.	• Learners who failed the test are given expanded opportunities to grasp the content.

Source A:

Activity 2 - Teacher

RITES OF PASSAGE

In Grade 10 you learned about the rites of passage and the rituals to celebrate them.
The transition from **childhood** to **adulthood** is a significant stepping stone in everyone's life. The age at which this happens, and how children celebrate their rite of passage into **adolescence**, depends entirely on where they live and what culture they grow up in. Question is, was that period **amazing, exciting** or embarrassing? Despite all the growing pain endured, these rituals are **pivotal** moments that deserve remembering in the life of a young person.

Source: https://www.globalcitizen.org/en/content/13-amazing-coming-of-age-traditions-from-around-th/

Group work:

1. What is meant by **rites of passage?**
2. Identify two **rituals** that are performed in different cultural/ religious groups during the rites of passage.
3. Rituals form an **integral** part of rites of passage. Explain why each rite of passage in the different cultures/ religions is performed.
4. Explain how your rite of passage was performed.
5. List the clothes/ items that were given to you during the performance of your rite of passage. Explain what each item **signifies**.
6. Share with the group your experiences of the rituals performed in your culture during the celebration of your rite of passage. Was the experience exciting or embarrassing? Explain why.
7. What impact did the celebration of your rite of passage make on your social and spiritual view of your life?

Source B

Activity 3: Pair work

ROLE OF THE RITUAL

Transitional rituals are performed at moments of critical change in a person's life, most significantly at birth, entering **puberty**/ adulthood, marriage and death. However, over the past decades, the role and the significance of these rituals have been **diminished** in the lives of many people because of the **transformative** and **redemptive** power of rituals that had been put solely into the hands of the authorities. In many cases, transition rituals are still being **re-enacted** but often out of habit or a sense of '**propriety**', even if they have become empty and almost meaningless. In other cases, they are simply **abandoned**.

In general, only the celebration of a meaningful transition into a new phase of life remains and becomes the new focal point. Now, an 18th birthday celebration becomes an opportunity to get legally drunk for the first time instead of it being an entry point into adult life. Occasionally, people are brave enough to invent their own rituals to give meaning and direction at **significant crossroads** of life. Often those who are non-religious or **pagan** adapt, expand or **transcend** into a new spirituality that is better fitting to their needs, lifestyle and views.

Adapted source: http://networkmagazine.ie/articles/importance-ritual-and-ceremony

Work with a partner to complete the activity below:

1. What is a ritual?
2. Discuss the roles and characteristics of rituals.
3. Explain what the values and behaviours are that rituals teach.
4. Critically discuss the impact of the ritual performance on the life of a traditionalist.
5. Are indigenous rituals still relevant in modern society? Justify.
6. Why has the performance of rituals been abandoned by some communities?
7. 'The 18th birthday celebration becomes an opportunity to get legally drunk. 'Mention one other ritual or celebration that has changed and critically evaluate how it has lost its value.

Source C: Presentation of rituals in different religions

Complete the following table with regards to rituals for your assigned religion.
Use the following headings to complete the table below: birth, initiation marriage and death.
Follow the example given below for Islam.

RELIGION	BIRTH	INITIATION	MARRIAGE	DEATH
1.1. ISLAM 	• Parents give thanks to Allah for the gift of the baby.	• Muslims circumcise their baby boys. Boys may be as young as seven days and as old as ten years, depending on the culture /tradition of particular places after birth.	• Marriage is arranged	• Mourners observe a three-day mourning period. • Declaration of faith: The Shahadah or declaration of faith has two parts, which are always said together. The first is, 'I bear witness that there is no God but Allah', and the second is 'and that Muhammad is his servant and messenger'.
1.2. CHRISTIANITY 				

RELIGION	BIRTH	INITIATION	MARRIAGE	DEATH
1.3. JUDAISM 				
1.4. HINDUISM 				
1.5. ATR 				

Acknowledgement of sources
https://www.globalcitizen.org/en/content/13-amazing-coming-of-age-traditions-from-around-th/

Adapted Source: http://networkmagazine.ie/articles/importance-ritual-and-ceremony

Religion Studies: Grade 12

Exemplar lesson 11

Subject and grade	Religion Studies: Grade 12	
Topic	**Common features of religion as a generic and unique phenomenon** Examining secular world views.	
Duration	Two weeks.	
Resources	• Newspaper clips; • Textbooks; • Poster paper; • Felt-tip pens.	
Preamble	▪ How to teach language aspects. ▪ Reading in the subject.	
Pre-knowledge vocabulary	**Terminology/ Concepts required as prior knowledge**	
	• **Civic**	• Relating to/ benefiting citizens as individuals.
	• **Ethic**	• System of principles governing morality and acceptable conduct.
	• **Secular**	• Non-spiritual, of this world, worldly, materialistic.
	• **Secularism**	• The belief that government and morality should not be based on religion.
	• **World view**	• A particular philosophy of life or conception of the world.
New terminology	• **Religious diversity**	• Variety of religions/ differences in religious beliefs/ range of religions.
	• **Religious freedom**	• The right to choose a religion without the interference of the government or other religions.
	• **Humanism**	• A system of thought that attaches importance to humans rather than to divine or supernatural matters.
	• **Agnosticism**	• A belief that nothing is known or can be known of the existence or nature of God.
	• **Atheism**	• Disbelief or lack of belief in the existence of God or gods.
	• **Materialism**	• A tendency to consider material possessions and

		physical comfort as more important than spiritual values.
	• **Communism**	• A theory or system of social organisation in which all property is owned by the community and each person contributes and receives according to his or her ability and needs.
	• **Capitalism**	• An economic and political system in which a country's trade and industry are controlled by private owners for profit, rather than by the state.
Language skills	• Listening; • Reading and viewing; • Writing and presenting.	
Knowledge	• Analysis of secular world views and universal dimensions of religion: atheism, agnosticism, humanism and materialism. • Investigating the origin, purpose and influencing factors behind the world views.	
Skills	• Development of summaries; • Comparing and contrasting; • Critically discussing; • Evaluating.	
Values	• Respect for self/ others; • Religious tolerance; • Respect for diversity.	
Teacher Activities		**Learner Activity**
Activity 1: Brainstorm vocabulary list • The teacher will conduct a baseline assessment to determine prior vocabulary knowledge.		**Activity 1:** • Baseline assessment on the learners' understanding of the concepts and terminology stated above.
PERIOD 1		
Activity 2: Baseline Assessment **Source A** **Prior content knowledge: Secularism**		**Activity 2:** • Learners are provided with chart paper/ posters and

• Hand out Activity 2 **Source A** to the learners. • Divide the learners into small groups of six. • Mediate questions to the learner to ensure that they understand the instructions of the activity. • Provide them with poster paper/ chart paper, pens and Prestik.	required to complete Activity 2 Source A. • Learners should only use one colour felt-tip pen per group to do their poster. • Learners choose a leader to present the information. on the poster to the class • After the presentations, all the posters must be pasted on the wall for a gallery walk. • Learners from other groups may use their assigned felt-tip pens (which should be a different colour) to add facts or correct statements by their peers.
Introduction	
Activity 3: Class debate • The teacher introduces the new topic by making the following assertion: "a society can only be peaceful and harmonious if there is only one religion." • This statement must either be written on the board or on chart paper. • Throughout, the teacher must serve as a facilitator/ mediator. **Notes for the teacher:** • The purpose of this exercise is to open debate about other world views that may not have a **spiritual basis** or a belief in a **spiritual being/ supreme being.** • The teacher will also emphasise the importance of religious tolerance and respect for different religions/ world views.	**Activity 3:** • Learners are divided into two groups with one group agreeing with this view and another dissenting. dissenting.
PERIOD 2	
Activity 4: Panel discussion **Source B** • The teacher divides the class into five groups.	**Activity 4:** • Learners need to work in their assigned groups to

Each group is assigned a world view (agnostics, atheists, secular humanists, materialists and communists). • Each group has to take the standpoint of the assigned world view and argue in its defence. • The teacher has to mediate Source B to the learners to provide guidance. . **Notes to the teacher:** All the charts must be collected and pasted on the wall for the duration of the topic. The teacher can encourage the learners to take notes from the charts.	gather information that will be used in the panel discussion to support their assigned world view and to refute the evidence provided for the opposing world views. • A spokesperson must be chosen to represent the world view in a panel discussion. • A scribe must be chosen who will summarise the points for the given world view on chart paper. • The charts will be pasted on the wall after the panel discussion for all learners to view as a reflection/ revision exercise.
PERIOD 3	
Activity 5: Pair work **Source C** • The teacher must mediate **Source C** to the class and pair the learners to complete the activities set out in this document.	**Activity 5** • Work in pairs to complete the questions provided in Source C. • The responses must be noted in your Religion Studies notebooks.
PERIOD 4	
Activity 6: Individual work **Source D and E**	• Learner to complete questions from Source D and E and write responses in their RS notebooks.
PERIOD 5	
Activity 7: Revision Teacher recaps content covered.	Buzz groups. Brainstorming.
PERIOD 6 Informal Assessment	
The teacher designs an **informal task** for the learners – Peer assessment.	Learners complete the puzzle.
PERIOD 7 Formal Assessment	
The teacher designs a **formal task** for the	Learners write a short test.

Source A:

Instructions:

- Work in groups of six to complete the activity:
  Study the scenarios below and answer the questions that follow:

  The texts of both scenarios are mixed up. There is no indication in the instruction that this is deliberate or if the activity includes restoring the texts to their proper order. I did not therefore attempt to edit it. Clarify and revise.

Scenario A

We accept that France is a secular state, but we We disagree.
All religious practices
Should be allowed to wear our head scarfs. They are out of
place in government
are part of our religious dress code? Christians are not schools.
Crucifixes are allowed
stopped from wearing crosses because they are
worn under clothing.

France is a secular state. In the mid-1990s, the French government passed a law prohibiting Muslim girls at state schools from wearing headscarves (hijab) while attending school.

Source: Top Class, Gr 11

Scenario B

In South Africa we recognise Christmas as a holiday throughout the country. Other religions can celebrate in private. **penalised** but others

to celebrate their Religious holidays? That's

Either the government

to be celebrated in

celebrated in private.

That's unfair. This is a secular state. Why should Christians take Christmas day off without being

don't get days

discriminatory.

allows all religions

public or all should be

Source: Top Class, Gr 11

1 What is meant by secularism?
2 Discuss whether you think South Africa is a secular state. State reasons for your answers.
3 Compare the two situations as represented in the dialogues and answer the following questions:
    a. Which of the situations do you view as discriminatory? Why?
    b. Critically discuss what you would do to address the issue around religious holidays if you were in government in France and in the USA.
4 In South Africa, religious freedom is granted by the Constitution. Evaluate the allocation of religious holidays on the South African calendar.
5 In your opinion, what is the influence of secularism on the South African Constitution?
6 Compare and contrast the impact of secularism on the moral values of the South African society.

Source B

Instructions

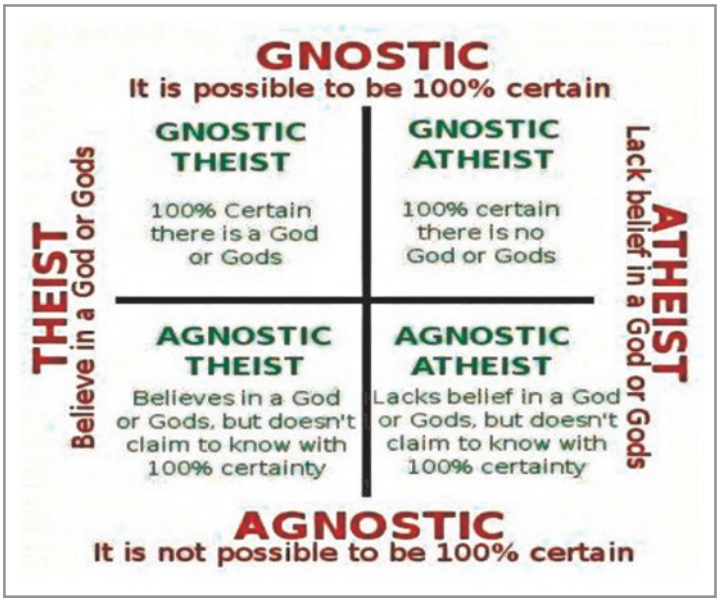
- Group work: Five groups must be formed.
- Assign one world view per group (agnostics, atheists, secular humanists, materialists and communists).
- Conduct research and gather both supporting and dissenting views of the assigned world view.
- Write the summarised information gathered on chart paper.
- Choose a leader that will present the facts for the assigned world view in a panel discussion.
- Conduct a panel discussion between yourselves (an agnostic, atheist, secular humanist, materialist and communist) in front of your peers in which you follow the instruction below:

1. Opening statements:

1.1 Religious beliefs of your world view;
1.2 Where this belief originated;
1.3 Who the main philosopher is/was behind this belief.

2. Argue for or against each world view.
3. Critique the religious beliefs of your opponents by providing research evidence that refutes or supports the world view.

Source



Source: https://www.google.co.za/agnosticism+images

Instruction:

Work with a partner to complete the activity below:

1. The terms gnostic, theist, agnostic and atheist have specific origins. Clarify the origins and meanings of these terms.
2. The letter a in the words atheism and agnosticism functions as a prefix that means … Provide other words that may begin with the letter a that may have a similar function.

3. Draw a table in which you compare and contrast the following:

3.1 Atheism vs Theism;

3.2 Agnosticism vs Gnosticism.

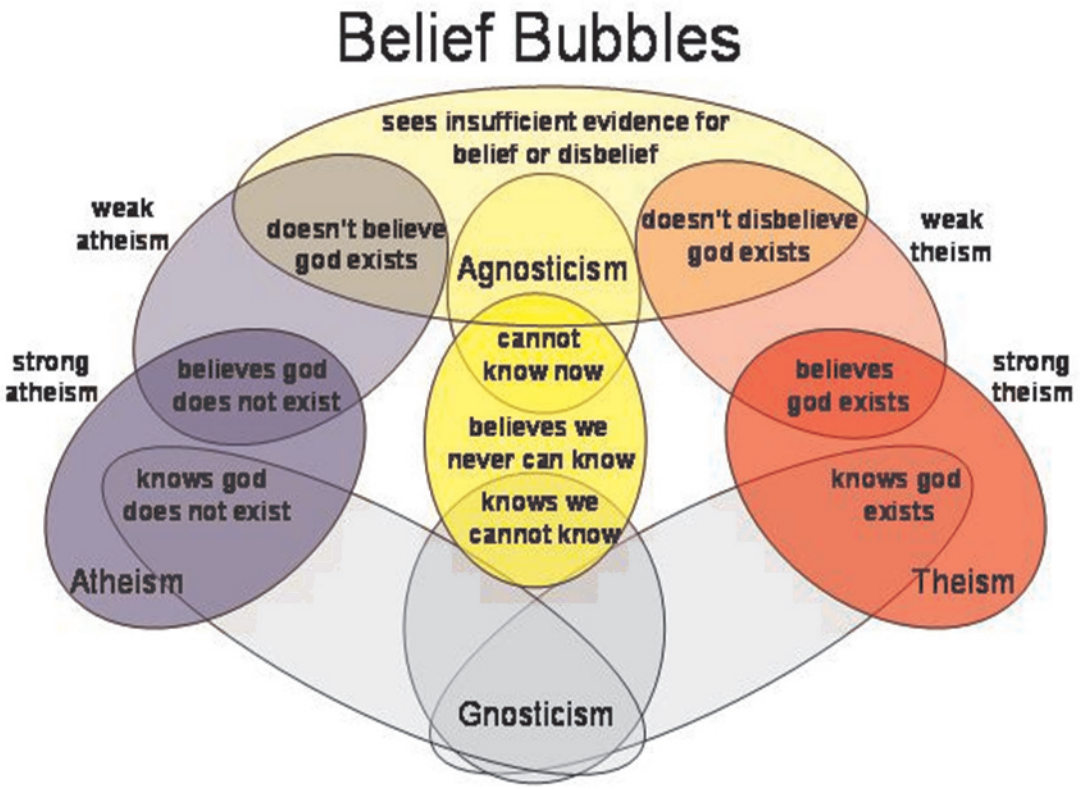
4. In brief sentences explain the following regarding atheism and agnosticism:

4.1 Their beliefs;

4.2 The main philosophers of these beliefs.

5. "Certain strands within Hinduism, Jainism and Buddhism are atheistic. " Critically discuss this statement.

Source



Source: https://www.google.co.za/agnosticism+images 795532863

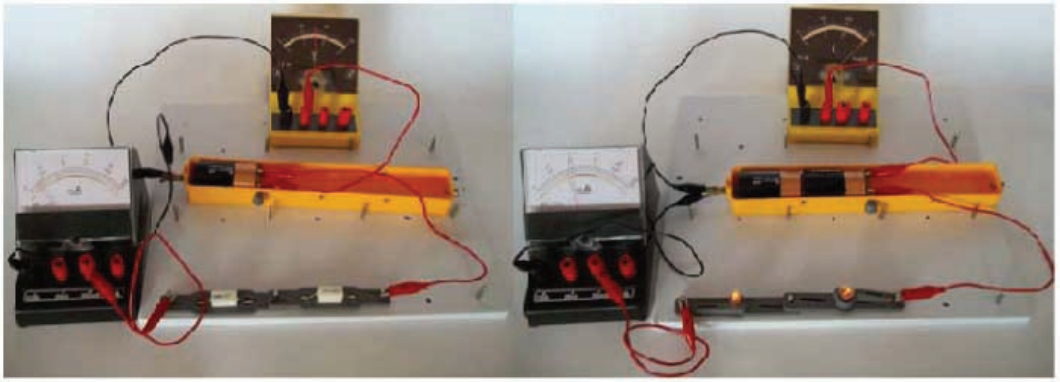
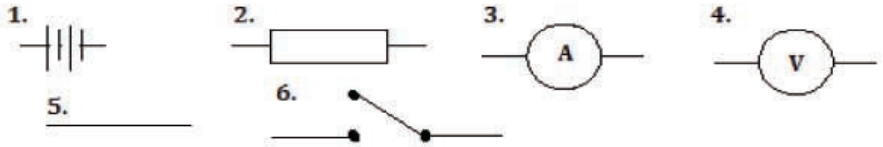
Technical Science: Grade 10

Exemplar lesson 12

Subject and grade	Technical Science: Grade 10	
Topic	**Electric Circuit Symbols**	
Preamble	In recognition of cultural and language diversity in the South African context, English Across Curriculum seeks to address challenges attributed to the Language of Learning and Teaching (LoLT). There is a strong correlation between language proficiency and conceptual understanding. Furthermore, there is formidable variation in the meaning of subject-specific terminology based on context. Planning so that careful attention is given to terminology which often cuts across many contexts is key and critical to addressing EAC. Learners may also have their own misconceptions of terminology based on their background (prior learning, social, cultural, religious). Hence, there is a need to have some form of engagement which will create a platform to unearth such misconceptions and subsequently remedy them for effective teaching and learning.	
Objective	At the end of the lesson, learners should be able to: • Identify and label the components of a simple circuit. • Draw the components using appropriate circuit symbols.	
Prior knowledge	Learners should be able to: • Connect a simple electric circuit. • State the functions of the components in a circuit.	
Pre-activities	Introduction: 1. Learners are given an extract and one learner is requested to read the given text aloud. 2. The teacher explains and emphasises that there might be some terms learners may not understand well but for the purpose of the lesson, the meanings of highlighted terms will be discussed in detail. 3. Learners identify and state the highlighted terms and the teacher lists them on the board. 4. Learners are required to give their own understanding of each term (all explanations, scientific and everyday use, will be accepted). 5. The teacher emphasises the scientific meaning of the terms discussed.	
New vocabulary	**Vocabulary**	**Meaning of the words and context of use in Technical Sciences**
	Conductor	A material that allows a charge/ charges to flow through it.

	Current	Rate of flow of charge.
	Resistance	The ability of a conductor to oppose the flow of charge.
	Power	Rate at which work is done.
	(Electric) Circuit	A continuous conducting path along which an electric current can flow. It may include a variety of electrical components such as lamps, resistors, ammeters and voltmeters.
	Potential difference (voltage)	The amount of work done **per coulomb of charge** moved between two points.
	Resistor	A component in an electric circuit that opposes the flow of charge.
	Cell	A cell is a single unit that converts chemical energy into electrical energy (a so-called battery in everyday language).
	Battery	A number of cells connected together / a combination of two or more cells.
	Ammeter	It is an instrument used to measure the amount of current flowing through a point in an electric circuit.
	Voltmeter	An instrument used to measure the potential difference (voltage) between any two points in an electric circuit.
	Switch	A safety device that is used to close and open a circuit.

