



GRADE 11 EXAMINATION  
NOVEMBER 2007

**MATHEMATICS: PAPER II**

NAME:

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Time: 3 hours

150 marks

**PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY**

1. This question paper consists of 20 pages and a Formula Sheet.
2. All questions are to be answered on this question paper.
3. Fill in your name in the space provided below.
4. You may use a non-programmable calculator.

**For use by marker**

**QUESTION 1**

1(a)	1(b)	1(c)	1(d)	1(e)	1(f)	1(g)	1(h)	1(i)	TOTAL
7	5	5	13	5	7	5	5	15	67

**QUESTION 2**

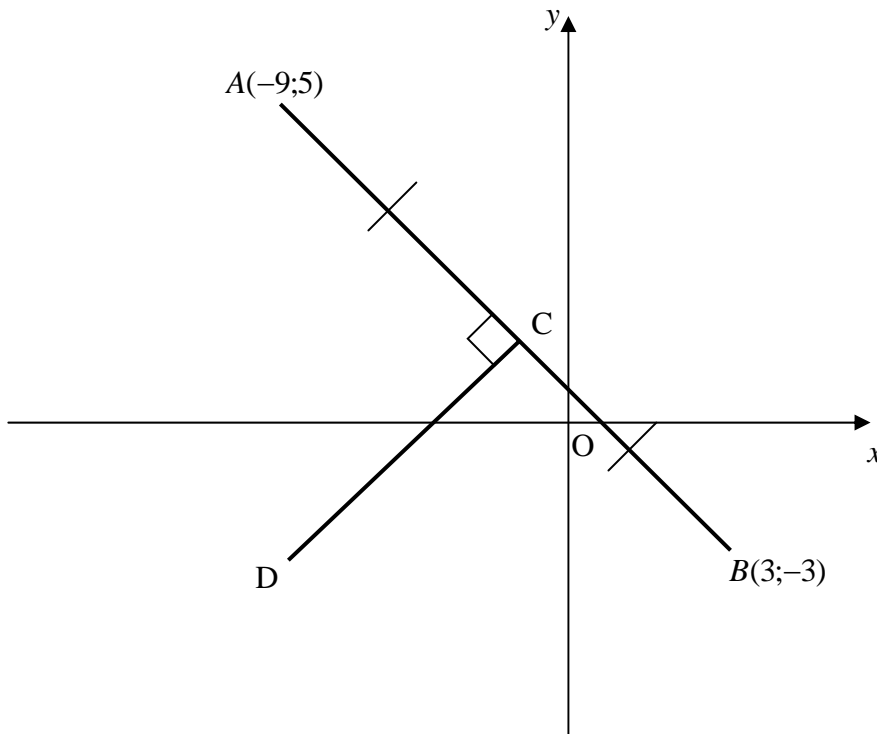
2(a)	2(b)	2(c)	2(d)	2(e)	2(f)	2(g)	TOTAL
4	16	4	6	10	9	7	56

**QUESTION 3**

3(a)	3(b)	3(c)	TOTAL
8	10	9	27

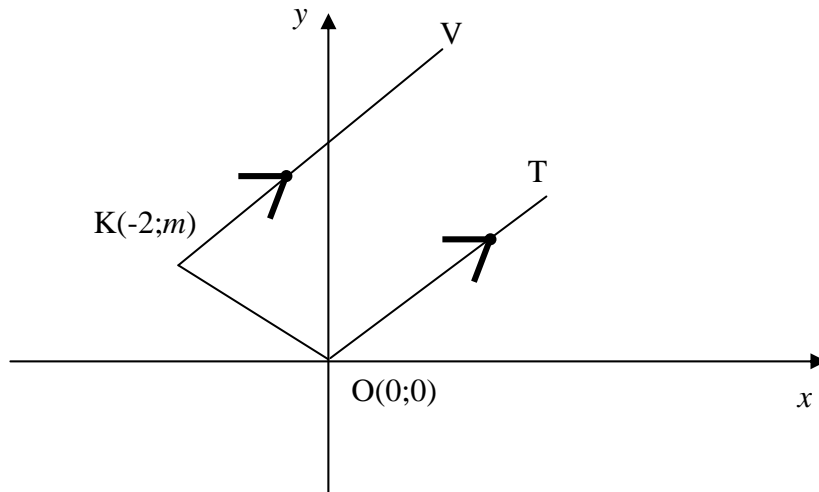
**QUESTION 1**

(a) In the diagram below, CD is the perpendicular bisector of AB.



