

Surname TP Solutions
Other Names

Centre Number

Candidate Number
0



GCSE



MATHEMATICS – Component 1
Non-Calculator Mathematics
FOUNDATION TIER

ADDITIONAL MATERIALS

The use of a calculator is not permitted in this examination.
A ruler, protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
You may use a pencil for graphs and diagrams only.
Write your name, centre number and candidate number in the spaces at the top of this page.
Answer **all** the questions in the spaces provided.
If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.
Take π as 3.14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.
Unless stated, diagrams are not drawn to scale.
Scale drawing solutions will not be acceptable where you are asked to calculate.
The number of marks is given in brackets at the end of each question or part-question.
You are reminded of the need for good English and orderly, clear presentation in your answers.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	3	
2.	4	
3.	7	
4.	2	
5.	3	
6.	5	
7.	4	
8.	8	
9.	4	
10.	5	
11.	4	
12.	6	
13.	4	
14.	3	
15.	2	
16.	5	
17.	4	
18.	4	
19.	3	
20.	7	
21.	8	
22.	4	
23.	4	
24.	5	
25.	4	
26.	5	
27.	3	
Total	120	

Formula list*Area and volume formulae*

Where r is the radius of the sphere or cone, l is the slant height of a cone and h is the perpendicular height of a cone:

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

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

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

Kinematics formulae

Where a is constant acceleration, u is initial velocity, v is final velocity, s is displacement from the position when $t = 0$ and t is time taken:

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

1. The table shows some words that may describe the numbers 1, 2, 8 or 9.

Complete the table by putting ticks (✓) in the correct boxes.
The first column has been done for you.

[3]

Words	Number			
	1	2	8	9
Prime		✓		
Odd	✓			✓
Even		✓	✓	
Square	✓			✓
Cube	✓		✓	

2. (a) Write this statement in words.

[2]

$$67.31 < 700$$

Sixty seven point three one is less than seven hundred.

- (b) Work out the difference between the value of the digit 8 and the value of the digit 5 in the following number.

[2]

$$38502$$

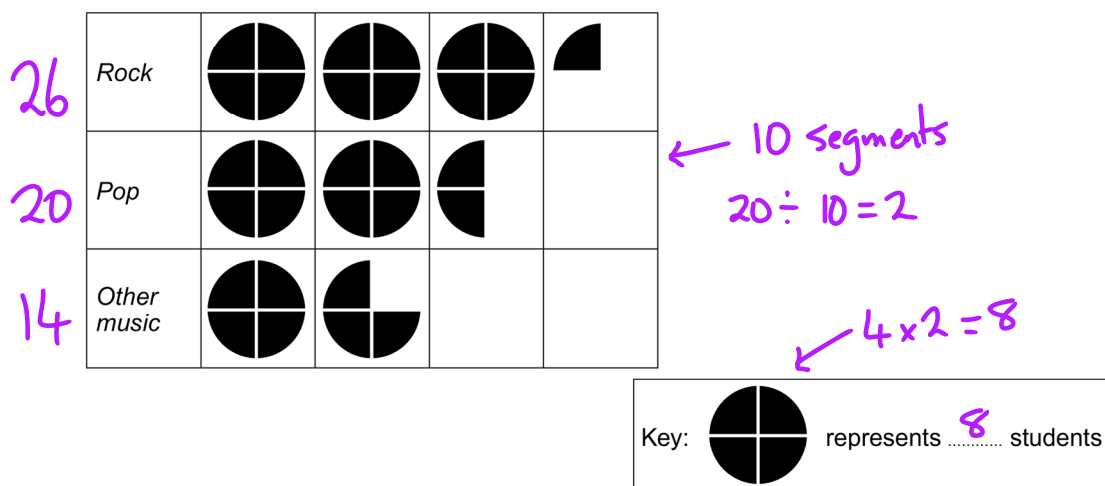
$$8000 - 500 = 7500$$

Turn over.

3. Alys asks a group of students:

"What is your favourite type of music?"

This pictogram shows her results.



- (a) Twenty students chose *Pop*.

Complete the key for the pictogram.

[1]

- (b) Write down the modal type of music.

[1]

Rock

- (c) How many students answered Alys's question?

