WHAT SHOULD YOU DO IF YOU ARE RAPED OR SEXUALLY ASSAULTED?

1. Go to a safe place where you can get help
2. Tell someone you trust what happened as soon as possible
3. Do not throw away your clothes or wash yourself
4. Put the clothes you were wearing in a paper bag or wrap them in newspaper
5. Go to a hospital as soon as possible
6. It is advisable to report the rape to the police
7. Tell the police if you are threatened by the perpetrator at any time
8. Get treatment and medication within 72 hours to prevent HIV, other sexually transmitted infections and pregnancy

REMEMBER, IT'S NEVER THE FAULT OF THE PERSON WHO WAS RAPED, ABUSED, VIOLATED OR HARASSED!

GET HELP AND SUPPORT

If you or someone you know is being sexually harassed or abused, get help to stop the abuse. Speak to someone you trust, tell your school, go to your local police station or phone one of the following national numbers:

SAPS Crime Stop:	**086 0010 111**
SAPS Emergency Number:	**10111**
Childline:	**0800 055 555**
Lifeline:	**011 781 2337/0861 322 322**

Department of Basic Education National Hotline: **0800 20 29 33**

ACT AGAINST ABUSE

Rainbow WORKBOOKS

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MATHEMATICS IN ENGLISH
GRADE 7 – BOOK 1 • TERMS 1 & 2
ISBN 978-1-4315-0218-9
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Revised and CAPS aligned

Grade 7

Name:

Class:

basic education
Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

MATHEMATICS IN ENGLISH

Book 1
Terms 1 & 2

Contents

Mrs Angie Motshekga,
Minister of
Basic Education

Dr Reginah Mhaule
Deputy Minister of
Basic Education

These workbooks have been developed for the children of South Africa under the leadership of the Minister of Basic Education, Mrs Angie Motshekga, and the Deputy Minister of Basic Education, Dr Reginah Mhaule.

The Rainbow Workbooks form part of the Department of Basic Education's range of interventions aimed at improving the performance of South African learners in the first six grades. As one of the priorities of the Government's Plan of Action, this project has been made possible by the generous funding of the National Treasury. This has enabled the Department to make these workbooks, in all the official languages, available at no cost.

We hope that teachers will find these workbooks useful in their everyday teaching and in ensuring that their learners cover the curriculum. We have taken care to guide the teacher through each of the activities by the inclusion of icons that indicate what it is that the learner should do.

We sincerely hope that children will enjoy working through the book as they grow and learn, and that you, the teacher, will share their pleasure.

We wish you and your learners every success in using these workbooks.

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Rainbow WORKBOOKS

Grade 7

Mathematics

Book 1

1. Revision worksheets: R1 to R16
   Key concepts from Grade 6
2. Worksheets: 1 to 64

Book 2

3. Worksheets: 65 to 144

ENGLISH

Book 1

Name:

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The structure of a worksheet

Worksheet number
(Revision R1 to R16, Ordinary 1 to 144)

Worksheet title

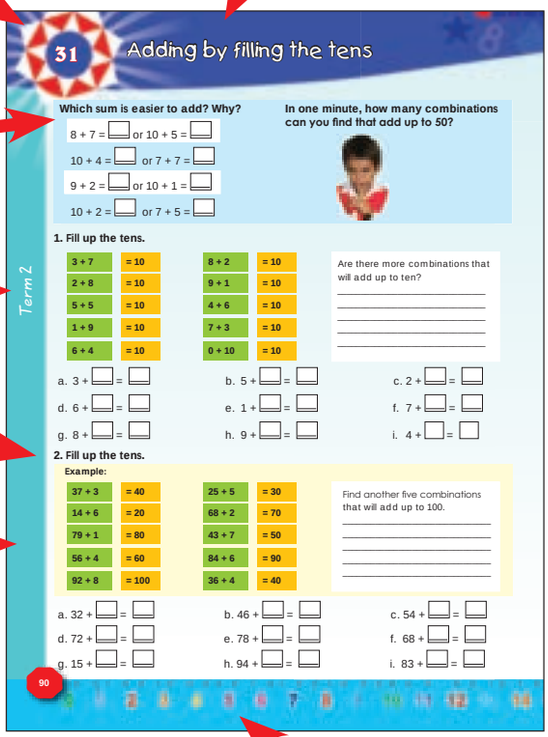
Topic introduction
(Text and pictures to help you think about and discuss the topic of the worksheet.)

Term indicator
(There are forty worksheets per term.)

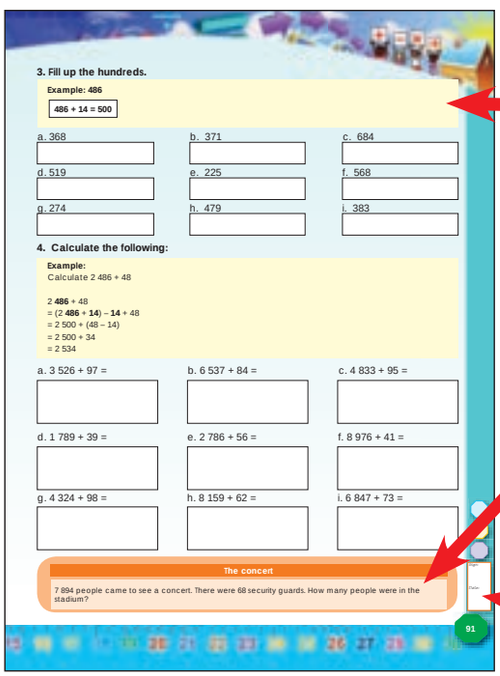
Questions

Colour code for content area

Content	Side bar colour
Revision	Purple
Number	Turquoise
Patterns and functions (algebra)	Electric blue
Space and shape (geometry)	Orange
Measurement	Green
Data handling	Red



Language colour code:
Afrikaans (Red), English (Blue)



Example frame (in yellow)

Fun/challenge/problem solving activity
(This is an end of worksheet activity that may include fun or challenging activities that can also be shared with parents or brothers and sisters at home.)

Teacher assessment rating, signature and date

Rainbow WORKBOOKS

Grade 7

Mathematics

ENGLISH Book 1

PART 1

Revision

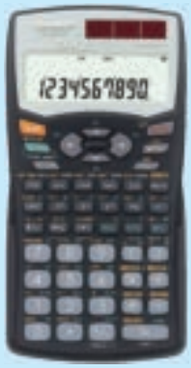
Key concepts from Grade 6

WORKSHEETS R1 to R16

Name:

Revision

R1 Represent nine-digit numbers



Type a nine–digit number into your calculator. Do not use zeros. Then, one by one, change each of the following to zero, the:

- hundred thousands
- units
- millions
- ten thousands
- tens
- ten millions
- hundreds
- thousands

I wonder how many digits a cellphone calculator can take?

Say how many digits each number has.

1. What is the value of the underlined digit?

Example: **7 6<u>3</u> 104**

60 000

a. 340 7<u>8</u>4

b. 512 97<u>3</u> 715

c. 1 5<u>1</u>7 451

d. 4<u>7</u>6 123 000

e. 451 783 21<u>5</u>

f. 998 9<u>9</u>9 999

2. Write the following in expanded notation:

Example: **942 576**

= 900 000 + 40 000 + 2 000 + 500 + 70 + 6

a. 154 798 105

b. 592 562

c. 4 978 879

d. 77 666

e. 549 327

f. 4 000 009

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3. What is the value of 5 in each of the following numbers?

Example: 532 789

500 000

a. 154 289 _____

b. 5 834 974 _____

c. 45 869 _____

d. 413 978 950 _____

e. 563 008 _____

f. 8 382 705 _____

4. Complete the following:

Example: 297 654 – 50 = 297 604

a. 378 457 ____ = 308 457 _____

b. 421 873 ____ = 401 873 _____

c. 887 114 ____ = 887 100 _____

d. 316 522 ____ = 96 522 _____

e. 124 893 ____ = 100 893 _____

f. 737 896 ____ = 732 096 _____

5. Complete the table. Always add and subtract from the number given in the first column.

	Add 10	Subtract 10	Add 100	Subtract 100	Add 1 000	Subtract 1 000	Add 10 000
a. 475 021							
b. 835 296							
c. 789 123							
d. 336 294							
e. 428 178							
f. 164 228							

Problem solving

Find numbers with four or more digits in a newspaper. Write each number in expanded notation. Write down what the number was measuring or used for.

Sign:

Date:

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Revision

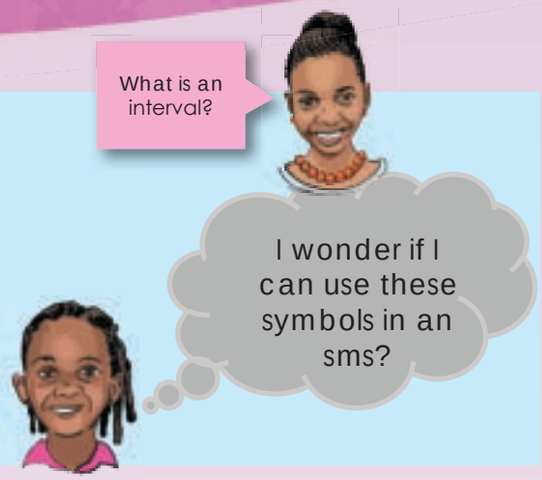
R2a Compare and order whole numbers

Things to know and to discuss!

What do the following symbols mean?

> < =

Give an example of each using numbers.



1. Arrange these numbers in ascending order on the number line:
17 235, 17 347, 18 212, 17 922, 17 211, 17 678.

17 211 ——— 18 212

a. What is the difference between the fourth and sixth number on the number line? _____

b. What number is between the third and the fifth interval on the number line?
_____

c. Write a whole number bigger than the fourth number, but smaller than the fifth number. _____

d. Which is the smallest number? _____

e. Which is the biggest number? _____

2. Arrange these numbers in ascending order on this number line:
1 782, 2 342, 1 699, 1 571, 2 102, 1 999

a. What is the smallest number? _____

b. What is the biggest number? _____

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c. What is the difference between the biggest and the smallest numbers?

d. Give one whole number smaller than the smallest number.

e. Give one whole number bigger than the biggest number.

f. What is the sum of the second number and the fourth number on this number line?

3. Arrange these numbers in ascending order on the number line:
34 289, 34 288, 34 287, 34 286, 34 285, 34 284

a. What is the smallest number?

b. What is the biggest number?

c, What is the difference between the biggest and smallest numbers?

d. Give one whole number smaller than the smallest number.

e. Give one whole number bigger than the biggest number.

f. What is the sum of the third number and the fourth number on this number line?

4. Fill in the missing numbers:

									30 000
						37 000			
				45 000					
	52 000								
									70 000

Sign:

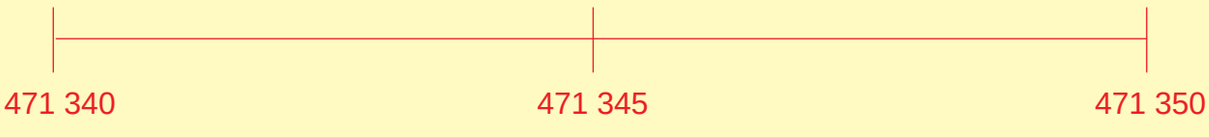
Date:

continued ☛

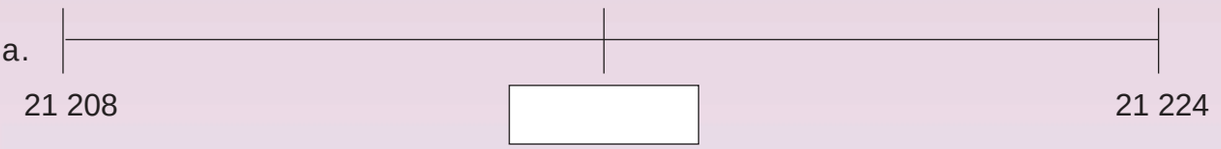
R2b Compare and order whole numbers continued

5. Which number is halfway?

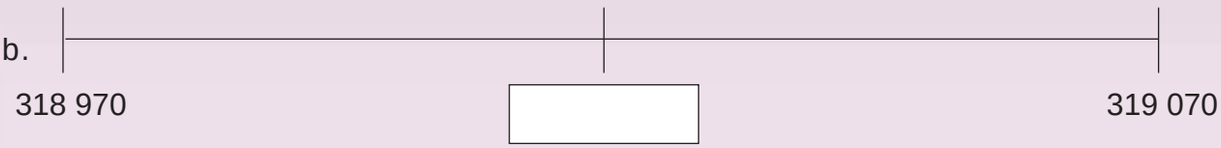
Example:



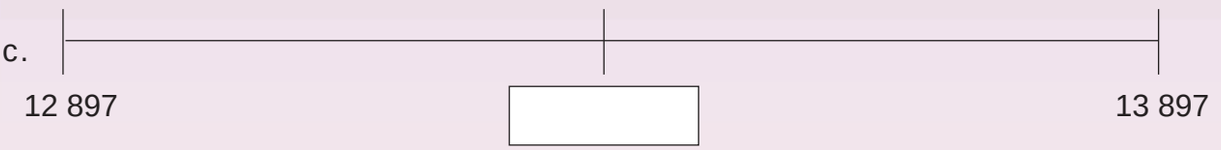
a.



b.



c.



6. Which number comes next?

Example: 593 485, 593 486, 593 487, 593 488, 593 489

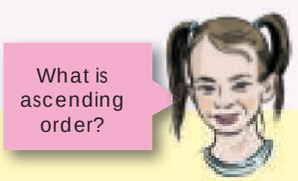
299 999, 299 998, 299 997, _____

a. 331 344; 331 345; 331 346; 331 347; 331 348; _____

b. 549 327; 549 326; 549 325; 549 324; _____

c. 508 609; 508 610; 508 611; 508 612; 508 613; _____

7. Write in ascending order:



Example: 289 541, 289 540, 289 539, 289 542, 289 538

289 538, 289 539, 289 540, 289 541, 289 542

a. 421 178; 421 182; 421 180; 421 183; 421 179; 421 181

_____

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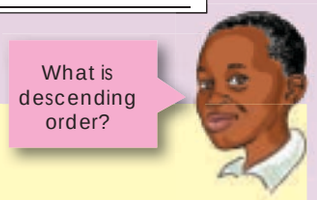
b. 543 688; 543 691; 543 689; 543 690; 543 687

c. 903 675; 903 678; 903 676; 930 679; 903 677

8. Write in descending order:



Example: 289 541; 289 540; 289 539; 289 542; 289 538

289 542; 289 541; 289 540; 289 539; 289 538

a. 564 743; 564 747; 564 745; 564 744; 564 746

b. 907 569; 907 566; 907 570; 907 568; 907 567

c. 352 701; 352 699; 352 703; 352 700; 352 702

9. Fill in >, < or =:

Example: 375 894 < 375 984

a. 564 746 ____ 751 023

b. 191 756 ____ 460 207

c. 697 059 ____ 699 059

d. 979 509 ____ 939 509

e. 563 435 ____ 560 640

f. 925 860 ____ 925 680

10. Fill in >, < or =:

Example: 300 000 + 5 < 300 500

a. 75 001 + 9 ____ 75 100

b. 3 838 ____ 3 888 – 50

c. 2 800 – 800 ____ 2 008

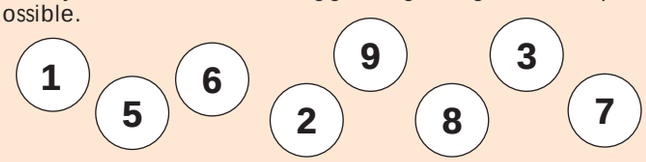
d. 50 000 + 3 ____ 50 300

e. 5 556 ____ 5 655 – 100

f. 200 000 + 50 ____ 200 050 + 50

Problem solving

Use each of the following digits only once to make the biggest eight–digit number possible, and then the smallest eight–digit number possible.



Sign:

Date:

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R3 Prime numbers

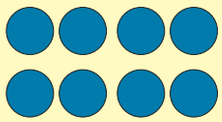
Which numbers smaller than 100 can only be divided by one or by the number itself?

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

A **Prime number** can be divided evenly only by 1 or itself. It has only two factors, namely 1 and itself. A prime number must be greater than 1.

1. Use drawings to show that the following numbers are not prime numbers but composite numbers.

Example: 8 can be divided by 1, 2, 4 and 8



2 × 4

1 × 8

a. 9

b. 18

c. 155

d. 57

e. 39

f. 68

Term 1

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2. Identify all the prime numbers from 1–100.

3. How would you write the following numbers as a product of prime numbers?

Example: 12

The number 12 can be made by multiplying using the prime numbers 2 and 3.

$12 = 2 \times 2 \times 3$

(2 and 3 are prime numbers because $2 = 2 \times 1$ and $3 = 3 \times 1$)

a. 36

b. 60

c. 105

d. 420

e. 48

f. 1 800

4. What numbers are these? Why?

2	3	5	7	11	13	17	19	23	29	31	37	41	43	47	53	59	61	67
71	73	79	83	89	97	101	103	107	109	113	127	131	137	139	149	151	157	163
167	173	179	181	191	193	197	199	211	223	227	229	233	239	241	251	257	263	269
271	277	281	283	293	307	311	313	317	331	337	347	349	353	359	367	373	379	383
389	397	401	409	419	421	431	433	439	443	449	457	461	463	467	479	487	491	499
503	509	521	523	541	547	557	563	569	571	577	587	593	599	601	607	613	617	619
631	641	643	647	653	659	661	673	677	683	691	701	709	719	727	733	739	743	751
757	761	769	773	787	797	809	811	821	823	827	829	839	853	857	859	863	877	881
883	887	907	911	919	929	937	941	947	953	967	971	977	983	991	997			

Problem solving

How many three–digit **prime numbers** are there less than 1 000.

Sign:

Date:

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R4 Rounding off to the nearest 5, 10, 100 and 1 000

Your friend missed the lesson on rounding off. Use the number lines to explain how to round off these pairs of numbers.

		Round off
4 528	4 523	To the nearest 10
6 891	6 828	To the nearest 100
2 189	2 620	To the nearest 1 000
643	649	To the nearest 5

1. What symbol do we use for approximation? _____

2. Round off to the nearest 10.

Example: 789 ≈ 790

a. 7 ____ b. 4 ____ c. 78 ____

d. 61 ____ e. 328 ____ f. 451 ____

3. Round off to the nearest 100.

Example: 789 ≈ 800

a. 3 ____ b. 54 ____ c. 28 ____

d. 765 ____ e. 938 ____ f. 1 764 ____

4. Round off to the nearest 1 000.

Example: 789 ≈ 1 000

a. 176 ____ b. 324 ____ c. 1 924 ____

d. 8 639 ____ e. 14 342 ____ f. 67 285 ____

5. Complete the table.

	Round off to the nearest 10	Round off to the nearest 100	Round off to the nearest 1 000
a. 7 632			
b. 8 471			
c. 9 848			
d. 5 737			
e. 9 090			

6. Round off to the nearest five.

Example: $4 \approx 5$

a. 7 ____ b. 3 ____ c. 472 ____

d. 589 ____ e. 2 372 ____ f. 3 469 ____

7. Complete the table.

	Round off to the nearest 10	Round off to the nearest 100	Round off to the nearest 1 000
a. 2			
b. 7			
c. 48			
d. 781			
e. 345			
f. 2 897			

8. Why do we round off? Give five examples from everyday life where we round off.

Example from every day life.

Problem solving

a. You have a five-digit number. After you round it off to the nearest thousand, you get a six-digit number. What number could your first number have been?

b. You have a four-digit number. After you round it off to the nearest five you get 3 895. What was your original number?

Sign:

Date:

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Revision

R5a Calculating whole numbers

What are the four basic operations in maths?

+ − X ÷

One common method used to **add** or **subtrac**t large numbers is to list them in columns. Then, column by column, you **add** or subtract only those digits that have the same **place value**. Do you know other methods?

One common method used to **multiply** two large numbers together is to write the numbers vertically with the larger number being multiplied by the smaller number below, which is called the multiplier. Do you know other methods?

How would you divide large numbers?

We give you some examples but you can use a method of your own choice.

1. Solve the sums. You can use the method of your choice.

Example 1:

278 467 + 197 539

= 200 000 + 100 000 + 70 000 + 90 000 + 8 000 + 7 000 + 400 + 500 + 60 + 30 + 7 + 9

= 300 000 + 160 000 + 15 000 + 900 + 90 + 16

= 300 000 + 100 000 + 60 000 + 10 000 + 5 000 + 900 + 90 + 10 + 6

= 400 000 + 70 000 + 5 000 + 900 + 100 + 6

= 400 000 + 70 000 + 5 000 + 1 000 + 6

= 400 000 + 70 000 + 6 000 + 6

= 476 006

Example 2:

	2	7	8	4	6	7	
+	1	9	7	5	3	9	
					1	6	(7 + 9)
					9	0	(60 + 30)
				9	0	0	(400 + 500)
		1	5	0	0	0	(8 000 + 7 000)
	1	6	0	0	0	0	(70 000 + 90 000)
	3	0	0	0	0	0	(200 000 + 100 000)
	4	7	6	0	0	6	

Example 3:

1	1	1	1	1		
2	7	8	4	6	7	
+ 1	9	7	5	3	9	
4	7	6	0	0	6	

a. 87 382 + 12 213 =

b. 65 479 + 32 599 =

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c. 178 673 + 145 568 =

d. 237 634 + 199 999 =

2. Calculate the sums. You can use a method of your own choice.

Example 1:

	4	7	6	0	0	6	
–	1	9	7	5	3	9	
						7	(16 – 9)
					6	0	(90 – 30)
				4	0	0	(900 – 500)
			8	0	0	0	(15 000 – 7 000)
		7	0	0	0	0	(16 000 – 9 000)
+	2	0	0	0	0	0	(300 000 – 100 000)
	2	7	8	4	6	7	

Example 2:

	3	16		15	9	9	1
	~~4~~	~~7~~		~~6~~	~~0~~	~~0~~	6
+	1	9		7	5	3	9
	2	7		8	4	6	7

a. 68 763 –29 552 =

b. 83 254 – 25 368 =

c. 426 371 – 231 528 =

d. 532 764 – 299 999 =

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Date:

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R5b Calculating whole numbers continued

3. Solve the sums. You can use the method of your own choice.

Example 1:

543 × 798

= (500 × 700) + (500 × 90) + (500 × 8) + (40 × 700) + (40 × 90) + (40 × 8) + (3 × 700) + (3 × 90) + (3 × 8)

= 350 000 + 45 000 + 4 000 + 28 000 + 3 600 + 320 + 2 100 + 270 + 24= 300 000 + 50 000 + 40 000 + 5 000 + 4 000 + 20 000 + 8 000 + 3 000 + 2 000 + 600 + 300 + 100 + 200 + 20 + 70 + 20 + 4

= 300 000 + 90 000 + 9 000 + 20 000 + 13 000 + 1 200 + 110 + 4

= 300 000 + 110 000 + 9 000 + 10 000 + 3 000 + 1 000 + 200 + 100 + 10 + 4

= 300 000 + 100 000 + 10 000 + 10 000 + 13 000 + 300 + 10 + 4

= 400 000 + 30 000 + 3 000 + 300 + 10 + 4

= 433 314

Example 2:

	5 4 3	
×	7 9 8	
	2 4	(3 × 8)
	2 7 0	(3 × 90)
	2 1 0 0	(3 × 700)
	3 2 0	(40 × 8)
	3 6 0 0	(40 × 90)
	2 8 0 0 0	(40 × 700)
	4 0 0 0	(500 × 8)
	4 5 0 0 0	(500 × 90)
	3 5 0 0 0 0	(500 × 700)
	4 3 3 3 1 4	

Example 3:

	3 2	
	5 4 3	
	× 7 9 8	
	4 3 4 4	
	4 8 8 7 0	
+	3 8 0 1 0 0	
	4 3 3 3 1 4	

a. 243 × 89 =

b. 579 × 73 =

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c. 241 × 137 =

d. 896 × 476 =

4. Solve the sums.

Example 1:

$$\begin{array}{r} 26 \\ 25\overline{)650} \\ -\ 500 \quad 25 \times 20 \\ \hline 150 \\ -\ 150 \quad 25 \times 6 \\ \hline 0 \end{array}$$

Example 2:

$$\begin{array}{r} 26 \quad \text{rem } 4 \\ 25\overline{)654} \\ -\ 500 \quad 25 \times 20 \\ \hline 154 \\ -\ 150 \quad 25 \times 6 \\ \hline 4 \end{array}$$

a. $2\overline{)2\,254}$

b. $12\overline{)1\,407}$

c. $25\overline{)2\,890}$

Problem solving

1. We cycled 2 455 m on the first day and 3 650 m on the second day. How many kilometres did we travel?
2. I jogged 1 550 m and my friend jogged 2 275 m. How much further did my friend jog than I did?
3. The bakery bakes 2 450 biscuits on one day. How many did they bake in four weeks? Note that they only bake six days of the week.
4. My mother bought 3 850 m of string. She has to divide it into 25 pieces. How long is each piece?

Sign:

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Revision

R6 Factors and multiples

Discuss this and give five more examples of each.

Multiple: A number that is the result of multiplying together two other numbers (excluding fractions), e.g. $3 \times 2 = 6$. Six is a multiple of 2 and 3. Examples of multiples of six are 6, 12, 18, 24.

Prime numbers have only two different factors. The one factor is 1. The other factor is the prime number itself. 2 is a prime number, e.g. $1 \times 13 = 13$. There are only two factors: 1 and 13.

Factors: Factors are the numbers you multiply together to get another number, e.g. 3 and 4 are factors of 12, because $3 \times 4 = 12$.

Composite numbers have three or more different factors, e.g. 21 is composite.
$1 \times 21 = 21$, $3 \times 7 = 21$.
So 21 has four factors: 1, 21, 3 and 7.

1. Write down the first six multiples of the following pairs of numbers and circle the common multiples.

a. 2 _____

6 _____

b. 3 _____

9 _____

c. 4 _____

7 _____

d. 5 _____

8 _____

e. 4 _____

5 _____

2. Look at the answers above. What is the lowest common multiple for each pair of numbers?

a. _____ b. _____ c. _____ d. _____ e. _____

We use the abbreviation LCM for the lowest common multiple.

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3. Write down the factors for the following, and circle the common factors for each pair of numbers.

a. 12 _____

24 _____

b. 28 _____

21 _____

c. 15 _____

18 _____

d. 24 _____

60 _____

e. 18 _____

81 _____

4. Look at your answers above. What is the highest common factor for the each pair of numbers?

a. _____ **b.** _____ **c.** _____ **d.** _____ **e.** _____

5. Complete the following:

Number	Factors	How many factors?	Prime or composite
a. 12	1, 2, 3, 4, 6, 12	6	Composite
b. 41			
c. 63			
d. 77			
e. 33			
f. 121			

6. Express each of the following odd numbers as the sum of 3 prime numbers:

a. 29 3 + 7 + 19

b. 83 _____

c. 55 _____

d. 53 _____

e. 99 _____

Problem solving

Which number or numbers between 1 and 100 has the most factors?

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R7a Fractions

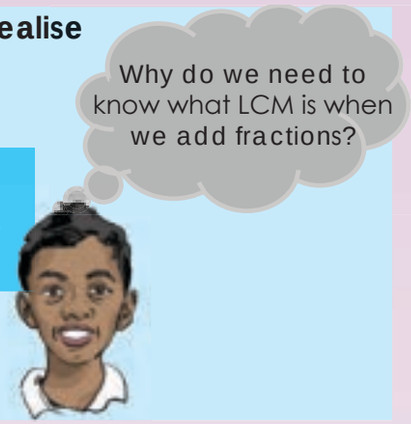
Fractions are used every day by people who don't even realise that they are using fractions. Name ten examples.

Read the definitions.

The **numerator** is the top number in a common fraction. It shows how many parts we have.

The **denominator** is the bottom number in a common fraction. It shows how many equal parts the item is divided into.

Equivalent fractions are fractions which have the same value, even though they may look different.



1. Complete the fractions to make them equal.

a. $\frac{2}{4} \overset{\times 2}{\underset{\times 2}{}} = \frac{4}{8}$

b. $\frac{3}{5} = \frac{\square}{10}$

c. $\frac{2}{6} = \frac{\square}{12}$

d. $\frac{6}{7} = \frac{\square}{21}$

e. $\frac{2}{4} = \frac{\square}{2}$

f. $\frac{9}{15} = \frac{\square}{5}$

g. $\frac{5}{6} = \frac{\square}{18}$

h. $\frac{7}{9} = \frac{\square}{18}$

i. $\frac{6}{22} = \frac{\square}{11}$

j. $\frac{20}{25} = \frac{\square}{100}$

You need to explain your answers to a brother, sister or friend. Use diagrams to explain the answers.

2. What happens to the numerator and denominator? Extend the pattern by writing down three more equivalent fractions.

a. $\frac{1}{3} \overset{\times 2}{\underset{\times 2}{}} = \frac{2}{6} \overset{\times 2}{\underset{\times 2}{}} = \frac{4}{12} \overset{\times 2}{\underset{\times 2}{}} = \frac{8}{24} \overset{\times 2}{\underset{\times 2}{}}$ _____

b. $\frac{1}{5} = \frac{3}{15} = \frac{9}{45} = \frac{27}{135}$ _____

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0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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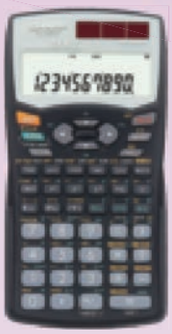
3. Complete the pattern.

a. $\frac{5}{6} \overset{\times 2}{\underset{\times 2}{}} = \frac{10}{12} \overset{\times 2}{\underset{\times 2}{}} = \frac{20}{24} \overset{\times 2}{\underset{\times 2}{}} = \frac{\quad}{\quad} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$

b. $\frac{3}{4} = \frac{9}{12} = \frac{27}{36} = \frac{\quad}{\quad} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$

c. $\frac{9}{11} = \frac{18}{22} = \frac{36}{44} = \frac{\quad}{\quad} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$

d. $\frac{1}{7} = \frac{5}{35} = \frac{25}{175} = \frac{\quad}{\quad} = \frac{\quad}{\quad} = \frac{\quad}{\quad}$



You can use a calculator.

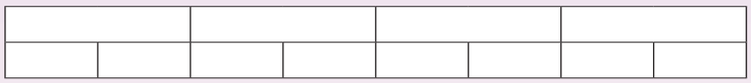
4. Fill in the empty boxes.

a. $\frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4} = \frac{\square}{4}$

b. $\frac{2}{6} + \frac{1}{2} = \frac{\square}{12} + \frac{6}{12}$

5. Complete the fraction sums using the diagrams on the right.

a. $\frac{3}{4} = \frac{1}{8} + \frac{\quad}{\quad} =$



b. $\frac{4}{6} = \frac{1}{3} + \frac{\quad}{\quad} =$

6. Complete the sums.

a. $\frac{1}{2} = \frac{1}{8} + \frac{\quad}{\quad} = \frac{\quad}{\quad}$

b. $\frac{1}{2} = \frac{1}{14} + \frac{\quad}{\quad} = \frac{\quad}{\quad}$

7. Add and then subtract to test your answer.

a. $\frac{5}{7} \overset{\times 2}{\underset{\times 2}{}} + \frac{2}{14}$

$= \_\_\_\_\_$

$= \_\_\_\_\_$

Test:

b. $\frac{7}{9} + \frac{1}{27}$

$= \_\_\_\_\_$

$= \_\_\_\_\_$

Test:

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R7b Fractions continued

8. Calculate the following:

a. $\frac{1}{3} + \frac{3}{4}$

Multiples of 3:

_____

Multiples of 4:

_____

LCM: _____

_____

_____

b. $\frac{4}{5} + \frac{1}{6}$

Multiples of 5:

_____

Multiples of 6:

_____

LCM: _____

_____

_____

9. Calculate the following:

a. $2\frac{1}{4} + 5\frac{2}{4}$

b. $7\frac{1}{8} - 3$

9. Calculate the following:

a. $5\frac{1}{3} + 1\frac{2}{4}$

b. $4\frac{3}{8} - 3\frac{4}{6}$

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11. 1,2 million goods are sold *per annum* (each year).

a. What is the total amount of goods sold per year? _____

b. What is $\frac{2}{12}$ of the total amount? _____

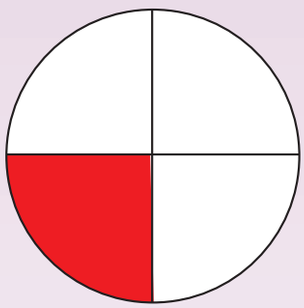
c. What is $\frac{6}{12}$ of the total amount? _____

d. What is $\frac{9}{12}$ of the total amount? _____

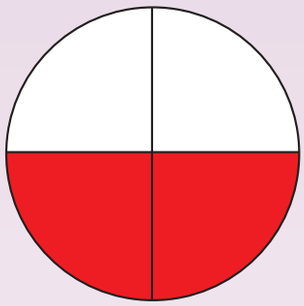
e. What is $\frac{11}{12}$ of the total amount? _____

12. What percentage of the circle is red?

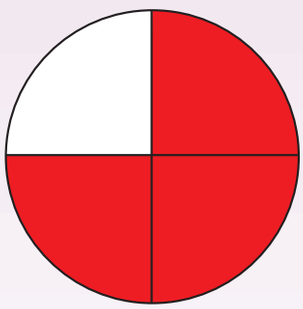
a. _____



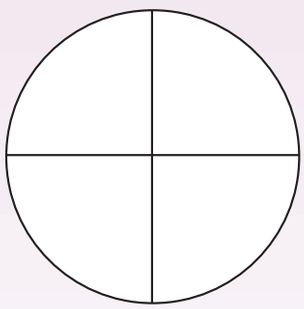
b. _____



c. _____



d. _____



Problem solving

I had $\frac{1}{12}$ of the cake.

