Candidate surname	Other names

Maths Planner

Edexcel

2024 Practice Paper

Mathematics

PAPER 3 (Calculator)

Higher Tier

Time 1 hour 30 minutes

Worked Written Solutions ✓

Total Marks

80

Q	Topic(s)	Marks
1	Factorising / Change the Subject	/ 4
2	Standard Form	/ 4
3	Angles in Parallel Lines	/ 4
4	Box Plots	/ 6
5	Laws of Indices	/ 6
6	Combining Ratios	/ 3
7	Mean from Frequency Table / Frequency Polygons	/ 5
8	Volume & Surface Area	/ 4
9	Graphical Simultaneous Equations	/ 1
10	Product Rule for Counting	/ 2
11	Compound Interest	/ 4
12	Angles in Polygons	/ 2
13	Calculating with Speed / Bounds	/ 4

Q	Topic(s)	Marks
14	MDV / PFA	/ 3
15	2D Trigonometry and Pythagoras	/ 4
16	Successive Probability	/ 5
17	Algebraic Fractions	/ 6
18	Circle Theorems	/ 4
19	Non-right Triangles	/ 5
20	Functions	/ 4

Student Warning

These topics are not guaranteed to show up in your Paper 3 exam. Please make sure to revise all topic areas, especially since topics covered in Paper 1 and 2 can still come up.

These questions have been selected using analysis on previous official exam papers.

Marking Codes

Mark	What does it mean?
M1	**Method mark**. This mark is generally given for an appropriate method in the context of the question. *This mark is given for showing your working and may be awarded even if working is incorrect.*
A1	**Accuracy mark**. This mark is generally given for a correct answer following correct working.
B1	**Working mark**. This mark is usually given when working and the answer cannot easily be separated.
C1	**Communication mark.** This mark is given for explaining your answer or giving a conclusion in context supported by your working
P1	**Process Mark.** This mark is generally given for setting up an appropriate process to find a solution in the context of the question

Student Warning

The questions in this paper will not be in the exam

These topics are **not guaranteed** to show up in your Paper 3 exam. Please make sure to revise **all topic areas**, especially since topics covered in Paper 1 and Paper 2 can still come up.

These questions have been selected using analysis on previous official exam papers.

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in you working.

1 (a) Factorise $3x^2 + 12xy$ $3x^2+12xy$

✓ A1 (for one correct factor)
✓ A2 (for both correct factors)

💡 Find the HCF of numbers and letters

$3x(x+4y)$

(2)

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

Make b the subject.

$a = 2b + c^2$

$-c^2$ ↓ ↓ $-c^2$ ✓ M1

$a - c^2 = 2b$

$\div 2$ ↓ ↓ $\div 2$

$\frac{a - c^2}{2} = b$

✓ A1

$b = \frac{a - c^2}{2}$ or $b = \frac{c^2 - a}{-2}$

(2)

(Total marks for Question 1 is 4 marks)

---

2 (a) Write 5×10^{-5} as an ordinary number.

0.00005.0

0.00005

0.00005 ✓ B1

(1)

(b) Write 830×10^6 in standard form.

830000000.

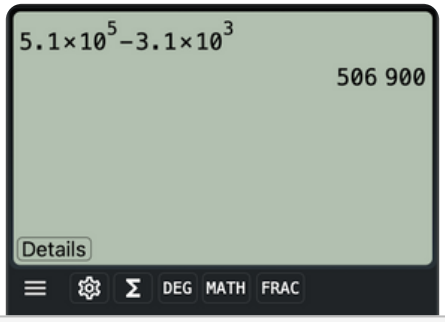
8.30000000

8.3×10^8 ✓ B1

(1)

(c) Work out $5.1 \times 10^5 - 3.1 \times 10^3$

Give your answer in standard form.



You can input into your calculator

506900 ✓ P1

5.06900

5.069×10^5 ✓ A1

(2)

(Total marks for Question 2 is 4 marks)

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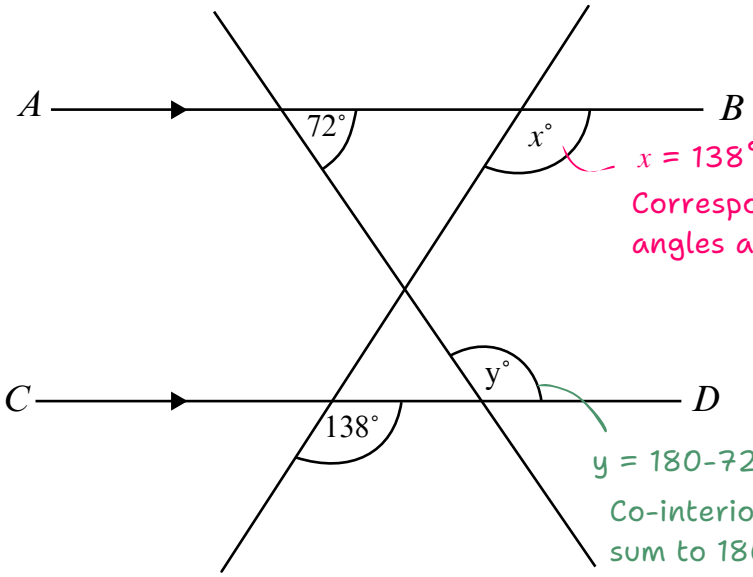
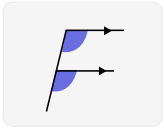
3 AB and BC are parallel lines.

