

# HILLCREST HIGH SCHOOL



## GR 12 MATHEMATICS PREPARATORY EXAM

### PAPER 2

SEPTEMBER 2013

MARKS: 150

TIME: 3 Hours

#### INSTRUCTIONS TO CANDIDATES

1. This question paper consists of ELEVEN questions. Answer ALL the questions in your answer booklet except for 1.2; 2.2; 3.1; 3.2; 3.4 and 10.1 which must be answered on the diagram sheet provided.
2. A formula sheet is included with this question paper.
3. All the necessary working details must be shown.
4. The diagrams are not drawn to scale.
5. Number the questions correctly according to the number system used in this question paper.
6. An approved calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
7. All the final answers must be rounded off correct to TWO decimal places, unless stated otherwise.
8. Start each question on a NEW page.
9. When you are finished, detach and hand in the graph sheet with your answer booklet, ensuring your name and teachers name is on both.

Write neatly and legibly.

## QUESTION 1

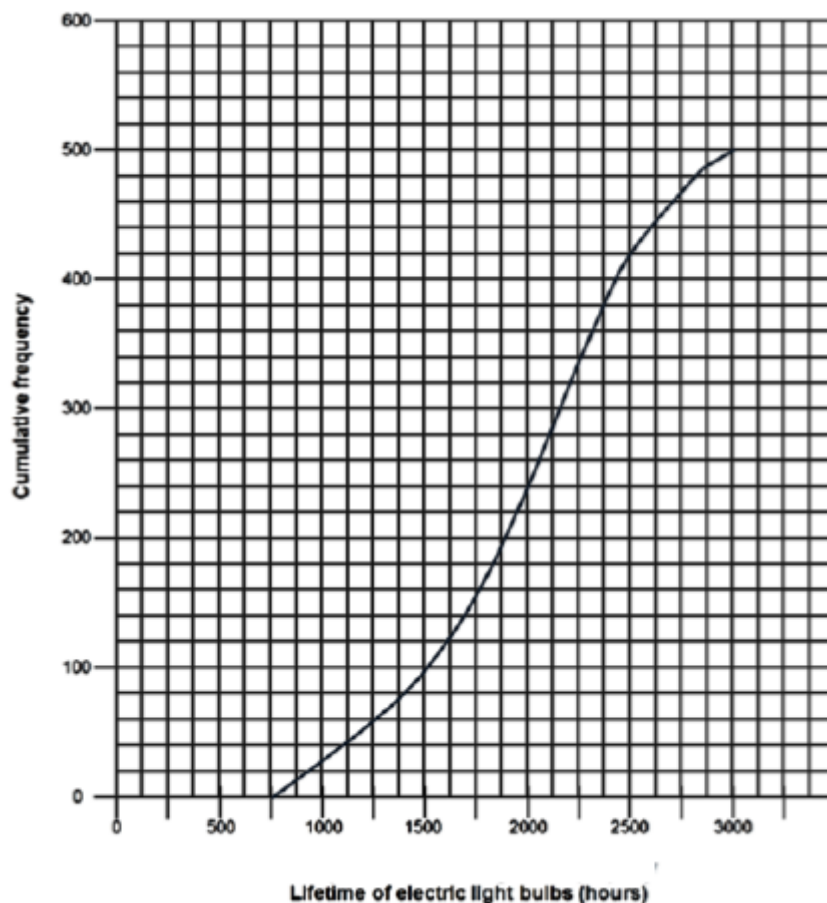
The following data set represents the shoe sizes of 23 rugby players.

6 6 6 6 7 7 7 7 8 8 8 9 9 9 9 9 10 10 10 11 12 13 13

- 1.1 Calculate the average shoe size of the rugby players. Round the answer off to the nearest integer. (2)
  - 1.2 Draw a box-and-whisker diagram of shoe sizes of the rugby players, on the diagram sheet provided. (4)
  - 1.3 Determine the standard deviation of shoe sizes of the rugby players. (2)
  - 1.4 How many of the rugby players wear a shoe size that lies within one standard deviation from the mean? (3)
- [11]

## QUESTION 2

The lifetimes of electric bulbs are measured in a laboratory. The results are shown in the ogive below.



