Write your name here

Surname Mr Thompson | Other names

**Pearson Edexcel GCSE**

Centre Number | Candidate Number

# Mathematics A Solutions

## Paper 2 (Calculator)

**Higher Tier**

Friday 13 June 2014 – Morning
**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
100

### 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 $\pi$ button, take the value of $\pi$ 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* ▶

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5/5/6/c2/

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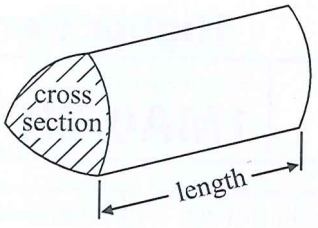
PEARSON

## GCSE Mathematics 1MA0

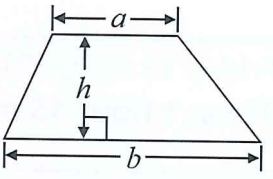
Formulae: Higher Tier

**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

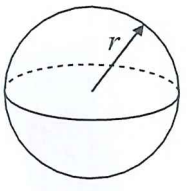



**Area of trapezium** $= \frac{1}{2}(a+b)h$



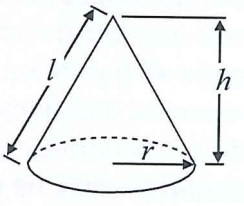

**Volume of sphere** $= \frac{4}{3}\pi r^3$

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

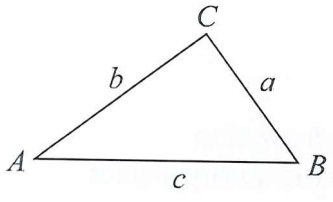



**Volume of cone** $= \frac{1}{3}\pi r^2 h$

**Curved surface area of cone** $= \pi r l$




**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** The point $A$ has coordinates (2, 3).
The point $B$ has coordinates (6, 8).

$M$ is the midpoint of the line $AB$.

Find the coordinates of $M$.

