ELITE

IGCSE Mathematics A • Pearson Edexcel

14_November_2025_provisional • Unit 2

1H + 2H source-order past paper

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REVIEWED PROVISIONAL | L-to-M

Converted from Linear Higher papers; not an official Pearson paper or mark scheme.

Contents

1H Q01 • Statistics Toolkit • 4 marks

1H Q03 • Bearings, Scale Drawing & Constructions • 2 marks

1H Q04 • Statistics Toolkit • 3 marks

1H Q05 • Algebraic Proof • 3 marks

1H Q06 • Ratio Problem Solving • 4 marks

1H Q09 • Percentages • 3 marks

1H Q12 • Angles in Polygons & Parallel Lines • 4 marks

1H Q16 • Statistics Toolkit • 2 marks

1H Q17 • Algebraic Proof • 3 marks

1H Q18 • Rearranging Formulas • 4 marks

1H Q24 • Transformations of Graphs • 3 marks

1H Q25 • Solving Inequalities • 3 marks

1H Q27 • Vectors • 6 marks

1H Q28 • Coordinate Geometry • 6 marks

2H Q02 • Simultaneous Equations • 3 marks

2H Q04 • Congruence, Similarity & Geometrical Proof • 3 marks

2H Q05 • Compound Interest & Depreciation • 6 marks

2H Q08 • Powers, Roots & Standard Form • 3 marks

2H Q10 • Graphing Inequalities • 4 marks

2H Q12 • Graphs of Functions • 5 marks

2H Q14 • Cumulative Frequency Diagrams • 5 marks

2H Q15 • Circle Theorems • 4 marks

2H Q16 • Algebraic Proof • 2 marks

2H Q17 • Direct & Inverse Proportion • 3 marks

2H Q19 • Functions • 3 marks

2H Q20 • Forming & Solving Equations • 3 marks

2H Q22 • Differentiation • 6 marks

2H Q23 • Area & Volume of Similar Shapes • 3 marks

2H Q25 • Sequences • 5 marks

2H Q26 • Standard & Compound Units • 6 marks

1 The table gives information about the number of kilometres that Ted cycled on each of the 30 days in April.

Number of kilometres (K)	Frequency
$0 \leqslant K < 5$	8
$5 \leqslant K < 10$	7
$10 \leqslant K < 15$	3
$15 \leqslant K < 20$	10
$20 \leqslant K < 25$	2

Calculate an estimate for the mean number of kilometres that Ted cycled on each day in April.

..... kilometres

(Total for Question 1 is 4 marks)

ANSWER / WORKED SOLUTION

1H • Family: Estimate grouped-data measures • Variant: Estimate a grouped total rather than the mean • USER-ATTESTED LEGACY SOLUTION

Topic check: Statistics Toolkit. The tag is correct.

Solution

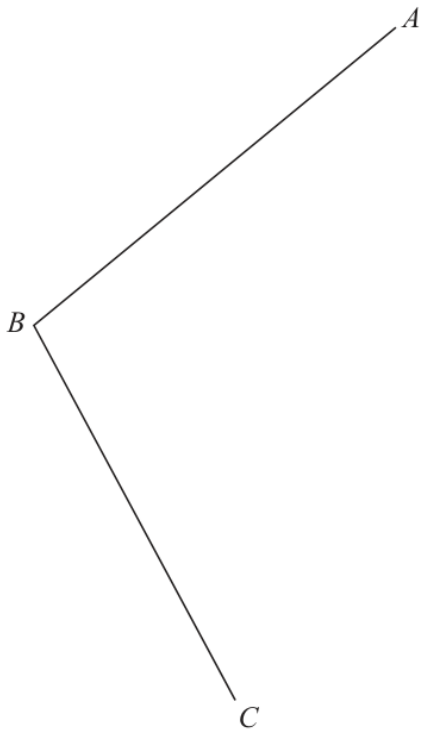
Use midpoints 2.5,7.5,12.5,17.5,22.5.

$2.5(8)+7.5(7)+12.5(3)+17.5(10)+22.5(2)=330$

estimated mean$=(330)/(30)=11$

Answer: 11 km.

3 Using ruler and compasses only, construct the bisector of angle ABC
Show all your construction lines.



(Total for Question 3 is 2 marks)

ANSWER / WORKED SOLUTION

1H • Family: Straightedge-and-compass construction • Variant: Construct a triangle or other 2D shape •
USER-ATTESTED LEGACY SOLUTION

Topic check: Bearings, Scale Drawing & Constructions. The tag is correct.

Construction answer

To construct the bisector of angle ABC:

1. Use centre B to draw an arc crossing BA and BC. 2. Use the same compass width from the two crossing points to make two arcs inside the angle. 3. Join B to the point where these two arcs meet.

Answer: That line is the required angle bisector.

4 e, f and g represent integers such that

$$e \quad f \quad 7 \quad g \quad 12 \quad 17$$

is a list of integers written in order of size.

The integers have

a range of 15
a median of 8.5
a mean of 9

Work out the value of e, the value of f and the value of g

$e =$ .....

$f =$ .....

$g =$ .....

(Total for Question 4 is 3 marks)

ANSWER / WORKED SOLUTION

1H • Family: Calculate and reverse discrete averages • Variant: Calculate the mean from a list or discrete frequency table • USER-ATTESTED LEGACY SOLUTION

Topic check: Statistics Toolkit. The tag is correct.

Solution

The range is 15:

$17-e=15$

$e=2$

The mean is 9, so the total is

$6 \times 9=54$

$2+f+7+g+12+17=54$

$f+g=16$

The median is 8.5:

$(7+g)/(2)=8.5$

$g=10$

$f=16-10=6$

Answers: $e=2,\ f=6,\ g=10$.