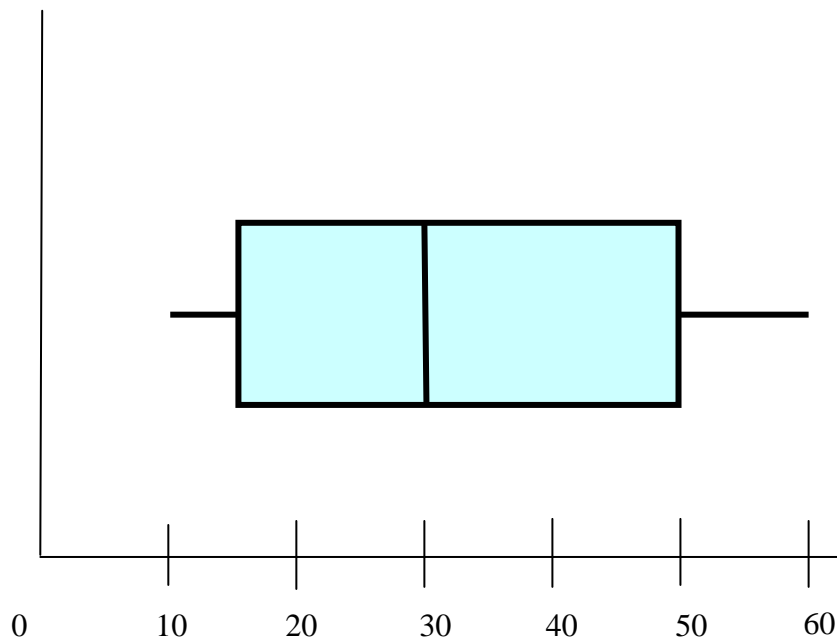
1. Determine the co-ordinates of C, the midpoint of AB. (2)
  
2. Determine the gradient of CD. (3)
  
3. Determine the equation of CD in the form  $y = mx + c$ . (2)

- (b) In the diagram below, lines KV and OT are parallel.  
 Line OT has equation  $3y - 4x = 0$ .  
 $K(-2; m)$



1. Write down the gradient of the line passing through K and V. (2)
  
2. If the distance from K to the origin is 2,5 units, find the value of  $m$ . (3)

- (c) Study the given box and whisker plot below and then answer the questions that follow.

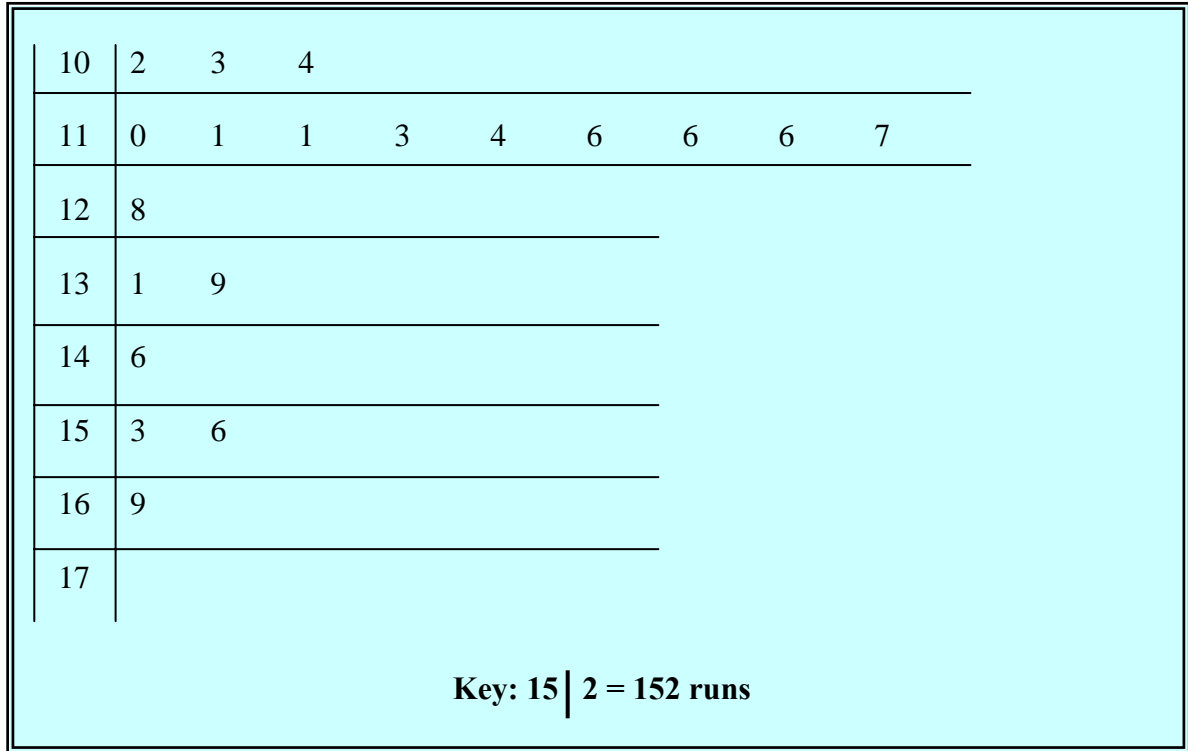


For the set of data represented estimate:

1. the minimum
2. the lower quartile
3. the median
4. the upper quartile
5. the maximum.

