



1 (a) Solve $14n > 11n + 6$

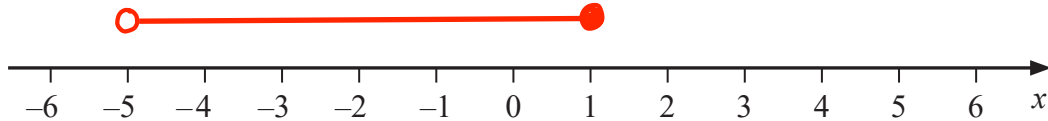
$$\begin{array}{rcl}
 -11n & & -11n \\
 3n & > & 6 \\
 \div 3 & & \div 3 \\
 n & > & 2
 \end{array}$$

$$n > 2$$

(2)

(b) On the number line below, show the set of values of x for which $-2 < x + 3 \leq 4$

$$\begin{array}{r}
 -3 \quad -3 \quad -3 \\
 -5 < x \leq 1
 \end{array}$$



(3)

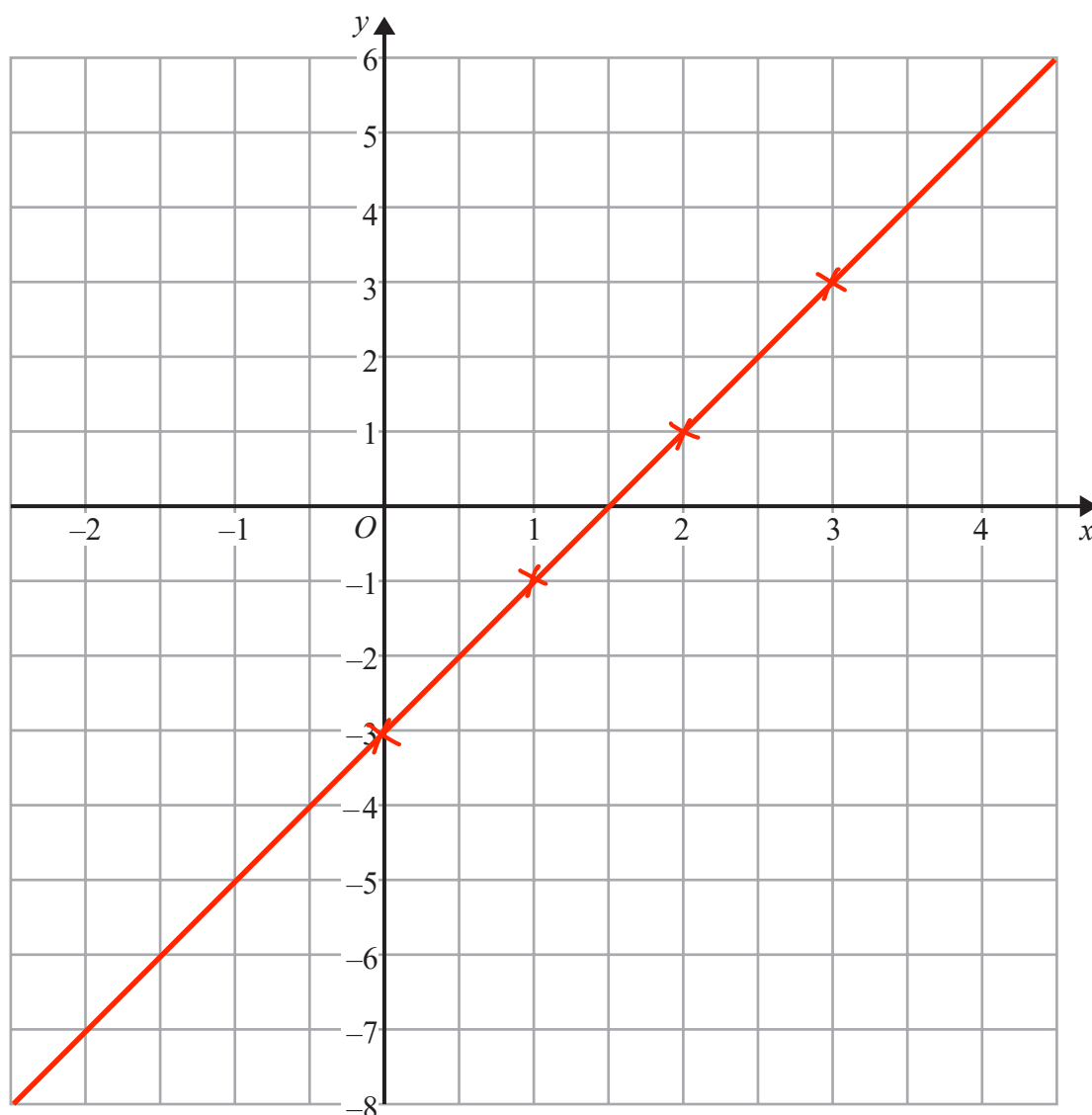
(Total for Question 1 is 5 marks)