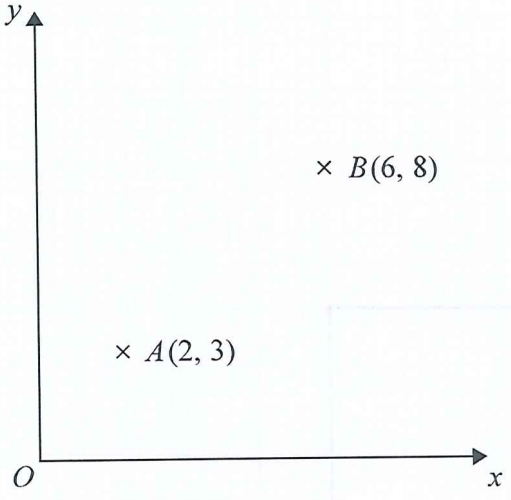



Diagram **NOT** accurately drawn

$\frac{2+6}{2}$ $\frac{3+8}{2}$

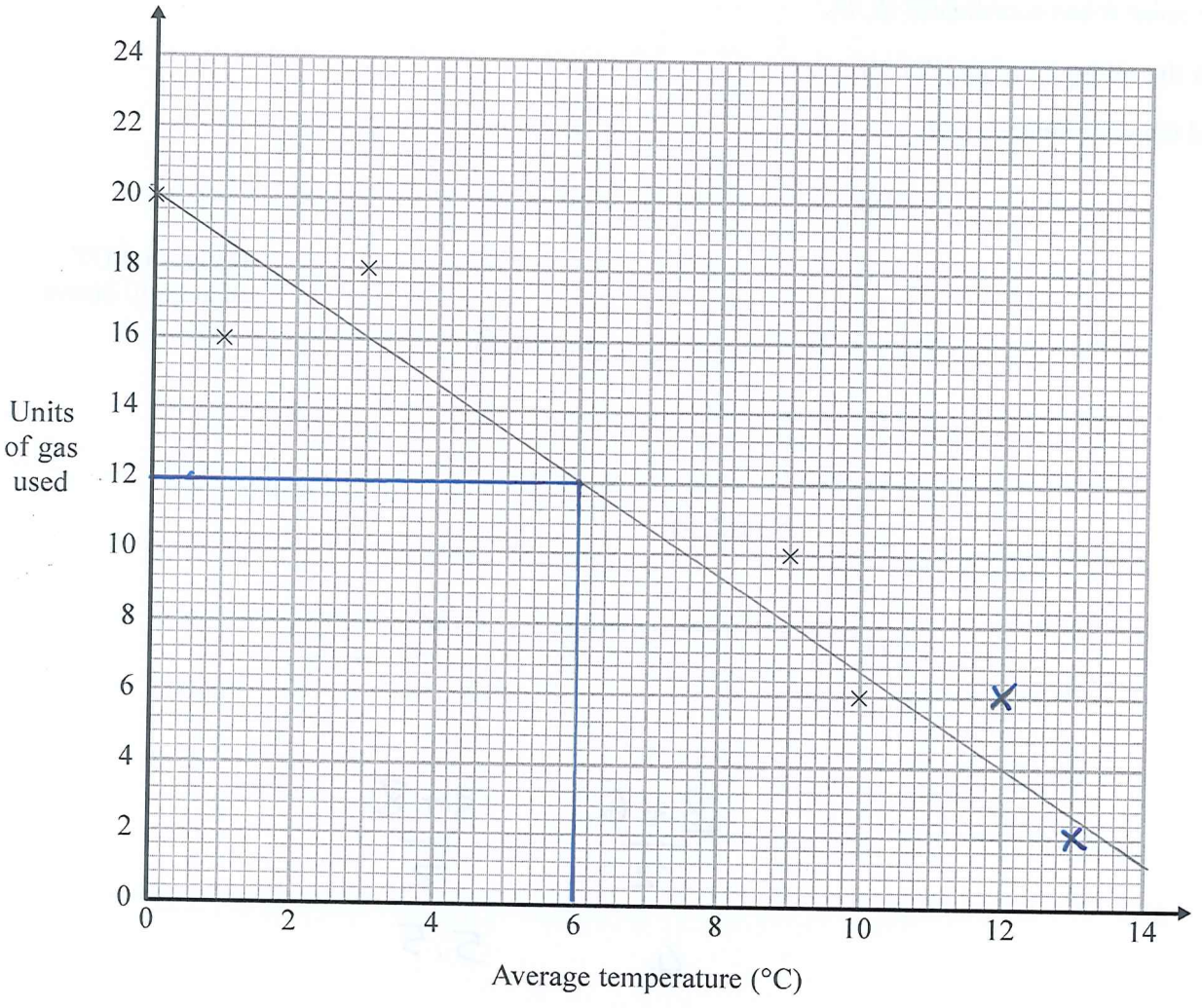
4 , 5.5

(4 , 5.5)

**(Total for Question 1 is 2 marks)**

2 The table shows the average temperature on each of seven days and the number of units of gas used to heat a house on these days.

| Average temperature (°C) | 0 | 1 | 3 | 9 | 10 | 12 | 13 |
|---|---|---|---|---|---|---|---|
| Units of gas used | 20 | 16 | 18 | 10 | 6 | 6 | 2 |




(a) Complete the scatter graph to show the information in the table.
The first 5 points have been plotted for you.

(1)

(b) Describe the relationship between the average temperature and the number of units of gas used.

As the temperature goes up the units of gas used goes down.

(1)

(c) Estimate the average temperature on a day when 12 units of gas are used.

Draw a line of best fit!

6 °C

(2)

**(Total for Question 2 is 4 marks)**

3 $x = 0.7$

Work out the value of $\frac{(x+1)^2}{2x}$

Write down all the figures on your calculator display.

$\frac{1.7^2}{1.4} = \frac{2.89}{1.4}$

2.064285714

**(Total for Question 3 is 2 marks)**

4 Here is a circle.

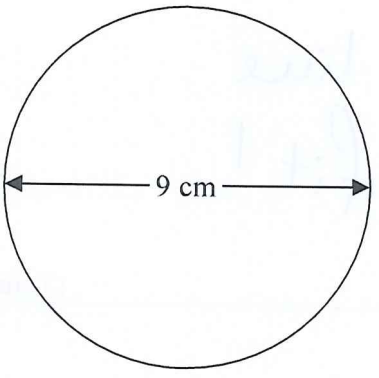



Diagram **NOT** accurately drawn

The diameter of the circle is 9 cm.