- (d) Brian Lara is a record breaking cricketer who is regarded as one of the greatest batsmen of all time.

The following stem and leaf plot shows his batting scores for 19 of the one day internationals that he played.



For the data above, determine:

1. the mean number of runs, correct to the nearest run (3)
  
2. the mode number of runs (1)
  
3. the median number of runs (1)
  
4. the interquartile range (3)
  
5. the standard deviation of the number of runs scored. (5)

- (e) If  $\tan A = \frac{9}{40}$  and  $\cos A < 0$ , find using a sketch and without determining the value of  $A$ , the value of  $\sin A + \cos A$ . (5)

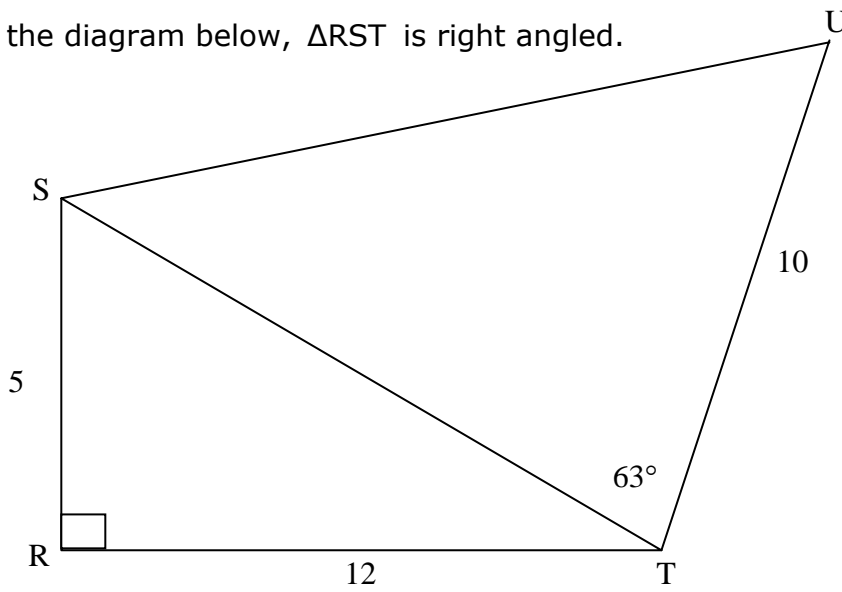
- (f) Simplify the following:

1.  $(\sin\theta + \cos\theta)^2 + (\sin\theta - \cos\theta)^2$ . (4)

2.  $\tan(180^\circ - \theta) \cdot \sin(90^\circ + \theta)$ . (3)

- (g) Find the general solution of  $\sin\theta = -0,6$ .  
 Give answers correct to one decimal digit. (5)

- (h) In the diagram below,  $\Delta RST$  is right angled.



Determine:

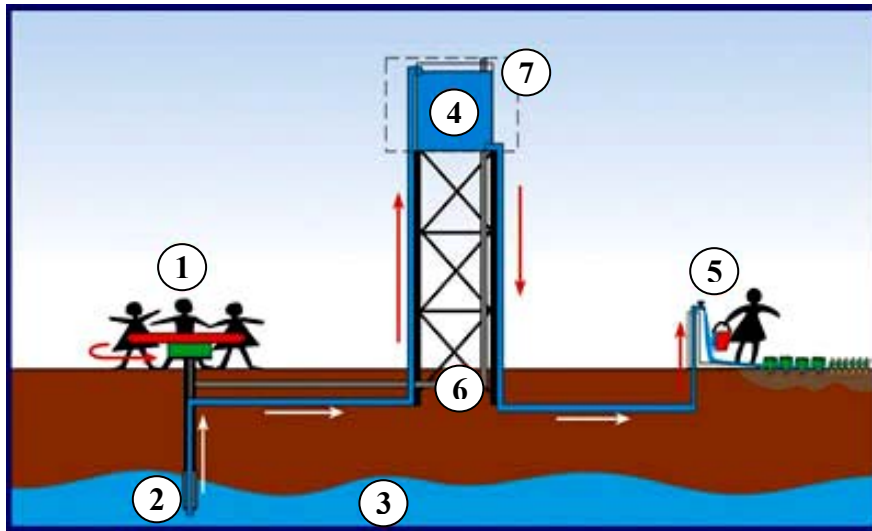
1. the length of  $ST$ . (2)

2. the area of  $\Delta STU$  correct to two decimal digits. (3)

- (i) Today, more than 1,1 billion people around the world have no access to clean drinking water.