- 2 On the grid below, draw the graph of $y = 2x - 3$ for values of x from -2 to 4

x	0	1	2	3
y	-3	-1	1	3

When $x = 0$
 $y = 2x - 3$
 $y = 2(0) - 3$
 $y = 2 - 3$
 $y = -1$



(Total for Question 2 is 3 marks)



3 Hannah is planning a day trip for 195 students.

She asks a sample of 30 students where they want to go.
Each student chooses one place.

The table shows information about her results.

Place	Number of students
Theme Park	10
Theatre	5
Sports Centre	8
Seaside	7

(i) Work out how many of the 195 students you think will want to go to the Theme Park.

$$\frac{10}{30} = \frac{x}{195}$$

$\times 6.5$

$$10 \times 6.5 = 65$$

65
(2)

(ii) State any assumption you made **and** explain how this may affect your answer.

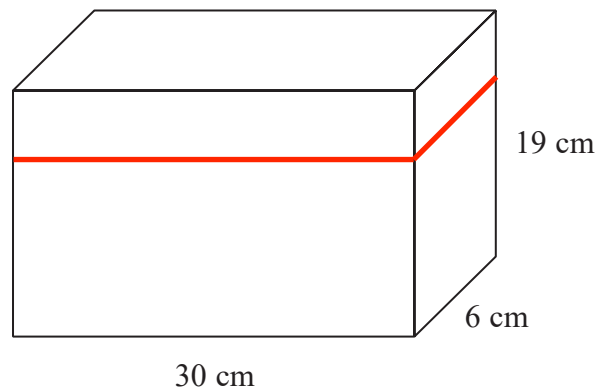
I have assumed that the people in the sample are representative of the 195 students, if this is not true, my answer would not be accurate

(1)

(Total for Question 3 is 3 marks)



- 4 A container is in the shape of a cuboid.



The container is $\frac{2}{3}$ full of water.

A cup holds 275 ml of water.

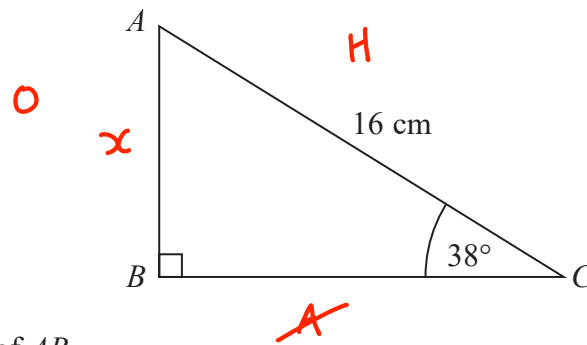
What is the greatest number of cups that can be completely filled with water from the container?

$$\begin{aligned} \text{Volume} &= 30 \times 19 \times 6 = 3420 \text{ cm}^3 \\ \frac{2}{3} \times 3420 &= 2280 \text{ cm}^3 \\ 2280 \div 275 &= 8.290... \end{aligned}$$

8

(Total for Question 4 is 4 marks)

5 ABC is a right-angled triangle.



Calculate the length of AB .
Give your answer correct to 2 decimal places.

~~S~~ ~~H~~ ~~C~~ ~~A~~ ~~H~~ ~~T~~ ~~A~~

$$\sin(38) \times 16 = 9.8505..$$

.....9.85.....cm

(Total for Question 5 is 2 marks)

- 6 Sally used her calculator to work out the value of a number y .

The answer on her calculator display began

8.3

Complete the error interval for y .

$$\underline{8.3} \leq y < \underline{8.4}$$

(Total for Question 6 is 2 marks)

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- 7 £360 is shared between Abby, Ben, Chloe and Denesh.

