Mixed Exercise 3 (solution)

Q1. $(2x+1)^2 = 3(1-x)$

$(2x+1)(2x+1) = 3-3x$

$4x^2 + 2x + 2x + 1 = 3 - 3x$

$4x^2 + 4x + 1 = 3 - 3x$

$+3x \qquad +3x$

$4x^2 + 7x + 1 = 3$

$-3 \qquad -3$

$4x^2 + 7x - 2 = 0$

( )( )

$(4x-1)(x+2) = 0$

$4x - 1 \qquad x + 2$

$4x = 1 \qquad x = -2$

$x = \frac{1}{4}$

t + e

$(4x, 2)$ $2x$

$(x, 1)$ $\frac{4x}{7x}$ (×)

$(4x-1) - x$

$(x+2) + 8x$

$7x$

2(a) $P_{square} = (2x+2) + (2x+2) + (2x+2) + (2x+2)$

$= 8x + 8$

$P_{rectangle} = l + (x+3) + l + (x+3)$

$= 2l + 2x + 6$

Q states $P_{of\ square} = P_{of\ rectangle}$

$8x + 8 = 2l + 2x + 6$

$-2x \qquad -2x$

$6x + 8 = 2l + 6$

$-6 \qquad -6$

$6x + 2 = 2l$

$2l = 6x + 2$

$l = 3x + 1$

(l in terms of x)

(b) A of square $= (2x+2)^2$

A of rectangle $= l \times (x+3)$

Sub from part (a) $= (3x+1) \times (x+3)$

$= (3x+1)(x+3)$

(c) $(2x+2)^2 = (3x+1)(x+3) + 16$ — see (a) for this info.

$2x^2 + 8x + 4 = 3x^2 + 10x + 3 + 16$

$2x^2 + 8x + 4 = 3x^2 + 10x + 19$

$-4 \quad\quad -4$

$2x^2 + 8x = 3x^2 + 10x + 15$

$-10x \quad\quad -10x$

$2x^2 - 2x = 3x^2 + 15$

$-3x^2 \quad\quad -3x^2$

$-x^2 - 2x = 15$

$-15 \quad\quad -15$

$-x^2 - 2x - 15 = 0$

↳ move everything over to make positive

$x^2 + 2x + 15 = 0$

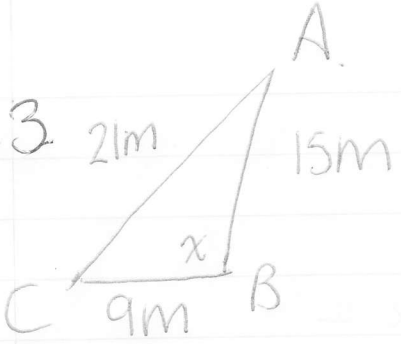
$(x+5)(x-3) = 0$

$x = -5 \quad x = 3$

can't have -ve dimensions

$x = 3$

Q3



$\angle ABC(x)$

$$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$$

$$\cos B = \frac{15^2 + 9^2 - 21^2}{2 \times 15 \times 9}$$

$$\cos B = \frac{-135}{270}$$

$$\cos B = -\frac{1}{2}$$

$B = \cos^{-1}(1/2)$ never put -ve value into calc.

$180 - 60° = 120°$

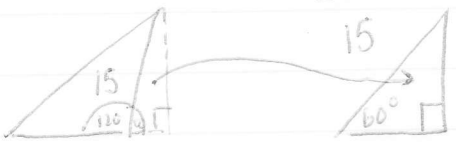
$B = 60°$

$B = 120°$

$180 + 60° = 240°$ (too big)

Q4.

(b).



SOH CAH TOA

$\sin 60° = \frac{x}{15}$

$x = 15 \times \sin 60$

$x = 12.99$ m (height)

Q4 $E = 4 \times 10^6 + ((5 \times 10)^{-3})^2$

= Enter into calculator.

$= 1.6 \times 10^{11}$

Q5 $C = aq^2 + \frac{b}{q}$

$30 = 4a + \frac{b}{2}$ ① $\times 4$

$50 = 16a + \frac{b}{4}$ ②

$120 = 16a + 2b$ ③ ③ − ②

$50 = 16a + \frac{b}{4}$ ② $16a - 16a = 0$

$16a + 16a = 32a$

$70 = \frac{7b}{4} \times 4$

$\times 4$ * $120 - 50 = 70$

$\triangle$ $2b - \frac{b}{4} = \frac{8b}{4} - \frac{b}{4}$

$= \frac{7b}{4}$

$280 = 7b$

$\div 7 \quad \div 7$

$b = 40$

Sub into ①

$30 = 4a + \frac{40}{2}$

$30 = 4a + 20$

$-20 \quad -20$

$4a = 10$

$a = 2.5$

$a = 2.5, b = 40$

(b)

$C = 2.5q^2 + \frac{40}{q}$

when $q = 10$

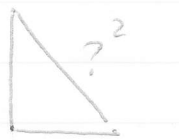
$$C = 2.5 \times (10)^2 + \frac{40}{10}$$

$$= 2.5 \times 100 + 4$$

$$C = 250 + 4$$

$$C = £254$$

Q6.



By Pythagoras

$?^2 = 2.32^2 + 1.74^2$

$?^2 = 8.41$

$? = \sqrt{8.41}$

$? = 2.9\text{cm}$

(ii) $SA = \pi r^2 + \pi r s$

$= \pi \times (1.74)^2 + \pi \times (1.74) \times 2.9$

$= 25.36\text{cm}^2$

$\Rightarrow 25.4\text{ cm}^2$ (3sf)

(iii) $V = \frac{1}{3}\pi \times (1.74)^2 \times 2.32$

$V = 7.36\text{cm}^3$

Q7. Distance $\Rightarrow$ *942.5cm

Time $\Rightarrow$ 2 seconds ($\frac{2}{60} = 0.033$ of a min)

$S = \frac{D}{T} = \frac{942.5}{5.556 \times 10^{-4}}$

$= 1696500\text{ cm/h}$

$\frac{0.033}{60} = 5.556 \times 10^{-4}$ ($\div 100$ for m)

* 1 revolution $= \pi \times 60 = 188.5\text{cm}$

5 revolutions (x5) $= 942.5\text{cm}$

16965 m (÷1000 for km)

16.965 km

⇒ 17 km