Surname StemUp Model Solution	Centre Number	Candidate Number
Other Names		0

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GCSE – NEW

3310U40-1

S17-3310U40-1

MATHEMATICS – NUMERACY
UNIT 2: CALCULATOR-ALLOWED
INTERMEDIATE TIER

THURSDAY, 8 JUNE 2017 – MORNING

1 hour 45 minutes

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

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 or use the π button on your calculator.

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.

In question **9***(b)*, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	3	
2.	3	
3.	3	
4.	2	
5.	3	
6.	9	
7.	5	
8.	5	
9.	12	
10.	3	
11.	2	
12.	4	
13.	8	
14.	4	
15.	8	
16.	6	
Total	80	

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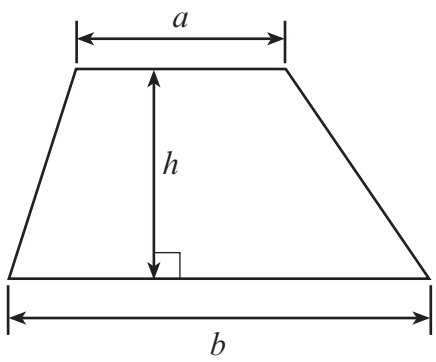
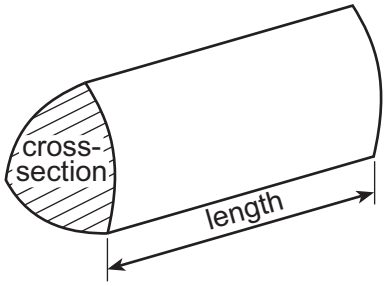
Formula List – Intermediate Tier

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



Volume of prism = area of cross-section × length



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1.

Bus timetable from Orme Station to Outlet Village

Only 55 minutes from Orme Station direct to Outlet Village.

Buses leave the station
- every 12 minutes from 8 a.m. until 12 noon
- every 24 minutes from 12 noon until 10 p.m.

(a) At what time does the first bus after 09:00 leave Orme Station?
Circle your answer. [1]

09:05 09:12 09:18 09:24 09:30

(b) Gwil looks at the timetable shown above.
He decides to take the latest possible bus to be at Outlet Village by 15:00.

At what time will Gwil arrive at Outlet Village?
You must show all your working. [2]

From 12 noon buses leave every 24 minutes:

12:00, 12:24, 12:48, 13:12, 13:36, 14:00, 14:24

To arrive by 15:00 he must leave by 15:00 − 55 min = 14:05

Latest bus = 14:00. 14:00 + 55 minutes = 14:55

Gwil arrives at Outlet Village at 14:55

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2. Luigi lives in south Wales.
Rosina lives in west Wales.
For each of the first 65 days of 2017, they recorded whether or not it rained.

Luigi recorded that it rained on 28 of these days.
Rosina recorded that it rained on 40% of these 65 days.

Luigi says,

'For the first 65 days of 2017, there were more days with rain where I live than where Rosina lives.'

Is Luigi correct?
You must show all your working. [3]

Luigi (south Wales): rain on 28 days

Rosina (west Wales): 40% of 65 = 0.40 × 65 = 26 days

28 days > 26 days

Yes, Luigi is correct. It rained on 28 days where Luigi lives

but only on 26 days where Rosina lives.

