Equation of a Circle (Centre $(0, 0)$)
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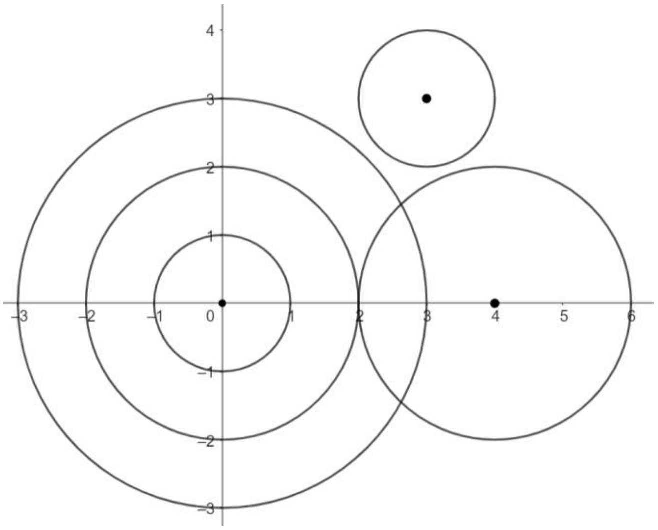
(1) Match the equation of the circles given with the circles drawn below.



$x^2 + y^2 = 9$ $\qquad$ $x^2 + y^2 = 1$ $\qquad$ $x^2 + y^2 = 4$

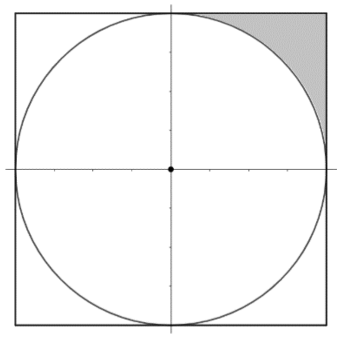
(2) Write down the equation of the circle with:
(a) Centre (0,0), Radius 5
(b) Centre (0,0), Radius 15
(c) Centre (0,0), Diameter 4
(d) Centre (0,0), Radius 6
(e) Centre (0,0), Diameter 2

(3) Without using calculator, find the radius of the circle with equation $x^2 + y^2 = 18$ giving your answer in the form $p\sqrt{q}$.

(4) Sketch the circles with the following equations showing where they cut the coordinate axes. Give any non-integers answers as simplified surds.
(a) $x^2 + y^2 = 36$
(b) $x^2 + y^2 = 100$
(c) $x^2 + y^2 = 20$
(d) $x^2 + y^2 = 1$
(e) $2x^2 + 2y^2 = 50$

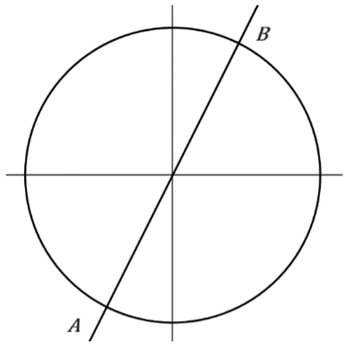
(5) A circle has the equation $x^2 + y^2 = 100$.
(a) Show that the point $P(3,9)$ lies inside the circle.
(b) Find the coordinates of a point Q on the circle where both coordinates are negative,

(6) The diagram below shows the circle with equation$x^2 + y^2 = 64$ inscribed in a square/ The side lengths of the square are tangents to the circle.



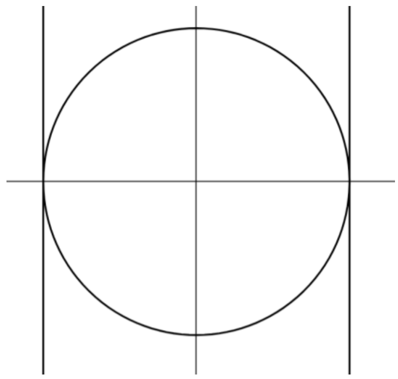
Show that the shaded region has area $64 - 16\pi$

(7) The diagram below shows the circle with equation $x^2 + y^2 = 20$ and part of the line with equation $y = 2x$. The line cuts the circle at the points A and B.