[1]

$$26 + 20 + 14 = 60$$

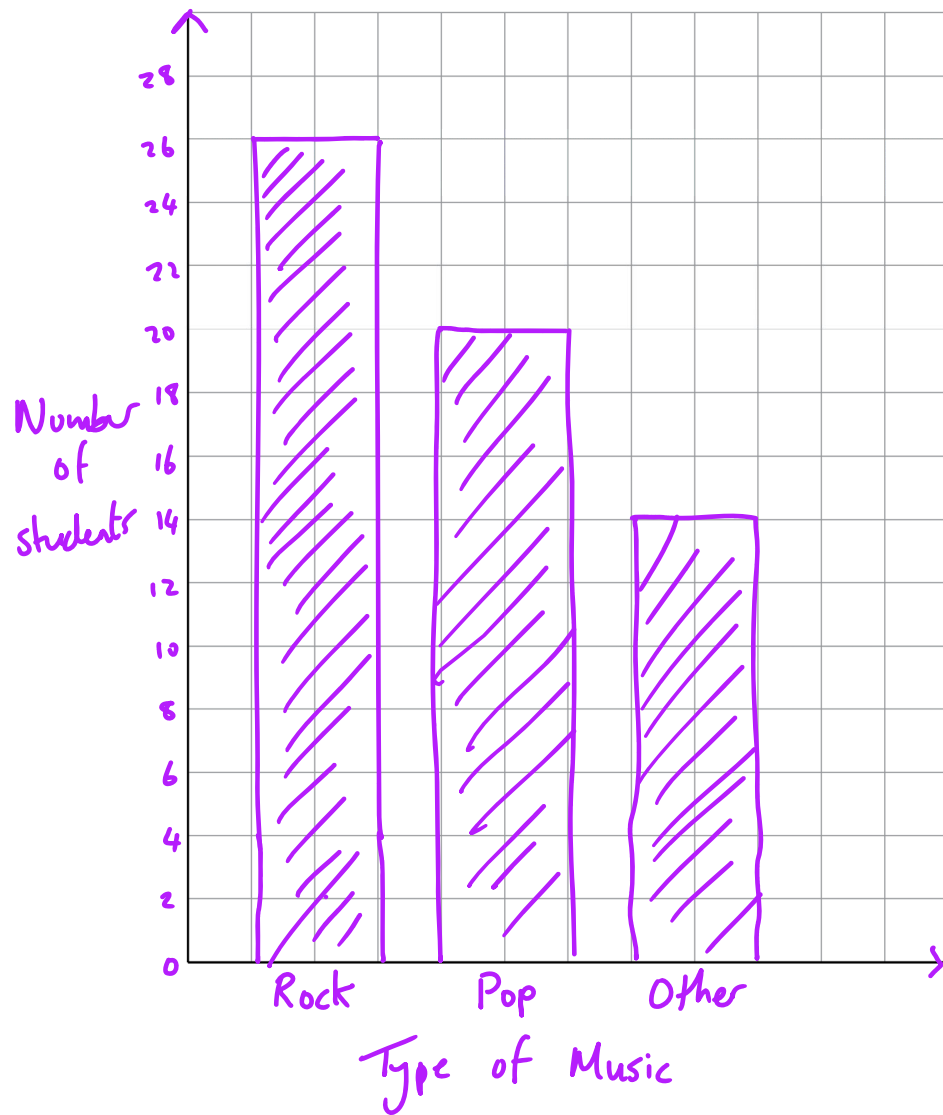
- (d) How many more students chose *Rock* than chose *Other music*?

[1]

$$26 - 14 = 12$$

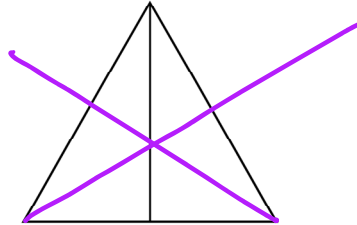
(e) Draw a bar chart of Alys's results on the grid below.

[3] Examiner only



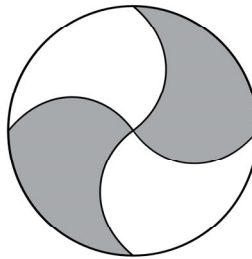
Turn over.

4. (a) Draw two more lines on the diagram, so that the shape has exactly three lines of symmetry. [1]



- (b) Renata says:

"This shape has rotational symmetry of order 4."



Explain why Renata is not correct.

[1]

If you spin the shape 360° it will only look the same once more so rotational symmetry = 2

5. (a) Find the size of angle a .

[1]

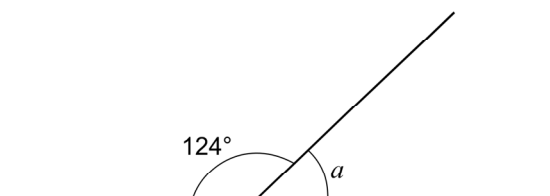


Diagram not drawn to scale

$$180 - 124 = 56$$

$$a = 56^\circ$$

- (b) Find the size of angle b .

[2]

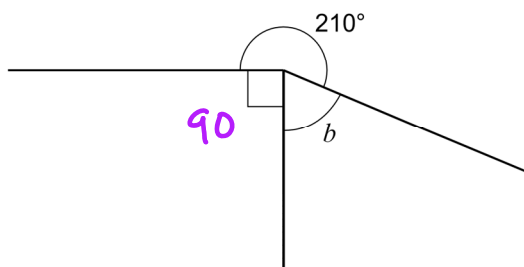


Diagram not drawn to scale

$$\begin{array}{r} 210 \\ + 90 \\ \hline 300 \\ \hline \end{array}$$

$$360 - 210 - 90 = 60$$

$$b = 60^\circ$$

Turn over.

