Candidate surname SOLUTIONS | Other names

Maths Planner

Pearson Edexcel
June 2023 Predicted Paper

Mathematics
PAPER 2 (Calculator)
Higher Tier

Time 1 hour

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

Total Marks

65

Q	Topic(s)	Q	Topic(s)
1	Standard form	10	Sector area (shaded region)
2	Error intervals	11	Probability tables & combined events
3	Speed, Distance, Time	12	Types of graphs
4	Product of prime factors	13	Combined pythagoras & trigonometry
5	Repeated % change	14	Drawing cubic graphs
6	Transformations	15	Trapezium and rectangle area applied
7	Using a calculator / Rounding	16	Histograms
8	nth term / Laws of indices	17	Algebraic fractions w/ solving quads.
9	Combined ratio as fractions	18	Cosine rule / Area non-right triangles

1 (a) Write the number 0.00006273 in standard form.

6.273×10^{-5}

(1)

(b) Work out $\dfrac{(1.6\times10^{-5})\times(4.8\times10^{3})}{2.4\times10^{-7}}$

Give your answer in standard form.

3.2×10^{5}

(2)

(Total marks for Question 1 is 3 marks)

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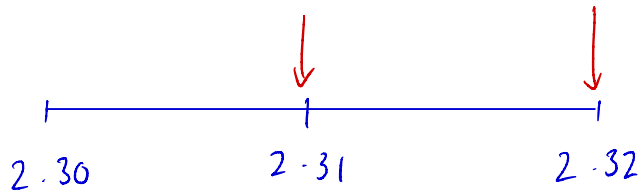
2 Sushil truncates the number y to 2 decimal places.
The result is 2.31

cuts off

Write down the error interval for y.



$2.31 \leqslant y < 2.32$

(Total marks for Question 2 is 2 marks)

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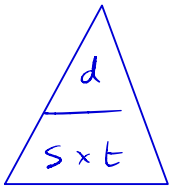
3 Jackie decided to cycle to her friend's house. She lives 18 miles away. Jackie estimates that her average cycling speed is 12 miles per hour.

(a) How many minutes **should** it take Jackie to cycle to her friend's house?



$t = \frac{d}{S} = \frac{18}{12} = 1.5\text{hrs}$

90 minutes

(1)

A sudden increase in wind speed reduces her average cycling speed by 20%.

(b) If she needs to be at her friend's house by 12:45 pm and leaves at 11:00 am, will she make it on time, considering the wind speed effect?

↓20% => 100% − 20% = 80%

×0·80

12 × 0·8 = 9.6 mph

$T = \frac{18}{9.6} = 1.875\text{hrs}$

0·875 × 60 = 52.5mins

∴ 1 hr 52mins 30 secs

11 am → 12:45 pm + 1hr 45mins

No

(3)

(Total marks for Question 3 is 4 marks)

4 $A = 2^3 \times 5 \times 7^3$
$B = 2 \times 3^2 \times 5 \times 7$

(a) Write **18A** as a product of prime factors.

18
1 \
3 6
  / \
 2 3

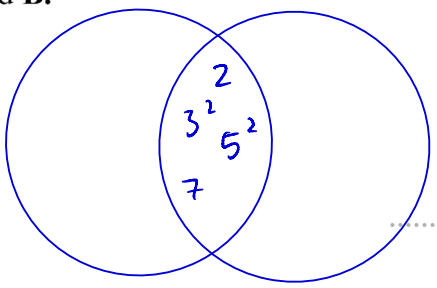
$18A = 18 \times 2^3 \times 5 \times 7^3$
$= 2 \times 3^2 \times 2^3 \times 5 \times 7^3$

$2^4 \times 3^2 \times 5 \times 7^3$

(2)

(b) Find the **HCF** of **18A** and **B.**

$18A = 2^4 \times 3^2 \times 5 \times 7^3$
$B = 2 \times 3^2 \times 5 \times 7$



$HCF = 2 \times 3^2 \times 5 \times 7$
$= 630$

(2)

(Total marks for Question 4 is 4 marks)

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5 During a housing market crash, the prices depreciated by 2% per quarter in the first year and 1.5% per quarter in the second year.

