

Equation of a Tangent to a Circle - Worksheet

Skill

Group A - Gradient between two points

Find the gradient of the straight line passing through:

1) $(0, 0)$ and $(1, 3)$

2) $(0, 0)$ and $(3, 1)$

3) $(3, 1)$ and $(0, 0)$

4) $(-3, 1)$ and $(0, 0)$

5) $(-3, -1)$ and $(0, 0)$

6) $(3, -1)$ and $(0, 0)$

7) $(4, 2)$ and $(0, 0)$

8) $(2, 4)$ and $(0, 0)$

9) $(-4, 2)$ and $(0, 0)$

10) $(-4, -2)$ and $(0, 0)$

11) $(4, -2)$ and $(0, 0)$

12) $(-2, -4)$ and $(0, 0)$

Group B - Perpendicular gradients

Find the gradient of a line perpendicular to these gradients:

1) 2

2) -2

3) $\frac{1}{2}$

4) $-\frac{1}{2}$

5) 7

6) -7

7) $\frac{1}{7}$

8) $-\frac{1}{7}$

9) 0.9

10) -0.9

11) $\frac{10}{9}$

12) $-\frac{10}{9}$

Equation of a Tangent to a Circle - Worksheet

Group C - Finding the equation of a line passing through a given point

Find the equation of the tangent to:

1) $x^2 + y^2 = 40$ at the point $(6, 2)$

2) $x^2 + y^2 = 40$ at the point $(-6, -2)$

3) $x^2 + y^2 = 40$ at the point $(-6, 2)$

4) $x^2 + y^2 = 40$ at the point $(6, -2)$

5) $x^2 + y^2 = 40$ at the point $(2, 6)$

6) $x^2 + y^2 = 40$ at the point $(-2, -6)$

7) $x^2 + y^2 = 40$ at the point $(-2, 6)$

8) $x^2 + y^2 = 40$ at the point $(2, -6)$

9) $x^2 + y^2 = 0.4$ at the point $(0.2, 0.6)$

10) $x^2 + y^2 = 0.4$ at the point
 $(-0.2, 0.6)$

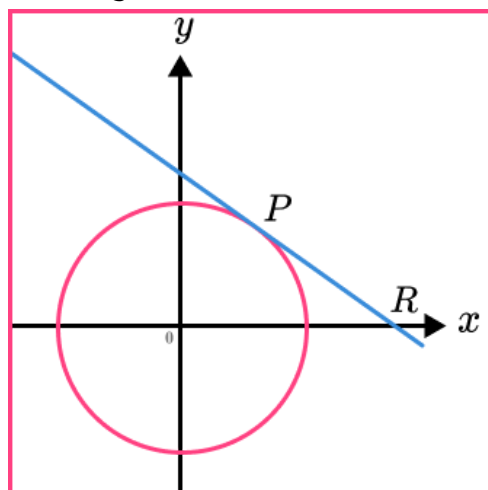
11) $x^2 + y^2 = 0.4$ at the point
 $(0.2, -0.6)$

12) $x^2 + y^2 = 0.4$ at the point
 $(-0.2, -0.6)$

Equation of a Tangent to a Circle - Worksheet

Applied

- 1) (a) A circle has the equation $x^2 + y^2 = 10$
Write down the centre of the circle.
- (b) Write down the exact length of the radius of the circle.
- (c) P is the point $(1, 3)$ on the circle $x^2 + y^2 = 10$
Work out the equation of the tangent to the circle at P .
- 2) (a) A circle C has centre O .
The points $A(0, 8)$ and $B(0, -8)$ lie on opposite ends of the same diameter.
Find the coordinates of the centre O .
- (b) Write down the equation of the circle.
- (c) Does the point $(-3, 5)$ lie on the circle?
- 3) The line L is a tangent to the circle $x^2 + y^2 = 29$ at the point $(-2, 5)$.
The line L crosses the x -axis at the point P .
Work out the coordinates of P .
- 4) The diagram shows the circle $x^2 + y^2 = 17$

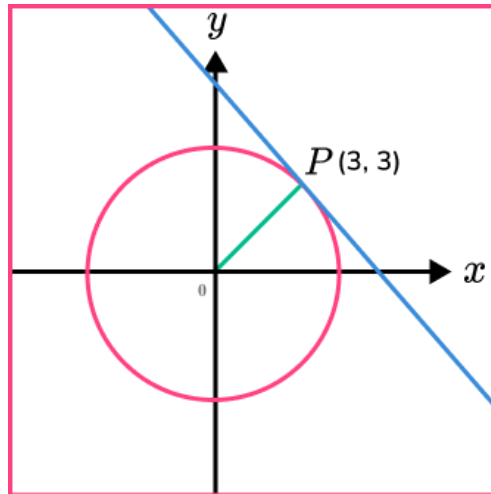


P lies on the circle and has x -coordinate 1.
The tangent at P intersects the x -axis at R .