6. (a) Write 5.907 correct to 1 decimal place.

[1]

5.9

- (b) Write 370 correct to 1 significant figure.

[1]

400

- (c) The mass of one red apple is 132 grams.

Estimate the mass of 38 of these red apples.
Give your answer in **kilograms**.

[3]

132 ~ 100 38 ~ 40

100 × 40 = 4000 g

4000 ÷ 1000 = 4 kg

4 kg

7. Daniel is a fast-food server.

- (a) One day, he works for 5 hours and earns a total of £30.50.

Work out how much Daniel is paid for each hour.

[2]

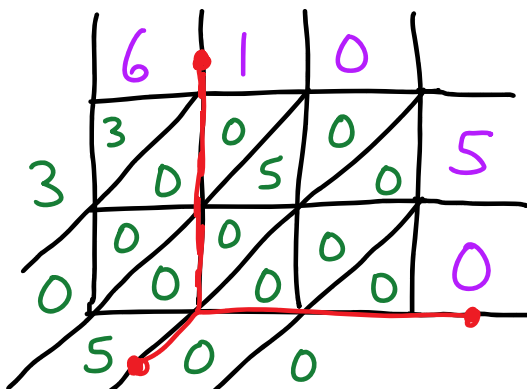
$$\begin{array}{r} 0 \ 6 \cdot 1 \ 0 \\ 5 \overline{) 3 \ 0 \cdot 5 \ 0} \end{array} \quad \pounds 6 \cdot 10$$

- (b) In July, Daniel works for a total of 50 hours.

How much does Daniel earn in July?
You must show all your working.

[2]

$$6 \cdot 10 \times 50 = \pounds 305$$



Turn over.

8. A vending machine sells drinks.
Each drink costs 50 pence.

A sign on the machine shows the coins that can be used to buy the drinks.

Drinks: 50p

This machine accepts
50p, 20p, 10p and 5p coins only

NO CHANGE IS GIVEN

- (a) Complete the table to show the 13 different ways of paying the **exact** amount for a drink. [2]

	50p	20p	10p	5p
Number of each coin	1			
		2	1	
		2		2
		1	3	
		1	2	2
		1	1	4
		1		6
			5	
			4	2
			3	4
			2	6
			1	8
				10

- (b) The machine has a display that shows how much cash has been put in. The machine resets the display to £0.00 after each drink is taken.

The cash container in the vending machine is emptied every night. When it was emptied, the cash container contained the following coins:

50p	20p	10p	5p
10 coins	15 coins	31 coins	20 coins

- (i) Work out the greatest possible number of drinks that could have been sold. You must state any assumption that you make. [5]

$$50 \times 10 = 500p \quad 10 \times 31 = 310p$$

$$\begin{array}{r} 20 \\ \times 15 \\ \hline 100 \\ 200 \\ \hline 300 \end{array} = 300p \quad 5 \times 20 = 100p$$

$$\begin{array}{r} 20 \\ \times 15 \\ \hline 100 \\ 200 \\ \hline 300 \end{array} \quad \begin{array}{l} \text{Total} \\ = 500 + 300 + 310 + 100 \\ = 1210p = £12.10 \end{array}$$

$$50 \overline{) 0024.2} \rightarrow 24 \text{ max}$$

Number of drinks sold 24

Assumption made One person overpaid by 10p

- (ii) Comment on the effect that your assumption has had on your solution. [1]

If more people overpaid the number of drinks could be lower.

Turn over.

9. (a) Complete the table.

Examiner
only
[3]

	Calculation	Answer
A	4×9	36
B	$\frac{3}{4}$ of 8	6
C	-2×-12	24
D	$2^3 + 1^2$	9

$8 \div 4 = 2$
 $2 \times 3 = 6$
 $- \times - = +$
 $2 \times 2 \times 2 = 8$
 $1 \times 1 = 1$

(b) Write down a relationship between the answers to calculation A and calculation B. [1]

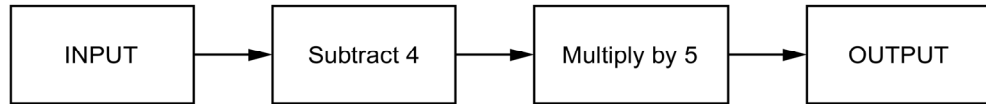
A is B squared



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Turn over.

10. (a) Here is a number machine.