Subject-specific jargon versus ordinary language use		**Ordinary language use**	**Scientific meaning and context**
	Current	Recent, present, existing, at the moment/ now, modern, in progress	The rate at which the charge is flowing.
	Resistance	Fighting, confrontation, struggle, conflict, opposition	Ability to oppose the flow of charge.
	Potential	Possibility, likelihood, probability	In Physical Sciences, we talk of **potential** energy, which is stored energy. We also talk of the **potential** difference between two points, which is a change in the energy of one coulomb of charge moving from one point to another.
	Battery	A single cell is usually referred to as a battery.	A number of cells connected together/ a combination of two or more cells.
	Switch	Change, shift, adjust	A safety **device** that is used to close

			and open a circuit.
	Power	Strength, authority	The rate at which work is done.
	Conductor	Choir conductor	A material that allows a charge/ charges to flow through it.
	Cell	Church cell, prison cell, compartment, chamber, animal or plant cell (life sciences)	A single unit that converts chemical energy into electrical energy.
Content activities during teaching	1. The teacher connects a simple circuit as illustrated in the diagrams below and demonstrates it to learners.  2. Learners are required to identify the different components of the circuit and list them in a table in their classwork books or worksheets. 3. The teacher **facilitates** a discussion on the functions of the different components. 4. The teacher draws the following circuit symbols on the board (no labels).  **Note**: Depending on the circumstances and availability of apparatus, this activity can be done in the form of a demonstration or the learners can be allowed to manipulate and connect the circuit themselves. 5. Learners are then required to use their textbooks to identify the correct symbol for each of the components they have listed and complete their table by drawing the correct symbol next to the appropriate component name.	
Assessment	Learners do the following exercise: 1. Complete the table by writing down the functions of the circuit components. 2. Draw a labelled circuit diagram to illustrate the circuit. 3. Answer the questions at the end of the worksheet.		

ASSESSMENT ACTIVITY

WORKSHEET

Symbols of Electric Circuit Components

LEARNER'S NAME: DATE:

A. Complete the table below:

Item name	Symbol	Function

B. Use appropriate symbols and draw a circuit diagram to represent the circuit you have connected and label the components of your circuit.

C. How many cells is the battery below made up of?

D. How should the following components be connected in a circuit?

- An ammeter.
- A voltmeter.

E. Write down the scientific meaning of the following terms:

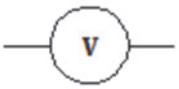
- Current.
- Battery.

WORKSHEET (Marking guidelines)

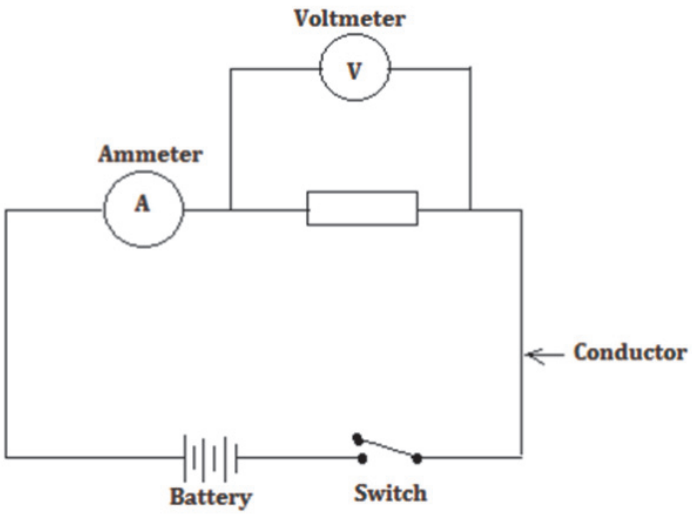
Symbols of Electric Circuit Components

LEARNER'S NAME: DATE:

A. Complete the table below:

Item name	Symbol	Function
1. Battery		
2. Resistor		
3. Ammeter		
4. Voltmeter		
5. Conductor/ Connecting wire		
6. Switch		

B. Draw a circuit diagram to represent the circuit you have connected and label the components of your circuit.



C. Five cells.

D. An ammeter - in series.
A voltmeter - in parallel.

E. Current - Rate of flow of charge.
Battery - A combination of two or more cells.

EXTRACT
Electrical Safety at Home
Last Updated: 28 July 2016

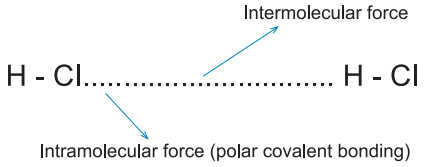
Electrical safety at home is an important consideration. Electricity is dangerous and can cause injury and death. A healthy respect for the dangers is a necessity before attempting any electrical repair.

The following are some basic tips for 'electrical safety at home':
Turn Power Off - This is the most important safety tip. Never work on electrical devices or wiring when the power is on. Even when you think you have turned off the breaker, check with a voltage tester before beginning work. The quickest way to get shocked is to start working on an electrical item when you think the power is off and it isn't.
Turn Breakers Off - Don't assume that just turning off a switch is enough. It is just too easy for someone to flip a switch on accidentally. Turn off the breaker at the main panel.
Tag Breakers - An added precaution to turning off a breaker is tagging it. Put a piece of tape over the breaker with a note on it not to turn it on. Do others in your house know how to check the breaker panel for tripped breakers? If the stereo goes off, will they check there before they ask you?
Notify Others - Let the whole family know when you are working on an electrical item. This will help to eliminate the chance that someone will turn something on.
Check for Power at Boxes - Even after you have turned off a breaker you want to make sure the power is off at the location you are working on. It is possible for more than one circuit to be going through the box you are working on. It is also possible that you turned off the wrong breaker. Use a voltage tester, such as a non-contact battery-operated one, to make sure the power is off.
Personal Protective Equipment - Wear non-conductive shoes and gloves when working on electrical devices. Even if you are sure the power is off, don't touch bare wires with any part of your body.
The above electrical safety tips do not cover every possible electrical safety issue. However, this does give you good guidance and makes you aware of potential dangers.

WARNING!! FOLLOW ALL OF THE AVAILABLE SAFETY GUIDELINES WHEN WORKING AROUND ELECTRICITY!!!

Technical Science: Grade 12

Exemplar lesson 13

Subject and grade	Technical Science: Grade 12
Topic	**Organic chemistry - Physical properties of organic compounds**
Preamble	In recognition of cultural and language diversity in the South African context, English Across Curriculum seeks to address challenges attributed to the Language of Learning and Teaching (LoLT). There is a strong correlation between language proficiency and conceptual understanding. Furthermore, there is formidable variation in the meaning of subject-specific terminology based on context. Planning so that careful attention is given to terminology which often cuts across many contexts is key and critical to addressing EAC. Learners may also have their own misconceptions of terminology based on their background (prior learning, social, cultural, and religious). Hence, there is a need to have some form of engagement which will create a platform to unearth such misconceptions and subsequently remedy them for effective teaching and learning.
Objectives	At the end of the lesson, learners must: • Improve their reading skills • Know the types of intermolecular forces that exist in different organic compounds. • Establish the relationship between the strength of intermolecular forces and physical properties. • Record, interpret and draw conclusions from data collected.
Language aspects covered	Reading
Pre-activities **Introduction** • Vocabulary • Language in the subject • Prediction	• Use real-life examples to illustrate the relationships between the strength of intermolecular forces and boiling point, melting point , vapour pressure and viscosity. Learners try to answer the following questions after three of them have read each question aloud in class: 1. Which liquid will boil at a lower temperature between water and petrol? 2. Which liquid will evaporate quicker between water and petrol? 3. Which liquid will flow easily between water and oil? **Introduction** Distinguish between intramolecular and intermolecular forces: **Intra** means 'inside' and **inter** means 'between' as illustrated in the diagram below using two molecules of hydrogen chloride: 

Definitions of concepts

1. Intermolecular forces - These are forces of **attraction between** the molecules of organic compounds.
2. Boiling point - The temperature at which the vapour pressure equals atmospheric pressure. **The stronger the intermolecular forces, the higher the boiling point.**
3. Melting point - The temperature at which the solid and liquid phases of a substance are at equilibrium. **The stronger the intermolecular forces, the higher the melting point.**
4. Vapour pressure - The pressure exerted by a vapour at equilibrium with its liquid in a closed system. **The stronger the intermolecular forces, the lower the vapour pressure.**
5. Viscosity - This is the property of a liquid to oppose relative motion between two adjacent layers of the liquid. **The stronger the intermolecular forces, the higher the viscosity. The higher the temperature of the liquid, the lower its viscosity.**

During teaching

The table below shows the different types of intermolecular forces that are found in the different homologous series.

Name of homologous series	Name of intermolecular forces
Alkanes	London/ dispersion/ induced dipole forces
Alkenes	London/ dispersion/ induced dipole forces
Alkynes	London/ dispersion/ induced dipole forces
Alkyl halides (Haloalkanes)	Dipole-dipole forces
Aldehydes	Dipole-dipole forces
Ketones	Dipole-dipole forces
Alcohols	Hydrogen bonds (one site)
Carboxylic acids	Hydrogen bonds (two sites)
Esters	Dipole-dipole forces

There are three cases to be considered when using intermolecular forces to explain the relationship between them and the physical properties of organic compounds:

1. Comparing the physical properties of the same homologous series. The following aspects must be included in the explanation and **degrees of comparison** must be used. Explanations must be written **in point form**:

- **Structure** - e.g. chain length, number of C atoms.
- **The strength of intermolecular forces as the chain length increases/ decreases** -

e.g. the longer the chain length, the stronger are the intermolecular forces.

- **Energy involved** - e.g. more energy will be needed to overcome the intermolecular forces (and NOT bonds) between the molecules of an organic compound if its intermolecular forces are stronger.

2. Comparing the physical properties of different homologous series.

The following aspects must be included in the explanation and **degrees of comparison** must be used.

Explanations must be written in point form:

- **Type of intermolecular force in each series** - e.g. London forces in alkanes and hydrogen bonds in alcohols).
- **Comparison of the strength of these intermolecular forces** - e.g. London forces are weaker than hydrogen bonds.
- **The energy involved to overcome/ break these intermolecular forces** - e.g. more energy is needed to overcome the hydrogen bonds in alcohols than in alkanes.

3. Comparison of the physical properties of straight and branched organic compounds of the same homologous series.

The following aspects must be included in the explanation:

- Structure - e.g. surface area- more compact and more spherical compounds have shorter chain lengths and smaller surface area.
- The strength of intermolecular forces.
- The energy involved to overcome/ break intermolecular forces.

One learner must read the following problem statement and another the questions to the whole class aloud:

The table below shows the results obtained from an experiment to determine the boiling points of some alkanes.

Alkane	Molecular formula	Boiling point(^{0}C)
A	C_2H_6	-89
B	C_3H_8	44
C	C_4H_{10}	58
D	C_5H_{12}	72

1. Which of the alkanes will be a liquid at room temperature? (3)
2. Define the term boiling point. (2)
3. Describe the trend in the boiling points of these alkanes. (2)
   Explain fully the trend in Question 3.
4. Refer to the STRUCTURE, STRENGTH OF INTERMOLECULAR FORCES and ENERGY in your explanation. (3)

[10]

Memo

1. B✓, C✓ & D✓ (3)
2. The temperature at which the vapour pressure equals atmospheric pressure. ✓✓ (2)
3. Boiling point increases as the chain length/ number of C atoms/ molecular mass increases. ✓✓ (2)
4. From A to D
   - Chain length increases from

A to D✓.

- The strength of London/ intermolecular forces increases from A to D. ✓
- More energy will be needed to overcome the London/ intermolecular forces between the molecules of D than in A. ✓ (3)

OR

From D to A

- Chain length decreases from D to A. ✓
- The strength of London/ intermolecular forces decreases from D to A. ✓
- Less energy will be needed to overcome the London/ intermolecular forces in A than in D. ✓

[10]

Practical demonstration

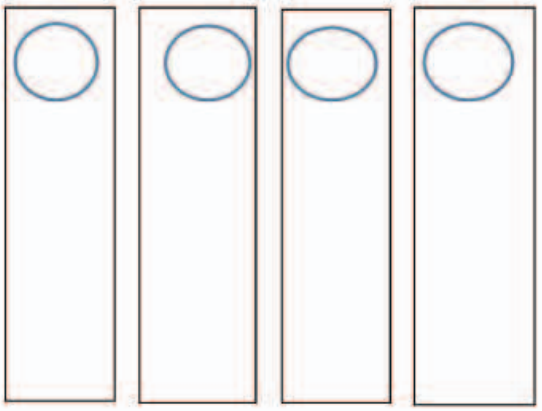
Apparatus and chemicals: identical marbles, syrup, water, shampoo, olive oil, identical measuring cylinders and stop-watches

Method:

A teacher will fill four measuring cylinders with 100 cm^3 of each of the liquids provided. Four learners will drop four marbles into each of the cylinders simultaneously while four other learners will immediately start their stop-watches. The learners will measure the time taken

by each marble to reach the bottom of the cylinders and record their results in the table below:

Liquid	Time(s)
Syrup	
Water	
Shampoo	
Olive oil	



1. Which physical properties are investigated in this demonstration? (1)
2. In which liquid did the marble reach the bottom of the tube first? (1)
3. In which liquid did the marble reach the bottom of the tube last? (1)
4. In which liquid are the intermolecular forces the strongest? (1)
5. In which liquid are the intermolecular forces the weakest? (1)
6. How would an increase in temperature influence the physical property mentioned in Question 1? (2)
7. Write down a conclusion about the relationship between the strength of intermolecular forces and the physical property mentioned in Question 1. (2)

	8. Explain why identical marbles and cylinders are used in this demonstration?	(1)
	Memo	
	1. Viscosity ✓	(1)
	2. Water ✓	(1)
	3. Syrup ✓	(1)
	4. Syrup ✓	(1)
	5. Water ✓	(1)
	6. An increase in temperature will cause a decrease in viscosity. ✓✓	(2)
	7. The stronger the intermolecular forces, the higher the viscosity. ✓ ✓ ✓ OR The weaker the intermolecular forces, the lower the viscosity.	(3)
	8. To make this a fair demonstration.	(1)
		[10]

Technical Science: Grade 11

Exemplar lesson 14

<table>
<tr><td>Subject and grade</td><td>Technical Science: Grade 11</td></tr>
<tr><td>Topic</td><td>Sound waves – Pitch and Loudness</td></tr>
<tr><td>Objectives</td><td>By the end of the lesson, learners must be able to:
Define the pitch of a sound wave.
Relate frequency to the pitch of sound.
Define loudness and relate it to amplitude.
Distinguish between various ranges of sound and real-life applications.
Observe and draw logical conclusions from a demonstration.</td></tr>
<tr><td>Preamble</td><td>In recognition of cultural and language diversity in the South African context, English Across Curriculum seeks to address challenges attributed to the Language of Learning and Teaching (LoLT). There is a strong correlation between language proficiency and conceptual understanding. Furthermore, there is formidable variation in the meaning of subject-specific terminology based on context. Planning so that careful attention is given to terminology which often cuts across many contexts is key and critical to addressing EAC. Learners may also have their own misconceptions of terminology based on their background (prior learning, social, cultural, and religious). Hence, there is a need to have some form of engagement which will create a platform to unearth such misconceptions and subsequently remedy them for effective teaching and learning.</td></tr>
<tr><td>Pre-knowledge vocabulary</td><td>In this lesson, the following terminology is very important:
<table>
<tr><td>Pulse</td><td>A single disturbance that occurs in a medium.</td></tr>
<tr><td>Longitudinal wave</td><td>A series of pulses in which the particles of a medium vibrate parallel to the direction of propagation.</td></tr>
<tr><td>Transverse wave</td><td>A series of pulses in which the particles of the medium vibrate at right angles to the direction of propagation.</td></tr>
<tr><td>Crest</td><td>The highest point of disturbance in a transverse wave.</td></tr>
<tr><td>Trough</td><td>The lowest point of disturbance in a transverse wave.</td></tr>
<tr><td>Compression</td><td>A point in a longitudinal wave.</td></tr>
<tr><td>Rarefaction</td><td>The process of becoming or of making something such as a gas less dense</td></tr>
<tr><td>Wavelength (λ)</td><td>The distance between two consecutive points that are in phase in a wave.</td></tr>
<tr><td>Amplitude</td><td>The distance from equilibrium (rest) position to the maximum point of disturbance in a wave.</td></tr>
</table></td></tr>
</table>

	Period (T)	The time (in seconds) taken to complete one pulse.
	Frequency (f)	The number of complete vibrations per unit time.
	Echo	Reflection of a sound wave.

Reference to specific words: new terminology

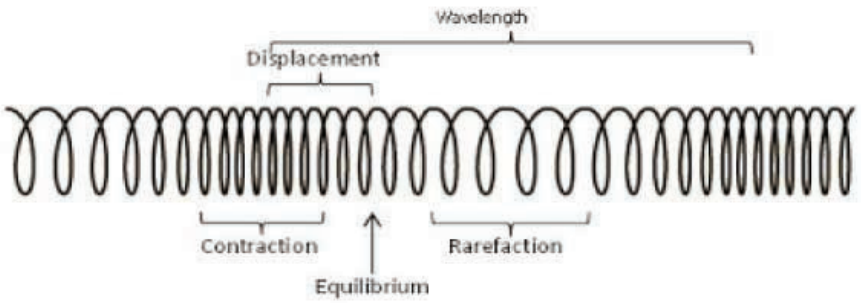
Pitch	The sound property that is determined by frequency.
Loudness	The sound property that is determined by the amplitude of a wave.
Volume	The sound property that relates to amplitude or loudness.
Infrasound	Sound with frequencies less than 20 Hz.
Ultrasound	Sound with frequencies greater than 20 000 Hz.
Audible sound	Sound with frequencies between 20 Hz to 20 000 Hz.

Subject-specific jargon versus everyday language.

Pre-knowledge

A brief recap of the key aspects listed hereunder:

- Define frequency.
- Define amplitude.
- Distinguish between transverse and longitudinal wave.
- Learners must be able to identify sound as an example of a longitudinal wave and identify the components thereof – wavelength, compression, rarefaction.



- There is a need to clarify that an oscilloscope is a device that models a sound wave as a transverse wave.

During teaching

Introduction

Scaffolding of concepts from what learners already know to new concepts is critical.

Sound is caused by vibrations.

Particles of a medium transfer energy in all directions and they, in turn, make different parts of the ear vibrate so that the sound is perceived.

Emphasise the scientific fact that sound is a wave and therefore has wave properties:

- It can be reflected (echo).
- It needs a medium for it to be propagated (air, for example).

The basic properties that will be dealt with are:

- Pitch.
- Loudness.

Loudness is a description of how loudly or softly a sound is perceived.

Loudness is determined by the amplitude of sound. The greater the amplitude, the greater the loudness.

The term **volume** is often used to describe the loudness of sound. Appliances such as radios have volume control mechanisms. Volume can also be thought of in terms of three-dimensional space in Mathematics. A clear distinction must be made.

Frequency

The frequency of an audible sound wave determines how high or low we perceive the sound to be, which is known as **pitch**.

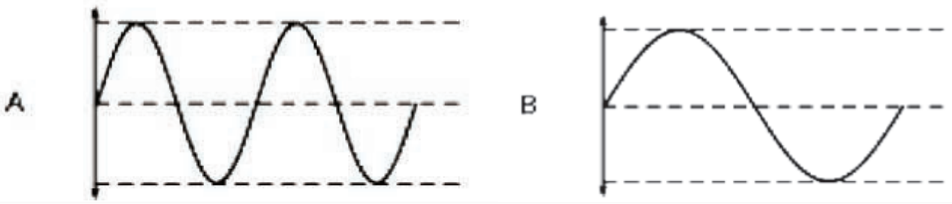
The frequency of a sound wave is what your ear understands as pitch.

The frequency of a wave is an objective quantity that can be measured, while pitch refers to how different frequencies are perceived by the human ear.

As the frequency of the sound wave increases, the pitch rises. A higher frequency sound has a higher pitch, and a lower frequency sound has a lower pitch.

For instance, the chirp of a bird would have a high pitch, but the roar of a lion would have a low pitch.

In the figure below, sound A has a higher pitch than sound B.

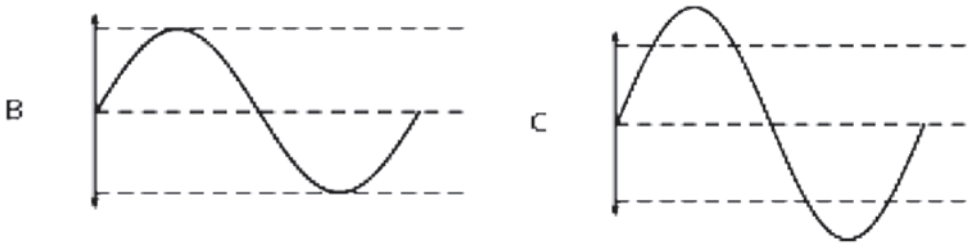


Amplitude

The amplitude of a sound wave determines its loudness or volume.

A larger amplitude means a louder sound, and a smaller amplitude means a softer sound.

In the following figure, sound C is louder than sound B.



The vibration of a source sets the amplitude of a wave. It transmits energy into the medium through its vibration. More energetic vibration corresponds to a larger amplitude. The molecules move back and forth more vigorously. The loudness of a sound is also determined by the sensitivity of the ear. The human ear is more sensitive to some frequencies than to others. The volume we receive thus depends on both the amplitude of a sound wave and whether its frequency lies in a region where the ear is more or less sensitive. The table below shows the loudness of sound in real-life situations.