5 Show that $3\frac{5}{7} + 1\frac{2}{3} = 5\frac{8}{21}$

(Total for Question 5 is 3 marks)

ANSWER / WORKED SOLUTION

1H • Family: Prove divisibility or a remainder • Variant: Expression built from a known multiple • USER-ATTESTED LEGACY SOLUTION

Topic check: Algebraic proof. The tag is acceptable because the question asks to show the exact result.

Solution

frac37+frac13

Use denominator 21:

frac37=frac9{21},qquad frac13=frac7{21}

frac9{21}+frac7{21}=(16)/(21)

Answer: (16)/(21).

6 Eli and Peta share \$275 in the ratio 2 : 3

Eli gives $\frac{3}{11}$ of his share to charity.

Peta gives 0.32 of her share to charity.

Work out the total amount that Eli and Peta give to charity.

\$.....

(Total for Question 6 is 4 marks)

ANSWER / WORKED SOLUTION

1H • Family: Update shares after allocation • Variant: Fixed transfers after sharing • USER-ATTESTED LEGACY SOLUTION

Topic check: Ratio Problem Solving. The tag is correct.

Method

The ratio is

Eli : Peta = 2:3

There are 5 parts, so one part is

275 ÷ 5=55

Eli gets

2 × 55=110

Peta gets

3 × 55=165

Eli gives

(3)/(11)× 110=30

Peta gives

0.32× 165=52.8

Total given to charity:

30+52.8=82.8

Answer: 82.8.

9 Hari scored 140 points playing a game on Tuesday.
This was 12% more points than he scored playing the game on Monday.

Work out the number of points that Hari scored playing the game on Monday.

.....

(Total for Question 9 is 3 marks)

ANSWER / WORKED SOLUTION

1H • Family: Recover an original amount • Variant: Reverse an increase or changed population/value •
USER-ATTESTED LEGACY SOLUTION

Topic check: Percentages. The tag is correct.

Method

Tuesday's score was 12\% more than Monday's score, so Tuesday was 112\% of Monday.

$1.12\times$ Monday$=140$

Monday$=(140)/(1.12)=125$

Answer: 125 points

12

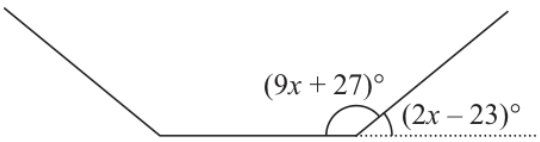


Diagram **NOT** accurately drawn

The diagram shows part of a regular n-sided polygon with

an interior angle of $(9x + 27)°$
an exterior angle of $(2x – 23)°$

Work out the value of n

$n =$ .....

(Total for Question 12 is 4 marks)

ANSWER / WORKED SOLUTION

1H • Family: Use regular and general polygon angles • Variant: Solve an irregular polygon angle or side-count problem • USER-ATTESTED LEGACY SOLUTION

Topic check: Angles in Polygons & Parallel Lines. The tag is correct.

Solution

The interior angle and exterior angle of a regular polygon add to 180^circ:

$(9x+27)+(2x-23)=180$

$11x+4=180$

$x=16$

The exterior angle is

$2x-23=2(16)-23=9^{\circ}$

For a regular polygon,

$n=(360)/(9)=40$

Answer: $n=40$.

16 Ivan asked 15 people how many books they read last year.

Here are his results.

1 1 3 4 6 7 8 9 10 12 15 25 30 37 50

Work out the interquartile range of the number of books read.

.....

(Total for Question 16 is 2 marks)

ANSWER / WORKED SOLUTION

1H • Family: Present and interpret statistical diagrams • Variant: Recover totals or a diagram scale in reverse • USER-ATTESTED LEGACY SOLUTION

Topic check: Statistics Toolkit. The tag is correct.

Solution

The data are already in order:

1,\ 1,\ 3,\ 4,\ 6,\ 7,\ 8,\ 9,\ 10,\ 12,\ 15,\ 25,\ 30,\ 37,\ 50

There are 15 values.

$Q_1=4,\qquad Q_3=25$

$IQR=25-4=21$

Answer: 21.

17 Show that $\frac{2\sqrt{7}+2}{\sqrt{7}-3}$ can be written in the form $a-\sqrt{b}$ where a and b are integers.

Show your working clearly.

(Total for Question 17 is 3 marks)

ANSWER / WORKED SOLUTION

1H • Family: Prove a universal parity statement • Variant: Product or sum of arbitrary odd/even numbers •
USER-ATTESTED LEGACY SOLUTION

Topic check: Algebraic proof. The tag is acceptable because the question asks for exact-form proof.

Solution

$\frac{2\sqrt{7}+2}{\sqrt{7}-3}\times\frac{\sqrt{7}+3}{\sqrt{7}+3}=\frac{(2\sqrt{7}+2)(\sqrt{7}+3)}{7-9}$

$=\frac{14+6\sqrt{7}+2\sqrt{7}+6}{-2}$

$=\frac{20+8\sqrt{7}}{-2}=-10-4\sqrt{7}$

Since $4\sqrt{7}=\sqrt{112}$,

$-10-4\sqrt{7}=-10-\sqrt{112}$

Answer: $-10-\sqrt{112}$, so $a=-10$ and $b=112$.

18 Make y the subject of $p = \sqrt{\dfrac{y + w}{3y - t}}$

.....