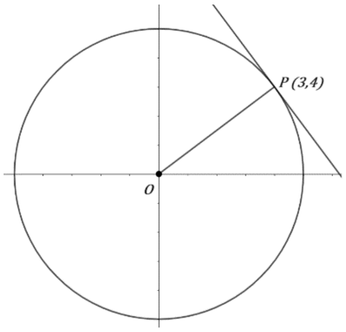
(a) Use simultaneous equations to show that $5x^2 = 20$
(b) Hence find the x coordinates of A and B.
(c) Use your answer to pat (b) to find the y coordinates of A and B.

(8) The diagram below shows a circle with equation $x^2 + y^2 = r^2$ and the line with equation $x = a$ and $x = b$. The two lines are tangents to the circle.



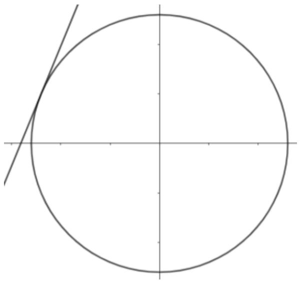
Given that $a - b = 12$, find the equation of the circle.

(9) The diagram below shows the circle with equation $x^2 + y^2 = 25$ and the tangent to the circle at the point $P(3,4)$



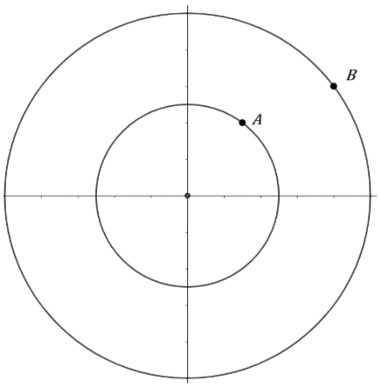
(a) Show that the gradient of the radius is $\frac{4}{3}$.
(b) Hence, explain why the gradient of the tangent is $\frac{-3}{4}$.
(c) Show that the equation of the tangent is $y = -\frac{3}{4}x + 25$

(10) The diagram below shows the circle with equation$x^2 + y^2 = 169$ and a tangent drawn to the circle at the point $(-12,5)$



Find the equation of the tangent.

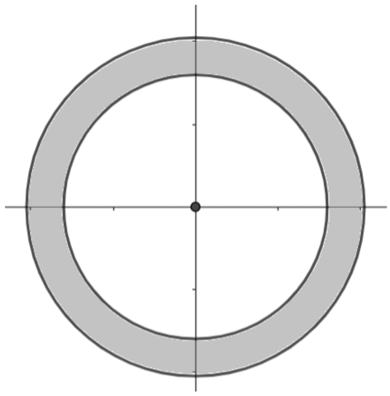
(11) The diagram below shows two circles centre O. Point A lies on the smaller circle and has coordinates $(3,4)$ and point B lies on the large circle and has coordinates $(8,6)$.



Given that A and B can move on the circumference of their circle, find the maximum possible distance AB.

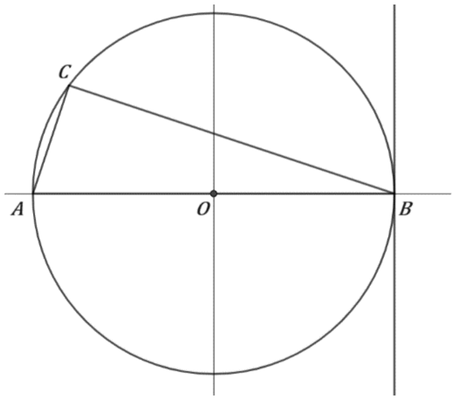
(12) A circle has centre $(0,0)$ and radius 10. A tangent to the ccircle is draw at the point $(6,-8)$. The tangent crosses the x axis at A and the y axis at B.
Find the area of ΔAOB where O is the origin.

(13) Two concentric circles centres O are shown below.



Given that the point $P(2\sqrt{2},\sqrt{3})$ lies on one circles and $Q(-2\sqrt{3},5)$ on the other, show that the shaded area between the circles is 6π.

(14) The diagram below shows a circle centre O. The points A, B and C are all points on the circle and form the tirangle ABC.



The points A and B lie on the x axis and a tangent to the circle is drawn at B.
Given that $AC = 7$ and $CB = 24$, find the equation of the tangent at B.

(15) A circle has equation $x^2 + y^2 = 108$ and a line has equation $y = \sqrt{3}x$.
(a) Without a calculator, find the exact coordinates of the point where the line intercests the circle.
(b) Explain why the line is a diameter of the circle.