Sound	Loudness in decibels(dB)	Hearing damage
Average home	40–50	
Loud music	90–100	After long exposure
Rock concert	115–120	Progressive
Jet engine	120–170	Pain

Two rules for objects that make a sound:

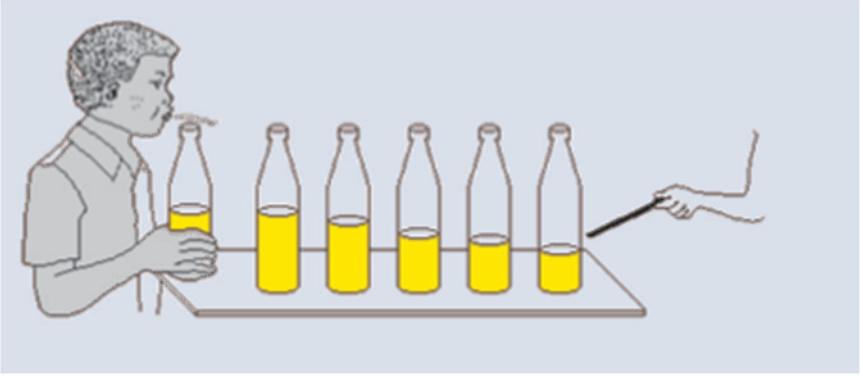
a) The shorter the column of air or the string being vibrated, the higher the pitch of the resultant sound.

b) The harder an object is hit, blown or plucked, the louder the sound made.

The teacher may conduct a demonstration of this activity while learners observe.

Activity 1

Investigation to determine the pitch of sound (taken from the SASOL book):

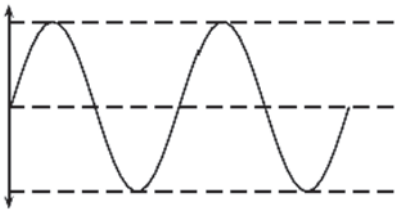


1. Place varying amounts of water into cooldrink bottles.
2. Blow across the bottle and write down your observations.
3. Now tap the bottles with a spoon and write down your observation.
4. Write your conclusion.

Learners attempt the individual activity in the last 15 minutes and feedback is given.

Activity 2

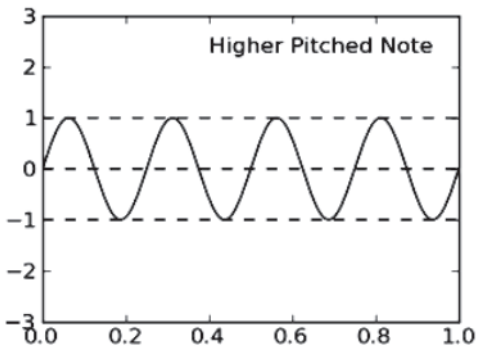
1. Study the following diagram representing a musical note. Redraw the diagram for a note.



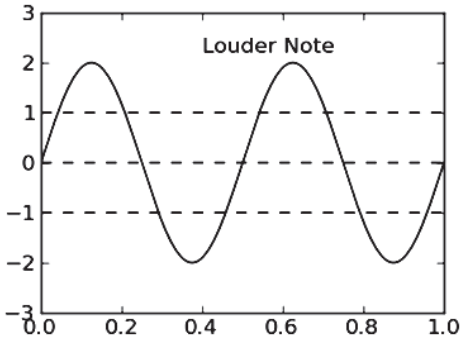
1.1 With a higher pitch.
1.2 That is louder.
1.3 That is softer.

Solutions to the activity

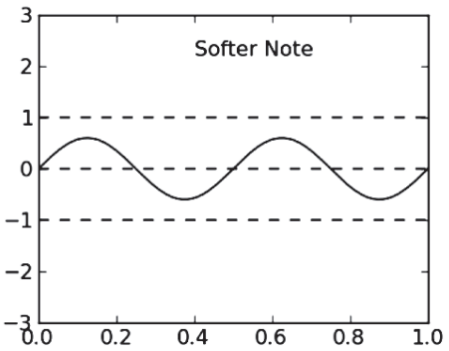
1.1



1.2



1.3



Tourism: Grade 10

Exemplar lesson 15

Subject and grade	Tourism: Grade 10
Topic	**Tourist Attractions** Sub-topic: South African fauna and flora as a tourist attraction. South African National Parks (SANParks).
CAPS reference	Term 3 Week 5
Duration	Three periods (Approx. 3 x 45 minutes).
Lesson resources	• SANParks brochures. • SANParks maps. • PowerPoint presentation. • Table: Conservation focus. • Sticky Notes sheet on responsible behaviour. • Table with animal sightings data. • Via Africa textbook. • Web-based resources: https://www.sanparks.org.
Preamble	**This topic expands prior knowledge from:** **Term 1**: Sectors available for sustainability of the different kind of parks, international communities involved (WWF/ WTO). **Term 2**: SADC countries, map work and domestic tourism campaigns. **Term 3**: Tourist attractions and focus on South Africa's national parks, transfrontier parks and transfrontier conservation areas. The knowledge gained in this lesson will develop life skills relating to the responsible behaviour of tourists visiting national parks and other conservation areas as well as the importance of nature conservation in general.
Expected outcomes	The learners must: • **Understand** the concepts: national parks, transfrontier parks, transfrontier conservation areas and the value of conservation. • **Demonstrate** an understanding of new terminology relating to South African fauna and flora. • **Familiarise** themselves with the accommodation, facilities and activities offered within the different parks. • **Understand** responsible tourist behaviour in the parks.
Determine prior knowledge	**The teacher will use various techniques to determine:** • **Prior knowledge** of the topics, e.g. an activity to test prior knowledge from:

Transfrontier conservation areas	Large areas, straddling frontiers between two or more countries that cover large-scale natural systems and that encompass one or more protected areas. Tourists will in future be able to drive across international boundaries into adjoining conservation areas of participating countries.
Wild card	Wild Card holders get one year's unlimited entry to 80+ national parks, reserves and resorts around South Africa, depending on the type of cluster chosen.
LESSON CONTENT	**South African fauna and flora as a tourist attraction:** **Concepts**: biodiversity, environment (natural, physical, cultural, man-made), ecosystem, species, fauna and flora, wildlife, habitat, endangered, red data list, extinct, indigenous, alien, threatened, culling, poaching, legal hunting, mass tourism, over-consumption in the tourism context. **South African National Parks (SANParks):** • What is a national park? Why do tourists visit national parks? • Kruger National Park (flagship): Concepts: Main rest camps (refer to Skukuza as the administrative headquarters and the largest camp), bushveld camps, overnight hides, bush lodges, luxury lodges. Mention the main activities offered by the park. **The following national parks** (location on a map, main conservation focus of each park): Addo Elephant, Augrabies, Bontebok, Golden Gate, Garden Route (Tsitsikamma, Knysna, Wilderness), Mountain Zebra, Namaqua, Table Mountain, West Coast. **Transfrontier parks** (location on a map): Explain what a transfrontier park is. Ai- Ais/Richtersveld, Kgalagadi, Greater Limpopo. **Transfrontier conservation areas**: Explain what a transfrontier conservation area is. Names and countries involved: - Limpopo-Shashe (SA, Zimbabwe and Botswana). - Maloti-Drakensberg (Lesotho and SA). **Determine prior knowledge:** Hand out maps of SANParks to each learner (see PowerPoint presentation).

Activity 1: Test prior knowledge from:

- **Term 1:** Sectors available for sustainability of the different kind of parks, international communities involved-WWF/ WTO.
- **Term 2:** SADC countries, map work and domestic tourism campaign.
- **Term 3:** Tourist attractions.

Study the map of South Africa's national parks and answer the questions that follow:

1. Identify the type of map (Term 2).
2. Name the:
   2.1 SADC countries involved in these parks (Term 2).
   2.2 Sectors responsible for maintaining the different types of parks

sustainably (Term 1).

2.3 Marketing campaign that can promote domestic tourism in these parks (Term 2).
3. Name TWO benefits of using the Wild Card for tourists.

Activity 1: Memorandum

1. Tourist map
2.
2.1 Botswana, Mozambique, Zimbabwe; the kingdom of eSwatini (Swaziland); Lesotho.
2.2 Public sector (government); public entities such as SA Tourism, SANParks, Private sector (international community, e.g. WTO, WTTC, SADC, WWF).
2.3 Sho't Left campaign.
3. Tourists will be entitled to one year's unlimited access to wild conservation partner parks, reserves and resorts (parks), based on the cluster and membership category selected. Membership is valid from the date of purchase for 365 days and is available for an individual, couple or family.
Explain new concepts: Hand out glossary with new concepts.
Show the PowerPoint presentation, highlighting the different types of parks, the main focus of the parks, sector responsible, SADC countries involved.

Discuss the advantages of the Wild Card.

ASSESSMENT

Informal Assessment:
Learners must complete Activities 2,3, 4 and 5 under the supervision of the teacher (classwork).

Activity 2:
Study the map of SANParks and answer the questions that follow.

1. Name the province with the:
1.1 most national parks.
1.2 fewest national parks.
2. Circle all the national parks that are also world heritage sites WHS on the map.

3. Explain how SANParks encourages domestic tourists to visit its national parks.
4. Identify the transfrontier parks.
5. Explain how transfrontier parks are identified.

Activity 2: Memorandum
1.
1.1 Western Cape (4)
Northern Cape (4)
Eastern Cape (4)
1.2 North West (0)

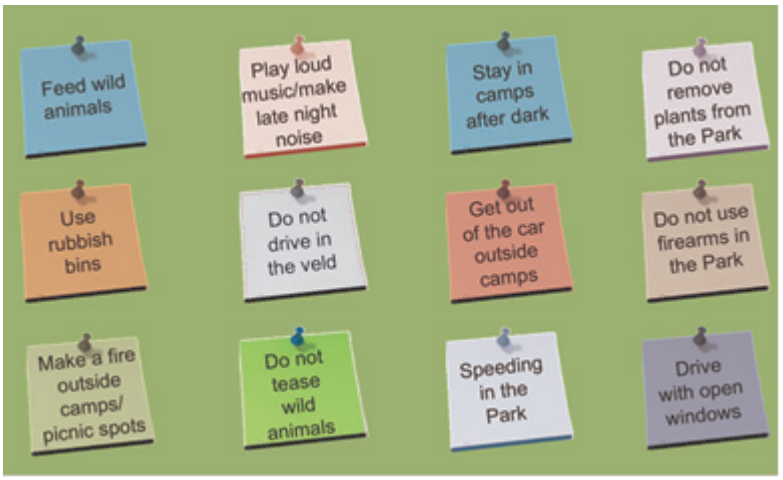
2. Circle on the map
Maluti-Drakensberg National Park
Limpopo-Shashe National Park
Greater Limpopo National Park
Kgalagadi Transfrontier Park

Activity 3: Conservation focus
Complete the table below (hand out a copy to each learner):

	Name of Park	Province	Other countries Involved	Conser-vation Focus
1.	Kruger National Park (flagship)			
2.	Kgalagadi Transfrontier Park			
3.	Table Mountain National Park			
4.	Namaqua National Park			
5.	Garden Route National Park			
6.	Augrabies National Park			
7.	Addo Elephant National Park			
8.	Golden Gate Highlands National Park			

	Name of Park	Province	Other countries Involved	Conser-vation Focus
9.	|Ai-|Ais Richtersveld Transfrontier Park			
10.	Greater Mapungubwe TFCA			
11.	Maloti-Drakensberg TFCA			

Activity 4
Hand out the sticky notes sheet to each learner.
Classify the behaviour of tourists as RESPONSIBLE or IRRESPONSIBLE when visiting national parks. Give reasons for your answers.



Activity 5:
Work in pairs.

Analyse the data* collected by a tourist in the table below.

REPORTED SIGHTINGS OF ANIMALS IN THE KRUGER NATIONAL PARK FOR DECEMBER 2018

Animal	Name of animal	Near which camp	Total number of animals seen
	Buffalo	Punda Maria	36
	Hyena	Letaba	2
	Lion	Lower Sabie, Satara, Skukuza	12
	Wild dog	Pafuri,	8
	Zebra	Pretoriuskop, Berg-en-Dal	12
	Leopard	Lower Sabie	1

Fictitious data

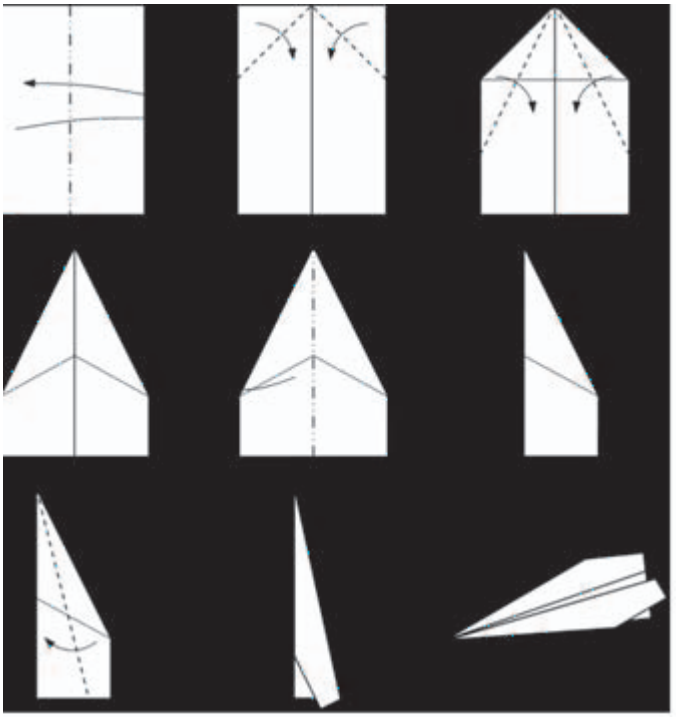
Extended opportunities/ homework	**Strengthening of the learning process (Reinforcement)** • Invite a specialist from SANParks or the Department of Tourism as a guest speaker. • Learners can investigate the use and advantages of the Green Card used by Table Mountain National Park. Differentiate between the Wild Card and the Green Card.  • Learners may use a dictionary to explain the concepts below: biodiversity, environment (natural, physical, cultural, man-made), ecosystem, species, fauna and flora, wildlife, habitat, endangered, Red Data List, extinct, indigenous, alien, threatened, culling, poaching, legal hunting, mass tourism, over-consumption in the tourism context. • A group of tourists who are visiting the Kruger National Park are sharing their experiences. Write a short dialogue to relate their stories. • Choose ONE national park in South Africa that you would like to visit. Do research on that park and write a post for Facebook to inform your friends about your upcoming trip. Remember to include photographs.
Self-reflection	Learners are to complete the table below:
	LEARNER SELF REFLECTION "Selfie" photo I, ... declare that I (am) / ... S atisfied that I understand this work E njoyed the assessment activities L earned many new terms and concepts F ound this work interesting I perservered through the content E liminated careless errors Signed.....on this .....day.....of.....2019

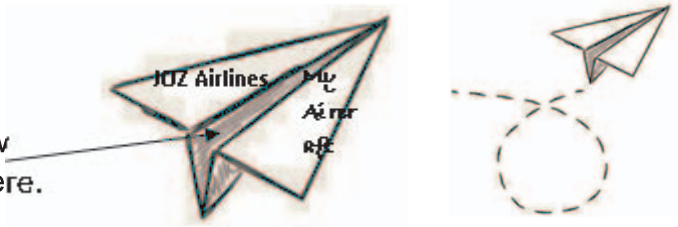
Tourism: Grade 11

Exemplar lesson 15

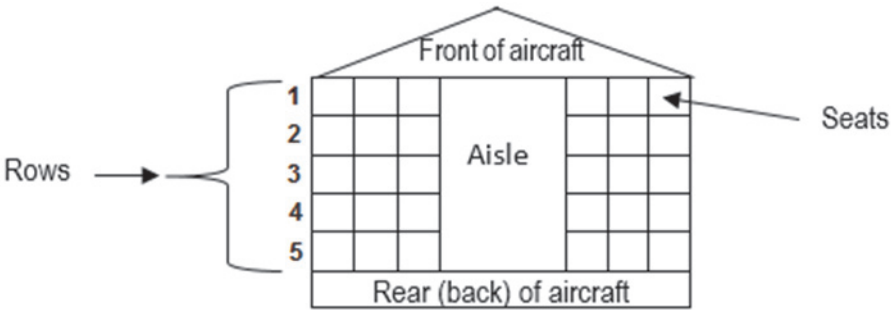
Subject and grade	Tourism: Grade 11
Topic	**Tourism Sectors: Transport services in South Africa** Sub-topics: Aircraft terminology; Seating configuration in an aircraft.
CAPS reference	Term 1 Week 1
Duration	Two periods (Approx. 2 x 45 minutes).
Lesson resources	• Electronic/ Hard copy questions to determine prior knowledge. • PowerPoint presentation: Getting to know your aircraft. • Addendum B: Examples of boarding passes. • Addendum C: Example of the seating configuration of an aircraft. • The paper aircraft made by each learner. • Video – 'OneTime'.
Preamble	This topic is expanding knowledge gained in Grade 10 (*The different modes of transport -Term 1 Week 3*) and will focus on domestic and international air travel as a mode of transport. The knowledge gained in this lesson will develop essential life skills relating to air travel, such as interpretation of boarding passes, procedures inside the aircraft and management of one's own travel plans. The teacher must ensure that terminology in this topic is well mastered as it will form the basis for some of the content to be studied in Grade 12.
Expected outcomes	The learners must: • Understand the procedure relating to domestic and international air travel. • Understand new concepts and terminology relating to aircraft. • Be able to use newly acquired terminology and concepts in the tourism context. • Understand the layout of aircraft and how to locate their seats. • Develop essential life skills for planning domestic, regional and international air travel.
Determine prior knowledge	Before starting with the lesson, the teacher can use 10 multiple-choice questions to determine the prior knowledge of learners. In schools where learners have access to the internet and have electronic devices, learners can click on this hyperlink or scan the QR Code below to complete the questions on any device. https://www.bookwidgets.com/play/9GFHS8?teacher_id=4528646736838656

	 Scan the QR code to answer the questions on a smartphone. **Note**: The teacher can get instant results for the online assessment by registering on the **BookWidgets** website (www.bookwidgets.com). Alternatively, hand out **Addendum A** with the printed questions to learners. Questions can be printed, written on the chalkboard or asked verbally. **Memorandum**: 1. The seat number appears on the boarding pass. 2. Be sitting at a window. 3. Cockpit 4. Cabin crew. 5. In the service panel above each seat. 6. When the cabin crew instructs them to switch them off. 7. Safety manual (booklet) of the airline. 8. Toilets. 9. Overhead storage bins. 10. Food. The teacher can also draw on learners' personal experiences by asking them to tell the class about their air travel experiences.
Introduction to the topic	Have ready: . A4 sheets of paper (one for each learner). . Pens (at least one additional colour). **Folding paper aeroplanes** 1. Give ONE blank A4-size paper to each learner. 2. Show learners how to fold an aeroplane using the instructions below and ask them to select a fictitious name for their airline.





3. Learners must now write the words 'My Aircraft' on one of the wings and the name of their airline on the other wing. Reinforce use of the word aircraft as opposed to aeroplane.
4. Open up the paper aircraft and draw six columns, the aisle and five rows to represent the layout of seats and rows on the flat area as indicated below.