↓2%

↓1.5%

Henry's house was valued at £465,000 at the start of the crash.
How much is Henry's house worth 18 months into the crash?
Give your answer to the nearest pound.

3 months
∴ 4 Q's in 1yr.

$\frac{18}{3} = 6$ Q's.

$100\% - 2\% = 0.98$

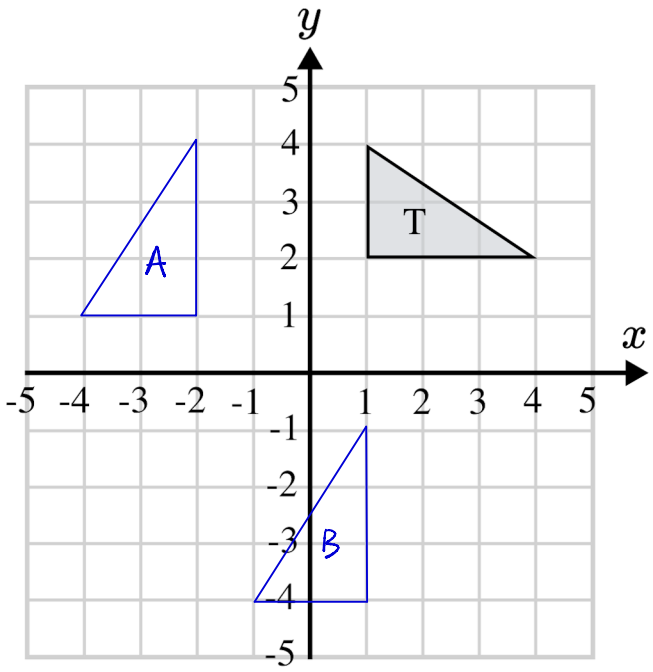
$100\% - 1.5\% = 0.985$

$465{,}000 \times 0.98^4 \times 0.985^2$
$= £416{,}130.66$

£416,131

(Total marks for Question 5 is 3 marks)

6



(a) Rotate triangle **T** 270° clockwise about the origin.
Label the new triangle **A**. **(1)**

(b) Translate triangle **A** by the vector $\begin{bmatrix} 3 \\ -5 \end{bmatrix}$
Label the new triangle **B**. **(1)**

(Total marks for Question 6 is 2 marks)

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7 (a) Use your calculator to work out

$$\frac{\sqrt{sin(30)+2.01^4}}{(6.7-3.20)^{\frac{1}{2}}}$$

Write down all the figures shown on your calculator

2.192350859

(1)

(b) Round your answer to part **(a)** to 2 significant figures

2.2

(1)

(Total marks for Question 7 is 2 marks)

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8 (a) The first five terms of an arithmetic sequence are

1.4 0.6 -0.2 -1 -1.8

Work out the value of the 79th term.

$T(n) = -0.8n + 2.2$

$T(79) = -0.8(79) + 2.2$

-61

.....

(2)

(b) Simplify $2y^0 \times x^2$

$8 = 2^3$

$2(1) \times x^2$

$2x^2$

.....

(1)

(c) $(\sqrt{8})^x \div 64^{2y}$ can be written in the form 2^a

Show that $a = \frac{3}{2}x - 12y$

$\therefore a = \frac{3}{2}x - 12y$

$8 = 2^3$

$64 = 2^6$

$(\sqrt{2^3})^x \div (2^6)^{2y}$

$(2^3)^{\frac{1}{2}x} \div 2^{12y} = 2^{\frac{3}{2}x} \div 2^{12y} = 2^{\frac{3}{2}x - 12y}$

(2)

(Total marks for Question 8 is 6 marks)

