1.3 Pure: Coordinate Geometry (Lines and Circles): Test Pack

Total Marks

EDEXCEL 9MA0 · Calculator allowed · about 65 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Find the gradient of the line joining A(2, 3) and B(6, 11).

(Total for Question 1 is 1 mark)

---

2 A circle has equation $(x - 3)^2 + (y + 2)^2 = 49$. Write down the coordinates of the centre and the radius of the circle.

(Total for Question 2 is 2 marks)

---

3 A line has gradient 3. State the gradient of a line perpendicular to it.

(Total for Question 3 is 1 mark)

---

4 A circle has centre (2, -1) and passes through the point (5, 3).

(a) Calculate the radius of the circle. **(2)**

(b) Write down an equation of the circle. **(2)**

(c) Determine, showing your working, whether the point (7, -4) lies inside, on, or outside the circle. **(3)**

(Total for Question 4 is 7 marks)

---

5 The points A(1, 1), B(5, 3) and C(7, -1) form a triangle.

(a) Show that angle ABC = 90 degrees. **(3)**

(b) Find the exact lengths of AB and BC. **(3)**

(c) Hence find the area of triangle ABC. **(2)**

(Total for Question 5 is 8 marks)

---

6 The points E(2, 1) and F(10, 7) form a diameter of a circle. Find an equation of the circle.

(Total for Question 6 is 3 marks)

© Revision Library | revisionlibrary.co.uk

7 The line l has equation $4x - 3y = 75$ and the circle C has equation $x^2 + y^2 = 225$.

(a) Show that l is a tangent to C. **(4)**

(b) Find the coordinates of the point where l touches C. **(3)**

(Total for Question 7 is 7 marks)

---

8 A circle has equation $(x-4)^2 + (y-1)^2 = 20$. The point P(2, 5) lies on the circle.

(a) Verify that P lies on the circle. **(2)**

(b) Find an equation of the tangent to the circle at P, giving your answer in the form $ax + by + c = 0$. **(4)**

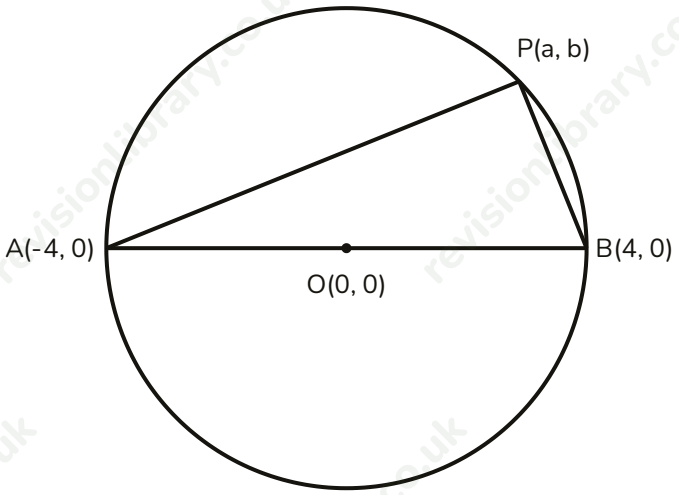
(c) The tangent found in part (b) meets the x-axis at A and the y-axis at B. Hence find the area of triangle OAB, where O is the origin. **(3)**

(Total for Question 8 is 9 marks)

---

9 A circle has centre O(0, 0) and radius 4, so that the points A(-4, 0) and B(4, 0) lie on the circle and AB is a diameter. The point P(a, b), where $b > 0$, also lies on the circle.

Diagram NOT accurately drawn



(a) Use gradients to show that angle APB = 90 degrees for any point P on the circle other than A or B. **(5)**

(b) Given further that the tangent to the circle at P has gradient -3/4, and that $a > 0$, find the coordinates of P. **(5)**

(Total for Question 9 is 10 marks)

---

10 A circle has equation $x^2 + y^2 - 4x + 6y - 19 = 0$. The line l has equation $y = x + k$, where k is a constant. Given that l is a tangent to the circle, find the two possible values of k.

(Total for Question 10 is 4 marks)

© Revision Library | revisionlibrary.co.uk

Mark scheme · 1.3 Pure: Coordinate Geometry (Lines and Circles): Test Pack

Question 1

gradient = 2 cao **B1**

Answer: 2

Question 2

centre (3, -2) cao **B1**

radius = 7 cao **B1**

Answer: centre (3, -2), radius 7

Question 3

-1/3 cao **B1**

Answer: -1/3

Question 4

(a) uses r = $\sqrt{(5-2)^2 + (3-(-1))^2}$ **M1**

(a) r = 5 cao **A1**

(a) Answer: r = 5

(b) uses $(x-a)^2 + (y-b)^2 = r^2$ with centre (2,-1) **M1**

(b) $(x-2)^2 + (y+1)^2 = 25$ cao **A1**

(b) Answer: $(x-2)^2 + (y+1)^2 = 25$

(c) substitutes (7,-4) into $(x-2)^2 + (y+1)^2$, i.e. $(7-2)^2 + (-4+1)^2$ **M1**

