Name and Surname : ....

Teacher : ....

Hudson Park High School

GRADE 10
MATHEMATICS
Paper 2

Time : 2 hours   Date : 8 November 2012

Marks : 100   Examiner : SLT
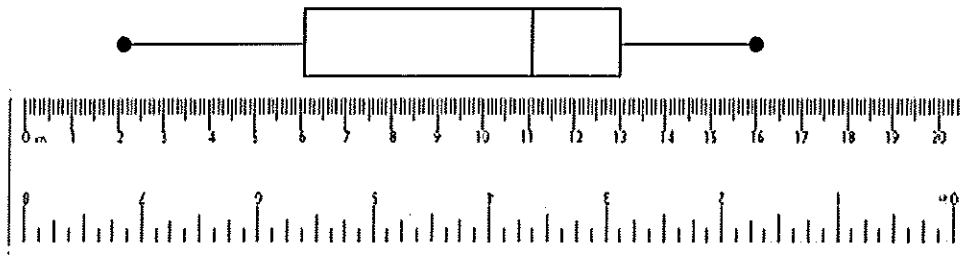
INSTRUCTIONS

1.   Illegible work, in the opinion of the marker, will earn zero marks.

2.   Number your answers clearly and accurately.

3. **NB**   **Start each question at the top of a new side of a page.**

4.1.   Fill in the details requested at the top of this page (of the question paper).

4.2.   Detach the answer page from the question paper.

4.3. **NB**   **Staple your foolscap answers and answer page in the correct order.**

4.4. **NB**   Hand in your answers and question paper **separately**.

5.   Employ relevant formulae and show all working out. Answers alone may not be awarded full marks.

6.   (Non programmable and non graphical) Calculators may be used, unless their usage is specifically prohibited.

7.   Round off answers to 2 decimal places, where necessary, unless instructed otherwise.

QUESTION 1 [12 marks]

1.1.   The box and whisker diagram for a certain set of data, is drawn below :

For the data, determine the :

1.1.1.   range   1

1.1.2.   interquartile range   1

1.1.3.   median   1

1.1.4.   percentage of the data that lies between 11 and 13.   1   (4)

1.2.   For the following data :

x	20	21	22	23	24	25
Frequency	30	44	50	60	21	6

determine the :

1.2.1.   modal value   1

1.2.2.1.   position of the median   1
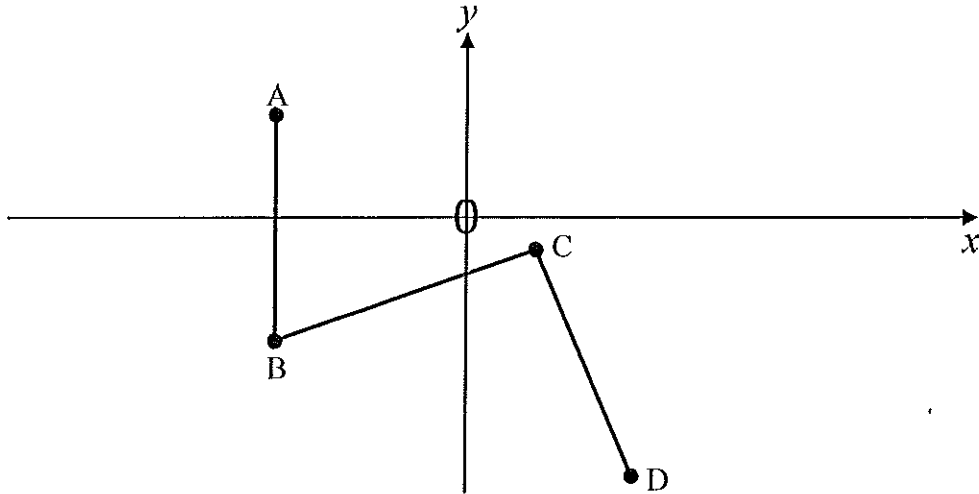
1.2.2.2.   median   1   2   (3)

