

1. Nov/2023/Paper_0444/23/No.10

$$P = \frac{2wy^2}{3}$$

Find the positive value of y when $P = 108$ and $w = 2$.

Substitute $P = 108$ and $w = 2$ into the equation

$$108 = \frac{2 \times 2 \times y^2}{3}$$

$$108 \times 3 = 4y^2$$

$$\frac{324}{4} = \frac{4y^2}{4}$$

$$y^2 = 81$$

$$\Rightarrow y = \sqrt{81}$$

$$y = 9$$

$y = \dots\dots\dots$ [3]

2. Nov/2023/Paper_0444/23/No.15

$$T = \sqrt{3d - e}$$

Solve for d .

Square both sides

$$T^2 = (\sqrt{3d - e})^2$$

$$T^2 = 3d - e$$

$$3d = \frac{T^2 + e}{3}$$

$$d = \frac{T^2 + e}{3}$$

$$\frac{x}{y} = \frac{0}{4} = \frac{3}{0}$$

$$d = \frac{T^2 + e}{3} \dots\dots\dots$$
 [3]

(a) Simplify

Using the law of indices
 $(a^m)^n = a^{m \times n}$

$$(64y^{27})^{\frac{2}{3}} = (2^6 y^{27})^{\frac{2}{3}} = 2^{6 \times \frac{2}{3}} y^{27 \times \frac{2}{3}} = 2^4 y^{18} = 16y^{18}$$

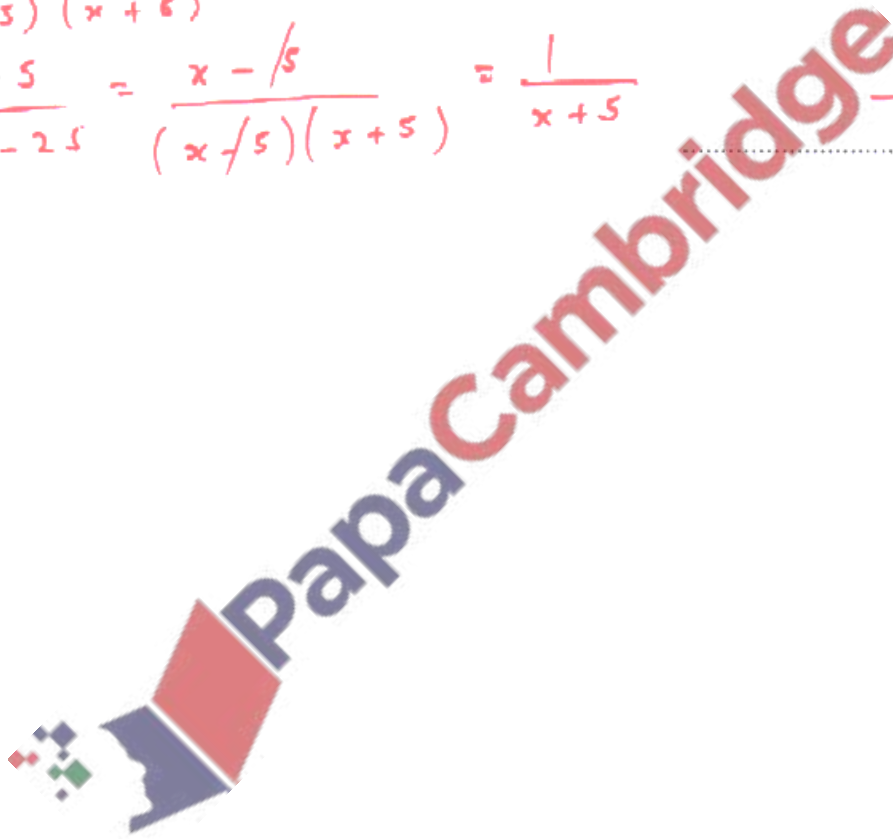
[2]

(b) Simplify.

$\frac{x-5}{x^2-25}$ is a difference of two squares which factorises to
 $(x-5)(x+5)$

$$\frac{x-5}{x^2-25} = \frac{x-5}{(x-5)(x+5)} = \frac{1}{x+5}$$

[2]



(a) Expand and simplify.

$$\begin{aligned}
 & 4(2x-1) - 6(3-x) \\
 &= 4 \times 2x + 4 \times -1 + -6 \times 3 + -6 \times -x \\
 &= 8x - 4 - 18 + 6x \\
 &= (8x + 6x) + (-4 - 18) \\
 &= 14x - 22
 \end{aligned}$$

$$\underline{\underline{14x - 22}} \quad [2]$$

(b) Factor completely.

(i) $6x^2y + 9xy$

Common factor = $3xy$

$$3xy \left(\frac{6x^2y}{3xy} + \frac{9xy}{3xy} \right) = 3xy (2x + 3)$$

$$\underline{\underline{3xy(2x + 3)}} \quad [2]$$

(ii) $4x^2 - y^2 + 8x + 4y$

$4x^2 - y^2$ is a difference of two squares and it factorises to $(2x - y)(2x + y)$

$$\Rightarrow (2x - y)(2x + y) + 8x + 4y$$

$$(2x - y)(2x + y) + 4(2x + y)$$

$$= (2x + y)(2x - y + 4) \quad \underline{\underline{(2x + y)(2x - y + 4)}} \quad [3]$$

- (c) Antonio travels 100 km at an average speed of x km/h.
He then travels a further 150 km at an average speed of $(x + 10)$ km/h.
The time taken for the whole journey is 4 hours 20 minutes.

(i) Show that $13x^2 - 620x - 3000 = 0$.

$$\text{Average Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Time} = \frac{\text{Distance}}{\text{Average Speed}}$$

$$\text{For 100 km: Time} = \frac{100}{x} \text{ hours}$$

$$\text{For 150 km: Time} = \frac{150}{x+10} \text{ hours}$$

$$\text{Time taken} = 4 \text{ h } 20 \text{ minutes}$$

$$1 \text{ hour} = 60 \text{ minutes}$$

$$4 \text{ h } 20 \text{ min} = 4 \frac{20}{60} = 4 \frac{1}{3} \text{ h} = \frac{13}{3} \text{ h}$$

$$\Rightarrow \frac{100}{x} + \frac{150}{x+10} = \frac{13}{3}$$

$$\frac{100(x+10) + 150(x)}{x(x+10)} = \frac{13}{3}$$

$$\frac{100x + 1000 + 150x}{x^2 + 10x} = \frac{13}{3}$$

$$\frac{250x + 1000}{x^2 + 10x} = \frac{13}{3}$$

$$13(x^2 + 10x) = 3(250x + 1000)$$

$$13x^2 + 130x = 750x + 3000$$

$$13x^2 + 130x - 750x - 3000 = 0$$

$$\therefore 13x^2 - 620x - 3000 = 0$$

As required.

[4]

(ii) Solve $13x^2 - 620x - 3000 = 0$ to find the speed Antonio travels for the first 100 km of the journey.

You must show all your working and give your answer correct to 1 decimal place.

Solve for x using the Quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-620) \pm \sqrt{(-620)^2 - 4(13)(-3000)}}{2 \times 13}$$

$$= \frac{620 \pm \sqrt{540400}}{26}$$

$$= \frac{620 \pm 735.119038}{26}$$

But $x > 0$

$$x = \frac{620 + 735.119038}{26}$$

$$= 52.119963$$

$$\approx 52.1 \text{ km/h}$$

52.1 km/h [3]