Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2011

MATHEMATICS P3

MARKS: 100

TIME: 2 hours

This question paper consists of 10 pages, including a formula-sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of NINE questions. Answer ALL the questions.

2. Show clearly ALL calculations, diagrams, graphs, and et cetera 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

1.1 Two events, A and B, are independent events. If P(A) = 0,8 and P(A and B) = 0,2 determine P(B). (2)

1.2 Two events, A and B are mutually exclusive events. Complete the following probability rules for mutually exclusive events:

1.2.1 P(A and B) = … (1)

1.2.2 P(A or B) = … (1)

1.3 The probability that the 100 m final for men in the Olympic Games is won by a Jamaican (J) is 0,6. The probability that it is won by an American (A) is 0,3. The probability that the race is won by neither a Jamaican nor an American is 0,2.

1.3.1 Draw a Venn-diagram to represent the above probabilities. (4)

Determine the probability that the100 m race is:

1.3.2 won by both a Jamaican and an American man, i.e. they cross the line together. (3)

1.3.3 won by either a Jamaican or an American man. (2)

1.3.4 not won by a Jamaican. (2)

[15]

QUESTION 2

According to an article in a newspaper nuclear energy could provide cheaper electricity in a time where electricity is expensive due to the high price of coal. A counter argument for not using nuclear energy is that it could be hazardous towards the environment as well as the inhabitants of where the nuclear plant is located. A survey conducted about the use of nuclear energy amongst 34 girls and 666 boys in one of the high schools in the Karoo District show some of the results, as illustrated in the table below:

	Girls (G)	Boys (B)	Total
Nuclear energy (N)	a	270	300
Not nuclear energy (not N)	4	b	c
Total	34	666	d

2.1 Calculate the values of (a, b, c, and d) in the table. (4)

2.2 Is a person's choice over the use of nuclear energy independent of a person's gender? Support your answer with appropriate calculations. (6)

2.3 If there are 35 000 high school learners in the Karoo District, how many learners will be against the use of nuclear energy if the information in the table is used to make a prediction? (2)

2.4 Is the prediction valid? Give a reason for your answer. (2)

[14]

QUESTION 3

At a certain school, the teachers are in the following ratio: 52% female and 48% male OR 13:12

3.1 Draw a probability tree diagram to calculate the following probabilities: (5)

If three teachers are chosen at random, what is the probability that:

3.2 All three are male? (1)

3.3 All three are female? (1)

3.4 Two are male and one is female? (2)

3.5 Two are female and one is male? (2)

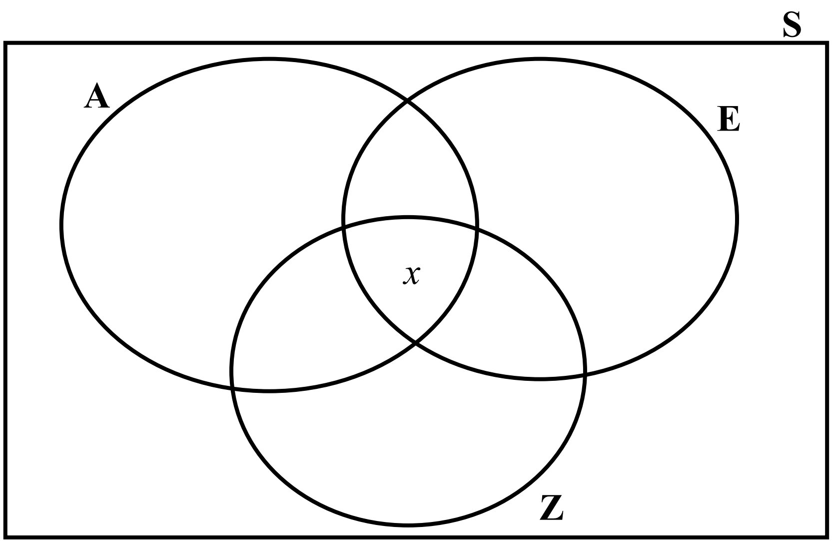
3.6 The first two are male and the last choice is female? (1)

[12]

QUESTION 4

From a group of 80 grade 11 learners, 40 of them can speak Afrikaans(A), 30 can speak English (E) and 30 can speak Zulu (Z), but:

- 10 cannot speak any of the three languages.
- 15 speak both Afrikaans and English.
- 10 speak both Afrikaans and Zulu.
- 10 speak both English and Zulu.
- x number can speak all three languages.