(Total for Question 18 is 4 marks)

ANSWER / WORKED SOLUTION

1H • Family: Isolate a subject through inverse operations • Variant: Subject in a product with several factors • USER-ATTESTED LEGACY SOLUTION

Topic check: Rearranging formulas. The tag is correct.

Solution

$p=\sqrt{((y+w)/(3y-t))}$

$p^2=(y+w)/(3y-t)$

$p^2(3y-t)=y+w$

$3p^2y-p^2t=y+w$

$y(3p^2-1)=w+p^2t$

Answer: $y=(w+p^2t)/(3p^2-1)$

24 A curve has equation $y = f(x)$

There is only one turning point on the curve.
The coordinates of this turning point are (4, 3)

Write down the coordinates of the turning point on the curve with equation

(i) $y = f(x + 5)$

(..... , ...)

(1)

(ii) $y = f(x) + 7$

(..... , ...)

(1)

(iii) $y = f(2x)$

(..... , ...)

(1)

(Total for Question 24 is 3 marks)

1H • Family: Write the transformed equation • Variant: Transform an explicit polynomial and simplify •
USER-ATTESTED LEGACY SOLUTION

Topic check: Correct.

Method

The turning point of y=f(x) is (4,3).

For

y=f(x+5)

the graph moves 5 units left:

(4,3)to(-1,3)

For

y=f(x)+7

the graph moves 7 units up:

(4,3)to(4,10)

For

y=f(2x)

the x-coordinate is divided by 2:

(4,3)to(2,3)

Answer: (-1,3), (4,10), and (2,3)

25 Solve the inequality $2x^2 + x - 28 > 0$
Show clear algebraic working.

.....

(Total for Question 25 is 3 marks)

ANSWER / WORKED SOLUTION

1H • Family: Translate inequality notation and number lines • Variant: Inequality symbol from a number line • USER-ATTESTED LEGACY SOLUTION

Topic check: Correct.

Method

$2x^2+x-28>0$

Factorise:

$2x^2+x-28=(2x-7)(x+4)$

The critical values are

$x=\frac{7}{2}$ quad and quad $x=-4$

The quadratic is greater than 0 outside the roots.

Answer: $x<-4$ or $x>\dfrac{7}{2}$

27

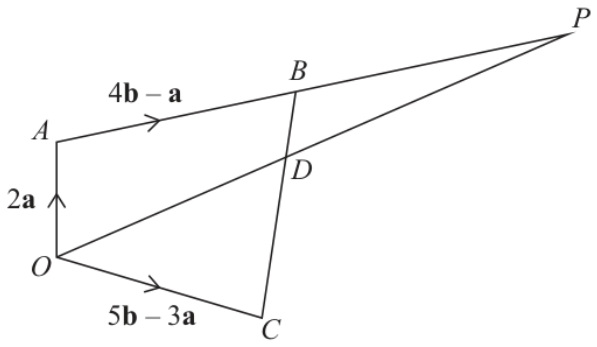


Diagram **NOT** accurately drawn

$OABC$ is a quadrilateral.
ABP and ODP are straight lines.

$\overrightarrow{OA} = 2\mathbf{a}$ $\overrightarrow{AB} = 4\mathbf{b} - \mathbf{a}$ $\overrightarrow{OC} = 5\mathbf{b} - 3\mathbf{a}$

(a) Find an expression in terms of **a** and **b** for the vector $\overrightarrow{BC}$
Simplify your answer.

.....

(2)

The point D lies on BC such that $BD : DC = 1 : 3$

Given that $\overrightarrow{OP} = n\overrightarrow{OD}$

(b) use a vector method to find the value of n

$n =$ .....

(4)

(Total for Question 27 is 6 marks)

ANSWER / WORKED SOLUTION

1H • Family: Use vectors with ratios and intersections • Variant: Find an intersection vector from two paths • USER-ATTESTED LEGACY SOLUTION

Topic check: Moved from Linear Graphs to Vectors.

Method

$\vec{OA}=2\mathbf{a},\quad \vec{AB}=4\mathbf{b}-\mathbf{a},\quad \vec{OC}=5\mathbf{b}-3\mathbf{a}$

First find $\vec{OB}$:

$\vec{OB}=\vec{OA}+\vec{AB}$

$\vec{OB}=2\mathbf{a}+4\mathbf{b}-\mathbf{a}$

$\vec{OB}=\mathbf{a}+4\mathbf{b}$

For part (a),

$\vec{BC}=\vec{OC}-\vec{OB}$

$\vec{BC}=(5\mathbf{b}-3\mathbf{a})-(\mathbf{a}+4\mathbf{b})$

$\vec{BC}=\mathbf{b}-4\mathbf{a}$

For part (b), BD:DC=1:3, so

$\vec{OD}=\vec{OB}+\frac{1}{4}\vec{BC}$

$\vec{OD}=\mathbf{a}+4\mathbf{b}+\frac{1}{4}(\mathbf{b}-4\mathbf{a})$

$\vec{OD}=\frac{17}{4}\mathbf{b}$

Since A,B,P are collinear, let

$\vec{OP}=\vec{OA}+s\vec{AB}$

$\vec{OP}=2\mathbf{a}+s(4\mathbf{b}-\mathbf{a})$

$\vec{OP}=(2-s)\mathbf{a}+4s\mathbf{b}$

But O,D,P are collinear, and $\vec{OD}$ has only a $\mathbf{b}$ component.

