



# education

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Department:  
Education  
**REPUBLIC OF SOUTH AFRICA**

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 11**

**MATHEMATICS P3**

**NOVEMBER 2007**

**MARKS: 100**

**TIME: 2 hours**

**This question paper consists of 10 pages and a 1-page formula sheet.**

**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions:

1. This question paper consists of 9 questions. Answer ALL the questions.
2. Show clearly ALL calculations, diagrams, graphs, etc. which you have used in determining the answers.
3. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
4. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Diagrams are NOT necessarily drawn to scale.
7. It is in your own interest to write legibly and to present the work neatly.
8. An information sheet with formulae is attached.

**QUESTION 1**

Samantha has just obtained her driver's license. She wants to buy a car and has the following options from which to make her choice:

Model: VW Polo or Toyota Yaris  
 Type: Sedan or hatchback  
 Colour: White, black or red



- 1.1 Draw a tree diagram that will show ALL possible choices available to Samantha. (6)
- 1.2 It is equally likely that Samantha may choose any model, any type of car or any colour of car. She chooses her car at random.
- 1.2.1 What is the probability that Samantha will choose a red car? (Indicate your answer correct to THREE decimal places.) (2)
- 1.2.2 What is the probability that she will choose a VW Polo hatchback? (2)
- [10]**

**QUESTION 2**

- 2.1 The probability that event A will occur, is 0,3 and the probability that event B will occur, is 0,5. The probability that event A or event B will occur, is 0,65.
- 2.1.1 Calculate the probability that both events A and B will occur. (2)
- 2.1.2 Are events A and B independent? Give a reason for your answer. (2)
- 2.2 Four hundred drivers were interviewed about the number of accidents they were involved in during a calendar year. The results were summarised in the table below:

Age of driver	Number of accidents		Total
	2 or fewer	More than 2	
40 years and younger	200	(c)	300
Older than 40 years	(a)	50	(e)
<b>Total</b>	(b)	(d)	(f)

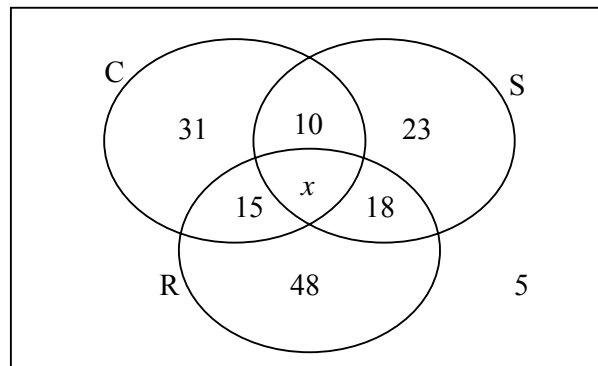
- 2.2.1 Calculate the values of (a), (b), (c), (d), (e) and (f) in the table. (3)
- 2.2.2 Is the number of accidents independent of the driver's age? Support your answer with appropriate calculations. (4)
- [11]**

**QUESTION 3**

In a survey carried out amongst Grade 11 learners at a particular high school, the learners were required to indicate whether they played the following kinds of sport:

- Cricket
- Rugby
- Soccer

In the process of summarising the information, the number of learners that played all three sports, was overlooked. The information gathered is shown in the Venn diagram below where  $C = \{\text{play cricket}\}$ ,  $R = \{\text{play rugby}\}$  and  $S = \{\text{play soccer}\}$ .

