



GRADE 10
MATHEMATICS
PAPER 2

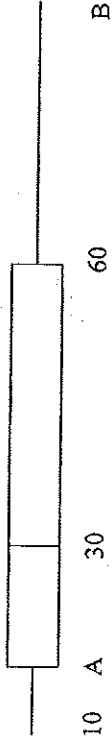
Time : 2 hours
Marks : 100
Date : November 2014
Examiner : CLM

INSTRUCTIONS

1. Illegible work, in the opinion of the marker, will earn zero marks.
2. Number your answers clearly and accurately.
3. **NE** Please use the attached diagram sheets where applicable.
STAPLE your submission in numerical order with the question paper at the back.
4. Employ relevant formulae and show all working out; answers alone may not be awarded full marks.
5. Non-programmable and non-graphical calculators may be used, unless their use is specifically prohibited.
6. Round off answers to 2 decimal places, where necessary, unless instructed otherwise.
7. Provide reasons for all geometric statements, unless otherwise instructed.
8. Note that drawings are not drawn to scale, unless stated.
9. Start each question on a new page.
10. Leave two lines open between each answer.

QUESTION 1 (6 marks)

1. The box and whisker diagram, with values as shown, for a grade 10 class of maths test results out of a 100 is drawn below:



- 1.1 For the data, determine:
- 1.1.1 The median (1)
 - 1.1.2 The highest test result, if the range is 80 (1)
 - 1.1.3 Q_1 , if the interquartile range is 44 (1)
- 1.2 What percentage of the data lies between the median and Q_3 (1)
- 1.3 Comment on whether you think the class who these results belong to is a strong mathematical class or not; justify your comment. (2) [6]

QUESTION 2 (6 marks)

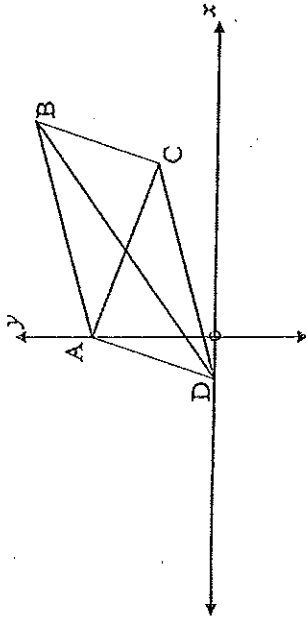
For the data given below:

x	frequency
$10 < x \leq 20$	2
$20 < x \leq 30$	5
$30 < x \leq 40$	8
$40 < x \leq 50$	6
$50 < x \leq 60$	3
$60 < x \leq 70$	1

- 2.1. What is the modal interval (1)
- 2.2.1 What position does the median hold in the data represented. (1)
- 2.2.2 Hence, state what interval the median falls into. (1)
- 2.3 Estimate the mean (3) [6]

QUESTION 4 (18 marks)

4. Consider the following quadrilateral $ABCD$, with coordinates $A(0; 4)$; $B(9; 7)$; $C(7; 3)$; $D(-2; 0)$ given. Diagonals AC and BD are drawn.



- 4.1 Determine the midpoints of:
 4.1.1 DB (2)
 4.1.2 AC (1)
- 4.2 Hence give a reason why $ABCD$ is, in fact, a parallelogram. (1)
- 4.3 If the point of intersection of the diagonals is called E , what name can be given to the line BE in $\triangle ABC$? (1)
- 4.4 If K is a point on the cartesian plane so that BK is perpendicular to the line BC , find the equation of the line BK (4)
- 4.5 Points B , C and $G(x; -4)$ are collinear; calculate the value of x . (4)
- 4.6 Point C is equidistant from B and $F(9; y)$, where $y < 0$; calculate the value of y , given that the distance of $BC = \sqrt{20}$. (5) [18]

QUESTION 3 (4 marks)

The following data values have a mean of 30; calculate the value of x :

$$2x; 3x - 3; 1 - x; 5x - 2; x; -2x$$

[4]

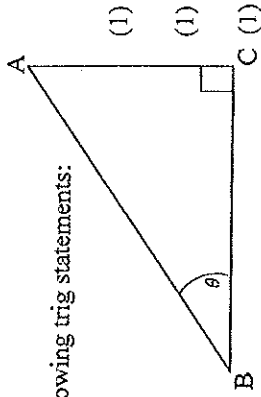
QUESTION 5 (11 marks)