So

$2-s=0$

$s=2$

Then

$\vec{OP}=8\mathbf{b}$

Given

$\vec{OP}=n\vec{OD}$

$8\mathbf{b}=n(\frac{17}{4}\mathbf{b})$

$n=\frac{32}{17}$

Answer: $\vec{BC}=\mathbf{b}-4\mathbf{a},\quad \displaystyle n=\frac{32}{17}$

28 The curve **C** has equation $x^2 + y^2 = d - 11x$ where d is an integer.
The line **L** has equation $y = 3x + e$ where e is an integer.

C and **L** intersect at the point A and at the point B

The coordinates of A are (0.2, 2.6)

Work out the coordinates of B
Show your working clearly.

(..... , ...)

(Total for Question 28 is 6 marks)

ANSWER / WORKED SOLUTION

1H • Family: Read and plot Cartesian coordinates • Variant: Read a plotted coordinate pair • USER-ATTESTED LEGACY SOLUTION

Topic check: Correct.

Method

The line is

$y=3x+e$

Point $A=(0.2,2.6)$ lies on the line.

$2.6=3(0.2)+e$

$2.6=0.6+e$

$e=2$

So

$y=3x+2$

The curve is

$x^2+y^2=d-11x$

Use point $A=(0.2,2.6)$:

$0.2^2+2.6^2=d-11(0.2)$

$0.04+6.76=d-2.2$

$d=9$

Now substitute $y=3x+2$ into the curve:

$x^2+(3x+2)^2=9-11x$

$x^2+9x^2+12x+4=9-11x$

$10x^2+23x-5=0$

One root is $0.2=frac15$.

The product of the roots is

$(-5)/(10)=-frac12$

So the other root is

$(-frac12)/(frac15)=-frac52$

Then

$y=3(-frac52)+2$

$y=-(11)/(2)$

Answer: $displaystyle B=(-frac52,-(11)/(2))$

2 Solve the simultaneous equations

$$5x + y = 11$$
$$3x - y = 9$$

Show clear algebraic working.

$x =$ .....

$y =$ .....

(Total for Question 2 is 3 marks)

ANSWER / WORKED SOLUTION

2H • Family: Interpret a system graphically • Variant: Draw the missing line for an intersection • USER-ATTESTED LEGACY SOLUTION

Topic check: Simultaneous equations. The tag is correct.

Solution

$5x+y=11$

$3x-y=9$

Add the equations:

$8x=20$

$x=2.5$

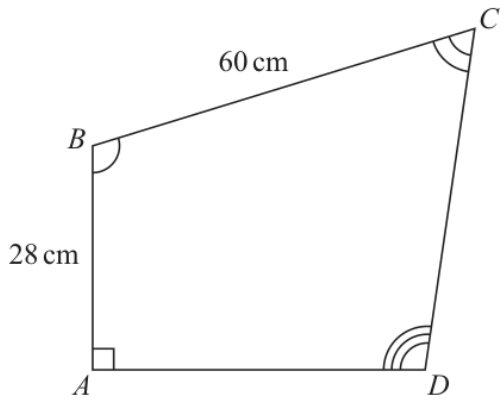
Substitute into $5x+y=11$:

$5(2.5)+y=11$

$y=-1.5$

Answer: $x=2.5$, $y=-1.5$.

4 Here are three similar quadrilaterals.



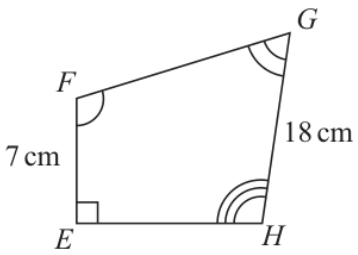
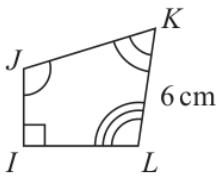


Diagram **NOT** accurately drawn



Work out the length of JK

..... cm

(Total for Question 4 is 3 marks)

2H • Family: Use length scale factor in similar figures • Variant: Find corresponding lengths in similar polygons • USER-ATTESTED LEGACY SOLUTION

Topic check: Congruence, Similarity & Geometrical Proof. The tag is correct.

Solution

The scale factor from the largest quadrilateral to the middle quadrilateral is

(7)/(28)=frac14

So the side corresponding to 60 cm in the middle shape is

60× frac14=15

The scale factor from the middle quadrilateral to the smallest quadrilateral is

(6)/(18)=frac13

JK=15× frac13=5

Answer: 5 cm.

5 Otis sells ice creams.

On Friday, Otis sells 75 ice creams.
On Saturday, Otis sells 87 ice creams.

(a) Work out the percentage increase in the number of ice creams Otis sells from Friday to Saturday.

.....%

(3)

Claudia buys an ice cream machine for 960 Swiss francs.

The value of the ice cream machine depreciates by 20% each year.

(b) Work out the value of the ice cream machine at the end of 3 years.

..... Swiss francs

(3)

(Total for Question 5 is 6 marks)

ANSWER / WORKED SOLUTION

2H • Family: Accumulate compound growth • Variant: Known annual asset appreciation • USER-ATTESTED LEGACY SOLUTION

Topic check: Compound Interest and Depreciation. The tag is correct because part (b) is depreciation.

Method

For part (a), the increase is

87-75=12

Percentage increase:

(12)/(75)× 100=16

For part (b), a depreciation of 20\% gives multiplier

0.80

After 3 years,

960(0.80)^3=491.52

Answer: (a) 16\%, (b) 491.52 Swiss francs

8 (a) Write 5.76×10^4 as an ordinary number.

.....

(1)

(b) Work out $\dfrac{3 \times 10^5 + 8 \times 10^3}{4 \times 10^{-2}}$

Give your answer in standard form.

.....