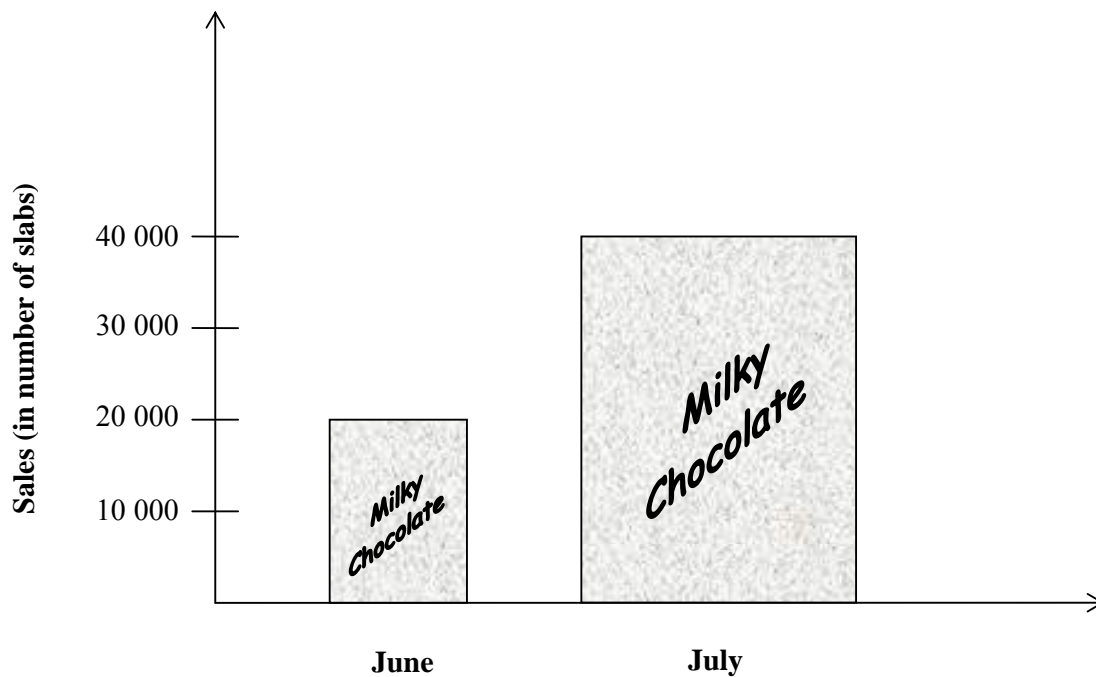


- 3.1 How many learners do NOT play cricket, rugby or soccer? (1)
- 3.2 If there are 160 learners in Grade 11, determine the number of learners who play ALL three kinds of sport. (3)
- 3.3 If it is given that  $x = 10$ , calculate the probability that a learner selected at random from Grade 11 will be playing soccer. (Indicate your answer correct to THREE decimal places.) (3)
- 3.4 Show that about 33% of the learners chosen at random play at least TWO kinds of sport. (3)

**[10]**

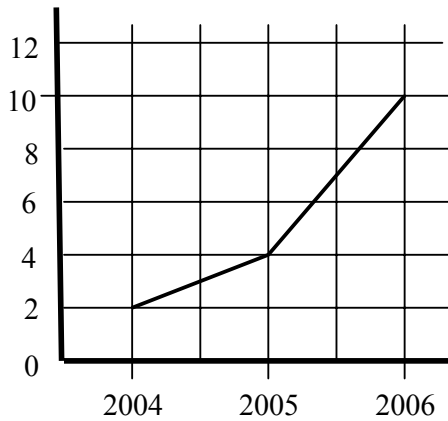
**QUESTION 4**

- 4.1 A chocolate manufacturer published the following graph of sales of the chocolate slabs *Milky Chocolate*, in two different months of the year:

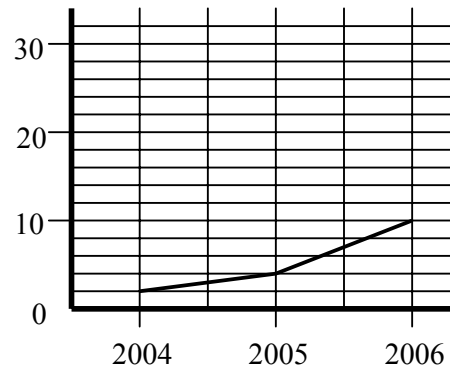


- 4.1.1 Calculate the difference in the sales for these two months. (2)
- 4.1.2 Explain how the picture for July differs from the picture for June. (2)
- 4.1.3 Is this a true representation of the difference in sales? Explain your answer. (2)

4.2 The graphs below show the sale of car alarms (in 1 000s) from 2004 to 2006:



**Graph A**



**Graph B**

- 4.2.1 Which graph seems to show a greater increase in the sale of car alarms? (1)
  - 4.2.2 Why do the graphs look different although they refer to the same information? (2)
  - 4.2.3 If you were a car alarm salesperson, which graph would you use to market your product? Motivate your answer. (3)
- [12]**

**QUESTION 5**

TABLE A below shows the HIV/Aids prevalence rate in women attending antenatal clinics in South Africa. Statisticians used the information in TABLE A to predict the overall infection figures in South Africa. This is displayed in TABLE B.