My friend had $\frac{1}{4}$ of the cake.

How much cake did we have altogether?

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R8a Decimals

How are the following linked? Give an example.

Common fractions

Decimal fractions

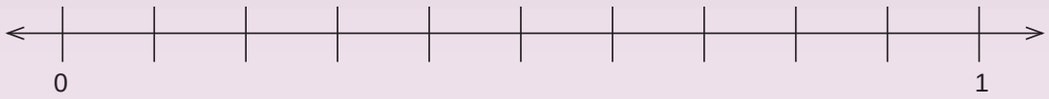
Percentages

When in everyday life do we use:

- Common fractions?
- Decimal fractions?
- Percentages?

1. Complete the number lines below, using decimal fractions.

a.

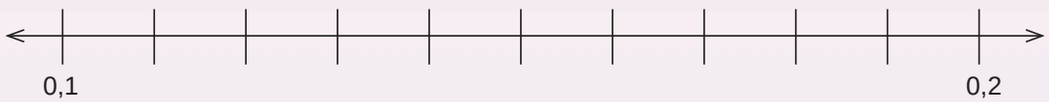


i. What comes after 0 on the number line? _____

ii. What comes before 1 on the number line? _____

iii. What is half way between 0 and 1 on the number line? _____

b.



i. What comes after 0,2 on the number line? _____

ii. What comes before 0,1 on the number line? _____

iii. What is half way between 0,1 and 0,2 on the number line? _____

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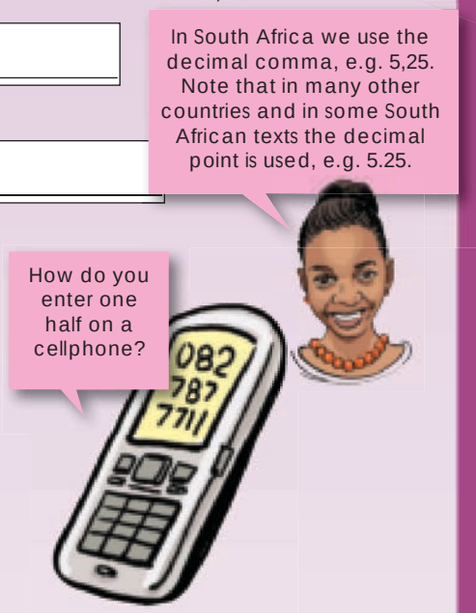
c.

i. What comes after 0,02 on the number line? _____

ii. What comes before 0,01 on the number line? _____

iii. What is half way between 0,01 and 0,02 on the number line? _____



2. Complete the table below by adding to or subtracting from the number given in the first column.

Number	Add 0,1	Add 0,01	Add 0,001	Subtract 0,1	Subtract 0,01	Subtract 0,001
a. 0,657	0,757					
b. 232,232						

3. Fill in the missing number:

a. 32,4 + _____ = 32,9

b. 8,452 + _____ = 8,492

4. Write the following in expanded notation:

a. 15,342 = 10 + 5 + 0,3 + _____

b. 456, 321 = _____

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R8b Decimals continued

5. Calculate the following using any method.

a. 5,326 + 4,542 =

b. 4,349 + 1,874 =

c. 32,24 + 19,387 =

d. 7,63 – 4,476 =

6. Complete the table:

Decimal fraction	Common fraction
a. 5,879	
b. 18,005	

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7. Answer the following:

a. What is 50% of R1,00?

b. What is 0,5 of R1,00?

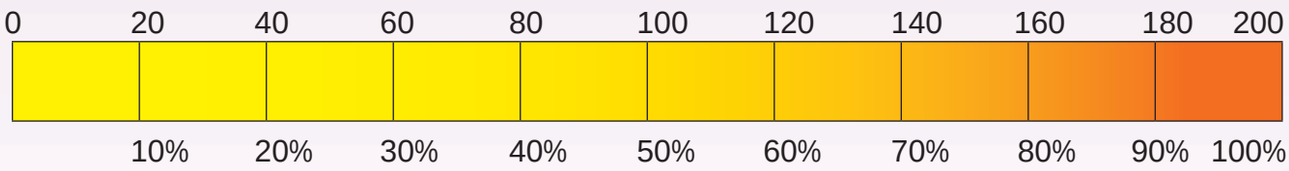
c. What is $\frac{1}{2}$ of R1,00?

d. What is 25% of R1,00?

e. What is 0,25 of R1,00?

f. What is $\frac{1}{4}$ of R1,00?

8. Look at the diagram and answer the following:



What is 40% of 200?

Problem solving

I bought trousers for R150 and then got 25% discount. What did I pay for my trousers?

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R9a Patterns

What will happen if I do these things? Give five examples of each.

- If I subtract the same number from a number.
- If I add two prime numbers.
- If I add or subtract 0 from a number.
- If I add two even numbers.
- If I subtract an odd number from an even number.
- If I multiply a number by 1.
- If I add five to a number.
- If I multiply a number by 4 and divide it by 2.
- If I divide an even number by an odd number.

1. Complete the following:

a. $4 - \square = 0$

b. $\square + 15 = 15$

c. $100\,000 \times \square = 100\,000$

d. $\square - 299\,999 = 0$

e. $\square \times 1 = 84\,934$

2. Replace each shape with a number.

a. ⬢ – ⬢ = 0

b. ■ × 1 = ■

c. ⬢ + 0 = ⬢

d. ⬟ – ⬟ = 0

e. ▬ × 1 = ▬

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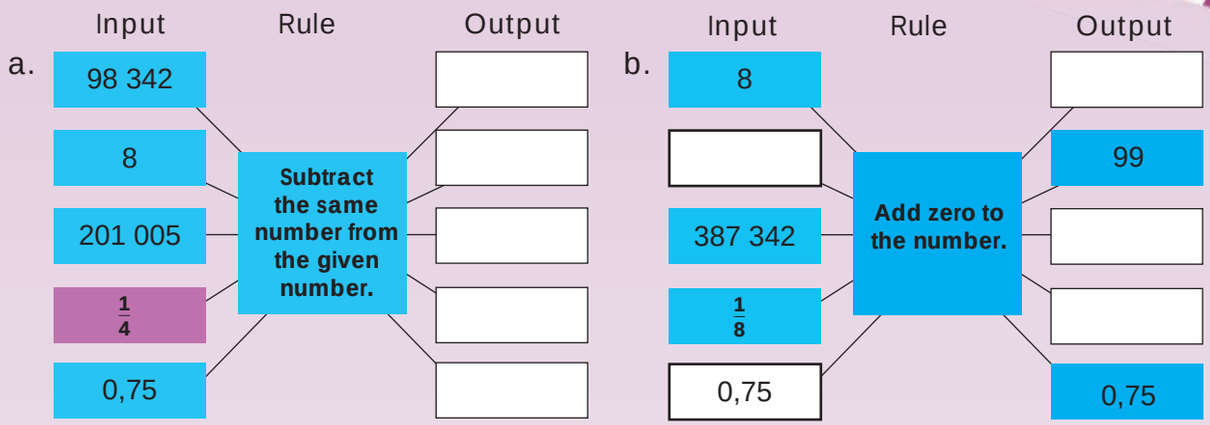
3. Complete the flow diagram.



4. Create your own flow diagrams using these rules:

a. Add nine and multiply by two.

b. Divide by three and subtract one.

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R9b Patterns continued

5. What is the value of ✗?

a. ✗ + 23 = 23 + 5 ✗ = ____

b. 8 × 2,5 = ✗ × 8 ✗ = ____

c. (90 + 10) × 0,2 = 90 × ✗ + 10 × ✗ ✗ = ____

d. 999 999 + 0 = ✗ + 999 999 ✗ = ____

e. 2,5 + ✗ = 4,5 + 2,5 ✗ = ____

6. If $a = 2$, $b = 3$, and $c = 10$, complete and calculate the sums.

a. $a + b$ = ____, $b + a$ = ____

Is $a + b = b + a$? Yes/No ____

b. $a \times b$ = ____, $b \times a$ = ____

Is $a \times b = b \times a$? Yes/No ____

c. $(a \times b) \times c$ = ____, $a \times (b \times c)$ = ____

Is $a \times b \times c = c \times b \times a$? Yes/No ____

d. $(a + b) \times c$ = ____, $a \times c + b \times c$ = ____

Is $(a + b) \times c = a \times c + b \times c$? Yes/No ____

e. $c \times 1$ = ____, $1 \times c$ = ____

Is $c \times 1 = 1 \times c$? Yes/No ____

7. Follow the order of operation to calculate each of the following:

BODMAS stands for:

B brackets
O other (power and square roots)
D division and } (left–to–right)
M multiplication }
A addition and
S subtraction (left–to–right)

The order in which we carry out a calculation is important.

a. $7 - 3 + 6 =$ _____

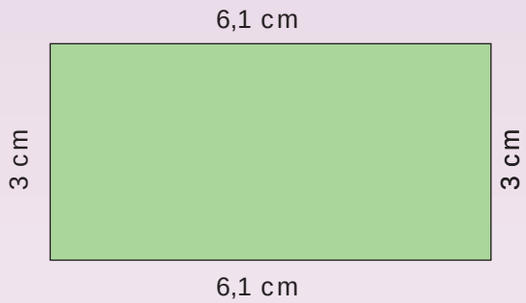
b. $16 + 29 - 87 =$ _____

c. $(96 \div 16) \times 2 =$ _____

d. $35 \div 5 + (18 - 16) =$ _____

e. $14 \div (36 - 29) + 11 =$ _____

8. Use the properties of number to find the perimeter of each rectangle.



Problem solving

		2			7			9
	8		2	4	9		3	
	3	1			5	7	2	
		9			8			1
	6	5				8	4	
4			7			2		
	9	3	1			6	5	
	5		8	6	2		7	
8			6				3	2

Sudoku fun

There are 9 rows and 9 columns in a Sudoku puzzle. Every row and column must contain the numbers 1, 2, 3, 4, 5, 6, 7, 8 and 9. There may not be any duplicate numbers in any row or column.

A region is a 3 x 3 box like the green one shown to the left. There are 9 regions in a traditional puzzle. Like the Sudoku rules for rows and columns, every region must also contain the numbers 1, 2, 3, 4, 5, 6, 7, 8, and 9. Duplicate numbers are not allowed in any region.

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R10a 2–D shapes and 3–D objects

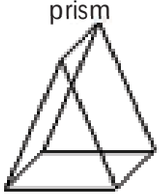
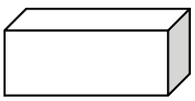
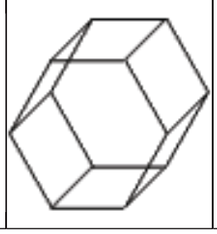
What is a 2–D shape?
What is a 3–D object?
Use the words below to guide you.

length volume area height width

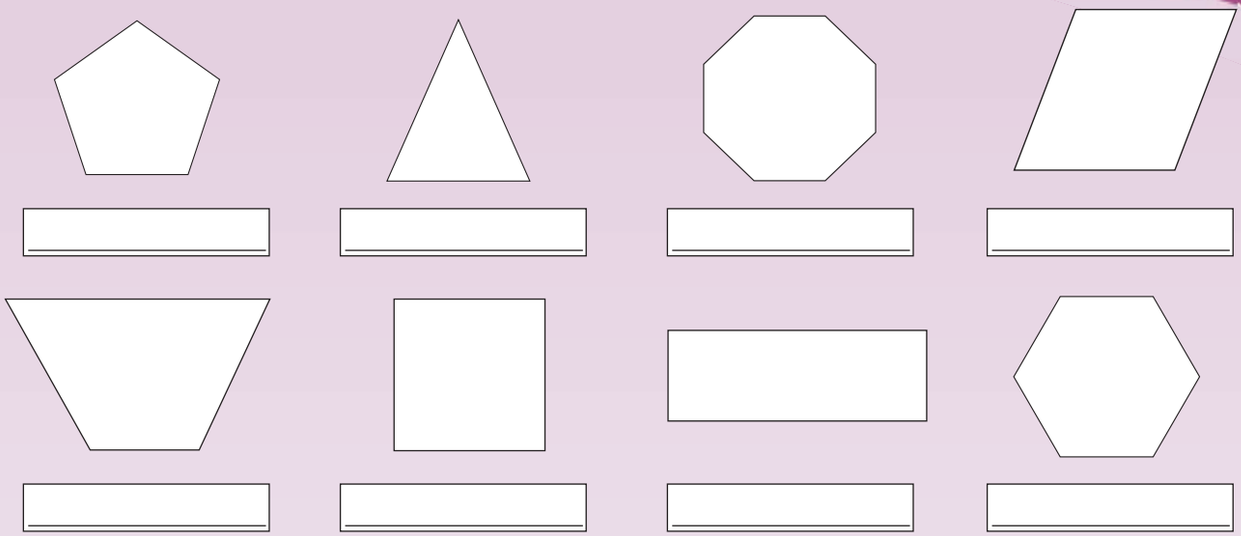
What is a 1–D shape?

All 1–D shapes have only length. The only 1–D shape is a line, even a wavy one.

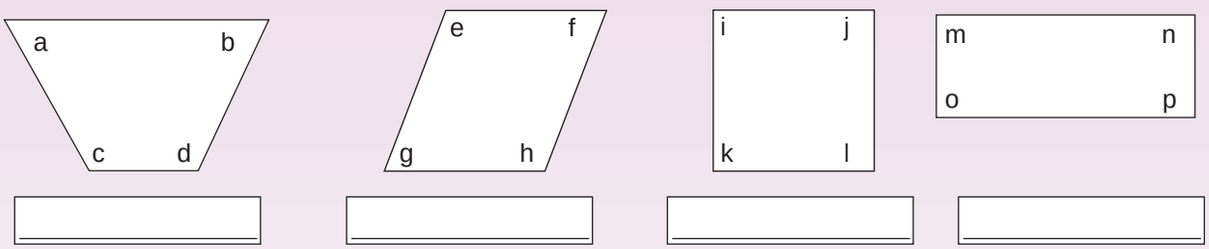
1. Complete the following table:

2–D shape within the 3–D object	Name the 3–D object	Draw the net	Number of faces	Number of vertices	Number of edges
2 triangles	Triangular prism 				
					
					
					

2. Name the polygons below. Tick all the quadrilaterals.



3. Name the quadrilateral and say whether the size of the angles equal 90º, is less than 90º or more than 90º.



a. _____ b. _____ c. _____ d. _____

e. _____ f. _____ g. _____ h. _____

i. _____ j. _____ k. _____ l. _____

m. _____ n. _____ o. _____ p. _____

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continued ☛

R10b 2-D shapes and 3-D objects continued

4. Make a tick in the correct answer column.

This shape can have:	1 right angle	2 right angles	3 or more right angles	No right angles
Square				
Rhombus				
Triangle				
Hexagon				
Trapezium				
Quadrilateral				
Rectangle				
Octagon				

5. Answer the following questions:

You know the lengths of 3 sides of a parallelogram: 12,5 cm, 7,5 cm and 7,5 cm. Is that enough information to work out the length of the 4th side? If so, what is it? Make a drawing to support your answer.

6. You know the lengths of 4 sides of a pentagon: 2,5 cm, 4,2 cm, 3,5 cm and 6 cm. What will the 5th side be? Measure it. Make a drawing to support your answer.

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7. Draw the following:

a. A rectangle with side of 5,5 cm and 35 mm.	b. A square with sides of 6,1 cm.
c. An irregular pentagon with one side that is equal to15 mm.	d. An irregular hexagon with all sides of different length.

Problem solving

Magazine or newspaper search

Find the following shapes in a magazine: quadrilateral, triangle and hexagon. Paste them here and describe their angles and sides.



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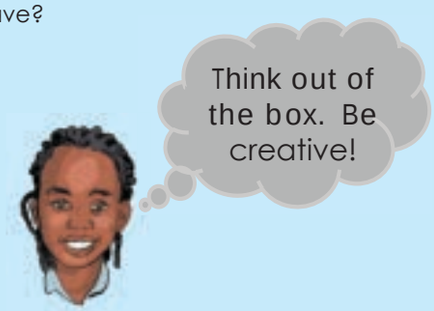
R 11 a Transformations

Revision

What does it mean when something transforms?

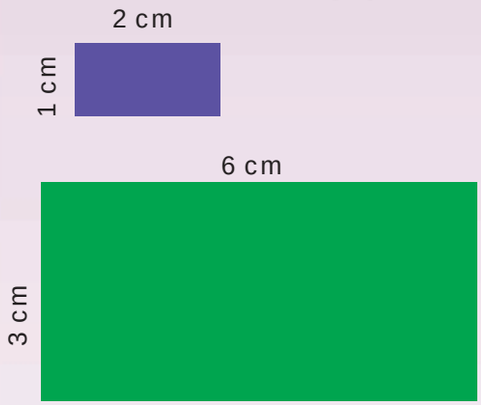
If a reflection is a transformation which has the same effect as a mirror, what effect will the following have?

- rotation
- translation
- enlargement



Transformation is the shift or movement of a shape according to certain rules. But no change in shape or form. Common kinds of geometric transformations are reflections, rotations, translations and enlargements.

1. Answer the following questions:



Purple rectangle:

a. The length = _____

b. The width = _____

Green rectangle:

c. The length = _____

d. The width = _____

e. The purple rectangle is enlarged _____ times to make the green rectangle.

2. Complete the table. Make drawings if needed.

	Rectangle	Perimeter	Area	Enlarge by:	Perimeter	Area
a.	Length: 4 cm Width: 2 cm			2 times Length: Width:		
b.	Length: 3 cm Width: 2 cm			3 times Length: Width:		
c.	Length: 5 cm Width: 4 cm			4 times Length: Width:		
d.	Length: 6 cm Width: 3 cm			2 times Length: Width:		
e.	Length: 7 cm Width: 6 cm			3 times Length: Width:		

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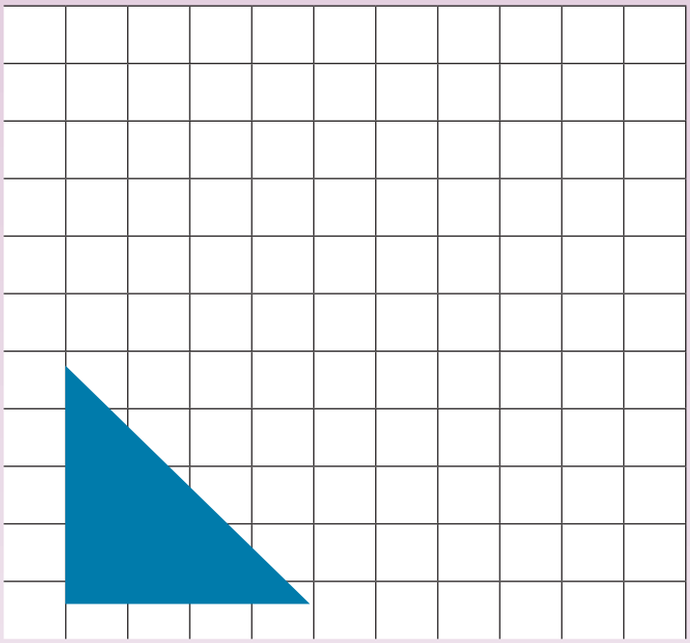
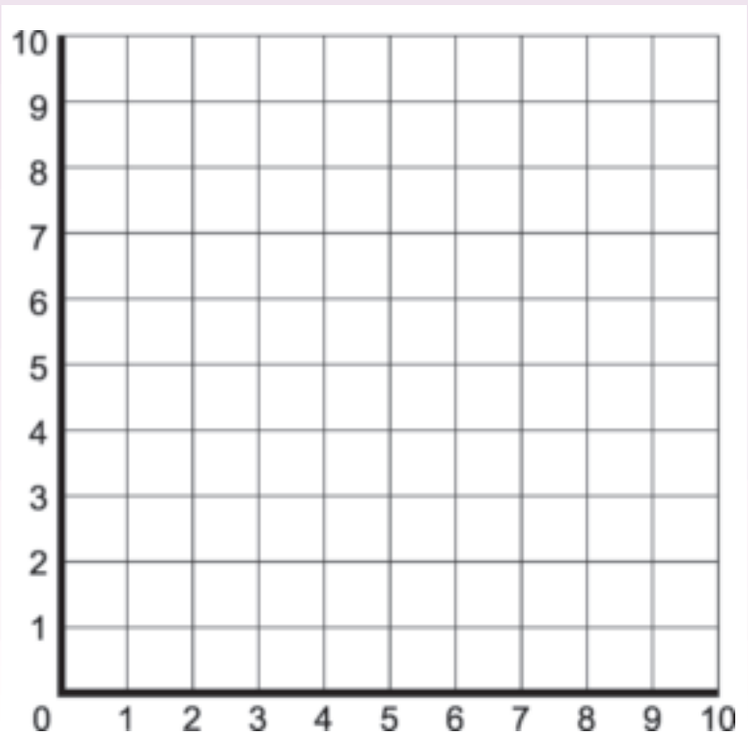
3. Slide the figure 4 right, 4 up



4. Plot the coordinates (9,9); (6,8); (6,5); (9,5) and connect the points in order. Then slide 3 down and 5 left and draw the figure at these new coordinates.



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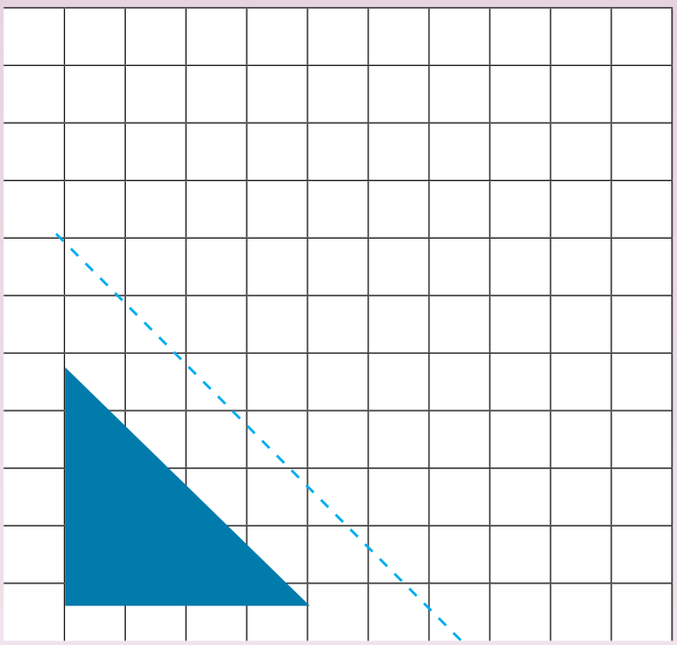
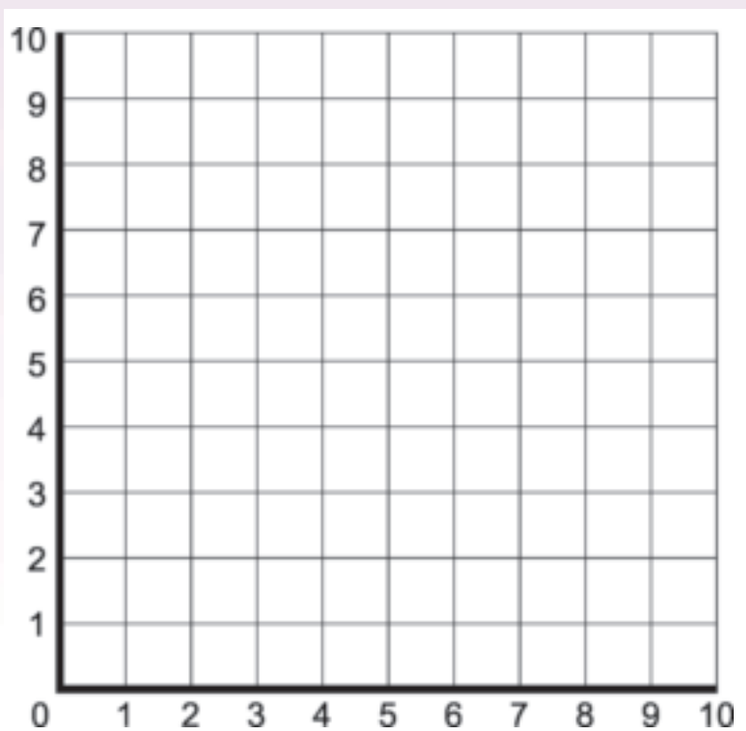
Transformations continued

5. Reflect the figure.



6. Draw a triangle with coordinates: (4,8); (1,5); (4,2). Then draw its reflection across a reflection line with coordinates (5,9); (5,1). Write the coordinates of the new triangle.



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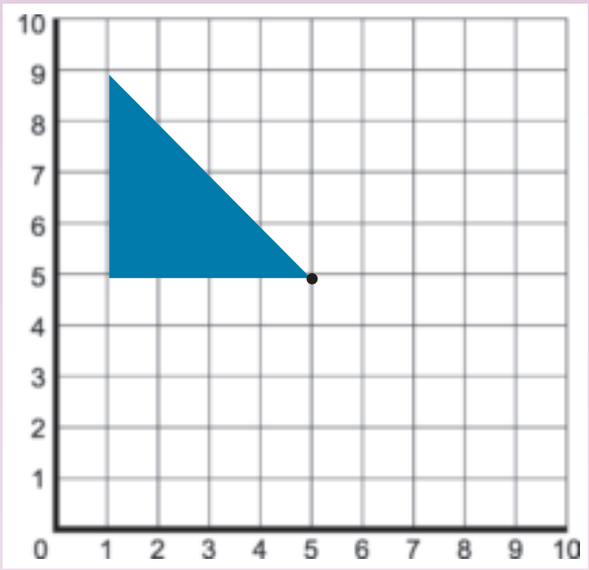
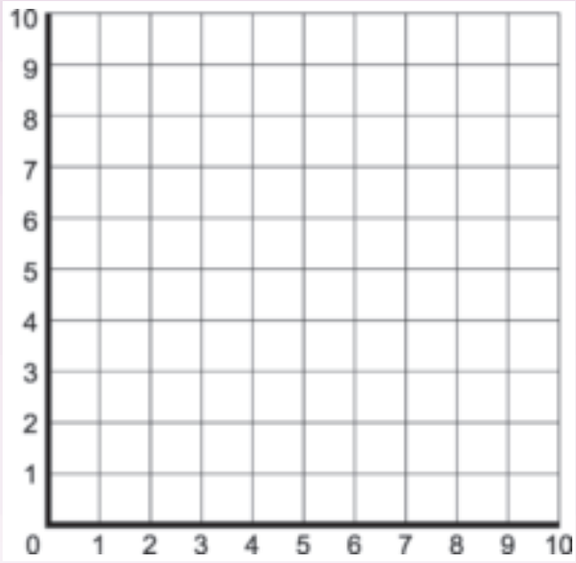
7. Rotate the figure by a quarter of a revolution around the point (5,5).



8. Draw a half turn image of the above figure and write the new coordinates:
Triangle: (5,5); (1,5); (1,9).



9. When we reflect, rotate or translate a shape, does the size of the shape change?

_____

10. Does the size of the shape change in enlargement and reduction?

_____

Sign:

Date:

Problem solving

Draw a transformation using reflection, rotation and translation on one graph showing the movement from one figure to the next.

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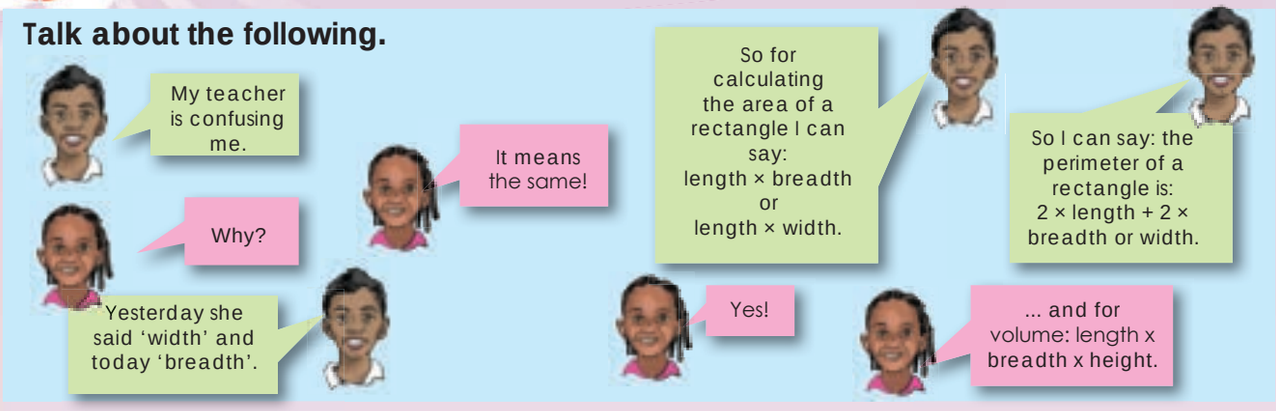
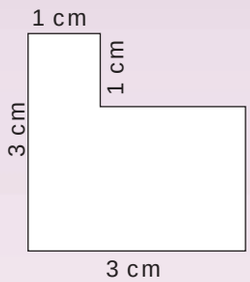
R12 Area, perimeter and volume

Talk about the following.



1. Calculate the perimeter and area of the following polygons.



a. What will you do with the figure before you calculate the perimeter and area?

_____

_____

_____

_____

_____

b. Perimeter

_____

_____

_____

_____

c. Area

_____

_____

_____

_____

2. Calculate the perimeter and area of the following rectangles.

a. Length: 10 cm; Width: 8 cm

Perimeter

_____

_____

_____

_____

Area

_____

_____

_____

_____

b. Length: 10 cm; Width: 7,5 cm

Perimeter

_____

_____

_____

_____

Area

_____

_____

_____

_____

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3. If you have a rectangle with the following area, what could its length and breadth be? What is the perimeter?

Area = 210 m^2

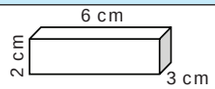
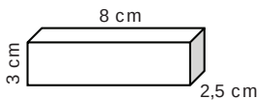
Length	Breadth	Perimeter

4. Sipho and his father are building a deck because the old one is too small. The old deck was 2,5 m × 3 m. They are going to double the dimensions of the deck. They'll need to know how much railing and paint to buy. What will be the perimeter and area of the new deck? Show the calculations on a separate piece of paper.

5. If a rectangular prism has a volume of 36 cubic units, what might be the:

a. Height? _____ b. Width? _____ c. Length? _____

6. Complete the following table.

	Length	Width	Height	Short way to calculate	Volume
				Length × width × height 6 cm × 3 cm × 2 cm	___ cm^3
					

7. If you have a rectangular prism with the following volume, what could the length, breadth and height be? Volume = 2 100 m^3.

Length	Breadth	Height
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Problem solving

Investigate:

How many different ways can you draw a square and rectangles covering 64 square units? Show them.

- Do all of the above shapes have the same area?
- Do they all have the same perimeter?

Now try a similar activity with an object of 64 cubic units.

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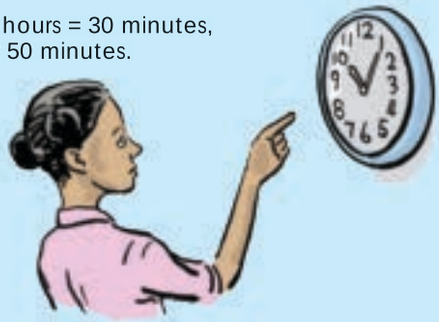
R13 Time

Very important to remember this! Talk about it.

0,5 hours = 30 minutes, not 50 minutes.



Decimals show fractions of tenths, hundredths, thousandths and so on. But minutes are measured in sixtieths of an hour. So a $\frac{1}{4}$ of an hour is 15 minutes and $\frac{1}{10}$ hour is 6 minutes.

1. This is how long I took to complete my maths homework this week. Help me to complete this table.

Maths homework	Hours	Minutes	Seconds	hh:mm:ss	I started my homework at:	I finished it at:
Monday	1	30	1	01:30:01	15:00	
Tuesday				01:15:25	15:30	
Wednesday	1	27	17		16:30	
Thursday	0	55	45		17:45	
Friday				01:15:09	14:50	

2. I visited my grandmother over the weekend. On Saturday, I arrived at her house at 10:57:02. I left on Sunday at 13:45:05. How long was my visit to my grandmother?