5. The teacher can now continue to introduce new concepts and terminology relating to the topic as indicated below.

Concept / Term	Meaning in the tourism context
Seating configuration	A diagram showing how seats are arranged in an aircraft, also known as an aircraft seat map.
Aisle	The walkway between rows of seats on an aircraft.
Galley	The kitchen or food preparation/ serving area on an aircraft.
Cockpit	The steering chamber of an aircraft. The area where the captain and his co-pilot(s) and flight engineer sit.
Overhead storage bins	Compartments mounted to the sides and/or roof of the fuselage (body) inside an aircraft where passengers can store their carry-on (hand) luggage during the flight.
Tray tables	Trays that fold up against the back of each seat, or into the armrest of the seat, that serve as a table when food or drinks are served.
Cargo hold	The large storage area at the bottom of the aircraft where the bulk of luggage is kept for the duration of the flight.
In-flight entertainment	TV screens mounted to the back of seats or suspended from the ceiling in larger aircraft that offer in-flight entertainment such as movies, TV programmes, games, news updates, flight information, music and much more.
Oxygen masks	Masks that cover the nose and mouth that supply oxygen in an emergency such as decompression.
Wide and narrow-bodied aircraft	Wide-bodied aircraft: Aircraft with two aisles between seat groupings. Narrow-bodied aircraft: Aircraft with one aisle between the seat groupings.
Travel class sections	Economy, Business and First Class. Economy class seats are cheaper than Business Class but with less legroom and a limited menu (if any). The most luxurious seats are found on large, wide-bodied aircraft and are very expensive.
Emergency exit	Doors where passengers can leave the aircraft in an emergency situation after landing. These doors are usually located in the front, in the rear and/or over the wings, depending on the size of the aircraft.
Disembark	To leave the aircraft. Disembarkation: The act of leaving the plane.
Smoke detectors	Sensors usually installed in the toilets to alert the cabin crew when a passenger is smoking in the aircraft. It is not allowed to smoke on any flights.
In-flight magazine	A free magazine published monthly by the airline, usually available in the seat pocket. Passengers may take the magazine home with them.
Inflatable life jackets	Safety jackets to be used in the event of a water landing, usually stored in a pouch under the seat. The jacket will inflate once it comes into contact with water.
Cabin crew	Employees of an airline working inside the cabin of an aircraft.
Seat pocket	A storage area in the seat-back containing the in-flight magazine and the safety

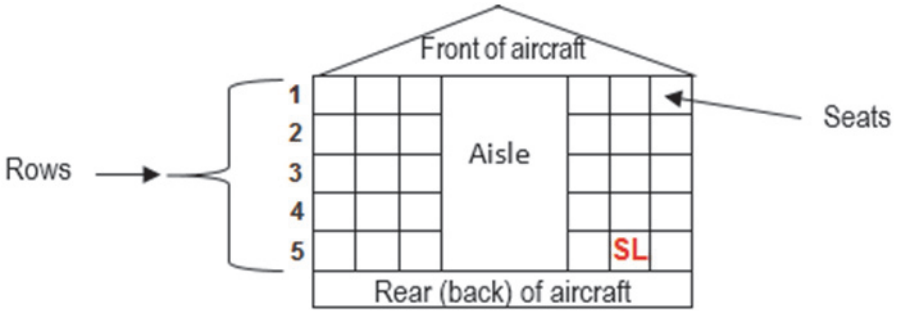
	instruction card.
Safety card	A visual representation (with pictures) of the procedures to be followed in the event of an emergency, published by the airline. On-board regulations regarding smoking and the use of electronic devices may also be included on the saf ety card.
	CONTENT **Aircraft terminology**: . Aisle, galley, cockpit, overhead storage bins, tray tables, cargo hold, entertainment and oxygen masks. **Seating configuration in an aircraft**: . Wide and narrow-bodied aircraft. . Travel class sections (business class, economy class). . Locating your seat in an aircraft. . Aisle seats and window seats, emergency exit seats (focus on the type of aircraft used by the airlines operating in South Africa). **Hand out Addendum B and C**. Revise interpretation of boarding passes. Explain the inside layout of the Airbus A321. Use as many of the new concepts as possible. **In class Activity 1**: Learners use Addendum B to plot where Tourist 1, 2 and 3 will be sitting in the aircraft (Addendum C). Emphasise that the seat number is compiled as follows: **Row number + Seat number**, e.g. 12 F 12 will indicate the row number and F the seat number. **Seat A** will always be on the right at the window when entering the aircraft from the front. 

In class Activity 2: Individual

Learners have to indicate where the passengers (numbered 1 to 20) below will sit in the paper aircraft that they folded at the beginning of the lesson. Write the initials of the passenger on the correct seat using a different colour.

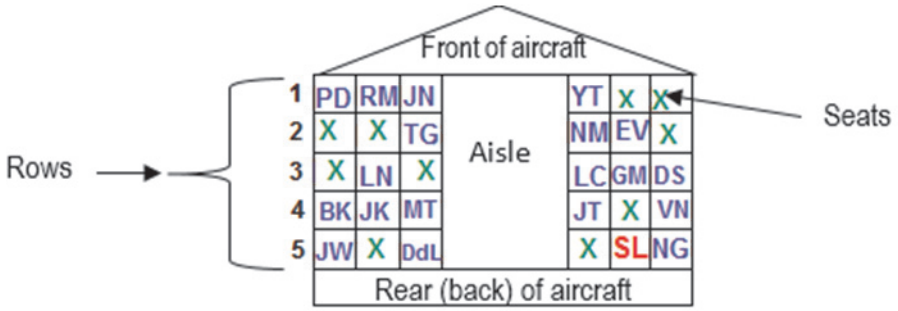
Mark vacant (empty) seats with an X.

The first name has been entered as an example.



1. Mr Sipho Lebitso (5 E)
2. Ms Nozuko Maliti (2D)
3. Mr Bertus Kotze (4A)
4. Ms Jacomine Kotze (4B)
5. Mr Dudu Siyanda (3F)
6. Mr Jon White (5A)
7. Ms Mary Thiso (4C)
8. Mr Jacob Thiso (4D)
9. Ms Elsa Venter (2E)
10. Ms Rhoda Maloi (1B)
11. Mr James Norton (1C)
12. Mr Patrick Duncan (1A)
13. Ms Lilian Ngunya (3B)
14. Ms Yvonne Tshayana (1D)
15. Ms Gerda Mini (3E)
16. Mr Thabo Galela (2C)
17. Mr David de Lange (5C)
18. Mr Linda Cloete (3D)
19. Ms Norida Govender (5F)
20. Mr Vivaan Naidoo (4F)

Memorandum



In class Activity 3: Individual
Answer the following questions based on Activity 1.

1. Write down the row numbers and seat numbers of all vacant seats on your paper aircraft.
2. Give ONE advantage and ONE disadvantage for passengers sitting in window seats.
3. Explain why so-called 'middle seats' may be considered inconvenient.
4. Name the TWO passengers who will disembark (leave) the aircraft first through the doors in the front. Give a reason for your answer.
5. Ms Gerda Mini does not feel comfortable in her seat and wants to change to a window seat after take-off. Suggest to which seat(s) she can be moved.
6. Explain why a passenger who is visually challenged will not be allowed to sit at an emergency exit.

Memorandum:

1. 1E and 1F / 2A, 2B, 2F / 3A, 3C / 4E / 5B, 5D
2. Advantage: Nice view; more shoulder room; not squashed between two people. Disadvantage: Not suitable if a passenger has a fear of heights. Will inconvenience other passengers when wanting to go to the toilet during the flight.
3. Middle seats are inconvenient because some passengers do not like to be squashed between two other passengers, especially in smaller, narrow-bodied aircraft.
4. Mr James Norton and Ms Yvonne Tshayana. Passengers are usually very orderly when disembarking and will not push ahead to get out.
5. 2A, 3A or 1F, 2F
6. Passengers seated at emergency exits are requested by the airline to assist fellow passengers in an emergency situation. They have to be able to see if the conditions are safe to evacuate (everybody must leave) the aircraft.

In-class Activity 3: In pairs

Dictionary work and game

Learners must look up the meaning of the words below and develop written clues for a guessing game similar to Charades. earners who are not familiar with the Charades game can just write the clues on pieces of paper for a class quiz. If time permits, the learners can play the game in class.

Smoke detectors
Online check-in
Inflatable life jackets
Cabin crew
Seat pocket
Paperless travel
Onboard Wi-Fi
Flying nanny
Universal accessibility
Minors travelling alone
Assisted passengers
Passengers with special needs
Decompression
Evacuate
Turbulence
Vacant seats

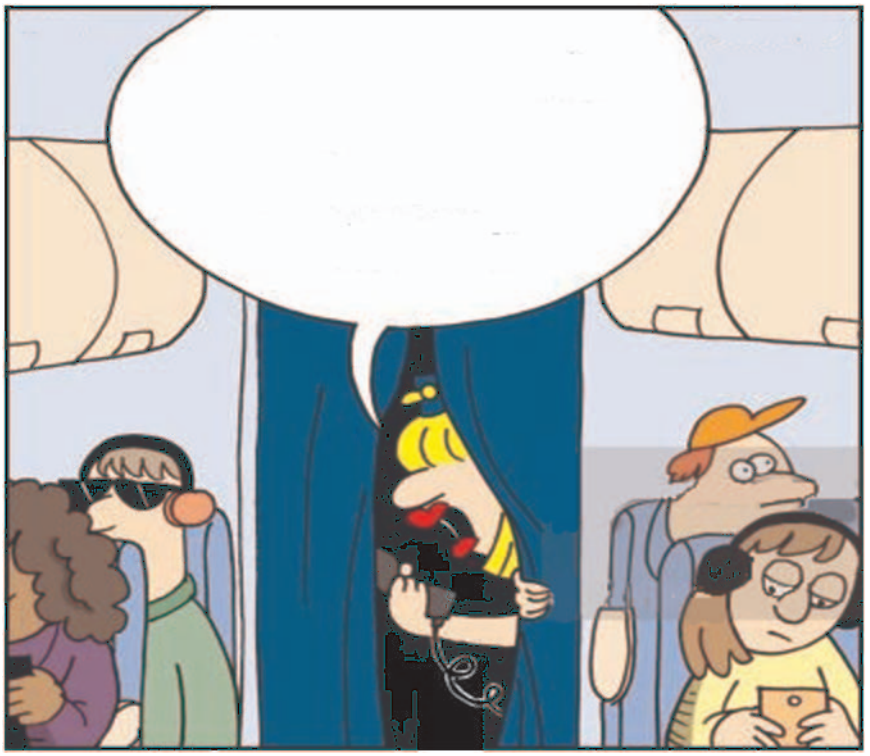
Charades:
A game where participants have to act out a word or phrase without speaking, while the other members of the team try to guess what the word/ phrase is.
The objective is for your team to guess the phrase as quickly as possible.

In-class Activity 4: Group work (Safety announcements before take-off)

Make copies of Addendum D for each learner. Learners must prepare the content of Addendum D at home for role-playing the next day. The teacher may assist so that learners pay special attention to the meaning of words that may be unfamiliar to them, and use correct phrasing, tone and pronunciation.

Divide the class into groups.
Each group must select five presenters who will participate in the role-play.
Two learners will be cabin crew members who will read the safety announcements while the other three will demonstrate safety procedures.

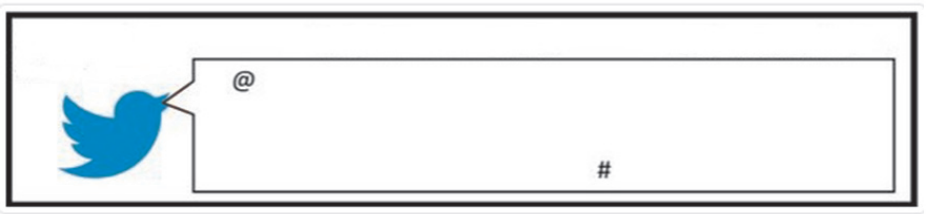
Ensure learners can pronounce all the words properly and read slowly and audibly.
The rest of the class may ask questions and will subsequently select the best act.

Extended opportunities	**Strengthening of the learning process (Reinforcement)** Do research on **career choices** in the airline industry and write an article for fellow learners who are interested in working in this industry. The teacher can put your document up on the wall in the classroom or it can be shared on social media. www.thebalancecareers.com/how-to-become-a-flight-attendant-525710 You are an **entrepreneur** who designs African souvenirs aimed at the domestic and inbound market. Design an **advertisement**, showcasing your products to be published in a local airline's in-flight magazine. Visit an airline's website and find the **bookings page**. Example: www.flysaa.com - click on Plan and Book - scroll down to Bookings and complete the information. **Enter the relevant information to get prices for**: (a) an economy ticket to any destination. (b) a business class ticket to the same destination. ***Note:*** *Remember to close the bookings page before any payment options are required*. Calculate the difference between an economy class ticket and a business class ticket. Deliberate why passengers prefer to fly business class. **Interpretation of a cartoon** Learners have to study the cartoon carefully. Write something humorous (funny) in the speech bubble below that is relevant to the lesson. 

Social Media - Twitter

(a) Learners have to describe their favourite part of this lesson. The challenge is to use only **140 characters**.

All learners just have to fill in the hard copy, but for those who have Twitter, it might be fun to do it for real!
The hashtag (#) represents something memorable from the lesson.



(b) Make a list of all the skills you acquired during this lesson. State where/ when these skills will be of value to you - either now or in the future.

ADDENDUM A
Instructions: Copy this page for each learner who does not have access to the internet. **Learners have to tick or colour the box to indicate the correct answer.** **The teacher will give the correct answers so that learners can assess their own work.**
Name of learner:

QUESTION 1
How does a passenger know where to sit in an aircraft?

- ☐ A passenger can choose any seat.
- ☐ The seat number appears on the boarding pass.
- ☐ A passenger has to phone the airline before the flight.
- ☐ Passengers can sit anywhere except at an emergency exit.

QUESTION 2
If a passenger sits in Row 3 in seat A, he/ she will:

- ☐ be sitting at a window.
- ☐ be sitting in the back of the plane.
- ☐ be sitting in an aisle seat.
- ☐ be sitting in the cockpit.

QUESTION 3
The area where the pilot sits in an aircraft.

- ☐ galley
- ☐ cockpit
- ☐ wing
- ☐ aisle

QUESTION 4
The airline staff on board the aircraft who are responsible for the safety of passengers during the flight.

- ☐ baggage crew
- ☐ cabin crew
- ☐ ground staff
- ☐ maintenance crew

The place where oxygen masks are stored in an aircraft.

☐ In the cargo hold of the aircraft.
☐ Under the passengers' seats.
☐ In the service panel above each seat.
☐ Under the armrest of each seat.

QUESTION 6
All electronic equipment must be switched off by passengers:

☐ When they board the aircraft.
☐ When it is disturbing the passenger in the seat next to you.
☐ When the cabin crew instructs them to switch them off.
☐ When the aircraft flies over the ocean.

QUESTION 7
This item is found in the seat pocket of an aircraft.

☐ Safety manual (booklet) of the airline.
☐ Knife and fork to eat with.
☐ The boarding pass.
☐ List of names of the cabin crew.

QUESTION 8
Smoke detectors are located in the...to prevent smoking in the aircraft.

☐ cockpit
☐ stairs
☐ galley
☐ toilets

QUESTION 9
The area where carry-on (hand) luggage is placed during the flight.

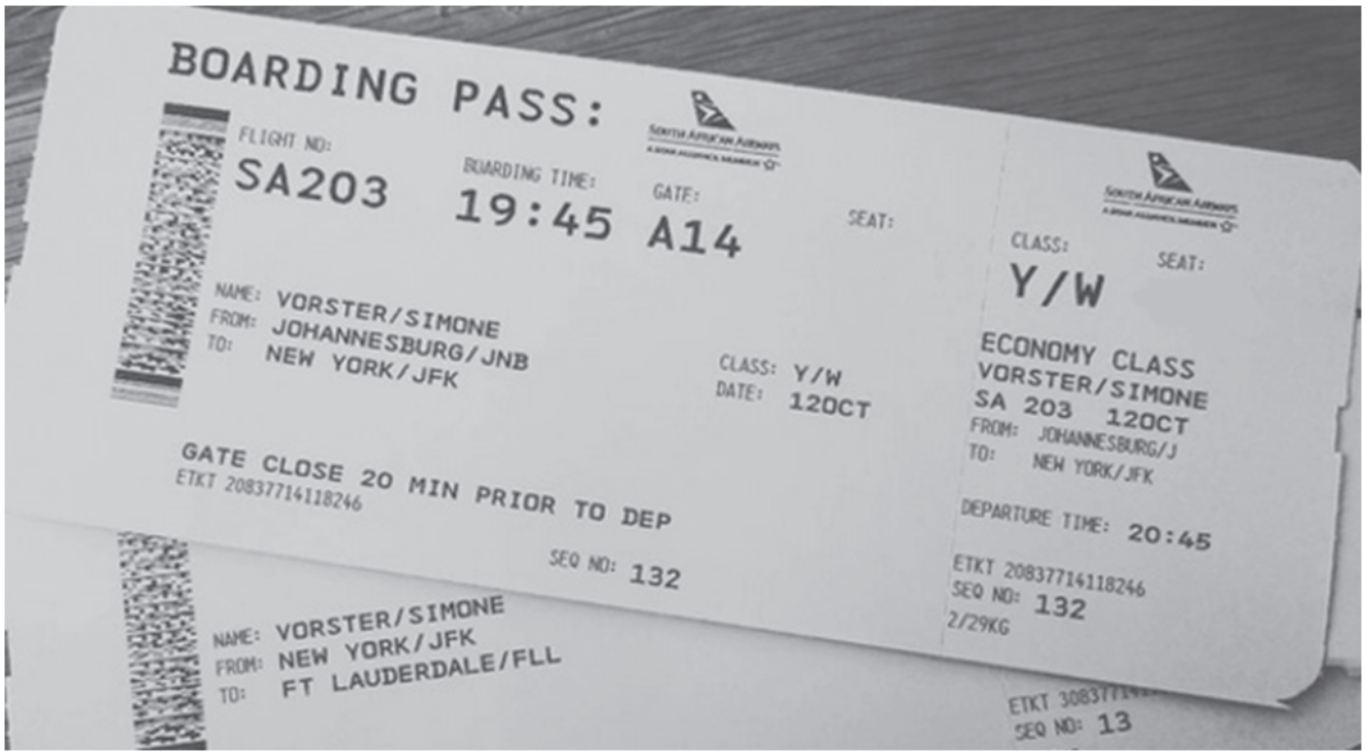
☐ cargo hold
☐ cockpit
☐ overhead storage bins
☐ seat pocket

QUESTION 10
This word is associated with the galley on an aircraft.

☐ Medication
☐ Food
☐ Tickets
☐ Luggage

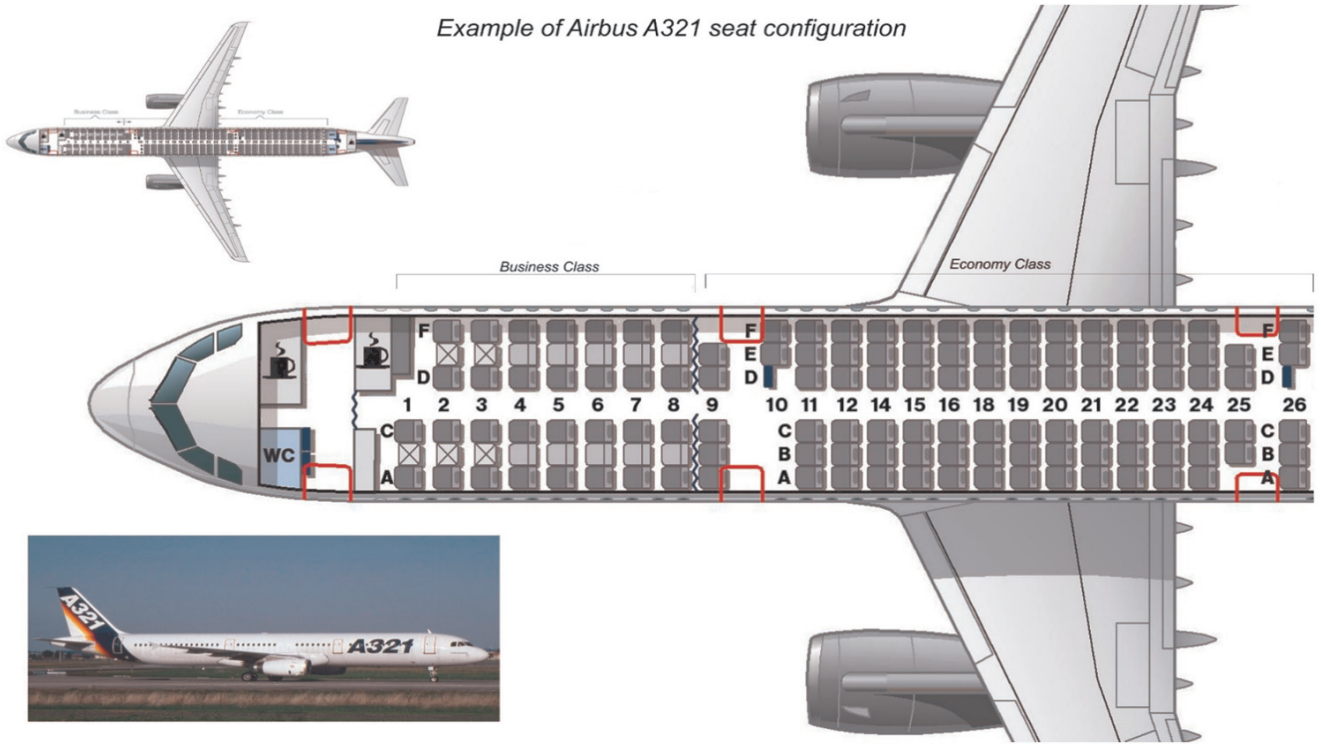
ADDENDUM A

Instructions: Copy this page for each learner if the teacher does not use a projector or an electronic whiteboard.
Learners have to interpret the different boarding passes and identify where each passenger will be sitting in the aircraft.



ADDENDUM A

Instructions: Copy this page for each learner. Learners have to interpret the picture of the aircraft.
By referring to the pictures in Addendum B, learners have to indicate where each passenger will be sitting in the aircraft below. Make a tick on the correct seat.



ADDENDUM D - Safety Announcements on board

Instructions: Copy this page for each learner.
Learners have to prepare the content at home for role-playing in class the next day.

Ladies and gentlemen

My name is (put your name here) and I am your flight attendant for this flight.

On behalf of Captain (put the name of the Captain here) and the entire crew, welcome aboard (put the name of your Airline here) Airlines' Flight (put the flight number here) to (name of the city you are flying to).

May I remind you that your safety on board this aircraft is as much your responsibility as it is ours.
We now request your full attention as the flight attendants demonstrate the safety features of this aircraft.

To fasten your seat belt, insert the metal clip into the buckle and tighten by pulling on the loose end of the strap. To unfasten your seat belt, lift the buckle. We suggest that you keep your seat belt fastened throughout the flight, as we may experience turbulence.

