

IEB Analytical geometry practice — Questions

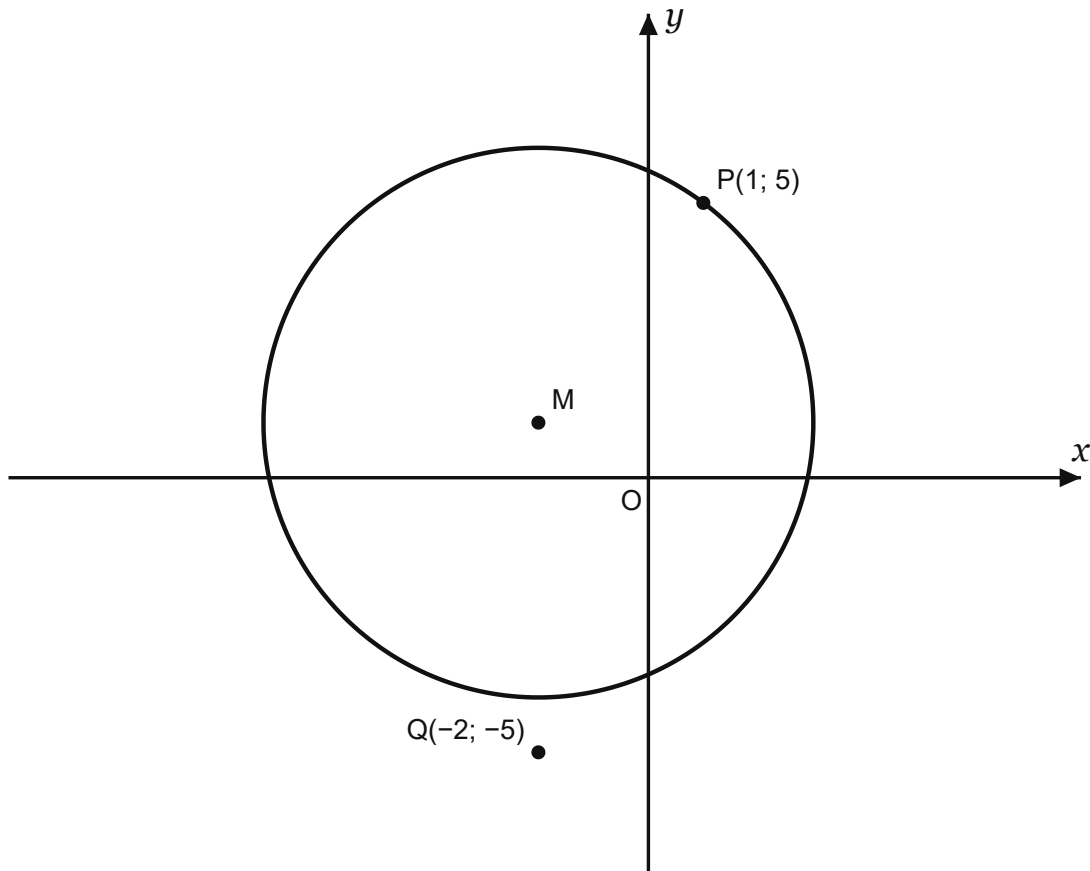
8 newly generated questions across all 13 analytical geometry topics the IEB examines in Paper II — 100 marks in all. Every answer is worked in the memorandum booklet. Nothing here is taken from a past paper.

The equation of a circle

1

[12]

The circle with centre M has the equation $x^2 + y^2 + 4x - 2y - 20 = 0$.



- (a) Determine the coordinates of the centre M and the radius of the circle. (3)

Answer: _____

- (b) Show that P(1; 5) lies on the circle. (2)