3. Complete the table.

Weeks	1	1,5	2	2,5	3	3,5	4	4,5	5	6,5	7
Days	7										
Hours	168										
Minutes											

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4. Convert years to weeks and days.

a. 5 years = _____ weeks = _____ days

b. 25 $\frac{1}{2}$ years = _____ weeks = _____ days

5. Convert centuries to years.

a. 10 centuries

b. 5 $\frac{1}{4}$ centuries

6. Time zones:

a. How many time zones are there in the world? _____

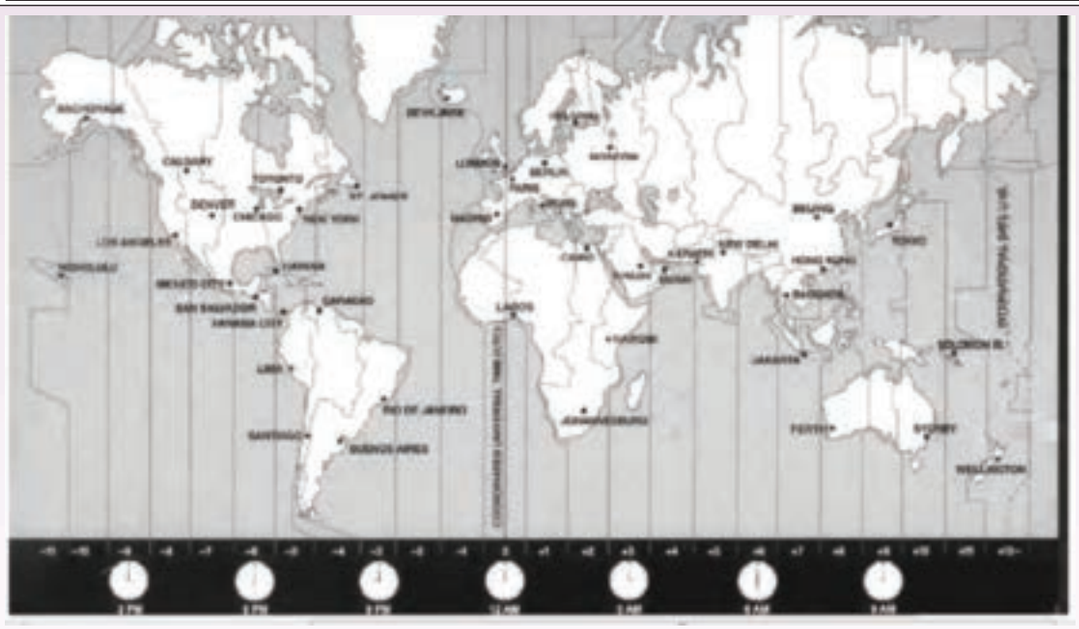
How do you know? _____

b. Name two other countries in the same time zone as South Africa.

_____

c. Name two other countries in a different time zone to South Africa.

_____



Problem solving

It took Sam 3 hours to travel 100 km. How many kilometres per hour did he travel? How long will it take him to travel 120 km? Give your answer in hours and minutes. What do you think he was travelling on at this speed?

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Revision

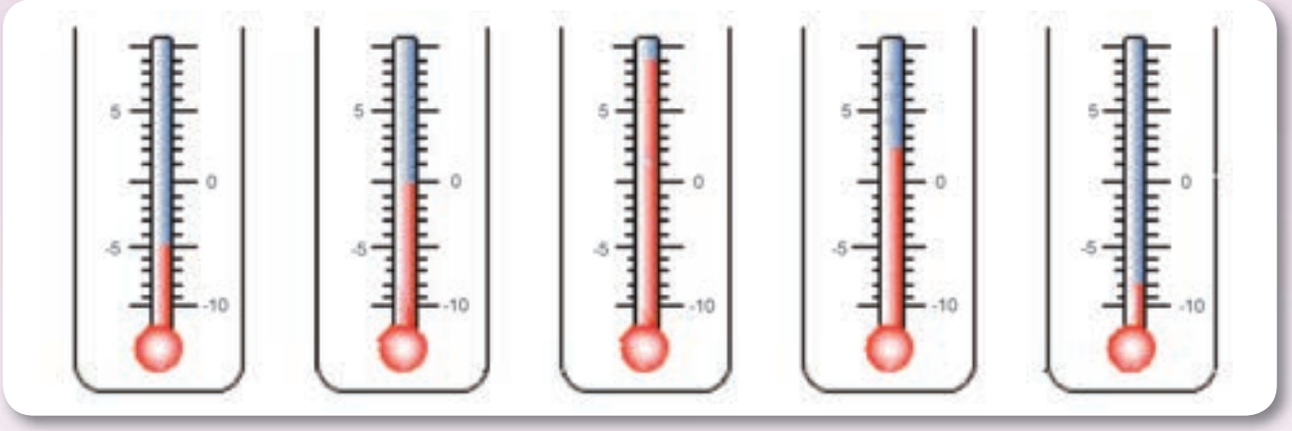
R14a Temperature, length, mass and capacity

Give five everyday examples of why and where we use the following:




1. Write down each temperature.

a. _____ b. _____ c. _____ d. _____ e. _____



f. Which temperature is the coldest? _____

g. Which temperature is the warmest? _____

h. A temperature of –5° C is colder than –3° C as it is 2° C less than _____.

i. A temperature of –9° C is colder than –8° C as it is _____ less than _____.

2. What is the difference in temperature shown in question 1 between:

a. a and b _____

b. b and c _____

c. d and b _____

d. e and d _____

e. e and a _____

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3. Answer the following questions about length.

a. How many mm are there in a cm? _____

b. How many cm are there in a m? _____

c. How many mm are there in a m? _____

d. How many m are there in a km? _____

e. Convert the following in this table:

		mm	cm	m	km
i.	**9 cm**				
ii.	**3 m**				
iii.	**2 km**				
iv.	**10,5 m**				
v.	**3 600 mm**				

f. A man travelled 450 km on the first day and 565 000 m on the second day. The third day he travelled double the distance he travelled on the first day. On the fourth day he reached his destination, which was 2 500 km from his starting point.

How far did he travel on the fourth day?

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R14b Temperature, length, mass and capacity continued

4. Answer the following questions about mass.

a. How many g are there in a kilogram? _____

b. How many kg are there in a tonne? _____

A tonne is equal to 1 000 kg.

c. How many mg are there in a gram? _____

d. How many mg are there in a kilogram? _____

e. Convert the following:

		mg	g	kg	t
i.	**3 500 g**				
ii.	**2 kg**				
iii.	**2,5 kg**				
iv.	**3 t**				
v.	**5 000 000 mg**				

f. An object weighs a quarter of a kilogram. I add one half of a kilogram to the object. I take 200 g off. I double the mass of the object. I add one tonne to the object and then half it. What is the mass of the object?

_____

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5. Answer the following questions on capacity.

a. How many ml are in a litre? _____

b. How many ℓ are in a kl? _____

c. How many ml are in a kl? _____

d. Convert the following:

		ml	ℓ	kl
i.	**5 250 ml**			
ii.	**4,5 ℓ**			
iii.	**3 kl**			
iv.	**9 999 ml**			
v.	**1,75 ℓ**			

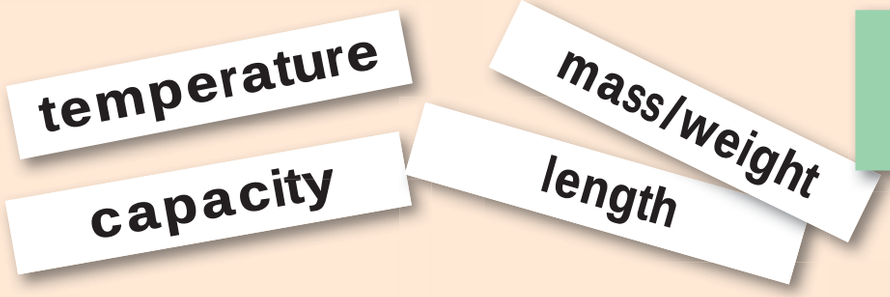
e. A swimming pool has the following dimensions: length 25 metres, width 10 metres and depth 1,5 metres. The capacity is 25 m × 10 m × 1,5 m = 375 cubic metres. One cubic metre is equal to 1 000 litres.

i) Therefore the capacity of the swimming pool in litres is _____.

ii) How many kilolitres is this? _____

Problem solving

Give five examples of how these words are used in your house.



What is the difference between capacity and volume?

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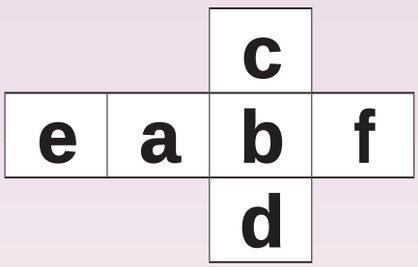
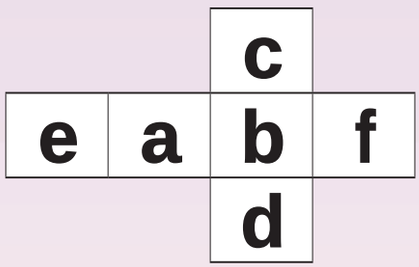
R15 Probability

Look at the following pictures and ask yourself, "What is the probability that this will happen today?"




1. **Draw and make these two nets on cardboard, cut, fold, and stick them to make two dice.**





2. **Roll these two dice a 100 times and write down each time the same two letters occur. Use tallies to record your answers in the table below.**

Letters on the dice	Times landed on the combination
a a	
b b	
c c	
d d	
e e	
f f	

3. **Compare your answers with those of a friend. Are they the same? Why?**

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4. You need to prepare.

You need an empty bag.

You need to make a set of 10 cards using cardboard or paper. Each card should be a square 4 cm by 4 cm. Cut the ten cards and place them in the bag.

x	y	z	m	m
a	a	a	b	k

5. Draw a card from the bag and record it below. Place the card back into the bag. Do this 100 times.

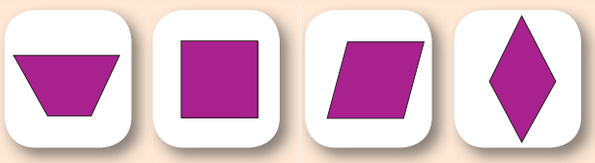
Letter on the card	Times landed on the letter
x	
y	
z	
m	
a	
b	
k	

6. Compare your answers with those of your friend. Are they the same? Why?

7. Drawing a number X card from the bag has a probability of 1 out of 10. We can write it as $\frac{1}{10}$.

What is the probability of drawing card y? ____, card z? ____, card m? ____, card a? ____, card b? ____, and card k? ____

Problem solving



Card fun: Do a similar activity but use the following quadrilateral cards. What is the probabitlity of drawing a card with a square?

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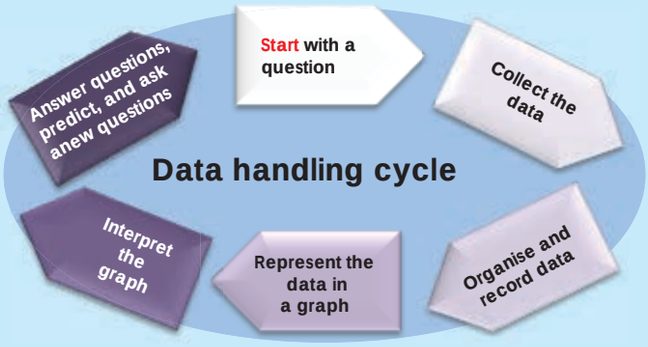
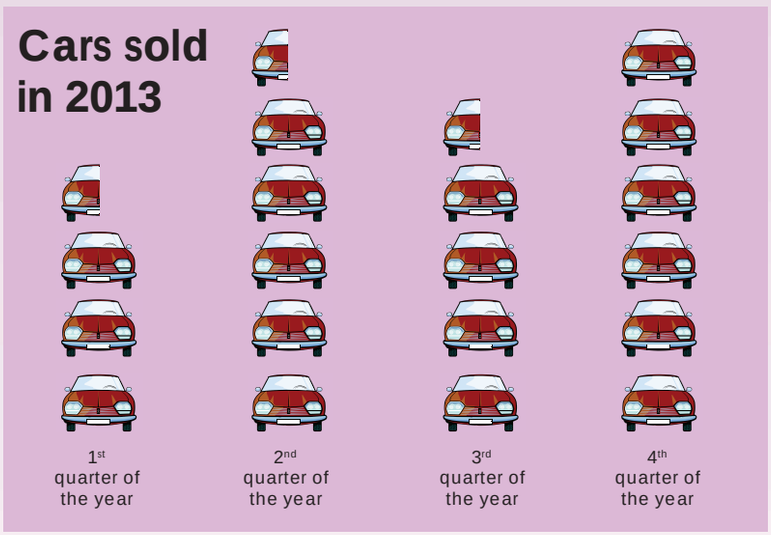
R16 Data

Look at this data-handling cycle and describe it.



1. Answer the question about the pictograph.



Key

= 100 000 cars

= 50 000 cars

a. Complete the table. How many cars were sold in each quarter?

1st quarter Jan – March	2nd quarter April – June	3rd quarter July – September	4th quarter October – December

b. Why do you think more cars were sold during the 4th quarter?

c. Look at the data-handling cycle. What steps of the data handling cycle had to happen before the pictograph could be drawn? What steps still need to happen to complete the data handling cycle?

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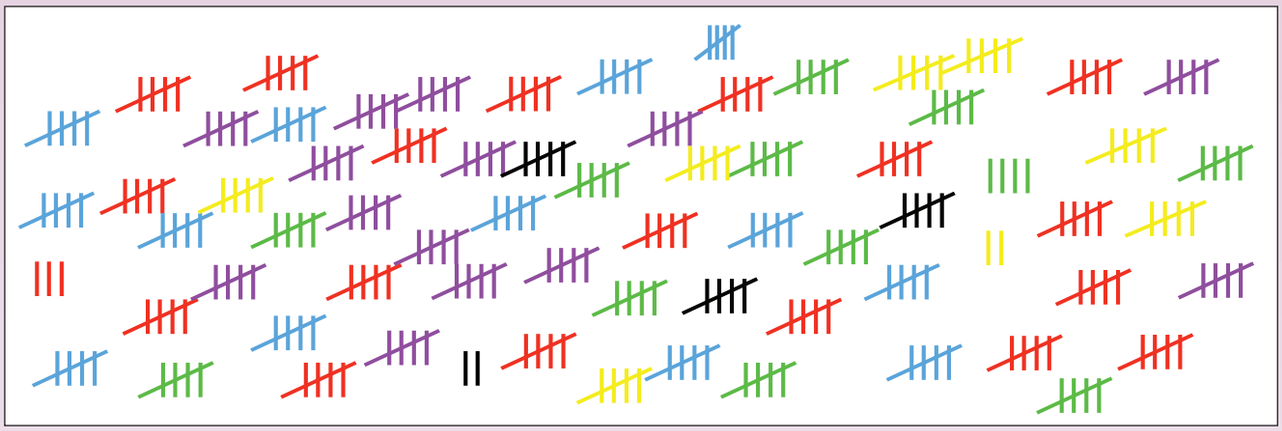
2. Sort the data using the frequency table below.

I collected data from children about their favourite colour. I recorded their answers by making tally marks on a piece of paper.

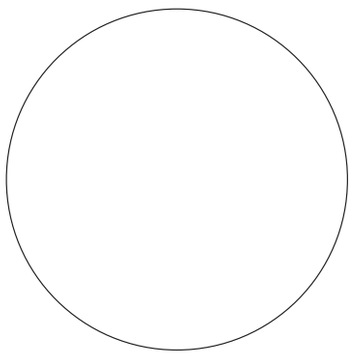


3. Complete this frequency table below using the data above.

Colour	Tally	Frequency
Red	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 III	93

4. Use the information from the frequency table to draw and label this pie chart.

Title: _____



Problem solving

Collect data about cell phone usage in your class and draw a bar chart of your results. Explain what you need to do.

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Date:

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Notes

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Rainbow WORKBOOKS

Grade 7

Mathematics

PART 2

WORKSHEETS

1 to 64

ENGLISH Book 1

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1 Commutative property of addition and multiplication

Commutative property of addition and multiplication

Are the following true or false?

- 3 + 4 = 4 + 3
- 3 × 4 = 4 × 3
- 20 + 5 = 5 + 20
- 20 × 5 = 5 × 20

What do you notice?

The **commutative property of addition and multiplication** says that you can swap numbers around and still get the same answer when you add or multiply whole numbers. The order in which you move the numbers around does not matter.

An **equation** says that two things are the same using an equal sign (=), e.g. 7 + 4 = 12 – 1

1. Use the commutative property of addition or multiplication to make the equations true.

Example: 5 + 1 = 1 + 5 (addition) and 5 × 1 = 1 × 5 (multiplication)

a. 13 + 2 =

13 + 2 = 2 + 13

b. 62 + 31 =

c. 4 × 5 =

d. 7 × 9 =

e. = 8 × 9

f. = 15 × 12

g. Make your own equations using the commutative property of addition and multiplication.

2. Use the commutative property of addition or multiplication to make the equations true.

Example: $f + e = e + f$ (addition) and $f \times e = e \times f$ (multiplication)

a. $a + b =$

b. $c \times d =$

c. $m \times n =$

d. $= g + h$

e. $= p \times 2$

f. $s \times t =$

g. Make your own equations using the commutative property of addition and multiplication.

Term 1

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3. Show that the Left Hand side is equal to the Right Hand side when you substitute: $a = 2$, $b = 5$ and $c = 3$.

Example:

$a + b = b + a$ (addition)

$a + b = 2 + 5$ and $b + a = 5 + 2$

$= 7$ $= 7$

$a + b = b + a$

$a \times b = b \times a$ (multiplication)

$a \times b = 2 \times 5$ and $b \times a = 5 \times 2$

$= 10$ $= 10$

$a \times b = b \times a$

a. $c + a = c + a$

b. $c \times a = c \times a$

c. $b \times a = a \times b$

d. $b + a = a + b$

e. $b \times c = c \times b$

f. $b + c = c + b$

4. Write an equation to show how each diagram illustrates the commutative property of multiplication.

a.

b.

c.

d.

Problem solving

If $a = 20$ and $b = 15$, write an **associative property of addition and multiplication** statement and solve it.

Sign:

Date:

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2 Associative property of addition and multiplication

Are the following true or false?

5 + (3 + 2) = (5 + 3) + 2

9 × (2 × 3) = (2 × 3) × 9

(12 + 14) + 13 = 12 + (14 + 13)

(11 × 2) × 4 = 11 × (2 × 4)

What do you notice?

The **associative property of addition and multiplication** says that it doesn't matter how you group numbers when you add or multiply.

1. Use the associative property of addition or multiplication to make the statements true.

Example: (5 + 1) + 3 = 5 + (1 + 3) (addition)

(5 × 1) × 3 = 5 × (1 × 3) (multiplication)

a. (6 + 2) + 4 =

(6 + 2) + 4 = 6 + (2 + 4)

Solve it:

12 = 12

b. (7 + 3) + 1 =

c. 8 × (10 × 4) =

d. 4 × (5 × 2) =

e. (11 × 3) × 2 =

f. (12 × 2) × 4 =

2. Use the associative property of addition or multiplication to make the statements true.

Example: $f + (g + h) = (f + g) + h$ (addition)

$f \times (g \times h) = (f \times g) \times h$ (multiplication)

a. $(a + b) + c =$

$a + (b + c)$

b. $(m + n) + c =$

c. $(g \times h) \times i =$

d. $(c \times d) \times f =$

e. $(k \times z) \times d =$

f. $(a + d) + v =$

g. $(a \times c) \times d =$

h. $(k \times l) \times m =$

i. $(v + c) + r =$

Term 1

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3. Solve if $a = 2$, $b = 4$ and $c = 3$. Show that the associative properties hold and calculate the answers.

Examples:

$a + (b + c) = (a + b) + c$

$2 + (4 + 3) = (2 + 4) + 3$

$2 + 7 = 6 + 3$

$9 = 9$

$a + (b + c) = (a + b) + c$

$a \times (b \times c) = (a \times b) \times c$

$2 \times (4 \times 3) = (2 \times 4) \times 3$

$2 \times 12 = 8 \times 3$

$24 = 24$

$a \times (b \times c) = (a \times b) \times c$

a. $(c + a) + b = c + (a + b)$

b. $(b \times a) \times c = a \times (b \times c)$

c. $b \times (c \times a) = c \times (b \times a)$

d. $b + (c + a) = (b + c) + a$

4. If $m = 1$, $n = 7$ and $q = 2$, show that the expressions are equal.

a. $(q + m) + n = q + (m + n)$

b. $(n \times m) \times q = m \times (n \times q)$

c. $n \times (q \times m) = q \times (n \times m)$

d. $n + (q + m) = (n + q) + m$

Problem solving

If $a = 25$, $b = 30$ and $c = 10$, write an **associative property of addition and multiplication** statement and solve it.

Sign:

Date:

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3 Distributive property of multiplication over addition

2(3) 3(9) 4(100)

4(6) 7(8)

What do the brackets mean?
Look at this statement:
2(3 + 2).
How do you think I will calculate this?

The distributive property lets you multiply a single number and each of two or more numbers between brackets (the products of which you then add together).

You will get the same answer when you multiply a group of numbers added together as when you do each multiplication separately and then add them together.

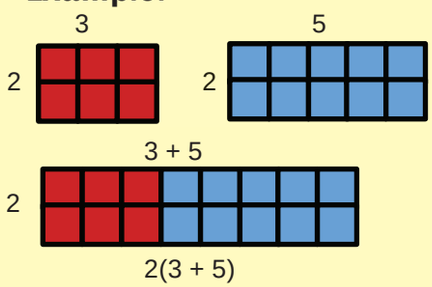
$2(3 + 2) = 2(5) = 10$

$2(3 + 2) = (2 \times 3) + (2 \times 2) = 6 + 4 = 10$

Usually we follow the rule that anything in brackets must be done first. In this example it would have been very easy to do this, 2(3+2) = 2(5) = 10. But the distributive property becomes very useful when what is inside the brackets is more complicated.

1. Use the distributive property to write a sum for each diagram so that you can calculate the total number of blocks in each drawing.

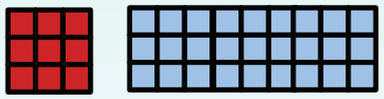
Example:



$2 \times 3 + 2 \times 5$

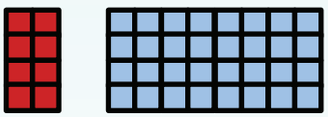
$2(3 + 5)$

a.



b.

c.



d. Draw a diagram for:

i. 5(2 + 3)

ii. 6(1 + 4)

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2. Use the distributive property of multiplication to make these statements true.

Example: $4(5 + 9) = 4 \times 5 + 4 \times 9 = (4 \times 5) + (4 \times 9)$

a. $3(4 + 2) =$ ☐

b. $10(2 + 3) =$ ☐

c. $5(3 + 1) =$ ☐

Calculate it:

3 | 4 | 2

12 + 6 = 18

☐ ☐

\+ =

☐ ☐

\+ =

3. Use the distributive property of multiplication to make these statements true.

Example: $4 \times 5 + 4 \times 3 = (4 \times 5) + (4 \times 3) = 4(5 + 3)$

a. $3 \times 2 + 3 \times 5 =$ ☐

b. $6 \times 1 + 6 \times 4 =$ ☐

c. $3 \times 2 - 3 \times 1 =$ ☐

Calculate it:

3 | 2 | 5

6 + 15 = 21

☐ ☐

\+ =

☐ ☐

\− =

4. If $a = 3$, $b = 2$ and $c = 4$, calculate the following:

Example: $a(b + c) = a \times b + a \times c$

$3(2 + 4) = 3 \times 2 + 3 \times 4$

$3(6) = 6 + 12$

$18 = 18$

a. $b(a + c)$ ☐

b. $c(b + a)$ ☐

c. $a(c + b)$ ☐

Problem solving

If $a = 5$, $b = 9$ and $c = 11$, write a distributive property statement and calculate the answer.

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4 Zero as the identity of addition, one as the identity of multiplication, and other properties of numbers

What do you notice?

3 + 0 =	5 + 0 =	100 + 0 =
0 + 16 =	0 + 250 =	72 + 0 =

3 × 1 =	5 × 1 =	100 × 1 =
1 × 16 =	1 × 250 =	1 × 72 =

Zero as the identify of addition:
The sum of zero and any number is the number itself. The answer will always be the number that **zero** is **added** to.

One as the identify of multiplication:
The product of 1 and any number is always the number itself. The answer will always be the number that **one** is multiplied **by**.

1. Use zero as the identity of addition, or one as the identity of multiplication to write a sum for the following:

		Zero as the identity of addition	One as the identity of multiplication
a.	5	5 + 0 = 5	5 × 1 = 5
b.	7		
c.	9		
d.	100		
e.	34		
f.	2,5		
g.	0,1		

2. Use zero as the identity of addition, or one as the identity of multiplication to solve the following:

a. $b + 0 =$ ☐ $\quad b \times 1 =$ ☐

b. $d \times$ ☐ $= d \quad d +$ ☐ $= d$

c. $e \times 1 =$ ☐ $\quad e + 0 =$ ☐

3. Choose the correct property of number to write and equivalent statement to complete the equation.

a. 4 + 5 =

4 + 5 = 5 + 4

b. 2(3 + 9) =

c. 3 + (4 + 8) =

d. 5(9 – 8) =

e. 9 + 12 =

f. (2 × 5) × 11 =

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4. Say whether the following are true or false. If it is false, explain why it is false.

a. $9 + 2 = 2 + 9$

b. $5 - 4 = 4 - 5$

c. $4(2 + 1) = 4 \times 2 + 4 \times 1$

d. $3 + 0 = 3$

e. $8 - (3 - 2) = (8 - 3) - 2$

f. $2(5 - 4) = 2 \times 5 - 2 \times 4$

5. If $a = 2$, $b = 5$, $c = 8$, solve the following:

Example: $b + a = a + b$

$5 + 2 = 2 + 5$

$7 = 7$

a. $a + c = c + a$

b. $b + (c + a) = (b + c) + a$

c. $a + 0 =$

d. $b(a + c)$

e. $a(c - b)$

f. $b \times 1 =$

6. Match column A with column B

Column A	Column B
Associative property of numbers	$a \times 1 = a$
Commutative property of numbers	$(a + b) + c = a + (b + c)$
Distributive property of numbers	$a + 0 = a$
Zero as the identity of addition	$a + b = b + a$
One as the identity of multiplication	$a(b + c) = a \times b + a \times c$

Problem solving

- What should I add to a number so that the answer will be the same as the number?
- By what should I multiply a number so that the answer will be the same as the number?
- Write five statements that are true using the properties of number.
- Write five statements that are false using the properties of number. Explain your answer.

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5 Multiples

How fast can you give me the first 12 multiples of 2s, 3s, 4s, 5s, 6s, 7s, 8s, 9s, and 10s?

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

1. Use the number board to find the first twelve multiples of the following:

Example: The multiples of 6 are 6, 12, 18, ... 72, or

We can write it as: multiples of 6: {6,12,18, 24, 30, 36, 42, 48, 54, 60, 66, 72}

a. Multiples of 4: {_____}

b. Multiples of 7: {_____}

c. Multiples of 5: {_____}

d. Multiples of 8: {_____}

e. Multiples of 2: {_____}

f. Multiples of 9: {_____}

2. Write down the first 12 multiples of the numbers below. Circle all the common multiples and identify the lowest common multiple (LCM).

Example: Multiples of 2: 2, (4), 6, (8), 10, (12), 14, (16), 18, (20), 22, (24)

Multiples of 4: (4), (8), (12), (16), (20), (24), 28, 32, 36, 40, 44, 48

The LCM is 4.

Term 1

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a. Multiples of 5: {_____}

Multiples of 10: {_____}

LCM? _____

b. Multiples of 5: {_____}

Multiples of 6: {_____}

LCM? _____

c. Multiples of 90: {_____}

Multiples of 20: {_____}

LCM? _____

3. What is the LCM for the following?

Example: Multiples of 4 and multiples of 7

Multiples of 4: { 4, 8, 12, 16, 20, 24, (28) }

Multiples of 7: {7, 14, 21, (28) }

a. Multiples of 2 and multiples of 8

b. Multiples of 3 and multiples of 6

c. Multiples of 50 and multiples of 30

d. Multiples of 45 and multiples of 90

e. Multiples of 100 and multiples of 125

f. Multiples of 320 and multiples of 245

Problem solving

In our homes there are various things that come in multiples. Give five examples of multiples from your home.

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6 Divisibility and factors

Your little brother messed up your notes. Find the missing information.

A number is divisible by ▪ if the number formed by the last three digits is divisible by 8.

A number is divisible by 3 if the sum of the digits is divisible by 3.

A number is divisible by 10 if the last digit is ▪

A number is divisible by ▪ if the last digit is either 0 or 5.

A number is divisible by 4 if the number formed by the last two digits is divisible by ▪

A number is divisible by 9 if the sum of the digits is divisible by 9.

A number is divisible by ▪ if the last digit is 0, 2, 4, 6 or 8.

A number is divisible by 6 if it is divisible by 2 and it is divisible by 3.

1. Tick whether the numbers are divisible by 2, 3, 4, 5 or 10. You can have more than one answer.

	2	3	4	5	10
a. 376	✔				
b. 7 232					
c. 9 050					
d. 6 312					
e. 2 355					

2. The following numbers are divisible by?

Example: 6 is divisible by 1, 2, 3 and 6.

a. 12 b. 36 c. 42 d. 24 e. 64

3. Which two numbers, when multiplied, give you this number?

Example: 6 = 2 × 3, 6 = 1 × 6

a. 12 b. 36 c. 42 d. 24 e. 64

4. What do you notice if you compare the answers to questions 2 and 3?

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5. For each of the numbers given below, write down:

(i) All the possible multiplication sums using only two numbers that will give you this number. (ii) All the numbers used in these multiplication sums, in ascending order (but do not repeat a number). (iii) Complete the sentence: "These are the factors of_____." (iv) Complete the sentence: "Factors of_____ = {_____}. "

Example: i. 12: 1 × 12, 2 × 6, 3 × 4
ii. 1, 2, 3, 4, 6, 12
iii. These are the factors of 12.
iv. Factors of 12 = {1, 2, 3, 4, 6, 12}

a.	b.	c.
i. **18:** _____	i. **25:** _____	i. **125:** _____
ii. _____	ii. _____	ii. _____
iii. _____	iii. _____	iii. _____
iv. Factors of __ = {_____}	iv. F__ = {_____}	iv. F__ = {_____}

6. Complete the following, using the example to guide you.

Example: i. Factors of 12 are 1, 2, 3, 4, 6 and 12
Factors of 30 are 1, 2, 3, 5, 6, 10, 15 and 30
ii. The common factors are: 1, 2, 3, 6
iii. The highest common factor is 6.

a. Factors of 8: {....}
Factors of 16: {....}

(i) _____
(ii) _____
(iii) _____

b. Factors of 12: {....}
Factors of 28: {....}

(i) _____
(ii) _____
(iii) _____

c. Factors of 108: {....}
Factors of 120: {....}

(i) _____
(ii) _____
(iii) _____

7. Complete the table.

	Words	Factors	Common factors	HFC
a. 4 and 8	Factors of 4 and Factors of 8	1, 2, 4, 1, 2, 4, 8	1, 2, 4,	4
b. 9 and 12				
c. 20 and 32				
d. 100 and 102				

Find out!

When in everyday life do we use HCF?

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7 Ratio

Remember that a ratio is a comparison between two numbers.
Discuss the following:

There is 1 boy and 3 girls in the room. You could write the ratio as: 1:3

→ $\frac{1}{4}$ are boys | 0,25 are boys | 25% are boys

→ $\frac{3}{4}$ are girls | 0,75 are girls | 75% are girls

1. Write the following ratios as fractions. Use boys:girls for all your ratios.

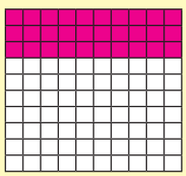
Example: 2 boys:3 girls is the same as $\frac{2}{5}$ are boys and $\frac{3}{5}$ are girls

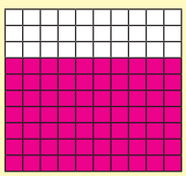
a. 3:4 b. 5:7 c. 6:8

d. 3:9 e. 1:2 f. 7:9

2. Write the following ratios as percentages.

Example:
3:7 is the same as
$\frac{3}{10}$ and $\frac{7}{10}$
= 0,3 and 0,7
= 30% and 70%





a. 4:6 b. 2:8 c. 5:5

Now try these. You need to think carefully to write each one as a percentage.

d. 12:13 e. 20:30 f. 1:3

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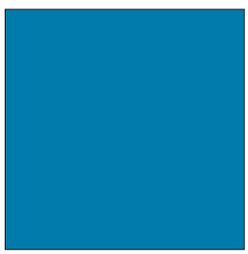
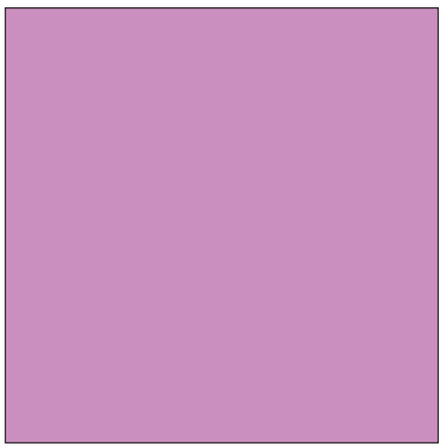
3. Solve the problems.

a. There were 6 cyclists with red mountain bikes and 4 with green mountain bikes at the race. What was the ratio of red to green mountain bikes? Write your answer as a common fraction, a decimal fraction and a percentage.

b. If the length of the side of a square is doubled, what is the ratio of the area of the original square to the area of the new square? Also write you answers as a common fraction, a decimal fraction and a percentage.





Problem solving

There are 600 pupils in a school. The ratio of boys to girls in this school is 9:11. How many girls and how many boys are in this school?