There are six emergency exits on this aircraft
Two in the front, two over the wings and two at the back. Please take a few moments now to locate your nearest exit. In some cases, your nearest exit may be behind you. If we need to evacuate the aircraft, floor-level lighting will guide you towards the exit.

In the event of a decompression, oxygen masks will automatically drop from the service panel above your head. To start the flow of oxygen, pull the mask towards you, place it firmly over your nose and mouth, secure the elastic band behind your head and breathe normally. Although the bag does not fully inflate, oxygen is flowing. If you are travelling with a child or someone who requires assistance, secure your mask first and then assist the other passengers.

In the event of a water landing emergency, locate the life vest under your seat. When instructed to do so, slip the life vest over your head. Fasten the straps around your waist and adjust at the front. To inflate the vest, pull firmly on the red cord, only when leaving the aircraft. If you need to refill the vest, blow into the mouthpieces. Use the whistle and light to attract attention.

We remind you that this is a non-smoking flight and all toilets are equipped with smoke detectors. Tampering with or damaging the smoke detectors located in the toilets is a criminal offence.

You will find this and all the other safety information in the safety card located in the seat pocket in front of you. We strongly suggest you read it before take-off. If you have any questions, please don't hesitate to ask one of our crew members. Sit back, relax and enjoy your flight with us.

Scan with a smartphone

Listen to real-life announcements

Listen to real life announcements at
www.englishclub.com/english-for-work/airline-announcements.htm

Tourism: Grade 12

Exemplar lesson 16

Subject and grade	Tourism: Grade 12
Topic	**Foreign Exchange** Sub-topic: The Multiplier Effect and GDP.
CAPS reference	Term 2 Week 6.
Duration	Two periods (Approx. 2 x 45 minutes).
Lesson resources	Addenda A, B, C, D and E Video
Preamble	This topic is expanding knowledge gained in Grade 11 (*Foreign exchange and its value to the South African economy – Term 2 Week 6 and 7*) and will focus on the multiplier effect and the GDP. The knowledge gained in this lesson will develop essential life skills relating to travel, such as interpretation of a currency rate sheet. It will create awareness of the contribution of tourism to local economies and the value of income generated by tourism to the growth of the GDP of South Africa.
Expected outcomes	The learners must: • Understand the concepts GDP and the multiplier effect. • Understand the link between the multiplier effect and the GDP. • Be able to apply the knowledge gained in real-life situations.
Determine prior knowledge	The teacher needs to determine whether the Grade 11 content has been mastered by learners before commencing with this lesson. The teacher can use various techniques to determine prior knowledge, e.g. questioning and drawing on learners' personal experiences. Consult teachers in other subjects where similar topics appear in the curriculum.
Introduction to the topic	In preparation for the lesson, the teacher must: • Make TWO copies of Addendum A for this lesson. The teacher must keep the copies for further use in follow-up lessons on currency conversions. • Make ONE copy of Addendum B. Cut out each label and allocate the different labels to selected learners. The learners must attach the labels to their person where it will be visible to other learners. • The learners will take on the roles indicated on the label.

Introduction to the topic:

- The teacher will start the lesson by introducing him/ herself as a foreign tourist visiting South Africa.
- The teacher demonstrates to the class how the tourist pays the **tour operator** a sum of money.
- The **tour operator** will then pay the **tourist guide**, a **bakery** and the **filling station**.
- The **tourist guide** then buys groceries from the **grocery store**.
- The **bakery** pays the farmer.
- The **grocery store** pays the cashier, who goes to the local market to buy food and then goes home and saves the remaining money.

Payments to be made	**Amount**
Tourist – tour operator	R1 800
Tour operator – tourist guide	R800
Tour operator – bakery	R200
Tour operator – filling station	R200
Tourist guide – grocery shop	R400
Grocery shop – cashier	R100

While the learners are continuing with the cycle as instructed, the teacher writes the amounts paid on the chalkboard/ whiteboard.

Instruct learners to tally the amounts on the whiteboard.
Illustrate to the learners that even during a simple cycle, the original amount of R1 800 does not physically increase. However, the spending of the money within that community spirals (goes round and round) and contributes significantly to the economy of that community and subsequently to the economy of the country.

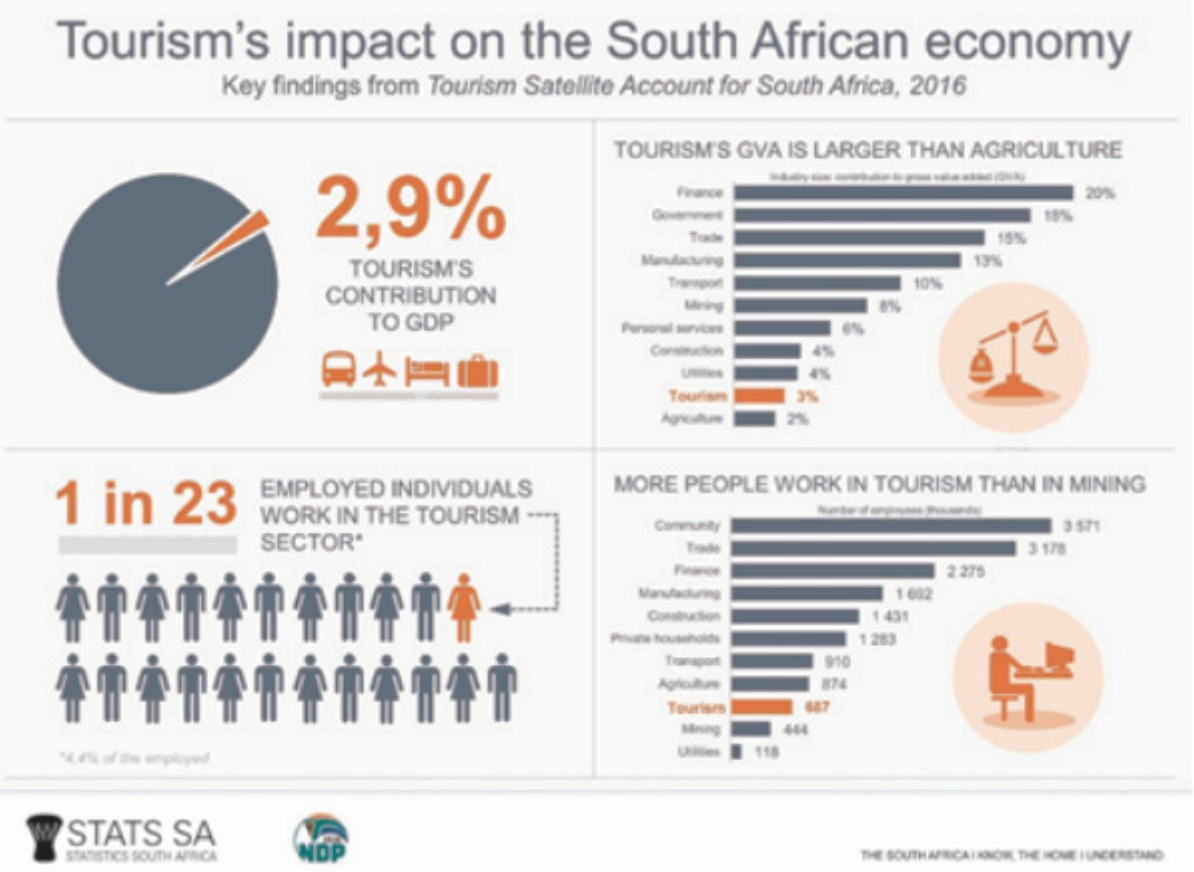
In essence, this means that the total value of the products and services is not only the R1 800, but also the R800 +R200 + R200 + R400 + R100.

This means that the **value** that was paid for products and services in this transaction amounts to R3 500.

NEW CONCEPTS	
Concept	**Meaning of the concept in context**
GDP	The Gross Domestic Product (GDP) refers to the value of all goods and services that are produced in the South African economy in one year. Income derived from domestic and inbound international tourism is one of the largest contributors to GDP in South Africa.
Multiplier effect	The flow of money derived (received) from tourists into a particular community where it will be circulated and ultimately benefit community members and businesses and contribute to the GDP of a country.
Buying power	The **value** that money has to procure (buy) goods and services.
Bank buying rate	The rate (price) at which a bank is **buying** foreign currency from tourists.
Bank selling rate	The rate (price) at which a bank is **selling** foreign currency to tourists.
Currency	The money of a country, e.g. the South African rand (ZAR), Australian dollar (AUD), Botswana pula (BWP).
Produced	Products manufactured (made) anywhere in the world.
Currency rate sheet	A table of all major currencies containing the rate at which one currency is exchanged for another at a particular day or time. Rates can fluctuate during the day.
Strong rand	The rand is considered strong when the rate of exchange (purchase price) of the foreign currency to be purchased declines significantly.
Weak rand	The rand is considered weak when the rate of exchange (purchase price) of the foreign currency to be purchased increases significantly.
Travel allowance	The pre-determined amount an outbound South African tourist is allowed to take out of the country in one calendar year (refer to www.money-transfers.co.za – click on allowances).
Tour operator	A person or company that provides holiday experiences to tourists where travel, accommodation, activities and entertainment may be combined into one package.
Tourist guide	A person with exceptional knowledge of specific places, events, history or any point of interest who delivers a service by sharing this knowledge with individual tourists or tour groups at an agreed fee.
Bakery	A business that produces and sells flour-based foods baked in an oven, such as bread, biscuits, cakes, pastries and pies.

Filling station	A business that sells fuel (petrol and diesel) to motorists.
Grocery store	A shop that sells a variety of grocery products such as canned foods, frozen and fresh foods items, cleaning materials and general household items.
Cashier	A person who operates the cash register ('till') at various pay points.

Lesson content	**Foreign Exchange** • The term Gross Domestic Product (GDP) and its benefits to the South African economy. • The multiplier effect and how it contributes to the GDP of a country. **GROSS DOMESTIC PRODUCT (GDP)** The teacher explains the term Gross Domestic Product (GDP). GDP includes all private and public consumption, government outlays, investments, private inventories, paid-in construction costs and the foreign balance of trade (exports are added, imports are subtracted). Put simply, GDP is a broad measurement of a nation's overall economic activity. It may be contrasted with gross national product (GNP), which measures the overall production of an economy's citizens, including those living abroad, while excluding domestic production by foreigners. Hand out Addendum D to learners. **How the income generated by tourism contributes to the country's GDP.** In South Africa, tourism contributed R136,1 billion, about 2.9% of our total GDP in 2017. When tourism's indirect and induced benefits across a very broad value chain are factored in, the total contribution amounts to R412,5 billion, or 8.9% of our GDP. (Source: NDT Annual report 2018) The teacher assists with the interpretation of the statistics below.



(Source: Stats SA - Tourism)

Further reading: http://www.statssa.gov.za/?p=11030

The Multiplier Effect

Tourism not only creates jobs in the tertiary sector. It also encourages growth in the primary and secondary sectors of industry.

This is known as the multiplier effect, which reflects how many times money spent by a tourist circulates through a country's economy.

For example, money spent in a hotel helps to create jobs directly in the hotel, but it also creates jobs indirectly elsewhere in the economy.

The hotel has to buy food from local farmers, who may spend some of this money on fertiliser or clothes. The demand for local products increases as tourists often buy souvenirs, which increases secondary employment and thus creates sustainable livelihoods in some of the most impoverished communities.

The Link between the Multiplier Effect and Gross Domestic Product

The tourism sector is known for setting the multiplier effect into motion and the subsequent contribution to GDP growth in the country. How does this happen?

Activity 1: Case Study
The teacher makes the case study (Addendum C) available to learners. Learners answer the questions that follow below the case study.

CASE STUDY - BARA-NADA GUESTHOUSE

Gladys Mokebeni owns Bara-nada Guesthouse in Cape Town. Her guesthouse serves breakfast every morning. This breakfast consists of three rashers of bacon, two eggs, toast, grilled tomato and baked beans. Bara-nada Guesthouse is almost always fully booked because of its proximity to the Cape Town International Airport and Gladys needs to do daily shopping in order to prepare fresh food for her guests every day. She decides to do research to see what impact her daily shopping has on the economy of her own community.
She buys bacon from a local grocery store, which in turn buys their stock from a local wholesaler, who buys it from the shop at the abattoir, which in turn buys the pigs from a farmer in the area.
She buys fresh bread from an entrepreneur, a woman who lives close by and bakes fresh bread daily in her own kitchen. This entrepreneur buys the flour from a local roller mill that buys the wheat from a local farmer.
She was surprised to learn how significant her daily purchases were for entrepreneurs, vendors and businesses in her community. She then realises that **every transaction that took place before she could have a final product on the table, involved the sale of someone else's final product.**

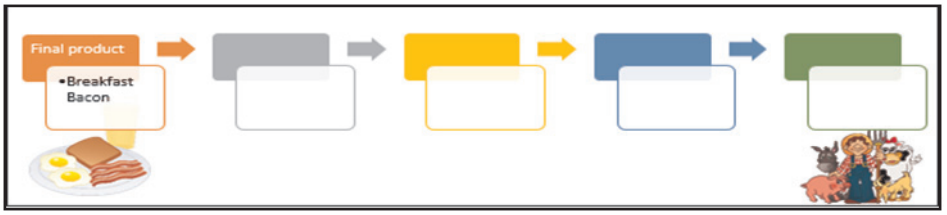
QUESTIONS:
1. Underline the words in the case study that you struggle to pronounce.
2. How many times does the word 'local' appear in the case study?
3. List the THREE sectors that provided the products for Gladys's breakfast.
4. Quote ONE phrase to show why Bara-nada Guesthouse is always fully booked.
5. Does the guesthouse make a significant impact on the quality of life of the members of this community? Motivate your answer.

Memorandum

1. Answers will differ from learners.
2. Five times
3. Primary, Secondary, Tertiary
4. "…because of its proximity to the Cape Town International Airport…"
5. Yes, all the products she buys are from local entrepreneurs, vendors and businesses in her community.

Activity 2:

Complete the diagram in Addendum C to illustrate the flow of the multiplier effect of the bacon Gladys buys.

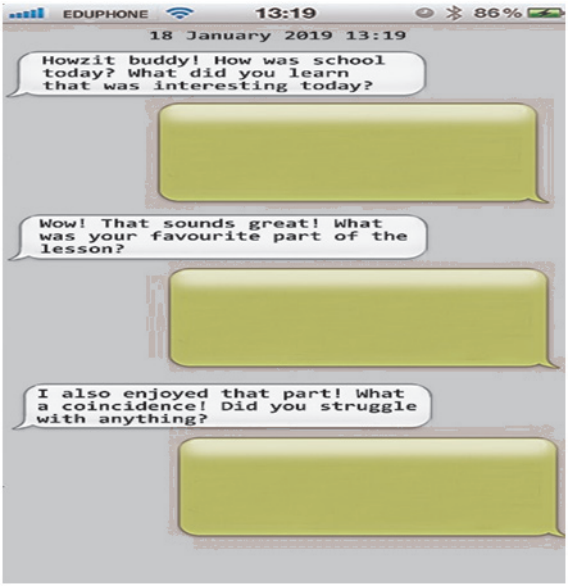


Memorandum

EAC integration:

1. Learners scan-read the case study quietly.
2. Learners underline difficult words - the teacher explains concepts.
3. Learners underline the words they do not know how to pronounce - the teacher assists with pronunciation.
4. Count how many times the word 'local' appears in the case study. Give possible reasons why.
5. The teacher selects individual learners to read the case study out loud.

Assessment	**Informal Assessment:** **Class Discussion: Opinion-type questions:** The class is divided into groups to discuss the questions below: Does the Bara-nada Guesthouse make a significant impact on the quality of life of the members of this community? Yes or No? Are there more ways that the guesthouse could contribute to the local economy? The group must write down all recommendations as well as the conclusion. Present your point of view to the class. **Example of a possible conclusion:** For Gladys to supply her tourists and guests with something as simple as breakfast, all three sectors in the economy are involved and she is also indirectly creating and sustaining jobs, thus making South Africa a better place.
Extended opportunities/ homework	**Strengthening of the learning process (Reinforcement)** • Invite an employee from a local bank to act as a guest speaker. The teacher will inform the guest speaker about the content needed. The teacher has to brief the learners on their expected conduct during the guest speaker's presentation. • Learners have to research a local tourist attraction and write a paragraph on how the attraction contributes to the multiplier effect and the GDP of South Africa. **Expanded knowledge: Leakage (not to be assessed formally).** The teacher may stimulate the interests of learners by also showing how money can disappear from a community (this content may not be examined). The multiplier effect continues until the money eventually 'leaks' from the economy through imports - the purchase of goods from other countries. Saving money is a form of leakage as it removes money from the cycle. Further reading about future predictions on tourism's contribution to the GDP: **https://www.fin24.com/Economy/record-year-for-sa-tourism-in-2018-global-report-20180322**

Self-reflection	1. Make copies for each learner of Addendum E. 2. Learners have to complete the following self-reflection activity by responding to questions in the green block in the social media conversation. All answers must be written in full sentences.  3. Write a paragraph on the content that was taught in today's lesson. Learners must ensure that the paragraph includes content they enjoyed as well as content they found challenging.

ADDENDUM A

Instructions: Copy this page, cut along the dotted lines and distribute one note per learner in the class.

R100	R100
R100	R100
R100	R100
R100	R100
R100	R100

ADDENDUM B

Instructions: Copy this page, cut along the dotted lines and hand to selected learners in the class.

TOUR OPERATOR

FARMER

TOURIST GUIDE

BAKERY

PETROL STATION

GROCERY SHOP

CASHIER

ADDENDUM C: Case study

Read the case study below and the answer the questions that follow.

Bara-nada Guesthouse builds a better community

Gladys Mokebeni owns Bara-nada Guesthouse in Cape Town. Her guest house serves breakfast every morning. This breakfast consists of three rashers of bacon, two eggs, toast, grilled tomato and baked beans.

Bara-nada Guesthouse is almost always fully booked because of its proximity to the Cape Town International airport and Gladys needs to do daily shopping in order to prepare fresh food for her guests every day. She decides to do research to see what impact her daily shopping has on the economy of her own community. She was surprised to learn how significant her daily purchases were for entrepreneurs, vendors and businesses in her community.

She buys bacon from a local grocery store, who in turn buys their stock from a local wholesaler, who in turn buys it from the shop at the abattoir, who in turn buys the pigs from a farmer in the area. entrepreneur, a lady who lives close by and bakes fresh bread daily in her own kitchen. This entrepreneur buys the flour from a local roller mill who buys the wheat from a local farmer.

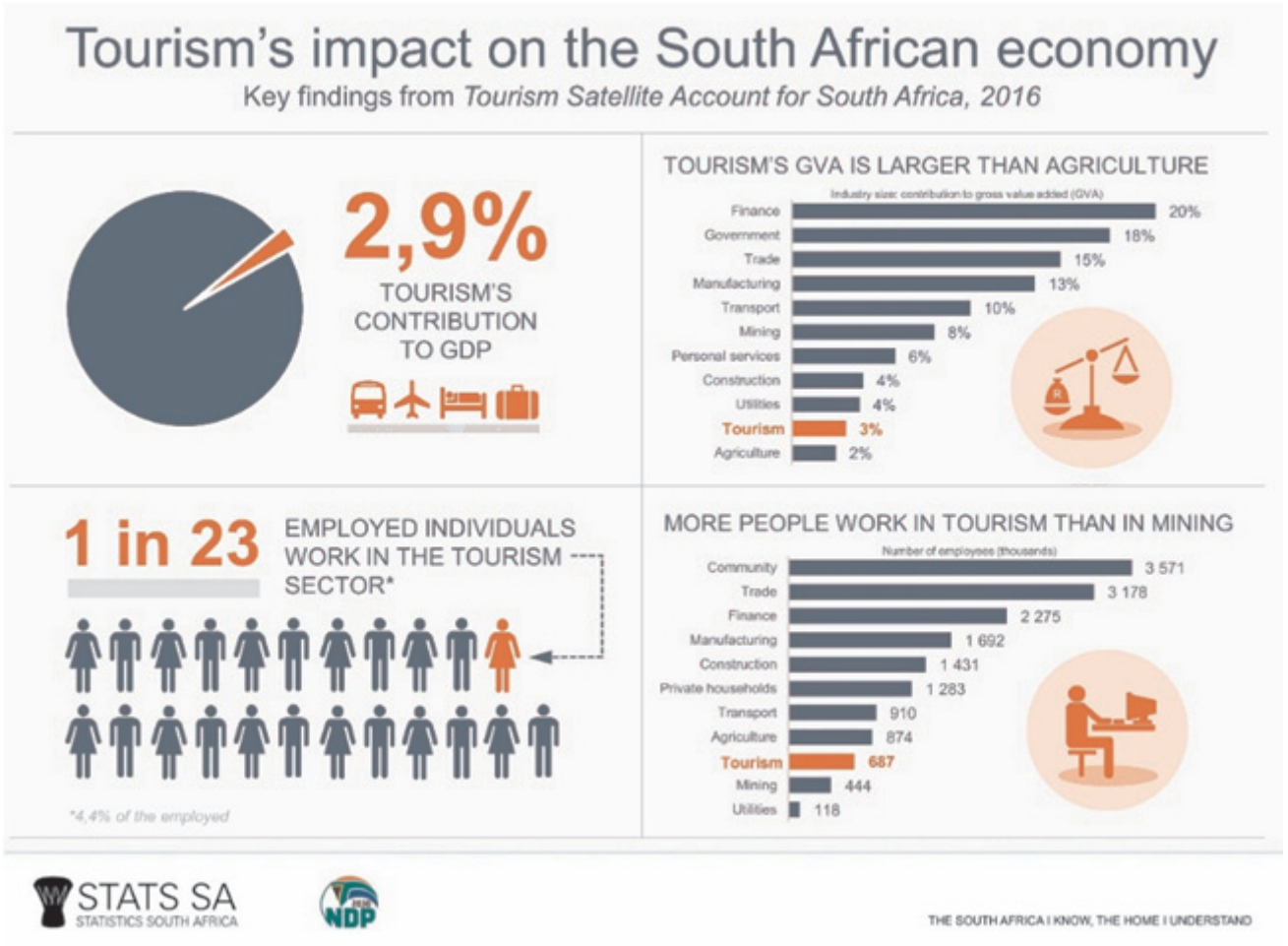
She was surprised to learn how significant her daily purchases were for local entrepreneurs, vendors and businesses in her community. She then realises that every transaction that takes place before she can have a final product on the table, involves someone else's final product.