4.1 Use the above information and complete the Venn-diagram on DIAGRAM SHEET 1. (5)

4.2 Calculate the number of learners that can speak all three languages. (3)

4.3 If a learner is randomly selected, determine the probability that the learner can speak Afrikaans and English, but not Zulu. (2)

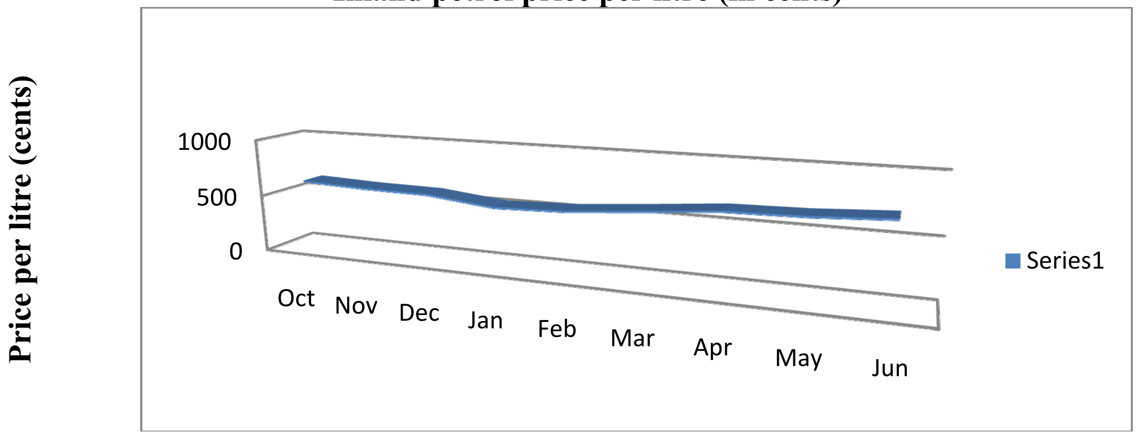
[10]

QUESTION 5

Two graphs below gives the inland petrol price per litre of unleaded petrol for nine months from October 2006 to June 2007.