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8 Rate

Look at the ratio and rate examples. Give another 5 real–life examples.

Ratio and Rate is used for solving many everyday problems that involve comparing same or different types of quantities.

A Ratio is a comparison between two or more quantities **of the same kind.**

4:5
4 boys to 5 girls

Rate is comparing two quantities of **different kind**

R25 per kg

1. Find the unit rate (the unit rate describes how many units of the first type of quantity correspond to one unit of the second type of quantity).

Example: 50 hamburgers in 10 days = **5** hamburgers **per** day.

a. 24 orders in 3 days = _____ orders per day.

b. 36 cupcakes in 3 boxes = _____ cupcakes per box.

c. 12 newspapers in 2 piles = _____ newspapers per pile.

d. 16 slices from 2 cakes = _____ slices per cake.

e. 120 pages in 3 days = _____ pages per day.

Explain how you got the answer each time.

2. Find the unit rate for each.

Example: $\frac{600 \text{ kilometres}}{60 \text{ litres}} = \frac{10 \text{ kilometres}}{1 \text{ litre}}$ = 10 kilometres/litre

a. $\frac{R150}{75 \text{ kilogram}}$ = _____

b. $\frac{80 \text{ metre}}{8 \text{ seconds}}$ = _____

c. $\frac{R200}{8 \text{ litres}}$ = _____

d. $\frac{10 \text{ kilometre}}{20 \text{ minutes}}$ = _____

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3. Solve the following. Show all calculations.

a. In autumn, 120 leaves fell from a tree over a period of 4 hours. How many leaves fell in one hour at the same rate?	b. Peter drove a total of 1 000 km and used 100 litres of petrol. Calculate the rate at which the petrol was used in kilometres per litre?
c. Zaheeda scored 9 goals in 5 netball matches. At this rate, about how many goals will she score in 10 games?	d. When Richard was climbing up the mountain, he ascended 120 metres every hour. How many metres will he ascend in 4 hours at the same rate?

4. We use rate on a daily basis. Give five examples and then write each one as a unit rate.

Rate daily example	Unit rate
a. We travelled 5 km to school, and it took us 10 minutes.	
b.	
c.	
d.	
e.	

Problem solving

A water tank that holds 100 litres is leaking at a rate of 2 litres/min. How long will it take to waste 24 litres at this rate?

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9 Money in South Africa

The **rand**, sign: **R**; code: **ZAR**, is the currency of South Africa. It takes its name from the Witwatersrand the ridge upon which Johannesburg is built and where most of South Africa's gold deposits were found. The rand has the symbol "R" and is equal to100 cents, symbol "c".

Find out what was the currency before Rand and cents.

The Earning and Spending Game!!

You sell some goods. Move one row up and earn R100.

You buy some goods. Move one row down and pay R100.

How to play:

- Put each player's token on the Start square.
- Take it in turns to throw a dice to see how many squares you can move to the right.
- When you move up to the next row, move to the left (as you can see from the numbered squares)..
- When you land on a money note you collect that value of note.
- When you land on a trolley sell you move up one row and also earn R100.
- When you land on a trolley buy you move one row down and pay R100. (If you do not have R100 you move one row down and lose the next turn.)
- The person who ends with the most money wins.

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1. If these were the results of the numbers your dice landed on, how much money do you have at the end of these throws. After each result use a number sentence or word sum to describe what happened.

Number on dice	Number sentence or word sum.
6	Earns R20
6	R20 + R100 = R120
3	R120 +
6	
1	
3	
6	
3	
2	
5	
5	
6	
2	
4	
2	
5	

Problem solving

Make your own dice and use two stones as tokens. Play this game with a family member.

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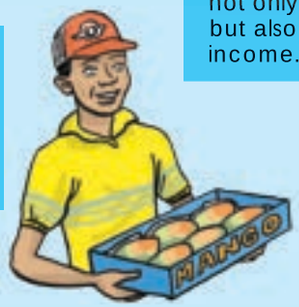
10 Finances – Profit, loss and discount

Do you know the meaning of profit, loss and discount?

Profit is the surplus remaining after total costs are deducted from total revenue.
Loss is the excess of expenditure over income.
Discount is the amount deducted from the asking price before payment.



Remember profit and loss do not only apply to businesses, but also to your personal income.

1. Are you making a profit or a loss in these examples? How much profit or loss?
(Circle the correct answer and calculate the amount.)

a. You are buying sweets for 45c each and selling them for 65c each. I made a profit / loss of _____ (amount) per sweet.

b. You are buying pencils for R2,00 each and selling them for R2,40 each to your friends. You manage to sell 40 pencils. I made a profit / loss of _____ (amount).

c. On Saturdays you hire a stall at the local flea–market for R50. You are buying juice for R1,50 each and selling them for R2,50 each. Last Saturday it was cold and you only managed to sell 40. I made a profit / loss of _____ (amount).

d. You are buying sweets in large packets of 100 for R10,45 per packet. You are selling to your friends for 30c per sweet. During the first break you manage to sell 75 sweets. I made a profit/loss of _____ (amount).

e. You are buying fruit directly from the market and selling it to your neighbours, friends and family. Last weekend you bought 3 boxes of bananas. Each box contained 12 bunches of 12 bananas each. Each box cost you R75. You managed to sell 80 % of the bananas at 65c each before the rest were too ripe to sell and you had to throw them away. I made a profit/loss of _____ (amount).

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Profit can be calculated in different ways. Normally when we talk about 10% profit, we calculate it on the cost price. We sometimes also refer to a 10% mark-up.

For example, if I sell a football which cost me R200 for R220, I made a 10% profit.

2. How much must I sell it for?

a. You are buying sweets for 45c each and you want to make a 25 % profit. How much must you sell them for?_____ (amount).

b. You are buying pens for R1,27 each and you want to make a 17 % profit. How much must you sell them for?_____ (amount).

c. On Saturdays you hire a stall at the local flea–market for R50. You buy juice for R1,50 per box and you normally sell 200 units per Saturday. If you want to make a 35 % profit after paying for the stall, how much must you ask per fruit juice?_____ (amount).

3. Will I still make a profit if I sell it with discount?

(Circle the correct answer and calculate the amount)

a. You are buying sweets in large packets of 100 for R12,45 per packet. You are selling to your friends for 20c per sweet. If they buy 10 sweets or more at a time you give them a 25 % discount. During the first break you sold 35 loose sweets and 25 sweets at discounted price. What will your profit be?_____ (amount).

b. You are buying fruit directly from the market and sell it to your neighbours, friends and family. Last weekend you bought 3 boxes of bananas. Each box contained 12 bunches of 12 bananas each. Each box cost you R75. You managed to sell 80 % of the bananas at 65c each The rest of the bananas got too ripe and you sold them at a discount of 80 %. I made a profit / loss of _____ (amount).

Problem solving

If you bought your bicycle for R1 300 and you are selling it for R1 500, what percentage discount, on selling price, can you give your friend who wants to buy your bicycle and still make R50 profit?

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11 Finances – Budget

Do you know what a budget is?
Can I have my own budget or is it only for adults?

Budget is the estimate of cost and revenues over a specified period.

Budget is like a scale where you try to balance your income and your expenses.

Important: Your income should always outweigh your expenses.

Creating a budget is the most important step in controlling your money.The first rule of budgeting: **spend less than you earn!**
Example: If you received R50 allowance (pocket money) per month and another R30 for your birthday, you cannot spend more than R80 for the entire month.

Structuring your budget

1. Determine your income

Make a list of all your possible income and estimate the amount you will earn during the next month.

Income	Estimated amount
Estimated total income	

2. Estimate your expenses

Make a list of all your possible expenses and estimate the amount you will spend during the next month.

Expenses	Estimated amount
Estimated total expenses	

Spend less than you earn !

Term 1

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Net income is, like profit, the surplus remaining after all costs are deducted from total (or **gross**) revenue. If the expenses exceed the income we call it a **shortage**.

3. Am I making a surplus?

Deduct your total expenses from your total income to determine if you are going to make a surplus or shortage.

	Estimated amount
Total income	
Total Expenses	
Net Income	

4. What can I do with my surplus?

Make a list of what you can do with your surplus.

It is always a bright idea to save for a rainy day !

5. Savings

If I manage to save R80 every month, how long must I save to buy myself a new computer game at R499.95?

months

6. Track your budget

Using the table below, draw up a budget in your writing book. Complete your budget and track your actual expenses for the next month.

Income	Actual amount	Estimated amount	Difference
Estimated total income			
Expenses			
Estimated total expenses			
Net Income			

Problem solving

Describe in your own words what you think of this saying: "A budget tells us what we can't afford, but it doesn't keep us from buying it."

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12 Finances – Loans and Interest

What is a loan? What is interest?

A **loan** is a sum of money that an individual or a company lends to an individual or company with the objective of gaining profits from interest when the money is paid back.

Interest is the fee charged by a lender to a borrower for the use of borrowed money, usually expressed as an annual percentage of the amount borrowed, also called interest rate.

It is never a good idea to borrow money. Rather save until you can afford to buy something.

When someone lends money to someone else, the borrower usually pays a fee to the lender. This fee is called 'interest'. There are two kinds of interest: '**simple**' and **'compound'**. **'Simple'** or **'flat rate'** interest is usually paid each year as a fixed percentage of the amount borrowed or lent at the start. With 'compound' interest you also pay interest on the interest!

The **simple interest** formula is as follows:

Interest = Principal × Rate × Time

where:

'Interest' is the total amount of interest paid,
'Principal' is the amount lent or borrowed,
'Rate' is the percentage of the principal charged as interest each year.
'Time' is the time in years to pay back the loan.

1. Calculating the interest amount

I want to buy a new bicycle to deliver newspapers. I do not have enough money but a friend offers to lend me the money. I agree to repay the money after 1 year with interest of 10 % per year. I borrow R1 500.

a. How much interest must I pay?_____
_

b. What will be the total amount that I need to repay to my friend?

_____

c. If I decide to repay him weekly, what will my weekly instalment be?

_____

d. If the interest rate was 12 % instead of 10 %, how much more would I have to pay for my bicycle?

_____

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2. Calculating the interest rate

I borrow R3 000 from the bank to buy a wheelchair for my sick brother. The contract stipulates that I have to repay the bank R3 900 after 2 years.

a. How much interest must I pay the bank per year?

_____

b. What is the interest rate I have to pay?

_____

c. If I decide to repay the bank weekly, what will my weekly instalment be?

_____

d. If I repay the loan after one year the bank will only charge me R3 360. What will the interest rate be if I repay them after one year?

_____

3. Calculating the repayment period

a. If the formula for calculating interest is: Interest = Principal × Rate × Time, what will the formula be for calculating the loan period?

_____

b. I borrowed R5 000 from the bank and they charge me 10 % simple interest per year. The total amount I have to repay is R6 750. How long will it take me to repay the loan?

_____

c. The interest rate changes to 12 % and the total repayment amount to R 8 360. What will the repayment period for the R5 000 loan be?

_____

d. The total interest I will have to pay on a loan of R 7 500 is R7 200 and the interest rate I am paying is 12 %. How many years will it take me to repay the loan?

_____

Problem solving

I am repaying R452 per month on my loan. The interest rate the bank charged me was 15 % simple interest. I have to repay my loan over 48 months. I calculated that the total amount of interest I am paying over the 48 months is: R8 136. What was the original amount I borrowed at the bank?

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13 Finances

Let us review these financial terms.

Profit is the surplus remaining after total costs are deducted from total revenue.

Loss is the excess of expenditure over income.

Discount is the amount deducted from the asking price before payment.

Budget is the estimate of costs and revenues over a specified period

A **loan** is sum of money that an individual or a company lends to an individual or company with the objective of gaining profits when the money is paid back.

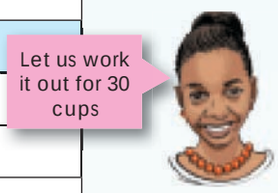
Interest is the fee charged by a lender to a borrower for the use of borrowed money, usually expressed as an annual percentage of the amount borrowed, also called interest rate.

1. You are starting your own lemonade stall.

You can get lemons from the neighbour at 10c per lemon and sugar at the local shop at R10 per packet. The paper cups will cost you 10c each and your brother is willing to sell the lemonade for 15c commission per cup. Your recipe needs 100 lemons, half a packet of sugar and water to make 15 cups of lemonade. You think you can sell one cup of lemonade for R2,50.

a. Complete the budget below to calculate if you will be able to make a profit if you sell 30 cups a week.

Income	Estimated amount
Lemonade sold	
Estimated total income	
Expenses	
Lemons	
Sugar	
Cups	
Commission (brother)	
Estimated total expenses	
Net Income	



b. Are you making a profit or a loss? _____

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c. What percentage profit or loss do you make on the cost?

_____

d. If you decide to increase your profit by 20 %, what would your new selling price have to be?_____

e. Your brother does not want to sell the lemonade anymore and you have to sell it yourself. What will the effect on your profit be?

_____

2. It is going very well with your lemonade stall and you are still making 100 % profit on the cost of 30 cups a week sold at R2,50 a cup and your brother continues to help you. You decide to buy a lemonade maker.

The lemonade maker will cost you R1 750 and you asked your family to lend you the money. They agree to lend you the money at 15 % simple interest per year. You have to repay them within one year. With the lemonade maker you will be able to sell 150 cups per month. Will you still be profitable? What percentage profit or loss will you make?

Problem solving

You are buying dried fruit in big bags and repacking them into smaller bags. A big bag of mixed dried fruit cost you R476 and you can repack it into 50 small bags. The trip to the market cost you R50 and the small bags 50c each. For how much must you sell the small bags of dried fruit to make a 33,33 % profit?

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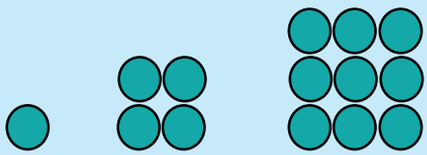
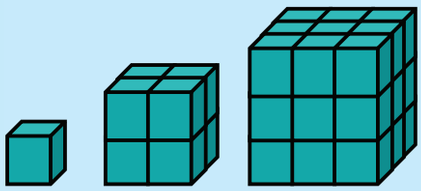
14a Square and cube numbers

Look at the following pattern:



If we have one circle in the first pattern, four circles in the second pattern and nine circles in the third pattern, how many circles will we have in the tenth pattern? How did you work out your answer?



If we have one cube in the first pattern, eight cubes in the second pattern and twenty seven cubes in the third pattern. How many cubes will we have in the fourth pattern? How did you work out your answer?

1. The numbers above are called _____ **and** _____ **numbers.**

2. Write the following as square numbers:

Example: $13 \times 13 = 13^2$

This 2 is the **exponent**. We say 13 squared or 13 to the power of 2.

a. $2 \times 2 =$ _____

b. $7 \times 7 =$ _____

c. $5 \times 5 =$ _____

d. $10 \times 10 =$ _____

e. $3 \times 3 =$ _____

f. $11 \times 11 =$ _____

3. Expand the following as a product of base numbers:

Example: $15^2 = 15 \times 15$

a. $5^2 =$ _____

b. $9^2 =$ _____

c. $4^2 =$ _____

d. $2^2 =$ _____

e. $7^2 =$ _____

f. $12^2 =$ _____

4. For 3^2, identify : a. the base number. b. the exponent.

5. Colour all the square numbers on the multiplication board. What pattern do you see?

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

6. Arrange these numbers in ascending order:

$2, 9^2, 5^2, 5, 6^2, 2^2, 8^2, 7^2, 12^2, 1^2, 3^2, 10, 11^2, 4^2, 10^2$

7. Arrange the above numbers in descending order:

8. Fill in <, > or =

a. 2^2 ____ 2×2

b. 5^2 ____ 5×2

c. 9^2 ____ 9×9

d. 8^2 ____ 2×8

e. 11^2 ____ 10×11

f. 3×3 ____ 3^2

9. Numbers which have an exponent of 2 are called _____ numbers.

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14b Square and cube numbers continued

10. Write the following as cube numbers:

Example: $6 \times 6 \times 6 = 6^3$

a. $3 \times 3 \times 3 =$ _____ b. $2 \times 2 \times 2 =$ _____ c. $5 \times 5 \times 5 =$ _____

11. Expand the following as a product of base numbers:

Example: $6^3 = 6 \times 6 \times 6$

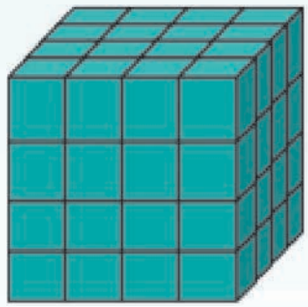
a. 2^3 _____ b. 4^3 _____ c. 1^3 _____

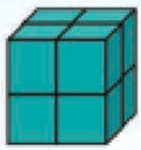
12. Explain in your own words what a cube number is.

13. Identify: a. the base number
b. the exponent

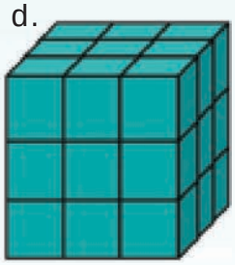
4^3

14. State the number of cubes in each of the diagrams below using exponents. Then arrange these numbers written in exponential form in ascending order

a. 

b. 

c. 

d. 

15. Arrange these numbers in ascending order:

3^3; 4^3; 2^3; 5^3; 1^3

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16. Fill in <, > or = :

a. 2^3 ☐ 2×2

b. 125 ☐ 5^3

c. 1×1 ☐ 1^3

d. 27 ☐ 3^3

e. 6 ☐ 3^3

f. 5^3 ☐ 8

17. First estimate and then calculate the answers.

Example: $5^2 + 3^2 = 25 + 9 = 34$

a. $2^2 + 10^2 =$

b. $6^2 - 3^2 =$

c. $8^2 + 10^2 =$

18. First estimate and then calculate the answers.

Example: $5^2 + 3^3 = 25 + 27 = 52$

a. $6^3 - 5^2 =$

b. $2^2 + 3^3 =$

c. $9^3 - 4^2 =$

19. First estimate and then calculate the answers.

a. $2^2 + 3^3 - 1^3 =$

b. $5^3 - 4^3 + 3^3 =$

c. $4^2 + 4^3 + 2^2 =$

Problem solving

Add the smallest square number and the largest square number that is smaller than 100. Do the same with cube numbers.

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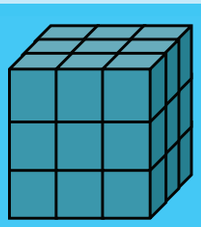
15a Square and cube roots

What do you think these diagrams represent?

1	2	3
4	5	6
7	8	9

$\sqrt{9}$

$3 \times 3 = 9$,
so the square root of 9 is 3.



$3 \times 3 \times 3 = 27$

$\sqrt[3]{27}$

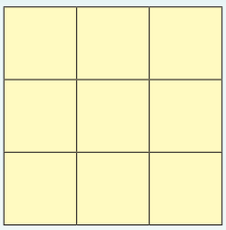
so the cube root of 27 is 3.

1. What square number and root do the diagrams below represent?

Example: a. 3 x 3 = 9, so the square number is 9 and the square root ($\sqrt{\ }$) of 9 is 3

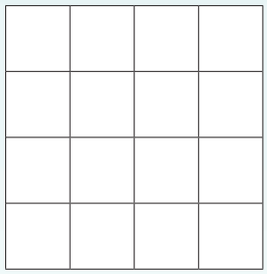
a. $(3)^2 = 9$

$\sqrt{9} = 3$



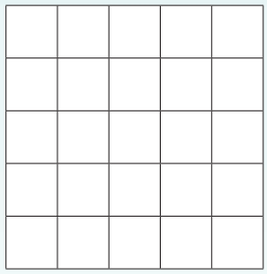
b. $(\ )^2 =$

$\sqrt{\ } =$



c. $(\ )^2 =$

$\sqrt{\ } =$



2. Write the following using the symbol for square root:

a. The square root of 9

b. The square root of 25

3. Calculate the square root:

Example: $\sqrt{9} = \sqrt{3 \times 3} = 3$

a. $\sqrt{81} =$

b. $\sqrt{1} =$

c. $\sqrt{121} =$

d. $\sqrt{64} =$

e. $\sqrt{36} =$

f. $\sqrt{169} =$

4. Write the following in ascending order:

$\sqrt{16}; \sqrt{4}; \sqrt{25}; \sqrt{9}; \sqrt{36}$

5. Write the following in ascending order:

$\sqrt{4 \times 4}; \sqrt{3 \times 3}; \sqrt{2 \times 2}$

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6. Write the following in descending order:

$\sqrt{25}$; 2^2; $\sqrt{16}$; $\sqrt{100}$; 9^2 _____

7. Fill in <, > or =

a. $\sqrt{36}$ ____ $\sqrt{25}$

b. $\sqrt{81}$ ____ $\sqrt[3]{27}$

c. $\sqrt{9}$ ____ $\sqrt{16}$

d. $\sqrt{81}$ ____ 3^2

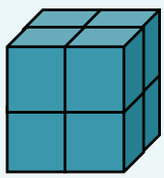
e. 3^2 ____ $\sqrt{36}$

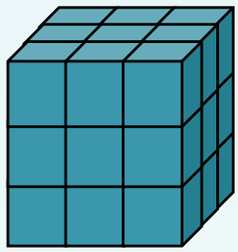
f. 4^2 ____ $\sqrt{25}$

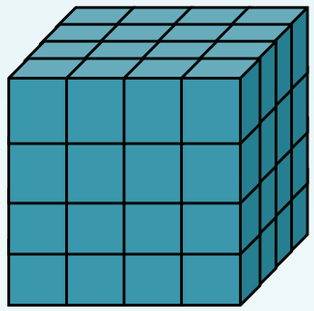
8. What is the cube root of these cubes below?

Example: 3 × 3 × 3 = 27, so the cube root of 27 is 3

a. 

b. 

c. 

d. 

a. so the cube root of _____ is _____

b. _____

c. _____

d. _____

9. Write the following using the symbol for cube root:

a. The cube root of 27 _____

b. The cube root of 8 _____

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15b Square and cube roots continued

10. Calculate the cube root.

Example: $\sqrt[3]{27}$ Since $27 = 3 \times 3 \times 3$

$= \sqrt[3]{3 \times 3 \times 3}$

$= 3$

a. $\sqrt[3]{8}$ b. $\sqrt[3]{64}$ c. $\sqrt[3]{1}$

11. Write the following in ascending order:

$\sqrt[3]{27}$; $\sqrt[3]{8}$; $\sqrt[3]{125}$; $\sqrt[3]{1}$

12. Write the following in descending order:

$\sqrt[3]{3\times3\times3}$; $\sqrt[3]{2\times2\times2}$; $\sqrt[3]{4\times4\times4}$

13. Write the following in ascending order:

2^3; 1^3; $\sqrt[3]{27}$; 4^3

14. Fill in <, > or =

a. $\sqrt[3]{8}$ ☐ $\sqrt[3]{1}$ b. 3^2 ☐ $\sqrt{36}$ c. 4^2 ☐ $\sqrt{25}$

d. $\sqrt[3]{125}$ ☐ 5^3 e. $\sqrt[3]{8}$ ☐ 8 f. $\sqrt[3]{125}$ ☐ 2

15. Write the following in ascending order:

$\sqrt[3]{27}$; $\sqrt[3]{8}$; $\sqrt[3]{125}$; $\sqrt[3]{1}$

16. Calculate.

Example: $\sqrt{16} + \sqrt{25}$

$= 4 + 5$

$= 9$

a. $\sqrt{9} + \sqrt{16} =$ b. $\sqrt{25} - \sqrt{16} =$

c. $\sqrt{100} + \sqrt{81} =$ d. $\sqrt{25} + \sqrt{64} =$

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17. Calculate.

Example: $\sqrt[3]{64} - \sqrt[3]{27}$
$= 4 - 3$
$= 1$

a. $\sqrt[3]{216} + \sqrt[3]{27} =$ ☐

b. $\sqrt[3]{27} - \sqrt[3]{8} =$ ☐

c. $\sqrt[3]{64} + \sqrt[3]{216} =$ ☐

d. $\sqrt[3]{27} + \sqrt[3]{64} =$ ☐

18. Calculate.

Example: $\sqrt[3]{125} - \sqrt{16}$
$= 5 + 4$
$= 9$

a. $\sqrt{216} - \sqrt{25} =$ ☐

b. $\sqrt{16} + \sqrt[3]{8} =$ ☐

c. $\sqrt{25} + \sqrt[3]{8} =$ ☐

d. $\sqrt{25} - \sqrt[3]{27} =$ ☐

19. Calculate.

Example: $\sqrt[3]{27} + 3^2 - \sqrt{25}$
$= 3 + 9 - 5$
$= 7$

a. $\sqrt[3]{216} + 4^2 - \sqrt{16} =$ ☐

b. $9^2 - \sqrt[3]{27} + \sqrt{4} =$ ☐

c. $3^3 + 4^3 + \sqrt{25} =$ ☐

d. $\sqrt{144} - 2^2 + \sqrt[3]{8} =$ ☐

Problem solving

Square and cube fun

a. Write down all the two–digit square numbers.
b. Write down all the three–digit cube numbers.
c. Write down the square roots of all the two–digit square numbers.
d. Write down the cube roots of all the two–digit and three–digit cube numbers.

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16 Exponential notation

In science, we deal with numbers that are sometimes extremely large or extremely small.

There are 602 000 000 000 000 000 000 000 water molecules in 18 grams of water. A shorter way of writing the same number is exponential notation to show all those zeros as a number to the power of ten:
$6{,}02 \times 10^{23}$ is the shorter way of representing the number of all those molecules. Such a number can be read as "Six comma zero two to the power of twenty three."

1. How fast can you calculate the following?

Example: $10 \times 10 \times 10 \times 10 = 10\,000$

a. $10 \times 10 =$ _____

b. $10 \times 10 \times 10 \times 10 \times 10 =$ _____

c. $10 \times 10 \times 10 \times 10 =$ _____

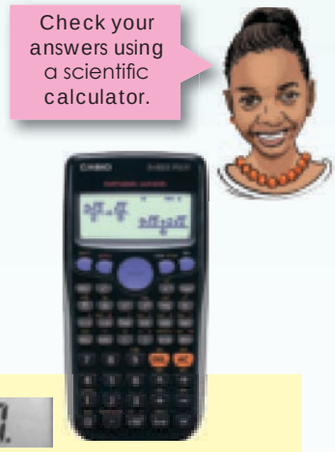
d. $10 \times 10 \times 10 =$ _____

e. $10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 =$ _____

f. $10 \times 10 \times 10 \times 10 \times 10 \times 10 =$ _____

2. Complete the table.

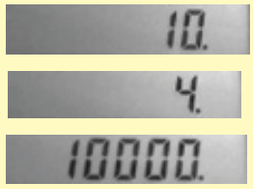
Sum	Exponential format	Answer
a. 10×10	10^2	100
b. $10 \times 10 \times 10$		
c. $10 \times 10 \times 10 \times 10$		
d. $10 \times 10 \times 10 \times 10 \times 10$		
e. $10 \times 10 \times 10 \times 10 \times 10 \times 10$		



To type 10^4, you can type ten:

Then use the x^y button and type 4:

The result should be ten thousand:



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3. Identify the base number and the exponent: 10^8. _____

4. Match column B with column A:

A	B
10^7	a. ten to the power of nine
10^5	b. ten to the power of seven
10^8	c. ten to the power of five
10^3	d. ten to the power of eight
10^9	e. ten to the power of three

5. Write the following in exponential form.

Example: $10 \times 10 \times 10 \times 10 = 10^4$

a. $10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 =$ _____

b. $10 \times 10 \times 10 \times 10 \times 10 =$ _____

c. $10 \times 10 \times 10 \times 10 \times 10 \times 10 =$ _____

6. Expand the following statements:

Example: $10^3 = 10 \times 10 \times 10$

a. 10^2 _____ b. 10^4 _____ c. 10^5 _____

d. 10^6 _____ e. 10^7 _____ f. 10^8 _____

7. Your cousin wrote this in her maths book: 10^5. What does this mean?

8. Give some practical examples of where exponential notation is used.

Problem solving

Write one billion in exponential notation.

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17 Estimate and calculate exponents

Which multiplication sums will give you an answer of 10^4?

10 × 1 000	1 × 10 × 1 000	10 × 100	10 × 100 × 10	100 × 1 000
1 × 1 000	100 × 10 × 1	10 × 10 × 10 × 10	1 × 1 × 1 × 1	1 000 × 10
1 × 1 000 × 10	10 × 10 × 100	100 × 10 × 1 × 1	1 × 10 000	100 × 10 + 10
10 000 × 1	100 × 10 × 10 × 1	1 000 × 1 000	100 × 10	10 + 10 + 10 + 10
100 × 10 × 10	10 × 10	10 × 1 × 1 000	10 × 10 × 10	100 × 100

1. Write in exponential form.

Example: $10 \times 10 \times 10 \times 10 = 10^4$

a. $10 \times 10 \times 10 \times 10 \times 10 =$ _____

b. $10 \times 10 \times 10 =$ _____

c. $10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 =$ _____

d. $10 \times 10 \times 10 \times 10 =$ _____

e. $10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 \times 10 =$ _____

2. Write in expanded form.

Example: $10^4 = 10 \times 10 \times 10 \times 10$

a. 10^3 _____ b. 10^{10} _____ c. 10^7 _____

d. 10^5 _____ e. 10^4 _____ f. 10^6 _____

3. Calculate.

Example: $10^4 + 10^3$
$= 10\,000 + 1\,000$
$= 11\,000$

a. $10^3 + 10^2 =$ b. $10^4 + 10^6 =$ c. $10^5 + 10^3 =$

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4. Calculate.

Example: $4 + 10^3$
$= 4 + 1\,000$
$= 1\,004$

a. $5 + 10^4 =$

b. $10^5 \times 9 =$

c. $10^4 \times 7 =$

5. Calculate.

Example: $2 \times 10^4 + 3 \times 10^5$
$= 2 \times 10\,000 + 3 \times 100\,000$
$= (2 \times 10\,000) + (3 \times 100\,000)$
$= 20\,000 + 300\,000$
$= 320\,000$

a. $3 \times 10^3 + 4 \times 10^4 =$

b. $8 \times 10^4 + 3 \times 10^2 =$

c. $5 \times 10^2 + 8 \times 10^6 =$

6. Calculate.

Example: $2 \times 10^4 + 3 \times 10^3 + 4 \times 10^5$
$= 2 \times 10\,000 + 3 \times 1\,000 + 4 \times 100\,000$
$= (2 \times 10\,000) + (3 \times 1\,000) + (4 \times 100\,000)$
$= 20\,000 + 3\,000 + 400\,000$
$= 423\,000$

a. $1 \times 10^2 + 8 \times 10^5 + 3 \times 10^6$

b. $3 \times 10^3 + 8 \times 10^3 + 7 \times 10^7 =$

c. $5 \times 10^3 + 6 \times 10^2 + 2 \times 10^4 =$

d. Make your own number sentence and calculate it.

Problem solving

Calculate ten to the power of three plus ten to the power of two plus three times ten to the power of one.

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18 Estimate and calculate more exponents

Match the word with the picture and explain your answer to a friend.

Square numbers

Cube numbers

Power of ten

A number to the power of 0. What does this mean?

Numbers to the power of ten can be useful for writing very big numbers. For example, the total volume of water stored on earth is 1 460 000 000 km^3. We can also write this as 146×10^6 km^3.

1. Calculate.

Example: $2^2 + 2^3 = 4 + 8 = 12$

a. $2^2 + 12^2 =$ _____

b. $4^2 + 10^2 =$ _____

c. $2^3 + 11^2 =$ _____

d. $6^3 + 1^3 =$ _____

e. $3^2 + 2^3 =$ _____

f. $5^2 + 2^3 =$ _____

2. Calculate.

Example: $2^2 + 3^3 + 4^2 = 4 + 27 + 16 = 47$

a. $2^2 + 4^3 + 3^2 =$ _____

b. $5^3 + 6^2 + 9^2 =$ _____

c. $7^2 + 2^3 + 8^1 =$ _____

d. $5^2 + 10^2 + 12^2 =$ _____

e. $11^2 + 4^2 + 3^3 =$ _____

f. $5^3 + 9^2 - 6^2 =$ _____

3. How fast can you calculate the following?

a. $3^2 =$ _____

b. $3^3 =$ _____

c. $5^2 =$ _____

d. $11^2 =$ _____

e. $2^4 =$ _____

f. $2^2 =$ _____

g. $5^3 =$ _____

h. $4^2 =$ _____

i. $6^2 =$ _____

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4. Calculate.

Example: $(12 - 9)^3$
$= (3)^3$
$= 27$

a. $(8 - 4)^3 =$ _____

b. $(7 + 1)^2 =$ _____

c. $(9 + 2)^2 =$ _____

d. $(18 - 9)^2 =$ _____

e. $(11 - 6)^3 =$ _____

f. $(16 - 11)^3 =$ _____

5. Create your own number sentences and calculate the answers.

a. Add three cube numbers.	b. Add three square numbers.	c. Add two cube numbers and one square number.
d. Subtract a square number from a cube number.	e. The sum of two cube and two square numbers.	f. The sum of three to the power of two and three cube numbers.
g. Use multi operations on three cube numbers.	h. Use multi operations on four square numbers.	i. Add a 3–digit cube number to a 2–digit square number.

Problem solving

What is four to the power of three minus one to the power of one plus one hundred to the power of one. Check your answer using a calculator.

