

13

Charlie is driving 293 miles home.

He

- leaves at 9.00 am
- travels the first 176 miles at an average speed of 48 mph
- drives the rest of the way at an average speed of 65 mph

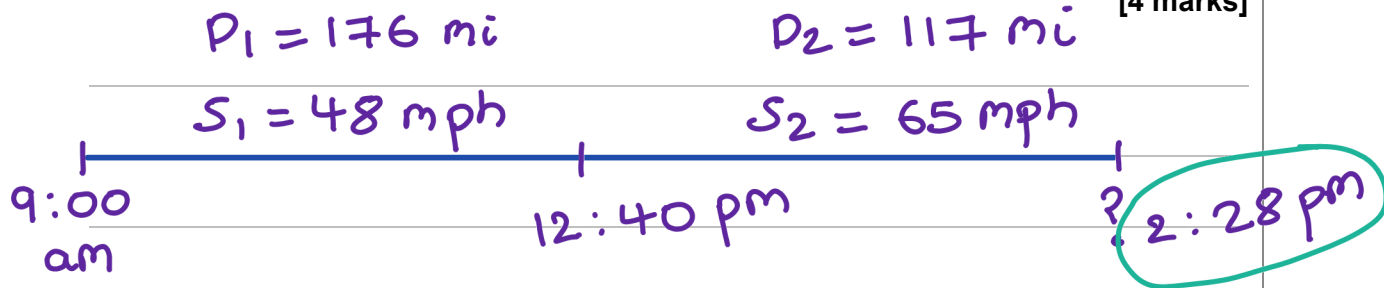
Will he be home by 2.30 pm?

You **must** show your working.

$$S = \frac{D}{T}$$

$$T = \frac{D}{S}$$

[4 marks]



$$T_1 = \frac{176}{48} = 3 \frac{2}{3} \text{ hr}$$

$$T_2 = \frac{117}{65} = 1 \frac{4}{5} \text{ hr}$$

$$\frac{2}{3} \times \overset{20}{\cancel{60}} = 40 \text{ min}$$

$$\frac{4}{5} \times \overset{12}{\cancel{60}} = 48 \text{ min}$$

$$T_1 = 3 \text{ hr } 40 \text{ min}$$

$$T_2 = 1 \text{ hr } 48 \text{ min}$$



19

Two integers have a difference of 6

The integers are multiplied together.

9 is then added.

Prove algebraically that the result is always a square number.

 $\rightarrow (\quad)^2$

[3 marks]

Let n and $n+6$ be the 2 int.

$$= n(n+6)$$

$$= n^2 + 6n + 9$$

$$= (n+3)(n+3)$$

$$= (n+3)^2$$

$$\begin{array}{c} a \times c \\ \underline{3} \times \underline{3} = \boxed{+9} \end{array}$$

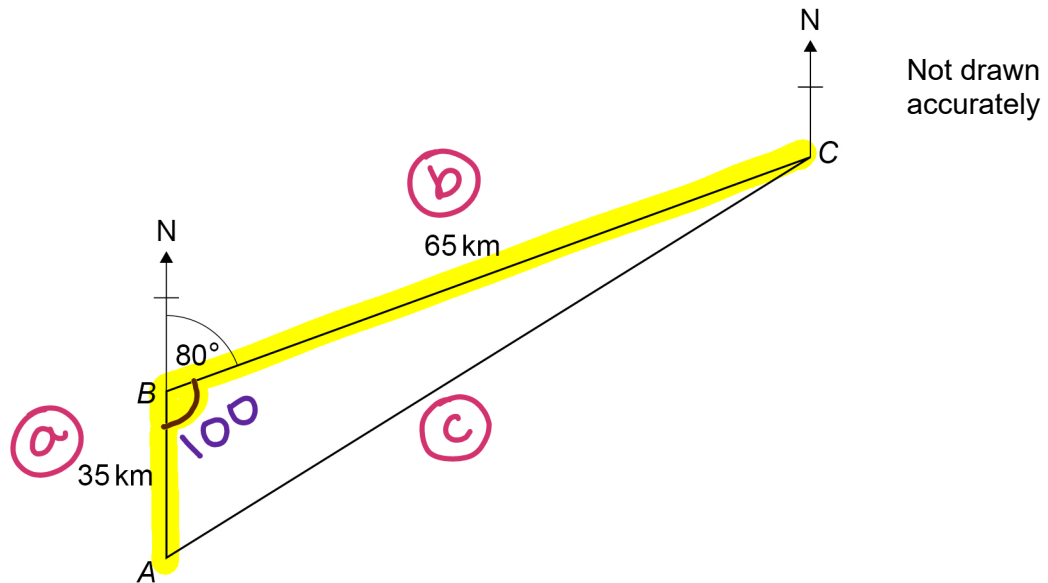
$$\begin{array}{c} \underline{3} + \underline{3} = \boxed{+6} \\ b \end{array}$$

