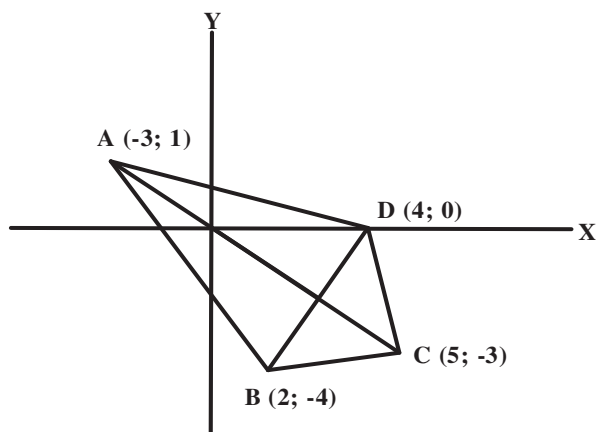


## SECTION A

## QUESTION 1

In the diagram below, a kite, ABCD, is drawn.



- (a) Calculate the length of AC and leave your answer in simplest surd form. (2)
- (b) Determine the equation of the line AC. (3)
- (c) Show that AC is the perpendicular bisector of DB if the equation of DB is given as:  
 $y = 2x - 8$  (8)
- (d) Determine the area of kite ABCD. (4)
- (e) Calculate the inclination of AB. (2)
- (f) Hence, or otherwise, calculate the size of  $\hat{BAD}$  (4)

[23]

## QUESTION 2

- (a) Determine the equation of the circle with centre M (2; -3) which passes through the point P (6; -1). (5)
- (b) Show that if Q is the point (0; -7) the perpendicular bisector of PQ passes through the centre of the circle mentioned in (a). (6)
- (c) Does the point R(-1; 2) lie on the circle, inside the circle or outside the circle? Justify your answer. (3)

[14]

**QUESTION 3**

(a) If it is given that P is the point  $(-1; 5)$ , write down the coordinates of the image of P after each of the following transformations:

(i) A reflection about the line  $y = x$  (2)

(ii) A rotation about the origin through an angle of  $180^\circ$ . (2)

(b) Describe in words the effect of the given transformation on the vertices and on the area of any  $\triangle ABC$ :

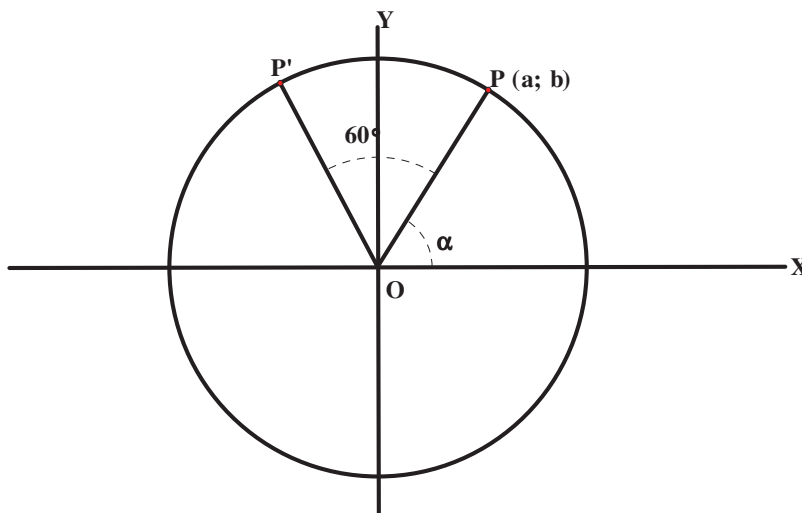
(i)  $(x; y) \rightarrow \left(\frac{x}{2}; \frac{y}{2}\right)$  (4)

(ii)  $(x; y) \rightarrow (x+2; -y)$   
(6)

**[14]****QUESTION 4**

Show, in detail, that the image of any point P  $(a; b)$ , after rotation through an angle of  $60^\circ$

about the origin is:  $\left(\frac{a - \sqrt{3}b}{2}; \frac{b + \sqrt{3}a}{2}\right)$