Answer: _____

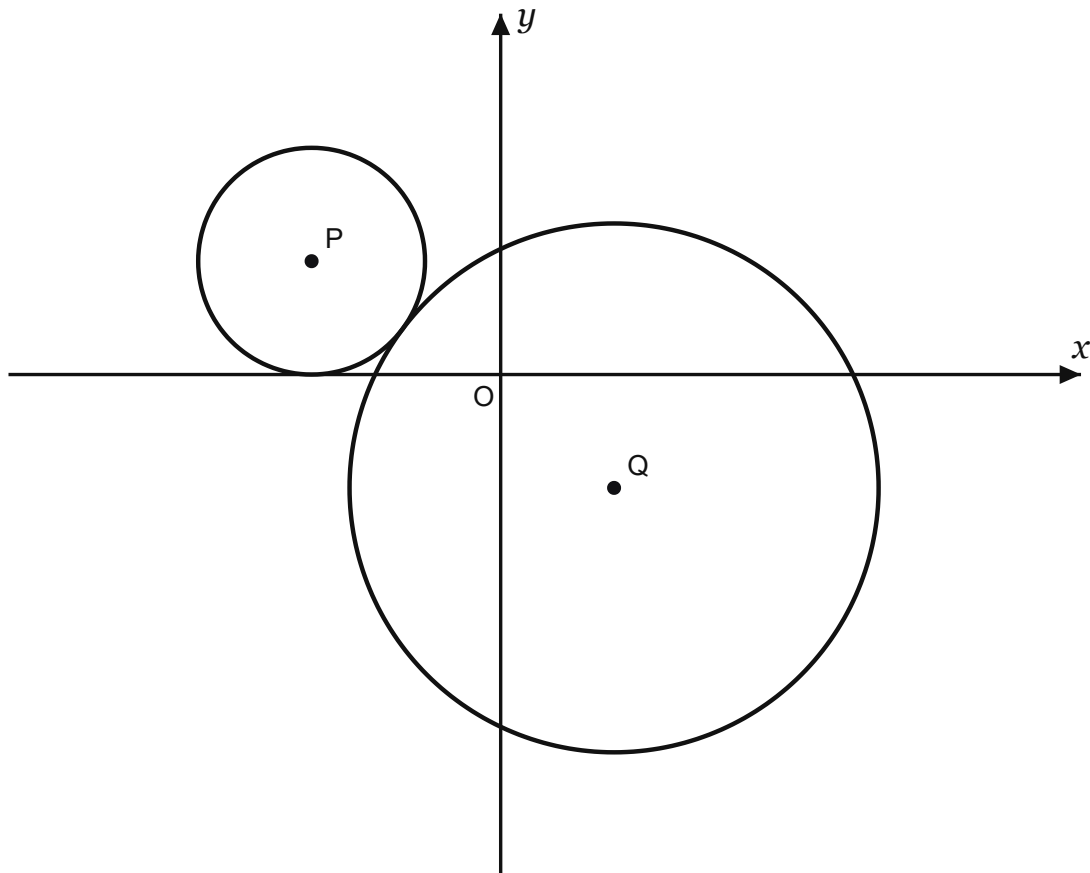
- (c) Determine the equation of the tangent to the circle at P. (4)

Answer: _____

- (d) A tangent is drawn from Q(-2; -5) to the circle, touching it at T. Determine the length of QT. (3)

Answer: _____

Circle P has centre $P(-5; 3)$ and touches the x -axis. Circle Q has the equation $(x - 3)^2 + (y + 3)^2 = 49$.



- (a) Write down the equation of circle P. (2)

Answer: _____

- (b) Calculate the distance PQ between the centres. (2)

Answer: _____

- (c) Show that the circles touch externally. (2)

Answer: _____

- (d) Determine the coordinates of T, the point where the circles touch. (3)

Answer: _____

- (e) Determine the equation of the common tangent to the circles at T. (3)

