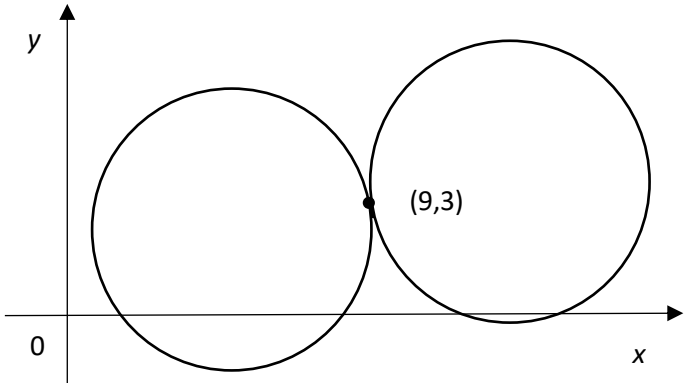|	Circles	
	Circles	
1	A and B are the points (-7,3) and (1,5). If AB is a diameter of a circle, find the equation of this circle	3
2	Two identical circles touch at the point P(9,3) as shown below. The circle to the left has equation $x^2 + y^2 - 10x - 4y + 12 = 0$. Find the equation of the other circle	5

3	Circle C_1 has equation $(x - 5)^2 + (y - 4)^2 = 25$
	Circle C_2 has equation $x^2 + y^2 + 6x + 4y - 3 = 0$
	
	   (a) State the centre and radii of C1 and C2
	   (b) Show that circles C_1 and C_2 do not intersect
		4
		3

4	Circle C_1 has equation $(x - 3)^2 + (y + 2)^2 = 25$ Find the equation of the tangent at the point (6,2)	5
5	Show that the line $y + x = 7$ is a tangent to the circle $x^2 + y^2 - 4x - 2y - 3 = 0$ and determine the point of contact	5

6	(a) Find the points of intersection P and Q of the line $y = 3x - 5$
	      and the circle C_1 with equation $x^2 + y^2 + 2x - 4y - 15 = 0$
	
	   (b) T is the centre of circle C_1. Show that lines PT and QT are
	      perpendicular
	
	   (c) A second circle C_2 passes through points P,Q and T.
	      Find the equation of C_2
		4
		
		3
		
		3

	Circles – Answers	
1	Find the midpoint	midpoint is (-3, 4)
	Find the length of the radius	radius is $\sqrt{(-3-1)^2 + (4-5)^2}$ = $\sqrt{17}$
	Express as an equation	$(x + 3)^2 + (y - 4)^2 = 17$
2	Centre and radius circle	(5,2) radius is √17
	Using P as the midpoint between circles	second circle has centre (13,4)
	State equation of the circle	$(x - 13)^2 + (y - 4)^2 = 17$
3	Centre and radius for C_1	(5,4) radius is 5
	Centre and radius for C_2	(-3, -2) radius is 4
	Find distance between centres	vector from centre$_1$ to centre$_2$ $\begin{pmatrix} -8 \\ -6 \end{pmatrix}$
		distance is 10 units
	State a conclusion	Total for radius$_1$ + radius$_2$ is 9 units < 10 units Thus C_1 and C_2 do not intersect
4	Find the centre of the circle	(3, -2)
	State the gradient of the radius	$m_{rad} = \dfrac{4}{3}$
	Find the gradient of the tangent	$m_{tan} = -\dfrac{3}{4}$
	State the equation of the tangent	$4y = -3x + 26$
5	Substitute straight line $y = $ 7−x into the circle	
		$x^2 + (7 - x)^2 - 4x - 2(7 - x) - 3 = 0$
	Simplify	$2x^2 - 16x + 32 = 0$
	Factorise	$2(x - 4)(x - 4) = 0$
	Proof	double root at $x = 4$, so line is tangent to the circle
	Point of contact	(4, 3) *substitute into the straight line not the circle*
6(a)	Subsitute straight line into circle	$x^2 + (3x - 5)^2 + 2x - 4(3x - 5) - 15 = 0$
	Simplify	$10x^2 - 40x + 30 = 0$
	Factorise and solve for x	$10(x - 1)(x - 3) = 0$, $x = 1$ and $x = 3$
	Find P and Q	P (1,-2) and Q(3,4)
(b)	Centre of circle	T (-1,2)
	Gradient of PT and QT	$m_{PT} = -2$, $m_{QT} = ½$
	Proof	Since m_{PT} x m_{QT} = -1, PT is perpendicular to QT
(c)	Circle Theorems	
	1. PQT is a right-angled triangle where PQ is the hypotenuse	
	2. PQ is the diameter of circle C_2,	
	Midpoint of PQ	centre of circle is (2, 1)
	Length of radius	radius is √10
	Equation of the circle	$(x - 2)^2 + (y - 1)^2 = 10$