Work out the circumference of this circle.
Give your answer correct to 3 significant figures.

$C = \pi d$

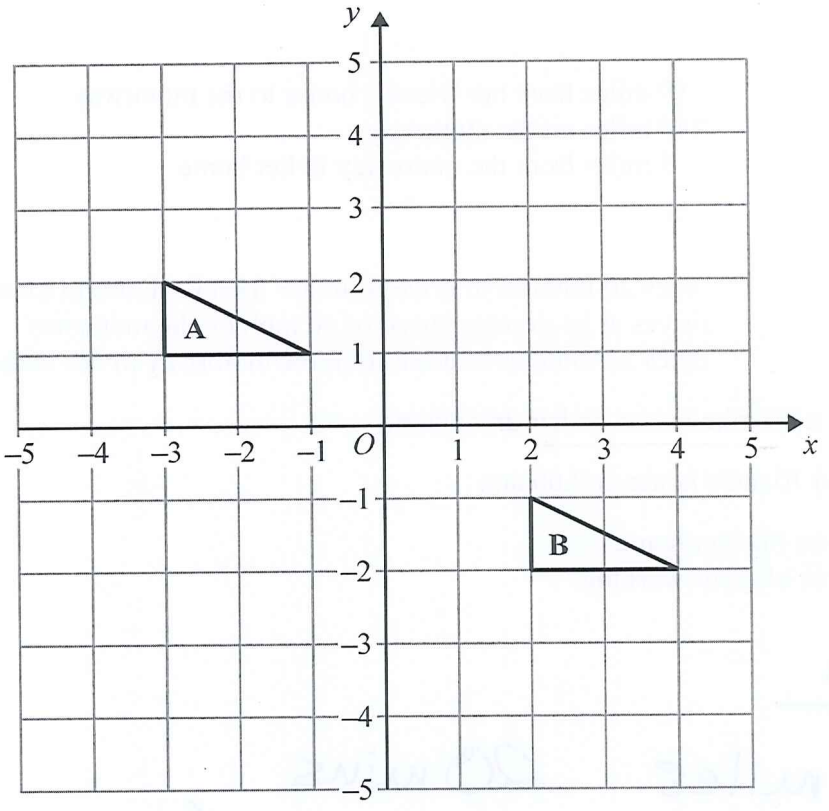
$C = \pi \times 9$

$C = 28.274333388$

28.3 cm

**(Total for Question 4 is 2 marks)**

5




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

Translation $\begin{pmatrix} 5 \\ -3 \end{pmatrix}$

**(Total for Question 5 is 2 marks)**

6 Sue is driving home from her friend's house.

Sue drives

10 miles from her friend's house to the motorway
240 miles on the motorway
5 miles from the motorway to her home

Sue

takes 20 minutes to drive from her friend's house to the motorway
drives at an average speed of 60 mph on the motorway
takes 25 minutes to drive from the motorway to her home

Sue stops for a 30 minute rest on her drive home.

Sue leaves her friend's house at 9.00 am.

What time does Sue get home?
You must show all your working.

9am

10 miles 20 mins
240 miles 60 mph (4 hours)
5 miles 25 mins

Journey → 4:45
Rest → 30
5:15

9am + 5 hours 15 mins = 2:15pm

2:15pm

**(Total for Question 6 is 3 marks)**

*7

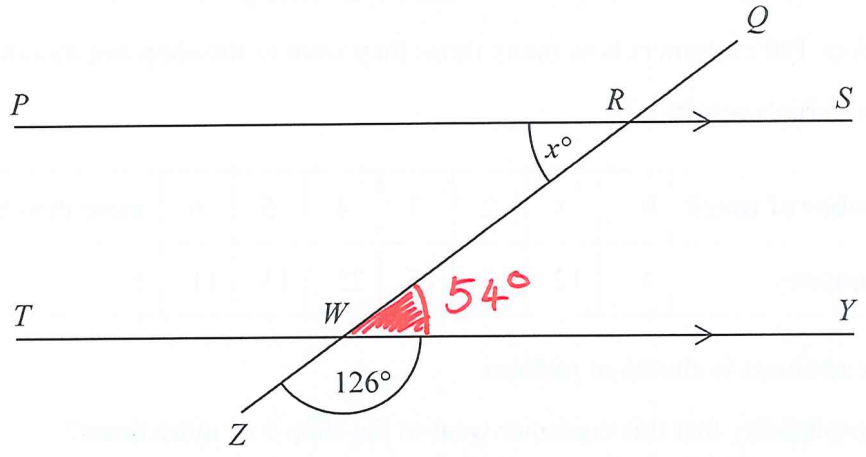



Diagram **NOT** accurately drawn

*PRS* and *TWY* are parallel straight lines.
*QRWZ* is a straight line.

