Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Centre Number | Candidate Number

Thursday 6 June 2019

Morning (Time: 1 hour 30 minutes) | Paper Reference **1MA1/2H**

Mathematics

Paper 2 (Calculator)
Higher Tier

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.

Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P54214A

6/6/1/1/1/1/1/

P 5 4 2 1 4 A 0 1 2 0

Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

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

$14n > 11n + 6$

$-11n$

$3n > 6$

$\div 3$ $\div 3$

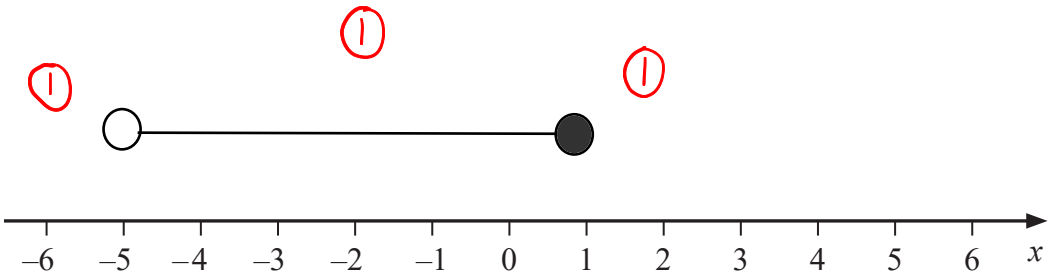
$n > 2$

(1)

$n > 2$

(2)

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



$-2 < x + 3 \leq 4$

-3 -3

$-5 < x \leq 1$

(3)

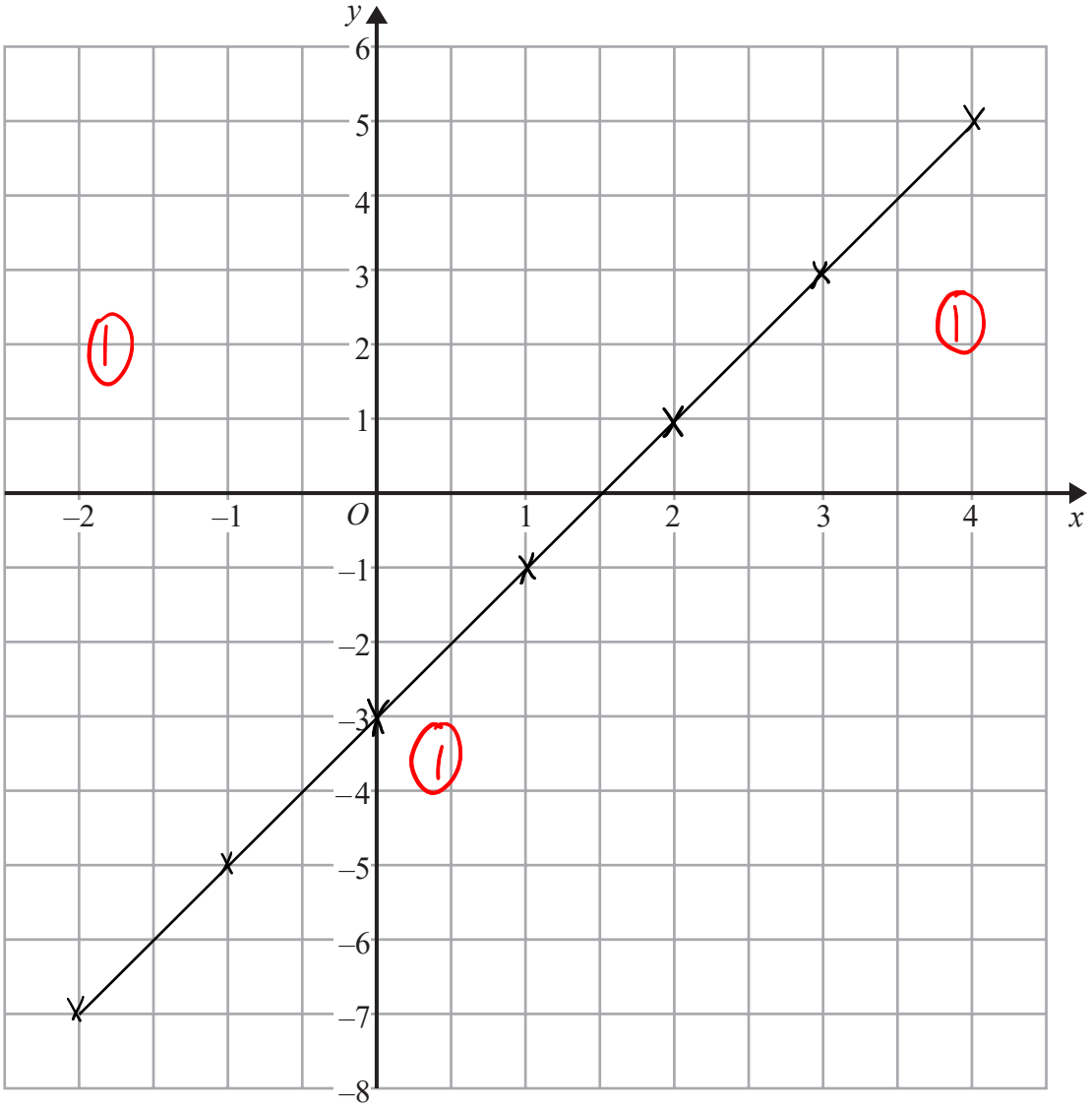
(Total for Question 1 is 5 marks)