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9 Given $\frac{p}{q} = \frac{3}{7}$ and $\frac{q}{r} = \frac{4}{9}$

find $p : q : r$

$p : q$

$3 : 7$

$\times 4$

$12 : 28$

$q : r$

$4 : 9$

$\times 7$

$28 : 63$

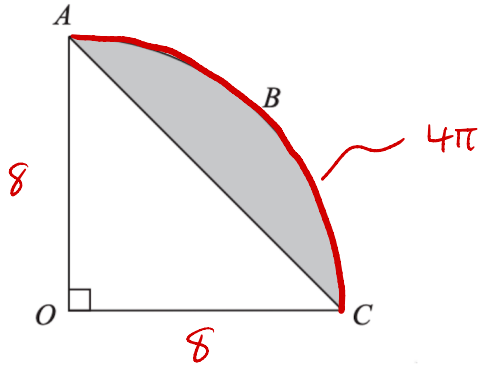
$p : q : r$

$12 : 28 : 63$

.....

(Total marks for Question 9 is 3 marks)

10



The arc ABC has a length of 4π *cm*
AC is a chord of the circle.

Work out the area of the shaded segment as a percentage of the sector OAC.
Give your answer correct to 2 decimal places.

STEP 1

$\therefore C = 4 \times 4\pi$

$= 16\pi$

$C = \pi \times d \quad \therefore d = 16$

$r = 8$

STEP 2

Area of $\triangle OAC = \frac{8 \times 8}{2} = 32 cm^2$

Area of sector $OAB = \frac{\pi \times 8^2}{4} = 16\pi \ cm^2$

Shaded Area $= 16\pi - 32$

% of shaded $= \frac{16\pi - 32}{16\pi} \times 100$

$= 36.338$

36.34% (2 d.p)

(Total marks for Question 10 is 4 marks)

11 A bag contains only red counters, blue counters, green counters and yellow counters.
A counter is taken at random.

The table shows the probabilities of taking a counter from the bag.

Colour	red	blue	green	yellow
Probability	0.15	$4x = 0.52$	$x = 0.13$	0.2

$= 1$

The probability of taking a blue counter is 4 times greater than the probability of taking a green counter.

$1 - (0.15 + 0.2) = 0.65$

There are 50 yellow counters.

$\therefore 5x = 0.65$

$x = 0.13$

(a) Work out the number of blue counters in the bag

$0.2 = 50$ counters

$20\% = 50$ counters

$100\% = 250$ counters

$P(B) = 0.52$

$0.52 \times 250 = 130$

.....

(3)

Chloe takes a counter from the bag, notes its colour and then replaces it. She then selects a second counter.

AND (×) OR (+)

(b) Find the probability that Chloe takes two counters of the same colour.

$P(RR) + P(BB) + P(GG) + P(YY)$

$= 0.15^2 + 0.52^2 + 0.13^2 + 0.2^2$

$= 0.3498$

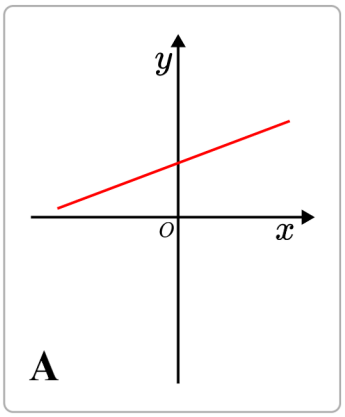
0.3498

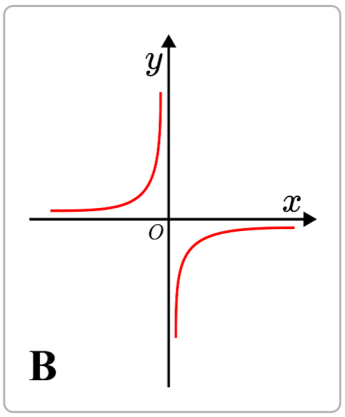
.....