Turn over for the next question

Turn over ►



23



A boat sails 35 km North from A to B .

From B the boat sails to C and then back to A .

23 (a) Show that the distance the boat sails from C to A is 79 km to the nearest km

You **must** show your working.

[2 marks]

$$c = \sqrt{35^2 + 65^2 - 2 \times 35 \times 65 \times \cos(100)}$$

$$c = CA = 78.99429858$$

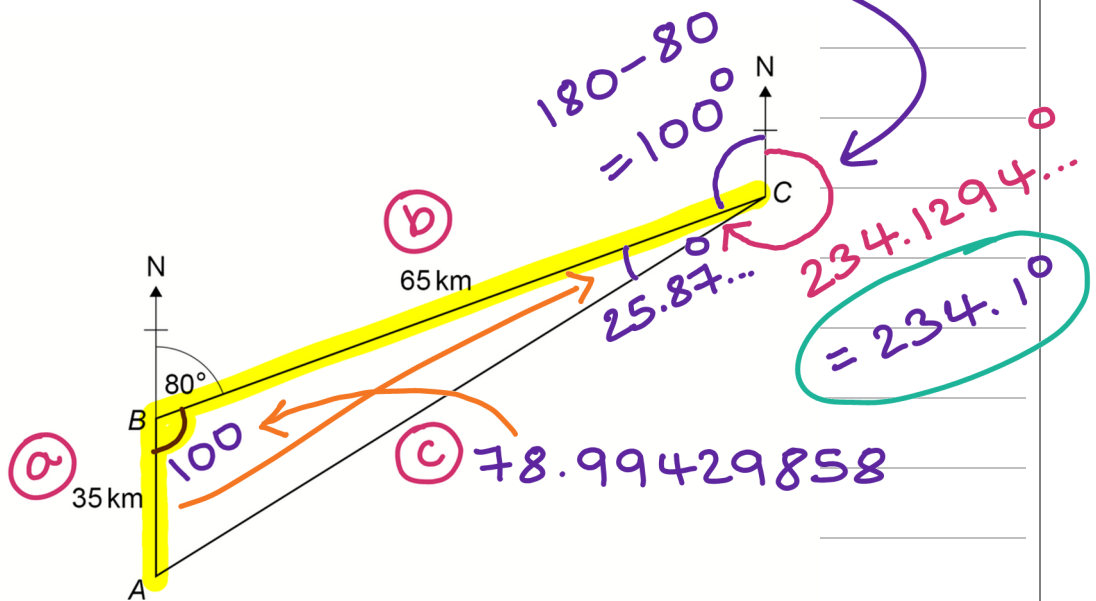
$$= 79 \text{ km}$$



23 (b)

Work out the bearing of A from C.