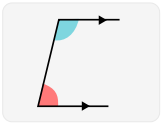
Not drawn accurately



$x = 138°$
Corresponding angles are equal



$y = 180-72 = 108°$
Co-interior angles sum to 180°



(a) Work out the size of angle x.

138 ✓ B1 °

(1)

(b) Give a reason for your answer.

Corresponding angles are equal ✓ C1

(1)

(c) Work out the size of angle y.

$y = 180-72 = 108°$

108 ✓ B1 °

(1)

(d) Give a reason for your answer.

Co-interior angles sum to 180° ✓ C1

(1)

(Total marks for Question 3 is 4 marks)

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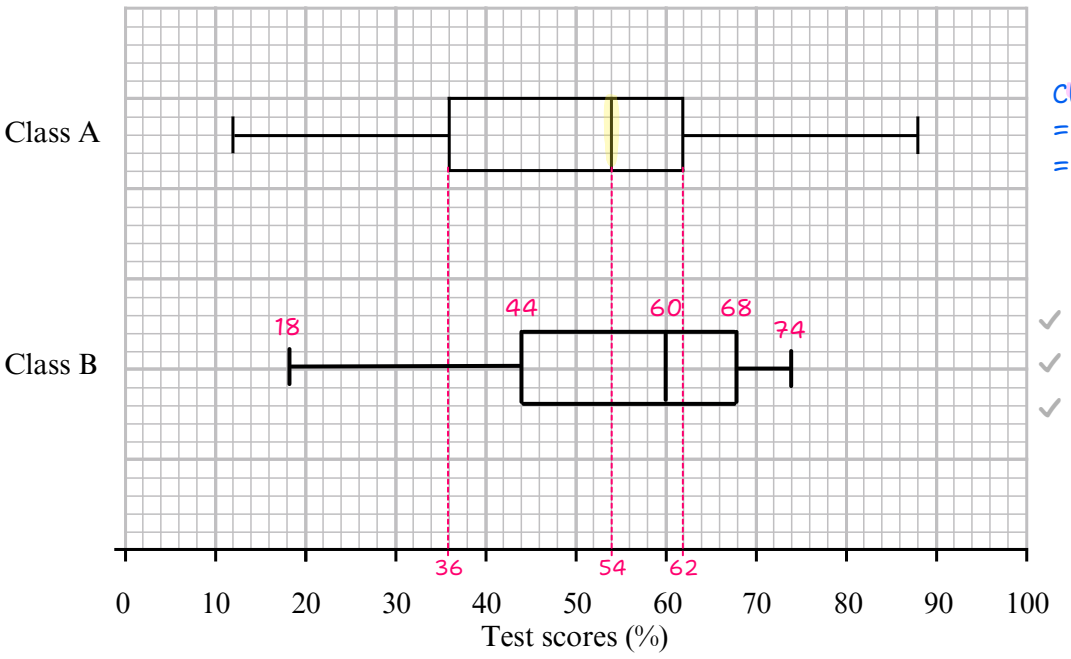
4 The following data represents the scores of students from two different classes on a recent math test. A box plot for Class A is drawn below.



Class A IQR
= 62 − 36
= 26

✓ C1 (2 correct)
✓ C2 (3 correct)
✓ C3 (5 correct)

(a) Write down the median test score for Class A.

54 ✓ B1 %

(1)

The table below shows information about the distributions of the test scores for Class B.

	Lowest	Interquartile range	Median	Upper quartile	Range
Score (%)	18	24	60	68	56

LQ = 68−24
= 44

Max = 18+56
= 74

(b) On the grid above, draw a box plot for the information in the table. (3)

(c) Compare the distribution of the test scores for Class A with the distributions of the test scores for Class B.