The ratio of the amount Abby gets to the amount Ben gets is 2:7

Chloe and Denesh each get 1.5 times the amount Abby gets. $1.5 \times 2 = 3$

Work out the amount of money that Ben gets.

$$\begin{array}{l} A : B : C : D \\ 2 : 7 : 3 : 3 \end{array}$$

$$360 \div 15 = 24 \text{ (1 part)}$$

$$7 \times 24 = 168$$

£ 168

(Total for Question 7 is 4 marks)



- 8 (a) Write 0.00562 in standard form.

$$\underline{5.62 \times 10^{-3}}$$

(1)

- (b) Write 1.452×10^3 as an ordinary number.

$$\underline{1452}$$

(1)

(Total for Question 8 is 2 marks)

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9 The circumference of circle **B** is 90% of the circumference of circle **A**.

(a) Find the ratio of the area of circle **A** to the area of circle **B**.

$$\begin{array}{l} A : B \\ 100 : 90 \\ 10 : 9 \end{array} \rightarrow \text{Length SF}$$

$$100 : 81 \rightarrow \text{Area SF}$$

$$\frac{100 : 81}{(2)}$$

Square **E** has sides of length e cm.

Square **F** has sides of length f cm.

The area of square **E** is 44% greater than the area of square **F**.

(b) Work out the ratio $e:f$

$$\begin{array}{l} E : F \\ 144 : 100 \rightarrow \text{Area SF } (SF^2) \\ 12 : 10 \rightarrow \text{Length SF} \end{array}$$

$$\frac{12 : 10}{(2)}$$

(Total for Question 9 is 4 marks)

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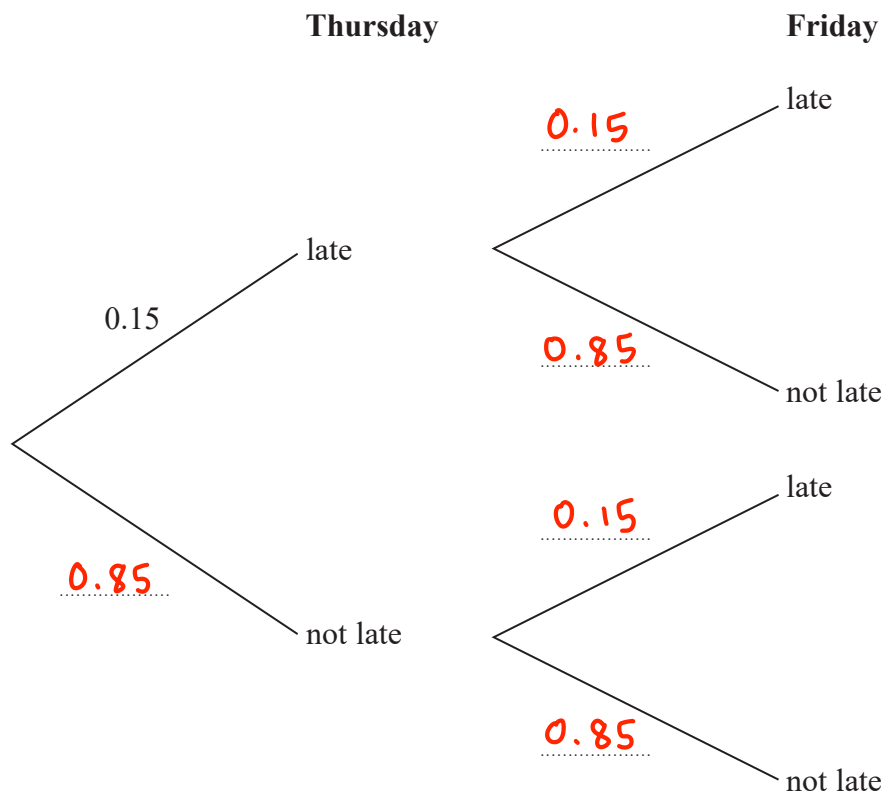
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10 Mary travels to work by train every day.

The probability that her train will be late on any day is 0.15

(a) Complete the probability tree diagram for Thursday and Friday.



(2)

(b) Work out the probability that her train will be late on at least one of these two days.

$$\begin{aligned}
 P(L, L') &= 0.15 \times 0.85 = 0.1275 \\
 P(L, L) &= 0.15 \times 0.15 = 0.0225 + \\
 P(L', L) &= 0.85 \times 0.15 = 0.1275 \\
 &\quad \underline{\hspace{1cm}} \\
 &\quad 0.2775
 \end{aligned}$$

0.2775

(3)

(Total for Question 10 is 5 marks)



- 11 The grouped frequency table gives information about the times, in minutes, that 80 office workers take to get to work.

