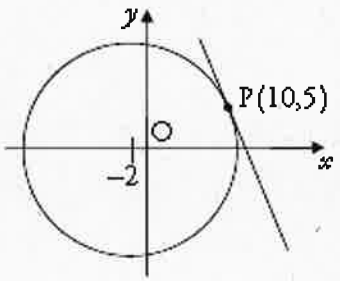
Applications Assessment Standard 1.2

1. (a) A circle has radius 7 units and centre (2, -3). Write down the equation of the circle.

   (b) A circle has equation $x^2 + y^2 - 10x + 6y - 3 = 0$. Write down its radius and the coordinates of its centre.

2. Show that the straight line $y = -2x - 3$ is a tangent to the circle with equation $x^2 + y^2 + 6x + 4y + 8 = 0$.

3. The point P(10, 5) lies on the circle with centre (-2, 0), as shown in the diagram below.



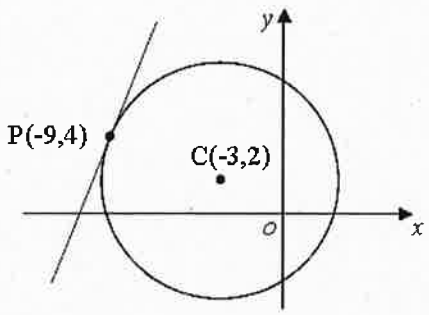
   Find the equation of the tangent to the circle at P.

4. (a) A circle has radius 6 units and centre C(4, -1). Write down the equation of the circle.

   (b) A circle has equation $x^2 + y^2 - 4x + 2y - 4 = 0$. Write down its radius and the coordinates of its centre.

5. Determine if the line $y = 5 - 2x$ is a tangent to the circle with equation $x^2 + y^2 + 6x - 2y - 10 = 0$.

6. The point P(-9, 4) lies on the circle with centre C(-3, 2), as shown in the diagram below.



Find the equation of the tangent to the circle at P.

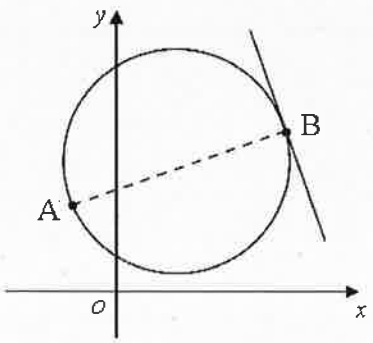
7. (a) A circle has radius 10 units and centre C(5, -2). Write down the equation of the circle.

(b) A circle has equation $x^2 + y^2 - 2x + 10y + 1 = 0$. Write down its radius and the coordinates of its centre.

8. Determine if the line $y = x - 10$ is a tangent to the circle with equation $x^2 + y^2 - 6x + 6y + 10 = 0$.

9. A circle has AB as a diameter, as shown in the diagram. A and B have coordinates (-2, 5) and (10, 8) respectively.

Find the equation of the tangent at B.



10. (a) A circle has a radius of 1 unit and centre $C(-2, 6)$. Write down the equation of the circle.

(b) A circle has equation $x^2 + y^2 - 6x + 5 = 0$. Write down its radius and the coordinates of its centre.

11. Determine if the line $y = 17 - 4x$ is a tangent to the circle with equation $x^2 + y^2 + 8x + 2y - 51 = 0$.

12. A circle has as its centre the point $C(5, 1)$. The point $P(9, 3)$ lies on its circumference.

Find the equation of the tangent at P.

13. Determine whether circle A: $(x - 2)^2 + (y - 1)^2 = 15$ intersects with circle

B: $(x + 4)^2 + (y - 3)^2 = 27$. Justify your answer.

14. Determine whether circle A: $(x - 2)^2 + (y - 3)^2 = 9$ intersects with circle

B: $(x - 1)^2 + (y + 1)^2 = 16$. State whether they intersect at zero, one or two points and justify your answer.

15. Determine whether circle A: $(x - 3)^2 + (y - 4)^2 = 25$ intersects with circle

B: $(x - 3)^2 + (y - 14)^2 = 25$. State whether they intersect at zero, one or two points and justify your answer. What does this mean geometrically?

16. Consider circles A: $(x - 18)^2 + (y - 20)^2 = 100$ and B: $(x - 15)^2 + (y - 16)^2 = 25$. Explain why these circles intersect at one common point.

Applications Assessment Standard 1.2 Answers

1. (a) $(x - 2)^2 + (y + 3)^2 = 49$ (b) Centre (5, -3). Radius = $\sqrt{37}$

2. Either discriminant = 0 or show that there is only one root, therefore line is a tangent.

3. $y - 5 = \frac{-12}{5}(x - 10)$

4. (a) $(x - 4)^2 + (y + 1)^2 = 36$ (b) Centre (2, -1). Radius = 3

5. Either discriminant = 0 or show that there is only one root, therefore line is a tangent.

6. $y - 4 = 3(x + 9)$

7. (a) $(x - 5)^2 + (y + 2)^2 = 100$ (b) Centre (1, -5). Radius = 5

8. Either discriminant = 0 or show that there is only one root, therefore line is a tangent.

9. $y - 8 = -4(x - 10)$

10. (a) $(x + 2)^2 + (y - 6)^2 = 1$ (b) Centre (3, 0). Radius = 2

11. Either discriminant = 0 or show that there is only one root, therefore line is a tangent.

12. $y - 3 = -2(x - 9)$

13. Circle A has centre (2, 1) and radius $\sqrt{15} = 3.9$

    Circle B has centre (-4, 3) and radius $\sqrt{27} = 5.2$

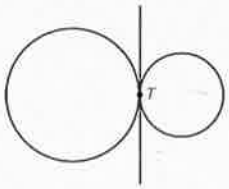
    The distance between the centres = $\sqrt{40} = 6.3 <$ sum of the radii, hence the circles intersect at two distinct points.

14. Circle A has centre (2, 3) and radius = 3

Circle B has centre (1, -1) and radius = 4

The distance between the centres = $\sqrt{17}$ = 4.1 < sum of the radii, hence the circles intersect at two distinct points.

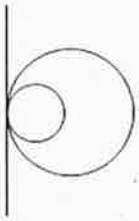
15. Circle A has centre (3, 4) and radius = 5



Circle B has centre (3, 14) and radius = 5

The distance between the centres = 10 ≡ sum of the radii, hence the circles intersect at one distinct point on a common tangent.

16. Circle A has centre (18, 20) and radius = 10



Circle B has centre (15, 16) and radius = 5

The distance between the centres = 5 < sum of the radii.

The distance between the centres = 5 ≤ each individual radii.

Hence the circles intersect at one distinct point on a common tangent.