basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 10

MATHEMATICS P2

NOVEMBER 2015

MARKS: 100

TIME: 2 hours

This question paper consists of 11 pages and a 16-page answer book.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1.   This question paper consists of 9 questions.

2.   Answer ALL the questions in the SPECIAL ANSWER BOOK provided.

3.   Clearly show ALL calculations, diagrams, graphs et cetera that you used to determine the answers.

4.   Answers only will NOT necessarily be awarded full marks.

5.   If necessary, round off answers to TWO decimal places, unless stated otherwise.

6.   Diagrams are NOT necessarily drawn to scale.

7.   You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.

8.   Write neatly and legibly.

QUESTION 1

Nineteen girls were required to complete a puzzle as quickly as possible. Their times (in seconds) were recorded and are shown in the table below.

14	15	16	16	17	17	18	18	19	19
19	20	21	21	22	23	24	24	29	

1.1   Identify the median time taken by the girls to complete the puzzle.   (1)

1.2   Determine the lower and upper quartiles for the data.   (2)

1.3   Draw a box and whisker diagram to represent the data.   (2)

1.4   The five-number summary of the time (in seconds) taken by 19 boys to complete the same puzzle is (15 ; 19 ; 23 ; 26 ; 30).

      1.4.1   Calculate the interquartile range for the time taken by the boys.   (2)

      1.4.2   If only one boy took 19 seconds to complete the puzzle, what percentage of the boys took at least 19 seconds to complete the puzzle?   (1)

1.5   In which group, the girls or the boys, did a larger number of learners complete the puzzle in less than 23 seconds? Justify your answer.   (2)

           [10]

QUESTION 2

The table below shows information about the number of hours 120 learners spent on their cellphones in the last week.

NUMBER OF HOURS (h)	FREQUENCY
$0 < h \leq 2$	10
$2 < h \leq 4$	15
$4 < h \leq 6$	30
$6 < h \leq 8$	35
$8 < h \leq 10$	25
$10 < h \leq 12$	5

2.1   Identify the modal class for the data.   (1)

2.2   Estimate the mean number of hours that these learners spent on their cellphones in the last week.   (3)

           [4]

QUESTION 3

In the diagram, C is a point on the y-axis such that A(0 ; 4), B(4 ; – 4), C and D(– 4 ; 2) are vertices of parallelogram ABCD. K is the point $\left(0 ; -2\frac{1}{4}\right)$ and L is a point on AB such that KL || CB.
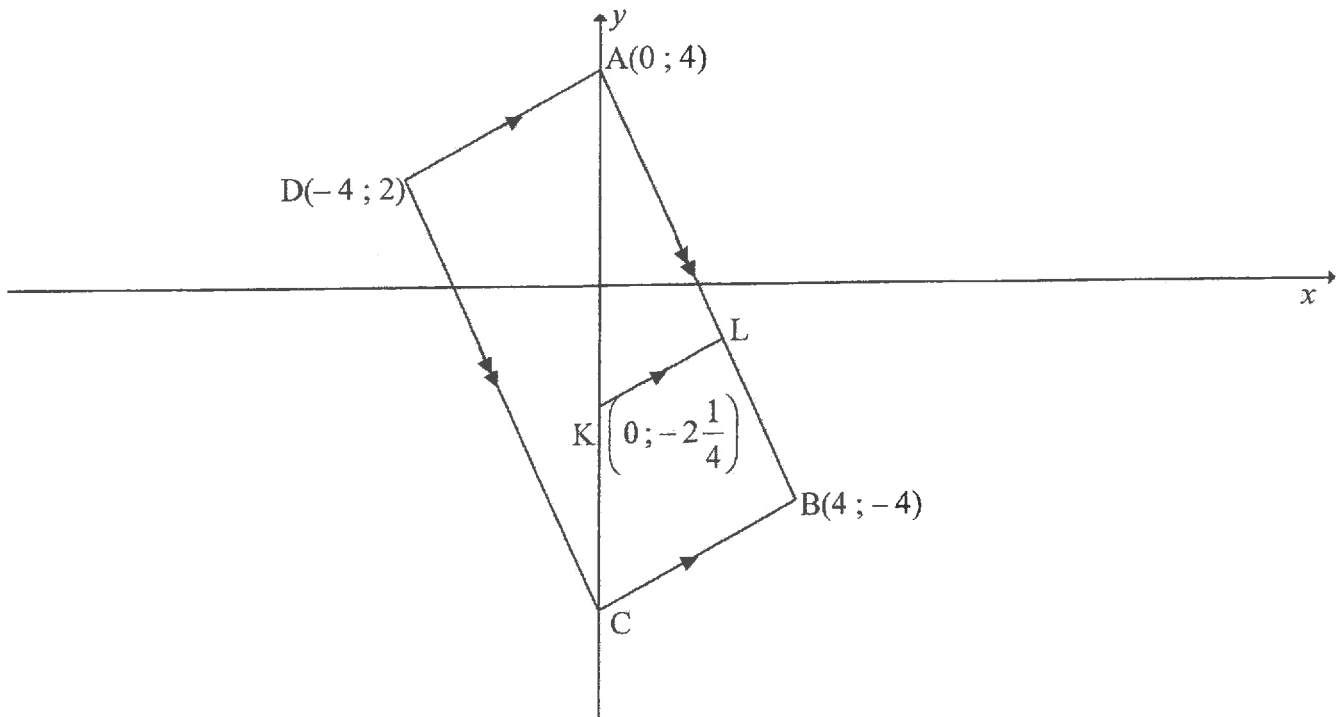

