Write your name here

Surname	Other names

Centre Number | | | | | |

Candidate Number | | | | |

Edexcel GCSE

Mathematics A

Paper 2 (Calculator)

Higher Tier

Thursday 8 November 2012 – Afternoon
Time: 1 hour 45 minutes

Paper Reference
1MA0/2H

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.*
- **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 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

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 ▶

P40675A

6/6/7/4/

P 4 0 6 7 5 A 0 1 2 8

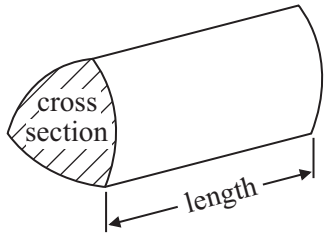
PEARSON

GCSE Mathematics 1MA0

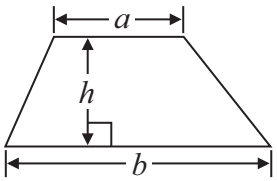
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

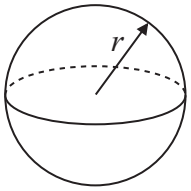


Area of trapezium = $\frac{1}{2}(a + b)h$



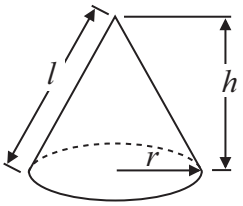
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$

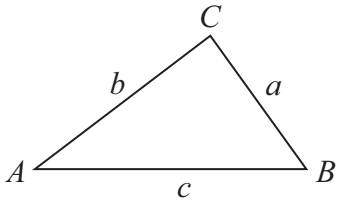


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



The Quadratic Equation
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

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

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule $a^2 = b^2 + c^2 - 2bc \cos A$

Area of triangle = $\frac{1}{2}ab \sin C$

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1 Use a calculator to work out

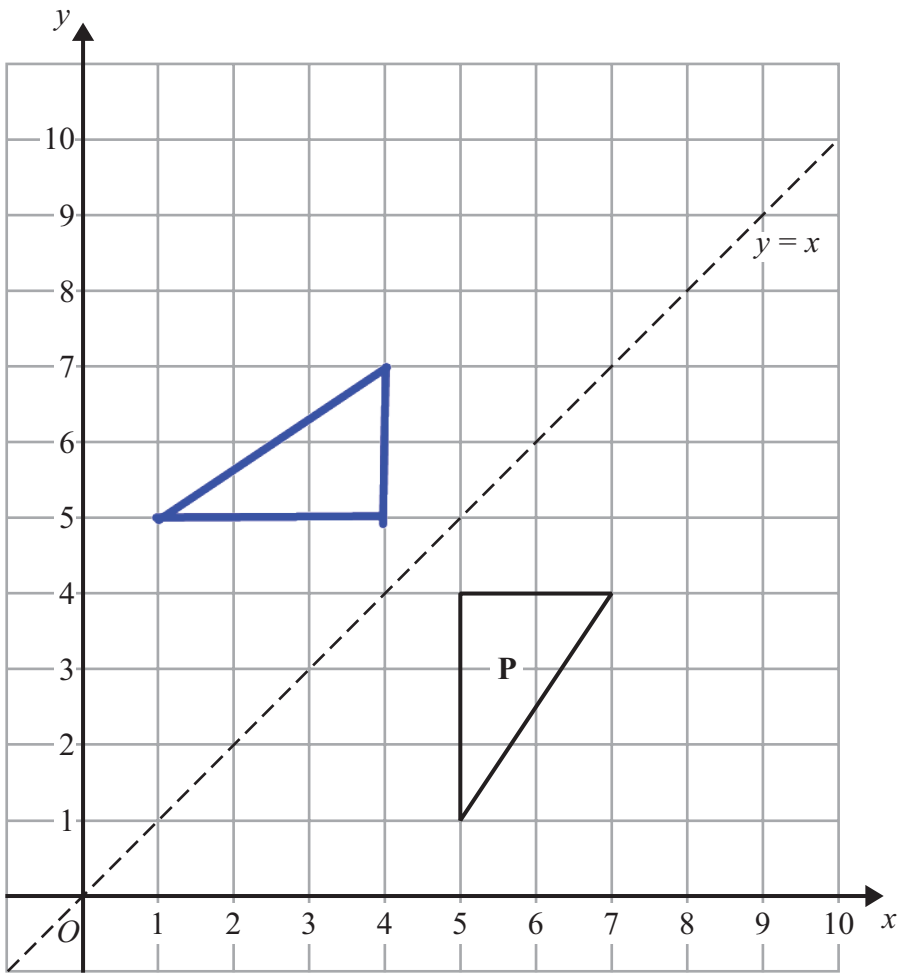
$$\frac{\sqrt{20.4}}{6.2 \times 0.48}$$

Write down all the figures on your calculator display.
Give your answer as a decimal.