5.1 Use the diagram to complete the following trig statements:

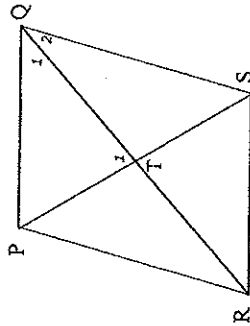
5.1.1 $\sin \theta = \frac{AC}{(\quad)}$ (1)

5.1.2 $\cos \theta = \frac{AC}{BC}$ (1)

5.1.3 $\cos(90^\circ - \theta) = \frac{(\quad)}{AB}$ (1)



5.2 PQRS is a rhombus with diagonals intersecting at T. $Q_1 = 36^\circ$ and $QR = 96\text{mm}$.



Without giving geometric reasons, determine:

5.2.1 Q_2 (1)

5.2.2 QT (1)

5.2.3 T_1 (1)

5.2.4 the perimeter of PQRS (3)

5.3 Given that $x = 25^\circ$ and $y = 5^\circ$ calculate, leaving your answer in decimal form:

5.3.1 $-\cos^2(x - y)$ (1)

5.3.2 $(-\cos(x - y))^2$ (1) [11]

QUESTION 6 (8 marks)

6.1 Sketch the special diagram/s used to evaluate, without the use of a calculator, the trigonometric ratios of 30° , 45° , 60° , 0° and 90° angles. (3)

6.2 Hence, without using a calculator, simplify the following, leaving your answer in surd form, if necessary:

6.2.1 $\sin 45^\circ$ (1)

6.2.2 $\tan 90^\circ$ (1)

6.2.3 $\sin 30^\circ$ (1)

6.2.4 $\cos 60^\circ$ (1)

6.2.5 $\cos 0^\circ$ (1) [8]

QUESTION 7 (9 marks)

7.1 If $2\tan \theta + 1 = 0$ and $90^\circ < \theta < 270^\circ$,

7.1.1 Draw a diagram, in the correct quadrant, to represent this information, clearly indicating θ , x , y and r on the diagram. (3)

7.1.2 Hence, determine $\cos \theta$ without a calculator. (1)

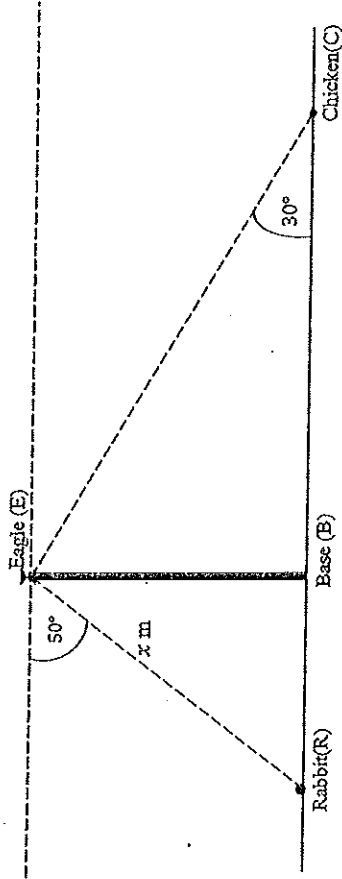
7.2 Solve for the variable x in the following equations:

7.2.1 $\frac{\sin x}{2} = \frac{\sin 18^\circ}{3}$ where $x \in (0^\circ; 90^\circ)$ (2)

7.2.2 $4^2 + 3^2 - 2 \cdot 4 \cdot 3 \cos(2x + 10^\circ) = 2^2$ where $(2x + 10^\circ) \in (0^\circ; 90^\circ)$ (3) [9]

QUESTION 8 (9 marks)

An eagle is surveying his hunting area, from a perch above the ground. To the left, he sees a rabbit, x m away and to the right, he sees a chicken. The angle of depression to the rabbit from the eagle is 50° . The angle of elevation from the chicken to the eagle is 30° . The rabbit and the chicken are 80m apart. $RC \perp BE$



8.1 State, with reason the size of $\angle ERB$. (1)

8.2 Determine the distance (RB) the rabbit is from the base of the eagle's perch in terms of x and a trigonometric ratio of 50° . (2)

8.3 Hence, write down an expression for the distance (CB) the chicken is from the base of the eagle's perch, in terms of x and a trigonometric ratio of 50° . (1)