3.1	Calculate the length of diagonal DB.	(3)
3.2	Calculate the coordinates of M, the midpoint of DB.	(3)
3.3	Calculate the gradient of AD.	(3)
3.4	Prove that AD ⊥ AB.	(3)
3.5	Give a reason why parallelogram ABCD is a rectangle.	(1)
3.6	Determine the equation of KL in the form $y = mx + c$.	(2)
3.7	Write down, with reasons, the coordinates of C.	(3)

[18]

QUESTION 4

ΔPQR and ΔSQR are right-angled triangles as shown in the diagram below.
PR $= 26$, PQ $= 24$, QS $= 8$, SR $= 6$, QR $= 10$ and $\hat{PRQ} = \theta$.
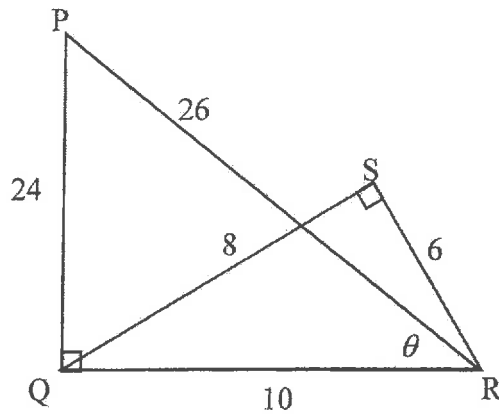
4.1 Refer to the diagram above and, WITHOUT using a calculator, write down the value of:
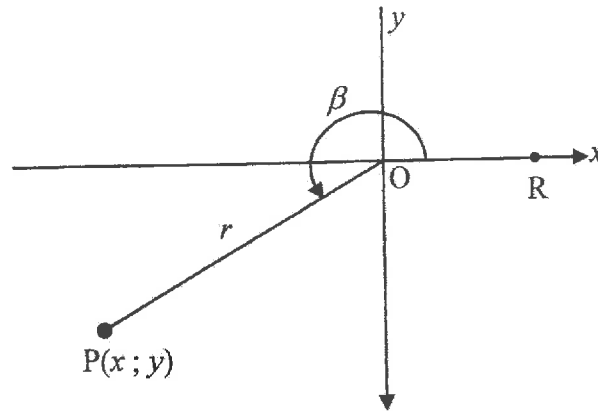
4.1.1 $\tan \hat{P}$ (1)

4.1.2 $\sin \hat{SQR}$ (1)

4.1.3 $\cos \theta$ (1)

4.1.4 $\sec \hat{SRQ}$ (1)

4.2 WITHOUT using a calculator, determine the value of $\dfrac{\cot \theta}{\operatorname{cosec} \hat{QRS}}$. (3)

[7]