On average, pupils in Class B score higher as their median is 60% compared to Class A's 54%. ✓ C1

Pupils in Class B score more consistently as IQR is 24, compared to Class A's IQR of 26. ✓ C1

(2)

(Total marks for Question 4 is 6 marks)

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5 (a) Simplify $a^2 \times a \times a^{-5}$

$a^n \times a^m = a^{n+m}$

$a^2 \times a^1 \times a^{-5} = a^{-2}$

a^{-2} ✓ B1

(1)

(b) Simplify $\dfrac{(4wc^3)^3}{8wc}$

$\dfrac{(4wc^3)^3}{8wc} = \dfrac{4^3w^3c^9}{8wc}$ ✓ M1

$(a^n)^m = a^{nm}$

$= \dfrac{64w^3c^9}{8w^1c^1} = 8w^2c^8$ ✓ M1

$a^n \div a^m = a^{n-m}$

$64 \div 8 = 8$

$8w^2c^8$ ✓ A1

(3)

(c) Write $32^{\frac{1}{2}}$ as a single power of 2.

$2^5 = 32$

✓ M1

$\therefore (2^5)^{\frac{1}{2}} = 2^{\frac{5}{2}}$

$(a^n)^m = a^{nm}$

✓ A1 ✓ A1

$2^{\frac{5}{2}}$ or $2^{2.5}$

(2)

(Total marks for Question 5 is 6 marks)

---

6 Given $x : y = 4 : 5$ and $\dfrac{x}{w} = \dfrac{7}{3}$

find the ratio $x : y : w$ in its simplest form.

$x : y : w$

x7 $4 : 5$

✓ M1 $7 : \ : 3$ x4

$28 : 35 : 12$

They have 'x', we can use this fact to link the two ratios!

$4 \times 7 = 28$

✓ A1 (at least 2 correct values)

✓ A2 (all three values correct)

$28 : 35 : 12$

(Total marks for Question 6 is 3 marks)

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7 The frequency table gives information about the time taken for workers to drive to work.

Time (t minutes)	Frequency (f)	mp	f x mp
$0 < t \leq 10$	5	5	25
$10 < t \leq 20$	13	15	195
$20 < t \leq 30$	18	25	450
$30 < t \leq 40$	4	35	140
	40		810

✓ P1

(a) Work out an estimate for the mean time for their drive to work.

(3)

$$\text{mean} = \frac{\sum fxmp}{\sum f} = \frac{810}{40} = 20.25 \text{ minutes}$$

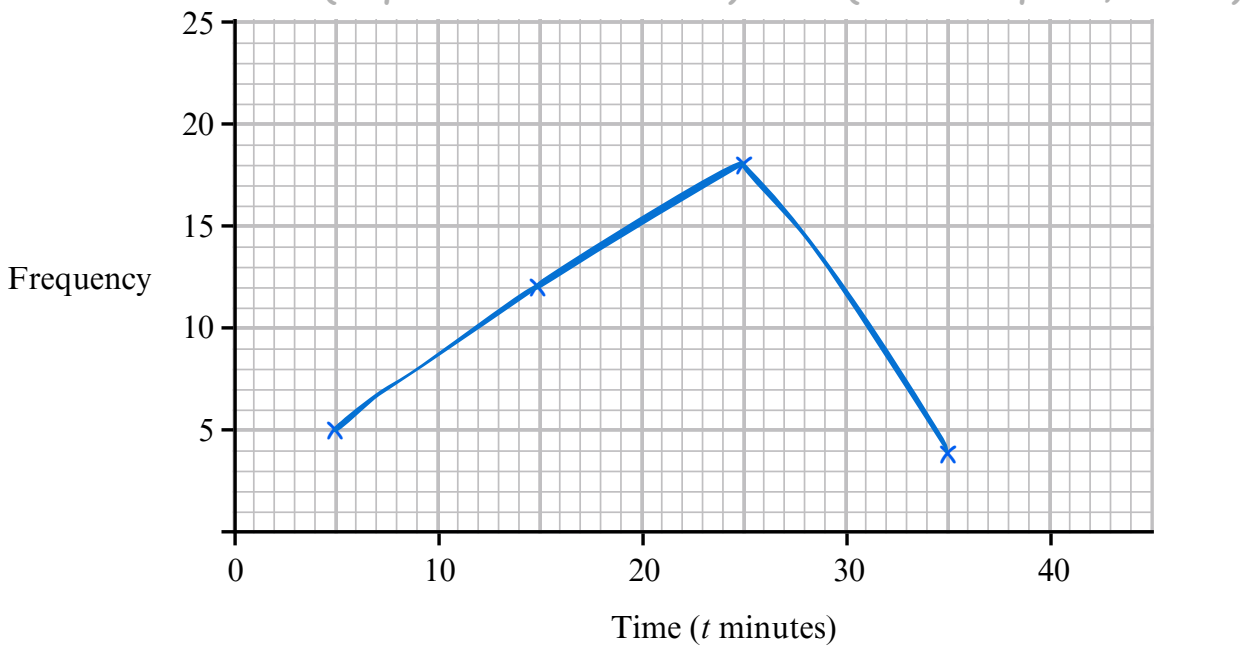
✓ M1

✓ A1 20.25 minutes or ✓ A1 20 mins & 15 seconds

(b) On the grid, draw a frequency polygon for the information in the table.