(6)  
**[6]**

**QUESTION 5**

(a) If  $\tan \alpha = -\frac{3}{4}$ ;  $\alpha \in (0^\circ; 180^\circ)$  and  $13 \cos \beta - 12 = 0$ ;  $\beta \in (180^\circ; 360^\circ)$ ,  
Determine the value of  $\sin \alpha \cdot \sin \beta$  **without the use of a calculator.** (5)

(b) Simplify the following expressions (**without the use of a calculator**)

(i) 
$$\frac{\sin(180^\circ - x) \cdot \cos(180^\circ + x) \cdot \tan(180^\circ + x)}{\sin(-x) \cdot \cos(360^\circ - x)}$$
 (8)

(ii) 
$$\frac{\cos 10^\circ \cdot \cos 120^\circ}{\sin 80^\circ \cdot \sin 150^\circ}$$
 (4)

[17]

**QUESTION 6**

Solve for  $x$  if:

$$2 \sin x \cdot \cos x + 2 \sin x + \cos^2 x + \cos x = 0 \quad \text{for } x \in (-180^\circ; 180^\circ)$$
 (8)

[8]

**QUESTION 7**

Consider the functions  $f$  and  $g$  such that:

$$f(x) = 2 \sin x \quad \text{and} \quad g(x) = -\sin x$$

(a) On the same system of axes sketch the graphs of  $f$  and  $g$  for the interval  $[-180^\circ; 180^\circ]$ .  
Indicate the intercepts with the axes and the coordinates of the turning points. (6)

(b) What is the range of  $f$ ? (2)

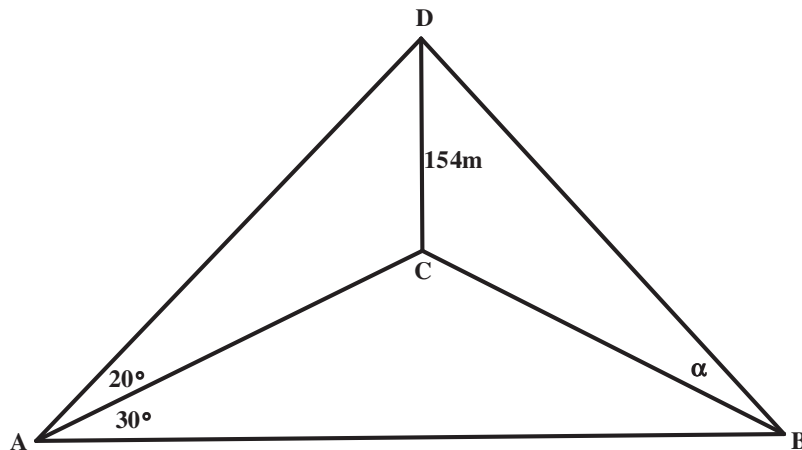
(c) For what value(s) of  $x$  is:  $f(x) < g(x)$ ? (3)

[11]

**QUESTION 8**

In the diagram below, AB is a straight line 1000m long. DC is a vertical tower 154m high with C, A and B points in the same horizontal plane.

The angles of elevation of D from A and B are  $20^\circ$  and  $\alpha$  respectively.  $\hat{CAB} = 30^\circ$ .



- (a) Determine the length of AC (rounded to two decimal places). (2)
- (b) Determine the value of  $\alpha$  to the nearest degree. (6)

[8]

**QUESTION 9**

Geoff, a driver of a courier motorcycle, recorded the following distances he travelled (in kilometers) on 15 trips. The data is given below:

24    19    21    27    20    17    32    22  
 26    18    13    23    30    10    13

- (a) What is the median for the above-mentioned data? (2)
- (b) Write down the upper and lower quartiles. (2)
- (c) Draw a box and whisker diagram for the data of Geoff's travels. (5)
- (d) Another driver, Simon, in the same company had also travelled and recorded (in kilometers) the distance that he had travelled on 15 trips. The five number summary of his data is: (12; 21; 25; 32; 34).  
 Comment on the differences or similarities, if there are any, between the distances covered by each. (2)

[11]

**SECTION B****QUESTION 10**

(a) If  $\cos D = 2p$  and  $\cos 2D = 7p$ , determine the value(s) of  $p$ . (5)

(b) Given:  $\sin(A + B) - \sin(A - B) = 2 \cos A \sin B$ .