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

$y = 2x - 3$

positive gradient of 2.

y-intercept at $(0, -3)$.



(Total for Question 2 is 3 marks)

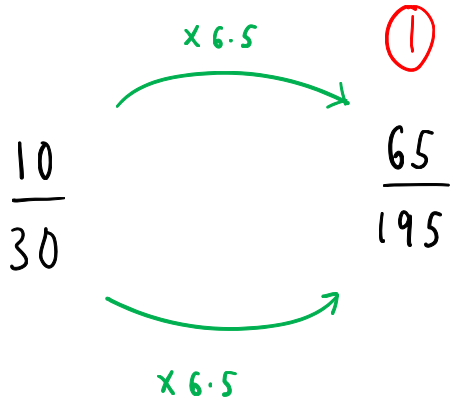
3 Hannah is planning a day trip for 195 students.

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.



(1)

65

(2)

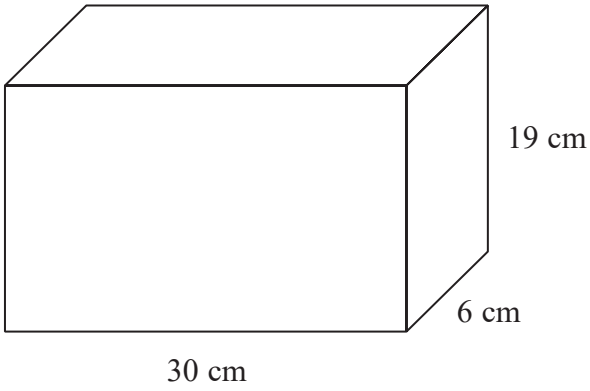
(ii) State any assumption you made **and** explain how this may affect your answer.

Assumed that the sample is representative - otherwise, our answer would be wrong. (1)

(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 m*l* of water.

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

Volume of cuboid:

$V = 30 \times 6 \times 19 = 3420\ cm^3$ (1)

$1\ cm^3 = 1\ ml \therefore V = 3420\ ml.$

Amount of water in container:

$\frac{2}{3} \times 3420 = 2280\ ml.$ (1)

How many cups in 2280 ml:

1 cup = 275 ml. (1)

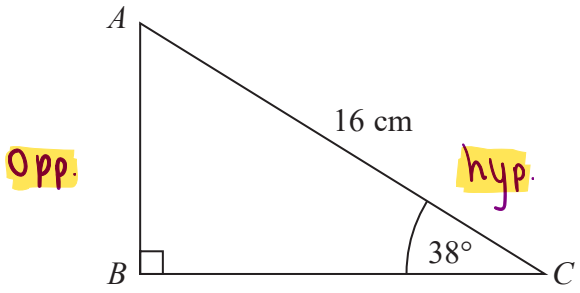
$\times \frac{2280}{275}$ ↓ 8.290... = 2280 ml ↓ $\times \frac{2280}{275}$

∴ the greatest number of cups that can be completely filled with water from the container = 8. (1)

8

(Total for Question 4 is 4 marks)

5 *ABC* is a right-angled triangle.



Opp.

hyp.

adj.

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

$\sin x = \frac{\text{opp.}}{\text{hyp.}}$

$\sin 38 = \frac{AB}{16}$ (1)

$AB = 16 \times \sin(38) = 9.85 \text{ cm}$ (2 d.p.) (1)

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.

8.300004...

8.367928...

8.399918...

(1) (1)

8.3 $\leqslant y <$ 8.4

(Total for Question 6 is 2 marks)

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.

Work out the amount of money that Ben gets.

A : B
= 2 : 7

1.5 × 2 = 3

so C : D
= 3 : 3

(1)

A : B : C : D (1)
= 2 : 7 : 3 : 3 = 15 parts.

15 parts = £360

÷15 ↓ 1 part = £24 (1) ↓ ÷15

money that Ben gets: (1)

£24 × 7 = £168.