- (i) The input is 2.
What is the output?

$$2 - 4 = -2 \quad -2 \times 5 = -10$$

[1]

-10

- (ii) The input is $6\frac{1}{2}$.
What is the output?

$$6.5 - 4 = 2.5 \quad 2.5 \times 5 = 12.5$$

[1]

12.5

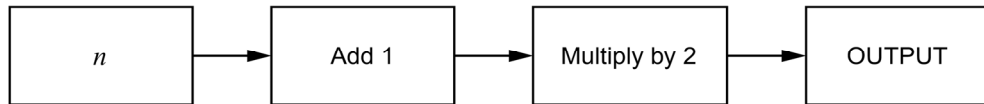
- (iii) The output is 45.
What is the input?

$$45 \div 5 = 9 \quad 9 + 4 = 13$$

[1]

13

(b) Here is a different number machine.



(i) The input, n , is always a whole number for this number machine.

Which **one** of these statements describes the output?
Circle your answer.

It must be odd

It must be even

It is sometimes odd
and sometimes even

Show how you decided.

[1]

If you multiply any number by 2
it makes 2 a factor and is
therefore even.

(ii) Write an expression for the output.
Give your answer in terms of n .

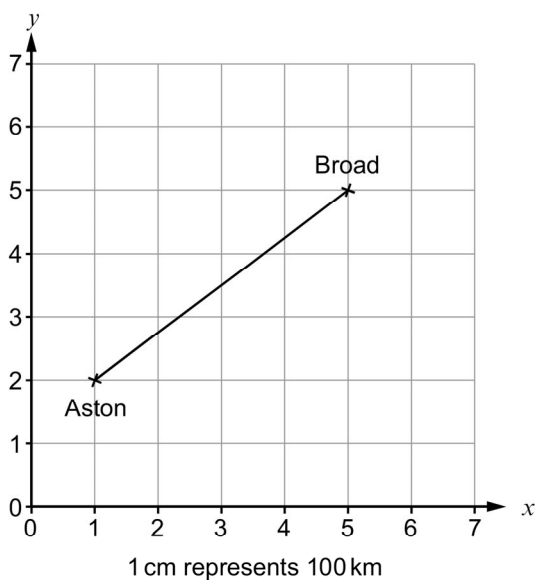
[1]

$$2n + 2$$

$$n \rightarrow n+1 \rightarrow 2(n+1) \\ = 2n+2$$

Turn over.

11. The grid shows a scale drawing of the flight path of a plane from Aston to Broad.



- (a) Write down the coordinates of Aston.

[1]

(1, 2)

- (b) The scale of the drawing is 1 cm represents 100 km.
On average, the plane flies 4 km for each litre of fuel used.

Work out how much fuel is used to fly from Aston to Broad.

[3]

Aston → Broad = 5 cm
 5 cm = 500 km (x100)
 125
 4 | 500

Fuel used is 125 litres.

12. Sam thinks of a number. His number is n .

Anwen, Bea and Carl also think of numbers.
Their numbers are shown in the table.

Sam	n
Anwen	$n - 7$
Bea	$4n$
Carl	$\frac{n}{2}$

- (a) Anwen's number is seven less than Sam's number.

Using words, complete the following statement.

[1]

Bea's number is four times Sam's number.

- (b) Carl says:

'My number is double Sam's number.'

Explain why Carl is not correct.

[1]

Should be "half Sam's number"

- (c) David thinks of a number. His number is 9 more than Anwen's number.

Write an expression, in terms of n , for David's number.
Give your answer in its simplest form.

[1]

$$n - 7 + 9 = n + 2$$

- (d) Anwen's number is 63.

Find Carl's number.

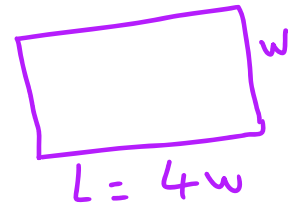
[3]

$$\begin{array}{r} n - 7 = 63 \\ +7 \quad \quad +7 \end{array}$$

$$n = 70$$

$$\frac{n}{2} = \frac{70}{2} = 35$$

Turn over.

Examiner
only

13. (a) The area of a rectangle is 100 cm^2 .
The length of the rectangle is 4 times its width.

Work out the width of this rectangle.

[2]

$$w \times 4w = 100$$

$$4w^2 = 100$$

$$w^2 = 25$$

$$w = 5\text{ cm}$$

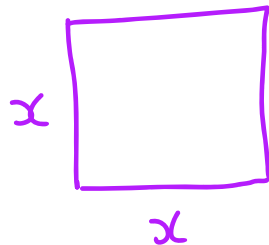
 $\div 4$
 $\sqrt{}$

- (b) A square has sides of length $x\text{ cm}$.
The length of a rectangle is equal to the perimeter of this square.
The perimeter of this rectangle is $14x\text{ cm}$.

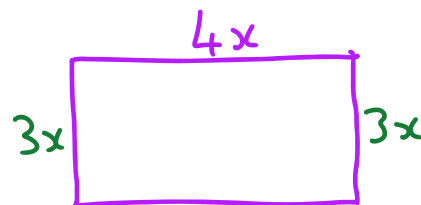
Find an expression for the width of this rectangle.
Give your answer in terms of x .