Work out the coordinates of R .

Equation of a Tangent to a Circle - Exam Questions

- 1) The diagram shows the circle $x^2 + y^2 = 18$ with a tangent at the point $P(3, 3)$.



- (a) Find the gradient of the line OP .

.....
(2)

- (b) Find the gradient of the tangent.

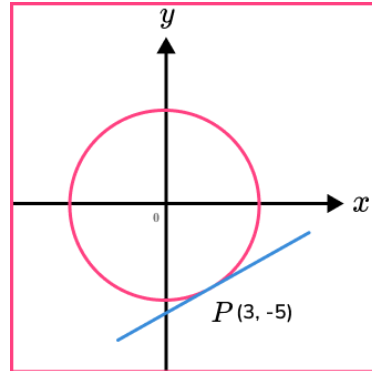
.....
(1)

- (c) Find the equation of the tangent.

.....
(2)
(5 marks)

Equation of a Tangent to a Circle - Exam Questions

- 2) Here is a circle, centre O , and the tangent to the circle at point $P(3, -5)$



Find the equation of the tangent at the point P .

.....
(4 marks)

- 3) The line L is a tangent to the circle $x^2 + y^2 = 29$ at the point P .

P is the point $(2, 5)$

The line L crosses the x -axis at the point Q .

Work out the area of triangle OPQ .

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(6 marks)

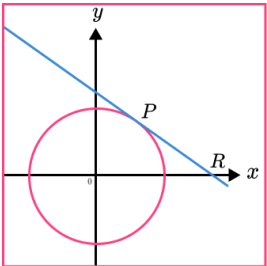
Equation of a Tangent to a Circle - Answers

	Question	Answer
	Skill Questions	
Group A	Find the gradient of the straight line passing through: 1) (0, 0) and (1, 3) 2) (0, 0) and (3, 1) 3) (3, 1) and (0, 0) 4) (− 3, 1) and (0, 0) 5) (− 3, − 1) and (0, 0) 6) (3, − 1) and (0, 0) 7) (4, 2) and (0, 0) 8) (2, 4) and (0, 0) 9) (− 4, 2) and (0, 0) 10) (− 4, − 2) and (0, 0) 11) (4, − 2) and (0, 0) 12) (− 2, − 4) and (0, 0)	1) 3 2) $\frac{1}{3}$ 3) $\frac{1}{3}$ 4) $-\frac{1}{3}$ 5) $\frac{1}{3}$ 6) $-\frac{1}{3}$ 7) $\frac{1}{2}$ 8) 3 9) $-\frac{1}{2}$ 10) $\frac{1}{2}$ 11) $-\frac{1}{2}$ 12) 2
Group B	Find the gradient of a line perpendicular to: 1) 2 2) − 2 3) $\frac{1}{2}$ 4) $-\frac{1}{2}$ 5) 7 6) − 7	1) $-\frac{1}{2}$ 2) $\frac{1}{2}$ 3) − 2 4) 2 5) $-\frac{1}{7}$ 6) $\frac{1}{7}$

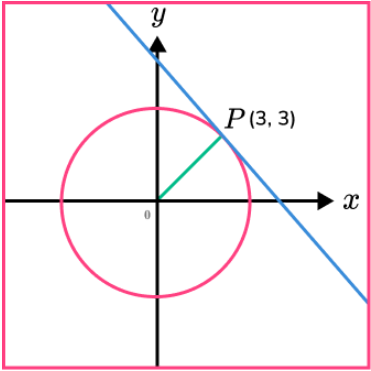
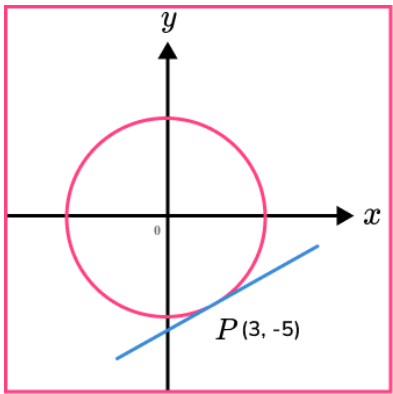
Equation of a Tangent to a Circle - Answers