1.5176868

(Total for Question 1 is 2 marks)

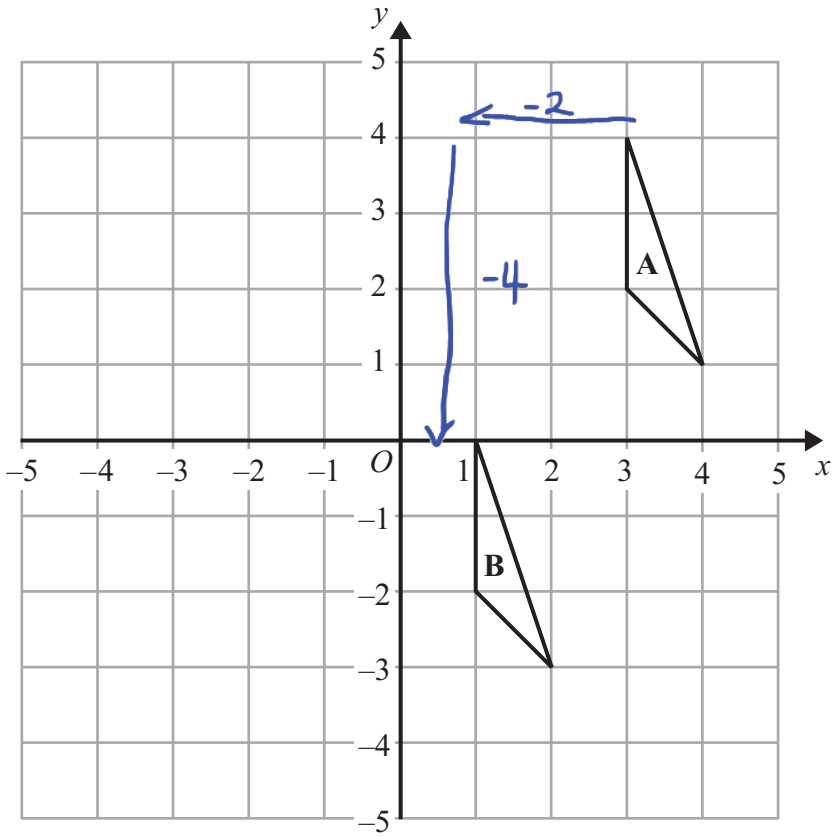
2 (a)



Reflect shape **P** in the line $y = x$

(2)

(b)



Describe fully the single transformation that maps triangle **A** onto triangle **B**.

A TRANSLATION OF $\begin{pmatrix} -2 \\ -4 \end{pmatrix}$

(2)

(Total for Question 2 is 4 marks)

*3 A company sells boxes to factories.
Fred buys boxes.
The boxes are sold in packs of 1000
Each pack costs £193.86

Fred orders 3 packs of boxes.
He gets a discount on his total order.

The table shows the discount he will get.

Total Order	Discount
£100 - £300	5%
£301 - £400	10%
£401 and above	15%

Work out the total cost of the order after the discount.
You must show your working.

3 packs × £193.86 = £581.58

order over £401 so 15% discount

£581.58 × 0.85 = £494.34

(Total for Question 3 is 5 marks)

4 The table gives some information about the birds Paula sees in her garden one day.

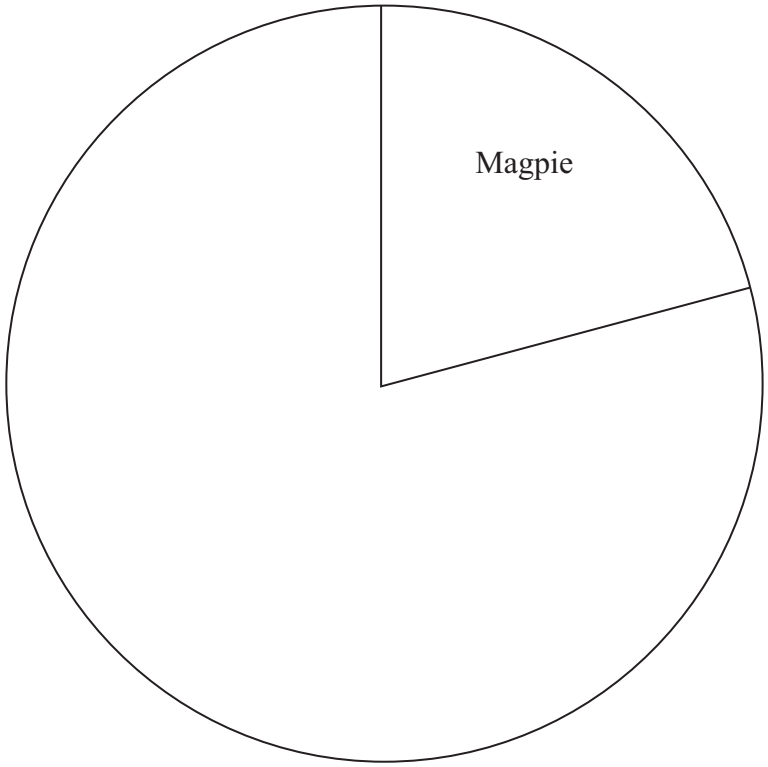
Bird	Frequency
Magpie	15
Thrush	10
Starling	20
Sparrow	27

72

ANGLE
75°
50°
100°
135°
360°

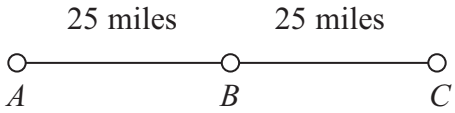
Complete the accurate pie chart.