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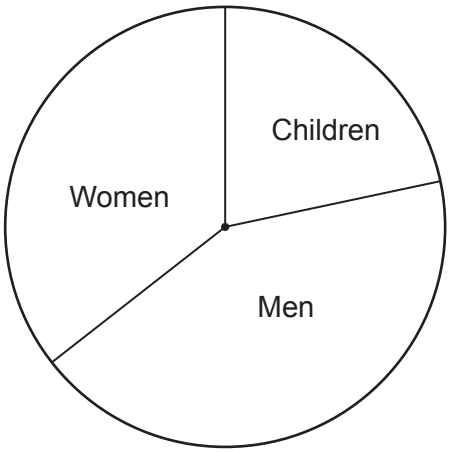
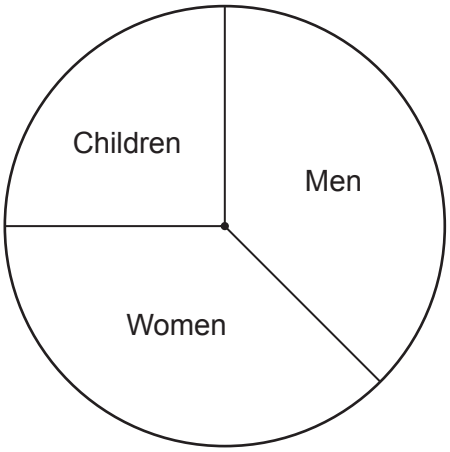
3. Tomos is looking at gym memberships for *Hadon's Gym* and *Workout Palace*.
Each of these gyms displays its membership in a pie chart.

Hadon's Gym	*Workout Palace*
	

(a) About what percentage of the members at *Hadon's Gym* are children?
Circle your answer. [1]

10% 20% 30% 40% 50%

.....

.....

(b) Which of the following is the best estimate for the percentage of the members at *Workout Palace* who are women?
Circle your answer. [1]

25% 28% 30% 32% 38%

.....

.....

(c) Tomos says,
'There are more men with membership at *Hadon's Gym* than at *Workout Palace*.'

Is Tomos **certain** to be correct?
You must give a reason for your answer. [1]

Yes ☐ No ☑

No. The pie charts only show the proportions, not how many members each gym has. Workout Palace could have many more members in total.

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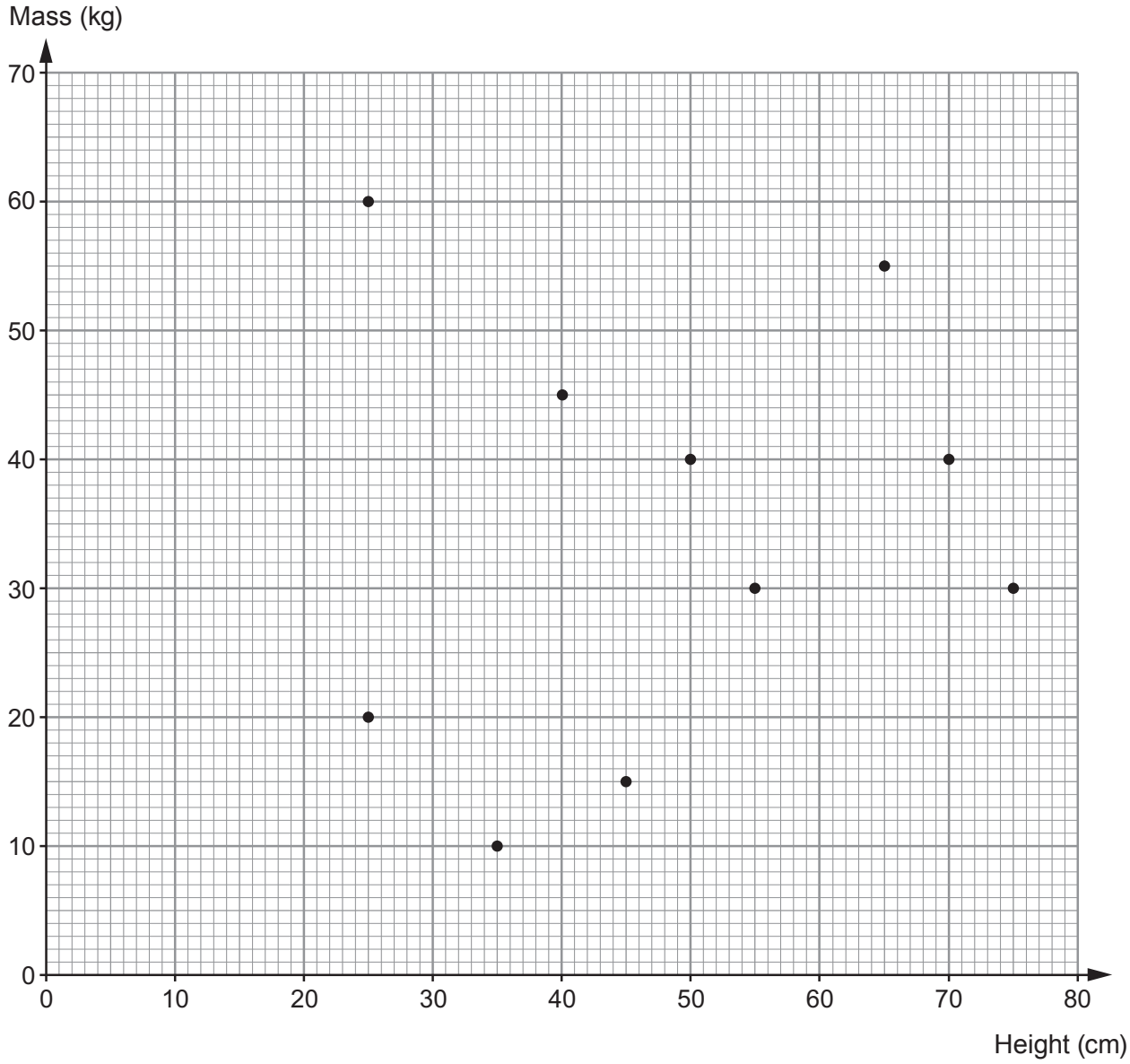
4. A group of friends measured the heights and masses of their pets.
The scatter diagram shows the results.