2.1 Use the ogive above and determine the values of A and B.

Lifetime of electric bulbs in hours	Frequency	Cumulative Frequency
$750 \leq t < 1000$		28
$1000 \leq t < 1250$		60
$1250 \leq t < 1500$		100
$1500 \leq t < 1750$		156
$1750 \leq t < 2000$		240
$2000 \leq t < 2250$		335
$2250 \leq t < 2500$		A
$2500 \leq t < 2750$		466
$2750 \leq t < 3000$		B

(2)

2.2 Complete the frequency table on the diagram sheet that is provided.

(3)

2.3 If one light bulb costs R2,50 determine the amount spent on purchasing the light bulbs that lasted longer than 2250 hours.

(3)

[8]

### QUESTION 3

A study was conducted amongst nine South African hockey players who want to participate in the Olympic games. The number of goals scored during a season, was measured against the number of hours each player trained per week. The table below shows the results:

Hours trained ( $x$ )	17	22	20	14	19	21	15	18	16
Number of goals scored per season ( $y$ )	11	14	13	10	8	13	11	12	11

3.1 Draw a scatter plot, on the diagram sheet provided, for the above mentioned data.

(2)

3.2 One of the data points above is an outlier. Indicate this point on the diagram, drawn in Question 3.1 above, with a letter A.

(1)

3.3 State if there is a correlation displayed in the scatter plot, if so, what kind?

(2)

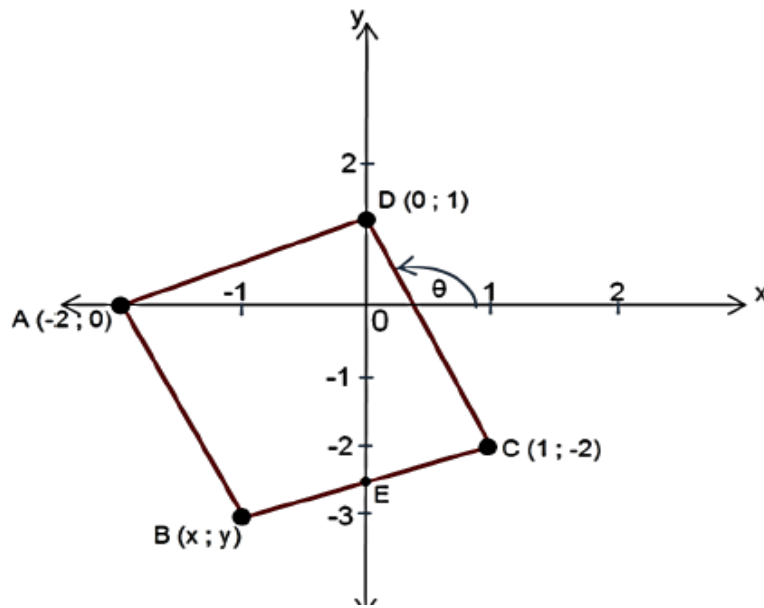
3.4 Draw a line of best fit on the scatter plot that you drew in Question 3.1 above.

(2)

[7]

## QUESTION 4

ABCD is a quadrilateral with vertices  $A(-2; 0)$ ;  $B(x; y)$ ;  $C(1; -2)$  and  $D(0; 1)$ . E lies on the  $y$ -axis.