[4 marks]

Do not write
outside the
box

$$\frac{\sin(\hat{B}CA)}{35} = \frac{\sin(100)}{78.99...}$$

Answer

$$\hat{B}CA = \sin^{-1} \left[\frac{35 \times \sin(100)}{78.99...} \right]$$

$$\hat{B}CA = 25.87...$$

END OF QUESTIONS



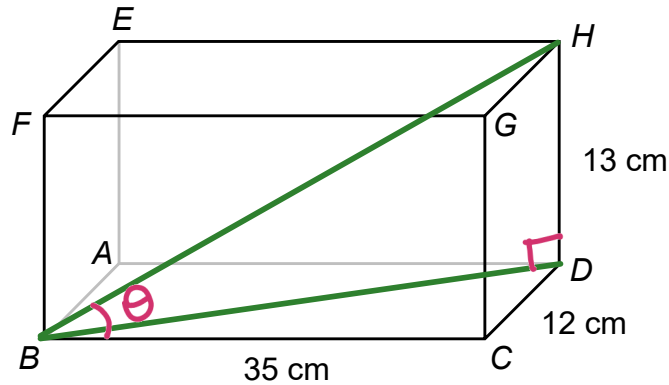


Do not write
outside the
box

15

Here is a cuboid.

$$BC = 35 \text{ cm} \quad CD = 12 \text{ cm} \quad DH = 13 \text{ cm}$$



Work out the size of angle DBH
Give your answer to 1 decimal place.

[4 marks]

Answer _____ °

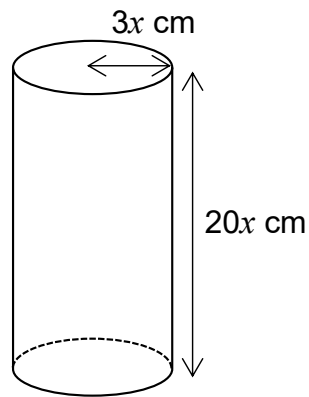
Turn over ►





16

Here is a cylinder.



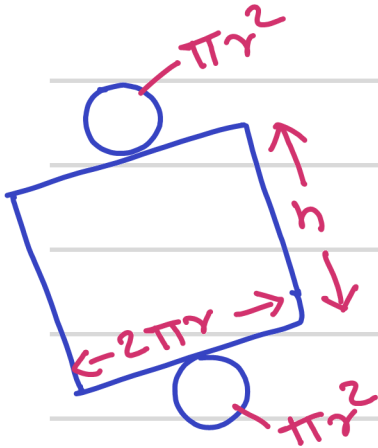
The radius of the cylinder = $3x \text{ cm}$

The height of the cylinder = $20x \text{ cm}$

The surface area of the cylinder = $k\pi x^2$

Work out the value of k .

[4 marks]



$$S.A. = 2\pi r h + 2\pi r^2$$

$$k = \underline{\hspace{10em}}$$





17

The equation of line L_1 is $y = 5x + 10$ The equation of line L_2 is $2y - 10x = 5$ Show that lines L_1 and L_2 are parallel.

Do not use a graphical method.

[3 marks]

18

Prove algebraically that $0.8\dot{1}\dot{3}$ converts to the fraction $\frac{61}{75}$

[3 marks]