(a) Describe the correlation shown by this scatter diagram. [1]

No correlation

(b) The friends notice that the tallest pet has the same mass as another pet.
What is the height of this other pet? [1]

55 cm

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5. Glenda plans to drive from Flint to Cardiff.

On a long journey, her average speed is usually 42 mph.

Last time she drove from Flint to Cardiff it took her $3\frac{1}{2}$ hours.

(a) Use this information to calculate the distance between Flint and Cardiff. [2]

Distance = speed × time

= 42 × 3½

= 42 × 3.5 = 147 miles

147 miles

(b) Give a possible reason why your answer in *(a)* is only an estimate of the distance between Flint and Cardiff. [1]

Her average speed on this journey might not be 42 mph,

for example the traffic could be different this time.

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6. *(a)* Gustav is making some scones for his sister's birthday party.

> Recipe to make **12 scones**
>
> 450 g self raising flour
> 2 teaspoons of baking powder
> 75 g butter
> 50 g caster sugar
> 2 eggs
> 225 ml milk
>
> Bake at **428°F** for 10 to 15 minutes

(i) How much self raising flour will Gustav need to make 30 scones?
Circle your answer. [1]

900 g 1000 g 1100 g 1125 g 1350 g

$30 \div 12 = 2.5$, $450\ g \times 2.5 = 1125\ g$

(ii) In the recipe, the temperature of the oven is given in degrees Fahrenheit, *F*.
The temperature gauge on Gustav's oven shows degrees Celsius, *C*.

The formula below is used to convert Fahrenheit into Celsius.

$$C = \frac{5F - 160}{9}$$

At what temperature should Gustav bake the scones?
Give you answer in degrees Celsius. [2]

$C = (5 \times 428 - 160) \div 9$

$= (2140 - 160) \div 9$

$= 1980 \div 9 = 220$

220 °C

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(b) Gustav also makes a birthday cake for his sister.
The top face of the cake is in the shape of a trapezium.

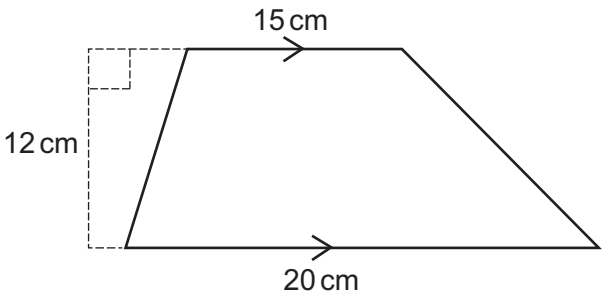


Diagram not drawn to scale

Gustav plans to ice the top face of the cake.
Each packet of icing costs £1.35 and is enough to cover 65 cm^2.
He has to buy complete packets of icing.