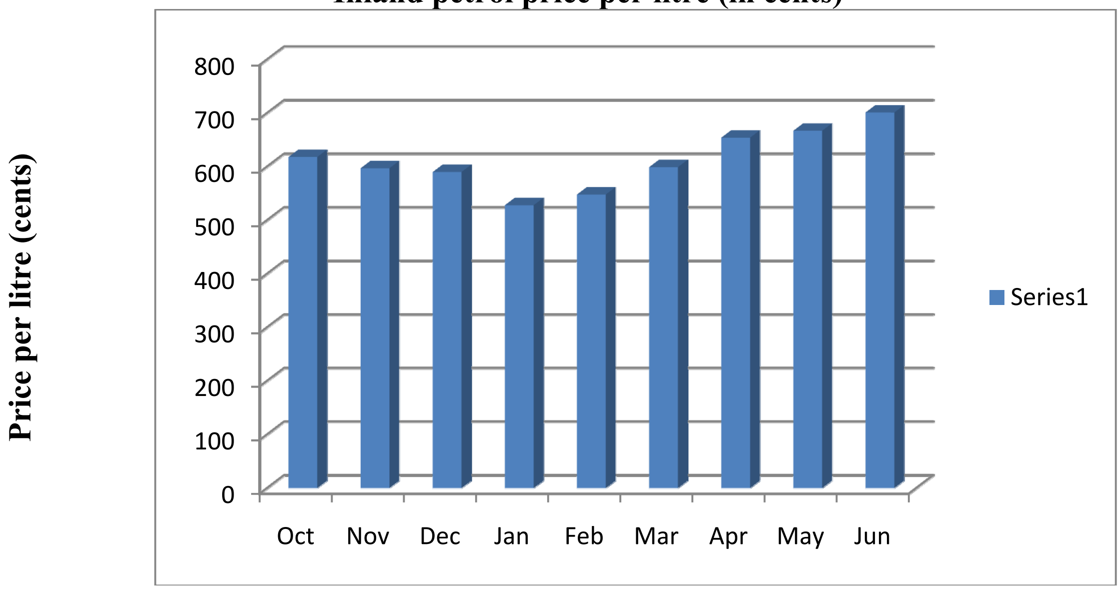
GRAPH A

Inland petrol price per litre (in cents)



GRAPH B

Inland petrol price per litre (in cents)



5.1 Which graph (Graph A or Graph B) do you think displays the information more clearly? What is causing the effect that the one graph is clearer than the other graph? (2)

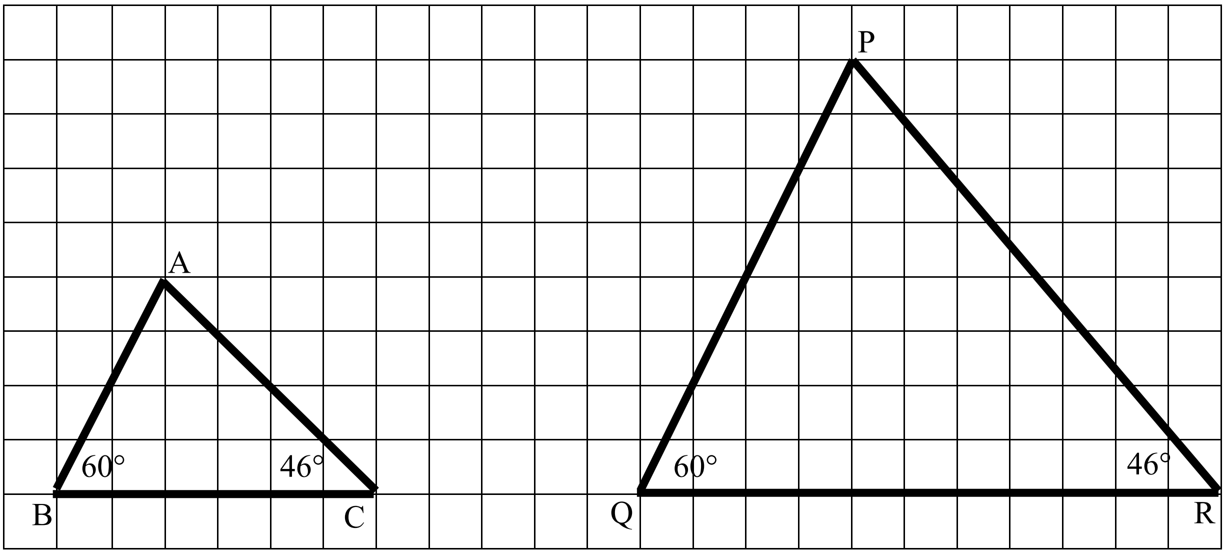
5.2 If you were asked by a television station as an economist to discuss the change in the petrol price, which graph (Graph a or Graph B) would you use in your discussion? Motivate your answer. (2)

5.3 Could you predict the petrol price for July 2007? Why do you think that is the case? (2)

[6]

QUESTION 6

The diagram below shows two triangles ΔABC and ΔPQR. In ΔABC, the length of the base (BC) is 6 units and its height measures 4 units.