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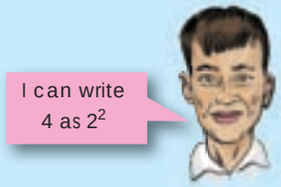
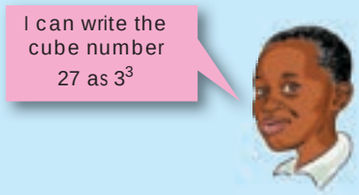
19 Numbers in exponential form

If:

- square numbers are 1, 4, 9,16, 25, ...
- Cube numbers are 1, 8, 27, 64, 81, ...





How can I write it in exponential form?

1. Extend the pattern another 3 times (up the power of 5).

a. $20 = 20^1$
$20 \times 20 = 20^2$

b. $10 = 10^1$
$10 \times 10 = 10^2$

c. $17 = 17^1$
$17 \times 17 = 17^2$

d. $38 = 38^1$
$38 \times 38 = 38^2$

e. $59 = 59^1$
$59 \times 59 = 59^2$

f. $15 = 5^1$
$15 \times 15 = 15^2$

2. Expand the exponential notation and use your calculator to calculate the answer.

Example: 18^4
$= 18 \times 18 \times 18 \times 18$
$= 104\ 976$

a. 22^3

b. 81^2

c. 74^4

d. 39^1

e. 97^7

f. 32^8

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3. Extend the pattern one more time.

a. $a = a^1$
$a \times a = a^2$

b. $b = b^1$
$b \times b = b^2$

c. $m = m$
$m \times m = m^2$

d. $r = r^1$
$r \times r = r^2$

e. $k = k^1$
$k \times k = k^2$

f. $n = n^1$
$n \times n = n^2$

4. Expand.

Example: m^4
$= m \times m \times m \times m$

a. a^3

b. b^2

c. r^4

d. m^1

e. p^7

f. p^8

5. Calculate the answers for questions 3 and 4, if:

$a = 10$ $b = 3$ $m = 100$ $r = 5$ $k = 1$ $n = 20$ $p = 2$

You will need additional paper to do these calculations.

Problem solving

I have fifty-four to the power of one, and seventy-nine to the power of one. What will the total be if I add these two numbers?

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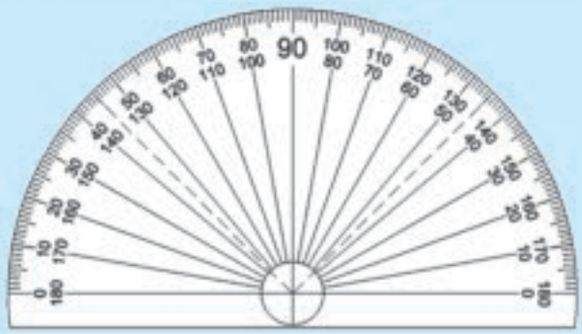
20 Construction of geometric figures

What do we use a protractor for?

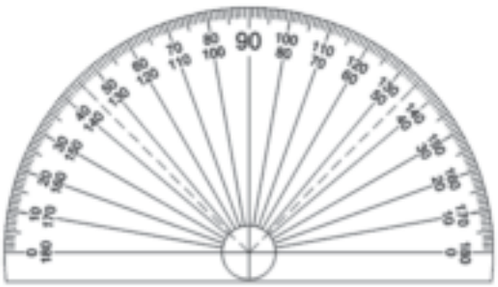
- A protractor is used for measuring an angle.
- An angle is measured in degrees.
- A circle has 360º.



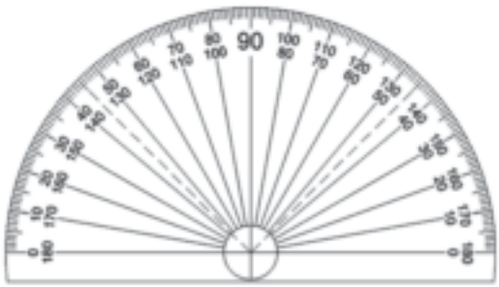
1. How do you measure angles using a protractor?

Fill in the missing words. These words can help you (you can use a word more than once): angle, sides, curved, centre, zero

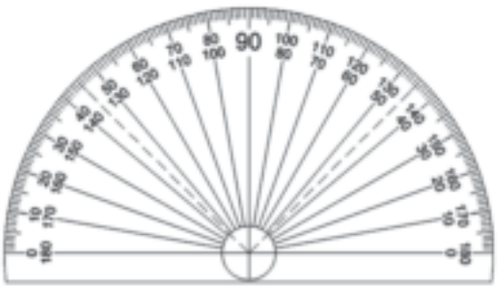
a. Find the _____hole above the straight edge of the protractor.



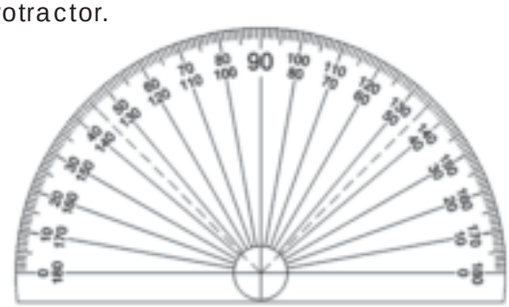
b. Place the hole over the vertex of the _____ you wish to measure.



c. Line up the _____ on the straight edge of the protractor with one of the _____of the angle.



d. Find the point where the second _____ of the angle intersects the _____ edge of the protractor.



2. Name four professions where people use protractors.

a. _____

b. _____

c. _____

d. _____

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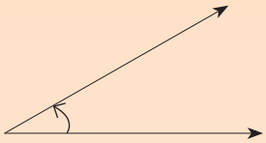
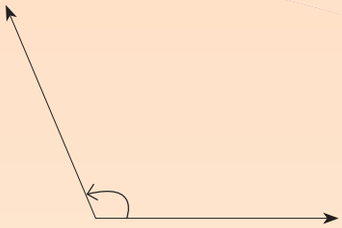
3. Measure each angle (you can extend the rays to help measure).

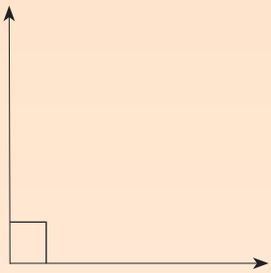
a.



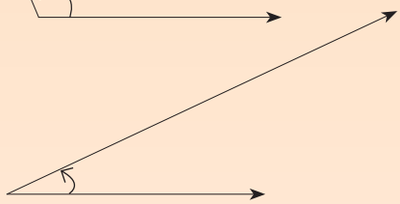
b.



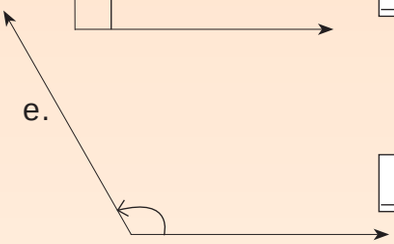
c.



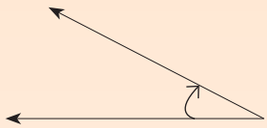
d.



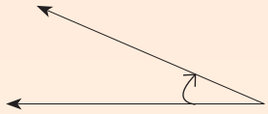
e.



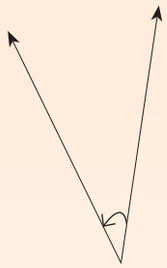
f.



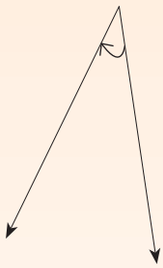
g.



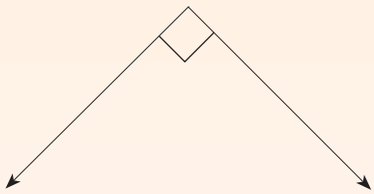
h.



i.



j.



4. Draw an angle.

a. Smaller than 90 degrees. Measure it.

b. Bigger than 90 degrees. Measure it.

Problem solving

If you measure an angle that is between 0º and 45º, how big could the angle be? Where in nature do we find an angle of that size?

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21a Angles and sides

Identify all the 90º angles, the angles smaller than 90º and the angles bigger than 90º.

1. What is an angle?

2. Match column A with column B:

A: Name of angle	B: Degrees
Acute angle	90º
Right angle	360º
Obtuse angle	Less than 90º
Straight angle	Between 180º and 360º
Reflex angle	Between 90º and 180º
Revolution	180º

3. What is a protractor?

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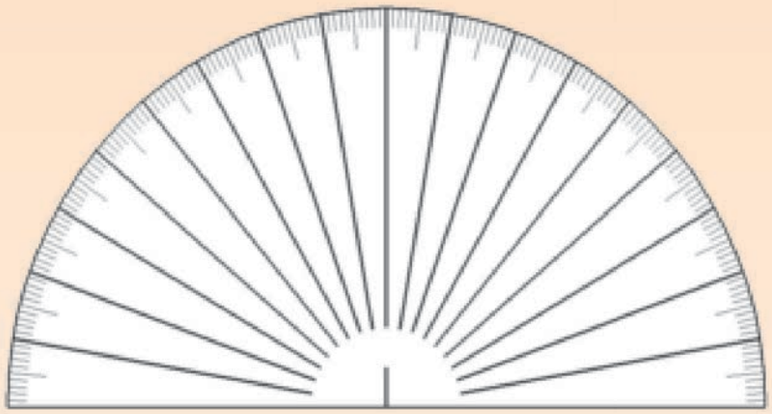
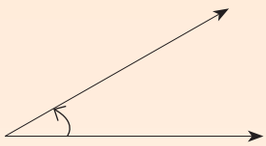
4. Label this protractor.



5. Measure and name each angle.

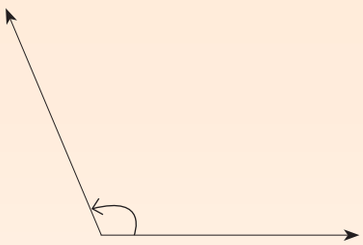
a.



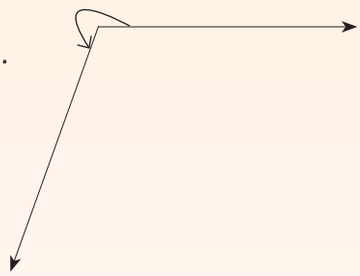
30º

Acute angle

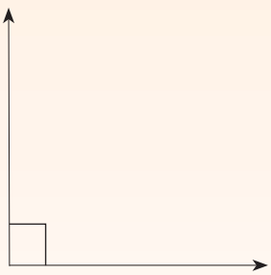
b.



c.



d.



e.

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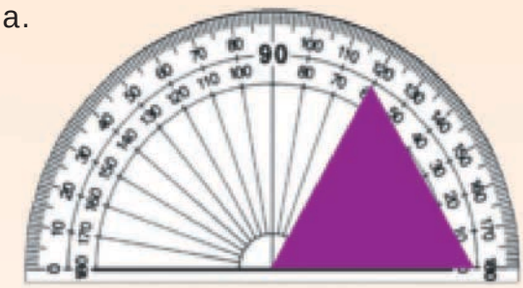
6. What is a side (or ray)?

7. Look at the pictures of the protractors.

Write down the size of the interior angle being measured each time and also use your ruler to measure the length of the sides of each shape.

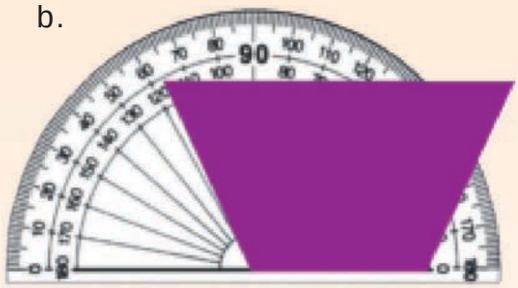
a.



Angle: 60º

Length of sides: 28 mm × 3

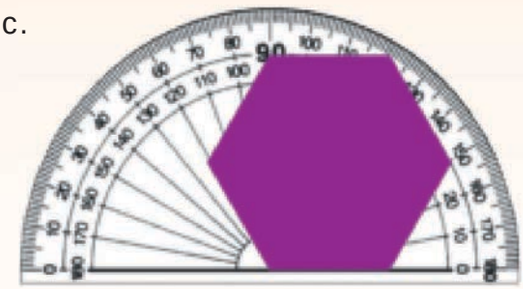
b.



Angle: _____

Length of sides: _____

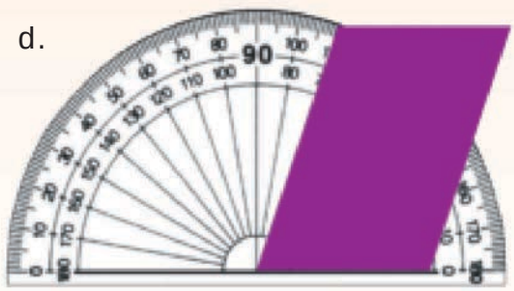
c.



Angle: _____

Length of sides: _____

d.



Angle: _____

Length of sides: _____

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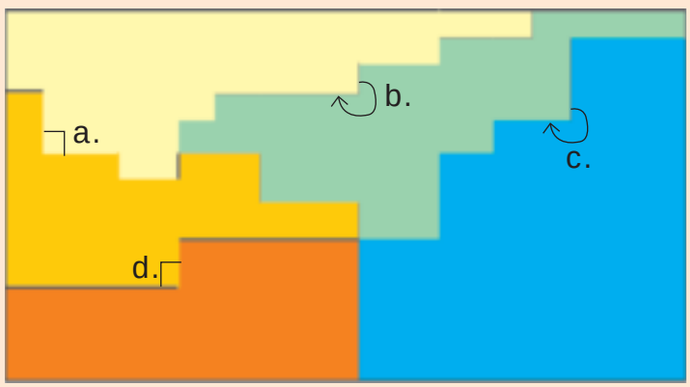
8. Name the angles.

Angle size	Name of angle
40º	**acute**
96º	
180º	
172º	
200º	
145º	
60º	
2º	
359º	
240º	

9. How many angles can you see in this picture? What kind are they?

Problem solving

a. Add the angles that are shown on the diagram.



b. If I have an angle that is not an acute angle and is smaller than 180º, what type of angle is it?

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22a Size of angles

What is an angle? Make three drawings of angles that you can see in your home.

1. Find angles in these pictures and measure them using your protractor. (Note: the angles in the pictures will not be all the same as they are on real objects because of perspective in the pictures).

Term 1

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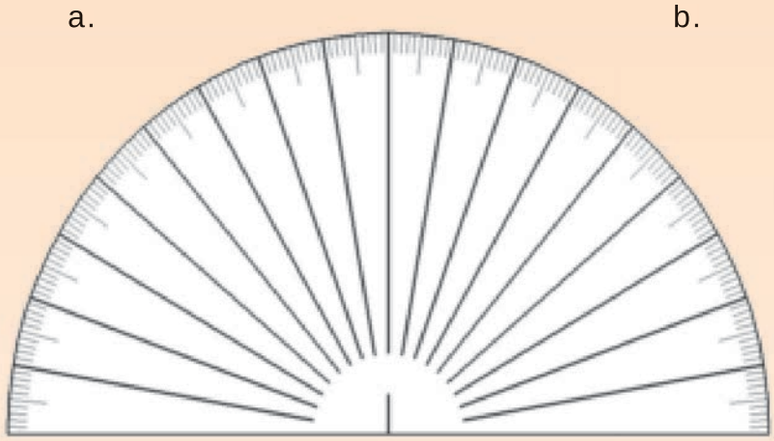
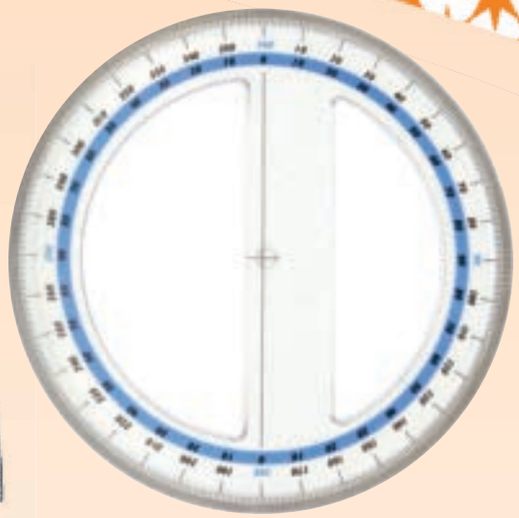
2. Fill in the degrees on the protractors.

a.

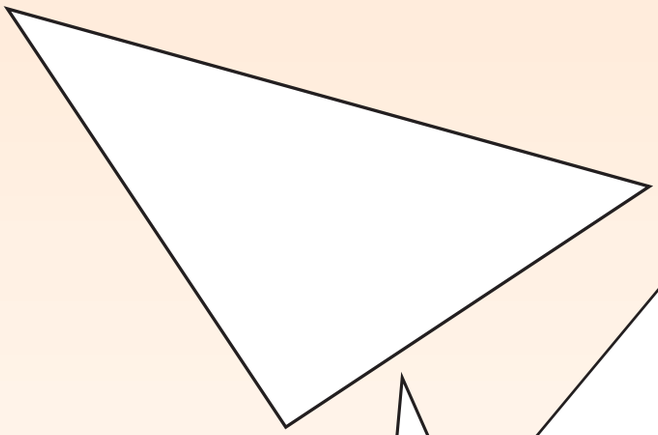


b.

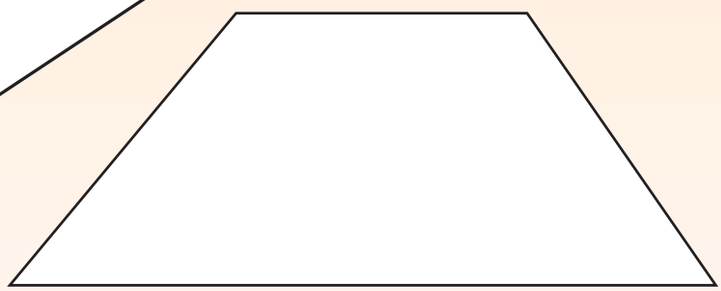


3. Measure the angle sizes and fill them in on the shapes?

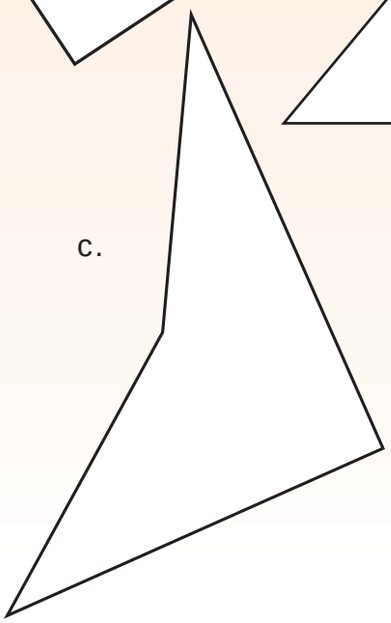
a.



b.



c.



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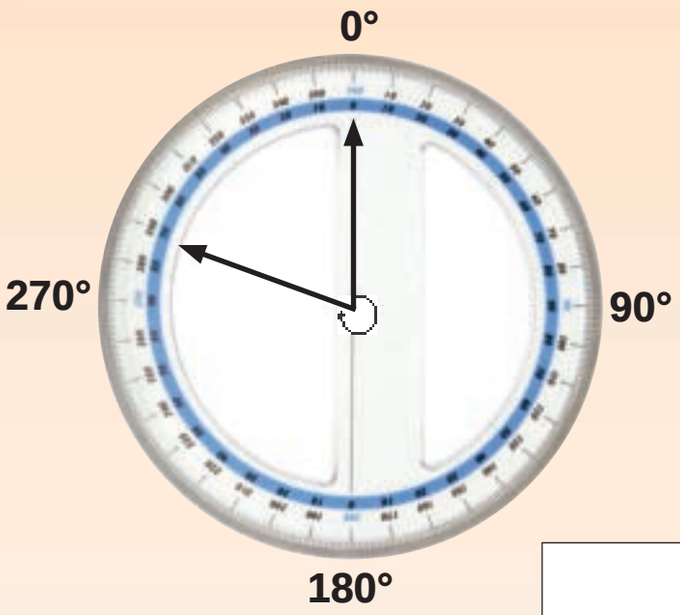
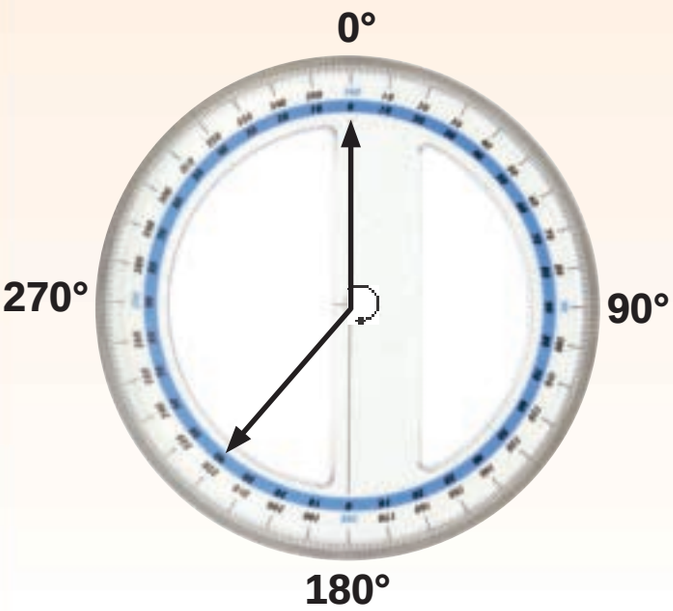
22b Size of angles continued

4a. The angle measured below is 290º. Is it possible to get a polygon with an interior angle of 290º? Explain your answer.



b. What is the size of the angle? Draw a polygon that has the same interior angle.



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5. Mark 3 angles on each picture and measure them.

a.

b.

Problem solving

What are the most common angles you will find in your home?
What angles are the most common in motor vehicles?

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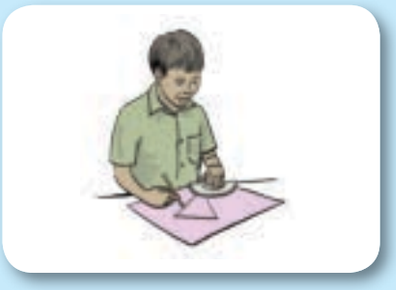
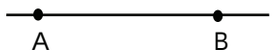
23 Using a protractor

Look at the pictures. What are these people using their protractors for?

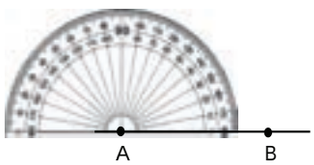


1. The step-by-step instructions below show how to draw a 45ª angle. Follow these instructions to draw the angles given in the questions.

Step 1: Draw a line segment. Label it AB.



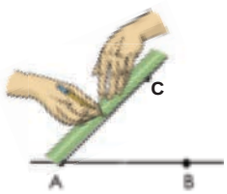
Step 2: Place the protractor so that the origin (small hole) is over the point A. Rotate the protractor so that the base line is exactly along the line AB.



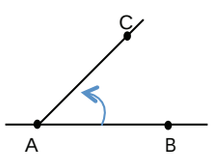
Step 3: Using (in this case) the inner scale, find the angle desired – In 1. it is 45°.

Step 4: Make a mark at this angle, and remove the protractor.

Step 5: With the protractor or a ruler draw a straight line from A to the mark you just made. Label this point C.



Step 6: The line drawn makes an angle BAC with a measure of 45°.



1. Draw a 45º angle ABC.

2. Draw a 100º angle CDE.

3. Draw a 175º angle JKL.

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2. Use a ruler and a protractor to draw and label geometric figures. Write down the steps you go through to construct each one.

a. A 60º angle ABC.

b. A triangle with angles including a 45º angle and a 65º angle.

c. A quadrilateral with angles including a 70º angle and a 100º angle. A quadrilateral has four sides.

Problem solving

Draw a polygon with six sides where one angle is 30º.

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24 Parallel and perpendicular lines

Look at the structures. Identify the parallel, perpendicular and line segments.



1. What mathematical instrument is a compass? Draw a picture of a compass.

2. Match column A with column B.

Column A	Column
Line segment	
Parallel lines	
Perpendicular lines	

3. Draw the following line segments with a ruler.

a. 5 cm

b. 7,5 cm

c. 65 mm

d. 23 mm

e. 8,9 cm

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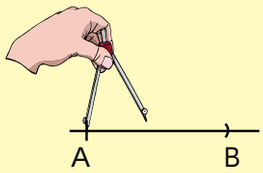
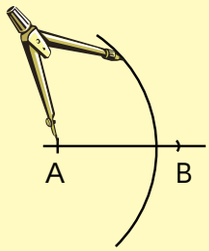
4. Revision: Construct a perpendicular line to bisect a given line. Use the guidelines to help you

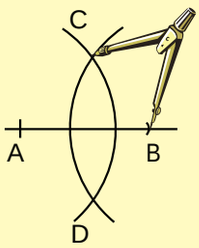
Step 1
Draw a line and mark points A and B on it. Put the compass point on A and open it so that the pencil touches point B. (So you have "measured" the length of AB with the pair of compasses.)



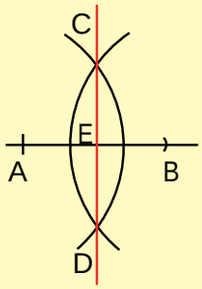
Step 2
Leaving the compass point on A, draw an arc with the compass approximately two thirds of the line length.



Step 3
With the compasses' width the same, move the compass point to B and draw another arc which crosses the first arc at two points. Label these points C and D.



Step 4
Draw a line through points C and D bisecting the line AB at E.



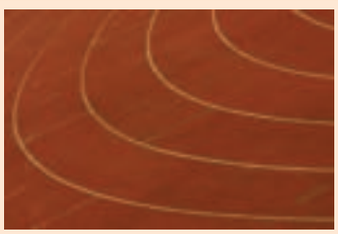
Measure angle AEC and BED to check how accurate your construction is.

5. What symbols do we use to show:

- Lines that are perpendicular?
- Sides that are equal?
- Sides that are parallel?

Problem solving

In reality are these lines and pillars parallel or not? Say why or why not.



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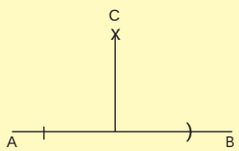
25a Construct angles and a triangle

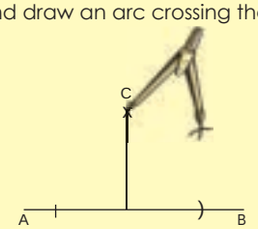
Identify the triangles and estimate the size of the angles.

1. Construct a 45° angle. Use the guideline to help you. (ONLY FOR ENRICHMENT)

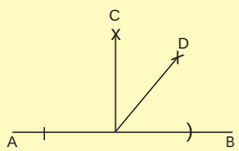
Step 1
Follow the steps to draw a perpendicular line on page 57.



Step 2
Leave the compass point on C, draw an arc with the compass half way or more between C and B. Then without adjusting your compass place it on point B and draw an arc crossing the first one.



Step 3
Mark it as D and draw the line which creates two 45° angles.



To construct a 45º angle you bisect a 90º angle.

2. Give five everyday examples of where we will find 45º angles.

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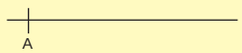
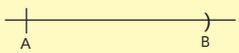
3. Construct an equilateral triangle. Follow the steps and construct your triangle below.

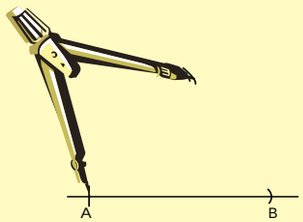
Step 1
Draw a line. Make a marking on it (A).



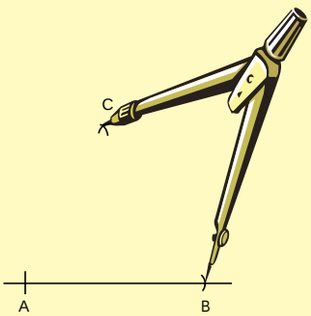
Step 2
Put the compass point on A and open it so that the pencil touches B. (So you have "measured" the length of AB with the pair of compasses.)



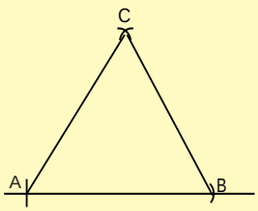
Step 3
Leaving the compass point on A, draw an arc with the compass roughly where you think the other vertex (corner) of the triangle is going to be. (The distance from A to this point is going to be the same as the length of AB.)



Step 4
Do not adjust the compass. Now move the compass point to B and draw another arc which crosses the first. Label it C.



Step 5
Since the lengths of AC and BC are both equal to the length of AB, we have three points all the same distance from each other. If we join them up, we therefore have an equilateral triangle, with each angle equal to 60°.



Measure the angles to determine how accurate your construction is.

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25b Construct angles and a triangle
continued

4. Construct a triangle with one angle of 90º and one angle of 60º without using a protractor.

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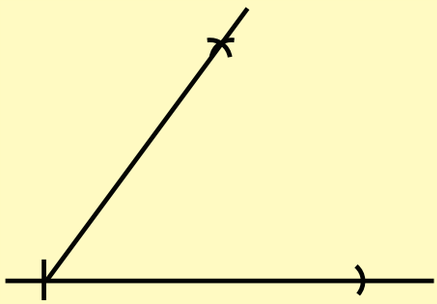
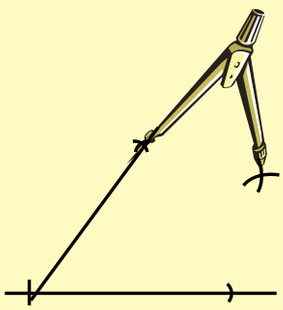
5. Construct a 30° angle. Use the guidelines below. (ONLY FOR ENRICHMENT).

Follow step 1 to construct a 60º angle (as in Question 3 on page 59) and then follow steps 2 and 3 below.

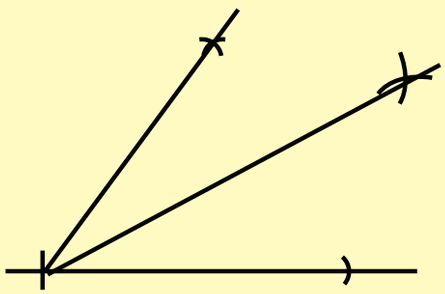
Step 1



Step 2



Step 3



To construct a 30º angle you bisect a 60º angle.

Problem solving

Construct any figure with at least one 30° and one 45° angle.

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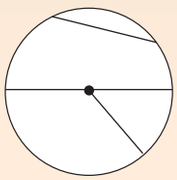
26 Circles

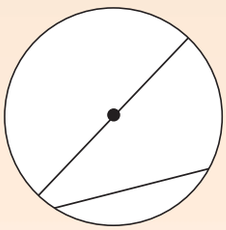
What do all these pictures have in common?

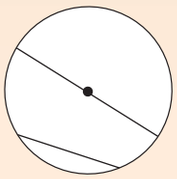


1. Label the circle.

Use the following words: Chord, diameter, radius, centre, sector and arc.

a. 

b. 

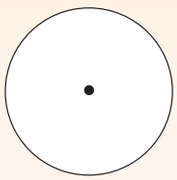
c. 

2. What is a circle?

3. Measure the diameter of each circle. What is the radius of each circle?

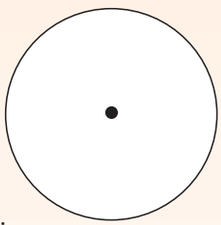
a. Underneath each circle write its radius.

b. Draw any chord on each circle and measure it.

(i). 

Radius: _____

Chord: _____

(ii). 

Radius: _____

Chord: _____

(iii). 

Radius: _____

Chord: _____

How to draw a circle

To draw a circle accurately, use a pair of compasses.

Align the pencil lead with the compass point.

Term 1

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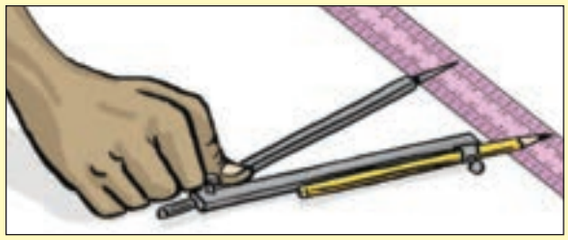
Tighten the hold for the pencil so it also does not slip.

Set the compass to the radius of the circle. (The radius is the distance between the centre and the circumference; it is half the diameter.)



Make sure that the hinge at the top of the compass is tightened so that it does not slip.

Press down the compass point and turn the knob at the top of the compass to draw a circle.

4. Draw these circles.

a. A circle with a diameter of 4 cm.

b. A circle with a diameter of 36 mm.

c. A circle with a diameter of 2,6 cm.

d. A circle with a diameter of 30 mm.

Problem solving

Draw a circle with a radius of 25 mm. Continue drawing circles with 25 cm radii to fill a separate sheet of paper with circle patterns.