(2)

✓ B2 (all points correct with lines) ✓ B1 (all correct points, no lines)



(Total marks for Question 7 is 5 marks)

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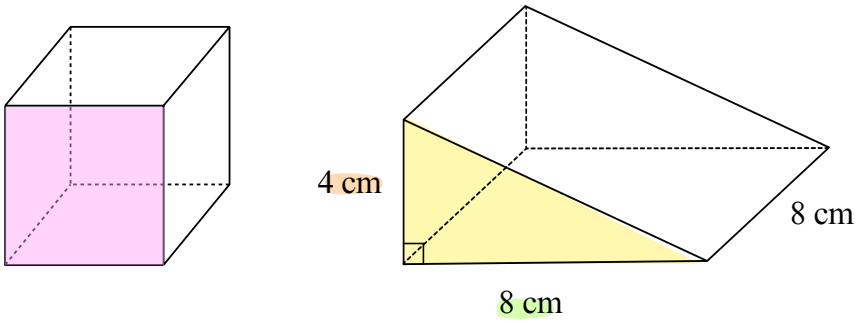
8 Here is a cube and triangular prism.



The volume of the cube is equal to the volume of the triangular prism.
Work out the surface area of the cube.
Give your answer correct to 2 decimal places.

Volume = cross-section area x length

Triangular Prism:

Cross-section area = $\frac{b \times h}{2}$

$= \frac{8 \times 4}{2} = 16cm^2$ ✓ B1

$\therefore$ Volume = 16×8

$= 128cm^3$

$\therefore$ Volume of Cube = $128cm^3$ ✓ B1

Side length of Cube = $\sqrt[3]{128}$ ✓ M1

$= 5.0396842$ cm

Surface Area of Cube = 6 x (Area of one face)

$= 6 \times (5.0396842)^2$

$= 152.390501$

152.39 ✓ A1 ..... cm^2

(Total marks for Question 8 is 4 marks)

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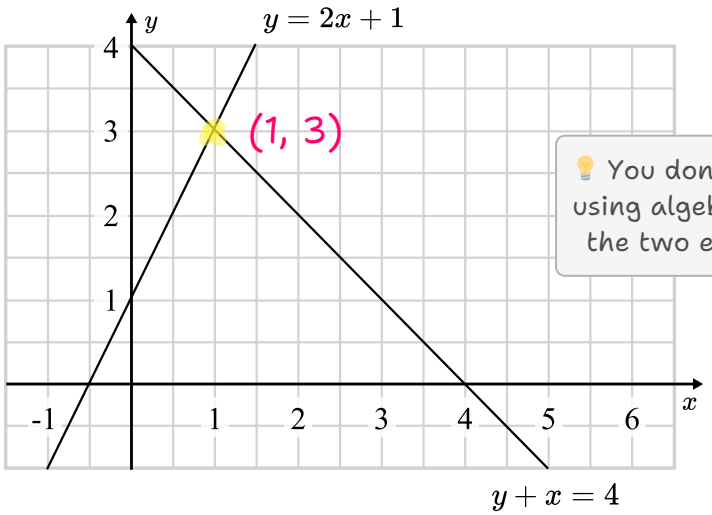
9



💡 You don't need to solve this using algebra! Just find where the two equations intercept!

Use these graphs to solve the simultaneous equations

$$y = 2x + 1$$

$$y + x = 4$$

✓ B1 (both correct)

$x =$ 1

$y =$ 3

(Total marks for Question 9 is 1 mark)

---

10 Emma is organising a music playlist.
She has 15 different songs and wants to create a playlist with one song from each genre.

There are

5 pop songs
6 rock songs
4 jazz songs

💡 Combinations = options x options x ...

Calculate the number of different ways Emma can choose one pop song, one rock song, and one jazz song for her playlist.

Combinations = 5 x 6 x 4 ✓ M1

= 120

120 ✓ A1

(Total marks for Question 10 is 2 marks)

3H24

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11 Henry invests £x in Moomoo Investments for 4 years.
Chloe invests £x in Trading 414 for 2 years.

💡 They both invest x, so we need to find x!

MooMoo Investments
Compound Interest
3% per annum for the **first** two years 1.8% per annum for each extra year

Trading 414
Compound Interest
5% per annum

At the end of the 4 years, Henry's investment is valued at £54,971.81
Work out the value of Chloe's investment at the end of the 2 years.
Give your answer to the nearest penny.