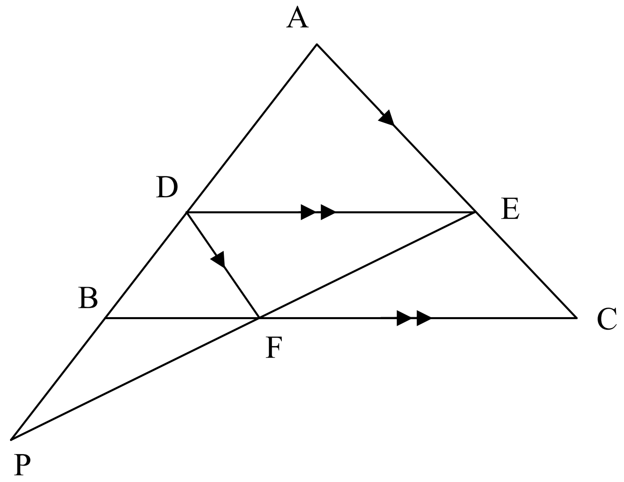
6.1 Are the triangles similar? How do you know? (2)

6.2 ΔPQR is an enlargement of ΔABC with a scale factor of 2. If the area of ΔABC is 12 units^2 then the area of ΔPQR would be … units^2. (2)

[4]

QUESTION 7

In the figure, DE ∥ BC and DF ∥ AC. PFE is a straight line.



7.1 In ΔABC, complete the following, stating reasons:

7.1.1 $\frac{AD}{DB} = \ldots$ (2)

7.1.2 $\frac{BF}{FC} = \ldots$ (2)

7.1.3 Hence, determine the value of $\frac{AE}{EC} \times \frac{BF}{FC}$ (2)

7.1.4 Prove that Δ BDF /// Δ DAE (3)

7.1.5 It is further given that BF = 3 units, DF = 2,1 units and DE = 9 units, determine the following:

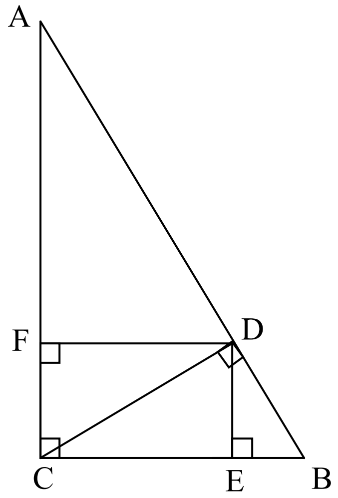
(a) AE (4)

(b) AC (2)

[15]

QUESTION 8

8.1 In ΔABC, $\hat{C} = 90°$ and CD is perpendicular to AB at D. DF is perpendicular to AC at F and DE is perpendicular to BC at E.

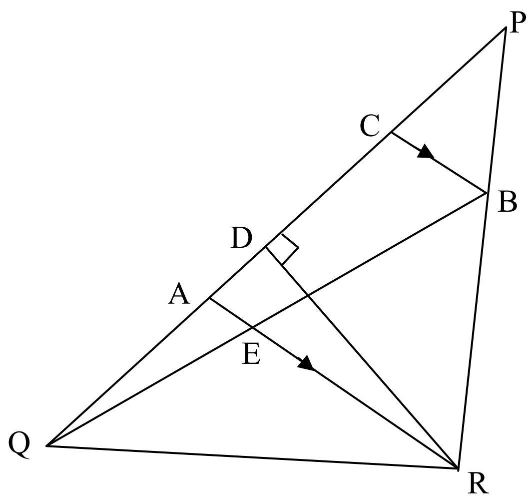


8.1.1 Write down any THREE triangles that are similar to ΔAFD. (3)

8.1.2 If $\Delta ACB /// \Delta ADC$ and $\Delta ACB /// \Delta CDB$ prove that $\frac{BC^2}{AC^2} = \frac{BD}{AD}$ (4)

8.1.3 Hence, if $\Delta ADC ///\ \Delta DEB$ and $\Delta AFD /// \Delta AFD /// \Delta CDB$ also prove that $\frac{EB}{AF} = \frac{BC^3}{AC^3}$. (4)

8.2 In the diagram below, $\frac{PA}{AQ} = \frac{3}{5}$ and $\frac{PB}{BR} = \frac{1}{2}$. BC∥ RA and RD is perpendicular to PQ. AR and BQ intersect at E.