360° ÷ 72 = 5° per bird



(Total for Question 4 is 3 marks)

5

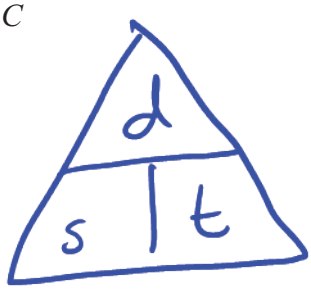


A, *B* and *C* are 3 service stations on a motorway.

AB = 25 miles
BC = 25 miles

Aysha drives along the motorway from *A* to *C*.

Aysha drives at an average speed of 50 mph from *A* to *B*.
She drives at an average speed of 60 mph from *B* to *C*.



$t = \frac{d}{s}$

Work out the difference in the time Aysha takes to drive from *A* to *B* and the time Aysha takes to drive from *B* to *C*.
Give your answer in minutes.

time A to B = $\frac{25 \text{ miles}}{50 \text{ mph}}$ = 0.5 hrs = 30 mins

time B to C = $\frac{25}{60}$ = 0.416 hrs = 25 mins

Difference in time = 30 − 25 = 5 mins

5 minutes

(Total for Question 5 is 3 marks)

***6**

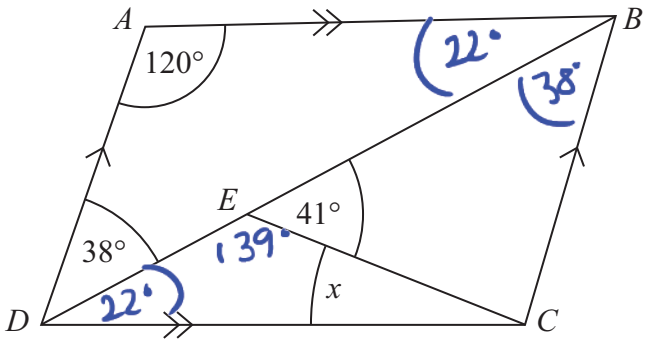


Diagram **NOT** accurately drawn

Fill in what you can work out easily!

$ABCD$ is a parallelogram.

Angle $ADB = 38°$.
Angle $BEC = 41°$.
Angle $DAB = 120°$.

Calculate the size of angle x.
You must give reasons for your answer.

120 + 38 = 158

180 − 158 = 22

180 − 41 = 139

22 + 139 = 161

$x = 180 - 161 = 19°$

$x = 19°$

(Total for Question 6 is 4 marks)

7 160 cm of gold wire has a weight of 17.8 grams.

Work out the weight of 210 cm of the gold wire.

1cm weighs $17.8g \div 160cm = 0.11125g$

so 210cm weighs $210 \times 0.11125g = 23.3625g$
$= 23.4$ (dp)

23.4 grams

(Total for Question 7 is 3 marks)

8 (a) n is an integer.

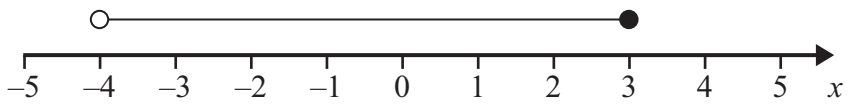
$-1 \leqslant n < 4$

List the possible values of n.

$-1, 0, 1, 2, 3$

(2)

(b)



Write down the inequality shown in the diagram.

$-4 < x \leq 3$

(2)

(c) Solve $3y - 2 > 5$

$(+2)\quad 3y > 7$

$(\div 3)\quad y > 7/3$

$y > 2\frac{1}{3}$

$y > 2\frac{1}{3}$

(2)

(Total for Question 8 is 6 marks)

9 The stem and leaf diagram gives information about the numbers of tomatoes on 31 tomato plants.

0	8	8	9					(3)
1	1	1	5	5				(4)
2	1	2	2	6	7	8	8	(7)
3	0	2	5	5	7	9		(6)
4	2	2	3	5	8	8		(6)
5	1	1	3	4	7			(5)

Key: 5 | 7 = 57 tomatoes

(a) Work out the median.

$n = 31$

Median position $= \frac{n+1}{2} = \frac{31+1}{2} = \frac{32}{2} = 16$

32

(1)

(b) Work out the interquartile range.

