Answers to Grade Gobbler 3

Answer 1

(i) By The Theorem of Pythagoras, 17

[2 marks]

(ii) $(x - 8)^2 + (y + 15)^2 = 17^2$

[2 marks]

Answer 2

$$\begin{aligned}(5 - 2x)^3 &= (1) \times (5)^3 \times (-2x)^0 \\ &\quad + (3) \times (5)^2 \times (-2x)^1 \\ &\quad + (3) \times (5)^1 \times (-2x)^2 \\ &\quad + (1) \times (5)^0 \times (-2x)^3 \\ &= 125 - 150x + 60x^2 - 8x^3\end{aligned}$$

[4 marks]

Answer 3

$$2\sin^2\theta - \sin\theta - 1 = 0$$

$$(2\sin x + 1)(\sin x - 1) = 0$$

$$\text{Either} \quad \sin x = -\frac{1}{2} \qquad \text{or} \qquad \sin x = 1$$

$$x_{WA} = \arcsin\left(\frac{1}{2}\right) \qquad x = \arcsin(1)$$

$$x_{WA} = 30^\circ \qquad x = 90^\circ$$

$$x = \{90^\circ, 210^\circ, 330^\circ\}$$

[5 marks]

Answer 4

$$\begin{aligned}f(x) = \sqrt{x}\left(1 + \sqrt{x}\right) &= \sqrt{x} + x \\ &= x^{\frac{1}{2}} + x \\ \therefore f'(x) &= \frac{1}{2}x^{-\frac{1}{2}} + 1 \\ &= \frac{1}{2\sqrt{x}} + 1\end{aligned}$$

[3 marks]

Answer 5

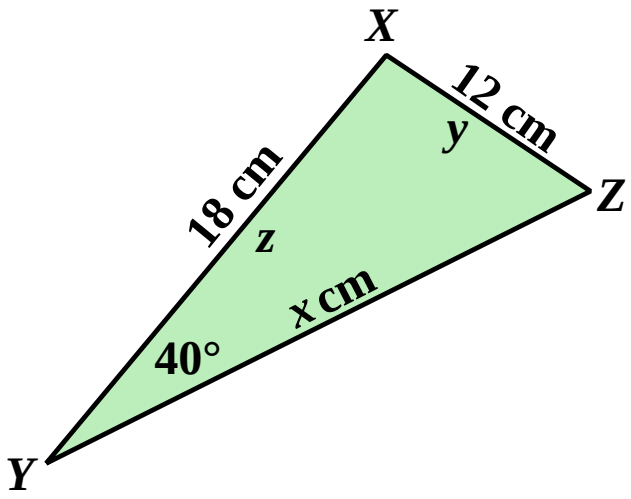
$$s = ut + \frac{1}{2}at^2$$

$$= 13 \times 12 + \frac{1}{2} \times 4 \times 12^2 \Rightarrow s = 444 \text{ metres}$$

[3 marks]

Answer 6

Label the triangle *XYZ*...



(i) By the inverted Sine Rule,

$$\frac{\sin Z}{18} = \frac{\sin 40}{12}$$

$$\sin Z = \frac{18 \sin 40}{12}$$

$$= 0.96418$$

$$Z = 74.62°$$

As the angles in a triangle sum to 180°,

$$\therefore X = 180 - 40 - 74.62$$

$$= 65.38°$$

Now to use the Sine Rule,

$$\frac{x}{\sin 65.38} = \frac{12}{\sin 40}$$

$$x = \frac{12 \sin 65.38}{\sin 40}$$

$$= 19.97 \text{ cm}$$

[3 marks]

(ii) Taking care to use the included angle,

$$Area \, \Delta = \frac{1}{2} x z \sin Y$$

$$= \frac{1}{2} \times 19.97 \times 18 \times \sin 40°$$

$$= 115.5 \text{ cm}^2$$

[2 marks]

Answer 7

(i) 1.63 **(ii)** 0.0274

[2 marks]

Answer 8

(i) $(x-5)^2 + (y-4)^2 = 5^2$

[3 marks]

(ii) Centre (5, 4) Radius 5

[2 marks]

(iii) When $y = 0$, $x^2 - 10x + 16 = 0$

$$(x-2)(x-8) = 0$$

$\therefore$ Crosses the x-axis at $(2, 0)$, $(8, 0)$

[2 marks]

(iv) When $x = 0$, $y^2 - 8y + 16 = 0$

$$(y-4)(y-4) = 0$$

$\therefore$ Crosses the y-axis at $(0, 4)$

[1 mark]

(v) Gradient between (5, 4) and (9, 7) will be...

$$m_r = \frac{7-4}{9-5} = \frac{3}{4}$$

So the gradient of the tangent, perpendicular to this radius will be,

$$m_t = -\frac{4}{3}$$

$$y = mx + c \quad \Rightarrow 7 = -\frac{4}{3} \times 9 + c \Rightarrow c = 19$$

The tangent will thus have the equation $y = -\frac{4}{3}x + 19$

[4 marks]

Answer 9

Trying to find turning points...

$$f'(x) = 0$$

$$3x^2 + 1 = 0$$

$$3x^2 = -1$$

$$x^2 = -\frac{1}{3}$$

$$x = \pm\sqrt{-\frac{1}{3}}$$ which has no real solutions

i.e. The curve has no turning points $\square$

[3 marks]