£ 168

(Total for Question 7 is 4 marks)

8 (a) Write 0.00562 in standard form.

(1) 5.62×10^{-3}

(1)

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

(1) 1452.

(1)

(Total for Question 8 is 2 marks)

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**.

	A	Scale Factor	B
Circumference	10	→ ×0.9 →	9
Area	100	→ $\times 0.9^2$ →	81

(1)

Area of A : Area of B
= 100 : 81

(1)

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 $e : f$

	F	Scale Factor	E
Length	10	→ $\times\sqrt{1.44}$ →	12
Area	100	→ ×1.44 →	144

(1)

e : f
length of E : length of F
= 12 : 10
= 6 : 5

(1)

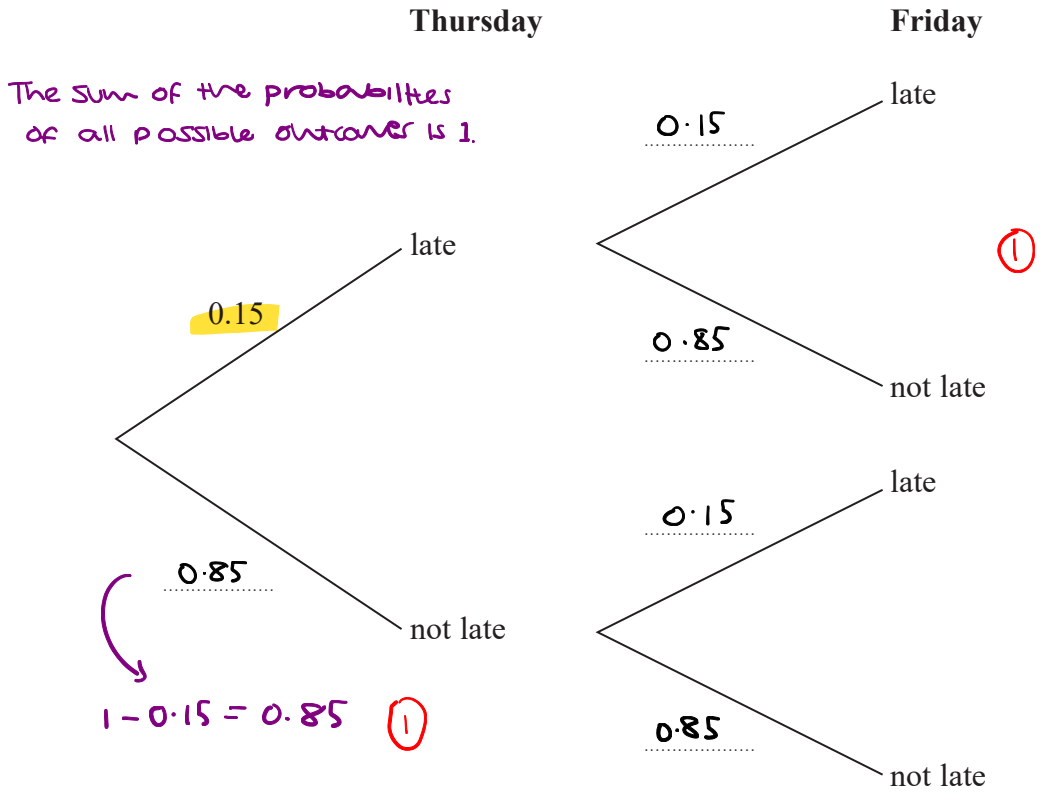
6 : 5

(2)

(Total for Question 9 is 4 marks)

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.



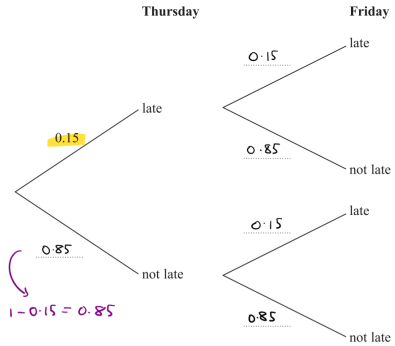
The sum of the probabilities of all possible outcomes is 1.

1 − 0.15 = 0.85 (1)

(1)

(2)

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



Late = L. Not late = NL

P(late on at least one day)

= P(L and NL)
OR P(NL and L)
OR P(L and L) (1)

AND = Multiply
OR = add.