Compound Interest

$P \times \left(1 + \frac{r}{100}\right)^n$ P = starting amount, r = interest rate, n = number of years

Compound Multipliers

$1 + \frac{3}{100} = 1.03$

$1 + \frac{1.8}{100} = 1.018$

$1 + \frac{5}{100} = 1.05$

MooMoo (Henry)

$x \times 1.03^2 \times 1.018^2 = 54{,}971.81$

$x = \frac{54{,}971.81}{1.03^2 \times 1.018^2}$ ✓ P1

$= 50{,}000.00311$

$\approx$ £50,000 ✓ A1

Trading 414 (Chloe)

$50{,}000 \times 1.05^2 =$ £55,125 ✓ M1

£ 55,125 ✓ A1

(Total marks for Question 11 is 4 marks)

3H24

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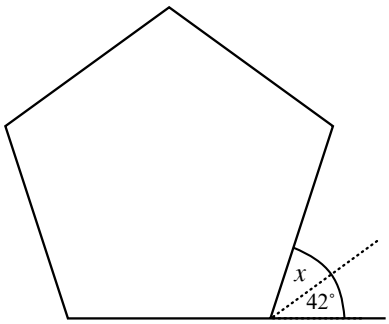
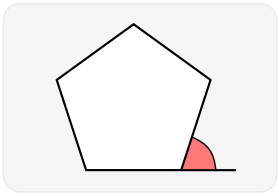
12 Here is a regular polygon.



Not drawn accurately

Work out the size of angle x.



Exterior Angle = $\frac{360}{N}$

Where N = number of sides

Exterior Angle = $\frac{360}{5}$ = 72° ✓ M1

$\therefore\ x = 72 - 42$

$= 30$

$x =$ 30 ✓ A1 °

(Total marks for Question 12 is 2 marks)

---

13 A car travels a distance of 150 km.
The distance is measured to the nearest 5 km.
The time taken for the journey is 2 hours, measured to the nearest 10 minutes.

2 hours = 120 minutes

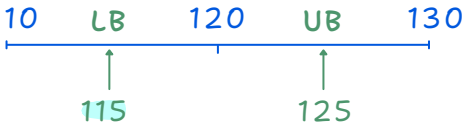
Calculate the maximum average speed that car could have travelled.
Give your answer correct to nearest integer.

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

Distance:

✓ M1 (finding bounds)

Time:



$\frac{115}{60} = \frac{23}{12}$ hours

✓ P1

$S_{max} = \frac{D_{max}}{T_{min}} = 152.5 \div \frac{23}{12}$ ✓ M1 (correct bounds used)

$= 79.5652...$ km/h

80 ✓ A1 km/h

(Total marks for Question 13 is 4 marks)

3H24

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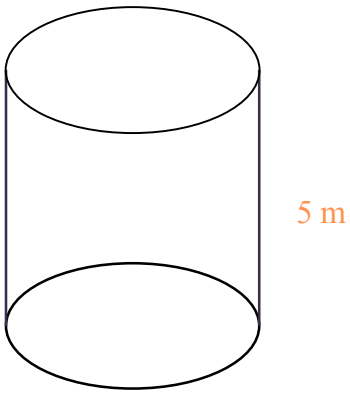
14 The diagram shows a cylinder placed on a horizontal floor.



$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

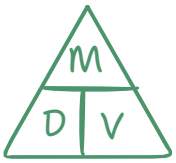
The cylinder has a height of 5 m

The cylinder has a density of 0.8 kg/m³ and a mass of 128.68kg

The pressure on the floor due to the prism is 8 newtons/m²

Work out the force exerted by the cylinder on the floor.

Volume of Cylinder = $\frac{\text{Mass}}{\text{Density}}$



$= \frac{128.68}{0.8}$ ✓ M1 $= 160.85\text{m}^3$

💡 Volume = cross-section area x length

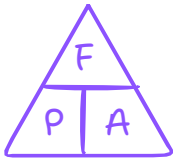
∴ Cross-section Area = 160.85 ÷ 5 ✓ M1

$= 32.17\text{m}^2$

Force = Pressure x Area

$= 8 \times 32.17$

$= 257.36$



257.36 ✓ A1 ..... newtons

(Total marks for Question 14 is 3 marks)

3H24

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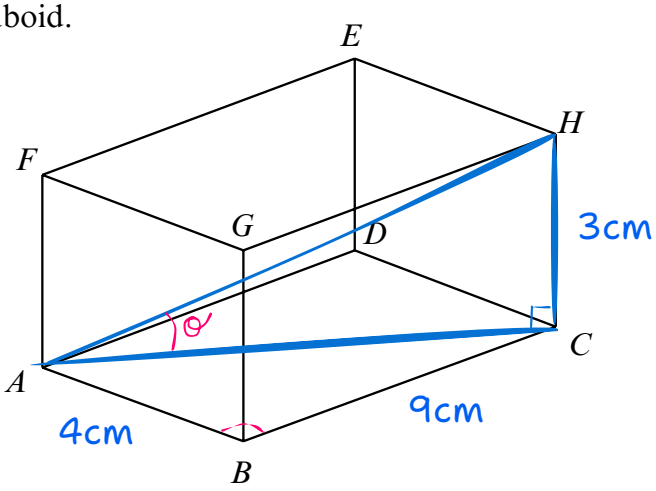
15 *ABCDEFGH* is a cuboid.