(i) Calculate the area of the top face of the cake Gustav has made. [2]

Area = ½(a + b)h = ½ × (15 + 20) × 12

= ½ × 35 × 12

= 210 cm^2

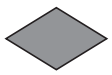
(ii) How much will it cost Gustav to ice the top face of the cake?
You must show all your working. [3]

Packets needed: 210 ÷ 65 = 3.23... so 4 packets

Cost = 4 × £1.35 = £5.40

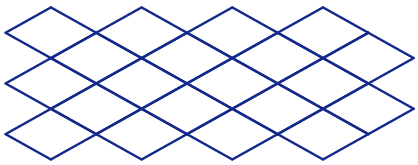
It will cost Gustav £5.40

(iii) Gustav also plans to decorate the cake with small pieces of marzipan shaped as shown below.
The top face of each piece of marzipan is a rhombus.
Will these pieces of marzipan tessellate?



Yes ☑ No ☐

Draw a simple diagram to support your answer. [1]



Four rhombuses meet at each point: the angles add up to 360°.

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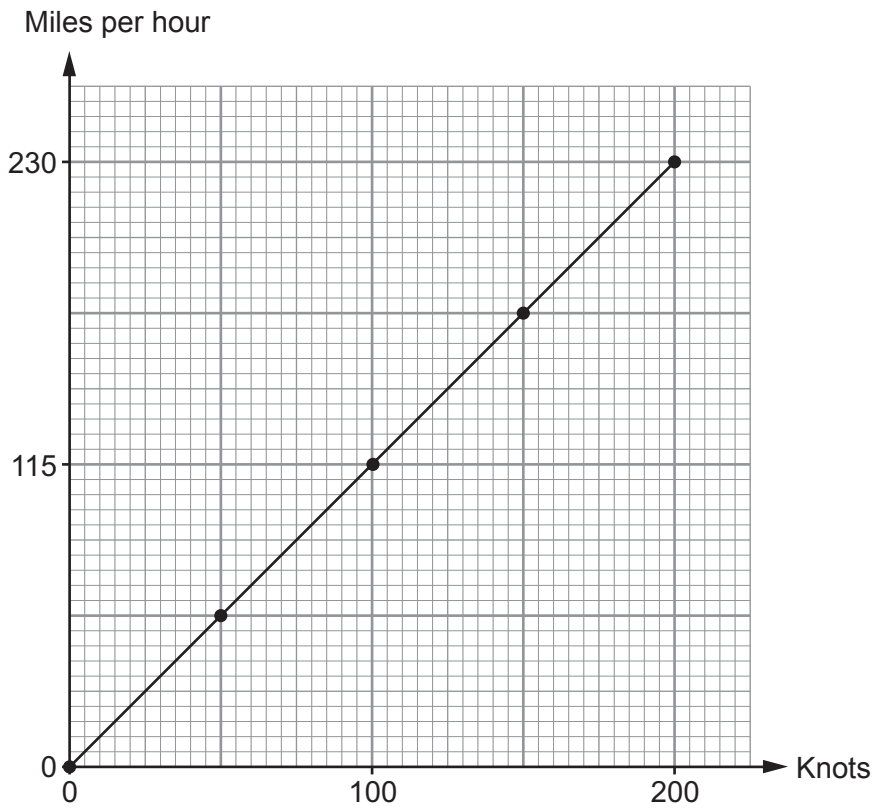
7. Alun has made his own conversion graph to change knots to miles per hour.



(a) Use Alun's conversion graph to write 150 knots in miles per hour. [1]

200 knots = 230 mph, so 100 knots = 115 mph and 50 knots = 57.5 mph

150 knots = 115 + 57.5

150 knots = 172.5 mph

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(b) Nikita thinks Alun's conversion graph may be inaccurate.