Work out the value of $x$.
Give reasons for your answer.

RWY = 54° as angles on a straight line add up to 180°.

$x$ = 54° as alternate angles are equal

**(Total for Question 7 is 3 marks)**

8 Lorna carries out a survey about the number of times customers go to a shop.

She asks at random 100 customers how many times they went to the shop last month.

The table shows Lorna's results.

| **Number of times** | 0 | 1 | 2 | 3 | 4 | 5 | 6 | more than 6 |
|---|---|---|---|---|---|---|---|---|
| **Frequency** | 4 | 12 | 13 | 17 | 25 | 13 | 11 | 5 |

One of the 100 customers is chosen at random.

(a) What is the probability that this customer went to the shop 5 or more times?

How many 5 or more?

$13 + 11 + 5 = 29$

$\frac{29}{100}$

(2)

Last month the shop had a total of 1500 customers.

(b) Work out an estimate for the number of customers who went to the shop exactly 2 times last month.

$1500 \times \frac{13}{100} = 195$

195

(2)

The owner of a different shop is carrying out a survey on the ages of his customers.
He records the ages of the first 10 customers in his shop after 9 am one morning.

(c) This may **not** be a suitable sample.
Give **two** reasons why.

1 Too small of a sample size

2 Customers at this time may not represent age of all customers.

(2)

**(Total for Question 8 is 6 marks)**

9 The diagram shows a trapezium.

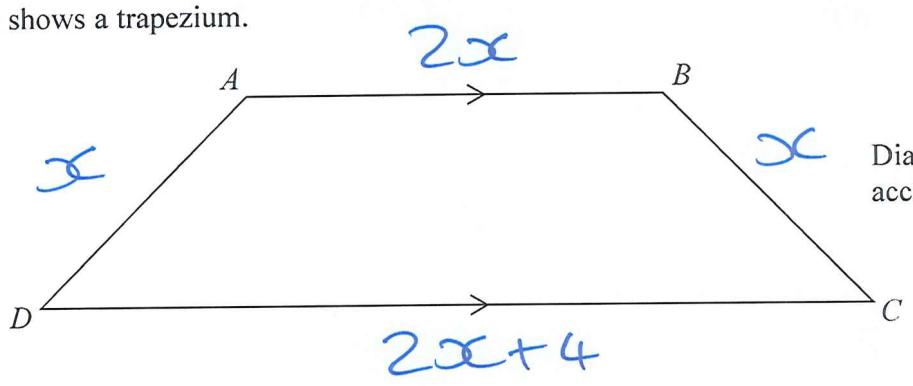



Diagram **NOT** accurately drawn

$AD = x$ cm.
$BC$ is the same length as $AD$.
$AB$ is twice the length of $AD$.
$DC$ is 4 cm longer than $AB$.

The perimeter of the trapezium is 38 cm.

Work out the length of $AD$.

$P = 6x + 4$

$P = 38$

$6x + 4 = 38$

$-4 \quad -4$

$6x = 34$

$\div 6 \quad \div 6$

$x = 5\frac{2}{3}$

$5\frac{2}{3}$ cm

**(Total for Question 9 is 4 marks)**

**10** (a) Simplify $(p^3)^2$

$p^6$

**(1)**

(b) Simplify $\frac{t^8}{t^3}$

$t^5$

**(1)**

$2^3 \times 2^n = 2^9$

(c) Work out the value of $n$.

$6$

**(1)**

$2x^3 = 128$

(d) Work out the value of $x$.