LQ position $= \frac{n+1}{4} = \frac{32}{4} = 8$ LQ = 21

UQ position $= \frac{3(n+1)}{4} = \frac{96}{4} = 24$ UQ = 45

IQR = 45 − 21 = 24

24

(2)

(Total for Question 9 is 3 marks)

***10** In the UK, petrol cost £1.24 per litre.
In the USA, petrol cost 3.15 dollars per US gallon.

1 US gallon = 3.79 litres
£1 = 1.47 dollars

Was petrol cheaper in the UK or in the USA?

Convert US price to £/litre

US price $3.15 / gallon

US price (litres) $3.15 \div 3.79 = 0.831134564$

$= \$0.83$ / litre

(store unrounded answer in calculator memory)!

US price (£/litre) $0.83 \div 1.47$

$= 0.565397663$

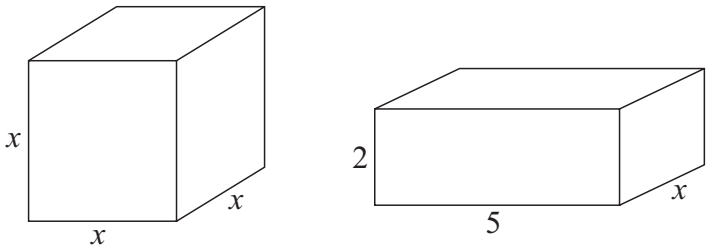
$= £0.57$ / litre

Petrol in the USA is £0.57 / litre compared to £1.24 per litre in the UK, so petrol is cheaper in the USA.

(Total for Question 10 is 4 marks)

11 The diagram shows a cube and a cuboid.

Diagram **NOT** accurately drawn



All the measurements are in cm.
The volume of the cube is 100 cm^3 more than the volume of the cuboid.

(a) Show that $x^3 - 10x = 100$

$x^3 = (2 \times 5 \times x) + 100$

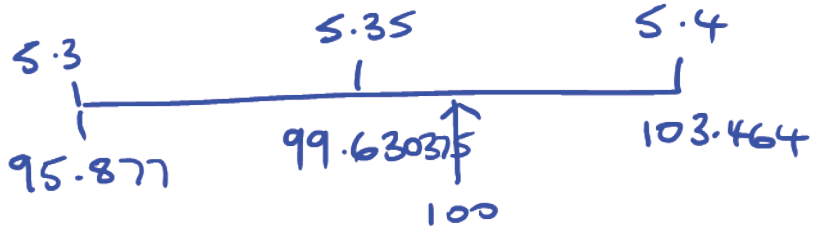
$x^3 = 10x + 100$

$x^3 - 10x = 100$

(2)

(b) Use a trial and improvement method to find the value of x.
Give your answer correct to 1 decimal place.
You must show **all** your working.

x	x^3	$-10x$	$x^3 - 10x$	too low/ too high
1	1	−10	−9	too low
10	1000	−100	900	too high
5	125	−50	75	too low
6	216	−60	156	too high
5.5	166.375	−55	111.375	too high
5.4	157.464	−54	103.464	too high
5.3	148.877	−53	95.877	too low
5.35	153.130375	−53.5	99.630375	too low



The value of x that gives $x^3 - 10x = 100$ is between 5.35 and 5.4 so $x = 5.4$ to 1 dp.

$x =$ 5.4

(4)

(Total for Question 11 is 6 marks)

12 The frequency table gives information about the times it took some office workers to get to the office one day.

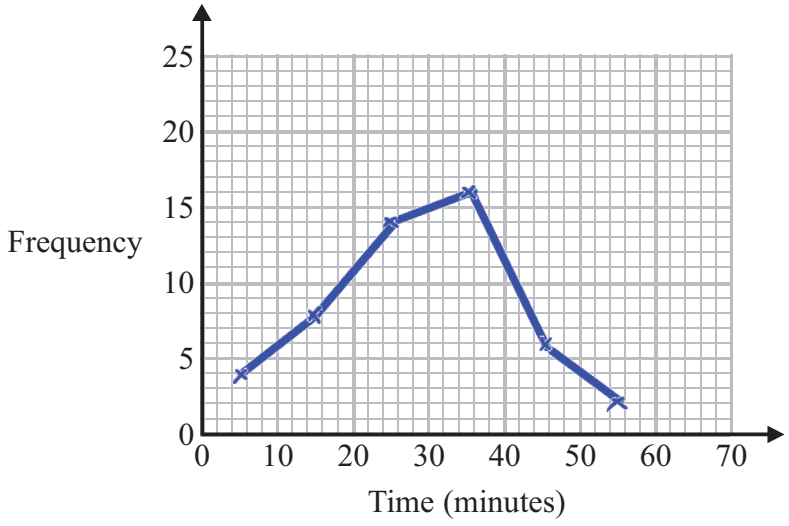
midpoint
5
15
25
35
45
55

Time (t minutes)	Frequency
$0 < t \leqslant 10$	4
$10 < t \leqslant 20$	8
$20 < t \leqslant 30$	14
$30 < t \leqslant 40$	16
$40 < t \leqslant 50$	6
$50 < t \leqslant 60$	2

6
2
8

50

(a) Draw a frequency polygon for this information.