Time (t minutes)	Frequency
$0 < t \leq 20$	5
$20 < t \leq 40$	30
$40 < t \leq 60$	20
$60 < t \leq 80$	15
$80 < t \leq 100$	8
$100 < t \leq 120$	2

- (a) Complete the cumulative frequency table.

Time (t minutes)	Cumulative frequency
$0 < t \leq 20$	5
$0 < t \leq 40$	35
$0 < t \leq 60$	55
$0 < t \leq 80$	70
$0 < t \leq 100$	78
$0 < t \leq 120$	80

(1)

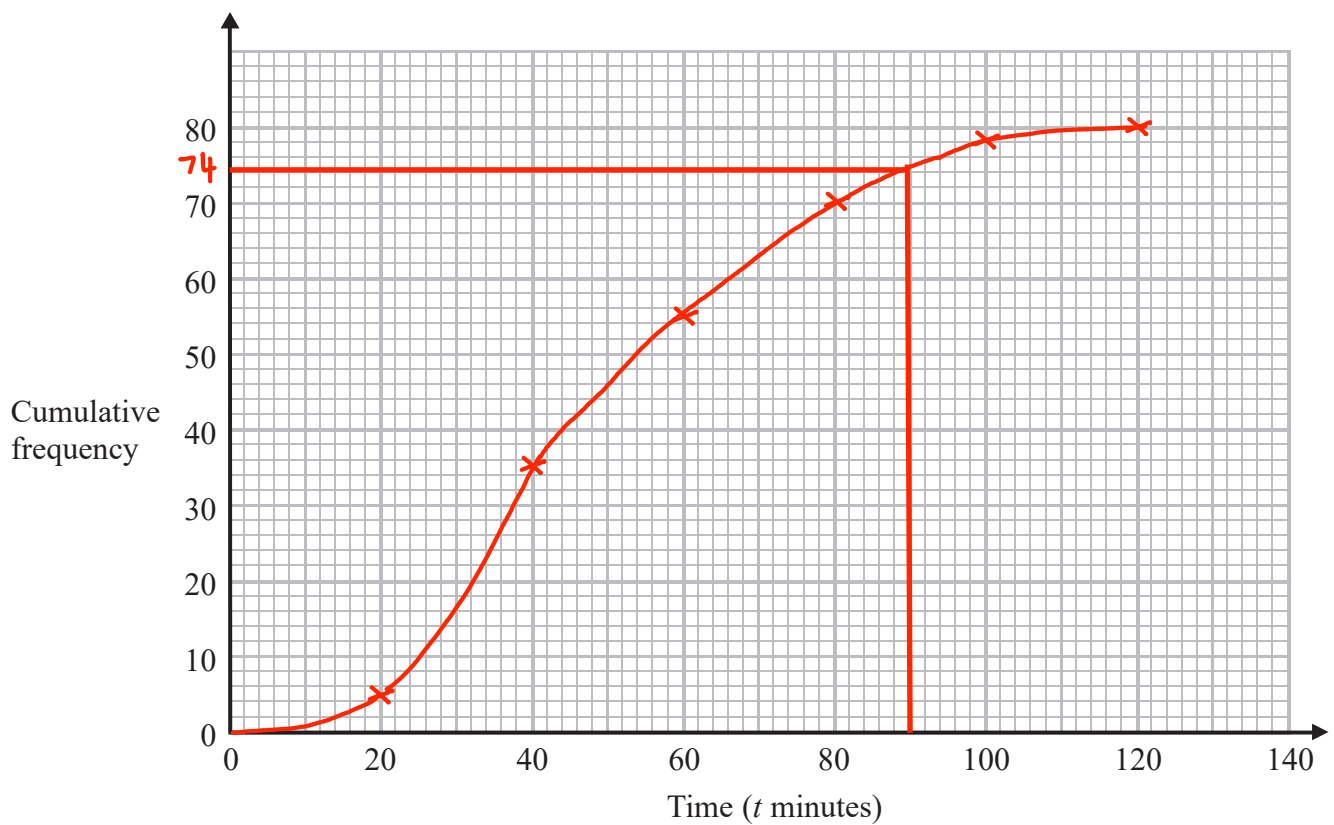
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(b) On the grid, draw the cumulative frequency graph for this information.



