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Equation of a Circle

(Gaeaf 2005)

6. The circles C_1 and C_2 are given

by $(x+1)^2 + (y+2)^2 = 25$

and $x^2 + y^2 - 10x - 5y + 25 = 0$, respectively.

(a) Write down the radius and the coordinates of the centre of C_1. [2]

(b) Find the radius and the coordinates of the centre of C_2. [3]

(c) Show that C_1 and C_2 touch. [3]

(Haf 2005)

5. The circle C is given by the equation

$$x^2 + y^2 - 8x + 4y - 5 = 0.$$

(a) Find the radius and the coordinates of the centre of C. [3]

(b) (i) Show that $P(1, -6)$ lies on C. [1]

(ii) Find the equation of the tangent to C at P. [4]

(Gaeaf 2006)

8. *(a)* Find the centre and radius of the circle C given by

$$x^2 + y^2 - 8x + 4y + 11 = 0.$$ [3]

(b) Given that the circle

$$x^2 + y^2 = a^2 \ (a > 0)$$

touches C externally, find the value of a, giving your answer correct to two decimal places. [4]

(Haf 2006)

9. A circle C has centre D and equation

$$x^2 + y^2 + 2x - 8y + 8 = 0.$$

(a) Find the coordinates of D and the radius of C. [3]

(b) A line is drawn through the point P (4, 6) so that it touches the circle C at the point T.

(i) Show that $PT = \sqrt{20}$.

(ii) Find the equation of the circle centre P which passes through the point T. [5]

(Gaeaf 2007)

5. A circle C_1 with centre A has equation

$$x^2 + y^2 - 6x + 8y - 75 = 0.$$

(a) Find the coordinates of A and the radius of C_1. [3]

(b) A second circle C_2 has centre B (–6, 8) and radius 5.

(i) Show that C_1 and C_2 touch.

(ii) Given that the circles touch at the point P (–3, 4), find the equation of the common tangent. [7]

(Haf 2007)

8. The circle $x^2 + y^2 + 4x - 16y + 18 = 0$ has centre A and radius r.

(a) Find the coordinates of A and the value of r. [3]

(b) The line $y = x + 2$ and the circle $x^2 + y^2 + 4x - 16y + 18 = 0$ intersect at the points B and C. Find the coordinates of B and C. [4]

(Gaeaf 2008)

8. The circle C has centre A and equation

$$x^2 + y^2 - 4x + 6y - 12 = 0.$$

(a) Find the coordinates of A and the radius of C. [3]

(b) The point P has coordinates (5, 1) and lies on C. Find the equation of the tangent to C at P. [4]

(c) The line L has equation $y = x + 3$. Show that L and C do not intersect. [4]

(Haf 2008)

8. The circle C has centre A and radius r. The points $P(1, -4)$ and $Q(9, 10)$ are at either end of a diameter of C.

(a) (i) Write down the coordinates of A.

(ii) Show that $r = \sqrt{65}$.

(iii) Write down the equation of C. [4]

(b) Verify that the point $R(4, 11)$ lies on C. [2]

(c) Find $\hat{QPR}$. [3]

(Gaeaf 2009)

8. The circle C_1 has centre A and equation

$$x^2 + y^2 + 4x - 2y - 20 = 0.$$

(a) Find the coordinates of A and the radius of C_1. [3]

(b) The line L has equation $y = -x + 6$. Find the coordinates of the points of intersection of L and C_1. [4]

(c) The circle C_2 has centre (10, 6) and radius r. Given that C_1 and C_2 touch externally, find the value of r. [3]

(Haf 2009)

8. The circle C_1 has centre A and equation

$$x^2 + y^2 - 6x + 2y - 15 = 0.$$

(a) Find the coordinates of A and the radius of C_1. [3]

(b) The point P has coordinates (7, 2) and lies on C_1. Find the equation of the tangent to C_1 at P. [4]

(c) The circle C_2 has centre $B(11, 14)$ and radius 8. A point Q lies on C_1 and a point R lies on C_2. Find the shortest possible length of the line QR. [3]

(Gaeaf 2010)

8. The circle C has centre A and equation

$$x^2 + y^2 + 4x - 8y + 10 = 0.$$

(a) Find the coordinates of A and the radius of C. [3]

(b) The line L has equation

$$x - 3y + 4 = 0.$$

Show that L is a tangent to the circle C. [4]

(Haf 2010)

9. The circle C has centre A and equation

$$x^2 + y^2 - 8x + 2y + 7 = 0.$$

(a) Find the coordinates of A and the radius of C. [3]

(b) The point P has coordinates $(7, -2)$.

(i) Verify that P lies on C.

(ii) Given that the point Q is such that PQ is a diameter of C, find the coordinates of Q. [4]

(c) The line L has equation $y = 2x - 4$. Find the coordinates of the points of intersection of L and C. [4]

(Gaeaf 2011)

8. The circle C has centre A and equation

$$x^2 + y^2 - 2x + 6y - 15 = 0.$$

(a) (i) Write down the coordinates of A.

(ii) The point P has coordinates $(4, -7)$ and lies on C. Find the equation of the tangent to C at P. [5]

(b) The line L has equation $y = x + 4$. Show that L and C do not intersect. [4]

(Haf 2011)

8. The circle C_1 has centre A and equation

$$x^2 + y^2 - 4x + 2y - 20 = 0.$$

(a) Find the coordinates of A and the radius of C_1. [3]

(b) A second circle C_2 has centre $B(8, -9)$ and radius 15.