QUESTIONS:

1. Underline the words in the case study that you struggle to pronounce.
2. Count how many times the word 'local' appears in the case study.
3. List the THREE sectors that provide the products for Gladys's breakfast.
4. Quote ONE phrase to show why Bara-nada Guesthouse is always fully booked.
5. Does the guesthouse make a significant impact on the quality of life of the members of this community? Motivate your answer.
6. Complete the diagram below to illustrate the flow of the multiplier effect of the bacon Gladys buys.

ADDENDUM D

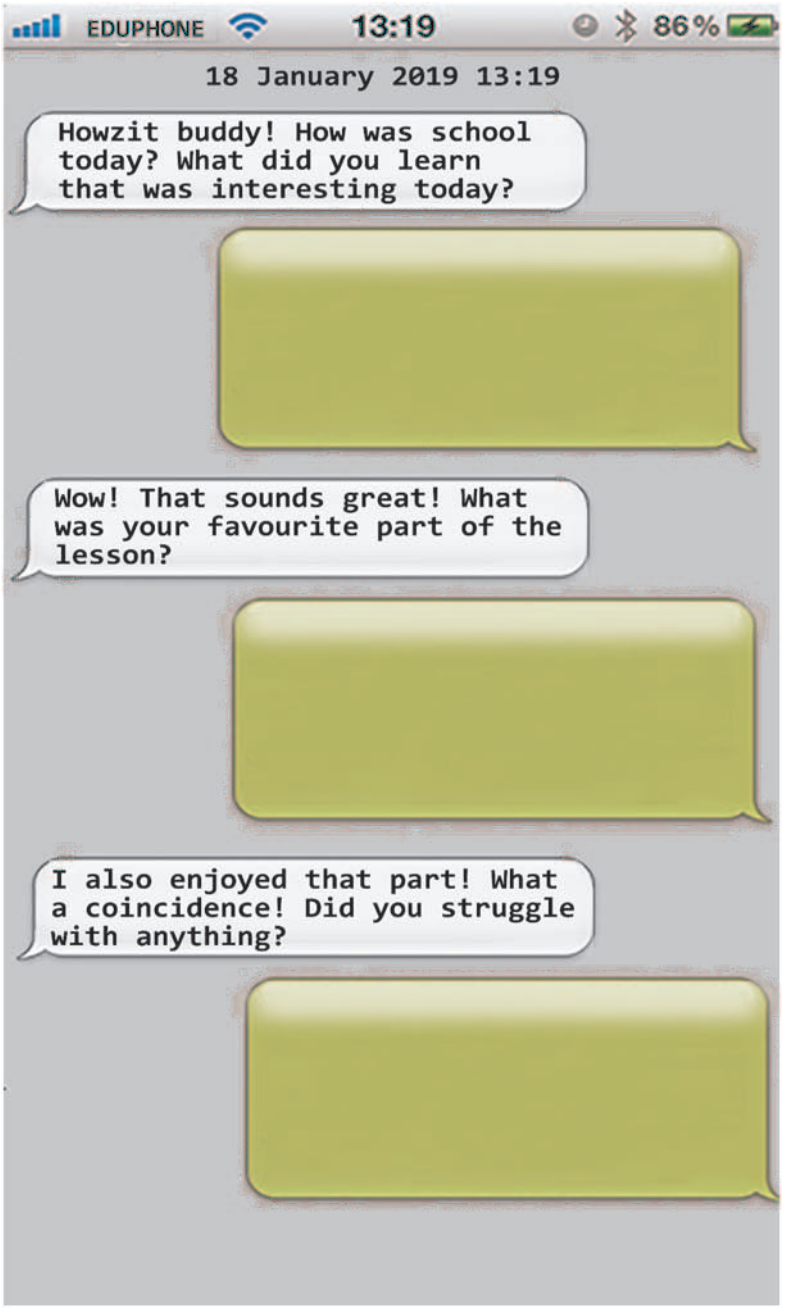
Instructions: Copy this page for each learner.
The teacher assists with the interpretation of the information.



ADDENDUM E - Self-reflection

1. Complete the following self-reflection exercise by filling in your part in the social media conversation.
All answers must be written in full sentences.

2. Write a paragraph on the content that was taught in today's lesson. Make sure that your paragraph includes the content you enjoyed and the content that you found challenging.



Technical Mathematics: Grade 10

Exemplar lesson 17

Subject and grade	Technical Mathematics: Grade 10
Topic	**Finance and Growth**
Preamble	• Understanding the language of mathematics and developing mental processes that will enhance logical and critical thinking, accuracy and problem-solving skills. • Applying the science of mathematics in a technical field where the emphasis is on application and not on abstract ideas.
Language aspects covered	
Introduction	There are two types of interests charged when a person or organisation borrows or lends money. Many micro-lenders charge their clients huge amounts of money (interest) when they lend to them. Briefly explain what you understand by simple and compound interest.
Pre-knowledge vocabulary	**Finance**: The management of money by government and organisations that includes activities related to investing, borrowing, lending, budgeting, saving and planning.
	Growth: Increase in size/ amount.
	Interest: An amount of money charged at a particular rate on an investment or loan over a period of time.
	Simple interest: Is a quick and easy method of calculating the increase on a loan/ investment and it is determined by multiplying the daily interest rate by the principal by the number of days that elapsed between payments.
	Compound interest: Interest calculated on the initial principal and which also includes all of the accumulated interest of previous periods of a deposit or loan.
	Hire purchase: A system by which one pays for an item in regular instalments while having the use of it.
	Exchange rates: The value of one currency for the purpose of conversion to another currency.
	Principal: The initial amount which is invested or loaned.
	Amount: An amount of money that is payable after a certain period when a person has borrowed money (A = P + I)
Reference to specific words: new terminology	**Simple interest formula**: $A = P + i = P + (P \times i \times n) = P(1 + in)$ A = Amount (final value)

	P = Principal (Initial value) r is rate of interest n = the investment/ loan period $i = \frac{r}{100}$ **Compound interest formula**: $A = P(1+i)^n$ **Inflation**: The general increase in prices and fall in the purchasing value of money. **Deflation**: A decrease in the general price level of goods and services. Deflation occurs when the inflation rate falls below 0% (a negative inflation rate). Inflation reduces the value of currency over time, but deflation increases it. **Population**: All the organisms of the same group or species which live in a particular geographical area and have a capability of interbreeding. **Population growth**: The increase in the number of individuals in a population.
During teaching	**At the end of the lesson the learners should be able to:** • Use the language of mathematics. • Use mathematical process skills to identify and solve problems. • Communicate appropriately by using descriptions in words. • Use relevant formulae to solve real-life problems. The topic is introduced by writing it on the board. Learners are requested to explain what they understand about the topic. Grade 9 knowledge of using whole numbers in financial concepts. Four examples covering all the four mathematics cognitive levels are given to learners. A learner is requested to read the problem aloud and the rest of the class identify the keywords and write them down. The learners will be requested to identify the missing variable. Learners are given an activity and work in pairs. Learners are given an activity to work on as individuals.
Post-teaching	Assessment covers the following cognitive levels: • Knowledge. • Routine procedures. • Complex procedures.

LESSON SCRIPT

Topic: Finance and growth

A. SIMPLE AND COMPOUND INTEREST

In the last few minutes, we managed to differentiate between simple and compound interest. Remember that simple interest is calculated once over a period of time and compound interest, *if the calculation is made annually*, is calculated at the end of each year over a period of time.

Examples

1. R100 invested for 3 years at 5% p.a. Simple interest will yield interest as follows

   Simple Interest = $P \times i \times n$ = $R100 \times 0.05 \times 3$ = R15

2. R100 invested for 3 years at 5% p.a. Compound interest will yield interest as follows:

   Interest on the 1st year = $R100 \times 0.05 \times 1$ = R5

   Interest on the 2nd year = $R105 \times 0.05 \times 1$ = R5.25

Explanation: The principal is no longer R100 but R105 because the interest of the 1st year has been added.

Interest on the 3rd year = $R110.25 \times 0.05 \times 1$ = R5.51

Explanation: The principal is no longer R105 but R110.25 because the interest of the 2nd year has been added.

Total interest accumulated over a period of 3 years will be:

Compound interest = R5 +R5.25 + R5.51 = R15.76

Explanation: More interest will be accumulated when using compound interest than simple interest because compound interest is calculated at intervals within the investment period while simple interest is calculated once at the end of the investment period. Stated differently, in simple interest, interest is only paid once on the principal whereas, in compound interest, interest is earned on both the principal and on earlier interest payments.

During teaching:

We indicated earlier that when a person loans/ invests money, at the end of the period he/ she will receive the money he/ she loaned plus the interest. The money is expressed as **Amount (A) = P + I**, which means that if the **Amount** is calculated at simple interest

A = P + I = $P + (P \times i \times n) = P(1 + in)$

and when the **Amount** is calculated at compound interest

A = $P(1+i)^n$

STEP 1: Read the statement carefully, twice or thrice.

STEP 2: Underline/ highlight key concepts and values.

STEP 3: Write down the key concepts and related values.

STEP 4: Identify the missing value or concept that you need to find.

STEP 5: Identify the correct formula and write it down.

STEP 6: Substitute the values into the formula.

STEP 7: Write down the correct answer.

EXAMPLE

1. John wants to start a chicken farming business. He borrows R25 000 from a bank to get his business started. Calculate the amount he will pay back to the bank after 5 years if simple interest is charged at the rate of 18% per annum.

SOLUTION

Since it is simple interest we use the simple interest formula

$A = P(1+in)$

Key concepts:

Principal (P) = R25 000

Period (n) = 5 years

$$i = \frac{r}{100} = \frac{18}{100} = 0.18$$

Amount (A) =?

$A = P(1+in)$ = R25 000 (1 + 0.18 × 5) = **R4 750**

2. John wants to start a chicken farming business. He borrows R25 000 from a bank to get his business started. Calculate the amount he will pay back to the bank after 5 years if compound interest is charged using the rate of 18% per annum.

SOLUTION

Since it is compound interest we use the compound interest formula

$A = P(1+i)^n$

Key concepts:

Principal (P) = R25 000

Period (n) = 5 years

$$i = \frac{r}{100} = \frac{18}{100} = 0.18$$

Amount (A) =?

$A = P(1+i)^n$ = R 25000 $(1 + 0.18)^5$ = R 25 000 $(1.18)^5$ = **R57 193.94**

$A = P(1+i)^n$ = R 25000 (1 + 0.18) ^{5} = R 25 000 (1.18) ^{5} = **R57 193.94**

Now when we compare the amount accumulated at simple interest and the amount calculated at compound interest, we realise that compound interest yields more interest than simple interest. In this case, charging compound interest benefited the bank more than John.

B. HIRE PURCHASE

Hire purchase: A system by which one buys furniture (and other items) on credit, paying for it in regular instalments over a specified period of time while having the use of it.
The client/ customer is sometimes requested to pay a certain percentage of the advertised price as a deposit.
Hire purchase is always calculated using simple interest, with the total amount owed divided into equal monthly instalments that the purchaser must pay.

EXAMPLE

Mary wanted to buy a TV. She visited a shopping centre on Black Friday and found the TV on sale at MYSTORE.
(a) Calculate how much Mary will have paid for the TV after finishing the payments, if interest was charged at 13% per annum.
(b) Calculate Mary's monthly instalment.

Samsung UA65MU735065II PURCOLOUR Smart UHD Curved TV

Normal Price: ~~R25 999~~
Sale Price: R16 999
You Save: R 9 000 (35%)
Repayment Terms: 36 Months
ONLY 10% DEPOSIT

SOLUTION

Since it a hire purchase, the simple interest formula will be used:

$$A = P(1 + in)$$

A: 3

P: R16 999

i: $\frac{13}{100} = 0.13$

Mary paid a 10% deposit, hence the principal amount after deposit will be:

New principal amount after deposit = R16 999 – R1 699.90 = R15 299.10

(a) $A = P(1+in)$ = R15 299.10 (1 + 0.13 ×3) = R21 265.75

Mary will have paid a total amount of R21 265.75 + R1 699.90 = R 22 965.65

(b) Monthly repayments = R590.72

C. INFLATION

Inflation: The general increase in prices and fall in the purchasing value of money. Inflation is always calculated at compound interest/ growth.

EXAMPLE

A Big Mac meal currently costs R31.00 at McDonald's.

How much will it cost in 2030 if inflation is calculated at the rate of 4,9% per annum?

SOLUTION

Since inflation is calculated at compound interest or growth, the compound interest formula will be used:

$A = P(1+i)^n$

Key concepts:

Principal/ Cost Price = R31.00

$i = \frac{4,9}{100} = 0,049$

$n = 11 years$

$A = P(1+i)^n$ = R31 (1+ 0,049)^{11} = R52.47

The Big Mac will cost R52.47 in 2030.

D. POPULATION GROWTH

Population: All the organisms of the same group or species which live in a particular geographical area and have a capability of interbreeding.

Population growth: The increase in the number of individuals in a population.

Population growth is a special kind of inflation.

EXAMPLE

According to statistics, the population in South Africa in 2019 is estimated at 57 725 600. The population growth rate is calculated at 1.55% per annum. Calculate by how many people the population would have increased in 2022.

SOLUTION

Key concepts:

Principal = 57 725 600

$n = 3 years$

$i = 0,0155$

A = Number of people in 2022

I = Increase

$A = P(1+i)^n$ = 57 725 600 (1 + 0, 0155)^3 = 60 451 661

TOTAL INCREASE = 60 451 661 – 57 725 600 = 2 726 061

E. EXCHANGE RATE

Exchange rates: The value of one currency for the purpose of conversion to another currency. It is always changing, not only on a daily basis but even during the day.

EXAMPLE

Tshepo wants to buy a pair of sneakers which he saw online.
The price of the sneakers was $24. How much will Tshepo pay for the sneakers in rand (exchange rate: $1 = R13.68)?

SOLUTION

Let the price in Rand be , then cross multiply

Tshepo wants to buy a pair of sneakers which he saw online. The price of the sneakers was $24.
How much will Tshepo pay for the sneakers in rand (exchange rate: $1 = R13.68)?

SOLUTION

Let the price in Rand be x , then cross multiply

$$\$1 = R13.68$$

$$\$24 = x$$

$$\$x = \$24 \times R13.68$$

$$\therefore x = R328.32$$

SUMMARY

Simple Interest formula: $A = P(1+in)$

$$P = \frac{A}{(1+in)}$$

$$i = \left(\frac{A}{P} - 1\right) \div n$$

$$n = \left(\frac{A}{P} - 1\right) \div i$$

Compound Interest formula: $A = P(1+i)^n$

$$P = \frac{A}{(1=i)^n}$$

$$i = \sqrt[n]{\frac{A}{P}} - 1$$

$$r = i \times 100$$

ASSESSMENT

NB: Answers must be in two decimal places unless otherwise stated.

Activity 1 (Group Work):

1. Gladys, who has just turned 52 years old, invests her bonus of R45 000 in a unit trust that earns 13% compound interest annually. How much will her investment be worth when she reaches her retirement age of 60 years?
2. Richard invested R25 000 for 5 years at a rate of r % per annum simple interest. At the end of the investment period, the amount was R50 000. Calculate the value of r.
3. After a certain period, John's investment of R3 000 has grown to R5 400. How long did it take the investment to grow if the interest was calculated at 15% per annum simple interest (give your answer in months)?

Activity 2 (Individual Work):

1. Risima buys a laptop computer priced at R15 200. She pays a deposit of 25% and settles the balance at a hire purchase agreement of 18% interest per annum.
   If she pays off the loan in 24 monthly instalments:
   - 1.1 What amount (in rand) did she pay as a deposit?
   - 1.2 Calculate the balance owing after the deposit has been paid?
   - 1.3 How much is the interest payable on the balance?
   - 1.4 How much, in total, is payable after the deposit?
   - 1.5 What is the monthly instalment?
   - 1.6 How much in total would she have paid by the end of the 24 months?

2. Soza has saved R1 200 as a deposit for a stove he needs.
   He has budgeted R250 per month towards the monthly instalments of the stove.
   A local furniture shop currently has a promotion for such a stove.
   They offer him a deal to buy the stove on hire purchase at an interest rate of 15.5%.
   Calculate the price of the stove.

3. In 2009, a loaf of brown bread cost R8.00 and in 2012 it cost R9.20.
   3.1 Calculate the average rate of inflation over the period.
   NB: (Inflation rate = $\frac{\text{changein cost}}{\text{Initial cost}} \times 100$ **)**

3.2. What will the price of the loaf be in 2022, assuming the same inflation rate?

MARKING GUIDELINES

Activity 1:

1	$A = P(1+i)^n$ $= 4500(1+0{,}13)^8$ $= 119629{,}99$	
2.	$A = P(1+in)$ $5000 = 2500\,(1+i(5))$ $\frac{5000}{2500} = \frac{2500}{2500}(1+5i)$ $2 = 1+5i$ $2-1 = 5i$ $i = 0{,}2$ $\therefore r = 0{,}2\times 100$ $r = 20\%\ p.a$	
3	$A = P(1+in)$ $\frac{5400}{3000} = \frac{3000}{3000}(1+0{,}15n)$ $1.8 = 1+0.15n$ $1.8-1 = 0{,}15n$ $0.8 = 0{,}15n$ $n = 5{,}33$ $\approx 64 months$	

Activity 2:

1.1	$R15200\times 25\%$ $= R3800$	
1.2	R15 200 – R3 800 = R11 400	
1.3	$I = P\times i\times n$ $= 11400\times 0.18\times 2$ $= R4104$	
1.4	$A = P(1+in)$ $= R11400(1+0.18\times 2)$ $= R15504$	
1.5	R15 504 ÷ 36 = 1 292	

1.6	Total paid = R15 504 + R3 800 = R18 904	
2	Total amount paid on the stove = Deposit + (250 x 36) = R1 200 + R9 000 = R10 200 $A = P(1+in)$ $R10200 = P(1+0.155\times 3)$ $\therefore P = \frac{10200}{1.465}$ $P = R6962,46$	
3	$Inflationrate = \frac{9,20-8}{8}\times 100$ $= \frac{1,2}{8}\times 100$ $= 15\%$ In 2022, the price of the bread will be $A = P(1+i)^n$ $= 9,20(1+5)^{10}$ $= R37,22$	

Now that you have the knowledge of finance and growth, you can assist your parents, relatives and friends to make good financial decisions

Technical Mathematics: Grade 11

Exemplar lesson 18

Subject and grade	Technical Mathematics: Grade 11
Topic	**Functions and Graphs**
Preamble	• Understanding the language of mathematics and developing mental processes that will enhance logical and critical thinking, accuracy and problem-solving skills. • Applying the science of mathematics in a technical field where the emphasis is on application and not on abstract ideas.
Language aspects covered	
Introduction	Functions are special relationships between variables, where each input value produces one output value. A function can be represented using words, equations, tables or graphs.
Pre-knowledge vocabulary	**Function**: A function is a relationship whereby one element of a set (input or independent variable) is **mapped** to exactly one element (output or dependent variable) of another set. A function can be either one to one or one to many.
	Variable: A letter that represents or stands in for a number.
	Independent variables: the output values of a function that are independent (x-values).
	Dependent variables: the output values of a function that are dependent on the x-values (y-values).
	One to one function: A function in which one value of x is assigned/ mapped to only one value of y.
	One to many function: A function in which one value of x is assigned or mapped to two or many values of y.
	Linear function: The graph of a straight line, represented by the equation $y = f(x) = mx + c$
	Gradient: The slope or steepness of a graph.
	***x*-intercept**: the values of x where the graph crosses the x-axis.
	***y*- intercept**: the values of y where the graph crosses the y-axis.
	Cartesian plane: two perpendicular number lines: x-axis which is horizontal and y-axis which is vertical. Using these axes, we can describe any point in the plane of an ordered pair of numbers.
	Functional notation: A way of expressing a function using f(x) to

	represent the y variable.
	Domain: The set of all the possible input values of a function.
	Range: The set of all the possible output values of a function.
Reference to specific words: new terminology	**Axis of symmetry**: Divides the graph into two symmetrical halves.
	Turning point: The stationary point at which the maximum or minimum value of a graph is found.
	Asymptotes: Lines that the graph never crosses or touches.
	Parabola: The graph of a quadratic function with an equation in the form: $f(x) = a(x-p)^2 + q$ or $f(x) = ax^2 + bx + c$
	Hyperbola: The graph of a rational function with an equation in the form: $f(x) = \frac{a}{x} + q$
	Exponential graph: The graph of an exponential function with an equation in the form: $f(x) = a.b^x + q$ where $b > 0$ and $b \neq 1$
	Parameters: A value that is part of a function but which can be changed. Changing the parameter affects the behaviour of the function.
During teaching	**At the end of the lesson the learners should be able to:** • Use the language of mathematics. • Use mathematical process skills to identify and solve problems. • Communicate appropriately by using descriptions in words. • Use relevant formulae to solve real-life problems. The topic is introduced by writing it on the board. Learners are requested to explain what they understand about the topic. Learners are given an activity and work in pairs. Learners are given an activity to work on as individuals.
Post-teaching	Assessment covers the following cognitive levels: • Knowledge. • Routine procedures. • Complex procedures. • Problem-solving.