(2)

(Total for Question 8 is 3 marks)

2H • Family: Convert and compare standard form • Variant: Ordinary number to standard form • USER-ATTESTED LEGACY SOLUTION

Topic check: Powers, roots and standard form. The tag is correct.

Method

$5.76\times 10^4=57600$

For part (b), simplify the numerator:

$3\times 10^5+8\times 10^3=300000+8000=308000$

Then

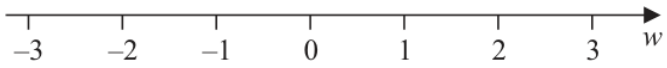
$\frac{308000}{4\times 10^{-2}}=(308000)/(0.04)=7700000$

In standard form:

$7700000=7.7\times 10^6$

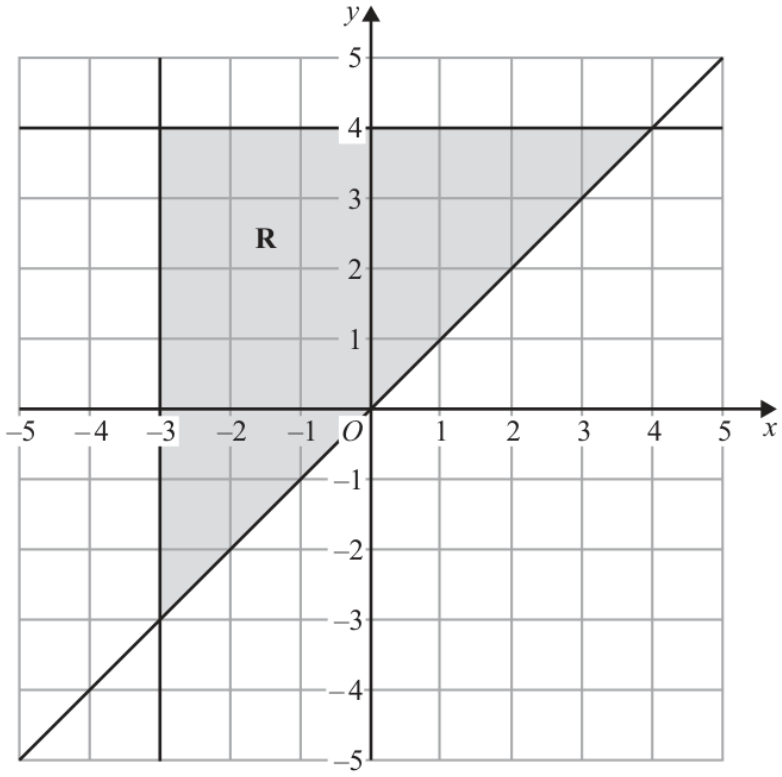
Answer: (a) 57600, (b) 7.7×10^6

10 (a) On the number line, represent the inequality $w < 1$



(1)

The region **R**, shown shaded in the diagram, is bounded by three straight lines.



(b) Write down the three inequalities that define the region **R**

.....

.....

.....

(3)

(Total for Question 10 is 4 marks)

ANSWER / WORKED SOLUTION

2H • Family: Construct the feasible region from inequalities • Variant: Boundaries drawn as an inseparable prerequisite • USER-ATTESTED LEGACY SOLUTION

Topic check: Correct. This combines a number line and graph inequalities.

Solution

For part (a), $w<1$ is shown with an open circle at 1 and an arrow to the left.

For part (b), the region is right of $x=-3$, below $y=4$, and above $y=x$:

$x \geq -3$

$y \leq 4$

$y \geq x$

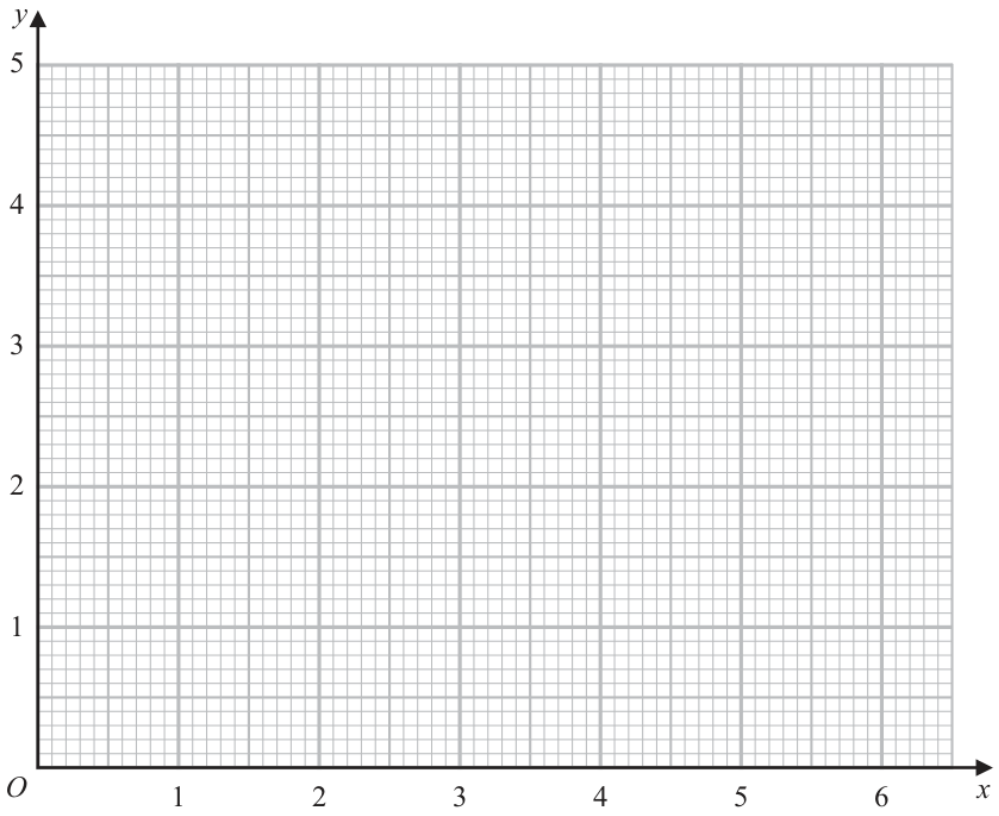
Answer: (a) Open circle at 1, shade left. (b) $x \geq -3$, $y \leq 4$, $y \geq x$.