1

(2)

(b) Write down the modal class interval.

$30 < t \leqslant 40$

(1)

One of the office workers is chosen at random.

(c) Work out the probability that this office worker took more than 40 minutes to get to the office.

$\frac{8}{50} = \frac{4}{25}$

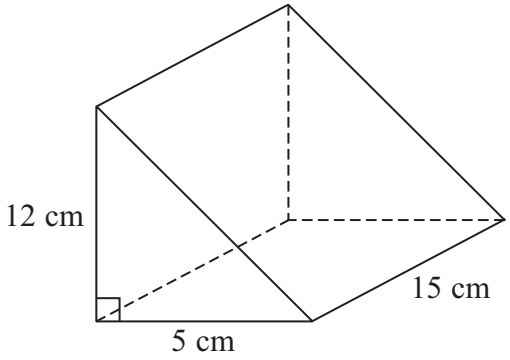
$\frac{4}{25}$

(2)

(Total for Question 12 is 5 marks)

13 The diagram shows a solid triangular prism.

Diagram **NOT** accurately drawn



The prism is made from metal.
The density of the metal is 6.6 grams per cm^3.

Calculate the mass of the prism.

Step 1 volume

x-section $\frac{1}{2} \times 12 \times 5 = 30 cm^2$

Volume $= 30 cm^2 \times 15 cm$

$= 450 cm^3$

Step 2 MASS

$6.6 \times 450 = 2970$ g

2970 ..... grams

(Total for Question 13 is 3 marks)

14 (a) Factorise $x^2 + 7x$

$x(x+7)$

$x(x+7)$

(1)

(b) Factorise $y^2 - 10y + 16$

-1×-16

-2×-8

$(y-2)(y-8)$

$(y-2)(y-8)$

(2)

*(c) (i) Factorise $2t^2 + 5t + 2$

Find factor pairs of axc $(ax^2 + bx + c)$ which add to b

axc = 4

$1 \times 4 = 4$

$1 + 4 = 5$

$2t^2 + 5t + 2$

$2t^2 + 4t + t + 2$

$2t(t+2) + 1(t+2)$

$(2t+1)(t+2)$

$(2t+1)(t+2)$

(ii) t is a positive whole number.

The expression $2t^2 + 5t + 2$ can never have a value that is a prime number.

Explain why.

Because the value of $2t^2 + 5t + 2$ will always have factors of $(2t+1)$ and $(t+2)$ and therefore isn't prime by definition.

(3)

(Total for Question 14 is 6 marks)

15 *ABCD* is a trapezium.

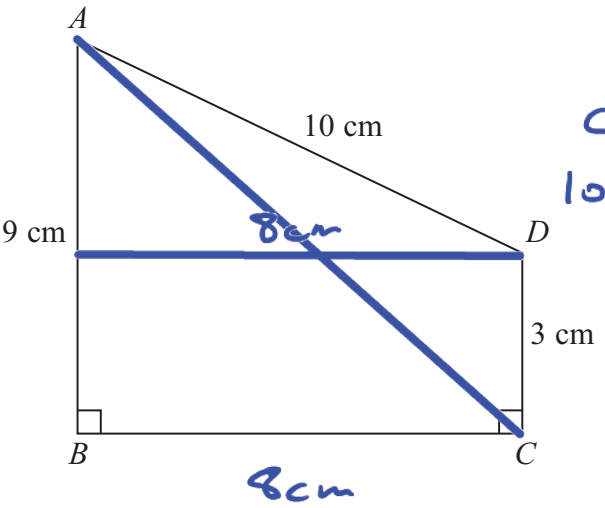


Diagram **NOT** accurately drawn

6cm

8cm

8cm

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

$100 = 36 + b^2$

$b^2 = 64$

$b = 8$

$AD = 10$ cm
$AB = 9$ cm
$DC = 3$ cm
Angle ABC = angle $BCD = 90°$

Calculate the length of AC.
Give your answer correct to 3 significant figures.

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

$c^2 = 9^2 + 8^2$

$= 81 + 64$

$= 145$

$AC = \sqrt{145}$

$= 12.0$ cm (3sf)

12.0 ..... cm

(Total for Question 15 is 5 marks)

16 Bill's weight decreases from 64.8 kg to 59.3 kg.

Calculate the percentage decrease in Bill's weight.
Give your answer correct to 3 significant figures.

$\frac{59.3}{64.8} = 0.915123456790 = 91.51\%$

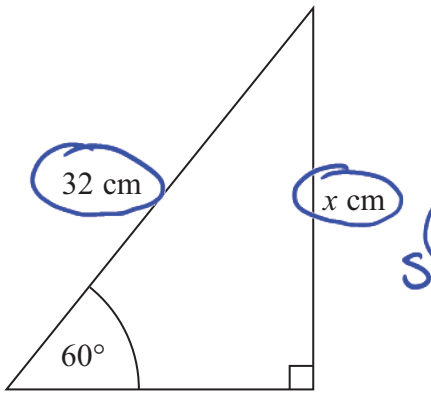
so decrease as % = $100\% - 91.51\% = 8.49\%$ (3sf)

8.49 %

(Total for Question 16 is 3 marks)

17

Diagram **NOT** accurately drawn



SOH CAH TOA

opposite = sin x hyp.