$x^3 = 64$

$x = 4$

**(1)**

**(Total for Question 10 is 4 marks)**

**11** Here is a plan of Martin's driveway.

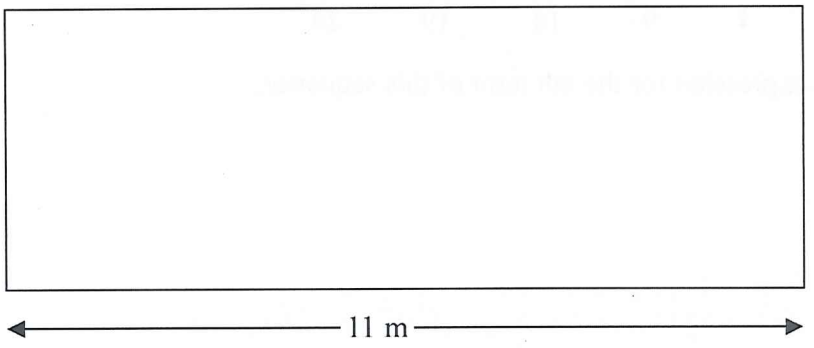



Diagram **NOT** accurately drawn

Martin is going to cover his driveway with gravel.
The gravel will be 6 cm deep.
$\rightarrow 0.06\text{ m}$
Gravel is sold in bags.
There are 0.4 $m^3$ of gravel in each bag.
Each bag of gravel costs £38

Martin gets a discount of 30% off the cost of the gravel.

Work out the total amount of money Martin pays for the gravel.

Area = $44\text{ m}^2$

Volume = $44 \times 0.06 = 2.64$

$2.64 \div 0.4 = 6.6$ bags

↳ We need 7

£$38 \times 0.7 = 26.60$

$26.60 \times 7 = £186.20$

£ 186.20

**(Total for Question 11 is 5 marks)**

**12** Here are the first five terms of an arithmetic sequence.

4 9 14 19 24

(a) Find, in terms of $n$, an expression for the $n$th term of this sequence.

$5n - 1$

**(2)**

Here are the first five terms of a different sequence.

2 2 0 –4 –10

An expression for the $n$th term of this sequence is $3n - n^2$

(b) Write down, in terms of $n$, an expression for the $n$th term of a sequence whose first five terms are

4 4 0 –8 –20

$2(3n - n^2)$

**(1)**

**(Total for Question 12 is 3 marks)**

**13** $-5 < y \leqslant 0$

$y$ is an integer.

(a) Write down all the possible values of $y$.

$-4, -3, -2, -1, 0$

**(2)**

(b) Solve $6(x - 2) > 15$

$6x - 12 > 15$

$+12 \quad +12$

$6x > 27$

$\div 6 \quad \div 6$

$x > 4.5$

$x > 4.5$

**(2)**

**(Total for Question 13 is 4 marks)**

**14** Ali is planning a party.

He wants to buy some cakes and some sausage rolls.

The cakes are sold in boxes.
There are 12 cakes in each box.
Each box of cakes costs £2.50

The sausage rolls are sold in packs.
There are 8 sausage rolls in each pack.
Each pack of sausage rolls costs £1.20

Ali wants to buy more than 60 cakes and more than 60 sausage rolls.
He wants to buy exactly the same number of cakes as sausage rolls.

What is the least amount of money Ali will have to pay?

12, 24, 36
8, 16, 24 → Needs to be over 60

24, 48, 72

72 ÷ 12 = 6
72 ÷ 8 = 9

6 x 2.50 = 15
9 x 1.20 = 10.80

10.80
15
25.80

£ 25.80

**(Total for Question 14 is 5 marks)**

**15** The diagram shows the positions of three turbines $A$, $B$ and $C$.

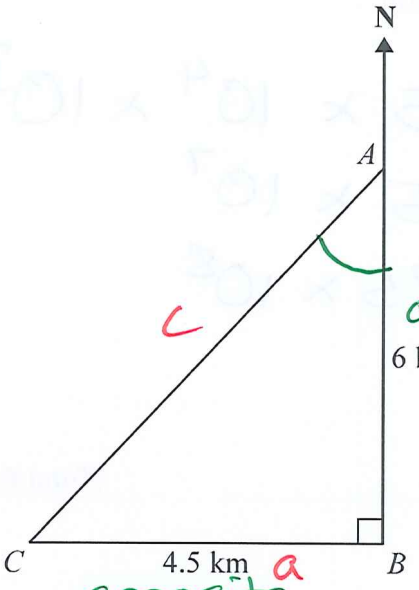



Diagram **NOT** accurately drawn

c adjacent

b

a opposite

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

$A$ is 6 km due north of turbine $B$.
$C$ is 4.5 km due west of turbine $B$.