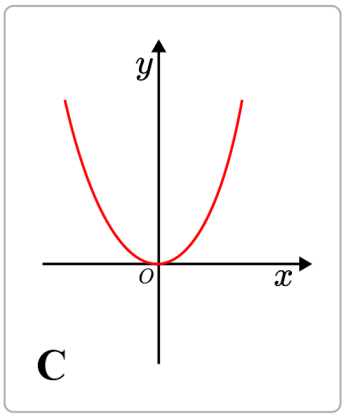
(3)

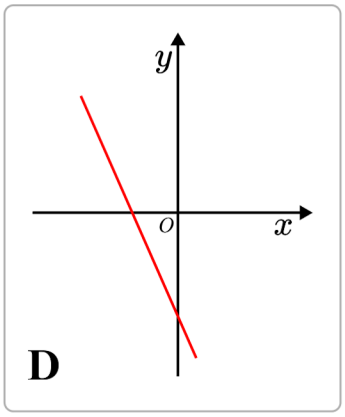
(Total marks for Question 11 is 6 marks)

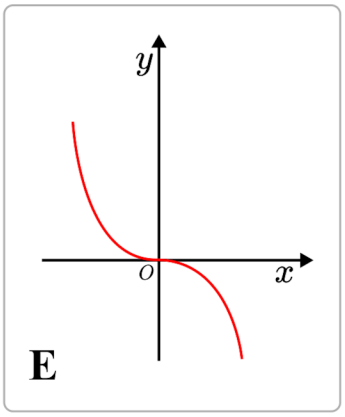
12 Here are some graphs.

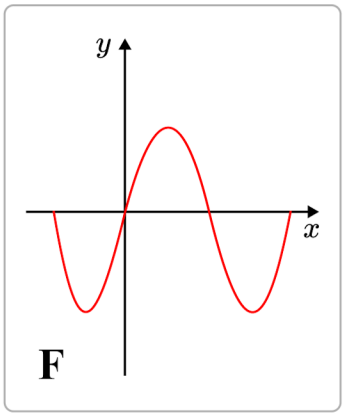


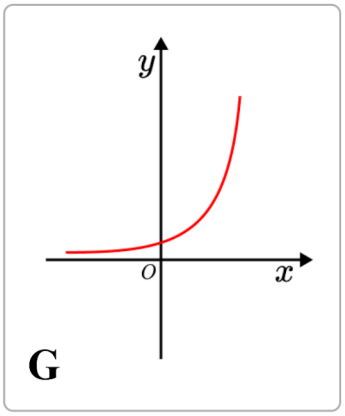


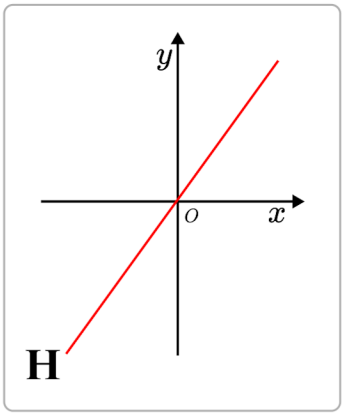


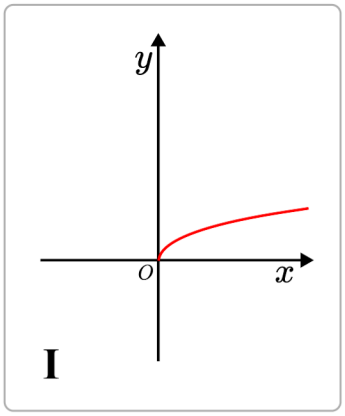










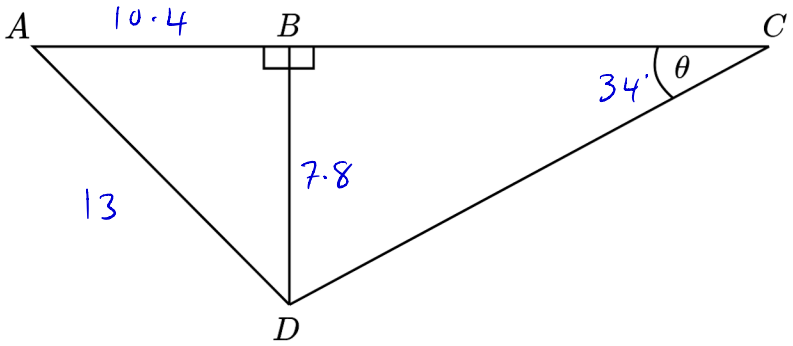


In the table below, match each equation with the letter of its graph.