The cuboid has a volume of 108 cm²

$AB = 4$ cm

$BC = 9$ cm

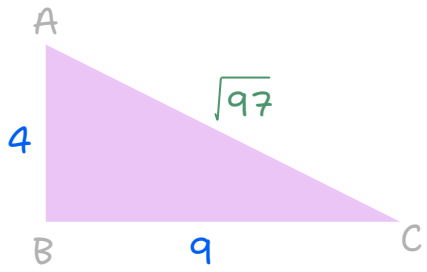
Work out the size of angle CAH.

Give your answer correct to 1 decimal place.

💡 Volume = l x w x h

$\therefore CH = 108 \div (4 \times 9)$ ✓ M1

$= 3$ cm

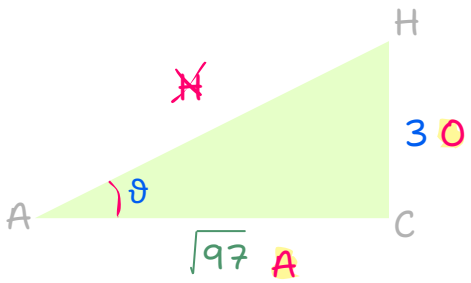


$AC^2 = AB^2 + BC^2$

$AC^2 = 4^2 + 9^2$ ✓ P1

$AC = \sqrt{4^2 + 9^2}$

$= \sqrt{97}$ $= (9.84885...)$



$\tan(\theta) = \frac{A}{H}$

$\tan(\theta) = \frac{3}{\sqrt{97}}$ ✓ P1

$\theta = \tan^{-1}\left(\frac{3}{\sqrt{97}}\right)$

$\theta = 16.9409...$

S°H C^A H T°A

16.9 ✓ A1 °

(Total marks for Question 15 is 4 marks)

3H24

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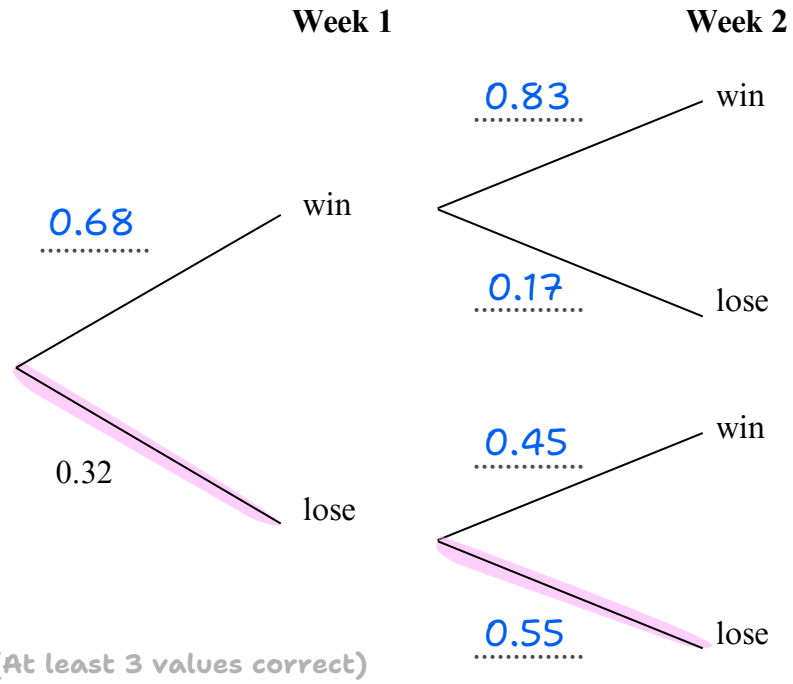
16 A tennis player is playing a game on Week 1 a tournament and another game on Week 2.
The probability that the player will lose on Week 1 is 0.32

If they win on Week 1, the probability that they will win on Week 2 is 0.83
If they lose on Week 1, the probability that they will win on Week 2 is 0.45

(a) Complete the probability tree diagram.

💡 Branches must add to 1

(2)



✓ A1 (At least 3 values correct)
✓ A2 (All 5 values correct)

(b) Find the probability that the team will win at least one match.