1.3.   For the data given below :

x	$10 < x \leq 20$	$20 < x \leq 30$	$30 < x \leq 40$
Frequency	15	20	14

1.3.1.   Estimate the mean   3

1.3.2.1   State the position of the 7th decile   1

1.3.2.2.   Write down the interval in which the 7th decile will lie.   1   2   (5)

QUESTION 2 [10 marks]

2.   In the diagram below, A$(-5; 3)$, B$(-5; -4)$, C$(2; -1)$ and D$(5; -8)$:

2.1.   Determine the equations of the lines through :

2.1.1.   B and C $\underline{3}$

2.1.2.   A and B $\underline{1}$ (4)

2.2.   State the gradient of any line parallel to BC.   (1)

2.3.   Prove that :   B$\hat{C}$D $= 90°$ (3)

2.4.   Write down the coordinates of E, if AECB is a parallelogram.   (2)

QUESTION 3 [13 marks]

3.1.   If A$(x; -3)$, B$(-1; 1)$ and C$(3; 7)$ are collinear, calculate the
           value of x .   (4)

3.2.   If P$(-2; y)$ is the midpoint of the line segment QR, where Q$(3; -4)$
           and R$(x; -8)$, calculate the values of :

3.2.1. y $\underline{1}$

3.2.2. x $\underline{2}$ (3)

3.3.   If A$(4; 5)$ is equidistant from B$(x; 1)$ and C$(8; -2)$, calculate
           the value(s) of x .   (6)
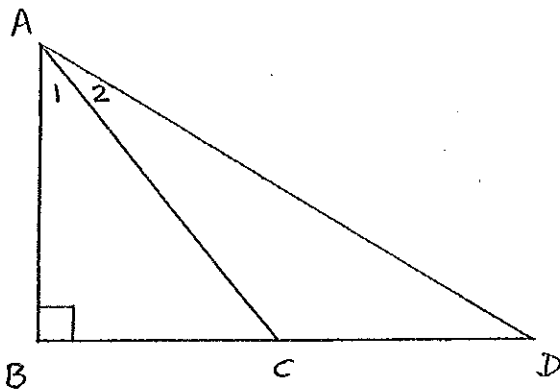
QUESTION 4 [9 marks]

CALCULATORS MAY NOT BE USED IN THIS QUESTION

4.1.   Given : $5 \sin \theta + 4 = 0$ and $\tan \theta > 0$.

4.1.1.   Draw a diagram, in the correct quadrant, representing the given
          information. ALL relevant values must be shown.   3

4.1.2.   Now, use your diagram to determine : $\cos \theta$.   1   (4)

4.2.   If : $\cos 20° = k$, where $0 < k < 1$, use a diagram to
        determine : $\tan 70°$.   (3)

4.3.1.   Sketch the special diagram used to evaluate trigonometric
          ratios of 30°.   1

4.3.2.   Now, use (4.3.1.) to determine : $\sin 30°$.   1   (2)

QUESTION 5 [10 marks]

5.1.   In the diagram, AB = 9, AD = 13, BC = 7 and AB $\perp$ BD :

Calculate :

5.1.1. $\hat{A}_1$ 2

5.1.2. $\hat{A}_2$ 3   (5)