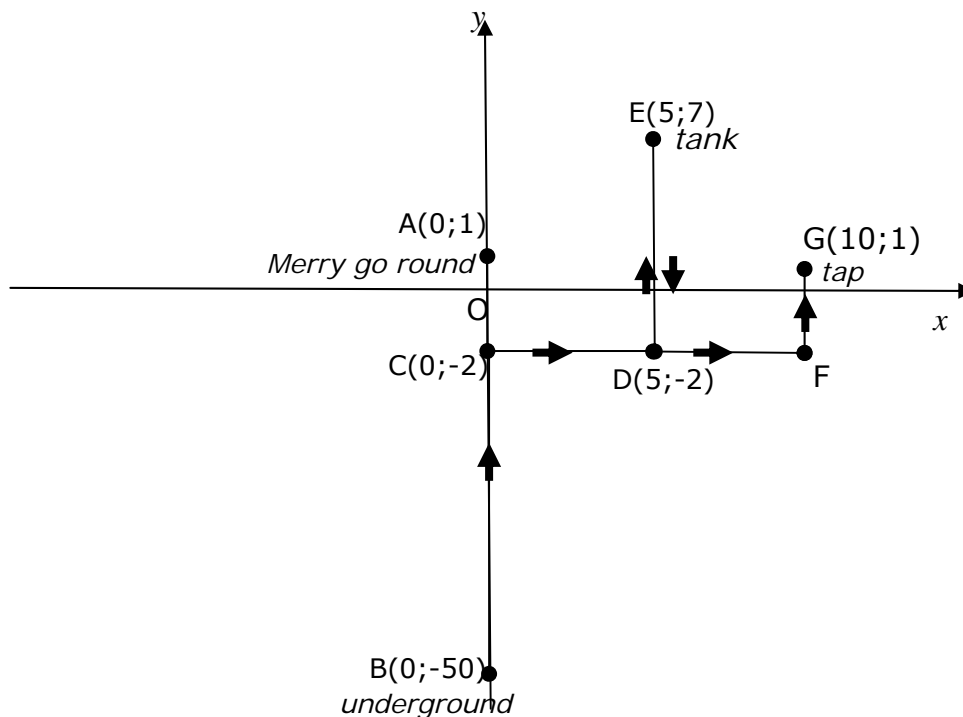
The PlayPump™ water system provides easy access to clean, safe drinking water bringing about improvements in health, education, gender equality, and economic development.

**HOW DOES THE PLAY PUMP WORK?**



While children have fun spinning on the Play Pump merry-go-round (1), clean water is pumped (2) from underground (3) into a 2,500-litre tank (4), standing seven meters above the ground. A simple tap (5) makes it easy to draw water. Excess water is diverted from the storage tank back down into the borehole (6).

The path of the water from below the earth’s surface to the tap is depicted in the Cartesian plane below.





1. Write down a chain of transformations which describe the path taken by the water from B to G. The first two of six translations have been done for you.

$$(x; y) \rightarrow (x; y + 48) \rightarrow (x + 5; y) \rightarrow ( \quad ; \quad ) \rightarrow ( \quad ; \quad ) \rightarrow ( \quad ; \quad ) \rightarrow ( \quad ; \quad )$$

(8)

2. The chain of transformations in (1) transforming point B to G, can be replaced by one equivalent transformation. State this single transformation as a general rule.

$$(x; y) \rightarrow ( \quad ; \quad )$$

(2)

3. (i) Write down the co-ordinates of G', the reflection of G. (1)

- (ii) What general rule applies to this transformation?

$$(x; y) \rightarrow ( \quad ; \quad )$$

(1)

4. (i) Write down the co-ordinates of E', the reflection of E in the line  $y = x$ . (2)

- (ii) What general rule applies to this transformation?