LESSON SCRIPT

Topic: Functions and graphs

The graph of the function $f(x) = a(x-p)^2 + q$ or $f(x) = ax^2 + bx + c$

For this lesson, our focus will be on the parabola.

Definition: The graph of a quadratic function with an equation in the form:

$f(x) = a(x-p)^2 + q$ or $f(x) = ax^2 + bx + c$

Now let us investigate the effect of the parameters a and q on the quadratic function.

Investigating the effects of the parameters a and q

1. a) Complete the following table using the equations given:

i) $f(x) = x^2$

ii) $g(x) = 2x^2$

iii) $h(x) = x^2$

iv) $k(x) = -2x^2$

x	-2	-1	0	1	2
$f(x) = x^2$					
$g(x) = 2x^2$					
$h(x) = -x^2$					
$k(x) = -2x^2$					

b) Plot the graphs of $f; g; h$ and k on the same set of axes.

c) What do you notice about the difference the change in the a-value makes between the graphs?

d) What is the difference between the graphs of $f(x)$ and $h(x)$?

2. a) Complete the following table using the equations given:

i) $f(x) = x^2 + 1$

ii) $g(x) = x^2 - 1$

iii) $h(x) = x^2 + 4$

iv) $k(x) = x^2 - 4$

x	-2	-1	0	1	2
$f(x) = x^2 + 1$					
$g(x) = x^2 - 1$					
$h(x) = x^2 + 4$					
$k(x) = x^2 - 4$					

b) Plot the graphs of $f; g; h$ and k on the same set of axes.

c) What do you notice about the difference the change in the q-value makes between the graphs?

d) What is the difference between the graphs of $h(x)$ and $k(x)$?

3. a) Complete the following table using the equations given:

i) $f(x) = (x-1)^2$

ii) $g(x) = (x+1)^2$

x	-2	-1	0	1	2
$f(x) = (x-1)^2$					
$g(x) = (x+1)^2$					

b) Plot the graphs of f and g on the same set of axes.

c) What do you notice about the difference the change in the p-value makes between the graphs?

Now you realise that the parameters a; p and q have got an effect on a function. The parameter a determines the shape of the graph in the parabola. When a is negative, the shape of the graph changes.

The parameter q translates the graph horizontally or vertically and p to the right or to the left.

To sketch means to construct. If you want to construct something you need to have a clear picture of what your product will look like after you have finished with the construction. It is the same with a graph. You need to know the shape of the graph in order to sketch it properly. Secondly you need to find the intercepts on the axes and lastly, you need to know the turning point.

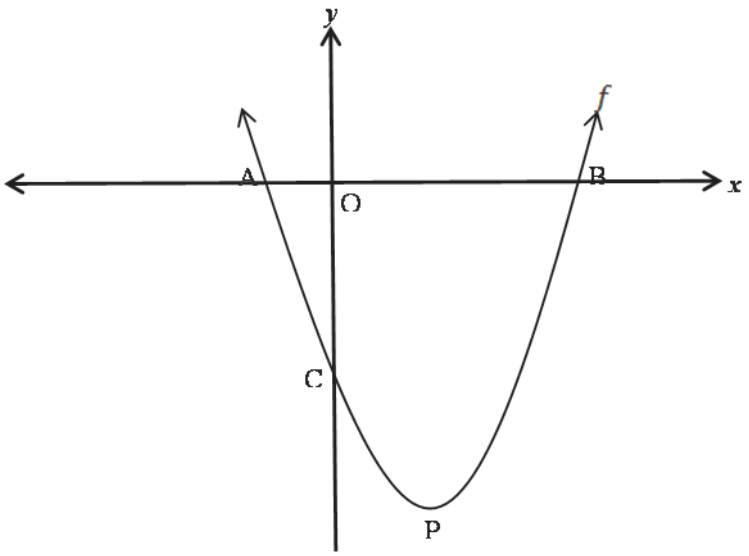
The shape of the parabola is convex when $a > 0$ and concave when $a < 0$

For the x intercepts, let y = 0 and for the y intercept let x = 0

In order to find the turning point, write the equation $y = a(x-p)^2 + q$ or find the axis of symmetry and substitute the axes of symmetry in the equation to find the Minimum/ Maximum value **OR** you can use a point system to draw the graph.

WORKED EXAMPLES

1. The graph below represents $f(x)=(x-3)^2-16$.
   A, B and C are the intercepts of *f* with the axes, and P is the turning point of *f*.



1.1 Write down the equation of the axis of symmetry of *f*.

1.2 Write down the minimum value of *f*.

1.3 Hence, write down the coordinates of the turning point P.

1.4 Determine the x - coordinates of points A and B.

1.5 Determine the length of QB.

SOLUTION

1.1	$x = 3$
1.2	$y = -16$
1.3	$P(3\,;\,-16)$
1.4	$(x-3)^2-16=0$ $x^2-6x+9-16=0$ $x^2-6x-7=0$ $(x-7)(x+1)=0$

	$\therefore x = 7$ (point B) or $x = -1$ (point A)
1.5	$Q(0\,;\,-7)$ $\therefore OQ = 7$ units and $OB = 7$ units The x – and y – axes forms a right angle at the origin $QB^2 = OB^2 + OQ^2$ (Theorem of Pythagoras) $QB^2 = 7^2 + 7^2$ $QB^2 = 98$ $\therefore QB = 7\sqrt{2}$

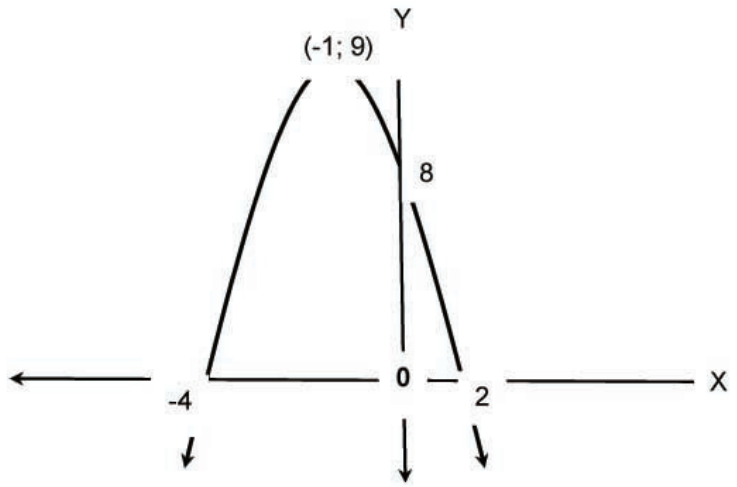
2. Sketch the graph of the function $f(x) = -(x+1)^2 + 9$ showing all the intercepts and the turning point.

2.1. Write down the domain of the function.

2.2. Write down the range.

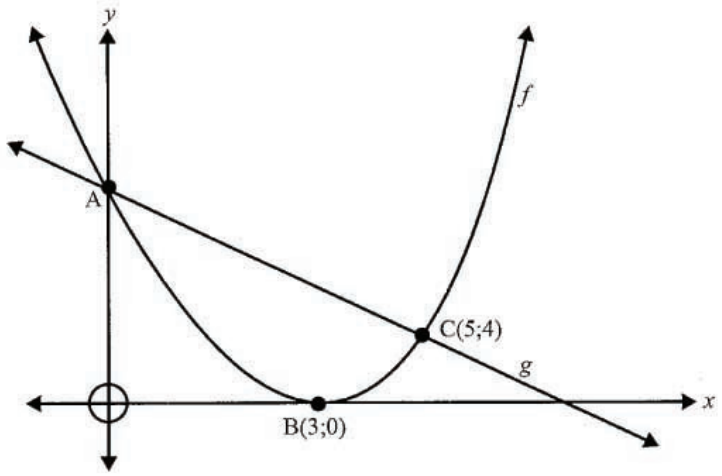
SOLUTION

2	$f(x) = -(x+1)^2 + 9$ x intercepts: let $y = 0$ $-(x+1)^2 + 9 = 0$ $-x^2 - 2x + 8 = 0$ $x^2 + 2x - 8 = 0$ $(x+4)(x-2) = 0$ $\therefore x = -4 or 2$ y – intercept: (0;8) Turning point: (-1;9)

	
2.1	Domain: $x \in R$
2.2	Range: $y \leq 9$

Activities

1. The sketch shows the graphs of $f(x) = ax^2 + bx + c$ and $g(x) = mx + c$, both passing through point C (5;4) and A. The turning point of $f(x)$ is point B (3;0).



1.1 Determine the values of *a*, *b* and *c*.

1.2 Determine the coordinates of A.

1.3 Determine the equation of *g* (*x*).

2. Given that $f(x) = -\frac{1}{2}x^2 + 2x + 6$ and $g(x) = x + 2$

2.1 Sketch the graphs of $f(x)$ and $g(x)$ of the same set of axes.

2.2 Determine the coordinates of the intersection points.

2.3 Solve graphically for x where:

(a) $\frac{f(x)}{g(x)} \geq 0$

(b) $f(x) > g(x)$

SOLUTIONS

1.1 $y = a(x-3)^2$

$4 = a(5-3)^2$

$4 = 4a$

$\therefore a = 1$

$y = x^2 - 6x + 9$

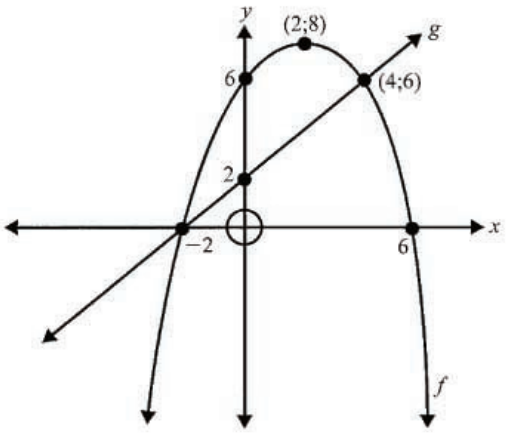
$\therefore b = -6$ and $c = 9$

1.2 A(0;9)

1.3 $m = \frac{9-4}{0-5} = -1$

$c = 9$

$g(x) = -x + 9$



2.2 $x + 2 = -\frac{1}{2}x^2 + 2x + 6$

$0 = x^2 - 2x - 8$

$0 = (x - 4)(x + 2)$

$x = 4$ or $x = -2$

$y = 6$ or $y = 0$

∴ Intersection points are: (4; 6) and (–2;0)

2.3 (a) $x < -2$ or $-2 < x \leq 6$

(c) $-2 < x < 4$

Technical Mathematics: Grade 12

Exemplar lesson 19

<table>
<tr><th>Subject and grade</th><th>Technical Mathematics: Grade 12</th></tr>
<tr><td>Topic</td><td>Analytical Geometry: The circle $x^2 + y^2 = r^2$ with centre at the origin (0;0)</td></tr>
<tr><td>Preamble</td><td>• How to teach / uplift language aspects and skills in Analytical Geometry.
• Reading in the subject.</td></tr>
<tr><td>Lesson content</td><td>By the end of the lesson, the learners should be able to:
• Understand the terms/ words relevant to the topic.
• Identify the equation $x^2 + y^2 = r^2$ as the equation defining a circle with radius r and centre (0 ; 0).
• Find the equation of the circle when the radius is given or a point on the circle is given. Only circles with the origin as the centre.
• Determination of the equation of a tangent to a given circle (gradient or point of contact is given).
• Find the points of intersection of the circle and a given straight line.</td></tr>
<tr><td>Pre-knowledge vocabulary</td><td>In this section, we will be revising mathematical terms/ words you encountered in your earlier grades.
<table>
<tr><th>Word</th><th>Explanation</th></tr>
<tr><td>Cartesian coordinate system</td><td>A system in which the location of a point is given by coordinates that represent its distance from the axes.</td></tr>
<tr><td>Gradient</td><td>Describes the slope or steepness of a line. It refers to the ratio of vertical change to horizontal change.</td></tr>
<tr><td>Horizontal line</td><td>A horizontal line has a gradient of zero (0). A horizontal line is parallel to the x-axis. The equation of a horizontal line is always in the form y = p.</td></tr>
<tr><td>Vertical line</td><td>The gradient of a vertical line is undefined. A vertical line is parallel to the y-axis. The equation of a vertical line is always in the form x = k.</td></tr>
<tr><td>Midpoint</td><td>The midpoint of a line segment is the point exactly halfway along the line which divides the line segment into two equal pieces.</td></tr>
</table></td></tr>
</table>

	Parallel lines	Lines in a two-dimensional plane that do not meet. The gradients of parallel lines are always equal.
	Perpendicular lines	Lines in a two-dimensional plane that intersect at right angles (i.e. 90°). The product of the gradients of perpendicular lines is –1.
	Inclination of a straight line	The slope or gradient of a line.
	Angle of inclination	The angle between the line and the positive axis. The angle is always in the interval [0° ; 180°].
	Coordinates	A set of values that shows the exact position of a point in relation to the axes. The coordinates should be an ordered pair (x ; y).

Reference to specific words: new terminology

Now that we have revised the earlier terminology you encountered in your study of Analytical Geometry, I would like to introduce you to new terminology which you will encounter during this lesson.

I am sure you have heard about people talking in **circles** or others going off at a **tangent** in a conversation, or directing you to the **intersection** of two streets in a particular suburb. These words are mathematical terms but when utilised in ordinary English, sometimes assume a different meaning from their mathematical meaning. In this lesson, you will be introduced to words/ terms related to circles and how they are applied in Analytical Geometry.

Word	Explanation
Circle	A set of points equidistant from a given point.
Centre of a circle	The point inside the circle that is the same distance from all points on the circle.
Radius	The distance from the centre of a circle to the circumference.
Origin	The point where the x- and y- axes meet, with coordinates (0 ; 0).
Circumference	A measure of the path around a circle.
Secant	A line that cuts a circle at two points.
Tangent	A line that touches a circle at only one point, but

<table>
<tr><td></td><td>
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<tr><td></td><td>if extended does not cross the circle at that point.</td></tr>
<tr><td>Point of contact</td><td>The point where a tangent touches a circle.</td></tr>
</table>
</td></tr>
<tr><td>Activity 1</td><td>Learners to complete the activity based on terminology associated with the circle.</td></tr>
<tr><td>During teaching</td><td>Introduction to the topic: P4.
Lesson script : P4 - P.</td></tr>
<tr><td>Post-teaching</td><td>Activity 2: Find the equation of the circle when the radius is given or a point on the circle is given. Only circles with the origin as the centre.

Activity 3: Determination of the equation of a tangent to a given circle (gradient or point of contact is given).

Activity 4: Find the points of intersection of the circle and a given straight line.</td></tr>
<tr><td>Assessment terms/ verbs</td><td>The following terms are some of the common ones you will come across.
<table>
<tr><th>Term / word</th><th>Explanation</th><th>Example</th></tr>
<tr><td>Calculate</td><td>The learner is expected to perform a mathematical calculation using a formula or a known algorithm.</td><td>Calculate the distance between A (1; 1) and B (–1 ; –1).

Solution:
[In this example the learner is expected to use the distance formula in order to calculate the distance AB]

AB
$=\sqrt{(1-(-1))^2+(1-(-1))^2}$
$=\sqrt{(1+1)^2+(1+1)^2}$
$=\sqrt{2^2+2^2}$
AB = $\sqrt{8}$
AB = $2\sqrt{2}$</td></tr>
<tr><td>Determine</td><td>The learner is expected to perform</td><td>Determine the equation of a circle with centre at the origin</td></tr>
</table>
</td></tr>
</table>

		a mathematical calculation using a formula or an algorithm.	and passing through the point (–3 ; –4). **Solution:** *[In this example the learner is expected to substitute the point (–3 ; – 4) in the equation* $x^2 + y^2 = r^2$ *to determine the radius and then write down the equation of the circle]* $x^2 + y^2 = r^2$ .....(1) Substitute the point (–3 ; – 4) in equation (1): $(-3)^2 + (-4)^2 = r^2$ $9 + 16 = r^2$ $r^2 = 25$ $r = 5$ Substitute $r = 5$ in equation (1) to obtain the required equation. $x^2 + y^2 = (5)^2$ $x^2 + y^2 = 25$	
	Show/ Prove	*When the learner is asked to show or prove something, he/ she needs to do some mathematical calculation which will either confirm or reject the statement he/ she is expected*	**Show** that the straight line defined by $y = -2x + 10$ is **not** a tangent to the circle defined by the equation $x^2 + y^2 = 25$. **Solution:** *[In this example the learner can solve this by determining the point(s) of intersection of the*	

		to prove/ show.	*straight line and the circle and then make a conclusion]* $y = -2x + 10$……..(1) $x^2 + y^2 = 25$……..(2) Substitute (1) in (2): $x^2 + (-2x + 10)^2 = 25$ $x^2 + 4x^2 - 40x + 100 - 25 = 0$ $5x^2 - 40x + 75 = 0$ $x^2 - 8x + 15 = 0$ $(x - 5)(x - 3) = 0$ **Either**: $x - 5 = 0$ **OR** $x - 3 = 0$ $x = 5$ **OR** $x = 3$ $y = 0$ **OR** $y = 4$ Points of intersection are: (5 ; 0) and (3 ; 4) . Hence the straight line defined by $y = -2x + 10$ is not a tangent to the circle defined by : $x^2 + y^2 = 25$

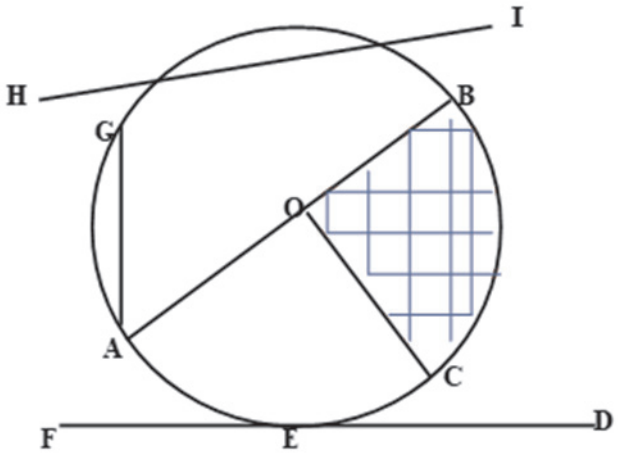
Activity 1:

Use the given words below to label the parts of the circle shown.

Radius	Diameter	Tangent	Chord	Secant	Minor sector

Part of circle	Reference on diagram

In the given diagram O is the centre of the circle.



Radius	
Diameter	
Tangent	
Chord	
Secant	
Minor sector	

LESSON SCRIPT

Introduction
The circle is a geometrical figure people borrowed from nature.
The pictures below are some instances of circles that appear in nature.

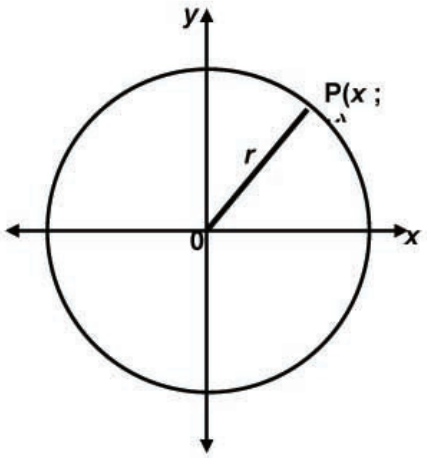
As humans evolved over time they used the power of circles in their inventions.

LESSON SCRIPT

Introduction
The circle is a geometrical figure people borrowed from nature.
The pictures below are some instances of circles that appear in nature.

In this lesson, we will be focusing on the circle with centre (0 ; 0) and radius of any length.

Circle with centre (0 ; 0) and radius of *r* units.



Suppose that the point P(***x;y***) is always r units from the origin (0; 0) [This implies P(***x;y***) lies anywhere on the circle].