**TABLE A**

Year	Percentage of infected women attending clinics
2000	24,5%
2001	24,8%
2002	26,5%
2003	27,9%
2004	29,5%
2005	31,6%

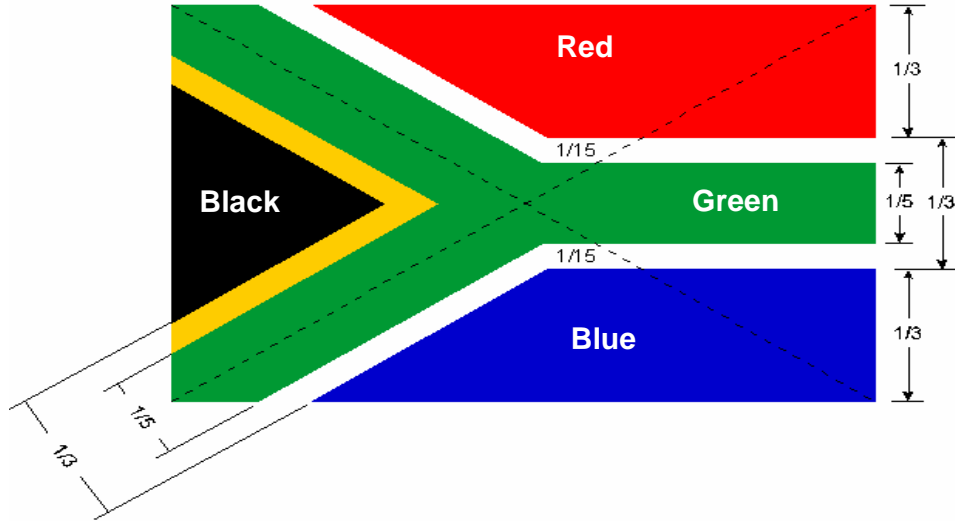
**TABLE B**

Year	South African population infected (in millions)
2000	11,3
2001	11,4
2002	12,2
2003	12,8
2004	13,6
2005	14,5

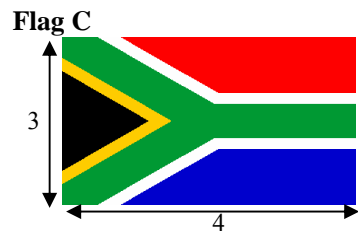
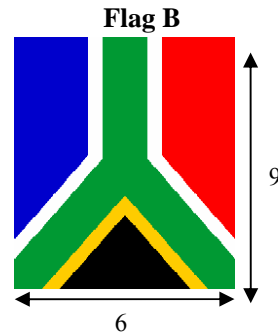
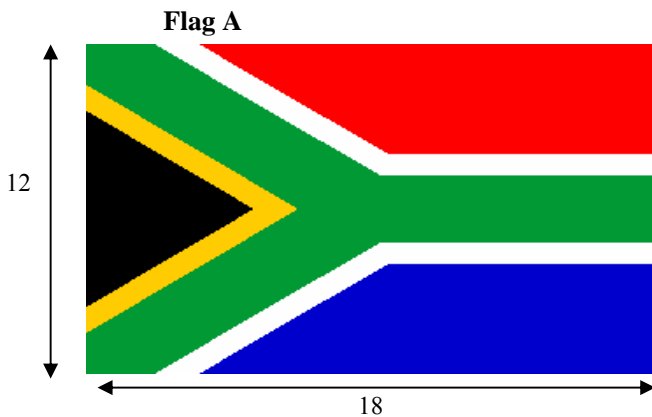
- 5.1 What was the population of South Africa in 2004? (2)
  - 5.2 Is it fair to use the information in TABLE A to conclude the infection rate for the country as a whole? Motivate your answer. (3)
- [5]**

**QUESTION 6**

6.1 The South African flag was designed using mathematical relationships. According to the Constitution the width of the flag in relation to its length must be in the ratio 2:3. The other ratios regarding the colours are indicated in a copy of the official flag below



Study the pictures (Flags A to C) below and answer the following questions. (The dimensions are given in centimetres.)