(a) Calculate the distance $AC$.

$4.5^2+6^2=AC^2$

$20.25+36=AC^2$

$56.25=AC^2$

$AC=7.5$

7.5 km

(3)

(b) Calculate the bearing of $C$ from $A$.
Give your answer correct to the nearest degree.

$+^{o}a$

$\tan CAB=\frac{4.5}{6}$

$\tan CAB=0.75$

$CAB=\tan^{-1}(0.75)$

$CAB=36.86989765$

$+180=216.86989876$

217 °

(4)

**(Total for Question 15 is 7 marks)**

**16** Work out the value of $(7.5 \times 10^4) \times (2.5 \times 10^3)$
Give your answer in standard form.

$18.75 \times 10^4 \times 10^3$

$18.75 \times 10^7$

$1.875 \times 10^8$

$1.875 \times 10^8$

**(Total for Question 16 is 2 marks)**

**17**

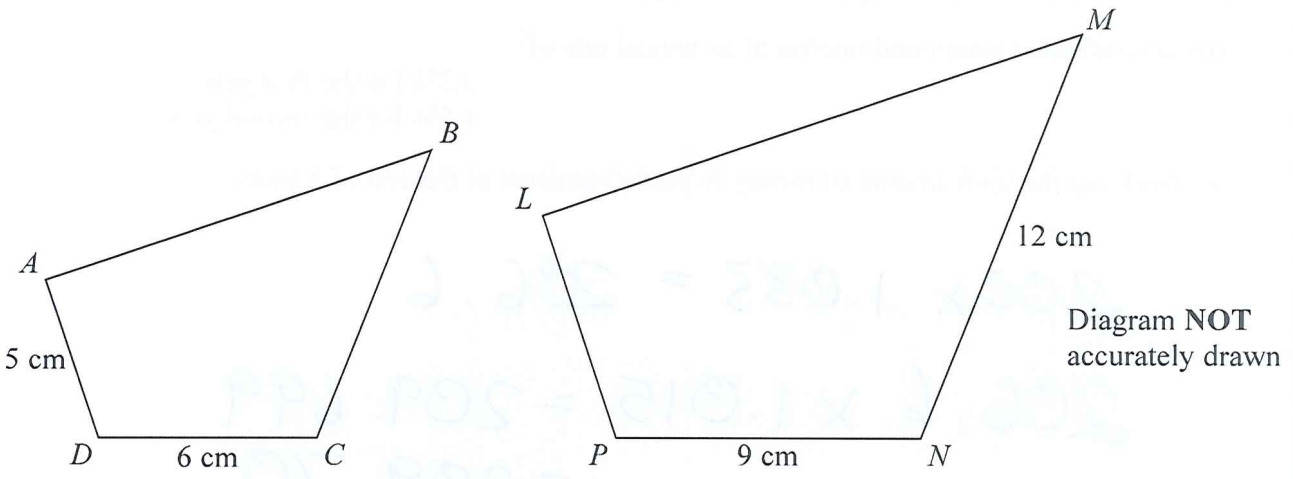



Diagram **NOT** accurately drawn

Quadrilaterals *ABCD* and *LMNP* are mathematically similar.

Angle *A* = angle *L*
Angle *B* = angle *M*
Angle *C* = angle *N*
Angle *D* = angle *P*

(a) Work out the length of *LP*.

S.f 1.5

5 × 1.5 = 7.5

7.5 ..... cm

(2)

(b) Work out the length of *BC*.

12 ÷ 1.5 = 8

8 ..... cm

(2)

**(Total for Question 17 is 4 marks)**

**18** Katie invests £200 in a savings account for 2 years.

The account pays compound interest at an annual rate of

3.3% for the first year
1.5% for the second year

(a) Work out the total amount of money in Katie's account at the end of 2 years.

$200 \times 1.033 = 206.6$

$206.6 \times 1.015 = 209.699$

$= 209.70$

£ 209.70

(3)

Katie travels to work by train.
The cost of her weekly train ticket increases by 12.5% to £225

Katie's weekly pay increases by 5% to £535.50

*(b) Compare the increase in the amount of money Katie has to pay for her weekly train ticket with the increase in her weekly pay.