[2]

$$3x$$



$$\text{Perimeter} = 4x$$



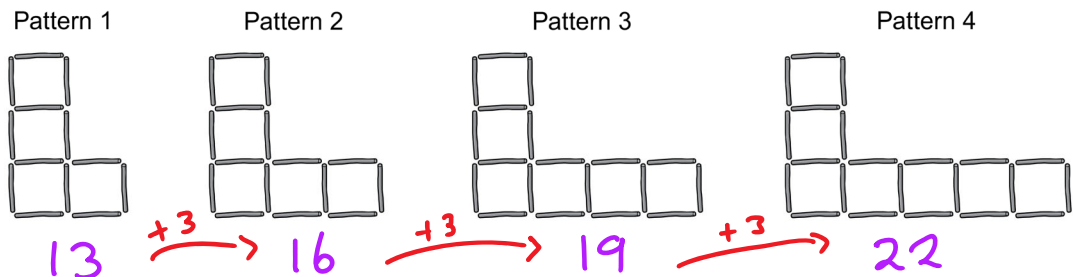
$$\rightarrow 4x$$

$$\text{Perimeter} = 14x$$

$$14x - 4x - 4x = 6x$$

$$6x \div 2 = 3x$$

14. Jodie makes 4 patterns using these straight sticks .



Jodie has 90 sticks left after making patterns 1, 2, 3 and 4.

She continues this sequence of patterns, starting with pattern 5.

How many **more** complete patterns can Jodie make before she runs out of sticks?
You **must** show all your working.

[3]

$$\text{Used} = 13 + 16 + 19 + 22 = 70$$

$$\text{Pattern 5} = 25$$

$$90 - 70 = 20 \text{ left}$$

$$\text{Pattern 6} = 28$$

$$20 - 25 = -5 \text{ left}$$

$$\text{Pattern 7} = 31$$

$$-5 - 28 = -33 \text{ left}$$

can complete 3 more patterns

15. (a) Pavel has to work out $\sqrt{484}$.
Here is his working.

$$\sqrt{484} = 484 \div 2 = 242$$

Pavel's method is incorrect.
Explain why.

[1]

Square rooting is not the same as dividing by 2
 $242 \times 242 \neq 484$

- (b) Nina works out $0.54 + 0.23 + 2$.
Here is her working.

$$\begin{array}{r} 0.54 + 0.23 + 2 = \\ 0.54 \\ 0.23 \\ \underline{2} + \\ 0.79 \end{array}$$

Nina's friend says that this answer is too small.
Explain why Nina's friend is correct.

[1]

The 2 is in the wrong column, should be in the units column.

Turn over.

16. Ahmed, Blake and Cath are given cash tips when working in a cafe. They share the tips in the ratio of the hours they work each week.

- (a) One week, Ahmed works for 5 hours, Blake works for 6 hours and Cath works for 12 hours.
Cath's share of the tips for this week is £18.

Work out Ahmed's share of the tips.

$$12 \overline{) 18.60} \begin{array}{r} 01.5 \\ \underline{12} \\ 60 \\ \underline{60} \\ 0 \end{array}$$

[2]

$$\begin{array}{l} A : B : C \\ 5 : 6 : 12 \\ \times 1.5 \quad \times 1.5 \quad \times 1.5 \\ \hline 7.5 : 9 : 18 \end{array}$$

$$£ 7.50$$

- (b) The following week, the tips total £72.
Blake works twice as many hours as Ahmed.
Cath works three times as many hours as Ahmed.

How much is Blake's share of the tips?

[3]

$$\begin{array}{l} A : B : C \\ x : 2x : 3x \\ x + 2x + 3x = 6x \\ 72 = 6x \\ 12 = x \end{array}$$

$$12 : 24 : 36$$

$$\underline{24}$$

17. Dev buys and downloads music.

The number of tracks he buys in one month and the **approximate** prices paid are shown in the table below.

Price per track (pence)	70	80	90	100
Frequency	5	1	2	2

- (a) Using the values in the table, calculate an estimate of the mean price paid per track. [3]

$$70 \times 5 = 350$$

$$80 \times 1 = 80$$

$$90 \times 2 = 180$$

$$100 \times 2 = 200$$

$$350 + 80 + 180 + 200 = 810p$$

$$810 \div 10 = 81p$$

- (b) All of the actual prices paid were **rounded up** to give the values in the table.

Is the mean price per track higher or lower than your estimate in part (a)?
Give a reason for your answer.

[1]

Lower as the real prices were lower

Turn over.

18. The diagram shows a rectangular garden, ABCD.

The garden is to be enclosed by a wire fence.
There must be a gap of 2 m for the gate.