Calculate the value of x.
Give your answer correct to 3 significant figures.

$x = 32 \times \sin 60$

$= 27.7\text{ cm}$ (3sf)

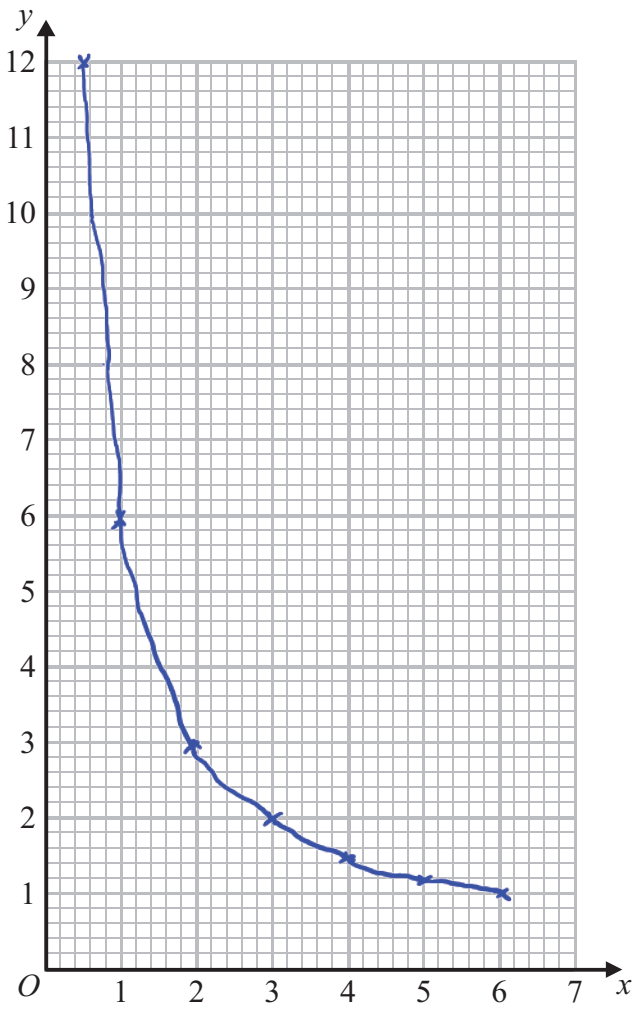
27.7 cm (3sf)

(Total for Question 17 is 3 marks)

18 (a) Complete the table of values for $y = \frac{6}{x}$

x	0.5	1	2	3	4	5	6
y	12	6	3	2	1.5	1.2	1

(2)



(b) On the grid, draw the graph of $y = \frac{6}{x}$ for $0.5 \leqslant x \leqslant 6$

(2)

(Total for Question 18 is 4 marks)

19 Rob is learning about the planets.

Rob makes a model of the Sun.
He also makes a model of the planet Jupiter.

Rob is going to hang the two models in the school hall.

Rob wants a distance of 16 m between the two models.
The real distance between the planet Jupiter and the Sun is 8×10^8 km.

Work out the scale Rob should use.
Give your answer in the form 1 : n

use [×10^x] button on your calculator!
e.g. 8 [×10^x] 8 × 1000
8×10^8 × 1000

1. convert Km to m
8×10^8 Km × 1000 = 8×10^{11}

2. work at scale
$(8 \times 10^{11}) \div 16 = 5 \times 10^{10}$
$= 50,000,000,000$

1 : 50,000,000,000

(Total for Question 19 is 3 marks)

20 Simplify $\frac{x+1}{2} + \frac{x+3}{3}$

multiply away divisors (×6) $3(x+1) + 2(x+3)$

Expand $3x+3 + 2x+6$

Simplify $5x+9$

$5x+9$

(Total for Question 20 is 3 marks)

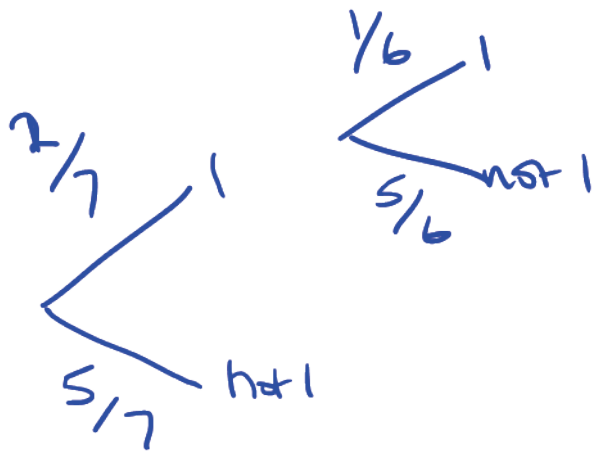
21 Here are seven tiles.