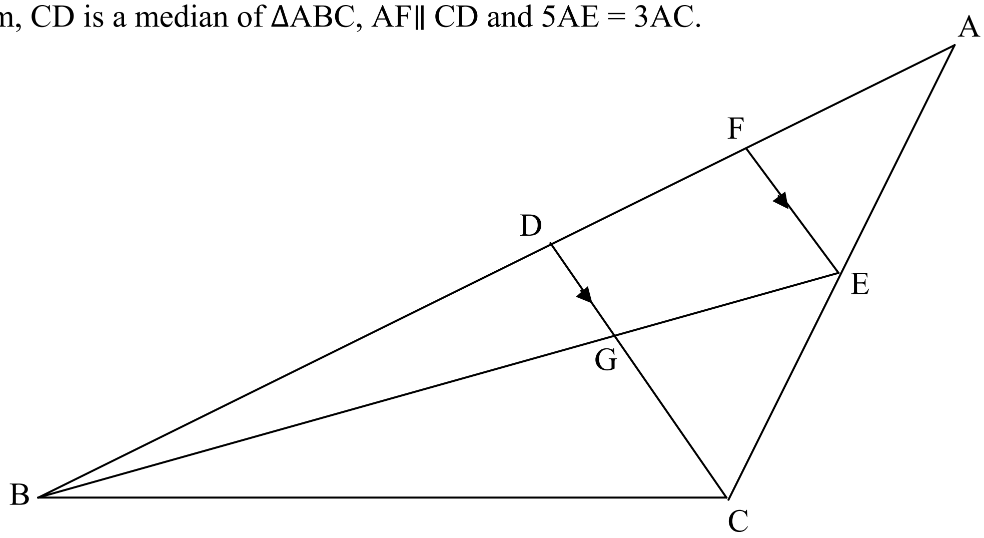
8.2.1 Determine $\frac{area\ \Delta PRA}{area\ \Delta QRA}$ (3)

8.2.2 Show that $\frac{BE}{EQ} = \frac{2}{5}$. (4)

[18]

QUESTION 9

In the diagram, CD is a median of ΔABC, AF∥ CD and 5AE = 3AC.



Determine the following ratios:

9.1 $\dfrac{AF}{FD}$ (1)

9.2 $\dfrac{AF}{FD}$ (1)

9.3 $\dfrac{EG}{GB}$ (1)

9.4 $\dfrac{Area\ \Delta AFE}{Area\ \Delta ADC}$ (3)

[6]

TOTAL: 100

INFORMATION SHEET: MATHEMATICS

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

$A = P(1+ni)$ $\quad$ $A = P(1-ni)$ $\quad$ $A = P(1-i)^n$ $\quad$ $A = P(1+i)^n$

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

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

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

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

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $\quad$ $\mathrm{M}\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$

$y = mx + c$ $\quad$ $y - y_1 = m(x - x_1)$ $\quad$ $m = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad$ $m = \tan\theta$

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

In ΔABC:

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $\quad$ $a^2 = b^2 + c^2 - 2bc.\cos A$ $\quad$ $area\ \Delta ABC = \frac{1}{2}ab.\sin C$

$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta$ $\quad$ $\sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$

$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta$ $\quad$ $\cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$

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

$\bar{x} = \frac{\sum fx}{n}$ $\quad$ $\sigma^2 = \frac{\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}{n}$

$P(A) = \frac{n(A)}{n(S)}$ $\quad$ $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$\hat{y} = a + bx$ $\quad$ $b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$