EASTERN CAPE

QUESTION 5

5.1 In the diagram below, P(x ; y) is a point in the third quadrant. $\hat{ROP} = \beta$ and $17\cos\beta + 15 = 0$.


5.1.1 Write down the values of x, y and r. (4)

5.1.2 WITHOUT using a calculator, determine the value of:

(a) $\sin\beta$ (1)

(b) $\cos^2 30°.\tan\beta$ (3)

5.1.3 Calculate the size of $\hat{ROP}$ correct to TWO decimal places. (2)

5.2 In each of the following equations, solve for x where $0° \leq x \leq 90°$. Give your answers correct to TWO decimal places.

5.2.1 $\tan x = 2,22$ (2)

5.2.2 $\sec(x + 10°) = 5,759$ (3)

5.2.3 $\dfrac{\sin x}{0,2} - 2 = 1,24$ (3)

[18]

QUESTION 6

In the diagram below, the graph of $f(x) = -2\cos x$ is drawn for the interval $0° \leq x \leq 360°$.
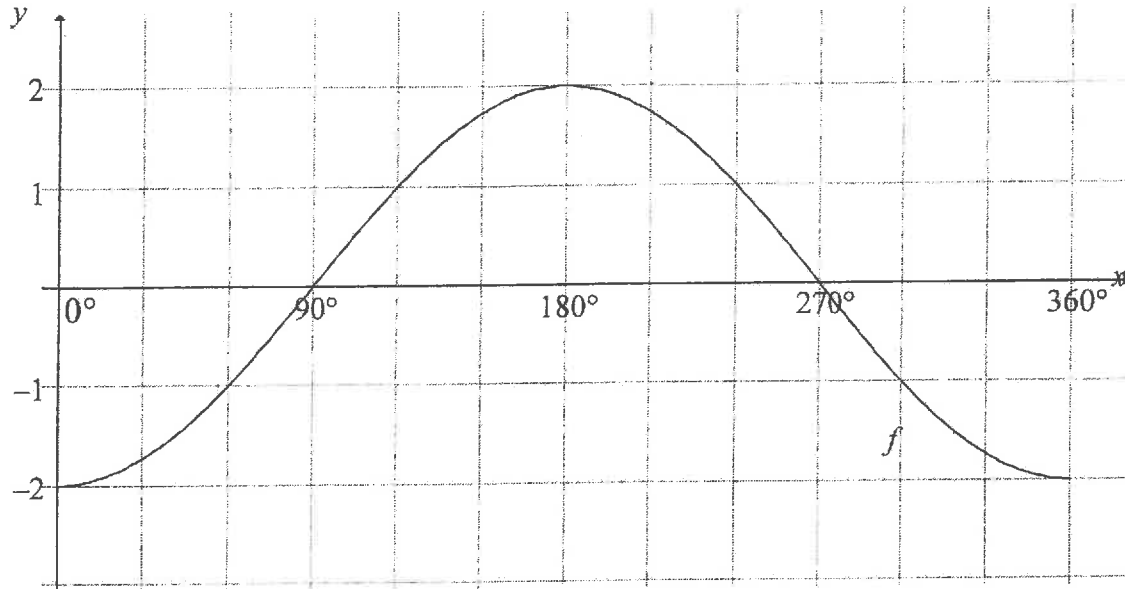
6.1   Write down the amplitude of f.   (1)

6.2   Write down the minimum value of $f(x) + 3$.   (1)

6.3   On the same system of axes, draw the graph of g, where $g(x) = \sin x + 1$ for the
       interval $0° \leq x \leq 360°$.   (3)

6.4   Use the graphs to determine the following:

       6.4.1   The value of $f(180°) - g(180°)$ (2)

       6.4.2   For which value(s) of x will $f(x).g(x) > 0$ (2)

6.5   The graph of f is reflected about the x-axis and then moved 3 units downwards to
       form the graph of h. Determine:

       6.5.1   The equation of h (2)

       6.5.2   The range of h for the interval $0° \leq x \leq 360°$.   (2)

                                                                                                                                     [13]