Nikita knows that 1000 knots is 1150.779 miles per hour, correct to 3 decimal places.

Convert 20 knots to miles per hour
- using Alun's conversion graph, and then
- using Nikita's values.

Calculate the difference, in miles per hour, between your answers.
Give your answer correct to 2 decimal places.
You must show all your working. [4]

Alun's graph: 200 knots = 230 mph

20 knots = 230 ÷ 10 = 23 mph

Nikita's values: 1000 knots = 1150.779 mph

20 knots = 20 × 1150.779 ÷ 1000

= 23.01558 mph

Difference = 23.01558 − 23

= 0.01558 mph

= 0.02 mph (to 2 decimal places)

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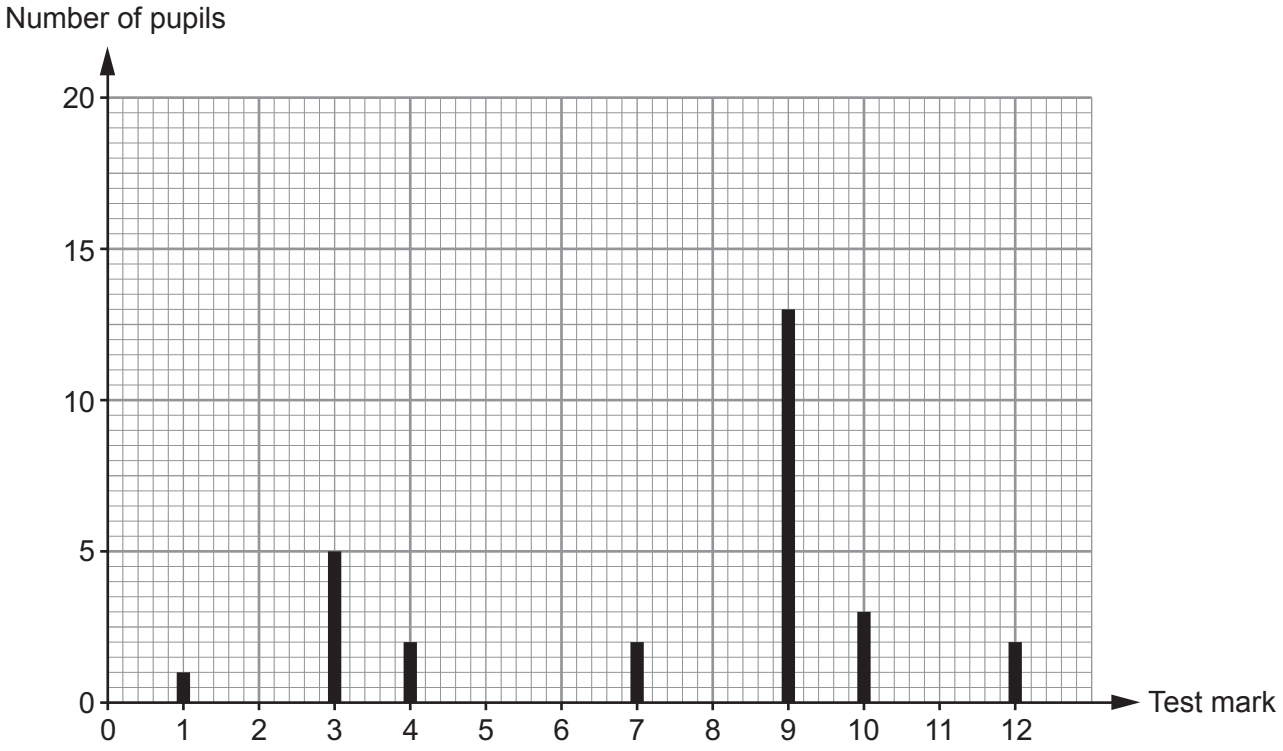
8. *(a)* Miss Rashud gave her Year 9 French class a test on Wednesday.
She asked her class to spell 12 different words.

She displays the results as shown below.