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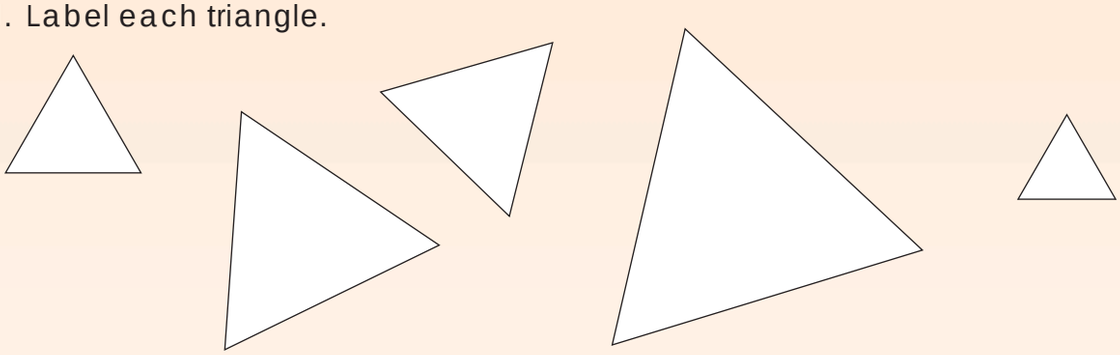
27a Triangles

What do these triangular road signs mean? Draw another two.

1. Measure each of these triangles:

a. Measure the sides.
b. What do you notice?
c. Measure the angles of the triangles.
d. Label each triangle.



2. A triangle called an equilateral triangle has three equal sides and three equal angles. Draw three different equilateral triangles. Label each.

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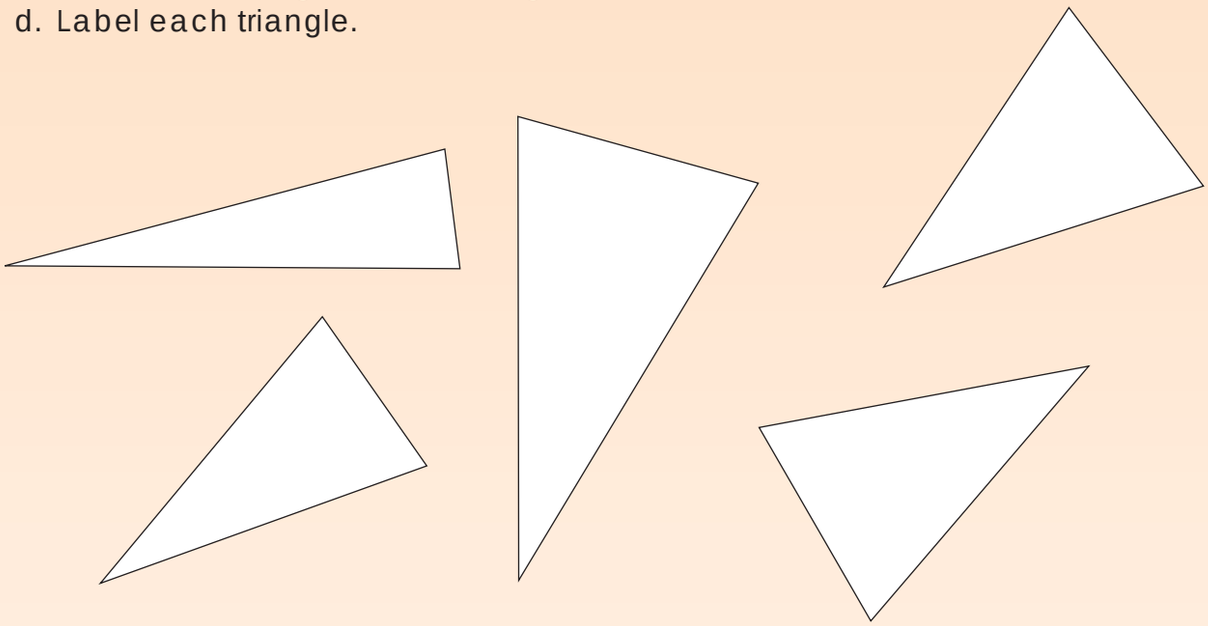
3. Measure each of these triangles:

a. Measure the sides.
b. What do you notice?
c. Measure the angles of the triangles.
d. Label each triangle.



4. A triangle is called an isosceles triangle if it has two sides of equal length. The angles opposite these two side will also be equal. Draw three different isosceles triangles.

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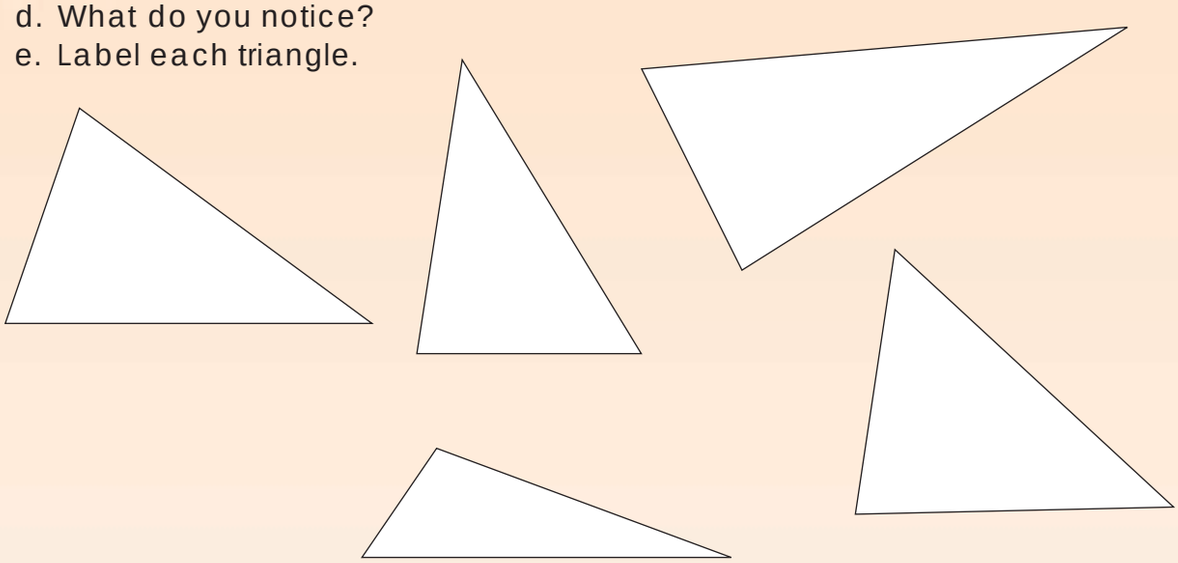
27b Triangles continued

5. Measure each of these triangles:

a. Measure the sides.
b. What do you notice?
c. Measure the angles of the triangles.
d. What do you notice?
e. Label each triangle.



6. A scalene triangle has three sides of different lengths. Draw three different scalene triangles.

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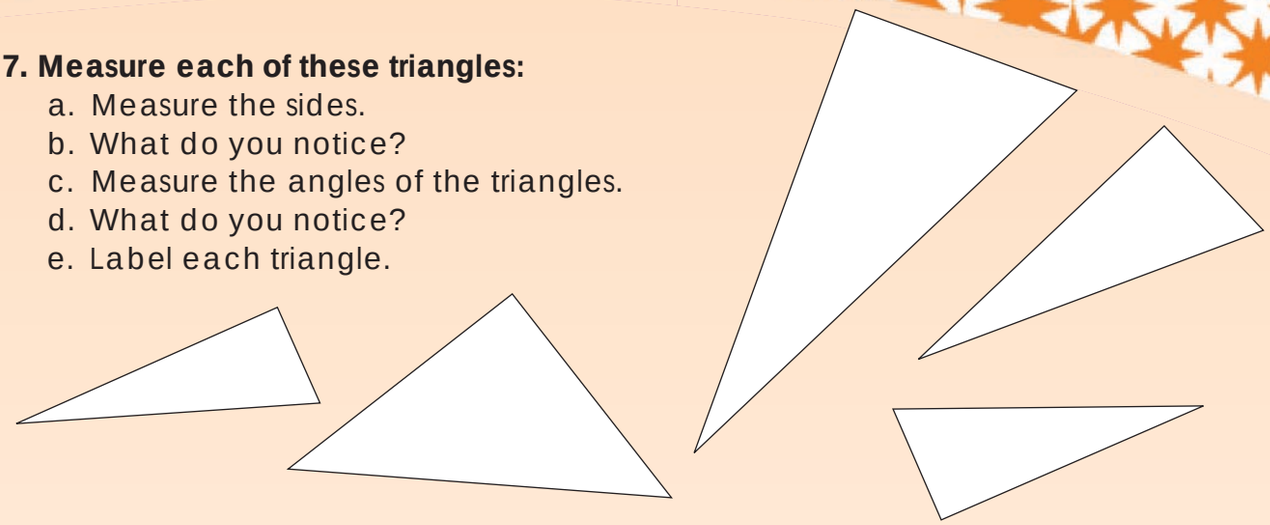
7. Measure each of these triangles:

a. Measure the sides.
b. What do you notice?
c. Measure the angles of the triangles.
d. What do you notice?
e. Label each triangle.



8. Draw three triangles of different size each with a right angle (90°).

Problem solving

Create your own gift wrapping by drawing triangles on a sheet of paper. You should use all the types of triangles you have learned about.

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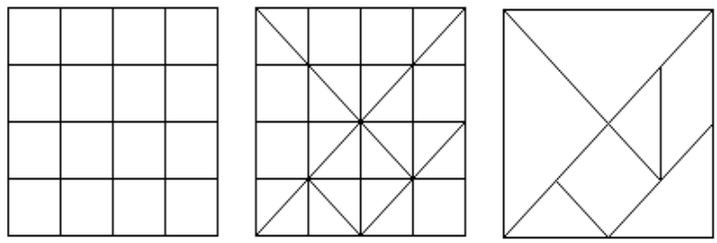
28a Polygons

Use the diagrams below to make your own Chinese puzzle, the tangram.



Why do you think we call a tangram a dissectional puzzle?

1. Complete this table.

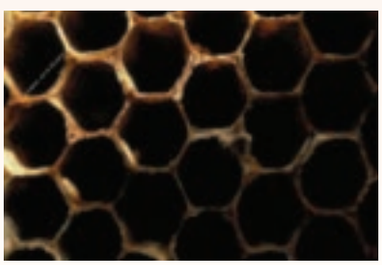
Polygon						
Number of sides						
Angle size						
Total sum of angles						

Measure all the other angles. What do you notice?

Test your answers using the formula for calculating the angles of a polygon (number of sides – 2) × 180°

2. What is this? Where would you find it? What polygon(s) can you identify?

a.



b.

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3. What geometric figures do you see?

a.

b.

4. Identify, name and describe the polygons in these pictures.

a.

b.

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5. The tangram in Cut–out 1 is a dissection puzzle. It consists of seven pieces, called tans, which fit together to form a shape of some sort. The objective is to form a specific shape with seven pieces. The shape has to contain all the pieces, which may not overlap.

a. One of the shapes is a square. Build a large square with all the tangram pieces and then make a drawing of it.

b. Make a rectangle with all the pieces. Make a drawing of it.

c. Make a parallelogram with all the pieces. Make a drawing of it.

d. Make a trapezium with all the pieces. Make a drawing of it.

e. Make a triangle with all the pieces. Make a drawing.

f. Make any other polygon with the tangram pieces. Make a drawing.

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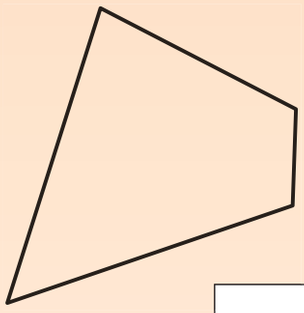
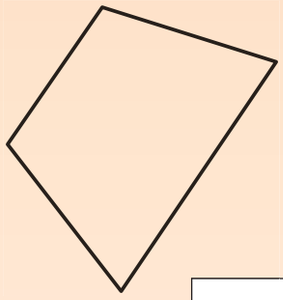
6. Say whether each of the following is a quadrilateral or not. Give reasons for your answers.

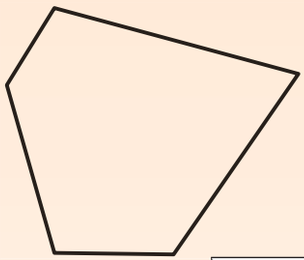
a.



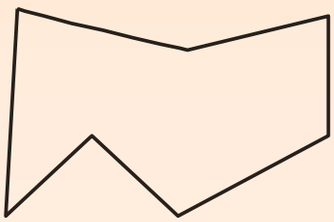
b.



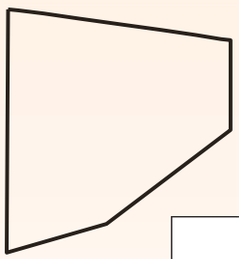
c.



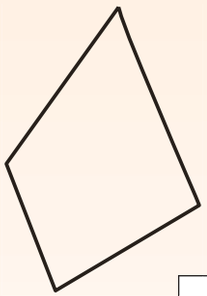
d.



e.

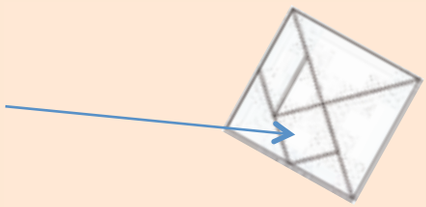


f.



Problem solving

What fraction of the tangram is this square?



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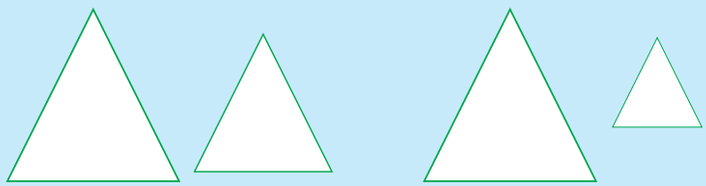
29 Congruent and similar shapes

Congruent shapes have exactly the same size shape and angles.

Similar shapes have the same shape and angles but different sizes.

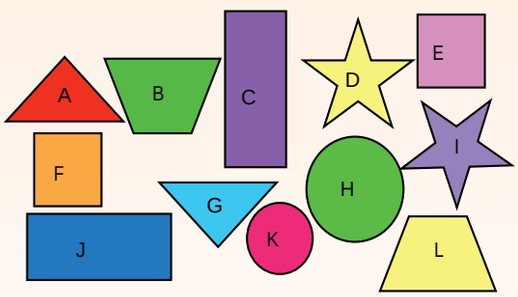
Which triangles are congruent?
Which triangles are similar?



1. What do you notice about these pictures?

2. What do you notice about these pictures?

3. Which of the following shapes are congruent?



4. Draw a set of four similar shapes (one in each box).

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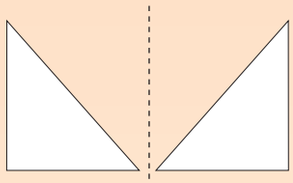
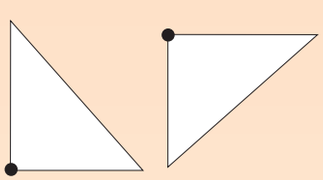
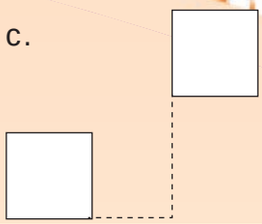
5. Are these shapes congruent? Give reasons for your answer.

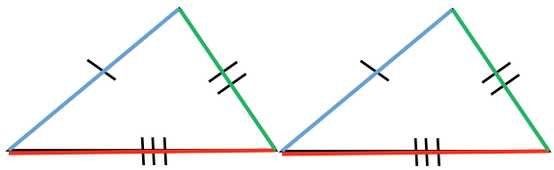
a. 

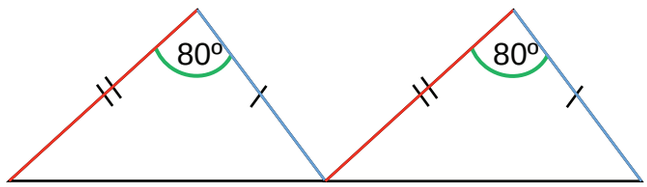
b. 

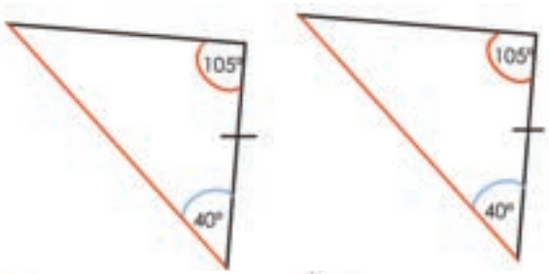
c. 

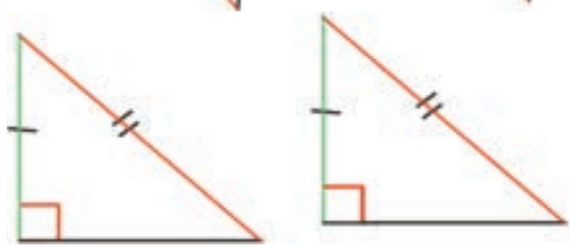
6. All these triangles are congruent. Write down what is the same in both triangles. Make a drawing *similar* to one triangle. We have done the first one for you.

Use the colours to help you. Also use S = side and A = angle .

a. 

b. 

c. 

d. 

SSS
side
side
side

All three corresponding sides are equal.

Problem solving

Where in nature will we see similarity and congruency? Draw a picture to illustrate your answer.

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30 Fractions

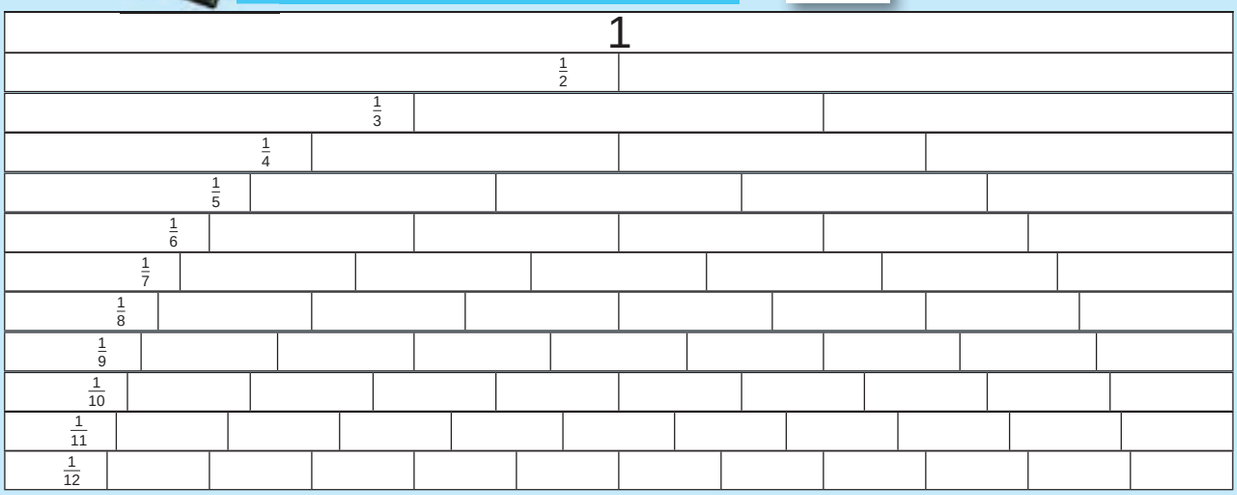
What is this?

A **fraction** is written with the bottom part (the **denominator**) telling you how many parts the whole is divided into, and the top part (the **numerator**) telling how many of those parts you have.

$$\frac{3}{4}$$

numerator

denominator



1. Complete the following:

a. $\frac{1}{4}; \frac{2}{4}$; ...1

b. $\frac{1}{9}; \frac{2}{9}; \frac{3}{9}$; ...1

c. $\frac{1}{11}; \frac{2}{11}; \frac{3}{11}$; ... 1

Where in daily life do we need to know about fractions and number lines?

d. $\frac{1}{5}; \frac{2}{5}; \frac{3}{5}$; ... 1

e. $\frac{1}{6}; \frac{2}{6}; \frac{3}{6}$; ...1

f. $\frac{1}{8}; \frac{2}{8}; \frac{3}{8}$; ... 1

2. Complete the number lines.

a.

b.

c.

d.

e.

3. Count from:

a. two tenths to four tenths.

b. one twentieth to nine twentieths.

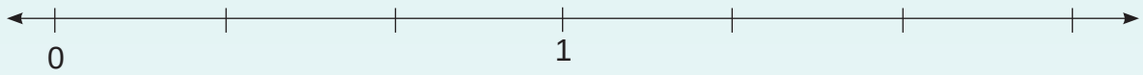
c. four fifteenths to ten fifteenths.

d. one hundredth to eight hundredths.

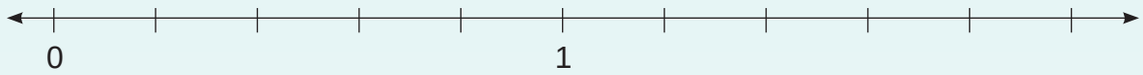
e. ten fiftieths to twelve fiftieths.

4. Complete the number lines:

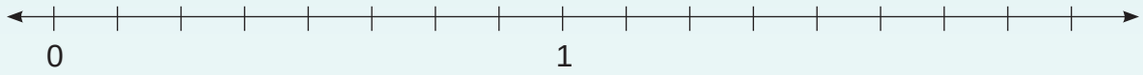
a.



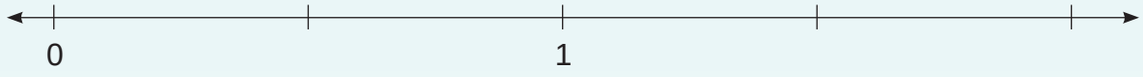
b.



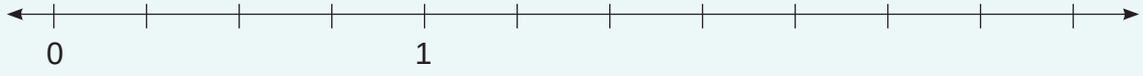
c.



d.



e.



f. How do these number lines differ from the ones in question 2?

5. Say whether it is a proper fraction, improper function or a mixed number:

a. $\frac{2}{4}$ b. $\frac{6}{2}$ c. $1\frac{1}{2}$

d. $\frac{8}{5}$ e. $\frac{1}{5}$ f. $\frac{7}{4}$

6. Write down:

a. Five proper fractions.

b. Five improper fractions.

c. Five mixed numbers.

Problem solving

Name five fractions that are between one quarter and two quarters.

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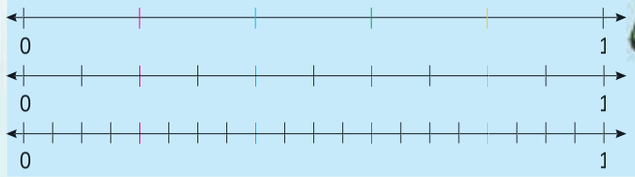
31 Equivalent fractions

Fill in the correct fraction at each of the coloured marks on the number lines below. What do the fractions at the red colour marks have in common? What about the fractions at the blue, green and yellow marks?

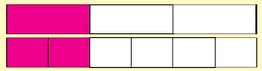


Equivalent fractions have the same value, even though they look different.

Example: $\frac{1}{2}$ and $\frac{2}{4}$ are equivalent, because they are both 'half'.

1. What fraction equals ___? Draw a diagram to show that the two fractions are equivalent.

Example: $\frac{1}{3} = \frac{2}{6}$



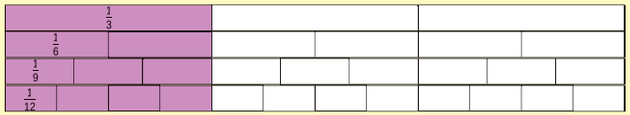
a. $\frac{1}{2}$ b. $\frac{1}{7}$ c. $\frac{1}{6}$

d. $\frac{1}{10}$ e. $\frac{1}{12}$ f. $\frac{1}{3}$

How can you use these measuring spoons to explain equivalent fractions to a friend?

2. Write the next or previous equivalent fraction for:

Example: $\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12}$



One third is equivalent to two sixths, this again is equivalent to three ninths, and this again to four twelfths.

a. $\frac{2}{4} = \square$ b. $\frac{3}{4} = \square$ c. $\square = \frac{4}{14}$

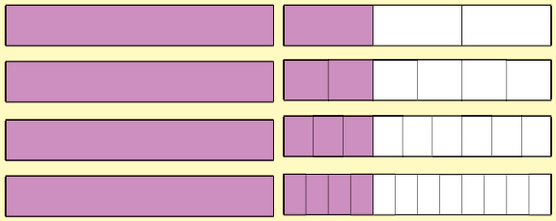
d. $\frac{8}{10} = \square$ e. $\square = \frac{4}{10}$ f. $\frac{4}{5} = \square$

3. What happened to the numerator and denominator in question 2?

a. b. c. d. e. f.

4. Write down three equivalent fractions for each mixed number and make a drawing.

Example: $1\frac{1}{3} = 1\frac{2}{6} = 1\frac{3}{9} = 1\frac{4}{12}$



What happened to the denominators and numerators? Always start with the given number.

$1 + \frac{1}{3} \times \frac{2}{2} = 1\frac{2}{6}$

$1 + \frac{1}{3} \times \frac{3}{3} = 1\frac{3}{9}$

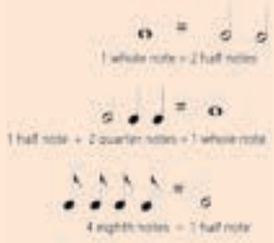
$1 + \frac{1}{3} \times \frac{4}{4} = 1\frac{4}{12}$

a. $1\frac{1}{2}$ b. $3\frac{2}{3}$ c. $4\frac{1}{2}$

d. $6\frac{1}{3}$ e. $2\frac{3}{4}$ f. $2\frac{4}{5}$

Problem solving

What have music notes and equivalent fractions in common? Fill in the answers.



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Term 2

32 Simplest form

Are $\frac{8}{16}$ and $\frac{1}{2}$ the same?

What happened to the numerator from the first to the second fractions?

What happened to the denominator?

Why do you think we need to know how to use the HCF?

Highest common factor (HCF)
The highest number that divides exactly into two or more numbers.
If you find all the factors of two or more numbers, and you find some factors are the same ("common"), then the largest of those common factors is the Highest Common Factor.

The HCF is sometimes also called the **Greatest Common Factor (GCF)** or the **Greatest Common Divisor (GCD)**.

1. What is the highest common factor?

Example:
Highest common factor (HCF)
Factors of 4: {1, 2, 4}
Factors of 6: {1, 2, 3, 6}
HCF = 2
So 2 is the biggest number that can divide into 4 and 6.

a. Factors of 3 and of 4

b. Factors of 5 and of 6

c. Factors of 6 and of 12

d. Factors of 3 and of 9

e. Factors of 7 and of 8

f. Factors of 11 and of 10

2. Write in the simplest form.

Example: $\frac{12}{16}$
$= \frac{12}{16} \div \frac{4}{4}$
$= \frac{3}{4}$

HCF:
Factors of 12: {1, 2, 3, (4), 5, 6, 12}
Factors of 16: {1, 2, (4), 8, 16}

a. $\frac{6}{18}$

b. $\frac{15}{25}$

c. $\frac{3}{9}$

d. $\frac{7}{21}$

e. $\frac{4}{36}$

f. $\frac{18}{36}$

3. Fill in the missing words.

(common factor, numerator, denominator)

a. Fractions can be simplified when the _____ and _____ have a _____ in them.

b. Give five examples of fractions that can be simplified.

Problem solving

What is $\frac{324}{414}$ in its simplest form?

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33 Add common fractions with the same and different denominators

Give five fractions where the denominators are the same.
Give five fractions where the denominators are different.

Proper fraction	Improper fraction	Mixed number
$\frac{3}{4}$	$\frac{5}{4}$	$3\frac{1}{2}$

Sometimes we need to change proper fractions to improper fractions or vice versa.

Mixed number	Improper fraction
$1\frac{1}{4}$	$\frac{5}{4}$

Mixed number to an improper fraction: 1 (whole number) × 4 (denominator) + 1 (numerator) = 5.

Improper fraction to a mixed number: 5 (numerator) ÷ 4 (denominator) = 1 remainder 1

1. Add the following, write it as a mixed number, and simplify if necessary.

Example: $\frac{1}{3} + \frac{4}{3}$
$= \frac{5}{3}$
$= 1\frac{2}{3}$

When we add fractions the denominators should be the same.

a. $\frac{2}{5} + \frac{4}{5} =$

b. $\frac{5}{9} + \frac{6}{9} =$

c. $\frac{3}{4} - \frac{2}{4} =$

d. $\frac{7}{10} + \frac{5}{10} =$

e. $\frac{5}{6} + \frac{3}{6} =$

f. $\frac{5}{7} + \frac{6}{7} =$

2. Calculate and simplify if necessary.

Example: $\frac{1}{2} \times \frac{2}{2} + \frac{1}{4}$
$= \frac{2}{4} + \frac{1}{4}$
$= \frac{3}{4}$

Remember when we add fractions the denominators should be the same. To make the denominators the same we need to find the Lowest Common Multiple (LCM)

Multiples of: {2, ④, 6, 8, ...}
Factors of: {④, 8, 12, 16, ...}

Note that in this case the denominators are multiples of each other (2 is a multiple of 4).

a. $\frac{1}{4} + \frac{1}{2} =$

b. $\frac{1}{5} + \frac{1}{10} =$

c. $\frac{1}{3} + \frac{1}{6} =$

d. $\frac{1}{8} + \frac{1}{4} =$

e. $\frac{1}{5} + \frac{1}{4} =$

f. $\frac{1}{2} + \frac{1}{3} =$

3. In your own words write down how you would add:

Fractions with the same denominators.	Fractions with denominators that are multiples of each other.

Problem solving

What is $\frac{5}{10} + \frac{3}{10}$ in its simplest form?

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34 Multiply unit fractions by unit fractions

Compare the two calculations on the right. What do you notice?

A unit (or unitary) fraction is a fraction with a numerator of 1.

E.g. $\frac{1}{4}$

$\frac{1}{2} + \frac{1}{4}$
LCM = 4
$\frac{2}{4} + \frac{1}{4}$
$= \frac{3}{4}$

$\frac{1}{2} \times \frac{1}{4}$
$= \frac{1}{8}$

When you are multiplying fractions you simply multiply the numerators with each other, and the denominators with each other. In this example the multiplication sum means $\frac{1}{2}$ OF $\frac{1}{4}$ which is $\frac{1}{8}$.

1. First add and then multiply the two fractions.

Example: $\frac{1}{2}, \frac{1}{3}$

Addition
$\frac{1}{2} + \frac{1}{3}$
LCM = 6
$\frac{3}{6} + \frac{2}{6}$
$= \frac{5}{6}$

Multiplication
$\frac{1}{2} \times \frac{1}{3}$
$= \frac{1}{6}$

I see that when multiplying proper fractions the answer gets smaller. The denominator of the answer gets bigger. So $\frac{1}{6}$ is less than $\frac{1}{2}$ and less than $\frac{1}{3}$.

That is true. Think about it. If I multiply a six pack of juice by 2 then I get twelve juices. But if I take half ($\frac{1}{2}$) of a six pack of juice I get three.

a. $\frac{1}{2}; \frac{1}{12}$

b. $\frac{1}{2}; \frac{1}{11}$

c. $\frac{1}{3}; \frac{1}{3}$

d. $\frac{1}{4}; \frac{1}{5}$

e. $\frac{1}{4}; \frac{1}{10}$

f. $\frac{1}{5}; \frac{1}{6}$

2. Calculate.

Example: $\frac{1}{2} \times \frac{1}{3} \times \frac{1}{4}$
$= \frac{1}{24}$

Why do you think it is so important to know your times tables?

a. $\frac{1}{2} \times \frac{1}{3} \times \frac{1}{2} =$

b. $\frac{1}{4} \times \frac{1}{5} \times \frac{1}{2} =$

c. $\frac{1}{3} \times \frac{1}{2} \times \frac{1}{4} =$

d. $\frac{1}{3} \times \frac{1}{6} \times \frac{1}{2} =$

e. $\frac{1}{3} \times \frac{1}{5} \times \frac{1}{2} =$

f. $\frac{1}{2} \times \frac{1}{5} \times \frac{1}{9} =$

3. What two fractions, when multiplied together, will give you the answer of $\frac{1}{32}$?
What three fractions, when multiplied together, will give you the same answer?

4. What do you notice when you extend this fraction pattern?

$\frac{1}{2} \times \frac{1}{2}, \frac{1}{3} \times \frac{1}{3}, \frac{1}{4} \times \frac{1}{4}, \frac{1}{5} \times \frac{1}{5} \ldots$

Problem solving

Can two unit (or unitary) fractions give you a single unit fraction with a numerator of 1 if you:
- add them together?
- multiply them?

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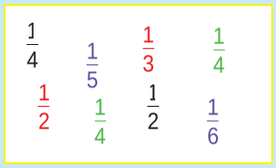
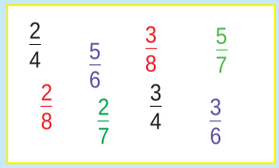
35 Multiply common fractions by common fractions with the same and different denominators

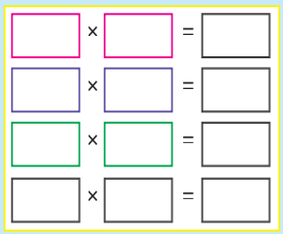
Look at the fractions and compare the two blocks. What differs between the numbers in the two blocks?

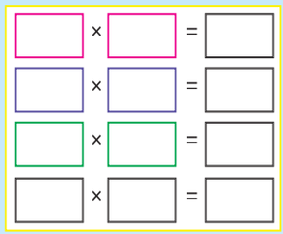




Unit fraction numerator is always 1 and non-unit fraction numerator is always more than one.