= (0.15 × 0.85) + (0.85 × 0.15) + (0.15 × 0.15) (1)

= 0.1275 + 0.1275 + 0.0225 (1)

= 0.2275

(1)

0.2275

(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
$0 < t \leqslant 20$	5
$20 < t \leqslant 40$	30
$40 < t \leqslant 60$	20
$60 < t \leqslant 80$	15
$80 < t \leqslant 100$	8
$100 < t \leqslant 120$	2

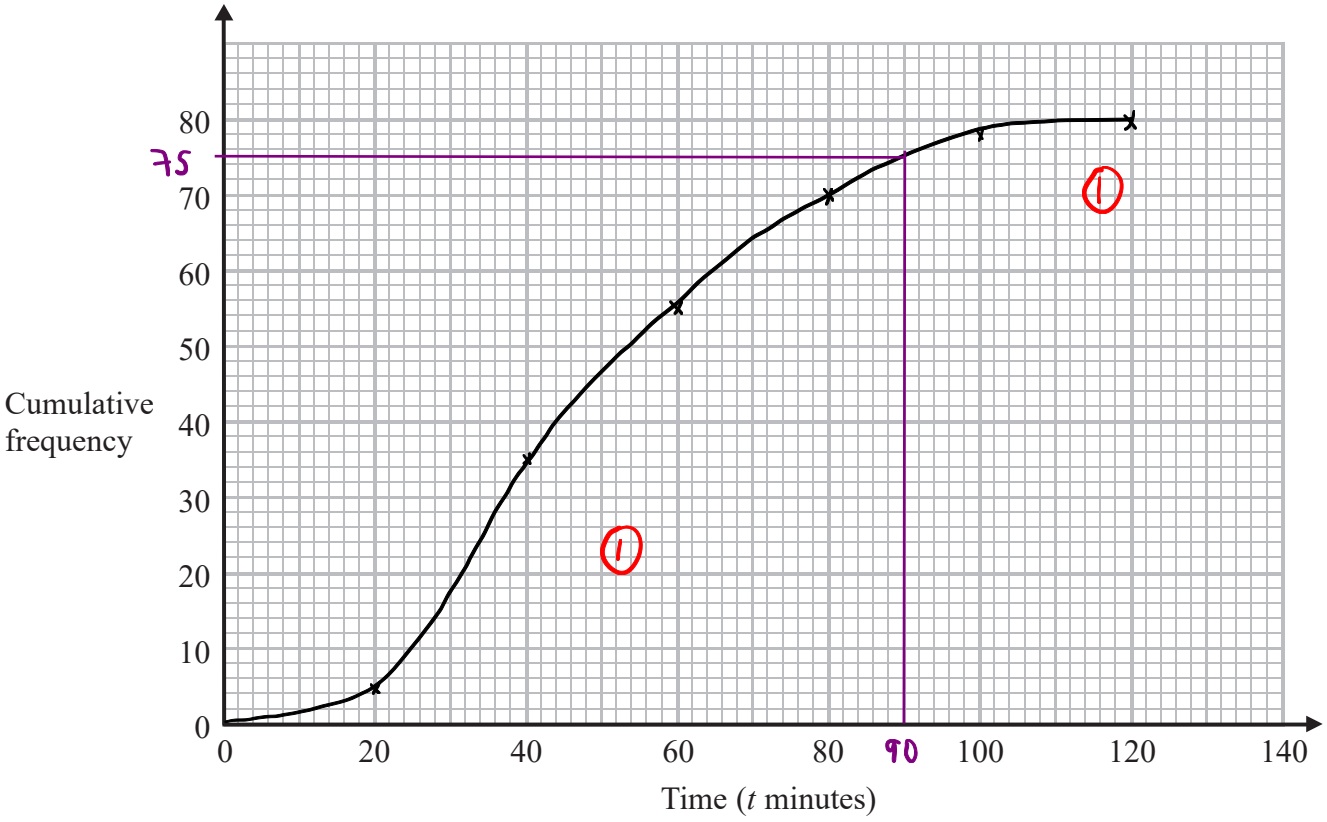
(a) Complete the cumulative frequency table.

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

(1)

(1)

(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.

Number of people who take less than 90 mins = 75 * 1

∴ number of people who take more than 90 mins = 80 − 75 = 5

% of people who take more than 90 mins

$= \frac{5}{80} \times 100 = 6.25\%$

1 1

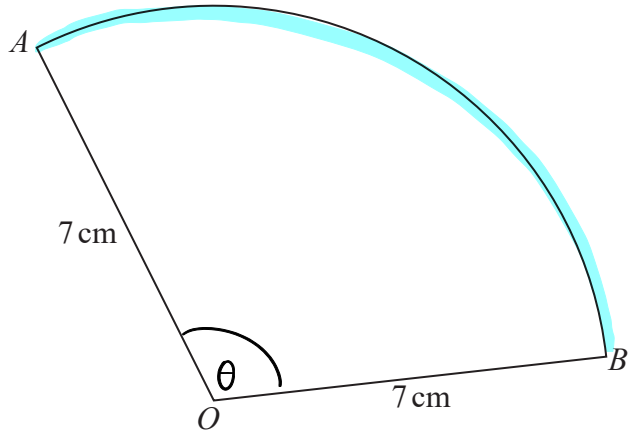
6.25 %

(3)

(Total for Question 11 is 6 marks)

* Since this question involves reading from a graph, there is a range of acceptable answers for the no. of people who take < 90 mins. Mark scheme accepts 72-76.