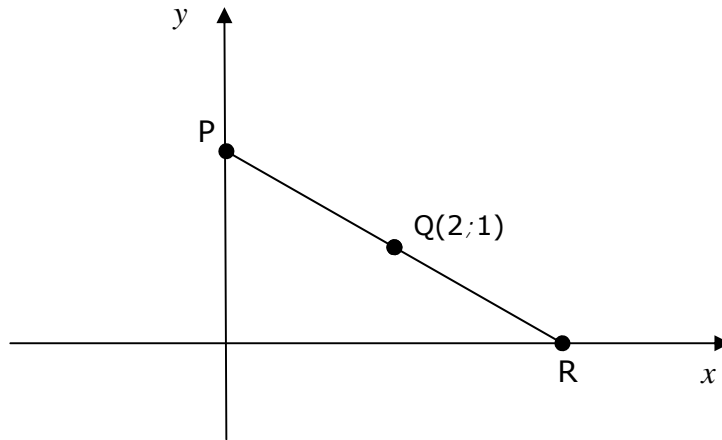
$$(x; y) \rightarrow ( \quad ; \quad )$$

(1)

<b>67 marks</b>
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**QUESTION 2**

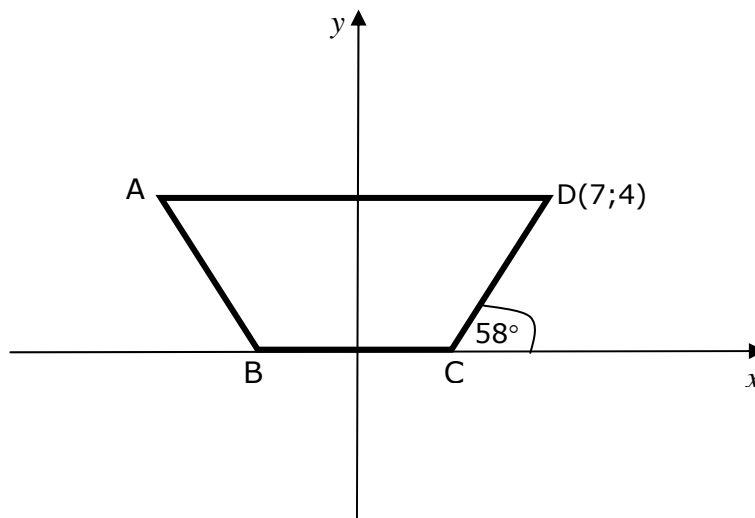
- (a) In the diagram,  $Q(2;1)$  is the midpoint of line segment  $PR$ .  $P$  is a point on the  $y$  axis and  $R$  is a point on the  $x$  axis.



Find the co-ordinates of  $P$  and  $R$ .

(4)

- (b) In the diagram below, isosceles trapezium  $ABCD$ , i.e.  $AB = CD$  and  $AB \parallel CD$  is drawn with  $BC$  on the  $x$  axis.  $CD$  makes an angle of  $58^\circ$  with the  $x$  axis. The  $y$  axis is a line of symmetry of the trapezium.