(2)

(c) Use your graph to find an estimate for the percentage of these office workers who take more than 90 minutes to get to work.

$$80 - 74 = 6$$

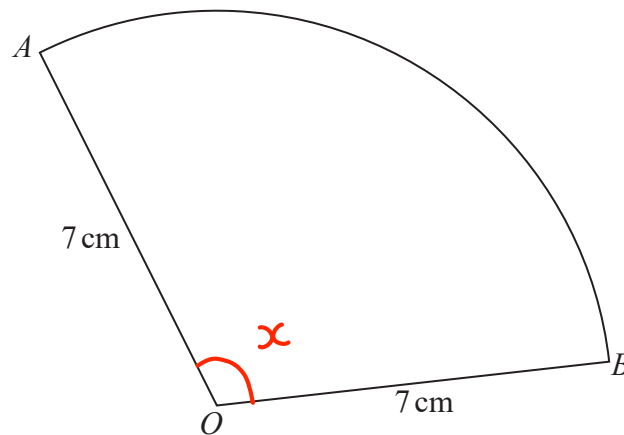
$$\frac{6}{80} \times 100 = 7.5$$

7.5 %

(3)

(Total for Question 11 is 6 marks)

12 OAB is a sector of a circle with centre O and radius 7 cm.



The area of the sector is 40 cm^2

Calculate the perimeter of the sector.

Give your answer correct to 3 significant figures.

$$\begin{aligned} \frac{x}{360} \times \pi \times 7^2 &= 40 \\ \frac{x}{360} \times 49\pi &= 40 \\ \div 49\pi &\div 49\pi \\ \frac{x}{360} &= 0.2598 \dots \\ \times 360 &\times 360 \\ x &= 93.544 \end{aligned}$$

$$\frac{93.544}{360} \times \pi \times 14 = 11.4285 \dots$$

$$11.43 + 7 + 7 = 25.4$$

25.4 cm

(Total for Question 12 is 4 marks)

13 Show that $6 + \left[(x+5) \div \frac{x^2 + 3x - 10}{x-1} \right]$ simplifies to $\frac{ax-b}{cx-d}$ where a, b, c and d are integers.

Tip: Don't forget to factorise first!

$$= 6 + \left[(x+5) \div \frac{(x+5)(x-2)}{(x-1)} \right] \quad \leftarrow \text{Keep, Change, Flip!}$$