Multiply the numbers of the same colour in each block together. Compare the two sets of calculations.





What happens with the denominators if you multiply them?
Remember:
- If you multiply unit (unitary) fractions, the product is a unit fraction.
- If you multiply non–unit fractions together, or a non–unit fraction with a unit fraction, the product is a non–unit fraction.

1. Calculate:

Example 1: $\frac{6}{7} \times \frac{5}{7} = \frac{30}{49}$

Example 2: $\frac{6}{7} \times \frac{5}{6} = \frac{30}{42}$

a. $\frac{1}{3} \times \frac{2}{3} =$

b. $\frac{2}{4} \times \frac{1}{4} =$

c. $\frac{1}{6} \times \frac{3}{7} =$

d. $\frac{1}{2} \times \frac{4}{6} =$

e. $\frac{7}{8} \times \frac{2}{4} =$

f. $\frac{8}{5} \times \frac{4}{5} =$

2. Write down two different multiplication sums that will give the fraction shown as the answer. State what kind of fractions you have multiplied together.

Example: $\_\_ \times \_\_ = \frac{12}{18}$

$\frac{3}{3} = 1$ $\frac{3}{3} \times \frac{4}{6} = \frac{12}{18}$ A whole number × a proper fraction.

$\frac{2}{9} \times \frac{6}{2} = \frac{12}{18}$ A proper fraction × an improper fraction.

a. $\_\_ \times \_\_ = \frac{4}{9}$

b. $\_\_ \times \_\_ = \frac{8}{4}$

c. $\_\_ \times \_\_ = \frac{6}{8}$

d. $\_\_ \times \_\_ = \frac{12}{16}$

e. $\_\_ \times \_\_ = \frac{10}{64}$

f. $\_\_ \times \_\_ = \frac{9}{12}$

3. What is one quarter of a half? Use diagrams to show your calculation.

Problem solving

What two fractions can you multiply to get the answer $\frac{42}{99}$?

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36 Multiply whole numbers by common fractions

Look at the following and discuss it with a friend.

$8 \div 1 = 8$

$\frac{8}{1} = 8$

So we can write the whole number 8 as the fraction $\frac{8}{1}$

How would I write the following whole numbers as fractions?

2	78	356	1 245	23 432	978 323

1. Calculate the following:

Example:

$8 \times \frac{1}{4}$

$= \frac{8}{1} \times \frac{1}{4}$

$= \frac{8}{4}$

$= 2$

$\frac{8}{4} = 8 \div 4 = 2$

a. $2 \times \frac{3}{5} =$

b. $4 \times \frac{5}{6} =$

c. $11 \times \frac{3}{10} =$

d. $9 \times \frac{1}{2} =$

e. $\frac{2}{3} \times 2 =$

f. $8 \times \frac{6}{7} =$

2. What multiplication sums, using a whole number and a fraction, will give you the following answers?

Example: $\_\_ \times \_\_ = \frac{2}{3}$

$= 2 \times \frac{1}{3}$

$= \frac{2}{1} \times \frac{1}{3}$

a. $\_\_ \times \_\_ = \frac{4}{6}$

b. $\_\_ \times \_\_ = \frac{9}{10}$

c. $\_\_ \times \_\_ = \frac{3}{8}$

d. $\_\_ \times \_\_ = \frac{15}{50}$

e. $\_\_ \times \_\_ = \frac{7}{21}$

f. $\_\_ \times \_\_ = \frac{6}{24}$

3. One fifth of 15 cell phones were sold on a special. What fraction were not sold?

Problem solving

If __ (whole number) × __ fraction $= \frac{8}{12}$, how many possible solutions are there for this multiplication sum?

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37 Multiply common fractions and simplify

Simplifying fractions means to make the fraction as simple as possible. Why say four eighths ($\frac{4}{8}$) when you really mean half ($\frac{1}{2}$) ?

Show a friend or family member how this fraction was simplified.

Explain this:

$$\frac{24}{108} \xrightarrow{\div 2} \frac{12}{54} \xrightarrow{\div 2} \frac{6}{27} \xrightarrow{\div 3} \frac{2}{9}$$

1. Simplify the following:

Example:

$$\frac{15}{20} = \frac{15}{20} \div \frac{5}{5} = \frac{3}{4}$$

a. $\frac{4}{12}$ b. $\frac{8}{16}$ c. $\frac{5}{20}$

d. $\frac{16}{24}$ e. $\frac{7}{21}$ f. $\frac{24}{64}$

2. Multiply and simplify if possible.

Example:

$$\frac{1}{3} \times \frac{4}{8} = \frac{4}{24} = \frac{4}{24} \div \frac{4}{4} = \frac{1}{6}$$

a. $\frac{1}{2} \times \frac{4}{8} =$ b. $\frac{7}{7} \times \frac{3}{6} =$ c. $\frac{8}{10} \times \frac{10}{12} =$

d. $\frac{1}{3} \times \frac{5}{5} =$ e. $\frac{1}{2} \times \frac{3}{4} =$ f. $\frac{1}{2} \times \frac{2}{7} =$

3. Simplify the improper fracton if necessary and then write it as a mixed number.

Example: $\frac{14}{4} = \frac{7}{2} = 3\frac{1}{2}$

a. $\frac{19}{3}$ b. $\frac{21}{5}$ c. $\frac{20}{6}$

d. $\frac{22}{7}$ e. $\frac{10}{8}$ f. $\frac{21}{9}$

4. Multiply and simplify.

Example:

$$\frac{6}{4} \times \frac{5}{2} = \frac{30}{8} = 3\frac{6}{8} = 3\frac{3}{4}$$

HCF is 2

a. $\frac{3}{2} \times \frac{7}{6} =$ b. $\frac{6}{3} \times \frac{6}{5} =$ c. $\frac{8}{7} \times \frac{6}{4} =$

d. $\frac{5}{4} \times \frac{9}{8} =$ e. $\frac{6}{5} \times \frac{9}{8} =$ f. $\frac{9}{7} \times \frac{6}{3} =$

Problem solving

a. What is $\frac{16}{20} \times \frac{2}{4}$ in its simplest form?

b. Multiply any two improper fractions and simplify your answer if necessary.

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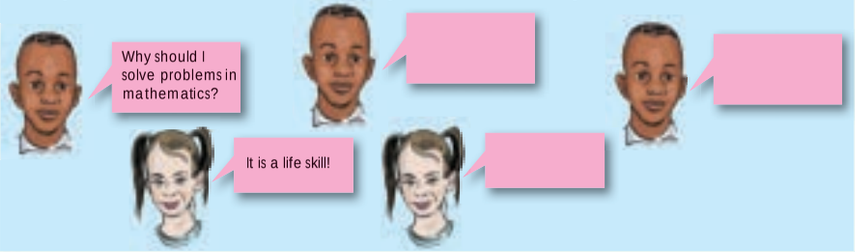
38 Solve fraction problems

Complete this conversation about why we should solve problems in mathematics.



1. Calculate the following. You may need extra paper to do your calculations.

Example 1: One half of an hour

$= \frac{1}{2}$ of 60 minutes

$= \frac{1}{2} \times 60$

$= \frac{1}{2} \times \frac{60}{1}$

Which word tells you it is a multiplication sum?

$= \frac{60}{2}$

$= 30$ minutes

Example 2: What fraction of one day is six hours?

$\frac{6}{24}$

Factors of 6 = {1, 2, 3, 6}

Factors of 24 = {1, 2, 3, 4, 6, 8, 12, 24}

$= \frac{6}{24} \div \frac{6}{6}$

$= \frac{1}{4}$

a. One half of a week.

b. One quarter of a day.

c. One fifth of a decade.

d. One third of an hour.

e. One half of a century.

f. One half of a millennium.

g. What fraction is 2 days of 9 weeks?

h. What fraction is 3 months of 9 years?

i. What fraction is 15 minutes of an hour?

2. A number of children had R150 to spend. How much of the R150 did they have left?

Example: You have R150. If you spent $\frac{1}{5}$ of it, how much money would you have left?

$\frac{1}{5}$ of R150

Which word tells you it is a multiplication sum? (of)

$= \frac{1}{5} \times \frac{R150}{1}$

$= \frac{R150}{5}$ (R150 ÷ 5)

$=$ R30

$=$ R150 – R30

You have R120 left.

a. John spent $\frac{1}{2}$

b. Veronica spent $\frac{1}{6}$

c. Mary spent $\frac{1}{10}$

d. Mandla spent $\frac{1}{8}$

e. Susan spent $\frac{1}{4}$

f. Gugu spent $\frac{1}{3}$

3. You have R120 to spend on clothing. You can get discounts at different stores. Work out how much discount you can get at each store.

Example: You bought clothing to the value of R120. You got a discount of $\frac{1}{3}$ off. How many rands was your discount worth?

$\frac{1}{3} \times$ R120

$= \frac{1}{3} \times \frac{R120}{1}$

$= \frac{R120}{3}$ (R120 ÷ 3)

$=$ R40

You got R40 discount.

a. $\frac{1}{2}$

b. $\frac{1}{8}$

c. $\frac{1}{12}$

d. $\frac{1}{4}$

e. $\frac{1}{6}$

f. $\frac{1}{5}$

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39 Solve more fraction problems

1. Solve these measurement of distance problems.

Example: What is one half of a metre?

$\frac{1}{2}$ of a metre

$= \frac{1}{2}$ of a 1 000 mm

$= \frac{1}{2} \times \frac{1\,000}{1}$ mm

$= \frac{1\,000}{2}$ mm (1 000 ÷ 2)

= 500 mm

a. $\frac{1}{2}$ of a kilometre ____ m

b. $\frac{1}{4}$ of a kilometre ____ m

c. $\frac{1}{4}$ of a centimetre ____ mm

d. $\frac{1}{5}$ of a kilometre ____ m

e. $\frac{1}{4}$ of a metre ____ cm

f. $\frac{1}{2}$ of a centimetre ____ mm

2. Solve these travel distance problems. If I completed ___ of the distance of 500 km, how far do I still have to travel?

Example: I completed one fifth of my 200 km journey. How far do I still need to travel?

$= \frac{1}{5} \times 200$ km

$= \frac{1}{5} \times \frac{200}{1}$ km

$= \frac{200}{5}$ km (200 ÷ 5)

= 40 km

I still need to travel 160 km.
(200 km – 40 km)

a. $\frac{1}{10}$ ____

b. $\frac{1}{12}$ ____

c. $\frac{1}{2}$ ____

d. $\frac{1}{3}$ ____

e. $\frac{1}{4}$ ____

f. $\frac{1}{6}$ ____

3. My friends and I competed in a cycling race of 120 km. We had to finish the race in eight hours. After five hours, we still needed to travel the remaining quarter of the distance. How far did we still need to go to the finishing line? Did we finish the race in time?

4. Solve: What is _____ of a kg?

Example: What is a quarter of a kilogram?

$\frac{1}{4}$ of a kilogram

$= \frac{1}{4}$ of 1 000 g

$= \frac{1}{4} \times \frac{1\,000}{1}$ g

$= \frac{1\,000}{4}$ g (1 000 ÷ 4)

= 250 g

a. $\frac{1}{2}$ of a kg ____

b. $\frac{1}{4}$ of a kg ____

c. $\frac{1}{5}$ of a kg ____

d. $\frac{1}{10}$ of a kg ____

e. $\frac{1}{8}$ of a kg ____

f. $\frac{1}{100}$ of a kg ____

5. Solve: How many grams of the 150 g of food did I eat?

Example: I ate $\frac{1}{5}$ of my 150 grams of food. How many grams did I eat?

$= \frac{1}{5}$ of 150 grams

$= \frac{1}{5} \times 150$ grams

$= \frac{1}{5} \times \frac{150}{1}$ grams

$= \frac{150}{5}$ grams

= 30 grams

= I ate 30 grams

a. $\frac{1}{8}$ ____

b. $\frac{1}{2}$ ____

c. $\frac{1}{4}$ ____

d. $\frac{1}{6}$ ____

e. $\frac{1}{10}$ ____

f. $\frac{1}{20}$ ____

6. Solve: How many mililitres did I drink?

Example: What is two fifths of a litre?

$\frac{2}{5}$ of a litre

$= \frac{2}{5} \times \frac{1\,000}{1}$ ml

$= \frac{2\,000}{5}$ ml (2 000 ÷ 5)

= 400 ml

a. $\frac{1}{2}$ of a litre ____

b. $\frac{1}{4}$ of a litre ____

c. $\frac{2}{4}$ of a litre ____

d. $\frac{4}{5}$ of a litre ____

e. $\frac{3}{8}$ of a litre ____

f. $\frac{3}{10}$ of a litre ____

Problem solving

Write your own word problem on a separate piece of paper, using capacity and fractions. Use the previous questions to guide you.

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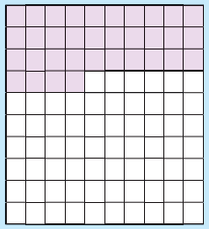
40 Fractions, decimals and percentages

Explain the following:



$\frac{34}{100}$ = 0,34 = 34%

Quick quiz: What does the following mean:

- **Cent**?
- **Cent**ury?
- **Cent**ipede?
- Per**cent**age?

100

1. Write the following as a fraction and a decimal fraction:

Example: 18% or $\frac{18}{100}$ or 0,18

= $\frac{9}{50}$

If possible write the fraction in the simplest form.

$\frac{18}{100}$ Simplified is $\frac{9}{50}$

a. 37%

b. 25%

c. 83%

d. 90%

e. 55%

f. 3%

2. Write the following as a fraction in its simplest form:

Percentage	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Fraction										
Simplest form										

Describe the pattern.

3. Calculate.

Example: 18% of R20

$= \frac{18}{100} \times \frac{R20}{1}$

$= \frac{R360}{100}$

= R3,60

a. 20% of R24

b. 70% of R15

c. 60% of R95

d. 80% of R74

e. 30% of R90

f. 50% of R65

4. Calculate.

Example: 60% of R150

$\frac{60}{100} \times \frac{R150}{1}$

$= \frac{3}{5} \times \frac{R150}{1}$

$= \frac{R450}{5}$

= R90

I can write 60% as $\frac{60}{100}$

$\frac{60}{100}$ simplified is $\frac{6}{10} = \frac{3}{5}$

or

$= \frac{9\,000}{100}$

= R90

a. 30% of R1,80

b. 80% of R1,60

c. 90% of R8,10

d. 20% of R4,60

e. 60% of R5,40

f. 20% of R6,40

Problem solving

I bought a pair of shoes for R150. I got 25% discount. How much did I pay for it?

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41 Percentage increase and decrease

What do increase and decrease mean?

Name five situations where you would like something to be **increased**.

Name five situations where you would like something to be **decreased**.

Name five situations where you would like something not to **increase**.

Name five situations where you would like something not to **decrease**.

1. Calculate the percentage increase.

Example: Calculate the **percentage** increase if the price of a bus ticket of R60 is **increased** to R84.

$$\frac{24}{60} \times \frac{100}{1} = \frac{240}{60} = 40\%$$

We first need to ask by how much the bus ticket price was increased.

It was increased by R24 because R84 minus R60 is R24.

$\frac{24}{60}$ is the price increase.

To work out the percentage increase we multiply by 100.

a. R50 to R70

Price increase: _____

b. R80 to R120

Price increase: _____

c. R15 to R18

Price increase: _____

d. R25 to R30

Price increase: _____

e. R100 to R120

Price increase: _____

f. R36 to R54

Price increase: _____

2. Name an item which you really like, the price of which was increased recently. What was the percentage increase?

3. Calculate the percentage decrease.

Example: Calculate the percentage decrease if the price of petrol goes down from 20 cents a litre to 18 cents.

$$\frac{2}{20} \times \frac{100}{1} = \frac{200}{20} = 10\%$$

We first need to say by how much the petrol price was decreased.

It was decreased by 2c because 18c + 2c gives you 20c.

$\frac{2}{20}$ is the decrease in price.

Then, to work out the percentage decrease, we multiply $\frac{2}{20}$ by 100.

a. R20 to R15

Price decrease: _____

b. R50 to R45

Price decrease: _____

c. R18 to R15

Price decrease: _____

d. R24 to R18

Price decrease: _____

e. R90 to R80

Price decrease: _____

f. R28 to R21

Price decrease: _____

4. What item do you want to be decreased in price? What does it cost? If the price is decreased by 20% what will the new price be?

Problem solving

Calculate the percentage decrease if the price of petrol goes down from 960 cents to 840 cents per litre.

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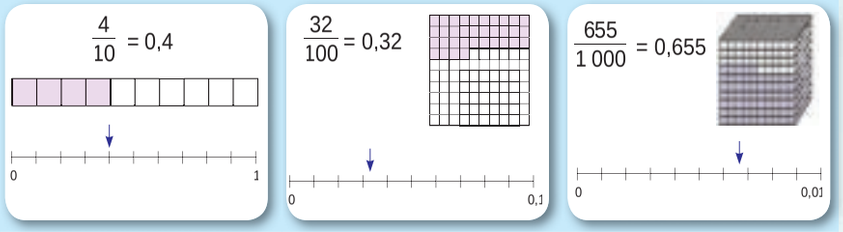
42 Place value, and ordering and comparing decimals

Look at the following and explain it.



1. Write the following in expanded notation:

Example: 3,785
= 3 + 0,7 + 0,08 + 0,005

a. 4,378 b. 5,213 c. 14,678

d. 5,036 e. 8,305 f. 9,006

2. Write the following in words:

Example: 4,326
= 4 units + 3 tenths + 2 hundredths + 6 thousandths

a. 5,376

b. 8,291

c. 3,589

d. 7,036

e. 8,005

3. Write the following in the correct column:

		thousands	hundreds	tens	units		tenths	hundredths	thousandths
a.	4,765				4	,	7	6	5
b.	18,346					,			
c.	19,005					,			
d.	231,04					,			
e.	7685,2					,			

4. Write down the value of the underlined digit:

Example: 3,7<u>8</u>4
= 0,08 or 8 hundredths

a. 6,3<u>5</u>7 b. 4,3<u>2</u> c. <u>5</u>,809

d. 8,9<u>9</u>9 e. 8<u>8</u>,080 f. 34,00<u>2</u>

5. Write the following in ascending order:

a. 0,04; 0,4; 0,004

b. 0,1; 0,11; 0,011

c. 0,99; 0,9; 0,999

d. 0,753; 0,8; 0,82

e. 0,67; 0,007; 0,06

6. Fill in <, >, =

a. 0,4 ___ 0,04 b. 0,05 ___ 0,005 c. 0,1 ___ 0,10

d. 0,62 ___ 0,26 e. 0,58 ___ 0,85 f. 0,37 ___ 0,73

g. 0,123 ___ 0,321 h. 0,2 ___ 0,20 i. 0,4 ___ 0,40

j. 0,05 ___ 0,050

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43 Writing common fractions as decimals

Look at the table and explain it.

$\frac{1}{1}$	$\frac{1}{10}$	$\frac{1}{100}$	$\frac{1}{1\,000}$
1	0,1	0,01	0,001

1. Write as a decimal fraction:

Example: $\frac{5}{100}$

$= 0,05$

a. $\frac{6}{10}$ b. $\frac{7}{10}$ c. $\frac{8}{1\,000}$

d. $\frac{4}{10}$ e. $\frac{5}{1\,000}$ f. $\frac{3}{1\,000}$

2. Write as a decimal fraction:

Example: $\frac{23}{100}$

$= 0,23$

a. $\frac{45}{100}$ b. $\frac{76}{100}$ c. $\frac{98}{100}$

d. $\frac{36}{100}$ e. $\frac{476}{100}$ f. $\frac{75}{1\,000}$

3. Write as a decimal fraction.

Example: $\frac{45}{10}$

$= 4,5$

a. $\frac{36}{10}$ b. $\frac{6\,705}{100}$ c. $\frac{88}{10}$

d. $\frac{3\,200}{100}$ e. $\frac{765}{10}$ f. $\frac{9\,347}{100}$

4. Write as a common fraction.

Example: 5,7

$= \frac{57}{10}$

a. 9,5 b. 15,15 c. 8,934

d. 3,76 e. 32,004 f. 7,6

5. Write the following as a decimal fraction.

Examples: $\frac{2}{5} = \frac{4}{10} = 0,4$ $\frac{1}{25} = \frac{4}{100} = 0,04$

a. $\frac{1}{5}$ b. $\frac{1}{4}$ c. $\frac{1}{2}$

d. $\frac{3}{5}$ e. $\frac{2}{4}$ f. $\frac{7}{25}$

Problem solving

[You can use a calculator if you want to.]

a. What would you do to change the decimal fraction 7,345 to 7,305?
b. Then to change it to 7,005 and then to 7?
c. If the tenths digit is nine and the units digit is five, what should I do to get an answer of 5,932?

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44 Decimal fractions

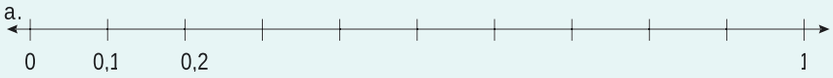
How fast can you count from:

0,2 to 1,3		0,2; 0,3; 0,4; _____
1,12 to 1,2	1,2 is the same as 1,20.	1,12; 1,13; 1,14; _____
1,251 to 1,26	1,26 is the same as 1,260.	1,251; 1,252; 1,253; _____

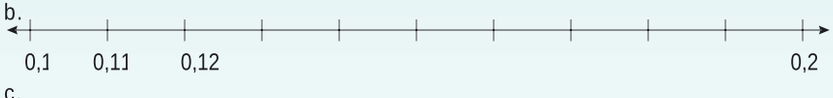
How does this link to decimal fractions: kg, m, ml, cm, etc.?

1. Complete the number lines.

a.



b.



c.

d. What do you notice? _____

2. Complete the following:

Example: 0,34; 0,35; 0,36; ____; ____; 0,39
= 0,34; 0,35; 0,36; **0,37**; **0,38**; 0,39

a. 0,1; 0,2; 0,3; ____; 0,5; 0,6; 0,7; 0,8; 0,9
_____

b. 0,21; 0,22; 0,23; _____; 0,25; 0,26; 0,27; 0,28; 0,29
_____

c. 0,31; 0,32; 0,33; ____; ____; 0,36; 0,37; 0,38; 0,39
_____

3. Extend the pattern by five decimal fractions:

Example: 5,36; 5,37; 5,38; ...
= 5,36; 5,37; 5,38; **5,39; 5,4; 5,41; 5,42; 5,43**

a. 7,7; 7,8; 7,9; _____

b. 3,64; 3,65; 3,66; _____

c. 2,173; 2,174; 2,175; _____

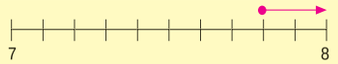
d. 5,4; 5,5; 5,6; _____

e. 9,6; 9,5; 9,4; _____

f. 3,874; 3,873; 3,872; _____

4. Round off to the nearest unit.

Example: 7,8
Rounded off to 8



a. 3,1 _____ b. 2,8 _____ c. 5,27 _____

d. 5,3 _____ e. 3,9 _____ f. 6,89 _____

5. Round off to the nearest tenth.

Example: 3,745
Rounded off to 3,7

a. 6,14 _____ b. 3,578 _____ c. 5,63 _____

d. 68,467 _____ e. 7,223 _____ f. 4,32 _____

6. Round off to the nearest unit and tenth.

		Unit	Tenth
a.	3,84		
b.	3,89		
c.	14,27		
d.	999,31		
e.	4,09		
f.	51,781		

Problem solving

a. Give five examples of decimal fractions that will be between 0,08 and 0,09.
b. Give five examples of numbers you could have rounded off to 5.

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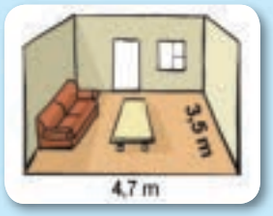
45 Addition and subtraction with decimal fractions

Look at the following pictures. Make up your own addition and/or subtraction sums.



1. Calculate using both methods. Check your answer.

Example 1: 2,37 + 4,53
= (2 + 4) + (0,3 + 0,5) + (0,07 + 0,03)
= 6 + 0,8 + 0,1
= 6,9

Example 2:
2,37
+ 4,53
6,90

Make sure the commas are under each other.

Note that 6,9 and 6,90 are the same.

You can check your answer using the inverse operation of addition, that is subtraction.

a. 3,12 + 4, 57 =

b. 5,34 + 2,26 =

c. 1,46 + 2,28 =

d. 3,45 + 4,67 =

e. 6,58 + 5,7 =

f. 9,9 + 9,97 =

2. Calculate using both methods.

Example 1: 2,37 + 4,53 – 3,88
= (2 + 4 – 3) + (0,3 + 0,5 – 0,8) + (0,07 + 0,03 – 0,08)
= 3 + 0 + 0,02
= 3,02

Example 2:
2,37
+ 4,53
6,90
– 3,88
3,02

Make sure the commas are under each other.

a. 1,15 + 2,21 – 1,21 =

b. 2,34 + 3,42 – 2,34 =

c. 3,24 + 3,35 – 5,36 =

d. 4,76 + 6,11 – 3,52 =

e. 2,36 + 5,4 – 3,47 =

f. 6,8 + 9,10 – 5,19 =

3. Make five different number sentences using the following decimals. Solve them in your exercise books. 2,56; 1,99 and 3,47. Calculate the answer.

Problem solving

My friend went on a diet and lost 2,5 kg the first week, and 1,25 kg the second week. He gained 0,75 kg the third week and lost 0,5 kg the fourth week. How much did he lose in the four weeks? (Remember it is not healthy to lose too much weight in a short period of time.)

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46 Multiplication of decimal fractions

Look at the following pictures. Make up your own addition, subtraction and multiplication sum for each.

1. Calculate. (Check your answers using a calculator.)

Example:

- 0,2 × 0,3 = 0,06
- 0,02 × 0,3 = 0,006
- 0,02 × 0,03 = 0,0006

Do you notice the pattern? Describe it.

a. 0,4 × 0,2 = _____ b. 0,3 × 0,1 = _____ c. 0,4 × 0,5 = _____

d. 0,6 × 0,7 = _____ e. 0,04 × 0,02 = _____ f. 0,05 × 0,1 = _____

2. Calculate. (Check your answers using a calculator.)

Example 1: 0,2 × 4 = 0,8

Example 2: 0,02 × 4 = 0,08

Example 3: 0,4 × 3 = 1,2

a. 0,5 × 3 = _____ b. 0,8 × 3 = _____ c. 0,6 × 4 = _____

d. 0,02 × 9 = _____ e. 0,07 × 6 = _____ f. 0,003 × 8 = _____

3. Calculate. (Check your answers using a calculator.)

Example 1: 0,3 × 0,2 × 100
= 0,06 × 100
= 6

Example 2: 0,3 × 0,2 × 10
= 0,06 × 10
= 0,6

a. 0,4 × 0,2 × 10 =

b. 0,5 × 0,02 × 10 =

c. 0,3 × 0,3 × 100 =

d. 0,6 × 0,03 × 100 =

e. 0,5 × 0,2 × 100 =

f. 0,7 × 0,01 × 100 =

4. Calculate. (Check your answers using a calculator.)

Example: 5,276 × 30
= (5 × 30) + (0,2 × 30) + (0,07 × 30) + (0,006 × 30)
= 150 + 6 + 2,1 + 0,18
= 150 + 6 + 2 + 0,1 + 0,1 + 0,08
= 158 + 0,2 + 0,08
= 158,28

a. 1,123 × 10 =

b. 4,886 × 30 =

c. 2,932 × 40 =

d. 7,457 × 60 =

e. 8,234 × 20 =

f. 6,568 × 80 =

g. Take your answers from a to f and write them down in ascending order.

5. Now redo the problem in question 4 using the column method to do all the multiplications. Use a separate sheet of paper.

Problem solving

Multiply the number that is exactly between 1,15 and 1,16 by the number that is equal to ten times three.

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47 Division, rounding off and flow diagrams

Look at the following two patterns and describe them.

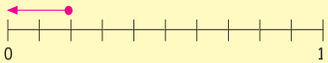
800 ÷ 4 = 200	80 ÷ 4 = 20	8 ÷ 4 = 2	0,8 ÷ 4 = 0,2	0,08 ÷ 4 = 0,02
150 ÷ 3 = 50	15 ÷ 3= 5	1,5 ÷ 3 = 0,5	0,15 ÷ 3 = 0,05	0,015 ÷ 3 = 0,005

Explain to a friend what rounding off to the nearest whole number or to a tenth means if you work with decimals.

1. Calculate the following:

Example: 0,4 ÷ 2 = 0,2

0,2 rounded off to the nearest whole number is 0.



a. 0,8 ÷ 4 = _____ b. 0,6 ÷ 3 = _____ c. 0,6 ÷ 2 = _____

d. 0,8 ÷ 2 = _____ e. 1,8 ÷ 3 = _____ f. 2,4 ÷ 8 = _____

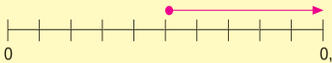
2. Now round off your answers to question 1 to the nearest whole number.

a. _____ b. _____ c. _____ d. _____ e. _____ f.

3. Calculate the following:

Example: 0,25 ÷ 5 = 0,05

0,05 rounded off to the nearest tenth is 0,1.



a. . 0,81 ÷ 9 = _____ b. 0,35 ÷ 7 = _____ c. 0,63 ÷ 7 = _____

d. 0,54 ÷ 6 = _____ e. 0,124 ÷ 4 = _____ f. 0,185 ÷ 5 = _____

4. Now round off your answers to question 3 to the nearest tenth.

a. _____ b. _____ c. _____ d. _____ e. _____ f.

5. Complete these flow diagrams. Round off to the nearest whole number.

a.
- R0,50
- Divide by 2
- Round off to the nearest rand
- _____

b.
- 2 m
- Divide by 8
- Round off to the nearest metre
- _____

c.
- 5,4 kg
- Divide by 9
- Round off to the nearest kilogram
- _____

d.
- R3,75
- Divide by 25
- Round off to the nearest rand
- _____

e.
- 2,5 ℓ
- Divide by 5
- Round off to the nearest litre
- _____

f.
- 1,44 kg
- Divide by 12
- Round off to the nearest kilogram
- _____

Problem solving

- You need seven equal pieces from 28,7 m of rope. How long will each piece be?
- I have R45,75. I have to divide it by five. What will my answer be?
- My mother bought 12,8 m of string. She has to divide it into four pieces. How long will each piece be?

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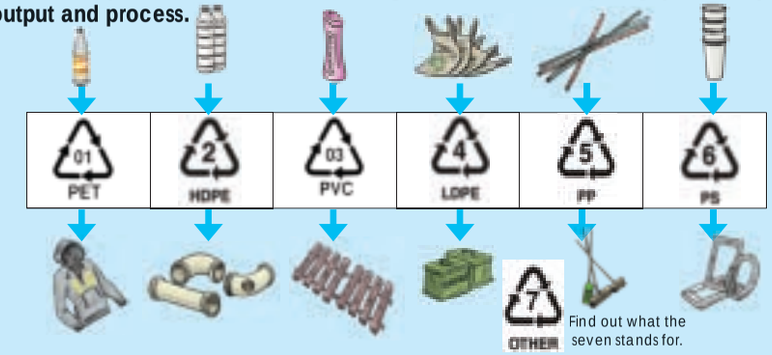
48 Flow diagrams

Look at the pictures. Describe them using words such as recycling, plastic, input, output and process.



Find out what the seven stands for.

This is why it is important to know your times tables.

1. How fast can you complete the flow diagrams?

a. Input Rule Output

Input	Rule	Output
1, 5, 7, 9, 12	× 6	

The rule is x6.

b. Input Rule Output

Input	Rule	Output
3, 6, 8, 4, 5	× 4	

The rule is _____.

c.

Input	Rule	Output
	× 8	96, 88, 72, 48, 40

The rule is _____.

d.

Input	Rule	Output
3, 10, 12, 9, 8	× 9	

The rule is _____.

e.

Input	Rule	Output
7, 10, 6, 4, 3	× 7	

The rule is _____.

f.

Input	Rule	Output
2, 4, 8, 9, 3	× 5	10, 20, 40, 45, 15

The rule is _____.

2. Use the given rule to calculate the value of b.

Example:

a	Rule	b
3, 2, 5, 7, 4	$b = a \times 4$	

$b = a \times 4$
- $3 \times 4 = 12$
- $2 \times 4 = 8$
- $5 \times 4 = 20$
- $7 \times 4 = 28$
- $4 \times 4 = 16$

a.

a	Rule	b
4, 5, 6, 2, 3	$b = a \times 6$	

The rule is _____.

b.

a	Rule	b
2, 12, 10, 11, 15	$b = a \times 10$	

The rule is _____.

c.

x	Rule	y
	$y = x - 9$	2, 1, 3, 11, 91

The rule is _____.

d.

r	Rule	s
4, 7, 9, 20, 5	$s = r + 11$	

The rule is _____.

e.

m	Rule	n
5, 7, 9, 10, 15	$n = m - 4$	

The rule is _____.

f.

a	Rule	b
3, 7, 100, 5, 8, 4		13, 17, 110, 15, 18, 14

The rule is _____.

3. Prepare to present any flow diagram done in this lesson in a future lesson period. Write in your exercise book.

Problem solving

Draw a flow diagram where $a = b + 7$.