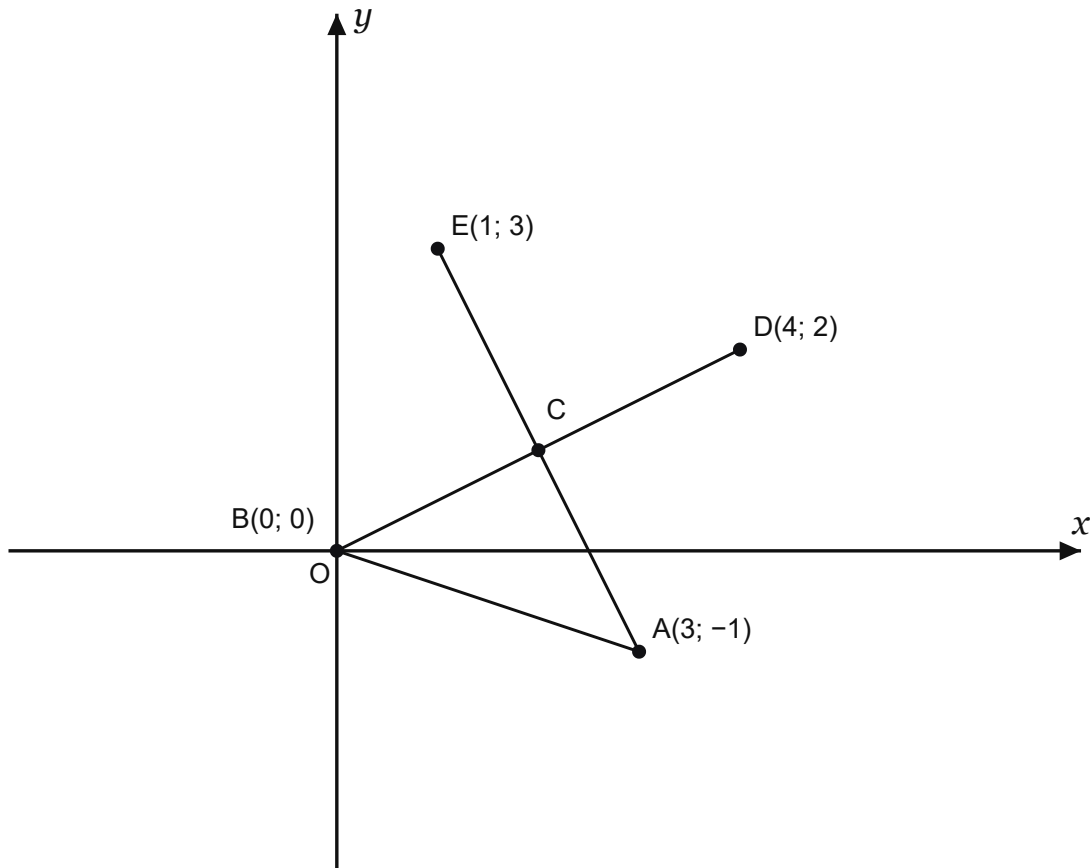
Answer: _____

The distance between two points

3

[14]

In the diagram, $A(3; -1)$, $B(0; 0)$, $D(4; 2)$ and $E(1; 3)$ are given. AE and DB intersect at $C(2; k)$.



- (a) Calculate the length of AB , in simplest surd form. (2)

Answer: _____

- (b) Determine the equation of the line DB . (3)

Answer: _____

- (c) Determine the value of k . (2)

Answer: _____

- (d) Prove that $AE \perp DB$. (3)

Answer: _____

- (e) Determine the size of $\hat{A}BD$, correct to one decimal place. (4)