$$= 6 + \left[\frac{(x+5)}{1} \times \frac{(x-1)}{(x+5)(x-2)} \right]$$

$$= 6 + \left[\frac{\cancel{(x+5)}(x-1)}{\cancel{(x+5)}(x-2)} \right]$$

$$= \frac{6}{1} + \frac{(x-1)}{(x-2)}$$

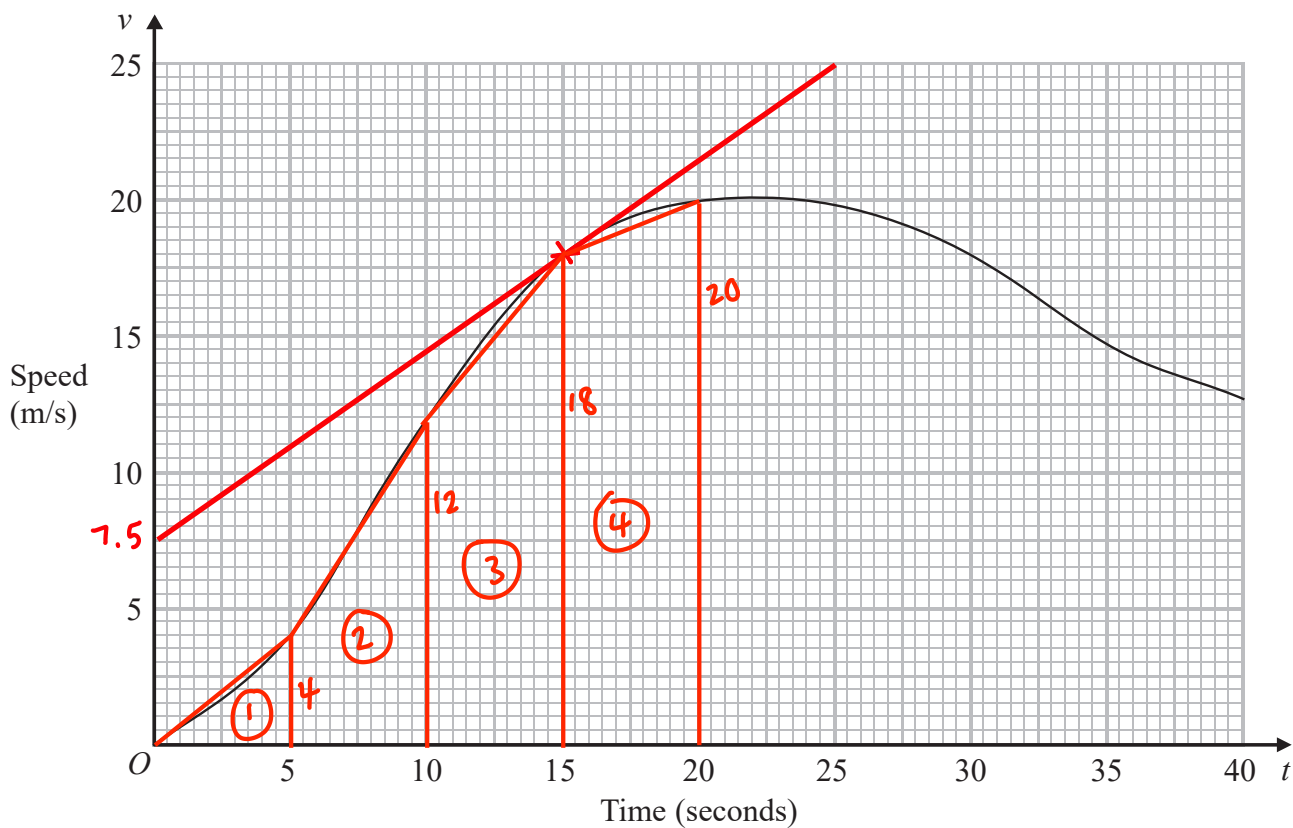
$$= \frac{6(x-2)}{x-2} + \frac{(x-1)}{(x-2)}$$

$$= \frac{6x-12+x-1}{x-2} = \frac{7x-13}{x-2}$$

(Total for Question 13 is 4 marks)

14 A car moves from rest.

The graph gives information about the speed, v metres per second, of the car t seconds after it starts to move.



- (a) (i) Calculate an estimate of the gradient of the graph at $t = 15$

$$\frac{17.5}{25} = 0.7$$

$$(0.6 \text{ to } 1) \quad 0.7 \quad (3)$$

- (ii) Describe what your answer to part (i) represents.

The rate of acceleration

(1)



- (b) Work out an estimate for the distance the car travels in the first 20 seconds of its journey.
Use 4 strips of equal width.

$$\textcircled{1} \quad \frac{5 \times 4}{2} = 10 \quad \textcircled{2} \quad \frac{1}{2} (12 + 4) \times 5 = 40$$

$$\textcircled{3} \quad \frac{1}{2} (18 + 12) \times 5 = 75$$

$$\textcircled{4} \quad \frac{1}{2} (20 + 18) \times 5 = 95$$

$$10 + 40 + 75 + 95 = 220$$

.....²²⁰.....m

(215 to 225)⁽³⁾

(Total for Question 14 is 7 marks)



15 Make m the subject of the formula $f = \frac{3m+4}{m-1}$

$$\begin{array}{rcl}
 & \times m-1 & \times m-1 \\
 f(m-1) & = & 3m+4 \\
 fm-f & = & 3m+4 \\
 -3m & & -3m \\
 fm-3m-f & = & 4 \\
 +f & & +f \\
 fm-3m & = & 4+f \\
 \frac{m(f-3)}{f-3} & = & \frac{4+f}{f-3} \\
 m & = & \frac{4+f}{f-3}
 \end{array}$$

$$m = \frac{4+f}{f-3}$$

(Total for Question 15 is 3 marks)

- 16 The straight line **L** has the equation $3y = 4x + 7 \rightarrow y = \frac{4}{3}x + 7$
 The point **A** has coordinates $(3, -5)$
 x, y

Find an equation of the straight line that is perpendicular to **L** and passes through **A**.

$$\text{Grad } L_1 = \frac{4}{3}$$

$$\text{Grad } L_2 = -\frac{3}{4}$$

$$y = -\frac{3}{4}x + c$$

$$-5 = -\frac{3}{4}(3) + c$$

$$-5 = -\frac{9}{4} + c$$

$$+\frac{9}{4} \quad +\frac{9}{4}$$

$$-\frac{11}{4} = c$$

$$y = -\frac{3}{4}x - \frac{11}{4}$$

$$y = -\frac{3}{4}x - \frac{11}{4}$$

(Total for Question 16 is 3 marks)

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- 17 There are some small cubes and some large cubes in a bag.
The cubes are red or the cubes are yellow.