Equation	Graph
$y = \sqrt{x}$	I
$y = -3x^3$	E
$y = \frac{1}{2}x + 2$	A
$y = sin(x)$	F

(Total marks for Question 12 is 3 marks)

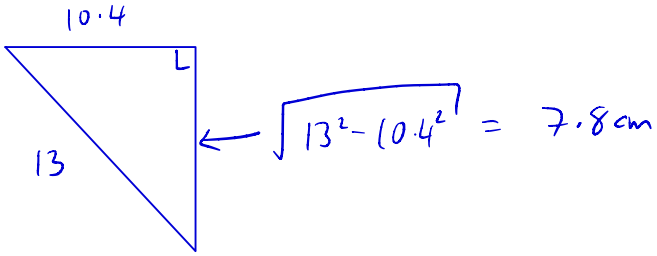
13



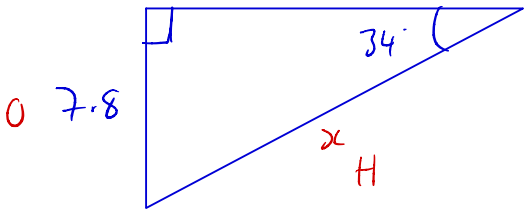
AB = 10.4 cm and $\theta = 34°$
The ratio of AB to AD is 4:5

Calculate length of *CD*, give your answer correct to 2 decimal places.