$$\text{Let } r = 0.81\dot{3}\dot{3}...$$

$$\times 10 \quad \times 10$$

$$10r = 8.1\dot{3}\dot{3}...$$

$$- r = 0.81\dot{3}\dot{3}...$$

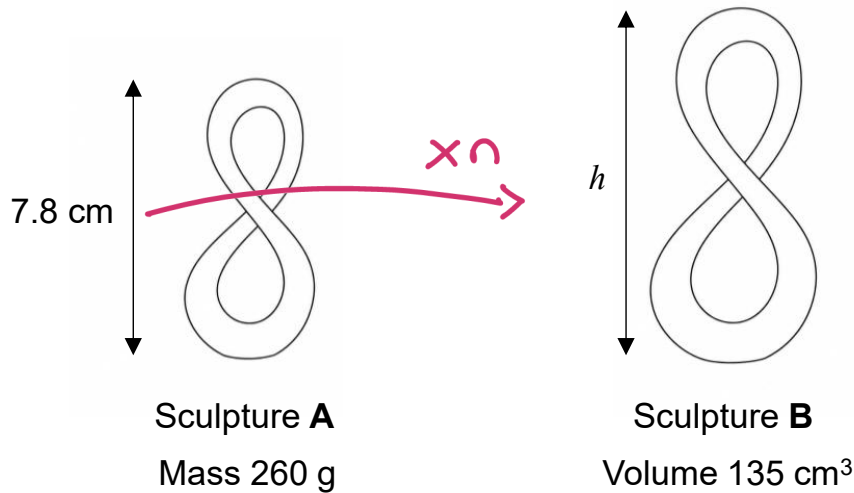
$$\hline 9r = 7.32$$

$$r = \frac{7.32}{9} = \frac{732}{900} = \frac{61}{75}$$





19

Similar sculptures **A** and **B** are made from a metal with a density of 6.5 g/cm^3 Sculpture **A** has a height of 7.8 cm and a mass of 260 g Sculpture **B** has a volume of 135 cm^3 

$$D = \frac{M}{V}$$

Work out the value of h , the height of sculpture **B**.**[4 marks]**

$$A: \quad V = \frac{M}{D} = \frac{260}{6.5} = 40 \text{ cm}^3$$

$$\text{Vol. S.F. :} \quad n^3 = \frac{135}{40} = \frac{27}{8}$$

$$n = \sqrt[3]{\frac{27}{8}} = \frac{3}{2}$$

$$h = 7.8 \times \frac{3}{2} = 11.7 \text{ cm}$$

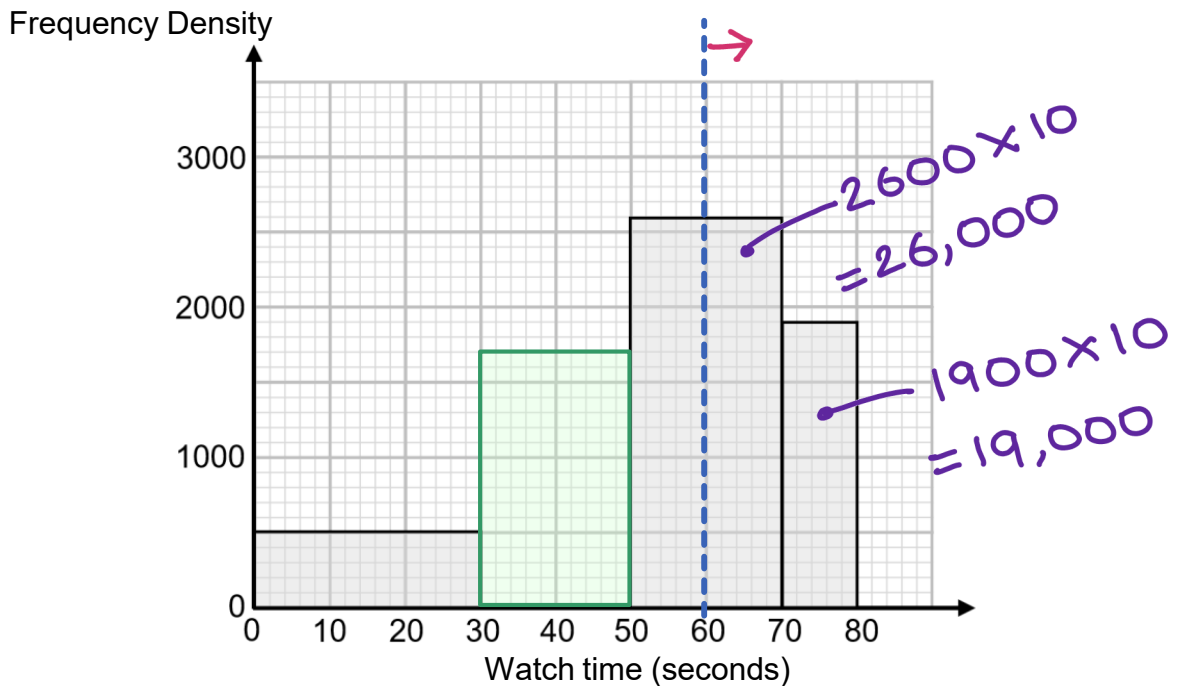
$$h = \underline{\hspace{2cm}} \text{ cm}$$