The ratio of the number of small cubes to the number of large cubes is $4:7$ (11 parts)

The ratio of the number of red cubes to the number of yellow cubes is $3:5$ (8 parts)

- (a) Explain why the least possible number of cubes in the bag is 88

The Lcm of 11 and 8 is 88.

(1)

All the small cubes are yellow.

- (b) Work out the least possible number of large yellow cubes in the bag.

$$\begin{array}{cc}
 \text{S : L} & \text{R : Y} \\
 \times 5 \downarrow 4 : 7 & 3 : 5 \\
 & 12 : 20 \downarrow \times 4 \\
 & 20 : 35
 \end{array}$$

35 large
12 red

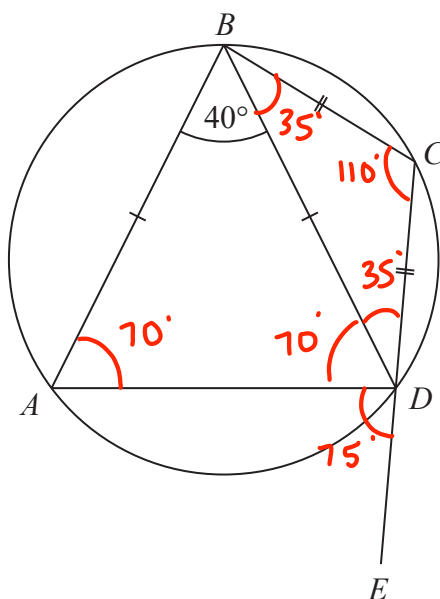
$$35 - 12 = 23$$

23

(3)

(Total for Question 17 is 4 marks)

- 18 The points A , B , C and D lie on a circle.
 CDE is a straight line.



$$BA = BD$$

$$CB = CD$$

$$\text{Angle } ABD = 40^\circ$$

Work out the size of angle ADE .

You must give a reason for each stage of your working.

$\angle BAD = \angle BDA$ as base angles in an isosceles triangle are the same

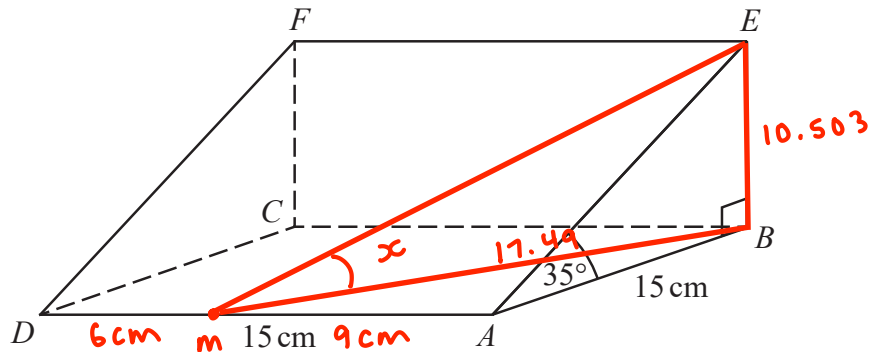
$\angle BCD = 110^\circ$ as opposite angles in a cyclic quadrilateral add to 180°

$\angle CDB = \angle CBD = 35^\circ$ as base angles in an isosceles triangle are the same

$\angle ADE = 75^\circ$ as angles on a straight line add to 180°

(Total for Question 18 is 5 marks)

19 The diagram shows a triangular prism.



The base, $ABCD$, of the prism is a square of side length 15 cm.

Angle ABE and angle CBE are right angles.