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



The area of the sector is 40 cm²

Calculate the perimeter of the sector.
Give your answer correct to 3 significant figures.

Sector area = 40.

$40 = \frac{\theta}{360}(\pi \times 7^2)$

$\theta = 93.54...^\circ$ (1)

ARC LENGTH = $\frac{\theta}{360}(2\pi r)$

SECTOR AREA = $\frac{\theta}{360}(\pi r^2)$

perimeter = arc length + radius + radius

$= \frac{\theta}{360}(2\pi r) + r + r$ (1)

$= \left(\frac{93.54...}{360}(2 \times \pi \times 7)\right) + 7 + 7$ (1)

$= 25.440...$

$\simeq 25.4$ cm (3sf) (1)

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.

$$\frac{x^2 + 3x - 10}{x - 1} = \frac{(x+5)(x-2)}{x-1} \quad (1)$$

$$(x+5) \div \frac{x^2 + 3x - 10}{x-1} = (x+5) \div \frac{(x+5)(x-2)}{x-1}$$

$$= (x+5) \times \frac{(x-1)}{(x+5)(x-2)} = \frac{(x-1)}{(x-2)} \quad (1)$$

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

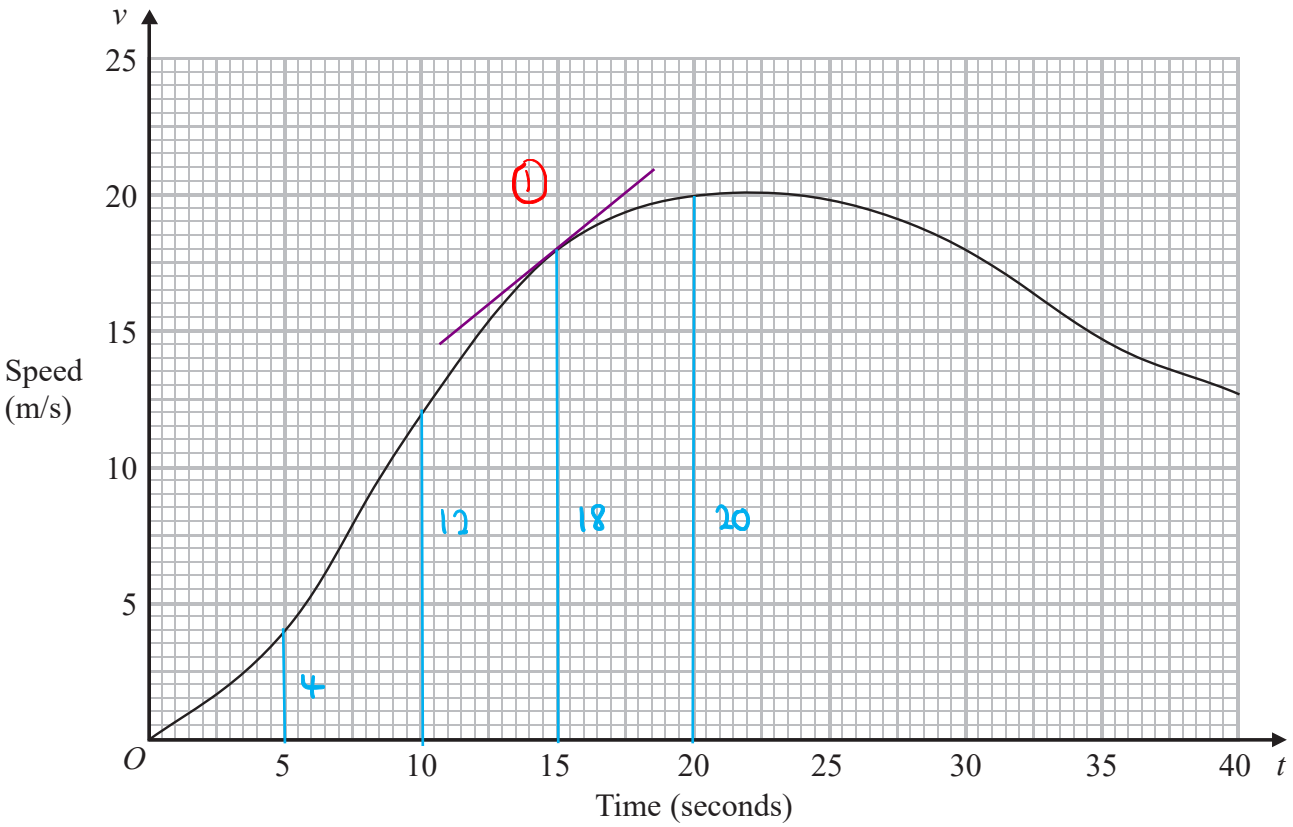
$$= \frac{6(x-2) + (x-1)}{x-2} = \frac{6x - 12 + x - 1}{x-2}$$

$$= \boxed{\frac{7x - 13}{x-2}} \quad (1)$$

(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 $t = 15$

$$\frac{20 - 16}{17.5 - 12.5} = 0.8$$

1

1

0.8

(3)