	AB : AD	total
	4 : 5	9
×2.6	10.4 : 13	



SOH



$\sin(\theta) = \frac{O}{H}$

$x = \frac{7.8}{\sin(34)}$

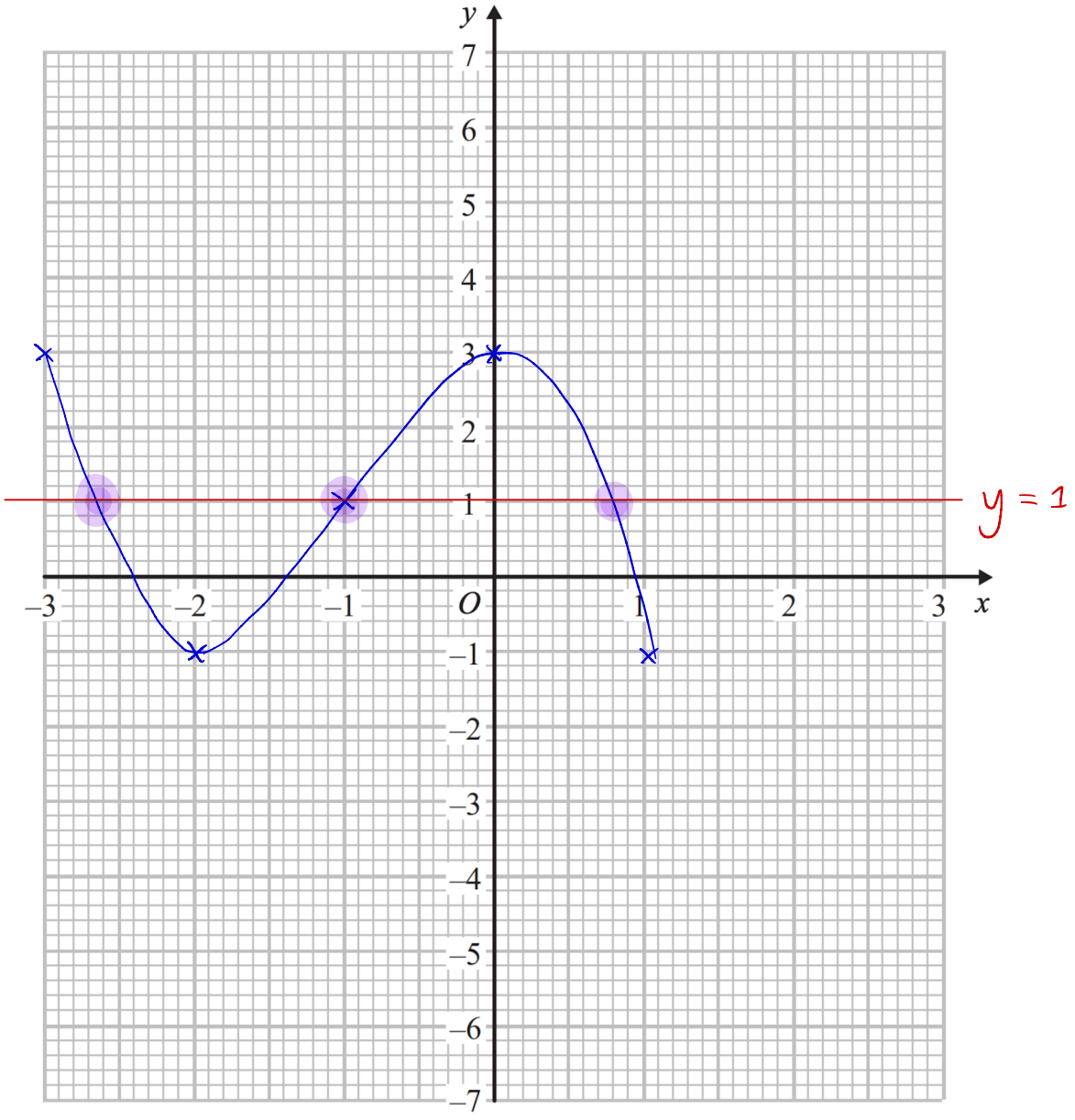
CD = 13.95 cm

(Total marks for Question 13 is 3 marks)

14 (a) Complete the table of the values for $y = 3 - 3x^2 - x^3$ **(2)**

x	-3	-2	-1	0	1
y	3	−1	1	3	−1

(b) On the grid, draw the graph $y = 3 - 3x^2 - x^3$ for the values of x from -3 to 1. **(1)**



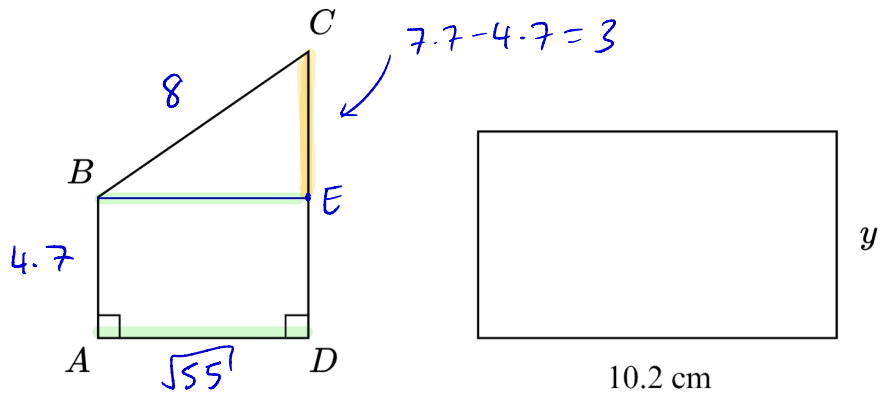
(c) Use your graph to estimate solutions for $3 - 3x^2 - x^3 = 1$ $y = 1$

$x = -2.7$, $x = -1$, $x = 0.8$

(1)

(Total marks for Question 14 is 4 marks)

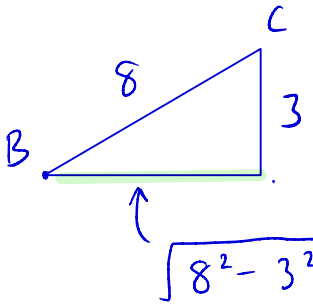
15 $ABCD$ is a trapezium.



$AB = 4.7$ cm
$BC = 8$ cm
$CD = 7.7$ cm

The area of the rectangle is $1\frac{1}{2}$ the area of $ABCD$.

Work out the length of side y, correct to 2 significant figures.