Train increase is £25

112.5% = 225 ÷112.5
1% = 2
100% = £200

Pay £25.50

105% = 535.50 ÷105
1% = £5.10
100% = £510

Pay increase is greater than the train fare increase

(3)

**(Total for Question 18 is 6 marks)**

**19** Here is a cuboid drawn on a 3-D grid.

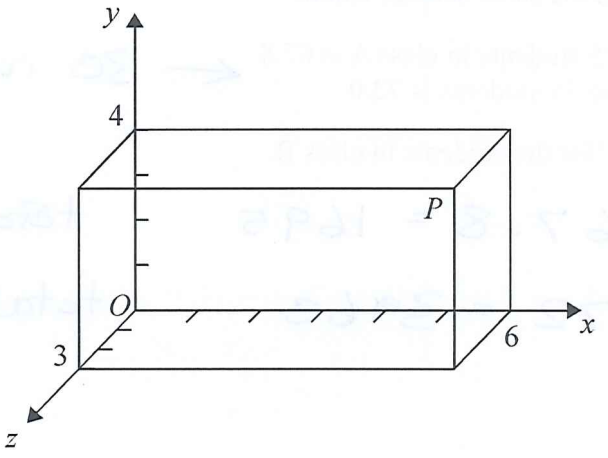



Diagram **NOT** accurately drawn

$P$ is a vertex of the cuboid.

$T$ divides the line $OP$ in the ratio 1 : 2

Find the coordinates of $T$.

x y z

P = 6, 4, 3

÷3

2 4/3 1

(..... 2 ....., ..... 4/3 ....., ..... 1 .....)

**(Total for Question 19 is 2 marks)**

**20** 25 students in class A did a science exam.
30 students in class B did the same science exam.

The mean mark for the 25 students in class A is 67.8
The mean mark for all the 55 students is 72.0

Work out the mean mark for the students in class B.

← 30 in class B

$25 \times 67.8 = 1695$ total for class A

$55 \times 72 = 3960$ total all

3960
−1695
2265

$2265 \div 30 = 75.5$

75.5

**(Total for Question 20 is 3 marks)**

**21** (a) Expand and simplify $(y - 2)(y - 5)$

$y^2 - 5y - 2y + 10$

$y^2 - 7y + 10$

(2)

*(b) Prove algebraically that

$(2n + 1)^2 - (2n + 1)$ is an even number

for all positive integer values of $n$.

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

$4n^2 + 2n + 2n + 1 - 2n - 1$

$4n^2 + 2n$

$2(2n^2 + n)$

All even numbers are a multiple of 2 and 2 is the multiplyer when the expression is simplified

(3)

**(Total for Question 21 is 5 marks)**

*22 Shabeen has a biased coin.
The probability that the coin will land on heads is 0.6 0.4 tails

Shabeen is going to throw the coin 3 times.

She says the probability that the coin will land on tails 3 times is less than 0.1

Is Shabeen correct?
You must show all your working.

0.4 × 0.4 × 0.4 = 0.064

0.064 is less than 0.1 so Shabeen is correct.

**(Total for Question 22 is 3 marks)**

**23** (a) Explain what is meant by a stratified sample.

A sample in the same proportions as the population

(1)

The table shows information about the ages of the people living in a village.

| Age group | Number of people |
|---|---|
| Under 21 | 72 |
| 21–40 | 90 |
| 41–60 | 123 |
| Over 60 | 314 |

599

Mrs Parrish carries out a survey of these people.
She uses a sample size of 50 people stratified by age group.

(b) Work out the number of people over 60 years of age in the sample.