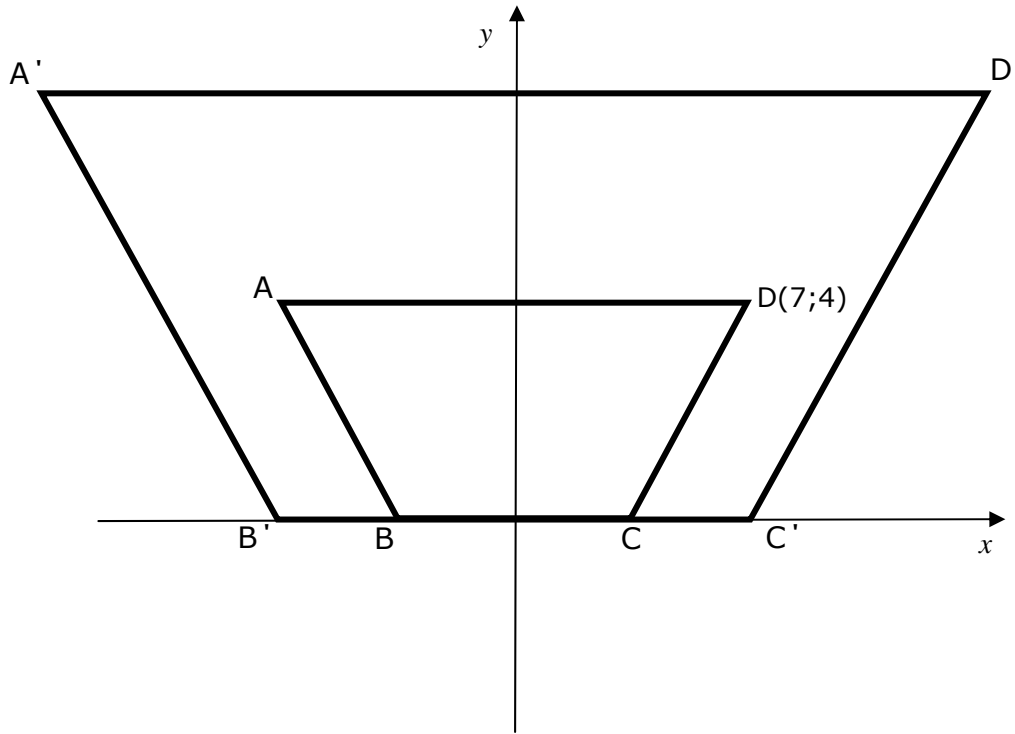


1. Show that the equation of CD is given by  $y = 1,6x - 7,2$ . (3)

2. Show that  $BC = 9$  correct to the nearest integer. (3)

3. Write down the equation of AB. (2)

4. If the trapezium is enlarged by a factor of 2 through the origin:



(i) find the equation of  $A'B'$ . (4)

(ii) find the length of  $A'B'$ . (4)

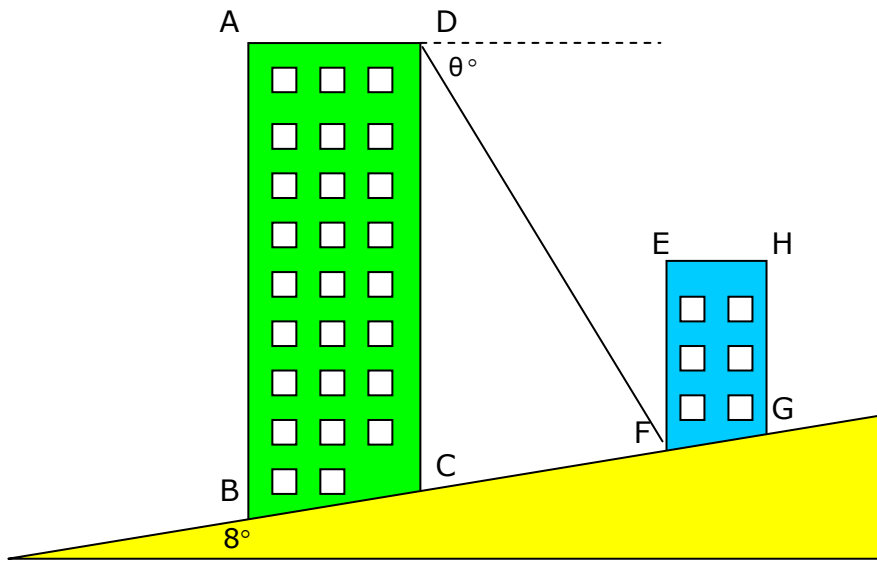
(c) Simplify without using a calculator.

$$\sin 12^\circ \cdot \cos 102^\circ - \cos^2(-12^\circ) \quad (4)$$

d) Solve for  $\theta$  correct to one decimal digit if  $\theta \in (0^\circ; 360^\circ)$  and

$$\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta} = \frac{3}{2}. \quad (6)$$

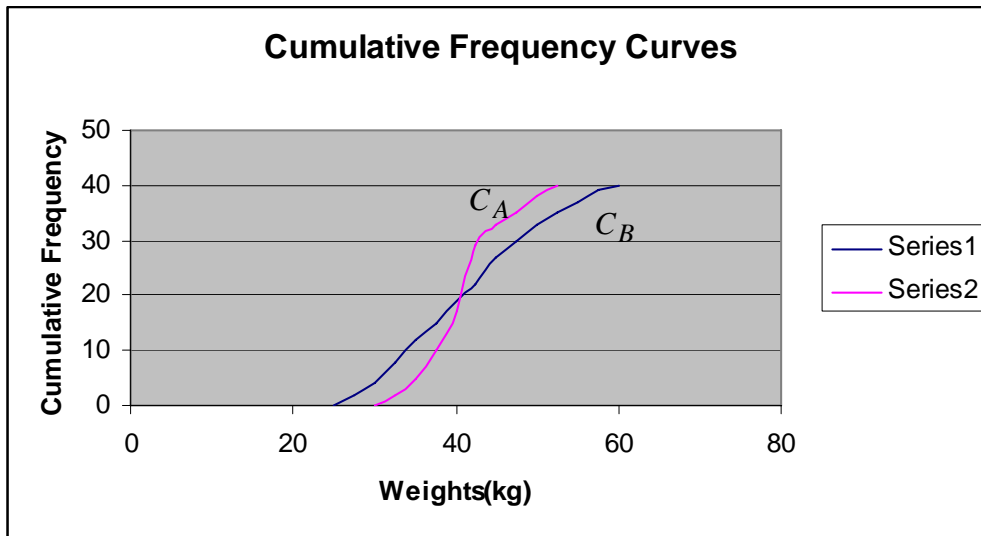
- (e) In the diagram below, ABCD and EFGH represent vertical buildings on a slanting ground that has a constant inclination of  $8^\circ$ .