QUESTION 7

A concrete gate post comprises a right rectangular prism having a square base and a pyramid at the top, as shown in the diagram below. The length of the sides of the base is 30 cm and the height of the rectangular section is 150 cm. The perpendicular height of the pyramid section is 8 cm.
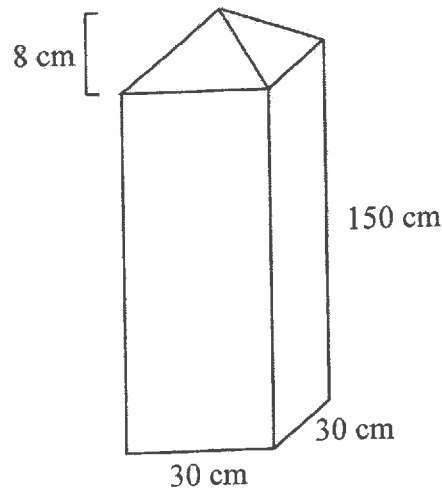
Volume of a pyramid $= \dfrac{1}{3}$ area of the base $\times$ height

Total surface area of a pyramid $=$ area of the base $+ \dfrac{1}{2}$ (perimeter of the base $\times$ slant height)

7.1	Calculate the volume of concrete required to make ONE post.	(3)
7.2	Calculate the surface area of the pyramid section of the post.	(3)
7.3	If the length of the sides of the base is halved, how many posts, having the same design as the original, can be made with the same volume of concrete as the original post?	(2)
		[8]

Give reasons for your statements in QUESTIONS 8 and 9.

QUESTION 8

In the diagram, ABCD is a rhombus having diagonals AC and BD intersecting in O. $A\hat{D}O = 36,87°$ and $DO = 8$ cm.
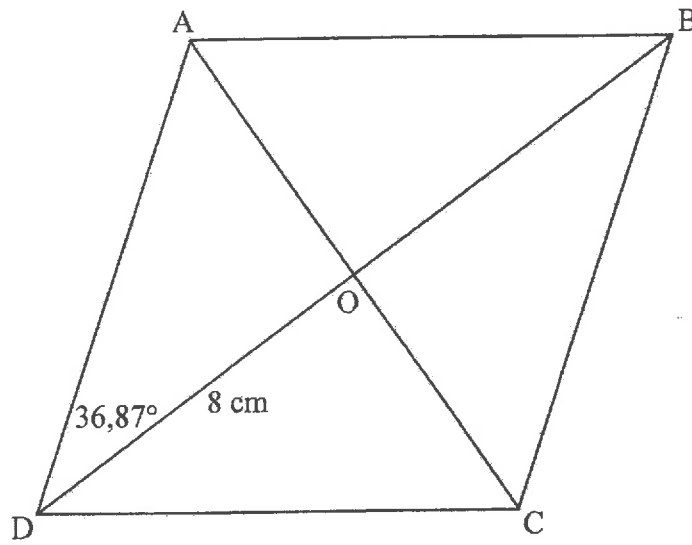
8.1   Write down the sizes of the following angles:

      8.1.1 $C\hat{D}O$ (1)

      8.1.2 $A\hat{O}D$ (1)