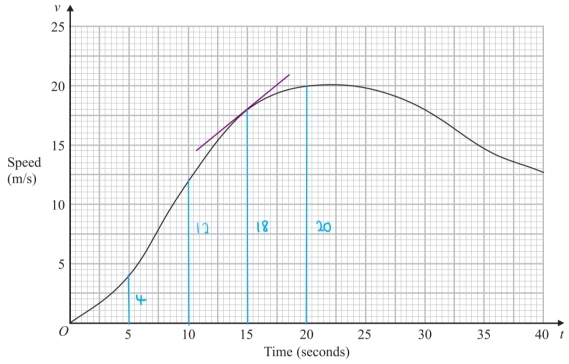
(ii) Describe what your answer to part (i) represents.

1

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.



Area of trapezium = $\left(\frac{a+b}{2}\right)h$.

$\frac{4+0}{2} \times 5 = 10.$ (1)

$\frac{12+4}{2} \times 5 = 40.$

$\frac{18+12}{2} \times 5 = 75$

$\frac{20+18}{2} \times 5 = 95$

total distance =

$10 + 40 + 75 + 95$ (1)

$= 220$ m

(1) 220 ..... m

(3)

(Total for Question 14 is 7 marks)

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

$f = \dfrac{3m+4}{m-1}$

$\times (m-1)$ $\times (m-1)$

$f(m-1) = 3m+4$ (1)

$fm - f = 3m + 4$

$fm = 3m + 4 + f$

$fm - 3m = 4 + f$ (1)

$m(f-3) = 4+f$

$\div (f-3)$ $\div (f-3)$

$\therefore m = \boxed{\dfrac{4+f}{f-3}}$

(1) $\dfrac{4+f}{f-3}$

(Total for Question 15 is 3 marks)

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

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

Line L: $3y = 4x + 7$.

$y = \frac{4}{3}x + \frac{7}{3}$. (1)

Perpendicular gradient is the negative reciprocal of the original gradient.

Negative reciprocal of $\frac{4}{3}$ is $-\frac{3}{4}$. (1)

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

passes through $(3, -5)$ $\therefore$ $-5 = -\frac{3}{4}(3) + c$

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

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

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

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

(Total for Question 16 is 3 marks)

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

Because the LCM of 11 and 8 is 88. (1)

(1)

All the small cubes are yellow.

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

Least possible number of cubes = 88.

	SMALL	LARGE	TOTAL
RED	0	33	33
YELLOW	32	23	55
TOTAL	32	56	88

S : L = 4 : 7

R : Y = 3 : 5 (1)

Total number of small cubes = $\frac{4}{11} \times 88 = 32$

Total number of large cubes = $\frac{7}{11} \times 88 = 56$ (1)

Total number of red cubes = $\frac{3}{8} \times 88 = 33$

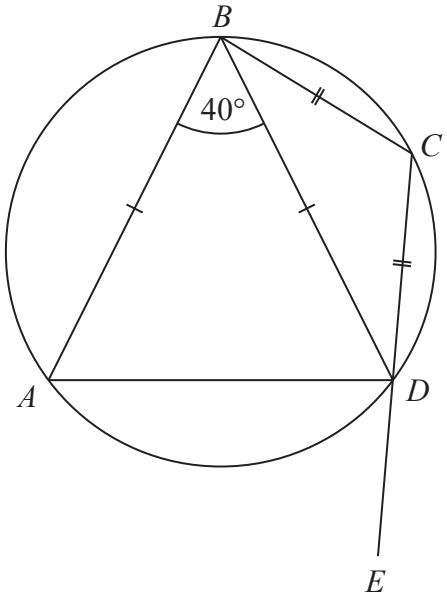
Total number of yellow cubes = $\frac{5}{8} \times 88 = 55$

(1) 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.



$BA = BD$
$CB = CD$
Angle $ABD = 40°$

Work out the size of angle ADE.
You must give a reason for each stage of your working.

$BA = BD \therefore \Delta BAD$ is isosceles.

↳ Base angles are equal.