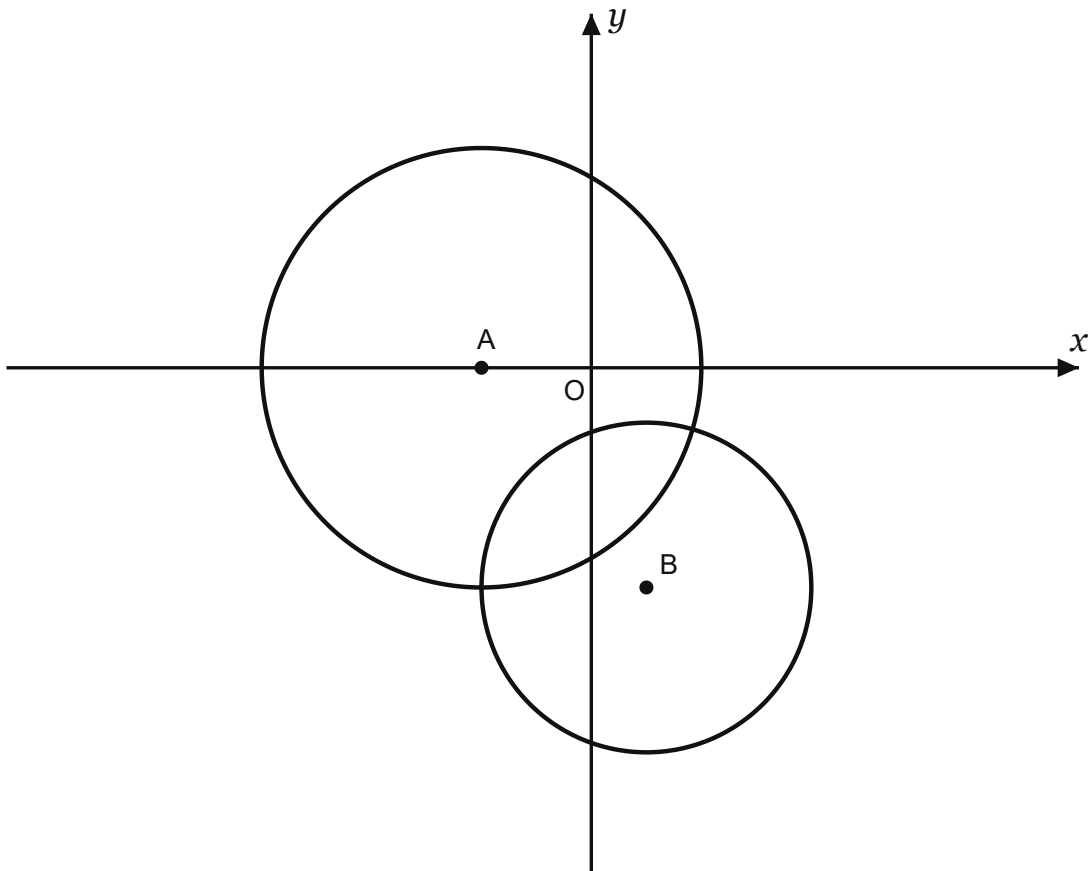
Answer: _____

Two circles: touching, intersecting or apart

4

[10]

Two circles are given: the first, with centre A, has the equation $(x + 2)^2 + y^2 = 16$; the second, with centre B, has the equation $x^2 + y^2 - 2x + 8y + 8 = 0$.



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- (a) Determine the centre B and the radius of the second circle. (3)

Answer: _____

-
- (b) Determine the distance AB between the centres. (2)

Answer: _____

-
- (c) Do the circles cut, touch or not meet? Justify your answer. (3)

Answer: _____

- (d) The second circle keeps its centre B. What must its radius be for it to touch the first circle externally? (2)