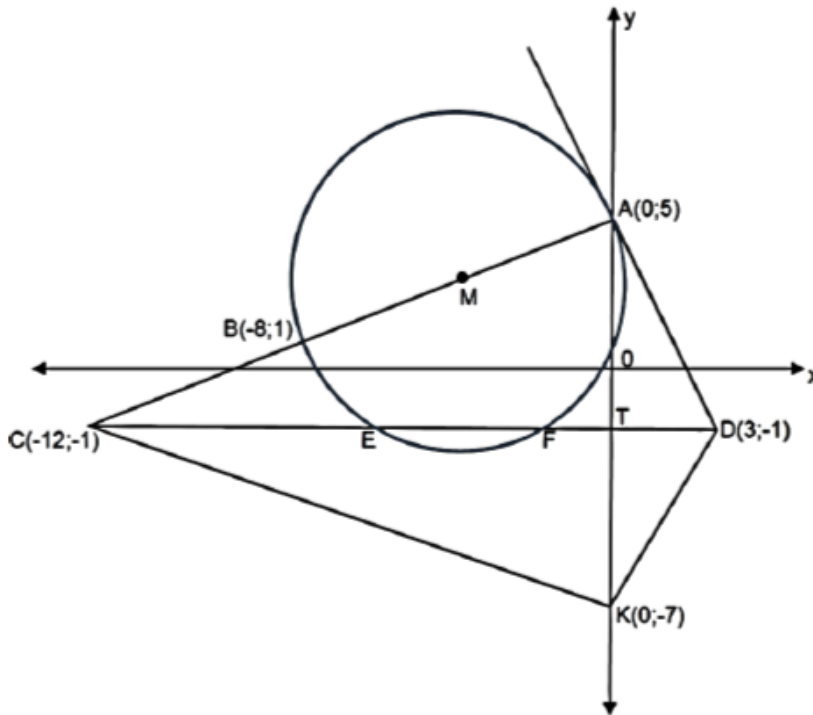


- 4.1 Determine an equation of the line AC in the form  $y = \dots$  (4)
- 4.2 Calculate the size of  $\theta$ , the angle of inclination of DC, correct to ONE decimal place. (4)
- 4.3 If ABCD is a parallelogram, determine the coordinates of B. (2)
- 4.4 Show that ABCD is not a rectangle. (3)
- 4.5 Is point E the midpoint of BC? Give reasons for your answer. (2)

[15]

QUESTION 5

AB is the diameter of the circle, with centre M.  $B(-8; 1)$  and  $A(0; 5)$  are endpoints of a diameter. DA is a tangent to the circle at A. CD is a straight line, with point T on the line and on the y-axis.  $D(3; -1)$  and  $C(-12; -1)$  are given.  $K(0; -7)$  is a point on the y-axis.

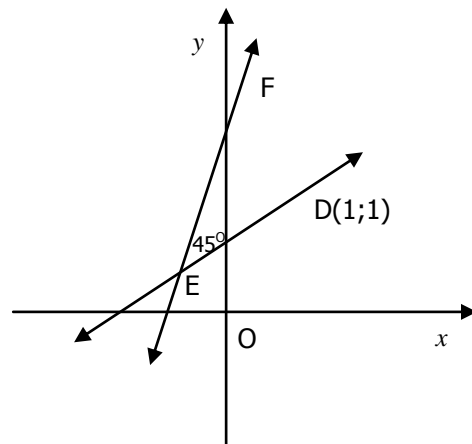


- 5.1 Determine the coordinates of M, the centre of the circle. (2)
  - 5.2 Determine the equation of the circle in the form  $ax^2 + by^2 + cx + dy + e = 0$ . (5)
  - 5.3 Determine the area of triangle CKD. (4)
  - 5.4 Show that  $AT = TK$ . (2)
  - 5.5 What type of figure is ACKD? Give a reason for your answer. (2)
  - 5.6 Find the coordinates of the points E and F where the line CD cuts the circle. (4)
- [19]

QUESTION 6

In the diagram the equation of the line EF is given by  $y - 3x - 2 = 0$ .  $D(1; 1)$  is a point on line DE and  $\angle DEF = 45^\circ$ .

Determine the equation of the line DE, if the gradient of DE is positive.