Angles in a $\Delta = 180°$ (1) (1)

$\therefore B\hat{A}D = B\hat{D}A = \frac{180-40}{2} = 70°$

Opposite angles of a cyclic quadrilateral $= 180°$ (1)

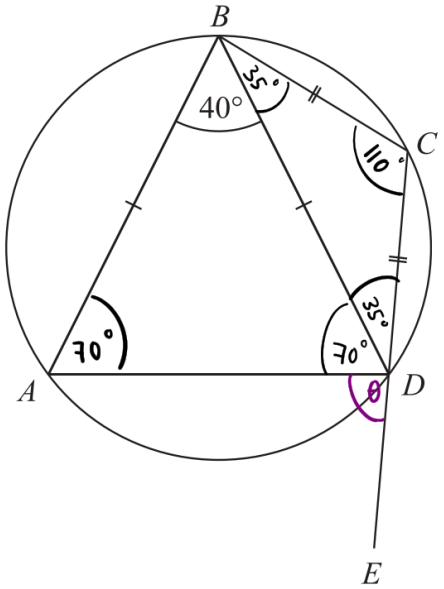
$\therefore B\hat{C}D = 180 - 70 = 110°$ (1)

$CB = CD \therefore \Delta BCD$ is isosceles.

$\therefore C\hat{B}D = C\hat{D}B = \frac{180-110}{2} = 35°$

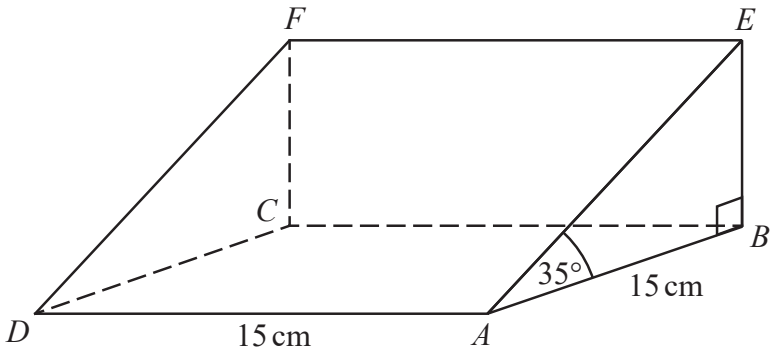
Angles in a straight line add up to $180°$

$\therefore A\hat{D}E = 180 - (35 + 70) = 75°$ (1)



(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°

M is the point on *DA* such that

$$DM : MA = 2 : 3$$

Calculate the size of the angle between *EM* and the base of the prism.
Give your answer correct to 1 decimal place.

(1) 15 cm

D 6cm M 9cm A

DM : MA = 2 : 3

DA split into 5 parts.

DM has 2 of these 5 parts.

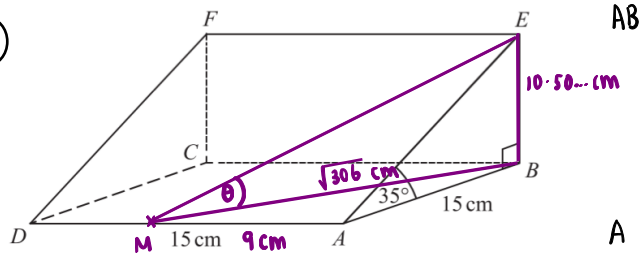
MA has 3 of these 5 parts.

$DM = \frac{2}{5} \times 15 = 6$ cm.

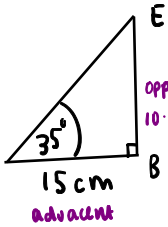
$MA = \frac{3}{5} \times 15 = 9$ cm

(1)

(2)



ABE is a right angled triangle.

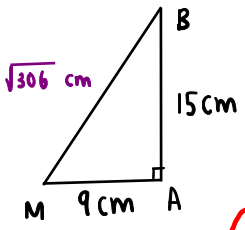


Find length EB:

$\tan 35 = \frac{EB}{15}$ (1)

$\therefore EB = 10.50311307...$ cm

(3) MAB is a right-angled triangle.



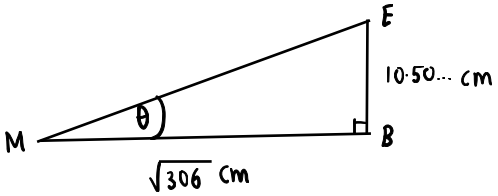
$a^2 + b^2 = c^2$

$9^2 + 15^2 = (MB)^2$

$MB = \sqrt{15^2 + 9^2} = \sqrt{306}$

(1)

(4)