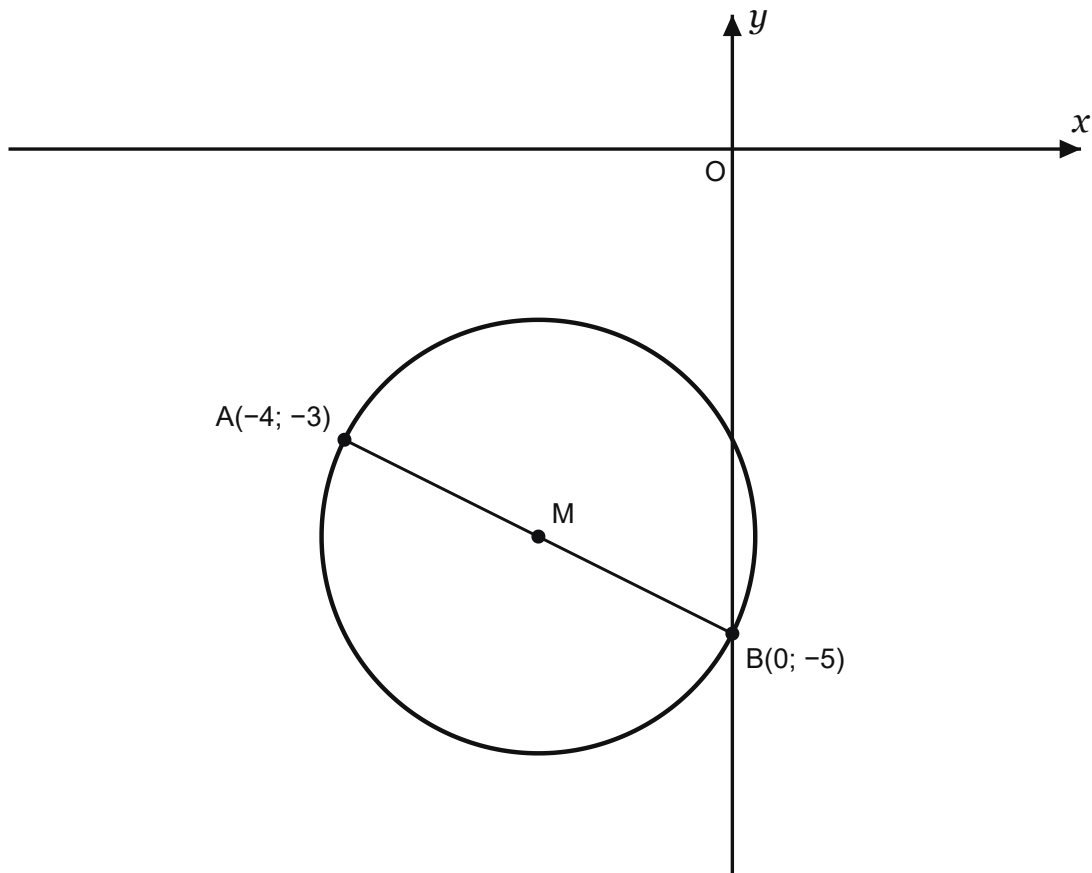
Answer: _____

The midpoint of a line segment

5

[14]

In the diagram, AB is a diameter of the circle with centre M , where $A(-4; -3)$ and $B(0; -5)$.



- (a) Determine the coordinates of M , the centre of the circle. (2)

Answer: _____

- (b) Determine the equation of the circle. (3)

Answer: _____

- (c) Show that $P(-3; -6)$ lies on the circle. (2)

Answer: _____

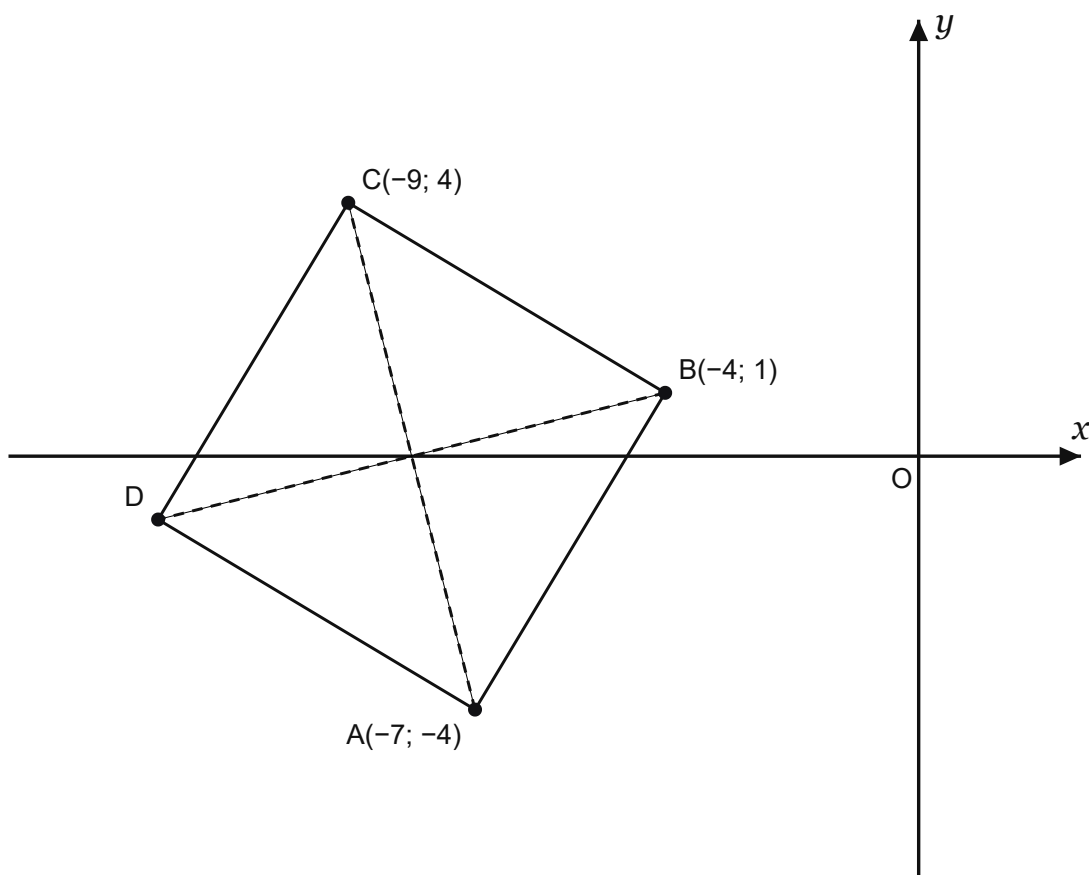
- (d) Determine the equation of the tangent to the circle at A . (4)