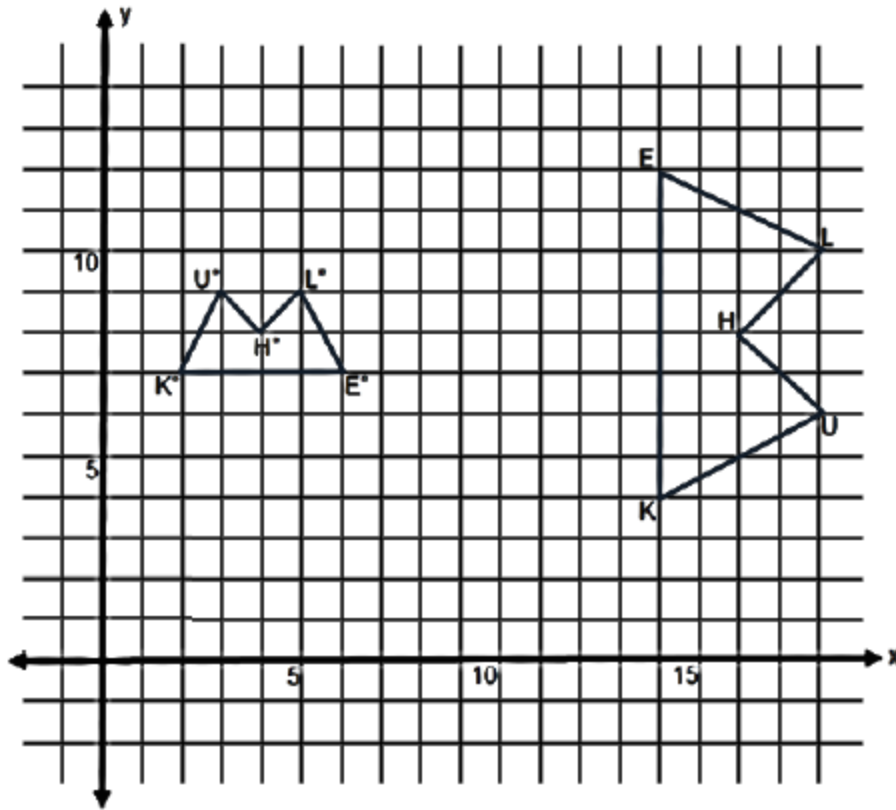
QUESTION 7

7.1 The point  $F(-2; 5)$  lies in a Cartesian plane. Determine the coordinates of:

7.1.1  $y = x$  (2)

7.1.2  $90^\circ$  in a clockwise direction. (2)

7.2  $(5; 9)$   $(6; 7)$ ,  $(2; 7)$ ,  $(3; 9)$  and  $(4; 8)$ . , with vertices



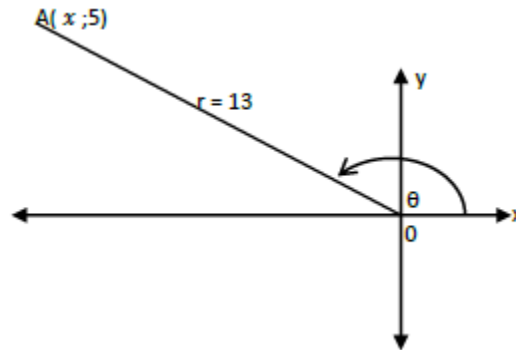
7.2.1 Describe, in words, the transformations that have to occur to move LEKUH to  $L^*E^*U^*H^*$ . (4)

7.2.2 The image of K after the first transformation  $T_1$ . Write down TWO possible sets of coordinates for  $T_1(K)$ . (4)

7.3 A point  $P(3; -4)$  is rotated about the origin in a clockwise direction through an angle of  $150^\circ$ . Calculate, **without the use of a calculator**, the coordinates of the image of P. Leave your answer in surd form. (6)  
[18]

QUESTION 8

In the Cartesian plane below, the point  $A(x; 5)$  is in the 2<sup>nd</sup> quadrant with  $r = OA = 13$  and the angle  $\theta$  are shown.