8.2   Calculate the length of AO.   (2)

8.3   If E is a point on AB such that OE ‖ DA, calculate the length of OE.   (4)

   **[8]**

QUESTION 9

9.1   In the diagram below, D is the midpoint of side AB of △ABC. E is the midpoint of AC. DE is produced to F such that DE = EF. CF || BA.
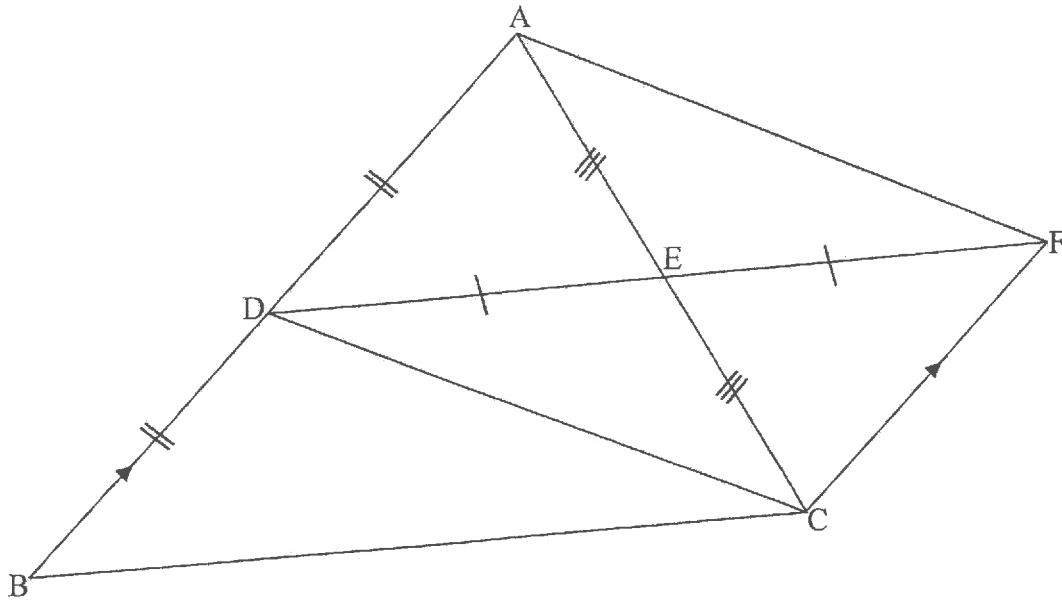
9.1.1   Write down a reason why △ADE ≡ △CFE.   (1)

9.1.2   Write down a reason why DBCF is a parallelogram.   (1)

9.1.3   Hence, prove the theorem which states that $DE = \frac{1}{2}BC$.   (2)

9.2 In the diagram below, PQRS is a parallelogram having diagonals PR and QS intersecting in M. B is a point on PQ such that SBA and RQA are straight lines and SB = BA. SA cuts PR in C and PA is drawn.
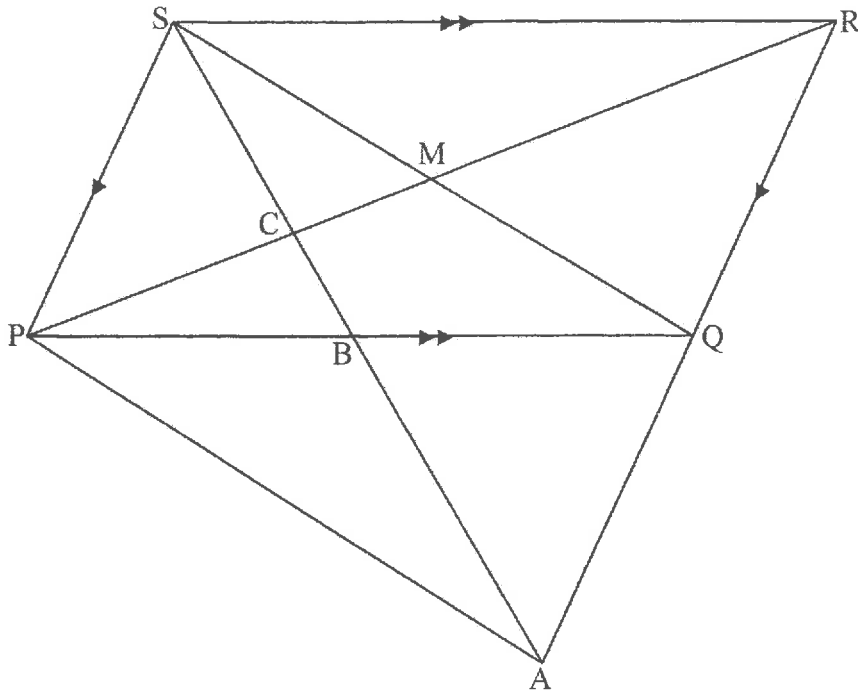
9.2.1 Prove that SP = QA. (4)

9.2.2 Prove that SPAQ is a parallelogram. (2)

9.2.3 Prove that AR = 4MB. (4)

[14]

TOTAL: 100