Group B contd	7) $\frac{1}{7}$ 8) $-\frac{1}{7}$ 9) 0.9 10) -0.9 11) $\frac{10}{9}$ 12) $-\frac{10}{9}$	7) -7 8) 7 9) $-\frac{10}{9}$ 10) $\frac{10}{9}$ 11) $-\frac{9}{10}$ 12) $\frac{9}{10}$
Group C	Find the equation of the tangent to: 1) $x^2 + y^2 = 40$ at the point (6, 2) 2) $x^2 + y^2 = 40$ at the point $(-6, -2)$ 3) $x^2 + y^2 = 40$ at the point $(-6, 2)$ 4) $x^2 + y^2 = 40$ at the point $(6, -2)$ 5) $x^2 + y^2 = 40$ at the point (2, 6) 6) $x^2 + y^2 = 40$ at the point $(-2, -6)$ 7) $x^2 + y^2 = 40$ at the point $(-2, 6)$ 8) $x^2 + y^2 = 40$ at the point $(2, -6)$ 9) $x^2 + y^2 = 0.4$ at the point (0.2, 0.6) 10) $x^2 + y^2 = 0.4$ at the point $(-0.2, 0.6)$ 11) $x^2 + y^2 = 0.4$ at the point $(0.2, -0.6)$ 12) $x^2 + y^2 = 0.4$ at the point $(-0.2, -0.6)$	1) $y = -3x + 20$ 2) $y = -3x - 20$ 3) $y = 3x + 20$ 4) $y = 3x - 20$ 5) $y = -\frac{1}{3}x + 6\frac{2}{3}$ 6) $y = -\frac{1}{3}x - 6\frac{2}{3}$ 7) $y = \frac{1}{3}x + 6\frac{1}{3}$ 8) $y = \frac{1}{3}x - 6\frac{2}{3}$ 9) $y = -\frac{1}{3}x + \frac{2}{3}$ 10) $y = \frac{1}{3}x + \frac{2}{3}$ 11) $y = \frac{1}{3}x - \frac{2}{3}$ 12) $y = -\frac{1}{3}x - \frac{2}{3}$

Equation of a Tangent to a Circle - Answers

	Question	Answer
	Applied Questions	
1)	a) A circle has the equation $x^2 + y^2 = 10$ Write down the centre of the circle. b) Write down the exact length of the radius of the circle. c) P is the point $(1, 3)$ on the circle $x^2 + y^2 = 10$ Work out the equation of the tangent to the circle at P.	a) $(0, 0)$ b) $\sqrt{10}$ c) $y = -\frac{1}{3}x + 3\frac{1}{3}$
2)	a) A circle C has centre O. The points $A(0, 8)$ and $B(0, -8)$ lie on opposite ends of the same diameter. Find the coordinates of the centre O. b) Write down the equation of the circle. c) Does the point $(-3, 5)$ lie on the circle?	a) $(0, 0)$ b) $x^2 + y^2 = 64$ c) No, $(-3)^2 + 5^2 = 9 + 25 = 34 \neq 64$
3)	The line L is a tangent to the circle $x^2 + y^2 = 29$ at the point $(-2, 5)$. The line L crosses the x-axis at the point P. Work out the coordinates of P.	Equation of tangent is: $y = \frac{2}{5}x + 5\frac{4}{5}$ $(-14.5, 0)$
4)	The diagram shows the circle $x^2 + y^2 = 17$  P lies on the circle and has x-coordinate 1. The tangent at P intersects the x-axis at R. Work out the coordinates of R.	$P = (1, 4)$ Equation of tangent: $y = -\frac{1}{4}x + 4\frac{1}{4}$ $R = (17, 0)$

Equation of a Tangent to a Circle - Mark Scheme

	Question	Answer		
	Exam Questions			
1)	(a) The diagram shows the circle $x^2 + y^2 = 18$ with a tangent at the point $P(3, 3)$.  Find the gradient of the line OP.	(a)	$\frac{3-0}{3-0}$ oe 1	(1) (1)
	(b) Find the gradient of the tangent.	(b)	-1	(1)
	(c) Find the equation of the tangent.	(c)	$y = -x + c$ $y = -x + 6$	(1) (1)
2)	Here is a circle, centre O, and the tangent to the circle at point $P(3, -5)$  Find the equation of the tangent at the point P.		Gradient radius $= -\frac{5}{3}$ Gradient tangent $= \frac{3}{5}$ Correct substitution of P into $y = \frac{3}{5}x + c$ to find $c = -6.8$ $y = \frac{3}{5}x - 6.8$	(1) (1) (1) (1)

Equation of a Tangent to a Circle - Mark Scheme

3)	The line L is a tangent to the circle $x^2 + y^2 = 29$ at the point P. P is the point $(2, 5)$. The line L crosses the x-axis at the point Q. Work out the area of triangle OPQ.	Gradient radius $= \frac{5}{2}$ (1) Gradient tangent $= -\frac{2}{5}$ (1) $y - 5 = -\frac{2}{5}(x - 2)$ $y = -\frac{2}{5}x + 5.8$ (1) $Q(14.5, 0)$ (1) $\frac{14.5 \times 5}{2}$ (1) 36.25 (1)
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