(i) Show that C_1 and C_2 touch, justifying your answer.

(ii) Given that the circles touch at the point $P(-1, 3)$, find the equation of the common tangent.

[7]

(Gaeaf 2012)

8. The circle C has centre A and radius r. The points $P(3, -8)$ and $Q(5, 6)$ are at either end of a diameter of C.

(a) (i) Write down the coordinates of A.

(ii) Show that $r = \sqrt{50}$.

(iii) Write down the equation of C. [4]

(b) Verify that the point $R(9, -6)$ lies on C. [2]

(c) Find $P\hat{Q}R$. [3]

(Haf 2012)

8. The circle C has centre A and equation

$$x^2 + y^2 - 4x + 6y + 1 = 0.$$

(a) Find the coordinates of A and the radius of C. [3]

(b) The point R lies on the circle C. The tangent to the circle at R passes through the point $T(8, 2)$. Find the length of RT. [3]

(Gaeaf 2013)

8. The circle C has centre A and equation

$$x^2 + y^2 + 6x - 10y + 14 = 0.$$

(a) (i) Find the coordinates of A and the radius of C.

(ii) The point P has coordinates $(-6, 2)$. Determine whether P lies inside C, on C or outside C. [5]

(b) The line L has equation

$$y = 2x + 1.$$

(i) Show that L is a tangent to the circle C and find the coordinates of Q, the point of contact of L and C.

(ii) The point R has coordinates $(4, 9)$ and R lies on L. Find $A\hat{R}Q$. [8]

(Haf 2013)

8. The circle C_1 has centre A and equation

$$x^2 + y^2 + 2x - 6y - 15 = 0.$$

(a) Find the coordinates of A and the radius of C_1. [3]

(b) The line L has equation $y = -x + 9$.

(i) Show that L is not a diameter of C_1.

(ii) Find the coordinates of the points of intersection of L and C_1. [5]

(c) The circle C_2 has centre $B(11, 8)$ and radius 6. Find the shortest distance between the circles C_1 and C_2. [3]

(Gaeaf 2014)

8. The circle C has centre A and equation

$$x^2 + y^2 - 4x + 8y - 5 = 0.$$

(a) (i) Write down the coordinates of A.

(ii) The point P has coordinates $(6, -7)$ and lies on C. Find the equation of the tangent to C at P. [5]

(b) The line L has equation $y = x + 3$. Show that L and C do not intersect. [4]

(Haf 2014)

8. *(a)* The circle C_1 has centre $A(-2, 9)$ and radius 5. The circle C_2 has centre $B(10, -7)$ and radius 15.

(i) Show that C_1 and C_2 touch, justifying your answer.

(ii) Given that the circles touch at the point $P(1, 5)$, find the equation of the common tangent at P. [7]

(b) Gareth, who has been asked by his teacher to investigate the properties of another circle C_3, claims that the equation of this circle C_3 is given by

$$x^2 + y^2 + 4x - 6y + 20 = 0.$$

Show that Gareth cannot possibly be correct. [3]

(Haf 2015)

8. The circle C has centre A and radius r. The points $P(-2, -3)$ and $Q(8, 1)$ are at opposite ends of a diameter of C.

(a) (i) Write down the coordinates of A.

(ii) Show that $r = \sqrt{29}$. [3]

(b) Given that the point $R(5, 4)$ lies on the circle C, find $P\hat{Q}R$. Give your answer in degrees, correct to one decimal place. [3]

(c) The point S lies on the circle C. The tangent to the circle at S passes through the point $T(11, 0)$. Find the length of ST. [3]

(Haf 2016)

8. The circle C_1 has centre A and equation

$$x^2 + y^2 + 6x - 20y + 59 = 0.$$

(a) (i) Find the coordinates of A and the radius of C_1.

(ii) Find the shortest distance from the origin to the circle C_1. Give your answer correct to two decimal places. [5]

(b) The line L has equation $y = 3x - 1$. The line L and the circle C_1 intersect at the points P and Q.

(i) Find the coordinates of P and Q.

(ii) The circle C_2 has centre $B(6, 7)$ and is such that PQ is the common chord of C_1 and C_2. Find the equation of C_2. [7]

(Haf 2017)

8. The circle C has centre A and equation

$$x^2 + y^2 + 10x - 8y + 21 = 0.$$

(a) (i) Find the coordinates of A and the radius of C.

(ii) The point P has coordinates $(-2, 0)$. Determine whether P lies inside C, on C or outside C. [5]

(b) The line L has equation $y = 2x + 4$. Show that L is a tangent to the circle C and find the coordinates of the point of contact of L and C. [5]

(Haf 2018)

8. The circle C_1 has centre $A(2, -1)$ and passes through the point $P(6, 1)$.

(a) (i) Show that the equation of C_1 is given by

$$x^2 + y^2 - 4x + 2y - 15 = 0.$$

(ii) Given that the point Q is such that PQ is a diameter of C_1, find the coordinates of Q.

(iii) Find the equation of the tangent to C_1 at P. [9]

(b) The circle C_2 has centre $B(-4, 7)$ and radius $\sqrt{8}$. Find the shortest distance between C_1 and C_2. Give your answer correct to one decimal place. [3]