Year 9 results



(i) How many pupils scored **more than 9** in the test? [1]

Scored 10 or 12: 3 + 2 = 5 pupils

(ii) How many pupils are there in Miss Rashud's French class? [1]

1 + 5 + 2 + 2 + 13 + 3 + 2 = 28 pupils

(iii) What assumption have you made in answering part (ii)? [1]

That every pupil in the class was present and took the test on Wednesday (nobody was absent).

(b) Miss Rashud also gave the same test to her Year 10 French class on Wednesday.
She asked her class to spell the same 12 words.

She displays the results as shown opposite.

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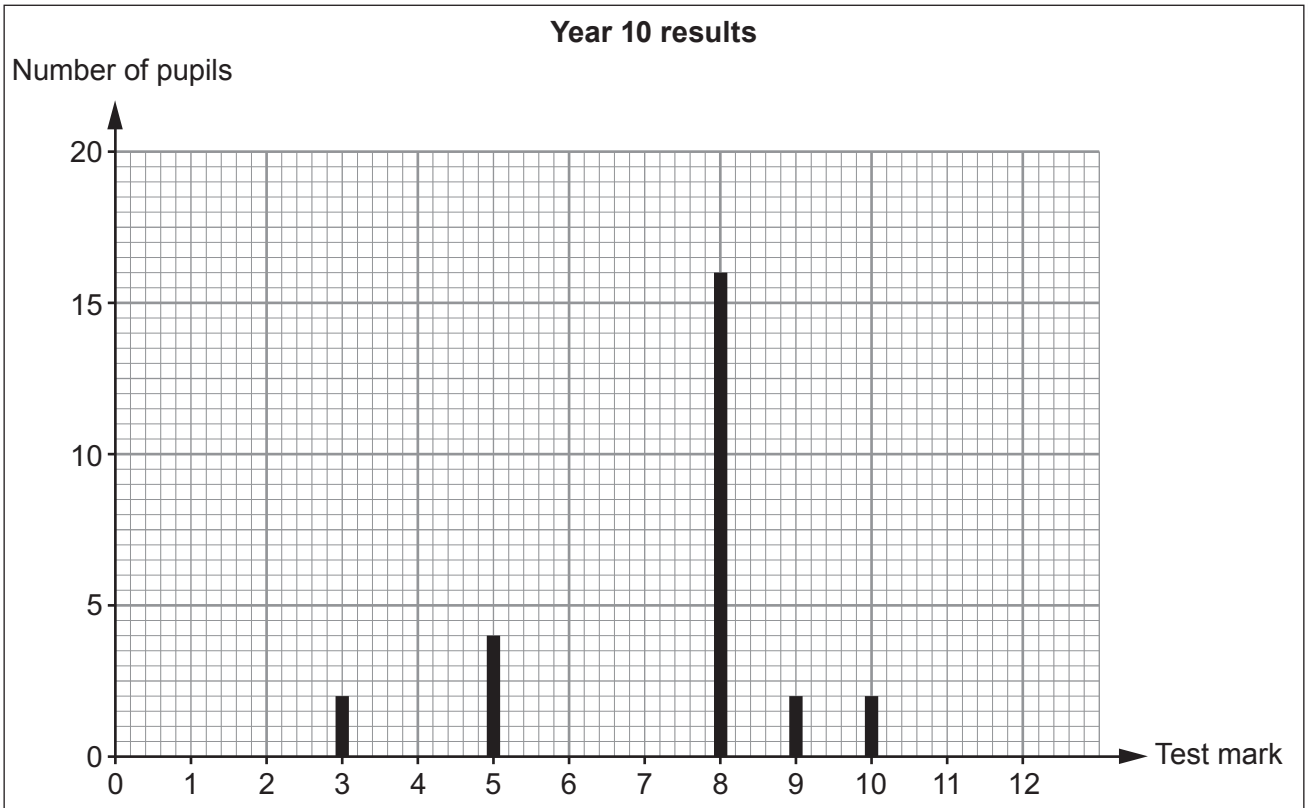

(i) Leon says,

'By looking at the **Year 10** graph, I think there is very little difference between the mode and the mean for these scores.'