12 (a) Complete the table of values for $y = \frac{1}{2}\left(x + \frac{4}{x}\right)$

x	0.5	1	2	3	4	5	6
y	4.25			2.17	2.5	2.9	3.33

(1)

(b) Draw the graph of $y = \frac{1}{2}\left(x + \frac{4}{x}\right)$ for $0.5 \leqslant x \leqslant 6$



(2)

(c) By drawing a suitable line on the grid, find estimates for the solutions of the equation $x + \frac{4}{x} = 6$

Give your answers correct to one decimal place.

.....

(2)

(Total for Question 12 is 5 marks)

ANSWER / WORKED SOLUTION

2H • Family: Solve using graph roots or intersections • Variant: Draw a line to solve a nonlinear equation • USER-ATTESTED LEGACY SOLUTION

Topic check: Correct. This is a reciprocal-curve graph and estimate question.

Solution

y=frac12(x+frac4x)

The completed table is:

begin{array}{c|rrrrrrr} x&0.5&1&2&3&4&5&6\\ hline y&4.25&2.5&2&2.17&2.5&2.9&3.33 end{array}

For

x+frac4x=6

we need

frac12(x+frac4x)=3

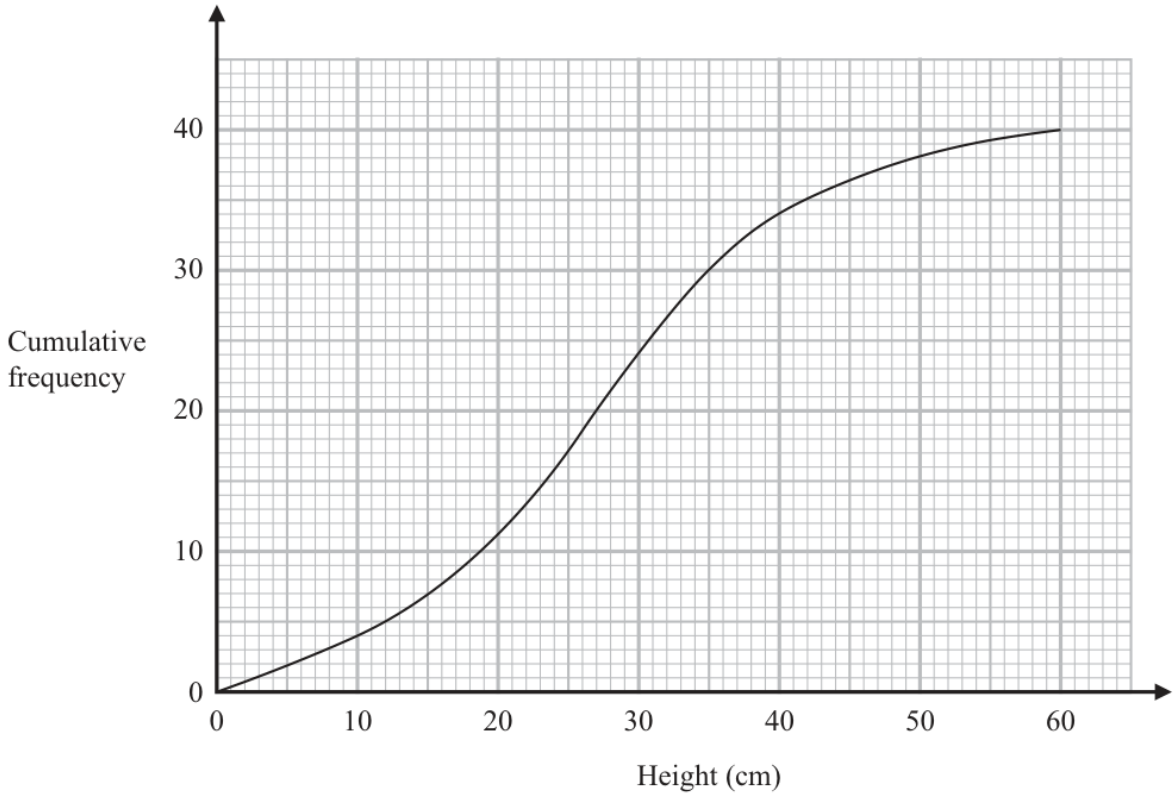
So draw the horizontal line y=3 on the graph.

The intersections give approximately

x=0.8 quad and quad x=5.2

Answer: Table missing values 2.5,2. Estimates 0.8 and 5.2.

14 The cumulative frequency graph shows information about the heights of 40 plants that Greta has grown.



(a) Use the graph to find an estimate for the median height.

..... cm

(1)

(b) Use the graph to find an estimate for the interquartile range of the heights.

..... cm

(2)

Plants with a height greater than 40 cm are premium plants.
Greta sells all the premium plants for 30 euros each.

(c) Work out the total amount of money Greta receives for the premium plants.