Wire fencing costs

- £32 for a whole 10 m roll
- £4.50 per metre

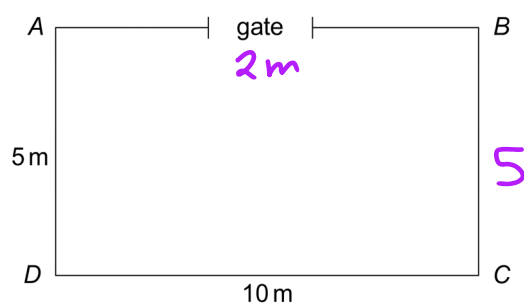


Diagram not drawn to scale

Work out the cheapest cost of enclosing the garden with this wire fencing.
Justify your answer.

[4]

$$10 + 5 + 5 + 8 = 28\text{m}$$

$$\text{Try 3 rolls} \rightarrow 32 \times 3 = £96$$

$$\text{Try 2 rolls + add on} \rightarrow 32 \times 2 = 64$$

$$\begin{array}{r} 4.50 \\ \times \quad 8 \\ \hline 36.00 \\ \hline \end{array} = 36 + \underline{100}$$

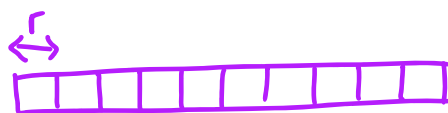
3 rolls for £96 is cheapest.

19. Amy needs 14 identical pieces of ribbon to gift wrap some presents.
 Amy has two rolls of ribbon that are the same length.
 She cuts 10 pieces from the first roll of ribbon and has none left over.
 She cuts the remaining pieces from the second roll of ribbon and has 9 metres left over.

If each piece of ribbon is r metres long, work out the value of r .

[3]

$$r = 1.5\text{m}$$



$$x = 10r$$



$$x = 4r + 9$$

$$\begin{array}{r} 10r = 4r + 9 \\ -4r \quad -4r \end{array}$$

$$\begin{array}{r} 6r = 9 \\ \div 6 \quad \div 6 \end{array}$$

$$r = \frac{9}{6} = \frac{3}{2} = 1.5\text{m}$$

Turn over.

20. The table gives some information about the nutritional value of 1000 grams of a breakfast cereal.

Every 1000 g contains:	
Fat	65 g
of which saturated fat	40 g
Protein	80 g
Salt	2 g

- (a) Show that

$$\text{saturated fat : other fat} = 8 : 5$$

[2]

$$\begin{aligned} \text{Other} &= 65 - 40 \\ &= 25 \end{aligned} \quad \begin{array}{l} 40 : 25 \\ \div 5 \quad \div 5 \\ 8 : 5 \end{array}$$

- (b) How much salt is there in a 50 gram serving of this cereal?

[3]

$$1000 \div 50 = 20$$

$$\begin{array}{r} 0020 \\ 50 \overline{)1000} \end{array}$$

$$2 \div 20 = 0.1 \text{ g}$$

$$\begin{array}{r} 0.1 \\ 20 \overline{)2.0} \end{array}$$

- (c) It is recommended that an adult eats no more than 6 grams of salt per day.

Meena is an adult and eats a 50 gram portion of the cereal.

What fraction of her daily salt intake does Meena eat?
Give your answer as a fraction in its simplest form.

[2]

$$\frac{0.1}{6} \times 10 = \frac{1}{60}$$

21. (a) Solve $7x + 2 = 3x + 4$.

[2]

$$4x + 2 = 4$$

$$\begin{array}{r} -2 \\ -2 \end{array}$$

$$4x = 2$$

$$\begin{array}{r} \div 4 \\ \div 4 \end{array}$$

$$x = \frac{2}{4} = \frac{1}{2}$$

(b) Solve $3 - 2(x - 9) = 5x$.

[3]

$$3 - 2x + 18 = 5x$$

$$-2x + 21 = 5x$$

$$\begin{array}{r} + 2x \\ + 2x \end{array}$$

$$21 = 7x$$

$$\begin{array}{r} \div 7 \\ \div 7 \end{array}$$

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

(c) (i) Solve $7 - 3x < 1$.

[2]

$$\begin{array}{r} + 3x \\ + 3x \end{array}$$

$$7 < 1 + 3x$$

$$\begin{array}{r} -1 \\ -1 \end{array}$$

$$6 < 3x$$

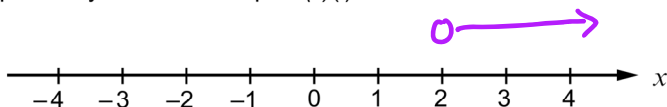
$$\begin{array}{r} \div 3 \\ \div 3 \end{array}$$

$$2 < x$$

$$\text{or } x > 2$$

(ii) Represent your answer to part (c)(i) on the number line below.

[1]



Turn over.

22. Sasha is carrying out a survey into the amount of chocolate teenagers eat in a day.

(a) Here is a question from her survey:

Too much chocolate is bad for your health.
How many pieces of chocolate did you eat yesterday?
Tick (✓) one box.

1-2 ☐ 3-4 ☐ 5-6 ☐

(i) Explain why this is a biased question.

