Mixed practice 6

1 Find the radius of the circle $x^2 - 8x + y^2 + 6y = 144$.

2 Line l_1 has equation $3x - 2y + 7 = 0$.

a Point $A(2k, 2k+1)$ lies on l_1. Find the value of k.

b Point B has coordinates $(-2, p)$. Find the value of p so that AB is perpendicular to l_1.

c Line l_2 is parallel to l_1 and passes through B. Find the equation of l_2 in the form $ax + by + c = 0$ where a, b and c are integers.

d l_2 crosses the x-axis at the point C. Find the coordinates of C.

3 Circle C has equation $x^2 - 2x + y^2 - 10y - 19 = 0$.

a Find the coordinates of the centre, P, of the circle.

b Show that point $A(7, 2)$ lies on the circle.

Point M has coordinates $(1, -1)$. Line l is perpendicular to PA and passes through M. It cuts
PA at the point S.

c Find the coordinates of S.

4 A circle has equation $x^2 + y^2 + 6x - 4y - 4 = 0$.

i Find the centre and radius of the circle.

ii Find the coordinates of the points where the circle meets the line with equation $y = 3x + 4$.

5 $y = -3x + 5$ is tangent to the circle C at the point $(4, -7)$. The centre of C is at the point $(k-4, k+3)$. Find the value of k.

6 Consider the points $A(4, 3)$, $B(3, -2)$ and $C(9, 2)$.

a Show that BAC is a right angle.

b Hence find the equation of the circle through A, B and C.

c Find the equation of the tangent to the circle at B. Give your answer in the form $ax + by + c = 0$ where a, b and c are integers.

7 A circle has centre $(3, 0)$ and radius 5. The line $y = 2x + k$ intersects the circle in two points. Find the set of possible values of k, giving your answers in surd form.

8 A circle has centre $C(7, 12)$ and passes through the point $D(4, 10)$. The tangent to the circle at D cuts the coordinate axes at points A and B. Find the area of these triangles:

a AOB **b** ABC

9 The points $A(-3, 7)$ and $B(5, -1)$ are endpoints of the diameter of a circle. Find the equation of the circle in the form $x^2 + ax + y^2 + by + c = 0$.

10 Find the exact values of k for which the line $y = kx + 3$ is tangent to the circle with centre $(6, 3)$ and radius 2.

11 **i** Find the equation of the circle with radius 10 and centre $(2, 1)$, giving your answer in the form $x^2 + y^2 + ax + by + c = 0$.

ii The circle passes through the point $(5, k)$ where $k > 0$. Find the value of k in the form $p + \sqrt{q}$.

iii Determine, showing all working, whether the point $(-3, 9)$ lies inside or outside the circle.

iv Find an equation of the tangent to the circle at the point $(8, 9)$.

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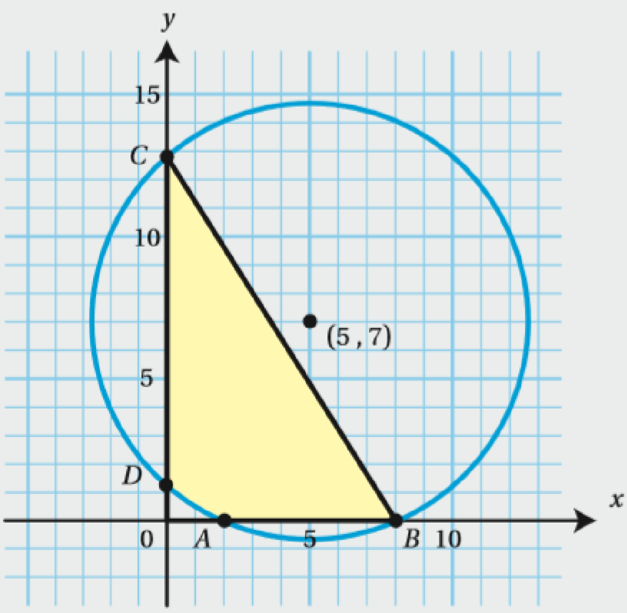
12 Find the shortest distance from the point $(-3, 2)$ to the line with equation $3x + 2y = 19$.
Give your answer in exact form.

13 Show that each of the circles $x^2 - 6x + y^2 + 10y + 18 = 0$ and $x^2 - 14x + y^2 - 6y + 49 = 0$ lies entirely outside the other one.

14 A circle has centre $(5, 7)$. It crosses the x-axis at points $A(2, 0)$ and $B(p, 0)$, where $p > 2$.



a Find the value of p and write down the equation of the circle.

b The circle crosses the y-axis at points C and D. Find the area of the quadrilateral $ABCD$.

Mixed practice 6

1 $k = 13$

2 a $k = -\frac{5}{2}$ **b** $p = 6$

c $3x - 2y - 6 = 0$ **d** $(2,0)$

3 a $(1, 5)$ **b** proof **c** $(3.4, 3.8)$

4 a Centre $(-3, 2)$, radius $\sqrt{17}$

b $\left(\frac{1}{5}, \frac{23}{5}\right)$ and $(-2, -2)$

5 $k = -19$

6 a Proof **b** $(x-6)^2 + y^2 = 13$

c $3x + 2y - 5 = 0$

7 $-6 - 5\sqrt{5} < k < -6 + 5\sqrt{5}$

8 a $\frac{256}{3}$ **b** $\frac{104}{3}$

9 $x^2 - 2x + y^2 - 6y - 22 = 0$

10 $k = \pm\sqrt{\frac{1}{8}} = \pm\frac{\sqrt{2}}{4}$

11 a $x^2 + y^2 - 4x - 2y - 95 = 0$ **b** $k = 1 + \sqrt{91}$

c Inside **d** $y = -\frac{3}{4}x + 15$

12 $\frac{24\sqrt{13}}{13}$

13 Proof; $\sqrt{80} > 7$

14 a $p = 8; (x-5)^2 + (y-7)^2 = 58$ **b** $21 + 5\sqrt{33}$