Area of ABCD

$A = \frac{(a+b) \times h}{2}$

$= \frac{(4.7 + 7.7) \times \sqrt{55}}{2}$

$= \frac{31\sqrt{55}}{5}$ or (45.9804)

$\therefore$ Area of $\square = 1.5 \times \frac{31\sqrt{55}}{5}$

$= \frac{93\sqrt{55}}{10}$ or (68.97...)

$\therefore y = 68.97 \div 10.2$

$= 6.7618...$

$y = 6.8$ (2sf)

(Total marks for Question 15 is 4 marks)

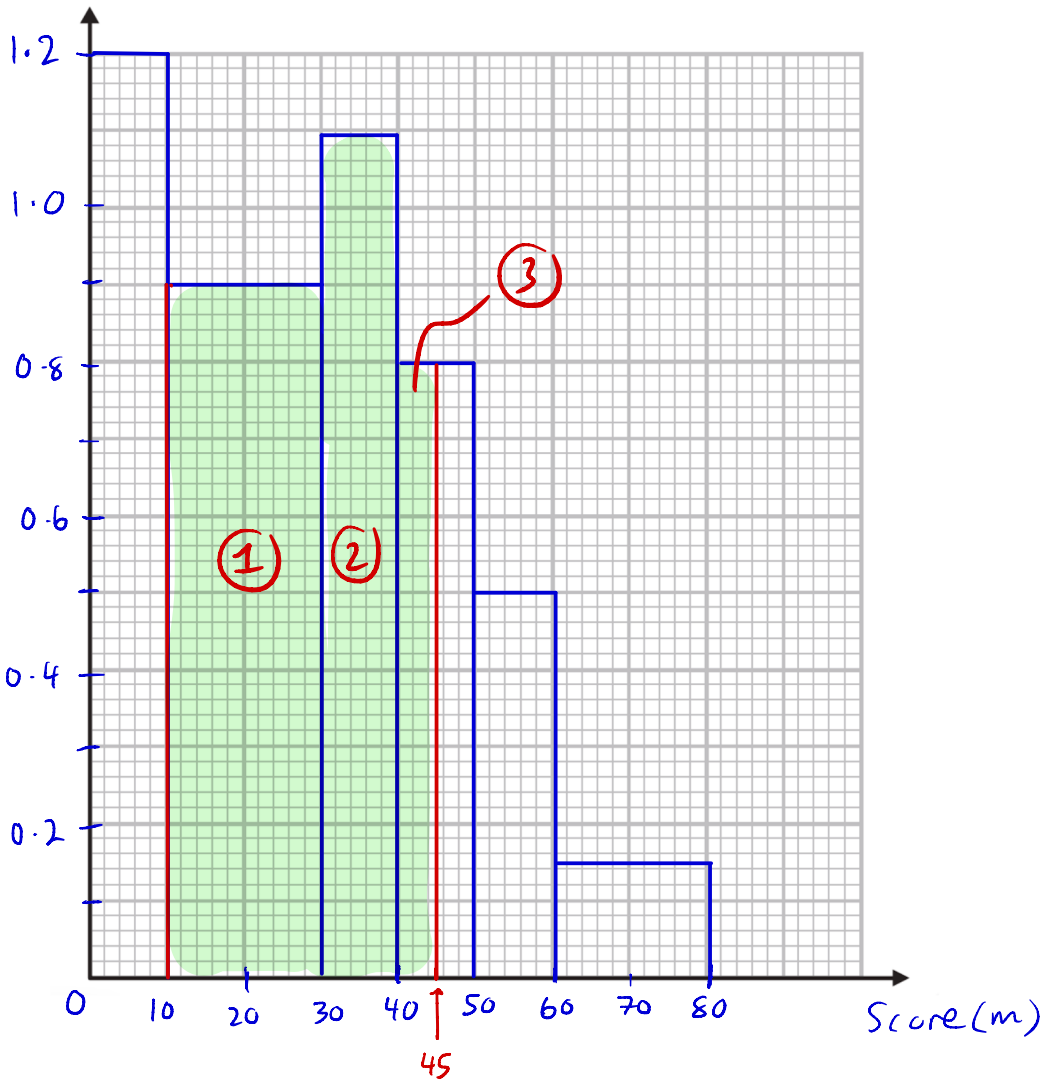
16 The table shows Mr Andrews year 10 GCSE Paper 1 mock results.