[1]

The first line would persuade you to underestimate and lie to seem healthier.

(ii) State **one** other criticism of the question.

[1]

Cannot answer 0 pieces.

(b) Sasha stands outside a supermarket on a Monday morning and surveys 10 people as they go in.

Are her results likely to be reliable?

Yes ☐ No ☒

Give **two** reasons to support your answer.

[2]

Reason 1:

Monday morning as the only time sampled limits the type of people Sasha will survey

Reason 2:

10 people is not enough to be reliable

23. The scale drawing below shows a lake.
There are two small islands in the lake at *A* and *B*.
The lifeguard station is marked at *C*.

Swimming is only allowed in the area of the lake that is,

- nearer to *A* than it is to *B* and
- less than 60 metres from *C*.

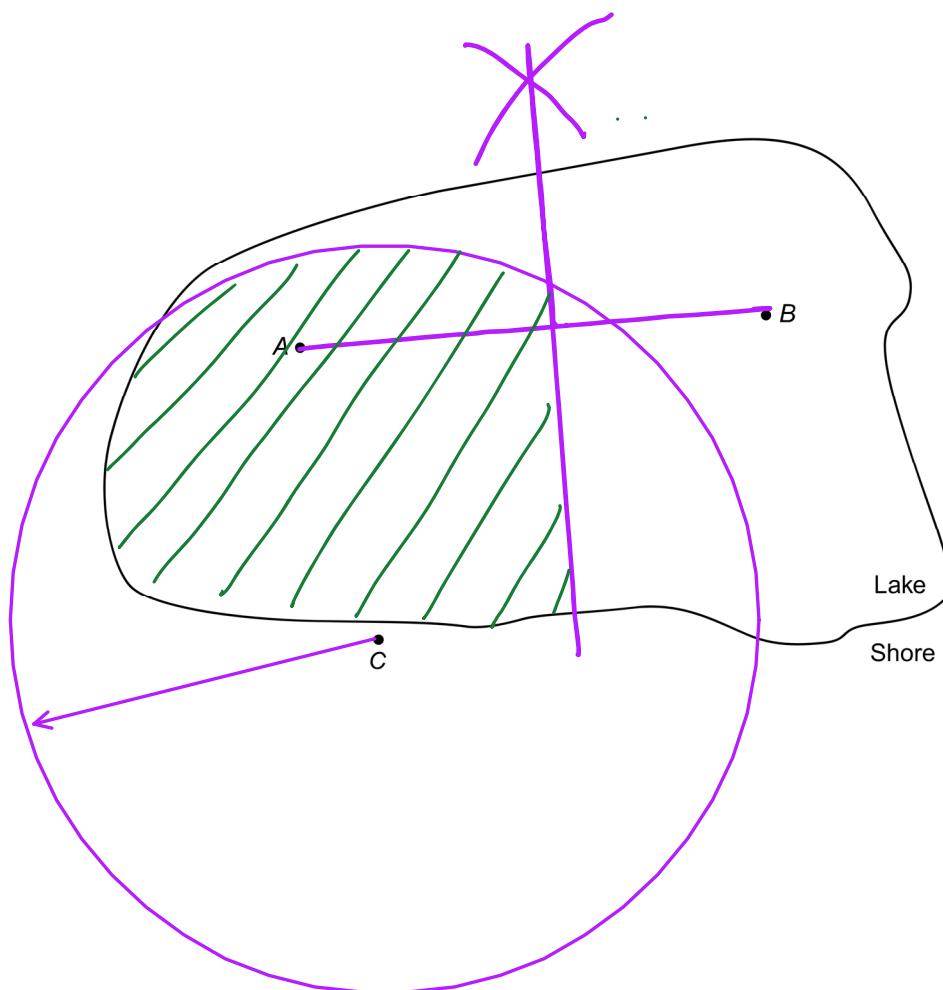
Using a ruler and a pair of compasses, show accurately on the diagram the area where swimming is allowed.

Shade the area where swimming is allowed.

Use the scale 1 cm represents 10 m.

[4]

$$60\text{ m} = 6\text{ cm}$$



Turn over.

24.

$$\mathbf{p} = \begin{pmatrix} 6 \\ -1 \end{pmatrix} \text{ and } \mathbf{q} = \begin{pmatrix} -4 \\ 7 \end{pmatrix}$$

(a) Work out the column vector $\mathbf{p} + 3\mathbf{q}$.

$$3\mathbf{q} = 3 \begin{pmatrix} -4 \\ 7 \end{pmatrix} = \begin{pmatrix} -12 \\ 21 \end{pmatrix} \quad [2]$$

$$\begin{aligned} \mathbf{p} + 3\mathbf{q} &= \begin{pmatrix} 6 \\ -1 \end{pmatrix} + \begin{pmatrix} -12 \\ 21 \end{pmatrix} \\ &= \begin{pmatrix} -6 \\ 20 \end{pmatrix} \end{aligned}$$

(b) When $\mathbf{p} + m\mathbf{q} = \begin{pmatrix} 10 \\ n \end{pmatrix}$, find the value of m and the value of n .