..... euros

(2)

(Total for Question 14 is 5 marks)

ANSWER / WORKED SOLUTION

2H • Family: Estimate and compare location and spread from cumulative frequency • Variant: Estimate lower and upper quartiles from cumulative frequency • USER-ATTESTED LEGACY SOLUTION

Topic check: Cumulative Frequency Diagrams. The tag is correct.

Solution

There are 40 plants.

From the graph,

medianapprox 26 cm

Q_1approx 19 cm,qquad Q_3approx 35 cm

IQRapprox 35-19=16 cm

For premium plants, use height >40 cm.

F(40)approx 34

40-34=6

6× 30=180

Answers: median about 26 cm, IQR about 16 cm, and 180 euros.

15 A, B, C and D are points on a circle with centre O

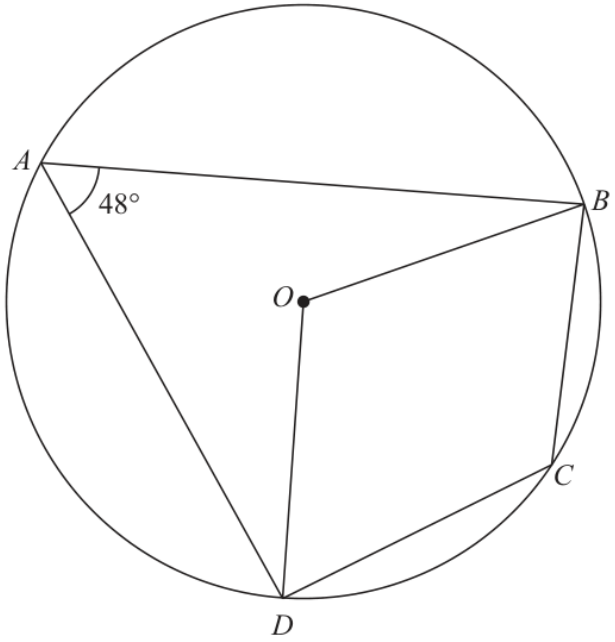


Diagram **NOT** accurately drawn

Angle $DAB = 48°$

(a) (i) Work out the size of the obtuse angle DOB

.....°

(1)

(ii) Give a reason for your answer.

.....

.....

(1)

(b) (i) Work out the size of angle BCD

.....°

(1)

(ii) Give a reason for your answer.

.....

.....

(1)

(Total for Question 15 is 4 marks)

ANSWER / WORKED SOLUTION

2H • Family: Write justified circle-angle chains • Variant: Complete a multi-theorem circle-angle chain •
USER-ATTESTED LEGACY SOLUTION

Topic check: Circle Theorems. The tag is correct.

Solution

(a) The angle at the centre is twice the angle at the circumference standing on chord DB:

□ DOB=2× 48^circ=96^circ

(b) Opposite angles in cyclic quadrilateral ABCD add to 180^circ:

□ BCD=180^circ-48^circ=132^circ

Answer: □ DOB=96^circ, and □ BCD=132^circ.

16 Use algebra to show that $0.3\dot{7}\dot{8} = \frac{25}{66}$

(Total for Question 16 is 2 marks)

ANSWER / WORKED SOLUTION

2H • Family: Construct an algebraic identity proof • Variant: Derive a general geometric algebra formula
• USER-ATTESTED LEGACY SOLUTION

Topic check: Algebraic proof. The tag is correct.

Solution

Let

$x=0.3787878\ldots$

Then

$10x=3.787878\ldots$

and

$1000x=378.787878\ldots$

Subtract:

$990x=375$

$x=(375)/(990)=(25)/(66)$

Answer: $0.3787878\ldots=\dfrac{25}{66}$.

17 T is inversely proportional to $\sqrt{m}$

$T = 15$ when $m = 36$

Find a formula for T in terms of m

.....

(Total for Question 17 is 3 marks)

ANSWER / WORKED SOLUTION

2H • Family: Build an inverse-variation model • Variant: Inverse-square or inverse-power variation •
USER-ATTESTED LEGACY SOLUTION

Topic check: Direct and Inverse Proportion. The tag is correct.

Method

T is inversely proportional to m, so

$T=\frac{k}{m}$

Use T=15 when m=36:

$15=\frac{k}{36}$

k=540

Therefore

$T=\frac{540}{m}$

Answer: $T=\frac{540}{m}$.

19 The functions f and g are such that

$$f(x) = 3x - 2 \qquad g(x) = \frac{x}{2x - 1}$$

(a) Find g(3)

.....

(1)

(b) Find gf(x)
Give your answer in its simplest form.

gf(x) = ...

(2)

(Total for Question 19 is 3 marks)

ANSWER / WORKED SOLUTION

2H • Family: Construct an inverse function • Variant: Inverse of a linear or fractional function • USER-ATTESTED LEGACY SOLUTION

Topic check: Functions. The tag is correct.

Solution

$f(x)=3x-2,\qquad g(x)=(x)/(x-1)$

(a)

$g(3)=(3)/(3-1)=\frac{3}{2}$

(b)

$gf(x)=g(f(x))$

$gf(x)=(3x-2)/((3x-2)-1)$

$gf(x)=(3x-2)/(3x-3)$

Answer: $g(3)=\frac{3}{2}$, and $gf(x)=\dfrac{3x-2}{3x-3}$.

20 Here is a quadratic equation.

$$ax^2 + 4x + c = 0$$

The solutions of this equation are given by $x = \dfrac{-4 \pm 2\sqrt{39}}{10}$

Find the value of a and the value of c
Show your working clearly.

$a =$ .....

$c =$ .....

