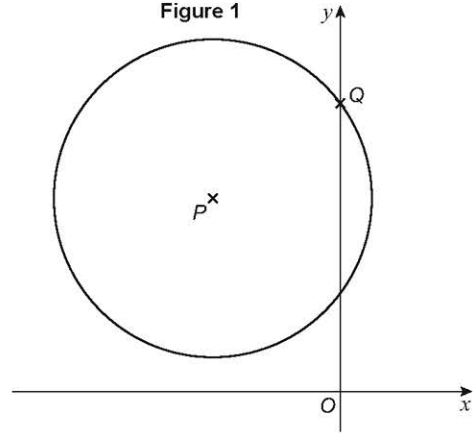
9 **Figure 1** shows a circle.

Figure 1



The centre of the circle is P and the circle intersects the y-axis at Q as shown in **Figure 1**.

The equation of the circle is $x^2 + y^2 = 12y - 8x - 27$

9 (a) Express the equation of the circle in the form

$$(x - a)^2 + (y - b)^2 = k$$

where a, b and k are constants to be found.

[3 marks]

9 (b) State the coordinates of P

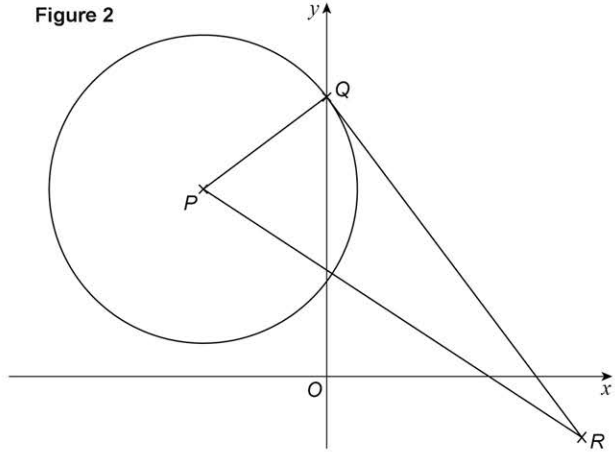
[1 mark]

9 (c) Find the y-coordinate of Q

[2 marks]

9 (d) The line segment QR is a tangent to the circle as shown in **Figure 2** below.

Figure 2



The point R has coordinates (9, –3).

Find the angle QPR

Give your answer in radians to three significant figures.

[3 marks]