From the distance formula we know that:

$OP^2 = (x_P - x_O)^2 + (y_P - y_O)^2$

$= (x - 0)^2 + (y - 0)^2$

$\therefore OP^2 = x^2 + y^2$

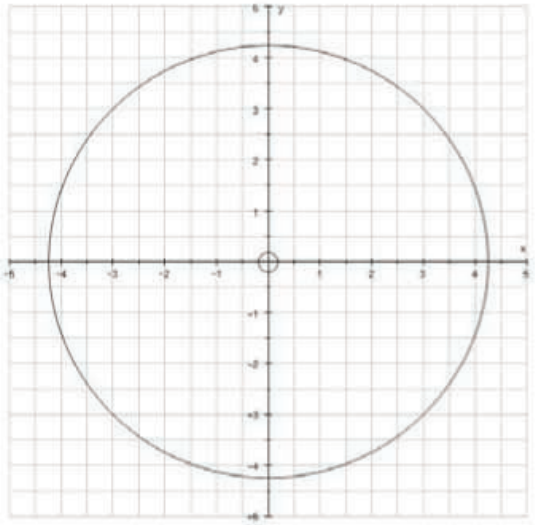
But: OP = ***r*** ; therefore $OP^2 = r^2$

$\therefore x^2 + y^2 = r^2$

The equation of a circle with centre (0; 0) is defined by: $x^2 + y^2 = r^2$

WORKED EXAMPLES

1.	Determine the equation of a circle with centre at the origin and radius of 5 units.	Start with equation: $x^2 + y^2 = r^2$ Substitute value of radius in the above equation; i.e.: $x^2 + y^2 = \underline{5}^2$ $\therefore x^2 + y^2 = 25$ is the required equation.
2.	Determine the equation of the circle with centre (0; 0) and passing through the point (–4 ; 2).	Start with equation: $x^2 + y^2 = r^2$ Substitute (–4 ; 2) in the above equation: i.e.: $(-4)^2 + (2)^2 = r^2$ $16 + 4 = r^2$ $r^2 = 20$ $x^2 + y^2 = 20$ is the required equation of the circle.
3.	Q(3 ; ***a***) is a point on the circle defined by $x^2 + y^2 = 18$.	
a)	Determine the ***x***- and ***y***- intercepts of the circle.	For ***x***-intercepts: let ***y*** =0 i.e.: $x^2 + (0)^2 = 18$ $x^2 = 18$ $x = 3\sqrt{2}$ **OR** $x = -3\sqrt{2}$ For ***y***-intercept: let ***x*** = 0 $y = 3\sqrt{2}$ **OR** $y = -3\sqrt{2}$

b)	Draw a sketch of the graph defined by $x^2 + y^2 = 18$.	
c)	Determine the possible value(s) of ***a***.	Start with equation: $x^2 + y^2 = 18$ Substitute (3 ; a) in the above equation: $(3)^2 + (a)^2 = 18$ $a^2 = 9$ $a = 3$ **OR** $a = -3$
d)	Find one other point with integer coordinates that lie on the circle.	**Discuss in your groups.**

Activity 2:

Radius or Given Point on circle **Equation**

1. Determine the **equation** of the circle centred at (0 ; 0) and with the given radius or given point on the circle:

a) Radius = 3 units

b) Radius = 7 units

c) Radius = $\sqrt{7}$ units

d) Radius = $3\sqrt{2}$ units

e) Passing through (–3 ;7)

f) Passing through ($\cos 60^0$; $\sin 60^0$)

g) Passing through (–5 ; –6)

h) Passing through (3 ; –1)

i) Passing through ($3 \tan 45^0$; $2 \cot 135^0$)

j) Passing through ($\log_{\frac{1}{2}} 2$; $\log_9 3$)

2. In each of the following, write down the **radius** of the given circles.

a) $x^2 + y^2 = 9$ b) $x^2 + y^2 = 25$

c) $x^2 + y^2 = 10$ d) $2x^2 + 3y^2 = 10$

e) $ax^2 + ay^2 = 9$; $a > 0$ f) $kx^2 + ky^2 = m$

3. Which of the following equations represent circles? Provide (a) reason(s) for your answer.

a) $x^2 + y^2 = 4$ b) $x^2 + y^2 - 9 = 0$

c) $x^2 + y^2 + 9 = 2$ d) $x^2 = y^2$

e) $x^2 + y^2 = 0$ f) $ax^2 + ay^2 = 1$; $a > 0$

g) $2x^2 + 3y^2 = 12$ h) $ax^2 + by^2 = 1$

4. The point T(12 ; –5) lies on the circle with centre at O(0 ; 0).

a) Determine the equation defining the circle.

b) Determine the coordinates of R, if RT is a diameter of the circle.

c) Show that K(0 ; –13) lies on the circle.

d) Show that $T\hat{K}R = 90^\circ$.

5. P(–2 ; 3), Q (2 ; 3) and R(3 ; –2) are three points in the Cartesian plane.

a) Plot the given points on the Cartesian plane.

b) Determine the equation of the circle with centre (0 ; 0) and passing through the points P, Q and R.

c) Write down the radius of the circle passing through the points P, Q and R.

d) If RD is a diameter of the circle passing through P, Q and R, determine the equation of RD in the form $ax + by + c = 0$.

e)** Find the equation of the tangent to the circle at D.

6. The points G (–5 ; 12) and H (5 : –12) are the endpoints of diameter GH.

a) Determine the equation of the circle with diameter GH.

b)** If B (0 ; 13) and D $(-1 ; -2\sqrt{3})$ are points in the Cartesian plane, show that GBHD is a cyclic quadrilateral.

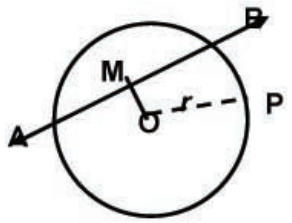
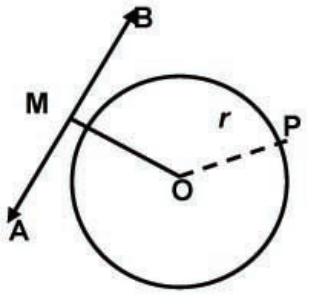
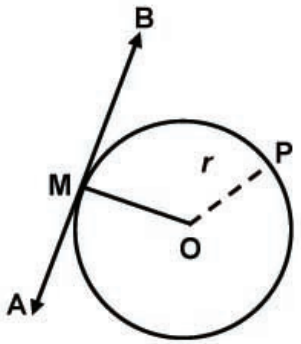
7. The points M (3 ; –2) and N (2 ; –3) are points on a circle with centre at O (0 ; 0).

a) Determine the equation of the circle.

b) Show, using analytical methods *(i.e. Analytical Geometry methods)*, that the line

drawn from the centre to the midpoint of the chord MN is perpendicular to the chord.

Condition for $y = mx + c$ to be a tangent to $x^2 + y^2 = r^2$

Figure 1	*Figure 2*	*Figure 3*
		
O is the centre of the circle, with OM ⊥ AB. OP is the radius of the circle.	O is the centre of the circle, with OM ⊥ AB. OP is the radius of the circle.	O is the centre of the circle, with OM ⊥ AB. OP is the radius of the circle.
In the above figure, **AB** is a **secant** to the circle.	In the above figure, **AB does not** intersect the circle.	In the above figure, **AB** is a **tangent** to the circle.

Note that AB:

Intersects the circle in **two places** (*see Figure 1*) **if OM < *r***

- **Does not** intersect the circle (*see Figure 2*) **if OM > *r***
- Intersects the circle in **one and only one place** (*see Figure 3*) **if OM = r**

The straight line $y = mx + c$ intersects the circle defined by: $x^2 + y^2 = r^2$ when:

$x^2 + (mx + c)^2 = r^2$

i.e.: $x^2 + m^2x^2 + 2mxc + c^2 - r^2 = 0$

$(m^2 + 1)x^2 + 2mc(x) + (c^2 - r^2) = 0$

Using the quadratic formula to solve for x:

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, $a = (m^2 + 1)$; $b = 2mc$ and $c = (c^2 - r^2)$

$x = \frac{-2mc \pm \sqrt{(2mc)^2 - 4(m^2+1)(c^2-r^2)}}{2(m^2+1)}$

On simplification, (the reader can verify): $x = \frac{-mc \pm \sqrt{r^2(m^2+1)-c^2}}{(m^2+1)}$

- There are therefore **two points of intersection** if $c^2 < r^2(m^2 + 1)$; i.e. the roots are real if $\Delta > 0$;
- There **no points of intersection** if $c^2 > r^2(m^2 + 1)$; i.e. the roots are non-real if $\Delta < 0$;
- The straight line $y = mx + c$ is a **tangent** to the circle $x^2 + y^2 = r^2$ if $c^2 = r^2(m^2 + 1)$; i.e. the roots are real and equal. From $c^2 = r^2(m^2 + 1)$; $c = \pm r\sqrt{m^2+1}$
- Thus , $y = mx \pm r\sqrt{m^2+1}$, represents a pair of tangents to the circle defined by $x^2 + y^2 = r^2$.

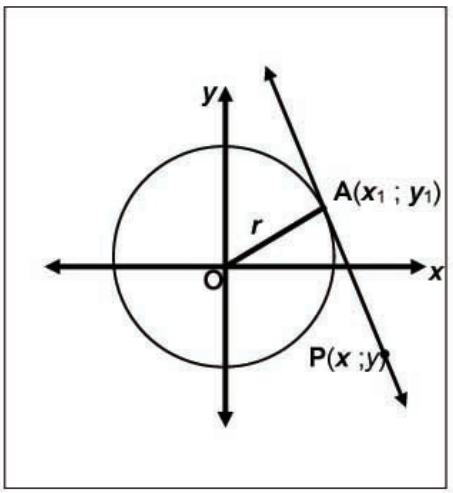
The straight line $y = mx + c$ is a **tangent** to the circle defined by $x^2 + y^2 = r^2$, if $c = \pm r\sqrt{m^2+1}$
The **equation of the tangent** is given by: $y = mx \pm r\sqrt{m^2+1}$

Worked examples

1.	**Show** that $2x + y + 5 = 0$ is a tangent to the circle defined by: $x^2 + y^2 = 5$	
	Method 1 (using the above formula) Write the equation of the given straight line in the form y = mx +c i.e.: y = – 2x – 5 ***Equation of tangent is given by:*** $y = mx \pm r\sqrt{m^2+1}$ ***if*** $c = \pm r\sqrt{m^2+1}$ LHS = – 5 RHS = $\pm\sqrt{5}\sqrt{(-2)(-2)+1}$ = $\pm\sqrt{5}\sqrt{5}$ = – 5	**Method 2** (Proving that there are two equal roots) Write the given straight line equation in the form y = mx + c i.e.: y = – 2x – 5 Substitute y = –2x – 5 in $x^2 + y^2 = 5$ i.e.: $x^2 + (-2x - 5)^2 = 5$ $x^2 + 4x^2 + 20x + 25 - 5 = 0$ $5x^2 + 20x + 20 = 0$ $5(x^2 + 4x + 4) = 0$ $(x + 2)^2 = 0$ **$x = -2$ is a repeated root,** which implies that the straight line $2x + y + 5 = 0$ is a tangent to the given circle.

	LHS = RHS Thus, $2x + y + 5 = 0$ is a tangent to the circle defined by $x^2 + y^2 = 5$	
	Can you solve the given problem differently? Discuss with your partner.	

The equation of the tangent through a given point (x1; y1) on the circle x2 + y2 = r2



In the diagram alongside, A $(x_1; y_1)$ is an arbitrary point on the circle defined by: $x^2 + y^2 = r^2$.

P$(x; y)$ is any point on the tangent through A.

$M_{OA} = \frac{y_1}{x_1}$;

Hence $M_{AP} = -\frac{x_1}{y_1}$ (*Why?*)

The equation of the tangent AP is given by:

$y - y_1 = m(x - x_1)$

$= -\frac{x_1}{y_1}(x - x_1)$

$yy_1 - y_1y_1 = -xx_1 + x_1x_1$

$yy_1 + xx_1 = x_1^2 + y_1^2$

$= r^2$

The equation of the tangent through $(x_1 ; y_1)$ on $x^2 + y^2 = r^2$ is given by:

$xx_1 + yy_1 = r^2$

Worked examples

1.	The point P(3; – 2) is a point on the circle defined by: $x^2 + y^2 = r^2$	
a)	Determine the equation of the circle.	The equation of the circle is of the form: $x^2 + y^2 = r^2$. Hence; $(3)^2 + (-2)^2 = r^2$ $r^2 = 13$ **Required equation is**: $x^2 + y^2 = 13$
b)	Determine the equation of the tangent to the circle at the point P(3 ; – 2)	The equation of the tangent through P(3 ; –2) is of the type: $xx_1 + yy_1 = r^2$ $x(3) + y(-2) = 13$

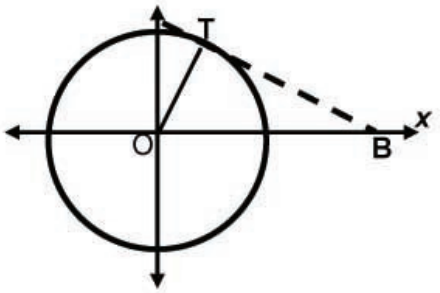
		Required equation is: $3x - 2y = 13$
2.	Determine the equation of the tangent to the circle $x^2 + y^2 = 10$ at the point K(–3 ; 1)	
	Method 1: (Using the formula developed above) The equation of the tangent through K is of the type: $xx_1 + yy_1 = r^2$ i.e.: $x(-3) + y(1) = 10$ $-3x + y = 10$ $y = 3x + 10$ is the required equation.	**Method 2**: First determine the gradient of the radius, OK: $M_{OK} = \frac{-1}{3}$ $M_{tangent} = 3$ (do you recall why?) **Equation of tangent is:** $y - y_1 = m(x - x_1)$ $y - (1) = 3(x - (-3))$ $y - 1 = 3x + 9$ $y = 3x + 10$ is the required equation.

Activity 3:

1. Determine the equation of the tangent to the circle at the given point.

	Equation of circle	**Given point**
a)	$x^2 + y^2 = 25$	P(3 ; –4)
b)	$x^2 + y^2 = 5$	M(1 ; – 2)
c)	$4x^2 + 4y^2 = 65$	R($\frac{-1}{2}$; 4)

2. In the diagram alongside, a crank mechanism is shown. BT is a tangent to the circle at T. OT is the radius of the circle, with centre O. OT = 10 units and OB = 40 units, with B a point on the x-axis.



a) Determine the equation of the circle in the form $x^2 + y^2 = r^2$

b) Determine the length of BT.

c) Determine the coordinates of T if $T\hat{O}B = 30^0$.

d) Determine the equation of the tangent BT at the point T.

3.** The point K(5 ; 0) is a point outside the circle $x^2 + y^2 = 5$. P and Q are two distinct

points on the given circle. Determine the equations of the tangents KP and KQ to the circle.

4.a) Prove that $x + 2y - 5 = 0$ is a tangent to the circle $x^2 + y^2 = 5$.

b) Calculate the coordinates of the point of contact.

c) If a second tangent to the circle is drawn parallel to the line $x + 2y - 5 = 0$; **calculate:**

c.i) The gradient of the second tangent.

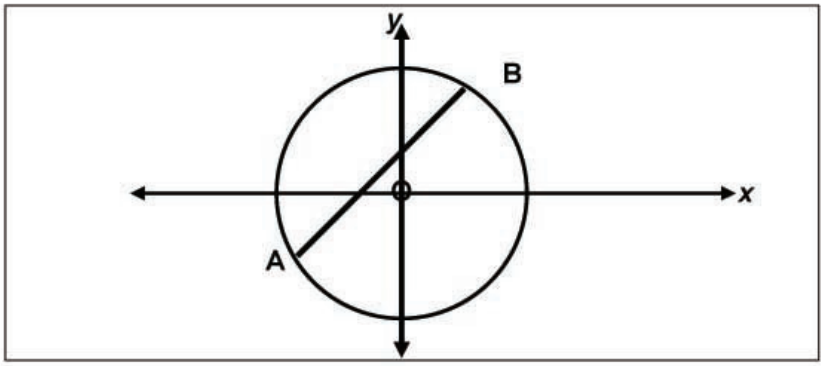
c.ii) The coordinates of the point of contact.

c.iii) Hence, write the equation of the second tangent in the form ax + by + c = 0.

The points of intersection of the circle $x^2 + y^2 = r^2$ and a given straight line

Worked Example(s)

1. The straight line $y = x + 2$ cuts the circle $x^2 + y^2 = 20$ at two points, A and B.



a) Determine the coordinates of A and B.

At A and B:

$x^2 + (x+2)^2 = 20$

$x^2 + x^2 + 4x + 4 - 20 = 0$

$2x^2 + 4x - 16 = 0$

$x^2 + 2x - 8 = 0$

$(x + 4)(x - 2) = 0$

$x = -4$ **OR** $x = 2$

$y = -2$ **OR** $y = 4$

A(–4 ; –2) **B(2 ; 4)**

b)	Determine the length of chord AB.	$AB^2 = (x_B - x_A)^2 + (y_B - yA)^2$ $= (2 - (-4))^2 + (4 - (-2))^2$ $AB^2 = 36 + 36$ $= 2(36)$ $\mathbf{AB} = 6\sqrt{2}$
c)	Determine the gradient of OB.	$M_{OB} = \frac{y_B - y_O}{x_B - x_o} = \frac{4-0}{2-0} = 2$
d)	Hence determine the equation of the tangent to the circle at B, in the form $ax + by + c = 0$	$M_{OB} \times M_{tangent} = -1$ $M_{tangent} = \frac{-1}{2}$ Equation of tangent at B is: $y - y_1 = m(x - x_1)$ $y - 4 = \frac{-1}{2}(x - 2)$ $2y - 8 = -x + 2$ $2y + x - 10 = 0$

Activity 4:

1. The straight line defined by $x - y = 1$ cuts the circle $x^2 + y^2 = 13$ at A and B.

a) Determine the coordinates of A and B.

b) Determine the length of the chord AB.

c) Determine the coordinates of M, the midpoint of chord AB.

d) Show, using analytical methods, that OM ⊥ AB.

e) Does the point T(–3 ; 2) lie:

- **on** the circle; *or*
- **inside** the circle; *or*
- **outside** the circle?

Justify your response, using appropriate calculations.

f) Determine the gradient of OT.

g) Hence, determine the equation of the tangent to the circle at T(–3 ; 2), in the form $y = mx + c$.

2. The straight line $2y - x = 5$ intersects the circle $x^2 + y^2 = 10$. Determine the coordinates of the points of intersection.

3. Determine the coordinates of the points of intersection of $x = 5y - 13$ and the circle $x^2 + y^2 = 13$

4. The straight line $y + x + 1 = 0$ is a secant of the circle $x^2 + y^2 = 25$. Determine the points of intersection of the circle and the secant.

5. The straight line defined by $2x + y + 7 = 0$ intersects the circle through (–4 ; –1) with centre (0 ; 0) in two points.

a) Determine the equation of the circle in the form $x^2 + y^2 = r^2$.

b) Determine the coordinates of the points of intersection of the line and the circle.

6. The straight line $x + y = 5$ intersects the circle $x^2 + y^2 = 17$ at A and B. C is the midpoint of chord AB. Determine:

a) the coordinates of the points A and B.

b) the coordinates of C, the midpoint of chord AB.

c) the equation of the circle with centre (0 ; 0) and passing through C.

7. The point A(–1 ; 2) is a point on a circle with centre (0 ; 0). The line PAQ is a tangent to the circle. RS is a chord of the circle with gradient $\frac{1}{3}$ and intersecting the y-axis at J$(0 ; -1\frac{2}{3})$.

Determine:

a) the equation of PQ.

b) the equation of RS.

c) the equation of the circle.

d) the coordinates of R and S.

8. Determine the equation of the tangent to the circle in the following cases:

a) Tangent through A(5 ;3) on the circle $x^2 + y^2 = 34$

b) Tangent parallel to the x-axis, to the circle $x^2 + y^2 = 9$.

c) Tangent, perpendicular to the x-axis to the circle $x^2 + y^2 = 8$.

d) Tangent through P(–1 ; 2) on the circle $x^2 + y^2 = r^2$. Will Q(3 ; 4) lie on the tangent?

9.a) Determine the equation of the circle with centre at (0 ; 0) and passing through P (7 ; –4).

b) Determine the equation of the tangent to the circle at P (7 ; – 4).

c) Determine the size of the angle which the tangent makes with the x-axis.

10. The straight line $y = 4x + c$ touches the circle $x^2 + y^2 = 17$. Determine the value of c.

11. The origin (0 ; 0) is the centre of two concentric circles.

A (– 3 ; k) is a point in the third quadrant on the larger circle.

B (3 ; – 2) is a point on the smaller circle.

AC is a tangent to the smaller circle at C The length of AC is $\sqrt{21}$ units.

AB produced cuts the x-axis at D.

a) Represent the given information on the Cartesian plane.

b) Determine the equation of the smaller circle.

c) Determine the equation of the larger circle.

d) Hence, determine the numerical value of k.

e) Show that the equation of AB is given by: $2y - x + 7 = 0$.

f) Hence, determine the coordinates of D.

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