f / fd x w

	Score (m marks)	w	Frequency	fd = f ÷ w
	$0 < m \leq 10$	10	12	1.2
①	$10 < m < 30$	20	18	0.9
②	$30 < m < 40$	10	11	1.1
	$40 < m \leq 50$	10	8	0.8
	$50 < m < 60$	10	5	0.5
	$60 < m < 80$	20	3	0.15
			57	

(a) On the grid, draw a histogram for this information. **(3)**

F.D



(b) Work out an estimate for the fraction of students who scored between 10 and 45 marks.

① Frequency = 18
② Frequency = 11
③ Frequency = 5 × 0.8 = 4

} 33

33/57

(2)

(Total marks for Question 16 is 5 marks)

17 Solve $\frac{4x-3}{x^2-3x+2} + \frac{2x+1}{x-1} = 1$

Give your solutions in surd form.

$\frac{4x-3}{(x-1)(x-2)} + \frac{2x+1}{x-1} = 1$

$\times (x-2)$

$\frac{4x-3}{(x-1)(x-2)} + \frac{(2x+1)(x-2)}{(x-1)(x-2)} = 1$ FOIL

$\frac{4x-3+2x^2-3x-2}{(x-1)(x-2)} = 1$

$2x^2 + x - 5 = (x-1)(x-2)$

$2x^2 + x - 5 = x^2 - 3x + 2$

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

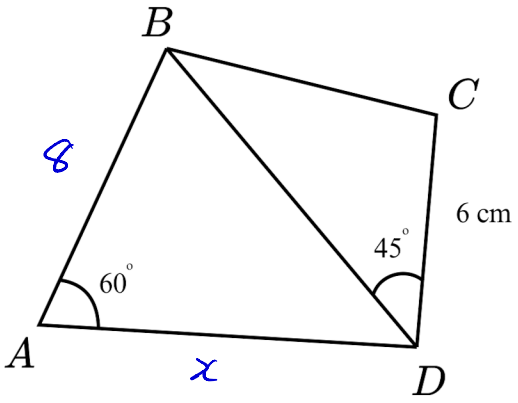
$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$ where $a = 1$, $b = 4$, $c = -7$

$x = -2 + \sqrt{11}$

$x = -2 - \sqrt{11}$

(Total marks for Question 17 is 4 marks)

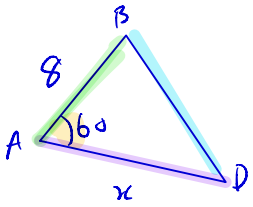
18



Triangle ABC, side AB has a length of 8cm.
Side AD has a length of x cm, where $x > 0$.
Given triangle BCD is a non-right triangle.

Show that the area of BCD can be written in the form $\frac{3\sqrt{2}}{2}\sqrt{x^2 - 8x + 64}$

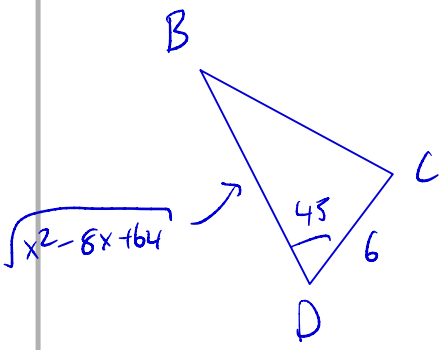
$BD^2 = b^2 + c^2 - 2bc\cos A$



$= 8^2 + x^2 - 2(8)x\cos 60 \times \frac{1}{2}$

$= 64 + x^2 - 8x$

$BD = \sqrt{x^2 - 8x + 64}$



$A = \frac{1}{2}ab\sin C$

$= \frac{1}{2}(6)(\sqrt{x^2-8x+64})\sin(45)\ \frac{\sqrt{2}}{2}$

$= \frac{3\sqrt{2}}{2}\sqrt{x^2-8x+64}$ as required

(Total marks for Question 18 is 4 marks)