5.2.   ABCD is a rhombus with AC = 24 and $\widehat{A}_1 = 50°$:

5.2.1.   Write down, without giving reasons, the sizes of :

5.2.1.1. $\widehat{C}_1$ 1

5.2.1.2. $\widehat{O}_1$ 1   2

5.2.2.   Calculate, giving reasons, the length of AB.   3   (5)
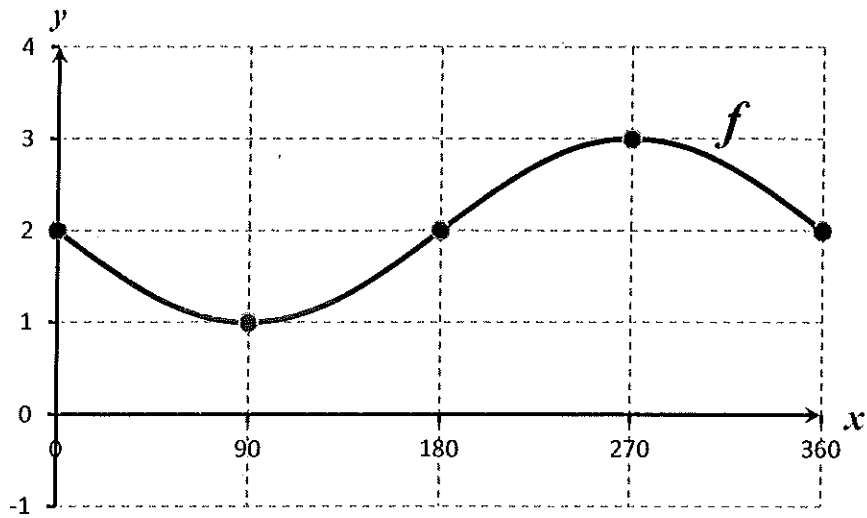

QUESTION 6 [7 marks]

6.1.   If $x = 38°$, evaluate : $\dfrac{\sin^2 x}{\tan x - 2\cos x}$ (2)

6.2.   Solve for x :

6.2.1. $9^2 = 8^2 + 7^2 - 2.8.7.\cos x$ ($x \in [0°; 90°]$)   2

6.2.2. $\tan 3x + 2 = 4\sin 75°$ ($3x \in [0°; 90°]$)   3   (5)

QUESTION 7 [6 marks]

7.1.   Sketched below is the graph of $f : x \rightarrow a \sin x - q$:

Write down the values of :

7.1.1. a $\underline{1}$
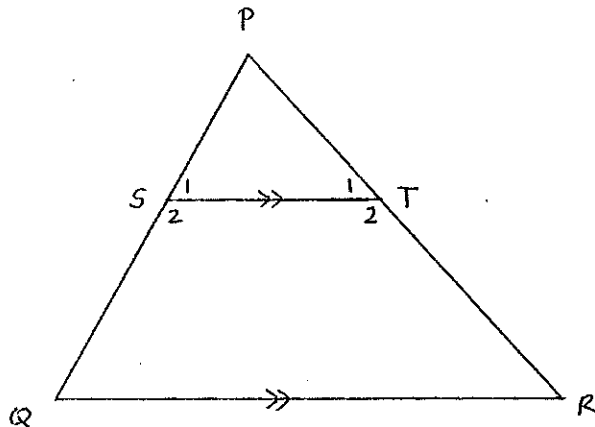
7.1.2. q $\underline{1}$ (2)

7.2.   **USE THE ANSWER SHEET PROVIDED**

On the given set of axes, sketch a neat graph of

$$g(x) = -\tan x + 1$$

for $x \in [0°; 360°]$. Show all relevant details.   (4)
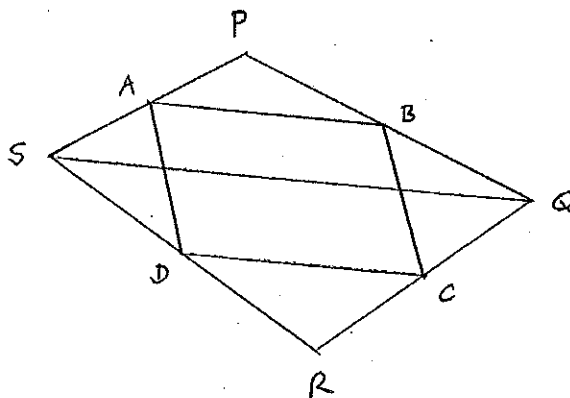
QUESTION 8 [6 marks]