$\frac{314}{599} \times 50 = 26.21035...$

26

(2)

**(Total for Question 23 is 3 marks)**

**24** $p$ is inversely proportional to $t$.

When $t = 4$, $p = 12$

Find the value of $p$ when $t = 6$

$p = \frac{k}{t}$

$12 = \frac{k}{4}$

$48 = k$

$p = \frac{48}{6}$

$p = 8$

8

**(Total for Question 24 is 3 marks)**

**25** The diagram shows a solid made from a hemisphere and a cone.

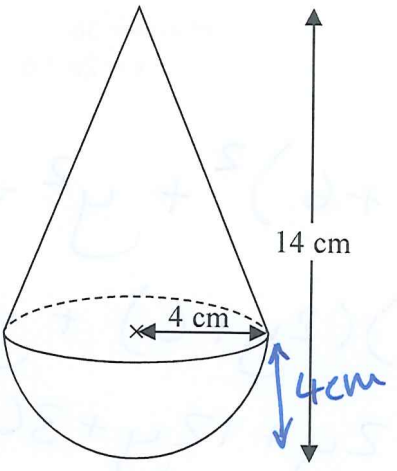



Diagram **NOT** accurately drawn

The radius of the hemisphere is 4 cm.
The radius of the base of the cone is 4 cm.

Calculate the volume of the solid.
Give your answer correct to 3 significant figures.

Use formula sheet!

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

half a sphere $= 0.5 \times \frac{4}{3} \times \pi \times 4^3$

$= 134.04128\,66$

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

$= \frac{1}{3} \times \pi \times 16 \times 18$

$= 167.55160\,82$

Total volume $= 301.59289\,48$

302 ..... $cm^3$

**(Total for Question 25 is 3 marks)**

**26** Solve the equations

$$x^2 + y^2 = 36$$
$$x = 2y + 6$$

$$(2y+6)^2 + y^2 = 36$$
$$(2y+6)(2y+6) + y^2 = 36$$
$$4y^2 + 12y + 12y + 36 + y^2 = 36$$
$$5y^2 + 24y + 36 = 36$$
$$-36 \quad -36$$
$$5y^2 + 24y = 0$$
$$a \quad b$$

$$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$y = \frac{-24 \pm \sqrt{24^2 - 4 \times 5 \times 0}}{2 \times 5}$$

$$y = \frac{-24 + \sqrt{576}}{10}$$

$$y = 0 \text{ (1 d.p)}$$

$$x = 2y + 6$$
$$x = 2 \times 0 + 6$$
$$x = 6$$

$$y = \frac{-24 - \sqrt{576}}{10}$$

$$y = -4.8 \text{ (1 d.p)}$$

$$x = 2y + 6$$
$$x = 2 \times -4.8 + 6$$
$$x = -3.6$$

**(Total for Question 26 is 5 marks)**

$x = 6 \quad y = 0$

$x = -3.6 \quad y = -4.8$

27 $ABCD$ is a parallelogram.

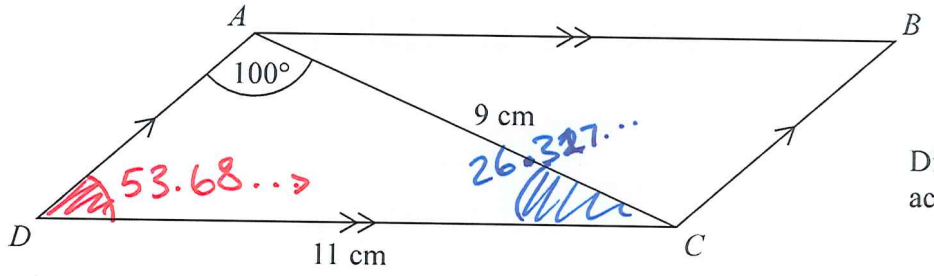



Diagram **NOT** accurately drawn

$AC = 9$ cm
$DC = 11$ cm
Angle $DAC = 100°$

Calculate the area of the parallelogram.
Give your answer correct to 3 significant figures.

$$\frac{a}{\sin A} = \frac{d}{\sin D}$$

$$\frac{11}{\sin 100} = \frac{9}{\sin D}$$

$$\sin D = \frac{9 \sin 100}{11}$$

$$\sin D = 0.80575\ldots$$

$$D = \sin^{-1}(\text{ans})$$

$$D = 53.6829\ldots$$

$$ACD = 180 - 100 - D = 26.317\ldots$$

$$\text{Area} = 2 \times 0.5 \times 11 \times 9 \times \sin 26.317\ldots$$

$$= 43.8903\ldots$$

43.9 cm²

**(Total for Question 27 is 5 marks)**

**TOTAL FOR PAPER IS 100 MARKS**

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