Answer: _____

- (e) Determine the y -intercepts of the circle, in simplest surd form where needed. (3)

Answer: _____

In the diagram, ABCD is a parallelogram with $A(-7; -4)$, $B(-4; 1)$ and $C(-9; 4)$. Its diagonals meet at M.



- (a) Determine the coordinates of M, the point where the diagonals meet. (2)

Answer: _____

- (b) Hence determine the coordinates of D. (2)

Answer: _____

- (c) Determine the length of AB in simplest surd form. (2)

Answer: _____

- (d) Determine whether ABCD is a rectangle. Show your working. (3)

Answer: _____

- (e) Calculate the area of $\triangle ABC$. (3)

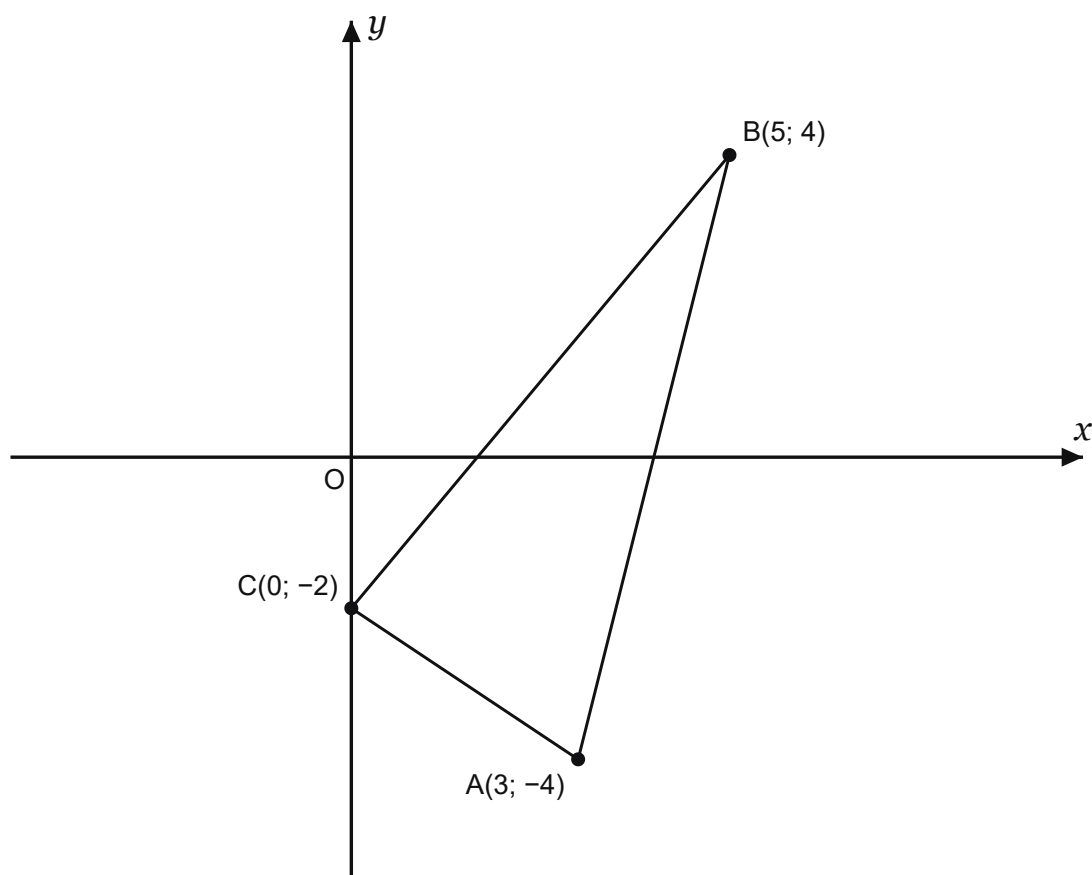
Answer: _____

Gradient

7

[14]

In the diagram, $A(3; -4)$, $B(5; 4)$ and $C(0; -2)$ are the vertices of $\triangle ABC$.