Sign:
Date:

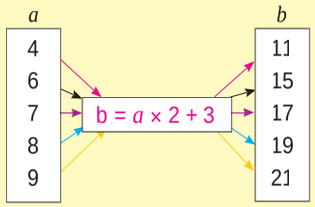
49 More flow diagrams

Let us look at Input and Output again. What do you think this is?



1. Complete the spider diagrams. Show all your calculations.

Example:



a is the **input**
b is the **output**
***b* = *a* × 2 + 3** is the **rule**

$b = 4 \times 2 + 3 = 11$

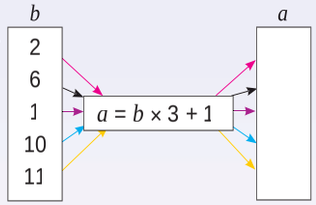
$b = 6 \times 2 + 3 = 15$

$b = 7 \times 2 + 3 = 17$

$b = 8 \times 2 + 3 = 19$

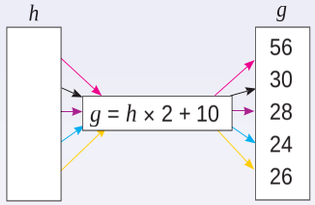
$b = 9 \times 2 + 3 = 21$

a.



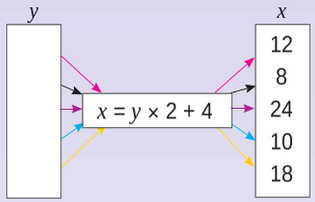
The rule is _____.

b.



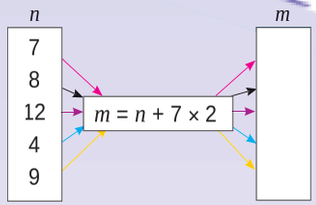
The rule is _____.

c.



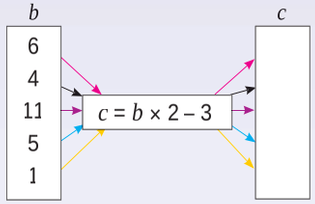
The rule is _____.

d.



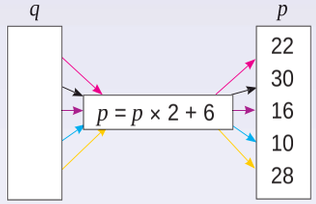
The rule is _____.

e.



The rule is _____.

f.



The rule is _____.

2. Prepare a flow diagram to present to the class. Change the flow diagram to an "input" and "output" device. Write in your exercise book.

Problem solving

Draw your own flow diagram where $a = b \times 2 + 11$.

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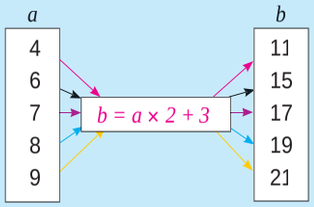
50 Tables

Complete the following:



The rule: $b = a \times 2 + 3$

$4 \times 2 + 3 = 11$
$6 \times 2 + 3 = 15$
$7 \times 2 + 3 = 17$
$8 \times 2 + 3 = 19$
$9 \times 2 + 3 = 21$

a	4	6	7	8	9
b	11	15	17	19	21

1. Complete the tables and show your calculations.

a. $y = x + 2$

x	2	4	6	8	10	20
y	4					

4 = 2 + 2

b. $b = a + 7$

a	1	2	3	4	5	10
b						

c. $n = m + 4$

m	4	5	6	7	10	100
n						

d. $z = x \times 2$

x	2	3	4	5	6	7
z						

e. $y = 2x - 1$

x	1	2	3	4	5	6
y						

f. $n = 3m + 2$

m	1	5	10	20	25	100
n						

2. Prepare a similar table to share with the class. Write in your exercise book.

Problem solving

If $x = 2y + 4$ and $y = 2, 3, 4, 5, 6$, draw a table to show it.

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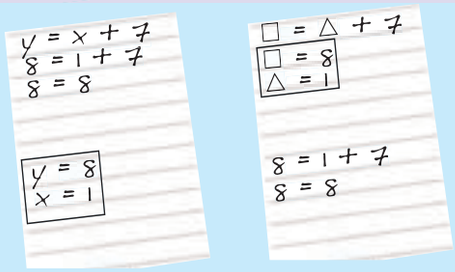
51 Input and output values

I got these notes from two of my friends. Compare them.



1. Determine the rule and solve m and n.

Example:

x	1	2	3	4		18	m	51
y	8	9	10	11		25	39	n

Determine the rule:
$y = x + 7$

m?
$x = m$ and $x = 39$
$y = x + 7$
$39 = m + 7$
$39 - 7 = m + 7 - 7$
$32 = m$
$m = 32$

n?
$y = x + 7$
$y = 51 + 7$
$y = 58$
n is 58

a.

x	1	2	3	4		25	m	51
y	10	11	12	13		n	39	60

m? ***n?*** Rule:

b.

x	1	2	3	4		m	30	60
y	2	4	6	8		22	n	120

m? ***n?*** Rule:

c.

x	1	2	3	4		10	15	m
y	5	10	15	20		50	n	90

m? ***n?*** Rule:

d.

x	1	2	3	4		7	m	46
y	13	14	15	16		19	24	n

m? ***n?*** Rule:

e.

x	1	2	3	4		6	10	m
y	3	6	9	12		18	n	60

m? ***n?*** Rule:

f.

x	1	2	3	4		m	41	70
y	11	12	13	14		28	n	80

m? ***n?*** Rule:

Problem solving

What is the 10th pattern for 3 × 4: 4 × 4: 5 × 4: . . .

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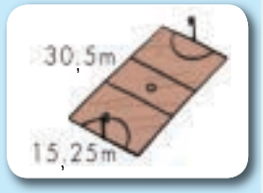
52 Perimeter and area

Look at the pictures and say what the perimeters are. What will the area of each shape be? You can use a calculator.



Draw these on grid paper where: 1 m × 1 m = 1 cm represents 1 m

1. Calculate the perimeter and the area of the following polygons:

Example: Perimeter

Perimeter of a rectangle: *2 × length + 2 × breadth*
Area of a rectangle: *length × breadth*

Double 4,5 cm + double 2,2 cm *or*
(2 × 4,5 cm) + (2 × 2,2 cm)
= 9 cm + 4,4 cm
= 13,4 cm

Example: Area

Perimeter of a square: *4 × length*
Area of a square: *length × length*

4,5 cm × 2,2 cm
= 9,9 cm²

a. 4,5 cm — A — 2,2 cm

b. 2,9 cm — B — 1,4 cm

c. 1,5 cm — C — 1,5 cm

2. Using the polygons A, B, C above, draw in each set of polygons in two different ways so that when joined together, they have:

- the shortest possible perimeter
- the largest possible perimeter

Do your drawings like this:

a. Polygons A and B
b. Polygons A and C
c. Polygons B and C
d. Polygons A, B and C

USE EXTRA PAPER FOR YOUR DRAWINGS

3. If the area is _____, what could the perimeter be?

a. 36 cm² b. 12 cm² c. 100 cm²

d. 125 cm² e. 30 cm² f. 18 cm²

4. Measure the perimeter and calculate the area of each shape. Give your answer in mm and cm.

a.

Perimeter:

Area:

b.

Perimeter:

Area:

c.

Perimeter:

Area:

Problem solving

a. Draw a square and a rectangle each of which has a perimeter of 9 cm.
b. If the perimeter of a square is 22 cm, what is the length of each side?
c. What is the perimeter of a regular octagon if the length of each side is 17 cm?
d. What is the perimeter of a square if its area is 225 cm²?

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Term 2

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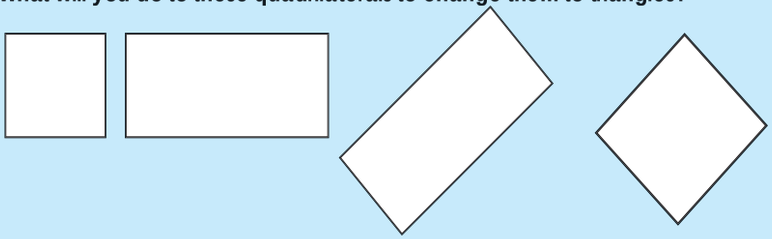
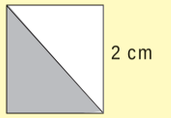
53 Area of triangles

What will you do to these quadrilaterals to change them to triangles?



1. What is the area of these triangles? Use both methods to solve this.

Example:



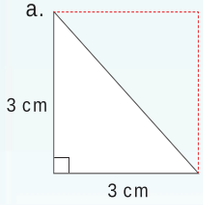
length^2
$= (2\text{ cm})^2$
$= 2\text{ cm} \times 2\text{ cm}$
$= 4\text{ cm}^2$

The triangle is half of the square.

Method 1
$\frac{1}{2}$ of 4 cm^2
$= \frac{1}{2} \times 4\text{ cm}^2$
$= \frac{1}{2} \times \frac{4}{1}\text{ cm}^2$
$= \frac{4}{2}\text{ cm}^2$
$= 2\text{ cm}^2$

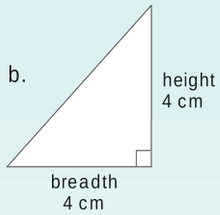
Method 2
$4\text{ cm}^2 \div 2$
$= 2\text{ cm}^2$

a.



Area:

b.



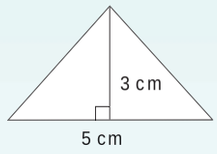
Area:

2. What is the area of the triangles?

Before calculating the area of the triangles, explain to a friend what the half in the formula means.

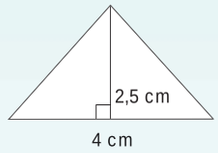
The area of a triangle is: $\frac{1}{2}$ × base × (vertical) height

a.



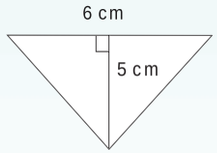
Area:

b.



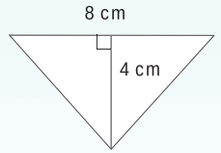
Area:

c.



Area:

d.



Area:

Problem solving

What is the area of a triangle if the base is 8 cm and the height is 3 cm?

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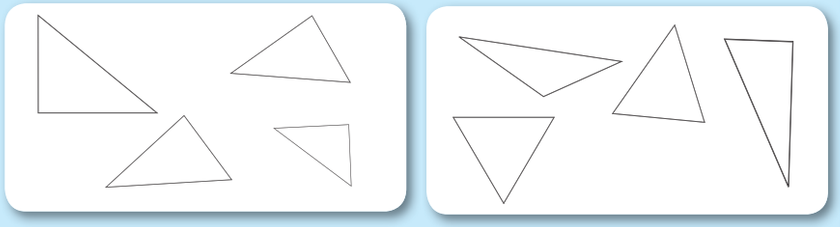
54 More area of triangles

Look at these triangles. Compare them.



1. Draw a perpendicular line showing the height of the triangle.

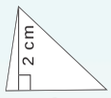
a. 

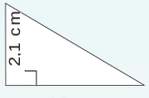
b. 

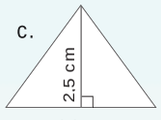
c. 

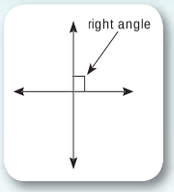
Perpendicular lines are lines that are at right angles (90°) to each other.

2. Calculate the area of the triangles.

a. 

b. 

c. 



3. Draw a triangle with the given measurements and then calculate the area.

a. Height 2 cm
Base 6 cm

Area

b. Height 3,5 cm
Base 10 cm

Area

c. Height 2,5 cm
Base 8 cm

Area

4. Measure and calculate the area. Give your answer in cm² and mm².

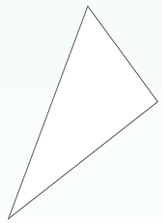
a. 

b. 

c. 

d. 

e. 

f. 

Problem solving

What is the area of a triangle if the base equals 3,5 cm and the height equals 1,5cm?

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Area conversion

Convert the following:

Revision

1 000 mm = ___m
___cm = 1 m
___m = 1 km

How did we get these answers?

$cm^2 = 100\ mm^2$

1 cm = 10 mm
1 cm^2 (1 cm × 1 cm)
= 100 mm^2 (10 mm × 10 mm)

$m^2 = 1\ 000\ 000\ mm^2$

1 m = 1 000 mm
1 m^2 (1 m × 1 m)
= 1 000 000 mm^2 (1 000 mm × 1 000 mm)

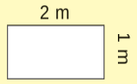
$km^2 = 1\ 000\ 000\ m^2$

1 km = 1 000 m
1 km^2 (1 km × 1 km)
= 1 000 000 m^2 (1 000 m × 1 000 m

1. Work out the area and give your answer in m^2, cm^2 and mm^2.

Example: Length = 2 m, breadth = 1m

l × b	l × b	l × b
= 2 m × 1 m	= 200 cm × 100 cm	= 2 000 mm × 1 000 mm
=2 m^2	=20 000 cm^2	=2 000 000 mm^2



a. Length = 5 m, breadth = 3 m

m^2	cm^2	mm^2	Possible drawing
			5 m, 3 m

b. Length = 3 m, breadth = 1,5 m

c. Length = 6 m, breadth = 3,2 m

d. Length = 4,5 m, breadth = 2,1 m

e. Length = 7,2 m, breadth = 5 m

2. Given the area of a rectangle, find a possible length and breadth in cm and m. You may want to draw sketches on a separate piece of paper.

Example: If the area is 9 000 000 mm^2, what is the length and breadth in cm and m?

Possible answer:
= 6 000 mm × 1 500 mm
= 600 cm × 150 cm
= 6 m × 1,5 m

length = 600 cm = 6 m
breadth = 150 cm = 1,5 m

a. 15 000 000 mm^2 — Calculation:

b. 63 000 000 mm^2 — Calculation:

c. 27 000 000 mm^2 — Calculation:

d. 28 000 000 mm^2 — Calculation:

e. 36 000 000 mm^2 — Calculation:

f. 16 000 000 mm^2 — Calculation:

Problem solving

If the base of a triangle is 4 m and the height 3 m, calculate the area and give your answer in m^2, cm^2 and mm^2.

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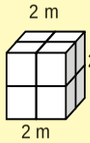
56 Understanding the volume of cubes

How many containers are on the truck?

How many cubes do you count in this block?

1. Label the diagram. Count the cubes. Write the number of cubes in exponential form.

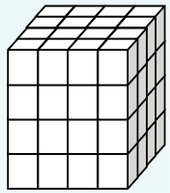
Example

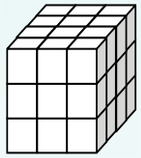


$2 \times 2 \times 2 = 2^3$

$= 2\text{ m} \times 2\text{ m} \times 2\text{ m}$

$= 8\text{ m}^3$





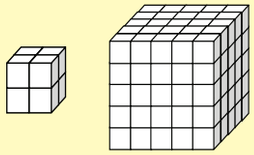
2. Write down a sum in exponential form for each diagram and then calculate the total number of blocks used.

Example:

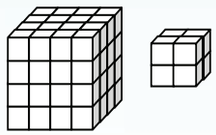
2^3 blocks + 5^3 blocks

= 8 blocks + 125 blocks

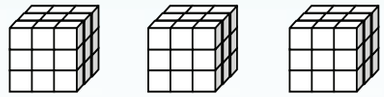
= 133 blocks



a.

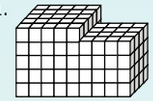


b.

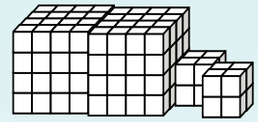


3. Calculate the volume of the buildings. Show your calculations.

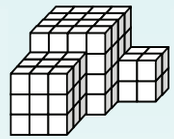
a.



b.



c.



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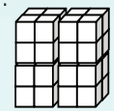
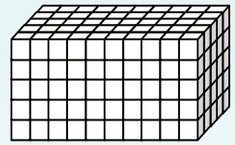


e.



4. Make a drawing and calculate the following:

a. 2 cm × 2 cm × 2 cm

b. 4 cm × 4 cm × 4 cm

c. 5 cm × 5 cm × 5 cm

d. 3 cm × 3 cm × 3 cm

e. 1 cm × 1 cm × 1 cm

f. 7 cm × 7 cm × 7 cm

Problem solving

If a block has 1 728 cubic units, what will its dimensions be?

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57a Volume of cubes

What is the difference between volume and capacity?

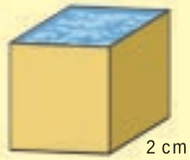
The **volume** of a solid is the amount of space it occupies.

Capacity is the amount of space, a liquid, or other substance, a container can hold.

10 cm × 10 cm × 10 cm
= 1 000 cm³
= 1000 ml
= 1 ℓ

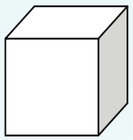
1. Use a formula to calculate the volume of water that will fill each cube.

Example:
The formula for the volume of a cube is ℓ^3

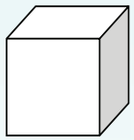


2 cm × 2 cm × 2 cm
= 8 cm³
= 8 ml
= 0,008 ℓ

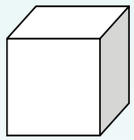
a.



b.



c.



2. What will the dimensions of a cube be if its volume is ___?

Example:
8 cm³ = 2 cm × 2 cm × 2 cm

a. 27 cm³

b. 64 cm³

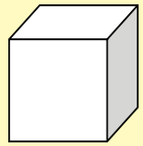
c. 125 cm³

d. 1 cm³

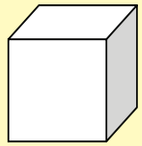
e. 216 cm³

3. Use the example to guide you in completing the volume calculations for these cubes:

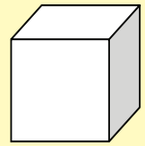
Example:



2 m × 2 m × 2 m
= 8 m³

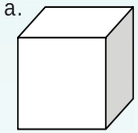


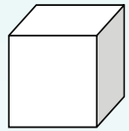
200 cm × 200 cm × 200 cm
= 8 000 000 cm³

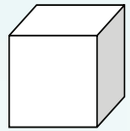


2 000 mm × 2 000 mm × 2 000 mm
= 8 000 000 000 mm³

a.





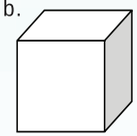


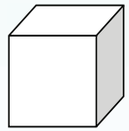
4 m ____ cm ____ mm

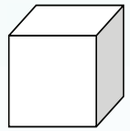
____ ____ ____

____ m³ ____ cm³ ____ mm³

b.







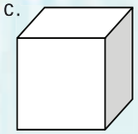
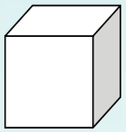
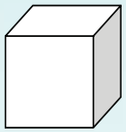
3 m ____ cm ____ mm

____ ____ ____

____ m³ ____ cm³ ____ mm³

continued

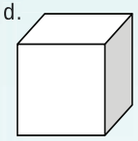
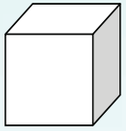
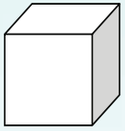
c.

500 m | ____ cm | 5 000 mm

____ m^3 | ____ cm^3 | ____ mm^3

d.

____ m | 100 cm | ____ mm

____ m^3 | ____ cm^3 | ____ mm^3

4. Look at the example showing how to calculate the dimensions of a cube with a particular volume. Re-write all the volumes below showing the dimensions of the cubes in mm, cm and m.

Example:

8 000 000 000 mm^3 = 2 000 mm × 2 000 mm × 2 000 mm

8 000 000 cm^3 = 200 cm × 200 cm × 200 cm

8 m^3 = 2 m × 2 m × 2 m

a. 216 m^3

b. 343 000 000 000 000 mm^3

c. 512 000 000 cm^3

d. 125 000 000 000 mm^3

Problem solving

a. If the volume of a cube is 125 cm^3, what are its dimensions in mm and m?

b. With a family member think of five everyday objects that are cubes.

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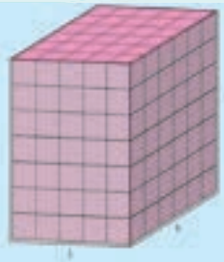
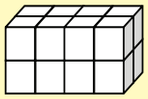
58 Volume of rectangular prisms

How many cubes are in the large container?



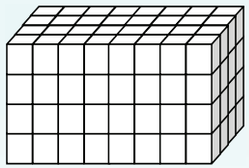
1. Write a multiplication sum to calculate the number of cubes making up each rectangular object.

Example:

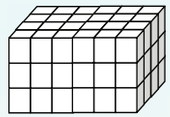


4 × 2 × 2 = 16 cubes

a.



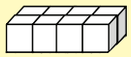
b.

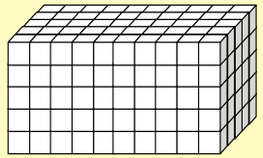


2. Write multiplication sums to calculate the number cubes in each pair of rectangular objects.

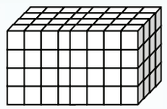
Example:

(4 × 1 × 2) + (10 × 5 × 5)
= 8 + 250
= 258 cubes

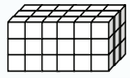


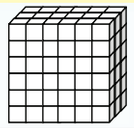


a.



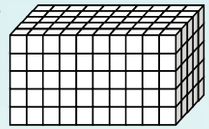
b.



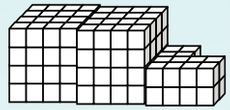


3. Calculate the volume of each of these buildings. Show your calculations.

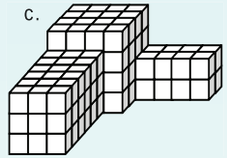
a.



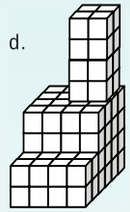
b.



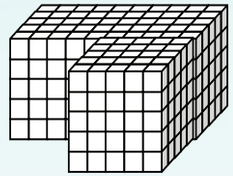
c.



d.



e.



4. Calculate the volume of retangular prisms with the following dimensions and make a drawing of each rectangular prism showing the dimensions:

a. 3 cm × 2 cm × 1 cm

b. 4 cm × 2 cm × 2 cm

c. 5 cm × 4 cm × 3 cm

d. 4 cm × 2 cm × 2 cm

Problem solving

If a rectangular prism has 384 cubic units, what will its dimensions be?

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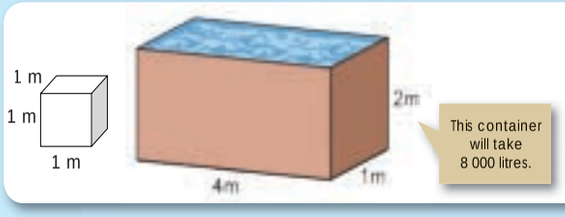
59 Volume of rectangular prisms again

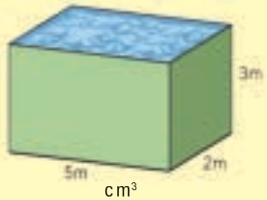
How many small containers will fit in the large container? How did you work it out? Why do we know the large container can hold 8 000 litres?



We know that
10 cm × 10 cm × 10 cm
= 1000 cm^3
= 1000 ml
= 1 ℓ

1. Calculate the volume of the following and give your answer in m^3, cm^3 and mm^3. Also say what the capacity of each container is when filled with water.

Example:



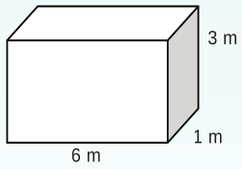
This containmer will hold 30 000 000 ml or 30 000 ℓ of water.

$\frac{m^3}{l \times b \times h}$
= 5 m × 2 m × 3 m
= 30 m^3

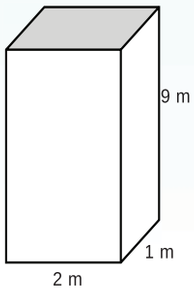
$\frac{cm^3}{l \times b \times h}$
= 500 cm × 200 cm × 300 cm
= 30 000 000 cm^3

$\frac{mm^3}{l \times b \times h}$
= 5 000 mm × 2 000 mm × 3 000 mm
= 30 000 000 000 mm^3

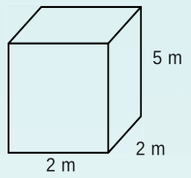
a.



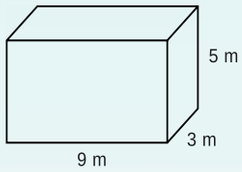
b.



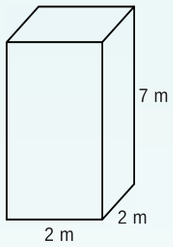
c.



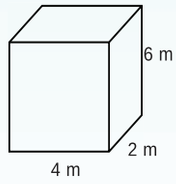
d



e.



f.



Problem solving

- What is the volume if the dimensions of a rectangular prism are the following: length = 2,4 cm, breadth = 3 m and height = 10cm? What type of geometric object is it?
- With a family member think of five everyday objects that are rectangular prisms.

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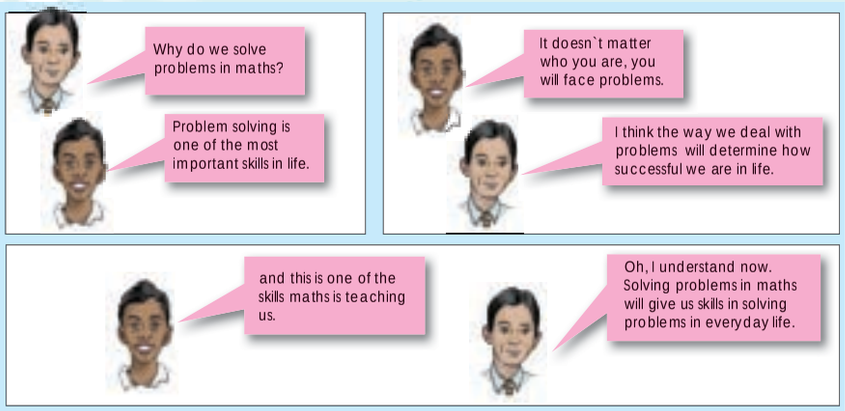
60 Volume problems



1. Calculate the volume (in cubic centimetres) of a retangular prism that is 5 m long, 40 cm wide and 2 500 mm high. Make a drawing.

2. A swimming pool is 8 m long, 6 m wide and 1,5 m deep. The water resistant paint needed for the pool costs R50 per square metre.

a. How much will it cost to paint the interior surfaces of the pool?

b. How many litres of water will be needed to fill the pool?

3. At a factory they are trying to store boxes in a storage room with a length of 5 m, width of 3 m and height of 2 m. How many boxes can fit in this space if each box is 10 cm long, 6 cm wide and 4 cm high?

Problem solving

Solve this with a family member or members.

- Assume we each create a cube of 30 cm × 30 cm × 30 cm of waste per day.
- We have a classroom with dimensions of 5,1m × 4,5m × 3 m.
- We are 30 children in the class.

How long will we take to fill the class with waste?

Imagine our waste didn't go to the landfills but to school classrooms.

Do you know that we will then fill all 28 000 school classrooms in South Africa about 6 times a year with waste.

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61 Volume and capacity

This person needs to collect information. What do you notice?

1. Show that the following statements are true:

1 cm^3 = 1 millilitre
1 000 cm^3 = 1 litre
1 m^3 = 1 000 litre

A possible way to look for the solution to this problem.

Start — What is the actual problem?

Ask yourself the following questions:

What do I know?

- What are millilitres and litres?
- What is cm^3?
- What is m^3?
- What examples do I know?

What do I need to prove?

- cm^3 = 1 millilitre
- 1 000 cm^3 = 1 litre
- 1 m^3 = 1 000 litres

What do I need to know?

Possibly:

- What is volume?
- What is capacity?

Note that sometimes we think of something later on; we don't always think of everything at the beginning. Add anything else.

2. Attack the problem.

Write down everything you know to prove that the statements are true. Show patterns and relationships. Make a sensible guess or conjecture and then see if you can prove it.

3. Come to a conclusion that is convincing.

Problem solving

Share this process step by step with a friend or a family member.

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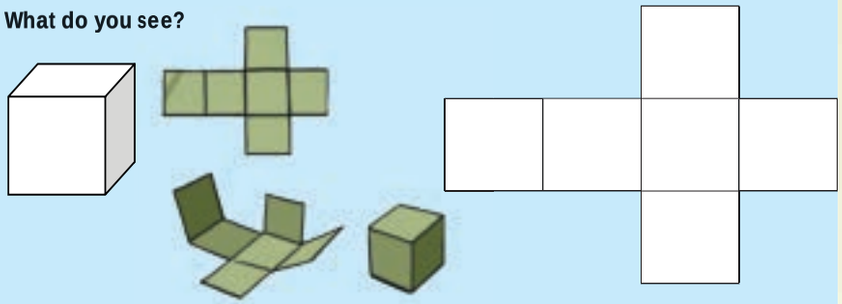
62 Surface area of a cube

What do you see?

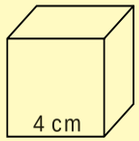


1. Revision: Calculate the volume of these cubes.

	cm	cm^3	mm^3	Make a drawing of the net. Describe in words the geometric figures (2–D shapes) in the net.
a.	4 cm × 4 cm × 4 cm			
b.	2,5 cm × 2,5 cm × 2,5 cm			

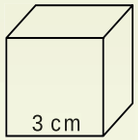
2. Calculate the surface area of the following cubes.

Example: The surface area of a cube is length × length × total number of faces.

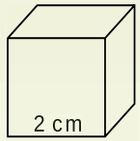


$= l^2 \times$ total faces
$= (4cm)^2 \times$ total faces
$= 16\ cm^2 \times 6$
$= 96\ cm^2$

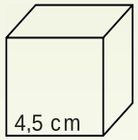
a.



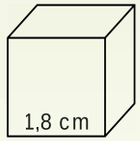
b.



c.



d.



3. You want to make a gift box in the shape of a cube. The gift is 15 cm high and 9 wide. How much cardboard do you need to make a cube gift box.

Problem solving

If a cube's surface area is 150 cm^2, what will the dimensions of the cube be?

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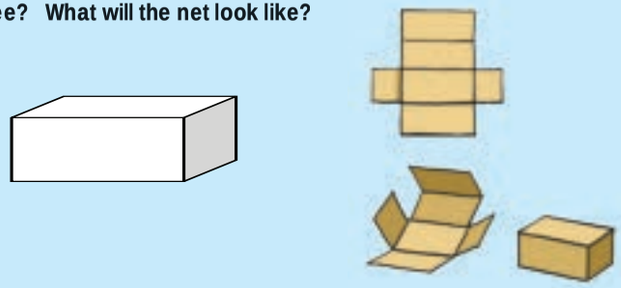
63 Surface area of rectangular prisms

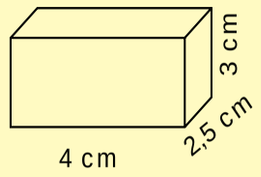
What do you see? What will the net look like?



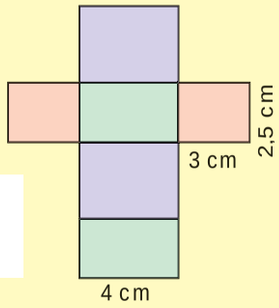
1. Revision: Calculate the volume of these rectangular prisms.

	cm	cm^3	mm^3	Make a drawing of the net. Describe in words the geometric figures (2–d shapes) in the net.
a.	3 cm × 2 cm × 1 cm			
b.	3 cm × 2,5 cm × 1,5 cm			

2. Calculate the surface area of the following rectangular prisms:



Surface area of a rectangular prism
= (2 × Length × Width) + (2 × Length × Height) + 2 × Width × Height)



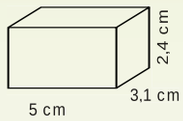
Area of this rectangle:
4 cm × 2,5 cm =10 cm^2
2 × 10 cm^2 = 20 cm^2

Area of this rectangle:
4 cm × 3 cm = 12 cm^2
2 × 12 cm^2 = 24 cm^2

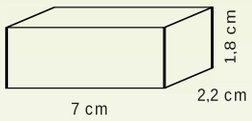
Area of this rectangle:
2,5 cm × 3 cm = 7,5 cm^2
2 × 7.5 cm^2 = 15 cm^2

20 cm^2 + 24 cm^2 + 15 cm^2 = 59 cm^2

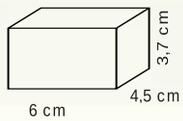
a.



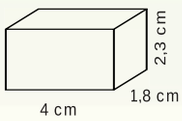
b.



c.



d.



Problem solving

If the surface area of a rectangular prism is 52 cm^2, what could its dimensions be?

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64 Surface area problem solving

Before solving the problems, make notes on how you will solve a problem.

Revise the formulas for surface area.
Write them down.

Cube:

Rectangular prism:

1. How many square tiles (20 cm × 20 cm) are needed to cover the sides and base of a pool that is 10 m long, 6 m wide and 3 m deep?

What is this problem all about?

What do I know?

What do I need to know more about?

Tackle the problem:

2. Four cubes of ice with side lengths of 4 cm each are left to melt in a square box with sides 8 cm long. How high will the water rise when all of them have melted?

What is this problem all about?

What do I know?

What do I need to know more about?

To calculate the area of a square, I need to know:
Area = length × width (l × w)

To calculate the volume, I need to know:
Area of the base of the box = l × w
Height: h
Volume = Area × Height (l × w × h)

Tackle the problem:

Problem solving

You are a great problem solver. Share with a family member why you are a great problem solver. Why is maths helping you to become such a problem solver?

Sign:

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Mathematics Grade 7 Cut-out 1