8.   In the diagram below, ST // QR :

8.1.   Complete :   Δ PST /// Δ ………..   (1)

8.2.   Prove the statement in (8.1.)   (3)

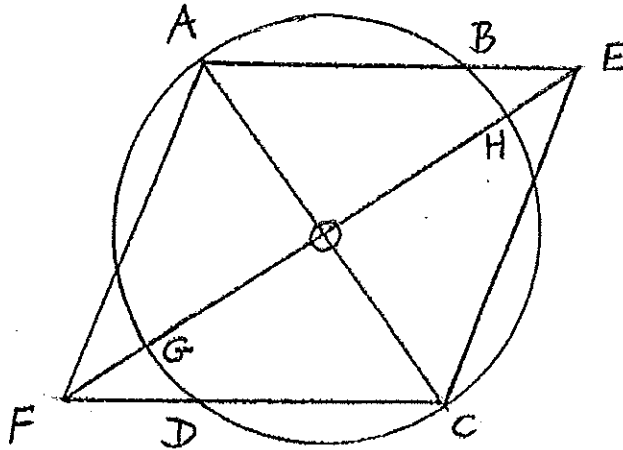8.3.   Hence, if PS = 2, SQ = 10 and ST = 3, calculate QR.   (2)

QUESTION 9 [3 marks]

9.   A, B, C and D are the midpoints of SP, PQ, QR and RS, respectively. SQ is drawn.

Prove that : AB // CD.   (3)
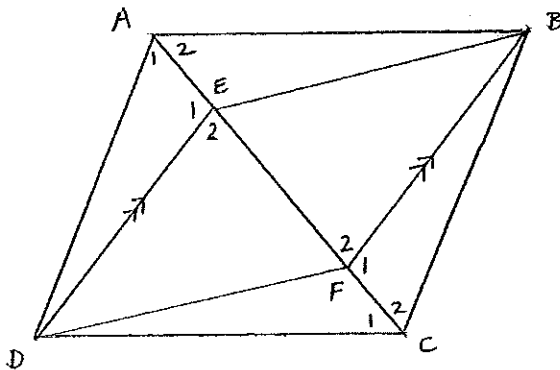
QUESTION 10 [12 marks]

10.1. O is the centre of the circle and FG = HE.

Prove that AECF is a parallelogram. (3)

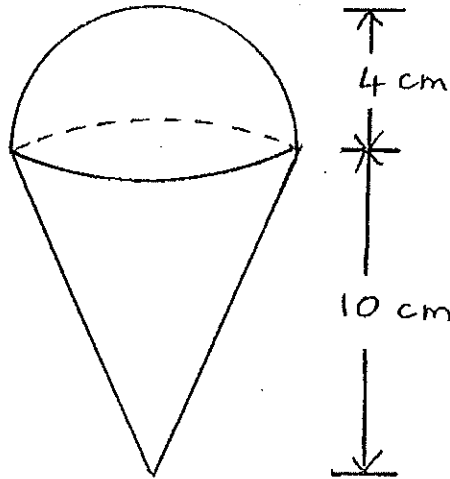10.2. ABCD is a parallelogram. Let : $\widehat{E}_1 = x$.

Prove that :

10.2.1. $\widehat{E}_1 = \widehat{F}_1$ <u>3</u>

10.2.2. $\triangle$ AED $\equiv$ $\triangle$ CFB <u>4</u>

10.2.3. DEBF is a parallelogram. <u>2</u> (9)

QUESTION 11 [12 marks]
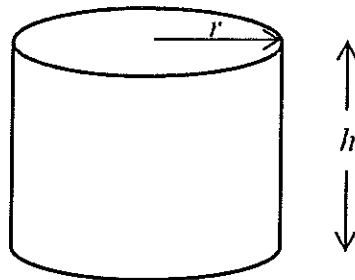
11.1.   The solid shown below, consists of a hemisphere placed on a cone :

For this solid, calculate the :

11.1.1.   volume   <u>3</u>

11.1.2.   total surface area.   <u>4</u>   (7)

11.2.   The cylinder shown below has a radius of r cm, height of h cm and a volume of 500 cm^3.

11.2.1.   Show that : $h = \dfrac{500}{\pi r^2}$ <u>1</u>

11.2.2.   Hence, show that the total surface area, TSA, of the cylinder will be :

$$TSA = 2\pi r^2 + 1000r^{-1}$$ <u>2</u>   <u>3</u>

11.2.3.   If r were to be tripled and h were to be halved, what would the volume of the cylinder become ?   <u>2</u>   (5)

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ANSWER SHEET

7.2.