If  $DC = 31\text{m}$  and  $CF = 20\text{m}$ ,

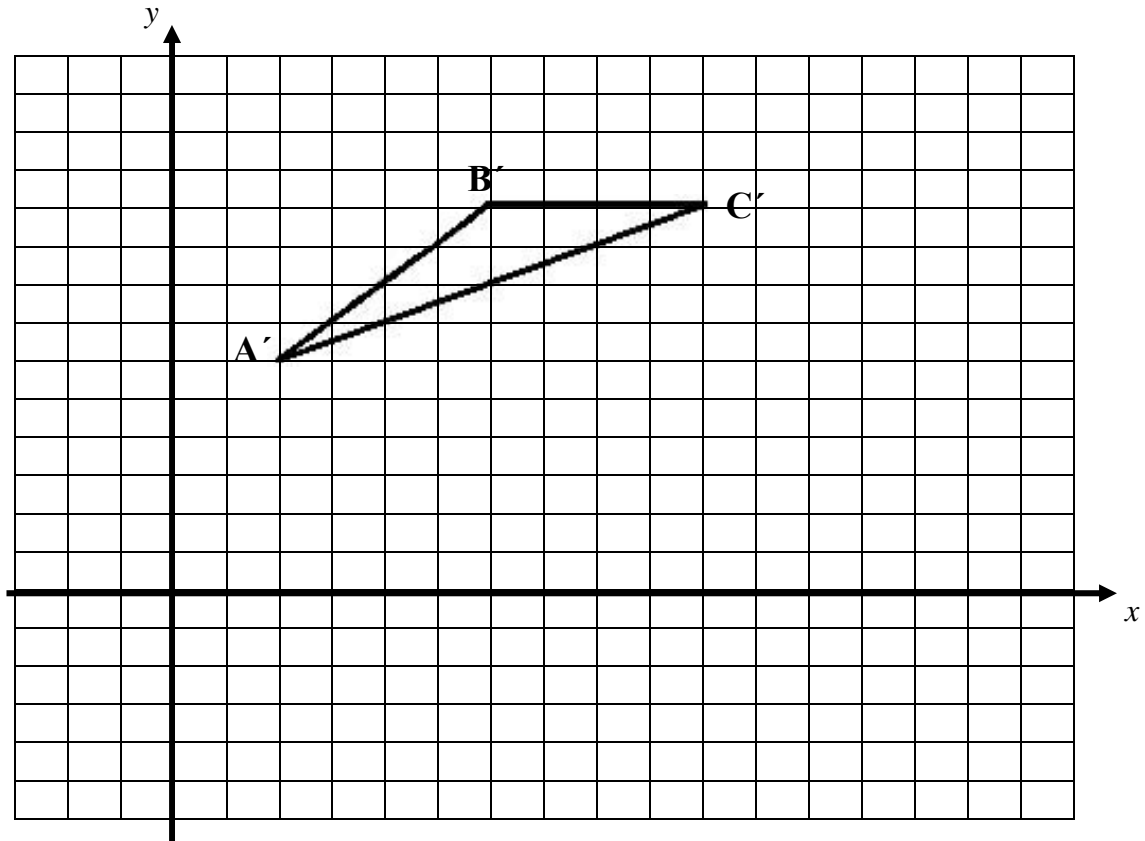
1. write down the size of  $\widehat{DCF}$ . (2)
  
2. show that  $DF = 34,5\text{m}$ . (4)
  
3. find the value of  $\theta$ , the angle of depression of F from D. Give answer correct to one decimal digit. (4)

- (f) In the diagram below,  $C_A$  and  $C_B$  are the cumulative frequency curves of two distributions of weights respectively.



1. Write down the median of  $C_A$ . (1)
  
2. In each case circle the statement that is correct.
  - (i) Median  $C_A >$  Median  $C_B$   
 Median  $C_A =$  Median  $C_B$   
 Median  $C_A <$  Median  $C_B$  (2)
  
  - (ii) Range  $C_A >$  Range  $C_B$   
 Range  $C_A =$  Range  $C_B$   
 Range  $C_A <$  Range  $C_B$  (2)
  
  - (iii) Lower quartile  $C_A >$  lower quartile  $C_B$   
 Lower quartile  $C_A =$  lower quartile  $C_B$   
 Lower quartile  $C_A <$  lower quartile  $C_B$  (2)
  
  - (iv) Inter-quartile Range  $C_A >$  Inter-quartile Range  $C_B$   
 Inter-quartile Range  $C_A =$  Inter-quartile Range  $C_B$   
 Inter-quartile Range  $C_A <$  Inter-quartile Range  $C_B$  (2)

- (g) In the diagram below  $\Delta A'B'C'$  is an enlargement of  $\Delta ABC$  through the origin by a factor of 2.  $A'(2;6), B'(6;10)$  and  $C'(10;10)$ .