8.4 Show that the distance the chicken is from the eagle (CE) is given by the following expression: (3)

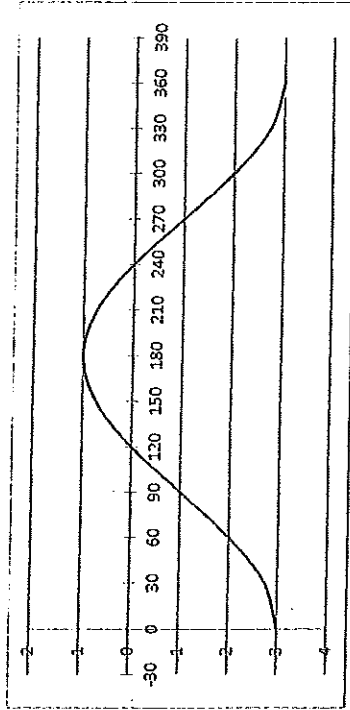
$$CE = \frac{80 - x \cos 50^\circ}{\cos 30^\circ}$$

8.5 If $x = 40$ m, calculate how far the chicken is from the eagle (CE), in meters. (2) [9]

QUESTION 9 (7marks)

9.1 On the given set of axes, sketch a neat graph of $f(x) = \tan x - 1$ for $x \in [0^\circ; 180^\circ]$, and label all relevant points (4)

9.2 The following function $g(x) = a \cos x - b$ is represented below:



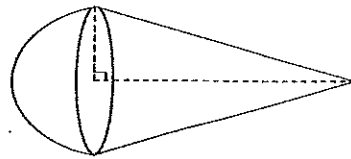
9.2.1 State the value of:

9.2.1.1 a (1)

9.2.1.2 b (1)

9.2.2 If $g(x)$ is shifted up by 3 units to become $h(x)$ write down the equation of $h(x)$ in the form $h(x) =$ (1) [7]

QUESTION 10 (7 marks)



The accompanying diagram shows a 3 dimensional shape, made up of a hemisphere with a radius of 5cm, and a cone with a perpendicular height of 7cm.

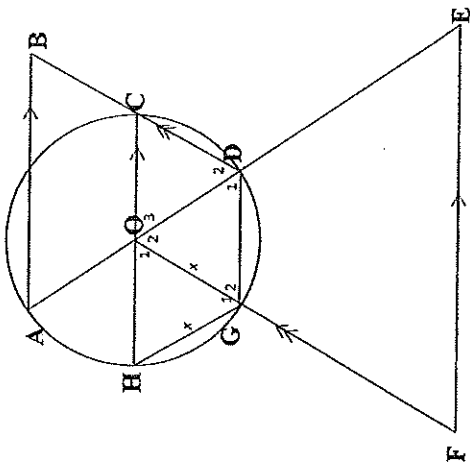
For this solid, calculate the:

10.1 volume (3)

10.2 total surface area (4) [7]

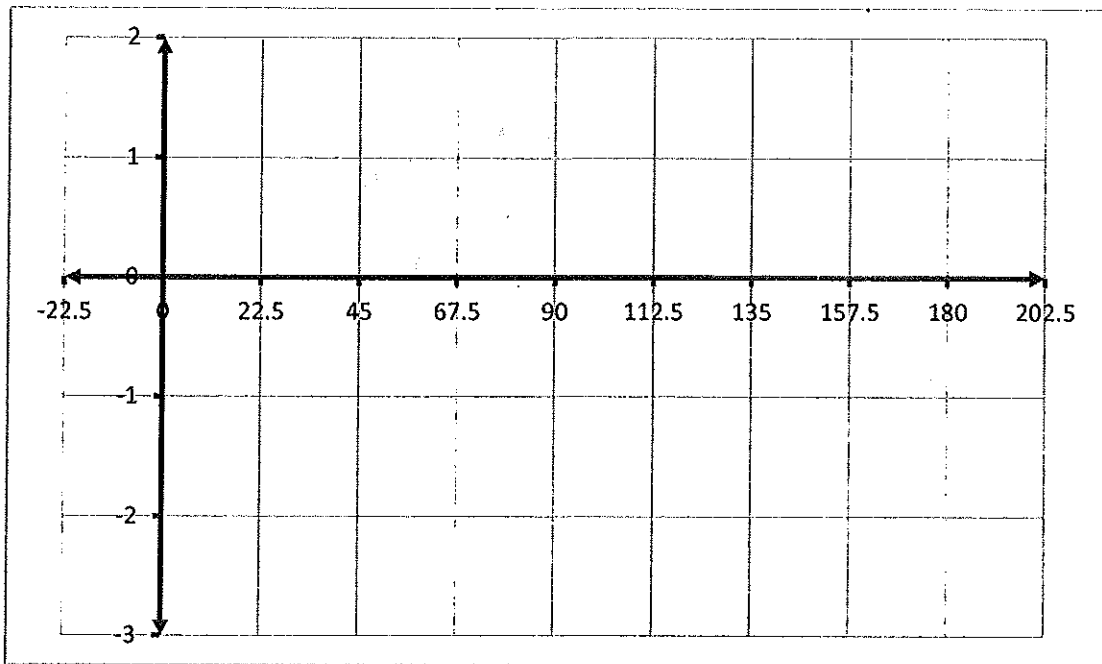
QUESTION 11 (15 marks)