Without calculating the mean, explain whether Leon is correct or not. [1]

Correct ☑ Not correct ☐

16 of the 26 pupils scored 8 (the mode) and the other scores are spread either side of 8, so the mean will be close to 8.

(ii) Catrin looks at the two sets of data Miss Rashud has displayed.
She says,

'Year 10 are better at spelling than Year 9.'

Is Catrin's statement correct?
You must give values to support your answer. [1]

Catrin is correct ☐ Catrin is incorrect ☑

Year 9: 13 + 3 + 2 = 18 pupils scored 9 or more.

Year 10: only 2 + 2 = 4 pupils scored 9 or more.

Year 9 mode = 9 marks but Year 10 mode = 8 marks.

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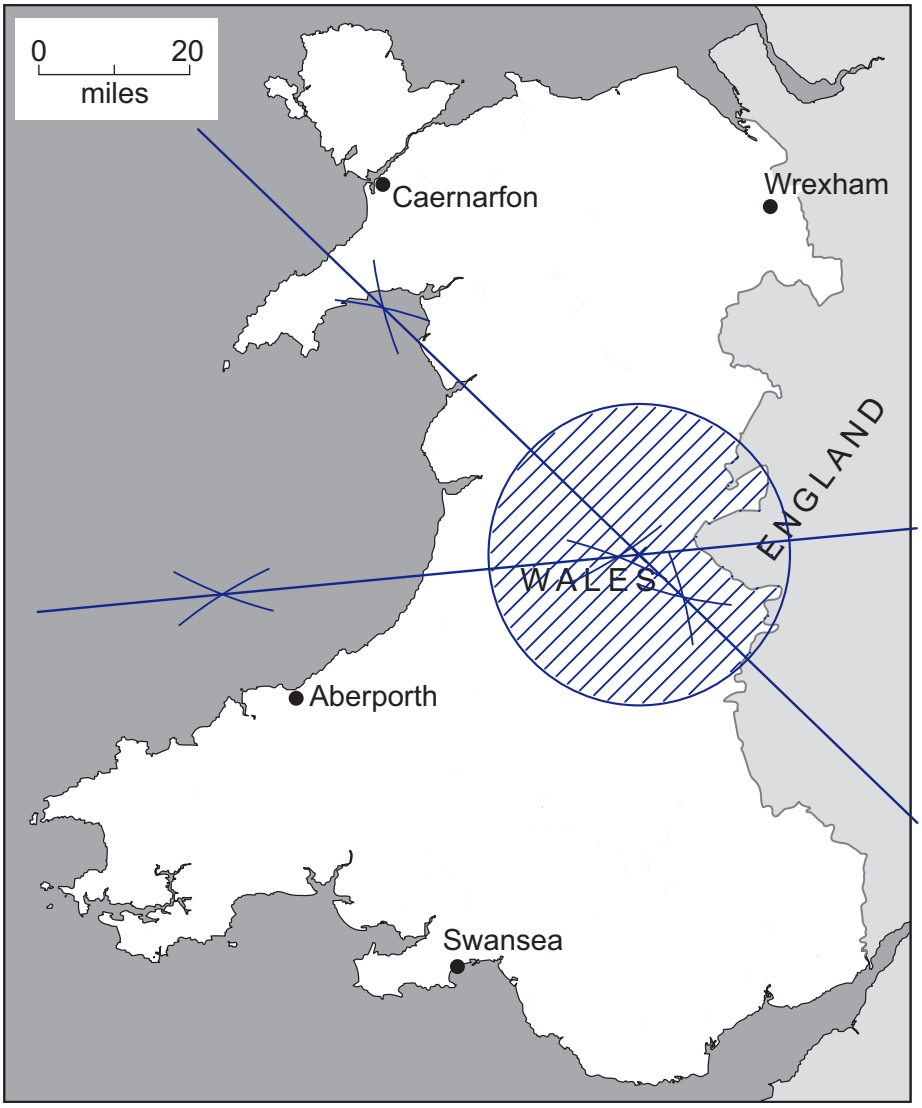
9. *(a)* *Organics4U* is planning to have its headquarters in Wales.
The manager has instructed Ffion to look for a site for the headquarters.