[3]

$$\begin{pmatrix} 6 \\ -1 \end{pmatrix} + m \begin{pmatrix} -4 \\ 7 \end{pmatrix} = \begin{pmatrix} 10 \\ n \end{pmatrix}$$

$$\begin{array}{rcl} 6 & - & 4m = 10 \\ -6 & & -6 \end{array}$$

$$\begin{array}{rcl} -4m & = & 4 \\ \div -4 & & \div -4 \end{array}$$

$$m = -1$$

$$-1 + 7m = n$$

$$-1 + 7 \times -1 = n$$

$$-1 + -7 = n$$

$$-8 = n$$

$$m = -1 \qquad n = -8$$

25. The table shows the cost of sending items using a delivery service.

Mass less than	Full insurance against being lost:		
	£250	£750	£1500
100 g	£5	£7	£9
250 g	£7.50	£9.50	£11.50
1000 g	£9.25	£11.25	£13.25
1750 g	£11	£13	£15
2500 g	£13.50	£15.50	£17.50
5000 g	£18	£20	£22

Riley is planning to send **two** laptops to James using this delivery service. The laptops are to be sent with full insurance against being lost.

Each laptop is worth £700 and has a mass of 1250 g, **correct to the nearest 50 g**.

Riley says,

The delivery charge is **more** than £20.

James says,

You can send these for **less** than £20.

Explain how Riley and James could have come to their conclusions. Show all your working and state any assumption that you make.

[4]

Riley $\rightarrow 2 \times £700 = £1400$
 $2 \times 1250g = 2500g$
 Riley is probably thinking together they are worth £1400 so need £1500 insurance as £750 is far too low and as the mass is only approximately 2500g and could be more he is going with the 5000g row to be sure leaving a cost of £22.
 James may be thinking similarly on cost but taking the risk that the mass is going to be below 2500g so will be £17.50

Turn over.

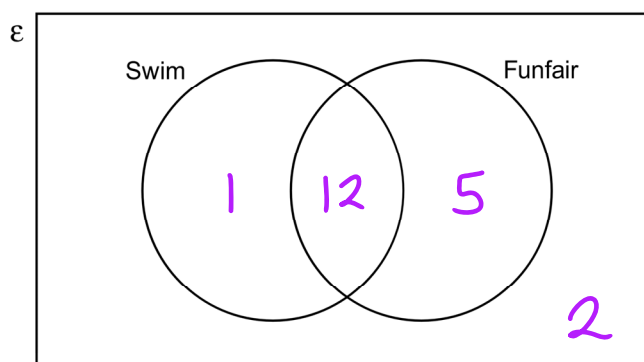
26. Twenty people go on a trip to the seaside.

Of these 20 people

- 13 swim in the sea
- 17 go to the funfair
- 2 do not swim in the sea or go to the funfair.

(a) Complete the Venn diagram below to show this information.

[2]



$$20 - 2 = 18$$

$$18 - 17 = 1$$

$$18 - 13 = 5$$

$$18 - (1 + 5) = 12$$

One person is chosen at random.

(b) Find the probability that this person swims in the sea and goes to the funfair.

[1]

$$\frac{12}{20}$$

(c) Find the probability that this person either swims in the sea or goes to the funfair, but does not do both.

[2]

$$\frac{1+5}{20} = \frac{6}{20}$$

27. In the diagram below, $ABCDEF$ is a regular hexagon.

Explain why triangle BDF is equilateral.

all angles + sides same

[3]

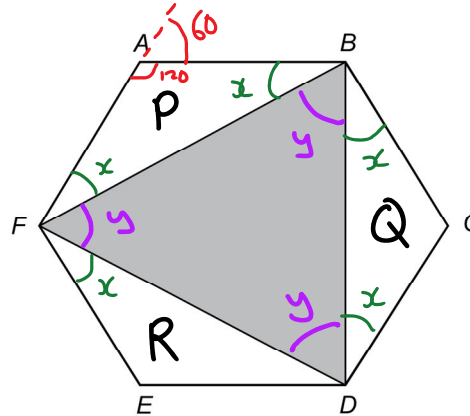


Diagram not drawn to scale

$$360 \div 6 = 60 \quad \leftarrow \text{exterior hexagon angle}$$

$$180 - 60 = 120 \quad \leftarrow \text{interior hexagon angle}$$

Each triangle P , Q and R are congruent (SAS) as they each share 2 sides and an angle of the regular hexagon. So all angles I've labelled x are the same. As these are all the same and they make up the same parts of each interior hexagon angle, the angle y left over must be the same each time. So each angle in the triangle is equal, hence it is an equilateral.

END OF PAPER

Turn over.