6.1.1 Which flag (A, B or C) is similar to the official national flag and is therefore legal in terms of the Constitution? Give a reason for your answer. (2)

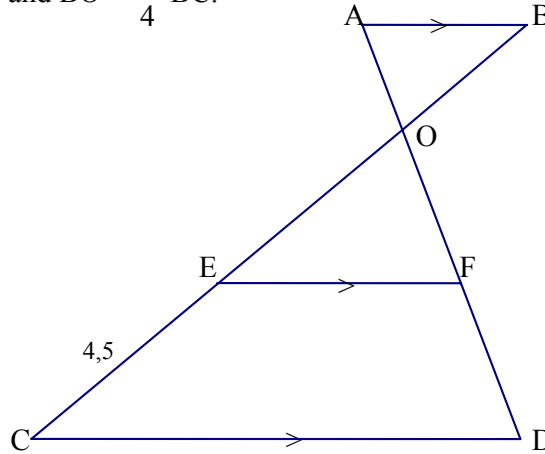
6.1.2 What is the width of the green strip in Flag B? (1)

6.1.3 Are the blue and red quadrilaterals in the South African flag similar? Give a reason for your answer. (2)

[5]

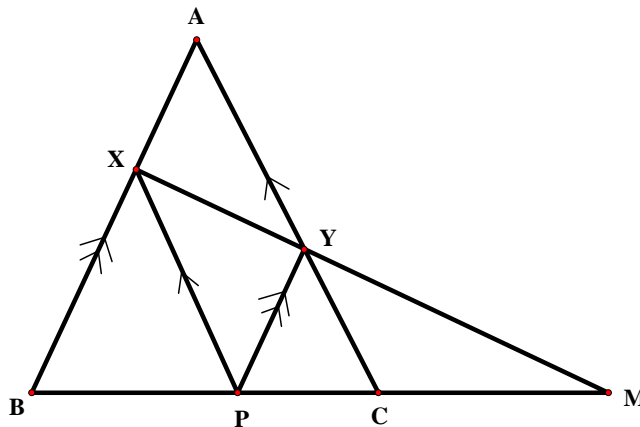
**QUESTION 7**

- 7.1 In the figure below,  $CE = 4,5$  units.  
 $AB \parallel EF \parallel CD$ .  
 F is the midpoint of OD and  $BO = \frac{1}{4} BC$ .



Give the numerical values of the following:

- 7.1.1 OE (2)
- 7.1.2 BO (2)
- 7.1.3 AO if  $FD = 3$  units (3)
- 7.1.4  $\frac{\text{area } \triangle AOB}{\text{area } \triangle ACB}$  (3)
- 7.2 In the diagram below,  $AB \parallel YP$  and  $AC \parallel XP$ . The extension of BC meets the extension of XY in N.



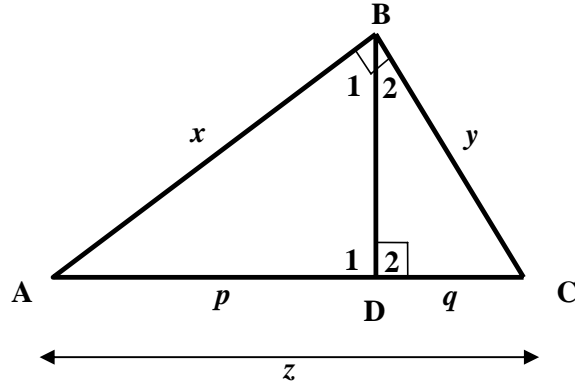
Prove that:

- 7.2.1  $\frac{CP}{PC} = \frac{PM}{BP}$  (3)
- 7.2.2  $PM^2 = CM \times BM$  (6)

**[19]**

**QUESTION 8**

8.1 In the figure below,  $\hat{A}BC = \hat{A}DB = 90^\circ$ . Let  $AD = p$ ,  $DC = q$ ,  $AC = z$ ,  $AB = x$  and  $BC = y$ .