Angle $EAB = 35^\circ$

M is the point on DA such that

$$DM:MA = 2:3$$

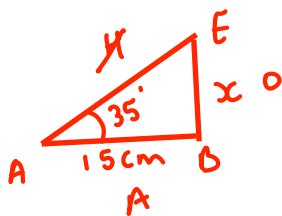
$$\begin{array}{ccc} DM & : & MA \\ 2 & : & 3 \\ \times 3 & \downarrow & \downarrow \times 3 \\ 6 & : & 9 \end{array} \quad 15 \div 5 = 3$$

Calculate the size of the angle between EM and the base of the prism.

Give your answer correct to 1 decimal place.

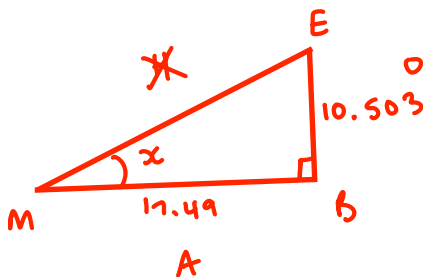
$$MB = 9^2 + 15^2 = 306$$

$$\sqrt{306} = 17.49$$



S^OH C^AH T^A

$$\tan(35) \times 15 = 10.503...$$



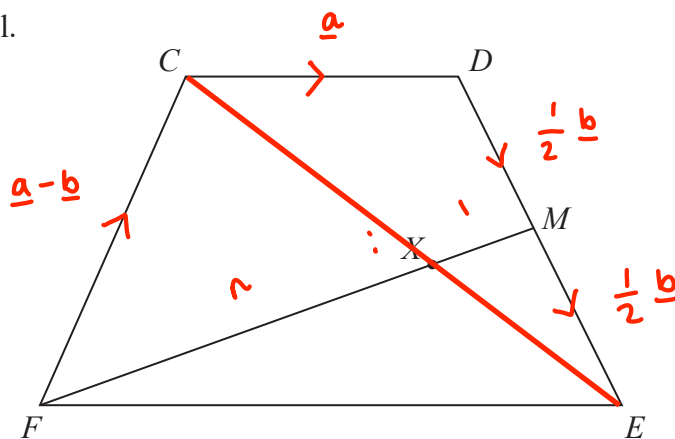
T^OA

$$\tan^{-1}\left(\frac{10.503}{17.49}\right) = 30.98..$$

31.0

(Total for Question 19 is 4 marks)

20 $CDEF$ is a quadrilateral.



$$\vec{CD} = \mathbf{a}, \vec{DE} = \mathbf{b} \text{ and } \vec{FC} = \mathbf{a} - \mathbf{b}.$$

- (a) Express $\vec{FE}$ in terms of $\mathbf{a}$ and/or $\mathbf{b}$.
Give your answer in its simplest form.

$$\begin{aligned} \vec{FE} &= \vec{FC} + \vec{CE} \\ &= \mathbf{a} - \mathbf{b} + \mathbf{a} + \mathbf{b} \\ &= 2\mathbf{a} \end{aligned}$$

$$\frac{2\mathbf{a}}{(2)}$$

M is the midpoint of DE .

X is the point on FM such that $FX:XM = n:1$

CXE is a straight line.

- (b) Work out the value of n .

$$\vec{FM} = \vec{FC} + \vec{CM} = \mathbf{a} - \mathbf{b} + \mathbf{a} + \frac{1}{2}\mathbf{b} = 2\mathbf{a} - \frac{1}{2}\mathbf{b}$$

$$\vec{FX} = k \left(2\mathbf{a} - \frac{1}{2}\mathbf{b} \right)$$

$$\begin{aligned} \vec{CX} &= \vec{CF} + \vec{FX} = -\mathbf{a} + \mathbf{b} + k \left(2\mathbf{a} - \frac{1}{2}\mathbf{b} \right) \\ &= (2k-1)\mathbf{a} + \left(1 - \frac{1}{2}k \right)\mathbf{b} \end{aligned}$$

$$\vec{CE} = \mathbf{a} + \mathbf{b}$$

$$\vec{CE} \text{ is a multiple of } \vec{CX} \therefore 2k-1 = 1 - \frac{1}{2}k$$

$$\begin{aligned} 2.5k &= 2 \\ k &= \frac{4}{5} \end{aligned}$$

$$\begin{aligned} n &: 1 \\ \frac{4}{5} &: \frac{1}{5} \\ 4 &: 1 \end{aligned}$$

$$n = \frac{4}{1} = 4 \quad (4)$$

(Total for Question 20 is 6 marks)

TOTAL FOR PAPER IS 80 MARKS