1	1	2	2	2	3	3

Jim takes at random a tile.
He does **not** replace the tile.

Jim then takes at random a second tile.

(a) Calculate the probability that both the tiles Jim takes have the number 1 on them.

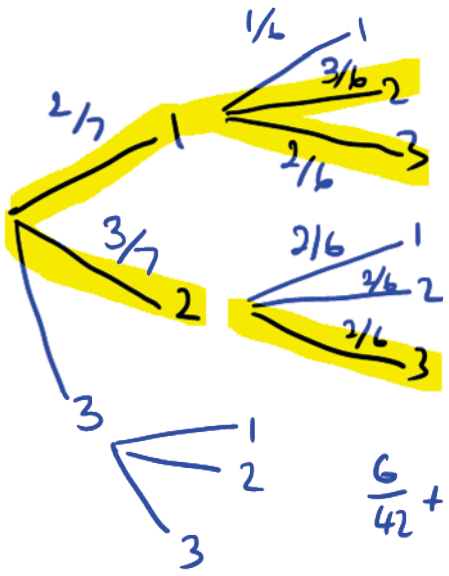


$\frac{2}{7} \times \frac{1}{6} = \frac{2}{42} = \frac{1}{21}$

$\frac{1}{21}$

(2)

(b) Calculate the probability that the number on the second tile Jim takes is greater than the number on the first tile he takes.



$\frac{2}{7} \times \frac{3}{6} = \frac{6}{42}$

$\frac{2}{7} \times \frac{2}{6} = \frac{4}{42}$

$\frac{3}{7} \times \frac{2}{6} = \frac{6}{42}$

$\frac{6}{42} + \frac{4}{42} + \frac{6}{42} = \frac{16}{42} =$

$\frac{8}{21}$

(3)

(Total for Question 21 is 5 marks)

22 (a) Solve $2x^2 + 9x - 7 = 0$

Give your solutions correct to 3 significant figures.

Use Qf $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ ← front of paper!

$a = 2$
$b = 9$
$c = -7$

$x = \dfrac{-9 \pm \sqrt{81 - (4 \times 2 \times -7)}}{4}$

$x = \dfrac{-9 \pm \sqrt{81 - (-56)}}{4}$

$x = \dfrac{-9 \pm \sqrt{137}}{4}$

$x = \dfrac{-9 + \sqrt{137}}{4} = 0.676$ (3sf)

$x = \dfrac{-9 - \sqrt{137}}{4} = -5.18$ (3sf)

$x = 0.676$ or $x = -5.18$

(3)

(b) Solve $\dfrac{2}{y^2} + \dfrac{9}{y} - 7 = 0$

Give your solutions correct to 3 significant figures.

$x^2 = \left(\frac{1}{y}\right)^2 = \frac{1^2}{y^2} = \frac{1}{y^2}$

set $x = \frac{1}{y}$ and substitute in!

$2x^2 + 9y - 7 = 0$ (same as part (a))

So if $x = 0.676$ or $x = -5.18$

and $x = \frac{1}{y}$ then $y = \frac{1}{x}$

so $y = \dfrac{1}{0.676}$ and $y = \dfrac{1}{-5.18}$

$y = 1.48$ or $y = -0.193$

(2)

(Total for Question 22 is 5 marks)

23 The diagram shows a pyramid.

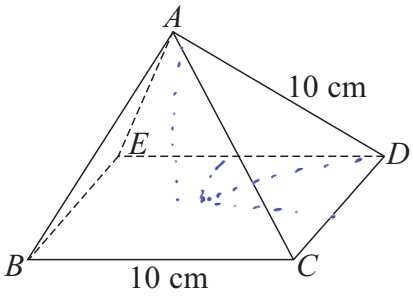


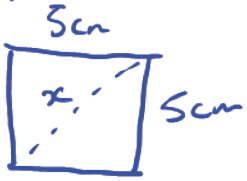
Diagram **NOT** accurately drawn

BCDE is a square with sides of length 10 cm.
The other faces of the pyramid are equilateral triangles with sides of length 10 cm.

(a) Calculate the volume of the pyramid.
Give your answer correct to 3 significant figures.

volume of pyramid = $\frac{1}{3}$ × area of base × vertical height.

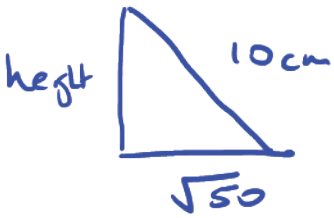
To find vertical height do Pythagoras twice!



$x^2 = 5^2 + 5^2$

$x^2 = 50$

$x = \sqrt{50}$



$height^2 = 10^2 - (\sqrt{50})^2$

$= 100 - 50$

$= 50$

so $h = \sqrt{50}$

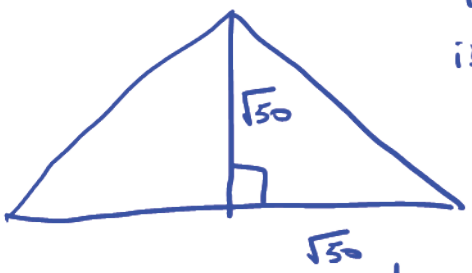
volume = $\frac{1}{3} \times 100 cm^2 \times \sqrt{50}$

$= 236 cm^3$ (3sf)

236 ..... cm^3

(4)

(b) Find the size of angle *DAB*.