P(Win at least once) = 1 – P(Lose) ✓ P1 (to find P(lose) or 3 ways to win)

= 1 – (0.32 x 0.55)
✓ M1

= 0.824

0.824 ✓ A1

(3)

(Total marks for Question 16 is 5 marks)

3H24
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17 (a) Write $\dfrac{3}{x-3} - \dfrac{5}{2x}$ as a single simplified fraction.

$= \dfrac{3}{x-3}^{\times(2x)} - \dfrac{5}{2x}^{\times(x-3)}$ ✓ P1 (common denominator)

$\times(2x)$ $\qquad$ $\times(x-3)$

$= \dfrac{3(2x) - 5(x-3)}{2x(x-3)}$

$= \dfrac{6x - 5x + 15}{2x(x-3)} = \dfrac{15 - x}{2x(x-3)}$ ✓ A1

$\dfrac{15 + x}{2x(x-3)}$ or $\dfrac{x + 15}{2x(x-3)}$ ✓ A1

(2)

(b) Given $5a - 1 : a + 9 = 2a - 3 : a + 7$

Find possible values for a.

💡 You can divide parts and equate!

$\dfrac{5a-1}{a+9} = \dfrac{2a-3}{a+7}$ ✓ P1

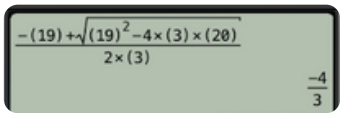
$(5a-1)(a+7) = (2a-3)(a+9)$

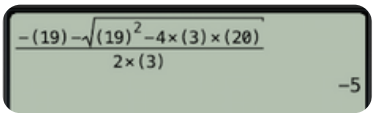
$5a^2 + 35a - a - 7 = 2a^2 + 18a - 3a - 27$ ✓ M1

$3a^2 + 19a + 20 = 0$

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

$x = \dfrac{-(19) \pm \sqrt{(19)^2-4\times(3)\times(20)}}{2\times(3)}$ ✓ M1 (Quad. Formula or Factorising)





$x^+ = -\dfrac{4}{3}$ $\qquad$ $x^- = -5$

✓ A1 (both values)

$x = -5, \; x = -\dfrac{4}{3}$

(4)

(Total marks for Question 17 is 6 marks)

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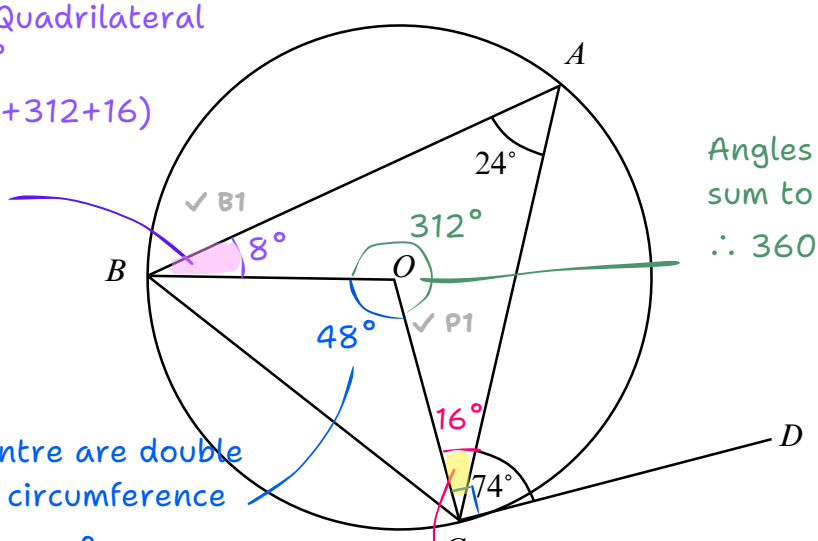
18 *A, B* and *C* are points on a circle, centre *O*

CD is a tangent to the circle.



Angles in a Quadrilateral sum to 360°
∴ 360 -(24+312+16)
= 8°

✓ B1

Angles around a point sum to 360°
∴ 360 -48 = 312°

✓ P1

Angles at centre are double those at the circumference
∴ 24 x 2 = 48°

Radius meets tangent at 90°
∴ 90 -74 = 16° ✓ P1

Work out the ratio of angle *ACO* : angle *ABO*

Give your answer in its simplest form.

ACO : ABO
16 : 8
2 : 1

2 : 1 ✓ A1

.....