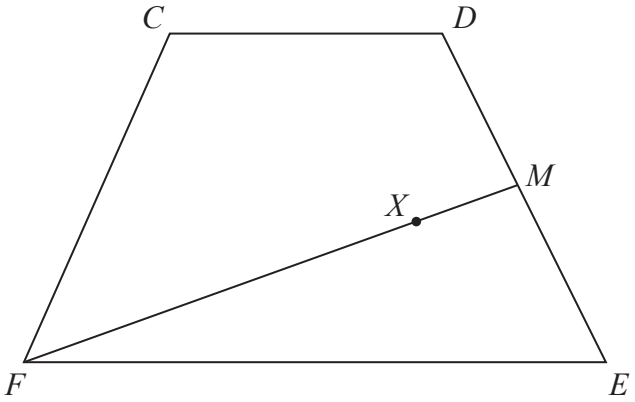
$\theta = \tan^{-1}\left(\frac{10.50...}{\sqrt{306}}\right) = 30.9815... \approx 31.0°$

(1)

31.0 °

(Total for Question 19 is 4 marks)

20 *CDEF* is a quadrilateral.



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

(a) Express $\overrightarrow{FE}$ in terms of **a** and/or **b**.
Give your answer in its simplest form. (1)

$\overrightarrow{FE} = \overrightarrow{FC} + \overrightarrow{CD} + \overrightarrow{DE} = (\underline{a} - \underline{b}) + \underline{a} + \underline{b} = 2\underline{a}$ (1)

$2\underline{a}$

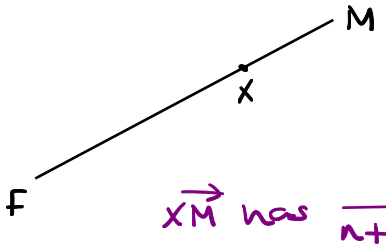
(2)

M is the midpoint of *DE*.
X is the point on *FM* such that $FX : XM = n : 1$ $(n+1)$ parts.
CXE is a straight line.

(b) Work out the value of *n*.

$\overrightarrow{FM} = \overrightarrow{FC} + \overrightarrow{CD} + \overrightarrow{DM} = (\underline{a} - \underline{b}) + \underline{a} + \frac{1}{2}\underline{b}$

$= 2\underline{a} - \frac{1}{2}\underline{b}$ (1)



$\overrightarrow{FX}$ has $\frac{n}{n+1}$ parts. $\therefore \overrightarrow{FX} = \frac{n}{n+1}\left(2\underline{a} - \frac{1}{2}\underline{b}\right)$

$\overrightarrow{XM}$ has $\frac{1}{n+1}$ parts. $\therefore \overrightarrow{XM} = \frac{1}{n+1}\left(2\underline{a} - \frac{1}{2}\underline{b}\right)$

CXE is a straight line $\therefore \overrightarrow{CX}$ is parallel to $\overrightarrow{CE}$.

$\overrightarrow{CX} = \overrightarrow{CF} + \overrightarrow{FX}$.

$\overrightarrow{CX} = -(\underline{a} - \underline{b}) + \frac{n}{n+1}\left(2\underline{a} - \frac{1}{2}\underline{b}\right)$

$n =$ 4

(4)

P.T.O

(Total for Question 20 is 6 marks)

TOTAL FOR PAPER IS 80 MARKS

$$\vec{CX} = (-\underline{a} + \underline{b}) + \frac{2n}{n+1}\underline{a} - \frac{n}{2(n+1)}\underline{b}$$

$$\vec{CX} = \left(-1 + \frac{2n}{n+1}\right)\underline{a} + \left(1 - \frac{n}{2(n+1)}\right)\underline{b}$$

$$\vec{CX} = \left(\frac{-(n+1) + 2n}{n+1}\right)\underline{a} + \left(\frac{2(n+1) - n}{2(n+1)}\right)\underline{b}.$$

$$\vec{CX} = \left(\frac{-n - 1 + 2n}{n+1}\right)\underline{a} + \left(\frac{2n + 2 - n}{2(n+1)}\right)\underline{b}.$$

$$\vec{CX} = \left(\frac{n-1}{n+1}\right)\underline{a} + \left(\frac{n+2}{2(n+1)}\right)\underline{b} \quad (1)$$

$\vec{CX}$ is parallel to $\vec{CE}$, which mean $\vec{CX}$ is a multiple of $\vec{CE}$.

$\vec{CE} = \underline{a} + \underline{b}$. coefficient of $\underline{a}$ = coefficient of $\underline{b}$.

↳ same applies to $\vec{CX}$!

$$\therefore \frac{n-1}{n+1} = \frac{n+2}{2(n+1)}. \quad (1)$$

$$n - 1 = \frac{n+2}{2}.$$

$\times 2$ $\times 2$

$$2(n-1) = n + 2.$$

$$2n - 2 = n + 2.$$

$$n - 2 = 2.$$

(1)

$$\therefore n = 4.$$