8.1 Determine each of the following:

8.1.1  $x$  (2)

8.1.2 (3)

8.1.3 (3)

8.2 Fully simplify the following, without the use of a calculator:

\_\_\_\_\_ (6)

[14]

QUESTION 9

9.1 Given  $\sin 40^\circ = t$ . Express each of the following in terms of  $t$ , without using a calculator.

9.1.1 (2)

9.1.2 (2)

9.1.3 (3)

9.2 Simplify the following expression as far as possible, without using a calculator:

(4)

9.3 Prove the following identity:

\_\_\_\_\_ (5)

9.4 In each of the following, solve for  $\theta$  :

9.4.1 Determine the general solution for  $\sin \theta = \frac{1}{2}$  (3)

9.4.2  $\cos \theta = -\frac{\sqrt{3}}{2}$  where  $0^\circ < \theta < 360^\circ$  (6)

[25]

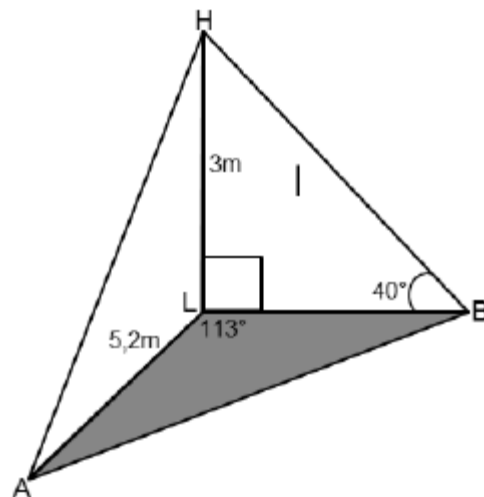
## QUESTION 10

Given \_\_\_\_\_ and \_\_\_\_\_

- 10.1 Use the diagram sheet provided and sketch the graphs of  $f$  and  $g$  on the same system of axes for \_\_\_\_\_ (6)
- 10.2 Use your sketched graph to solve \_\_\_\_\_ for \_\_\_\_\_ (4)
- 10.3 State the period of \_\_\_\_\_ - . (1)
- 10.4 Describe in words the transformations if \_\_\_\_\_ becomes \_\_\_\_\_ (6)
- [17]

## QUESTION 11

A, B and L are points in the same horizontal plane. The vertical pole  $HL = 3m$ ,  $AL = 5,2m$ , the angle \_\_\_\_\_ and the elevation angle of H from B is \_\_\_\_\_ .



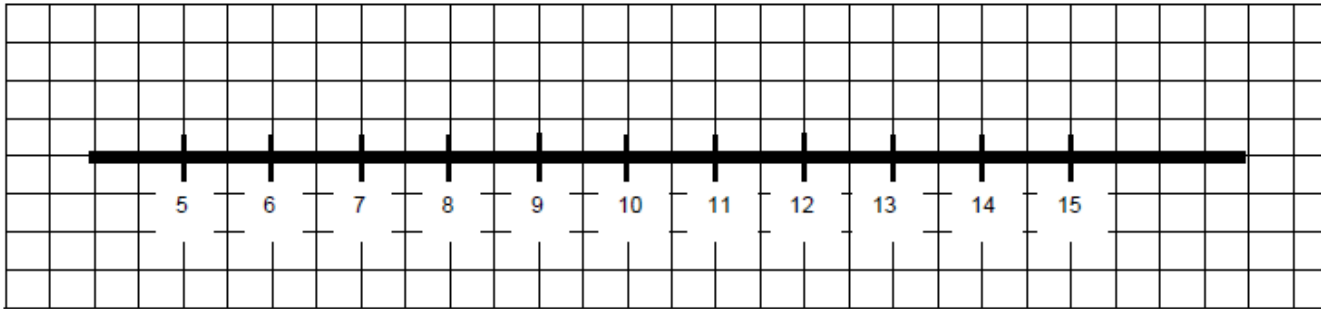
- 11.1 Calculate the length of  $LB$ . (2)
- 11.2 Hence, or otherwise, calculate the length of  $AB$ . (4)
- 11.3 Determine the area of \_\_\_\_\_ (3)
- [9]