(c) compares result to $r^2 = 25$ **M1**

(c) 34 > 25 so the point lies outside the circle, cao **A1**

(c) Answer: Outside the circle (34 > 25)

Question 5

(a) finds gradient AB = (3-1)/(5-1) = 1/2 **M1**

(a) finds gradient BC = (-1-3)/(7-5) = -2 **M1**

(a) product of gradients = (1/2)(-2) = -1, so AB is perpendicular to BC, hence angle ABC = 90 degrees, cso **A1**

(a) Answer: Gradients multiply to -1, so angle ABC = 90 degrees

(b) AB = $\sqrt{(5-1)^2 + (3-1)^2}$ **M1**

(b) BC = $\sqrt{(7-5)^2 + (-1-3)^2}$ **M1**

(b) AB = BC = $2\sqrt{5}$ exact, both correct **A1**

(b) Answer: AB = $2\sqrt{5}$, BC = $2\sqrt{5}$

(c) uses area = (1/2) x AB x BC since angle ABC = 90 degrees **M1**

(c) area = 10 cao **A1**

(c) Answer: Area = 10

Question 6

finds the centre as the midpoint of EF, (6, 4) **M1**

finds the length EF and halves it to obtain the radius **M1**

$(x-6)^2 + (y-4)^2 = 25$ cao **A1**

Answer: $(x - 6)^2 + (y - 4)^2 = 25$

Question 7

(a) eliminates y between the two equations (substitutes y = (4x - 75)/3 into the circle) **M1**

(a) substitutes into $x^2 + y^2 = 225$ and simplifies to $25x^2 - 600x + 3600 = 0$ (or equivalent) **M1**

(a) evaluates the discriminant **M1**

(a) discriminant = 0, so there is one repeated root and l is a tangent (cso) **A1**

(a) Answer: discriminant = 0, so l is a tangent

(b) repeated root x = -b/(2a) of the quadratic, or the foot of the perpendicular from the origin **M1**

(b) x = 12 **A1**

(b) y = -9 **A1**

(b) Answer: (12, -9)

Question 8

(a) substitutes (2,5) into $(x-4)^2 + (y-1)^2$ **M1**

(a) $(2-4)^2 + (5-1)^2 = 4 + 16 = 20$, which equals the right-hand side, so P lies on the circle, cso **A1**

(a) Answer: 4 + 16 = 20, so P lies on the circle

(b) finds gradient of radius from centre (4,1) to P(2,5): (5-1)/(2-4) = -2 **M1**

(b) uses perpendicular gradient of tangent = 1/2 **M1**

(b) forms y - 5 = (1/2)(x - 2) **M1**

(b) x - 2y + 8 = 0 oe, cao **A1**

(b) Answer: x - 2y + 8 = 0

(c) sets y = 0 to find A = (-8, 0) **M1**

(c) sets x = 0 to find B = (0, 4) **M1**

(c) area = (1/2)(8)(4) = 16 cao **A1**

(c) Answer: Area = 16

Question 9

(a) finds gradient of AP = b/(a+4) **M1**

(a) finds gradient of BP = b/(a-4) **M1**

(a) forms the product of gradients = $b^2/(a^2-16)$ **M1**

(a) uses $a^2 + b^2 = 16$ (P lies on the circle) to write $a^2 - 16 = -b^2$ **A1**

(a) product of gradients = $b^2/(-b^2) = -1$, so AP is perpendicular to BP, hence angle APB = 90 degrees, cso **A1**

(a) Answer: Gradients of AP and BP multiply to -1, so angle APB = 90 degrees

(b) states gradient of radius OP = b/a **M1**

(b) uses the tangent-radius perpendicularity: (b/a) x (-3/4) = -1, giving b/a = 4/3 **M1**

(b) substitutes b = (4/3)a into $a^2 + b^2 = 16$ **M1**

(b) a = 12/5, oe 2.4 **A1**

(b) b = 16/5, oe 3.2 **A1**

(b) Answer: P = (12/5, 16/5)

© Revision Library | revisionlibrary.co.uk

Question 10

substitutes $y = x + k$ into the circle equation	**M1**
forms the correct quadratic in x: $2x^2 + (2k+2)x + (k+3)^2 - 28 = 0$	**A1**
applies the tangency condition $b^2 - 4ac = 0$ and simplifies to $k^2 + 10k - 39 = 0$	**M1**
$k = 3$ or $k = -13$, both values cao	**A1**

Answer: k = 3 or k = -13

© Revision Library | revisionlibrary.co.uk