In the following diagram, O is the centre of the circle, $\widehat{O_1} = \widehat{O_2} = \widehat{O_3}$, $OG = HG = x$, $OF \parallel CD$, and $AB \parallel HC \parallel FE$



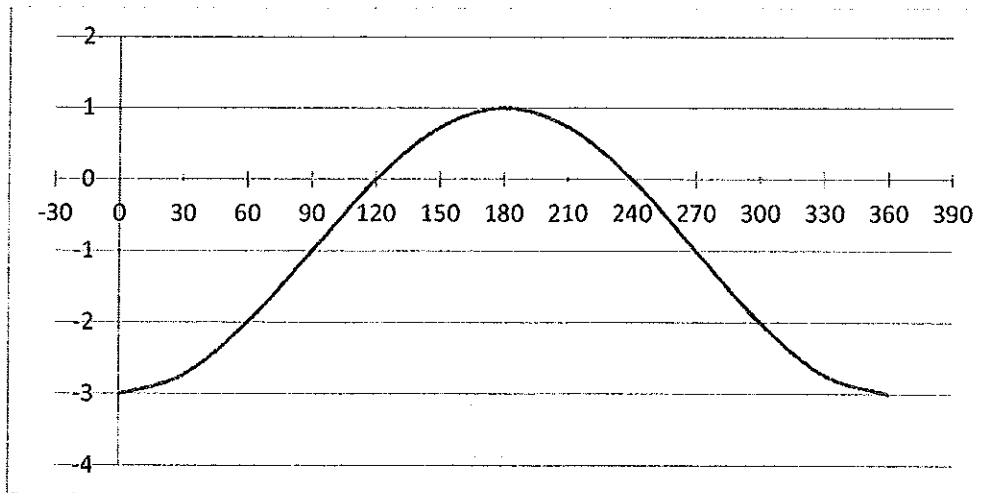
- 11.1 Prove that:
- 11.1.1 $\triangle GOH \cong \triangle DOC$ (4)
 - 11.1.2 Hence, prove that $OCDG$ is a parallelogram (4)
- 11.2 Using the given information:
- 11.2.1 Prove that $\triangle CGD \parallel \triangle OFE$ (3)
 - 11.2.2 Hence, if $FG = 2x$, and $OE = 24$ units, determine the length of OD (2)
- 11.3 Determine the length of AB in terms of x (2) [15]

9.1



(4)

9.2 The following function $g(x) = a \cos x - b$ is represented below:

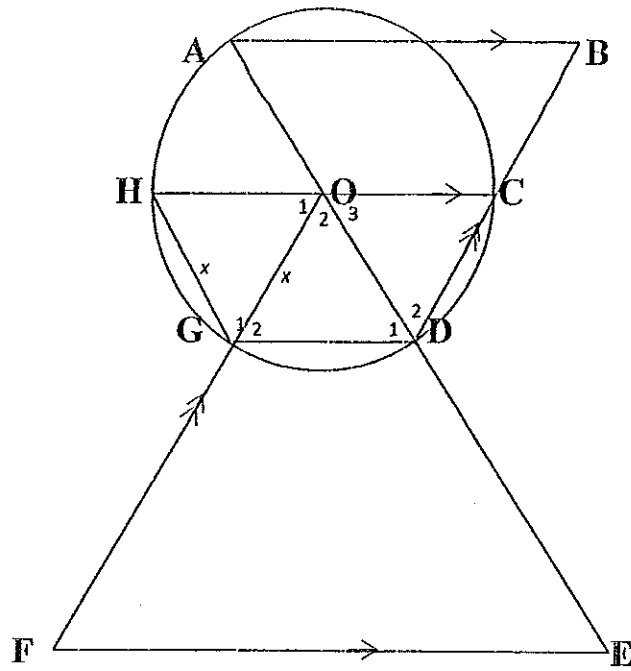


9.2.1.1 _____ (1)

9.2.1.2 _____ (1)

9.2.2 _____ (1)

QUESTION 11



11.1.1 _____

(4)

11.1.2 _____

(4)

11.2.1 _____

(3)

11.2.2 _____

(2)

11.3 _____

(2)