(Total for Question 20 is 3 marks)

ANSWER / WORKED SOLUTION

2H • Family: Derive a general expression or formula • Variant: General geometric formula derivation •
USER-ATTESTED LEGACY SOLUTION

Topic check: Correct.

Method

For

$ax^2+4x+c=0$

the quadratic formula gives

$x=(-4pm \sqrt{(4^2-4ac)})/(2a)$

The given solutions are

$x=(-4pm 2\sqrt{(39)})/(10)$

Compare denominators:

$2a=10$

$a=5$

Compare the square root parts:

$\sqrt{(16-4ac)}=2\sqrt{(39)}$

Square both sides:

$16-4ac=156$

Use $a=5$:

$16-20c=156$

$-20c=140$

$c=-7$

Answer: $a=5,\ c=-7$

22 Curve **C** has equation $y = x^3 - 16x + 7$

At two points on **C**, the gradient is 11
The tangents to **C** at these two points have equations of the form $y = ax + b$

Work out the two possible values of b
Show clear algebraic working.

(Total for Question 22 is 6 marks)

ANSWER / WORKED SOLUTION

2H • Family: Use the derivative as gradient or rate • Variant: Equation of a calculus tangent • USER-ATTESTED LEGACY SOLUTION

Topic check: Moved to Differentiation.

Method

$y=x^3-16x+7$

Differentiate:

$\frac{dy}{dx}=3x^2-16$

The gradient of the tangent is 11, so

$3x^2-16=11$

$3x^2=27$

$x^2=9$

$x=3 \quad \text{or} \quad x=-3$

When $x=3$:

$y=3^3-16(3)+7=27-48+7=-14$

The tangent has equation $y=11x+b$, so

$-14=11(3)+b$

$b=-47$

When $x=-3$:

$y=(-3)^3-16(-3)+7=-27+48+7=28$

$28=11(-3)+b$

$b=61$

Answer: $\boxed{b=-47 \text{ or } b=61}$

23 Shape **P** is similar to shape **Q**

The table shows some information about shape **P** and shape **Q**

	Surface area (cm^2)	**Volume (cm^3)**
Shape **P**	200	672
Shape **Q**	450	

Work out the volume of shape **Q**

..... cm^3

(Total for Question 23 is 3 marks)

ANSWER / WORKED SOLUTION

2H • Family: Use volume scale factors of similar solids • Variant: Solve a volume difference or sum for similar solids • USER-ATTESTED LEGACY SOLUTION

Topic check: Correct.

Method

Surface area ratio Q:P:

450:200=9:4

So the linear ratio Q:P is

3:2

Therefore the volume ratio Q:P is

3^3:2^3=27:8

Shape P has volume 672 cm^3.

Volume of Q:

672× (27)/(8)=2268

Answer: boxed{2268 cm^3}

25 The first term of an arithmetic series is 10
The 20th term of the series is 86

The sum of the first N terms of the series is 5194

Work out the value of N
Show your working clearly.

$N =$ .....

(Total for Question 25 is 5 marks)

ANSWER / WORKED SOLUTION

2H • Family: Use an arithmetic nth term • Variant: Arithmetic nth term from listed terms • USER-ATTESTED LEGACY SOLUTION

Topic check: Correct.

Method

$a=10$

$u_{20}=86$

$10+19d=86$

$d=4$

Use

$S_N=\frac{N}{2}(2a+(N-1)d)$

$5194=\frac{N}{2}(20+4(N-1))$

$5194=\frac{N}{2}(4N+16)$

$5194=2N(N+4)$

$N^2+4N-2597=0$

$N=(-4+102)/(2)=49$

Answer: $N=49$

26 A solid cone is joined to a solid hemisphere to make the solid shown below.

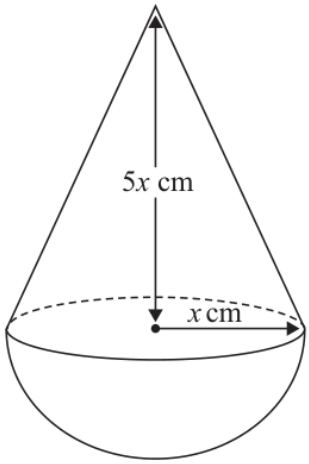


Diagram **NOT** accurately drawn

The cone is made from copper.
The density of copper is $9\,\text{g/cm}^3$

The hemisphere is made from a different metal.

The total mass of the solid is 4752π grams
The total volume of the solid is $504\pi\,\text{cm}^3$

Work out the density of the hemisphere.
Show your working clearly.

..... g/cm^3

(Total for Question 26 is 6 marks)

ANSWER / WORKED SOLUTION

2H • Family: Read time and measuring instruments • Variant: Make a sensible estimate of a measure • USER-ATTESTED LEGACY SOLUTION

Topic check: Correct.

Method

Volume of cone:

$\frac{1}{3}\pi x^2(5x)=\frac{5}{3}\pi x^3$

Volume of hemisphere:

$\frac{2}{3}\pi x^3$

Total volume:

$\frac{5}{3}\pi x^3+\frac{2}{3}\pi x^3=504\pi$

$\frac{7}{3}\pi x^3=504\pi$

$x^3=216$

$x=6$

Cone volume:

$\frac{5}{3}\pi(6)^3=360\pi$

Mass of copper cone:

$360\pi\times 9=3240\pi$

Mass of hemisphere:

$4752\pi-3240\pi=1512\pi$

Hemisphere volume:

$\frac{2}{3}\pi(6)^3=144\pi$

Density of the hemisphere:

$\frac{1512\pi}{144\pi}=10.5$

Answer: 10.5 g/cm^3