If vertical height ($\sqrt{50}$) is the same as distance from corner to centre ($\sqrt{50}$) then angle DAB is formed by two isosceles right angle triangles so DAB = 90 °

.....

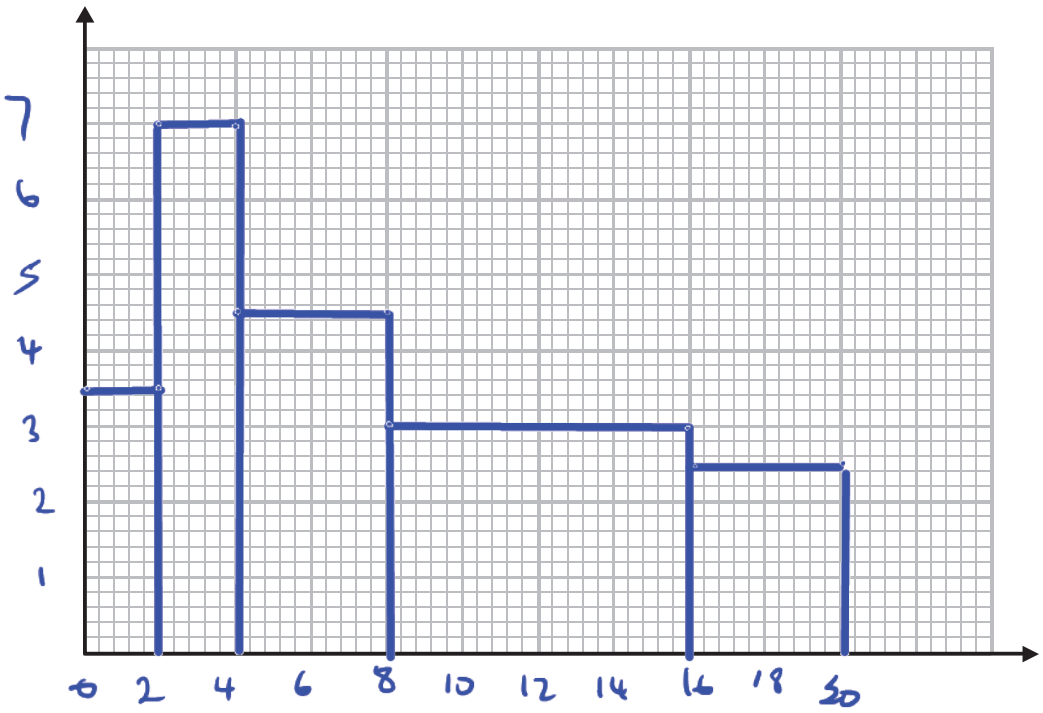
(2)

(Total for Question 23 is 6 marks)

24 The table gives information about the heights, h metres, of trees in a wood.

Height (h metres)	Frequency
$0 < h \leqslant 2$	7
$2 < h \leqslant 4$	14
$4 < h \leqslant 8$	18
$8 < h \leqslant 16$	24
$16 < h \leqslant 20$	10

Draw a histogram to show this information.



(Total for Question 24 is 3 marks)

***25** The diagram shows the triangle PQR.

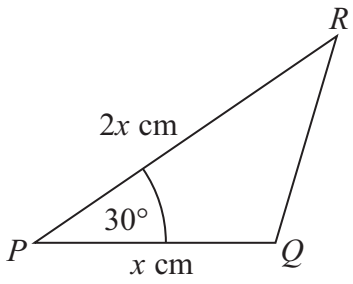


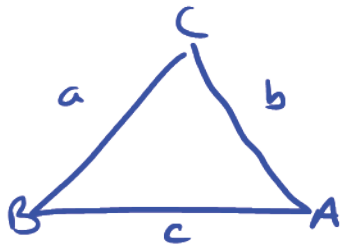
Diagram **NOT** accurately drawn

$PQ = x$ cm
$PR = 2x$ cm
Angle $QPR = 30°$

The area of triangle $PQR = A$ cm^2

Show that $x = \sqrt{2A}$

Area of triangle $= \frac{1}{2}ab\sin C$



$\sin 30° = \frac{1}{2}$

$\text{AREA} = \frac{1}{2}\ a\ b\ \sin C$

$A = \frac{1}{2} \times 2x \times x \times \sin 30°$

$A = \frac{1}{2} \times \frac{1}{2} \times 2x^2 = \frac{2}{4}x^2 = \frac{1}{2}x^2$

$A = \frac{1}{2}x^2$

$2A = x^2$

$x = \sqrt{2A}$

(Total for Question 25 is 3 marks)

TOTAL FOR PAPER IS 100 MARKS

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