TOTAL 150

Name: \_\_\_\_\_

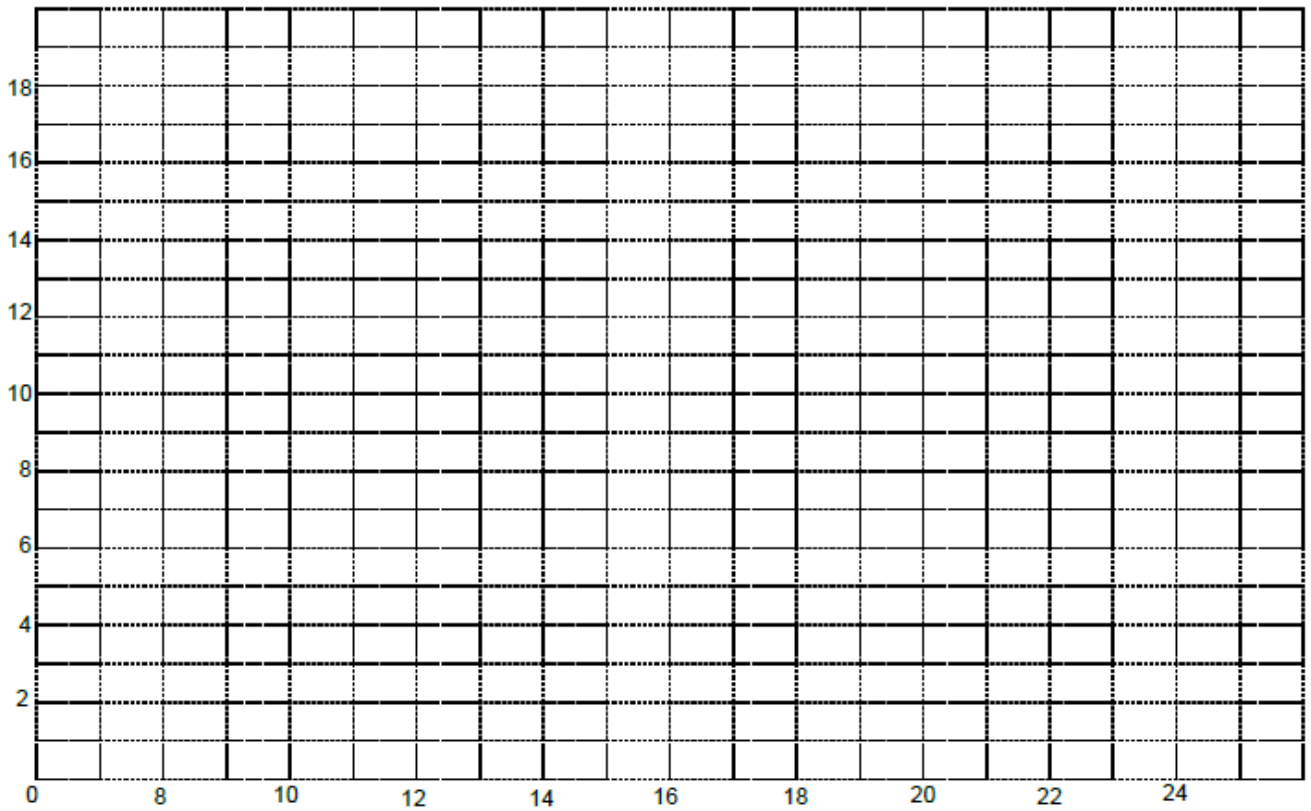
Maths Teacher: \_\_\_\_\_

Class: \_\_\_\_\_

**QUESTION 1.2****QUESTION 2.2****Complete the table:**

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QUESTION 3.1; 3.2 and 3.4



QUESTION 10.1