(i) Prove the above identity (3)

(ii) Use the identity to factorise:  $\sin 5x - \sin x$  (3)

(iii) Hence, or otherwise, find the general solution for  $x$  if  $\sin 5x - \sin x = 0$ . (5)

[16]

**QUESTION 11**

(a) A diameter MN of a circle with points M (-1; 0) and N (3; -2) is given.

(i) Determine the equation of the circle. (4)

(ii) Determine the  $x$ -intercepts of the circle. (3)

(iii) Show that the circle above touches the circle with the equation:

$$(x - 3)^2 + (y - 3)^2 = 5 \quad (4)$$

[11]

**QUESTION 12**

Three numbers: 2;  $x$ ;  $y$  have a mean of 5 and a standard deviation of  $\sqrt{6}$ . Determine the value(s) of  $x$  and  $y$ . (11)

[11]

**DIAGRAM SHEET**

**EXAMINATION NUMBER:**

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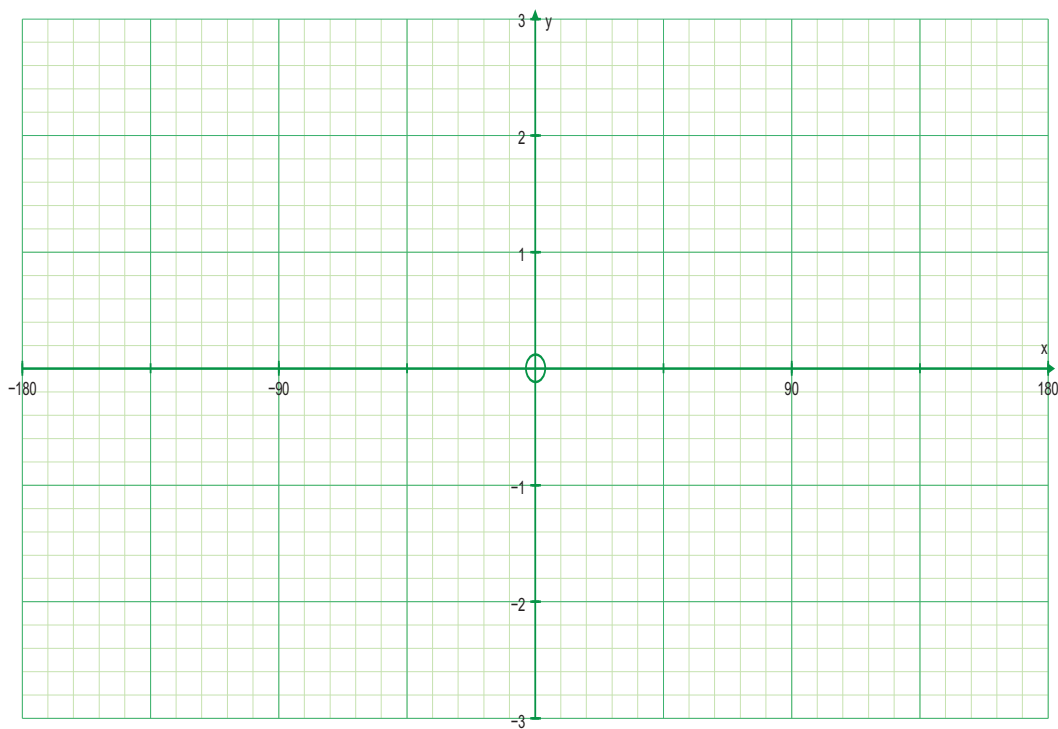
**QUESTION 7**

Consider the functions  $f$  and  $g$  such that:

$$f(x) = 2\sin x \text{ and } g(x) = -\sin x$$

- (a) On the same system of axes sketch the graphs of  $f$  and  $g$  for the interval  $[-180^\circ; 180^\circ]$ .  
Indicate the intercepts with the axes and the coordinates of the turning points.

(6)



- (b) What is the range of  $f$ ? \_\_\_\_\_ (2)

- (c) For what value(s) of  $x$  is:  $f(x) < g(x)$  ?

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(3)

**[11]**