1. Determine the co-ordinates of A, B and C. (3)

2. If  $\Delta A'B'C'$  is rotated  $90^\circ$  in an anticlockwise direction through the origin, give the co-ordinates of the  $A''$ ,  $B''$  and  $C''$  the vertices of  $\Delta A''B''C''$ . State the general rule used. (4)

**56 marks**

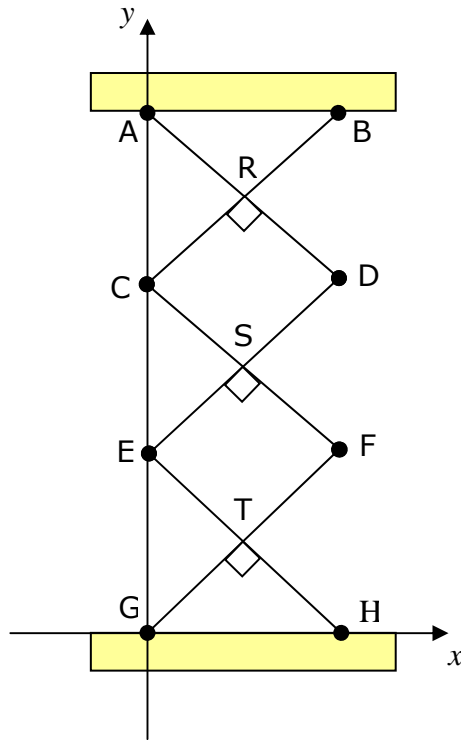


**QUESTION 3**

(a)



The diagram below shows a vertical cross-section of a scissors-type elevating platform which can be used to bring workers to a greater height.



AB and GH are horizontal lines.

The platform is raised to a height so that  $\hat{CRD} = \hat{ESF} = \hat{GTH} = 90^\circ$ .

The arms of the scissors are 2 units in length, i.e.

$GT = TH = ET = TF = ES = SF = CS = SD = CR = RD = AR = RB = 2$ .

1. Determine the equation of GF. (2)

2. Determine the equation of AD. (6)

(b) The following are all trig identities.

$$\frac{\sin\theta - \cos\theta}{1 - \tan\theta} = -\cos\theta$$

$$\frac{\sin^2\theta - \cos^2\theta}{1 - \tan^2\theta} = -\cos^2\theta$$

$$\frac{\sin^3\theta - \cos^3\theta}{1 - \tan^3\theta} = -\cos^3\theta$$

$$\frac{\sin^4\theta - \cos^4\theta}{1 - \tan^4\theta} = -\cos^4\theta$$

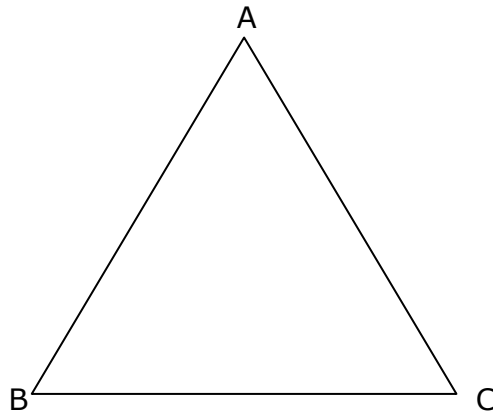
1. Use the pattern illustrated above to simplify

$$\frac{\sin^{2007}\theta - \cos^{2007}\theta}{1 - \tan^{2007}\theta} \quad (2)$$

2. Write down a general statement which can be conjectured from the listed identities. (2)

3. Prove your statement in 2. (6)

- (c) Three rural informal settlements (A, B and C) form an equilateral triangle as shown below.



Currently access to clean, safe water is only by moving vehicle as it is very far from the communities.

Finances have been approved to install a "Water Pump" which would be equidistant from all three settlements allowing the communities to access clean water regularly.

1. Show on the diagram where you would position the water pump so that it is equidistant from all three settlements. Use the letter P. (2)
2. If  $AB = AC = BC = d$  units, and the distance from any settlement to the pump is  $x$  units, show that  $d = \sqrt{3}x$ . (7)

<b>27 marks</b>
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