- (a) Determine the gradient of AB. (2)

Answer: _____

- (b) Determine θ , the angle of inclination of AB, correct to one decimal place. (2)

Answer: _____

- (c) Determine the equation of the line through C that is perpendicular to AB. (3)

Answer: _____

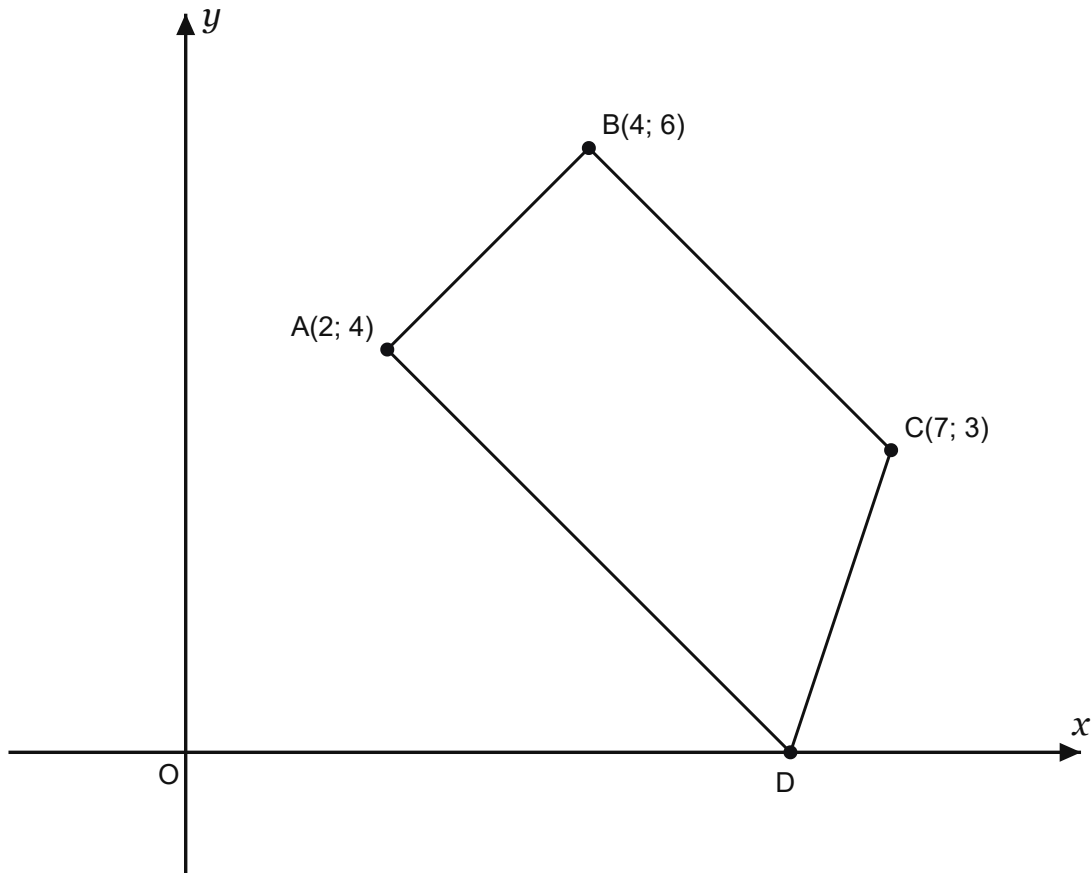
- (d) $D(4; k)$ lies on the same straight line as A and B. Determine k . (3)

Answer: _____

- (e) Determine the size of angle $\hat{B}AC$, correct to one decimal place. (4)

Answer: _____

In the diagram, ABCD is a trapezium with $AD \parallel BC$. $A(2; 4)$, $B(4; 6)$ and $C(7; 3)$ are given, and D lies on the x -axis.



- (a) Determine the gradient of BC. (1)

Answer: _____

- (b) Prove that $\hat{ABC} = 90^\circ$. (3)

Answer: _____

- (c) Determine the equation of AD. (3)

Answer: _____

- (d) Determine the coordinates of D. (2)

Answer: _____

(e) Calculate the area of $\triangle ABC$.

(3)

Answer: _____