(Total marks for Question 18 is 4 marks)

3H24

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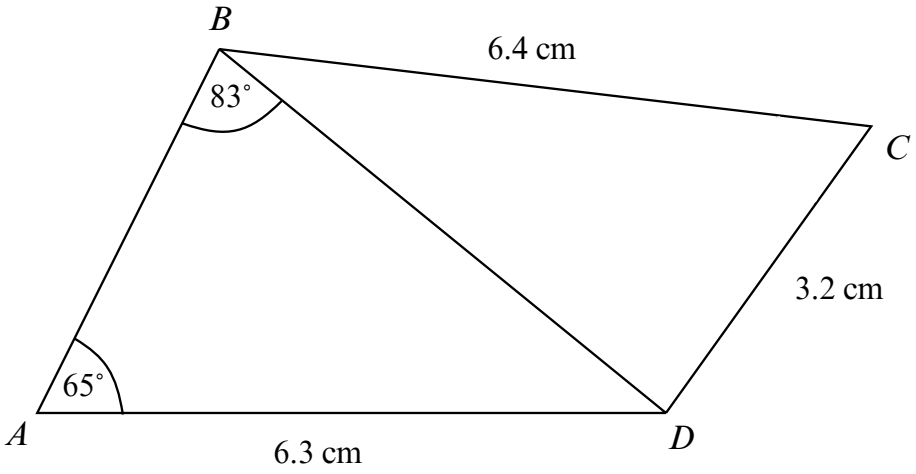
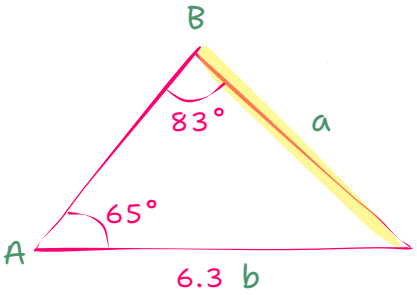
19 $ABCD$ is a quadrilateral.



Work out the area of triangle BCD.

Give your answer correct to 2 significant figures.

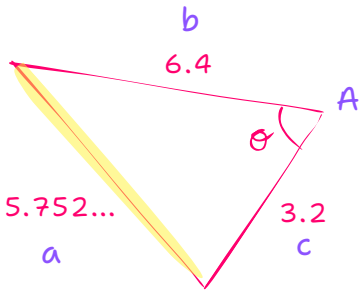


$\frac{a}{\sin A} = \frac{b}{\sin B}$

$\frac{a}{\sin(65)} = \frac{6.3}{\sin(83)}$ ✓ P1

$a = \frac{6.3}{\sin(83)} \times \sin(65)$

$a = 5.752618202$ ✓ A1

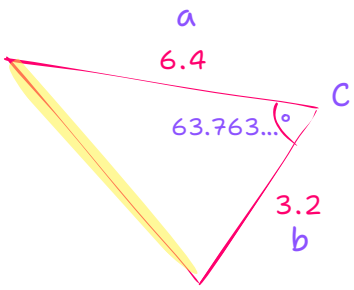


$\cos A = \frac{b^2+c^2-a^2}{2bc}$

$\cos(\vartheta) = \frac{6.4^2+3.2^2-5.752...^2}{2\times(6.4)\times(3.2)}$ ✓ P1

$\vartheta = \cos^{-1}(0.44207...)$

$\vartheta = 63.76366333$



Area = ½absinC

✓ P1

Area = ½(6.4)(3.2) x sin(63.763....)

= 9.185056652

= 9.2

9.2 ✓ A1 ..... cm²

(Total marks for Question 19 is 5 marks)

3H24

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20 f and g are functions such that,

$$f(x) = \frac{4}{\sqrt{x}} \qquad \text{and} \qquad g(x) = 4x + 1$$

Given $h(x) = fg(x)$

Work out the value of $h^{-1}(3)$

Give your answer in exact form.

f(g(x)) 💡 Substitute g(x) into f(x)

$f(4x+1) = \frac{4}{\sqrt{4x+1}} = h(x)$ ✓ M1

∴ Find $h^{-1}(x)$ 💡 To find the inverse function, rearrange to make x the subject!

Let $y = h(x)$

$$y = \frac{4}{\sqrt{4x+1}} \quad \checkmark \text{P1}$$

$\times\sqrt{4x+1}$ ↓ ↓ $\times\sqrt{4x+1}$

$$y\sqrt{4x+1} = 4$$

$\div y$ ↓ ↓ $\div y$

$$\sqrt{4x+1} = \frac{4}{y}$$

$[]^2$ ↓ ↓ $[]^2$

$$4x+1 = \frac{16}{y^2}$$

-1 ↓ ↓ -1

$$4x = \frac{16}{y^2} - 1$$

$\div 4$ ↓ ↓ $\div 4$

$$x = \frac{4}{y^2} - \frac{1}{4}$$

✓ A1 (or equivalent)

$$\therefore h^{-1}(x) = \frac{4}{x^2} - \frac{1}{4}$$

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

$$= \frac{7}{36}$$

$\frac{7}{36}$ ✓ A1

(Total marks for Question 20 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

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