20

The incomplete histogram shows information about the amount of time viewers spent watching an 80-second-long video on social media.



- 20 (a) 34000 viewers watched for between 30 and 50 seconds. Complete the histogram.

[1 mark]

$$\text{F.D.} = \frac{F}{\text{C.W.}} = \frac{34000}{20} = 1700$$

- 20 (b) The creator of the video receives 65p for every 1000 views that are for 60 seconds or more and no money for views less than 60 seconds.

Work out an estimate for the amount of money the creator made for this video.

[4 marks]

45,000 people

$$£ 0.65 \times 45 = £ 29.25$$

Answer £ _____

9

Turn over ►





21

 a and b are constants where

$$f(x) = 5x - b \longrightarrow y = 5x - b$$

$$g(x) = bx + a$$

$$f^{-1}(18) = a$$

$$g(3) = 2$$

Find the values of a and b

$$5x = y + b$$

$$x = \frac{y + b}{5}$$

[5 marks]

$$f^{-1}(x) = \frac{x + b}{5}$$

$$\frac{18 + b}{5} = a$$

$$3b + a = 2$$

$$5a - b = 18$$

$$a + 3b = 2$$

 $\times 5$

$$\cancel{5}a - b = 18$$

$$\begin{array}{r} \cancel{5}a + 15b = 10 \\ (-) \quad (-) \quad (-) \end{array}$$

$$\begin{array}{r} \cancel{-16}b = 8 \\ \cancel{-16} \quad \cancel{-16} \end{array}$$

$$b = -\frac{1}{2}$$

$$a + 3b = 2$$

$$a = 2 + \frac{3}{2}$$

$$= \frac{4 + 3}{2}$$

$$a = \frac{7}{2}$$

 $a =$ _____ $b =$ _____



22

 n is a four-digit number that is a multiple of 5.

$$2000 < n < 6000$$

Work out how many possible values of n there are.

[3 marks]

$$\underline{4} \times \underline{10} \times \underline{10} \times \underline{2} = 800$$

Answer _____

23

Solve $\frac{x^2 + 11}{6} - \frac{x+1}{3} \leq 2$

[5 marks]

$$6 \times \frac{x^2 + 11 - (2x + 2)}{6} \leq 2 \times 6$$

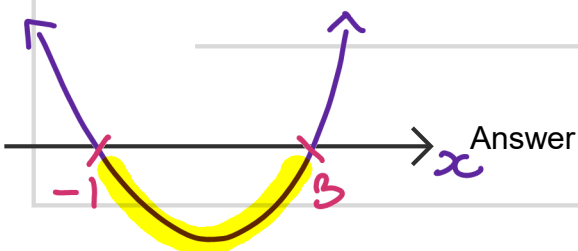
$$x^2 + 11 - 2x - 2 \leq 12$$

$$x^2 - 2x - 3 \leq 0$$

$$(x-3)(x+1) \leq 0$$

$$x=3, x=-1$$

$$\begin{array}{l} \text{a} \times \text{c} \\ \underline{-3} \times \underline{1} = \boxed{-3} \\ \underline{-3} + \underline{1} = \boxed{-2} \\ \text{b} \end{array}$$



$$\boxed{-1 \leq x \leq 3}$$

END OF QUESTIONS