8.1.1 Prove that  $\triangle ABD \sim \triangle ACB$ . (3)

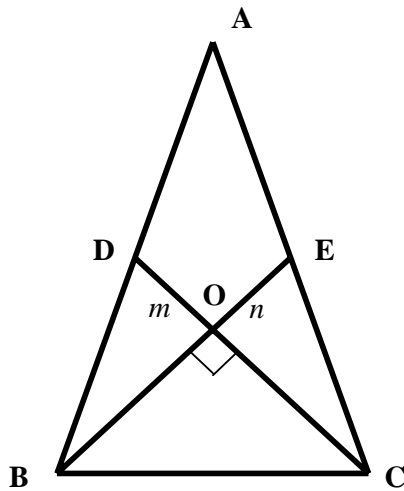
8.1.2 Prove that  $x^2 = p.z$ . (2)

8.1.3 Prove that  $\triangle BDC \sim \triangle ABC$ . (3)

8.1.4 Show that  $y^2 = q.z$ . (2)

8.1.5 Use the results in QUESTION 8.1.2 and QUESTION 8.1.4 to prove Pythagoras' theorem. (2)

8.2 In the figure below D and E are the midpoints of AB and AC respectively. DC is perpendicular to BE at point O. Further,  $DO:OC = 1:2$  and  $EO:OB = 1:2$ . Let  $DO = m$  and  $OE = n$ .



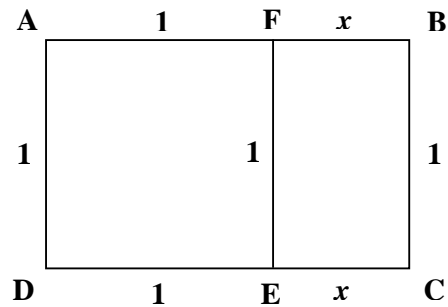
8.2.1 Calculate  $AB^2$  and  $AC^2$  in terms of  $m$  and  $n$ . (5)

8.2.2 Hence prove that  $AB^2 + AC^2 = 5BC^2$ . (5)

[22]

**QUESTION 9**

In the diagram below rectangle BCEF is similar to rectangle ABCD. A square is cut off from rectangle ABCD to leave rectangle BCEF. It is given that  $AB = 1$  unit and  $FB = x$  units.



9.1 Calculate the value of  $x$  correct to TWO decimal places. (5)

9.2 Hence state the ratio of the width to the length of rectangle ABCD. (1)  
[6]

**TOTAL: 100**

**INFORMATION SHEET: MATHEMATICS**  
**INLIGTINGSBLAD: WISKUNDE**

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

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

$$\sum_{i=1}^n 1 = n$$

$$\sum_{i=1}^n (a + (i-1)d) = \frac{n}{2}(2a + (n-1)d)$$

$$\sum_{i=1}^n ar^{i-1} = \frac{a(r^n - 1)}{r - 1} ; \quad r \neq 1$$

$$F = \frac{x[(1+i)^n - 1]}{i}$$

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$y = mx + c$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$(x-a)^2 + (y-b)^2 = r^2$$

In  $\triangle ABC$ :

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cdot \cos A$$

$$\text{area } \triangle ABC = \frac{1}{2} ab \cdot \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

$$\cos(\alpha + \beta) = \cos \alpha \cdot \cos \beta - \sin \alpha \cdot \sin \beta$$

$$\cos(\alpha - \beta) = \cos \alpha \cdot \cos \beta + \sin \alpha \cdot \sin \beta$$

$$\cos 2\alpha = \begin{cases} \cos^2 \alpha - \sin^2 \alpha \\ 1 - 2\sin^2 \alpha \\ 2\cos^2 \alpha - 1 \end{cases}$$

$$\sin 2\alpha = 2 \sin \alpha \cdot \cos \alpha$$

$$\bar{x} = \frac{\sum fx}{n}$$

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$