Here are the instructions that Ffion has been given by her manager.

'Find the point that is
- an equal distance between Wrexham and Aberporth, and
- an equal distance between Caernarfon and Swansea.

The new headquarters needs to be within 20 miles of this point.'

On the map below, shade the region, **in Wales**, that Ffion should identify for her manager. [4]



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(b) *In this part of the question, you will be assessed on the quality of your organisation, communication and accuracy in writing.*

Organics4U has 16 vehicles on the road every working day.
The company has 6 vans and 10 trucks.

Ffion has the following information for each type of vehicle.

Type of vehicle	Average distance travelled per litre (km per litre)	Average distance travelled per day (km per day)
Van	8	256
Truck	5·5	704

The fuel used by all of the 16 vehicles costs £1.10 per litre.
Use this information to calculate the **total** fuel bill for 1 working day.
You must show all your working. [6 + 2 OCW]

Fuel used by one van per day = 256 ÷ 8 = 32 litres

Fuel used by 6 vans = 6 × 32 = 192 litres

Cost of fuel for 6 vans = 192 × £1.10 = £211.20

Fuel used by one truck per day = 704 ÷ 5.5 = 128 litres

Fuel used by 10 trucks = 10 × 128 = 1280 litres

Cost of fuel for 10 trucks = 1280 × £1.10 = £1408.00

Total fuel used = 192 + 1280 = 1472 litres

Total fuel bill = £211.20 + £1408.00 = £1619.20

Check: 1472 litres × £1.10 = £1619.20

The total fuel bill for 1 working day is £1619.20.

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10. Mali's scooter depreciated (decreased) in value by 24% in the **first** year.
In all further years, her scooter depreciated by 13% of its previous year's value.
She originally paid £850 for her scooter.
Calculate the value of Mali's scooter after 7 years. [3]

First year: 100% − 24% = 76%, so multiplier 0.76

Value after 1 year = 850 × 0.76 = £646

Further years: 100% − 13% = 87%, so multiplier 0.87

Value after 7 years = 646×0.87^6 (6 more years)

= 646 × 0.433626...

= 280.1225...

= £280.12

After 7 years, the value of Mali's scooter was £ 280.12

11. Sanjay stacks three boxes in a pile.
The heights of the boxes are 25 cm, 36 cm and 47 cm.
They are all measured correct to the nearest centimetre.
What is the greatest possible height of the stack of the three boxes? [2]

Upper bounds: 25.5 cm, 36.5 cm, 47.5 cm

25.5 + 36.5 + 47.5 = 109.5 cm

Greatest possible height of the stack of three boxes is 109.5 cm

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12.

Ursula is lying on her surfboard 180 metres away from the foot of a vertical cliff.
The height of the cliff is 146 metres.

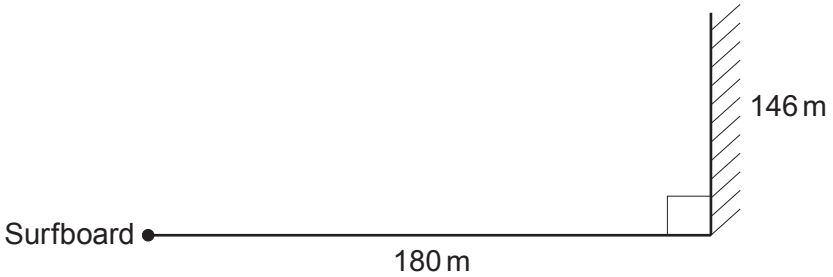

Diagram not drawn to scale

Ursula was told that if the angle of elevation of the top of the cliff from her lying position is between 42° and 45°, it is safe for her to attempt to stand on her surfboard.

Calculate the angle of elevation of the top of the cliff from Ursula's position lying on her surfboard.

State whether it is
- safe for Ursula to attempt to stand, or
- not safe as she is too near the cliff, or
- not safe as she is too far out at sea. [4]

tan x = opposite ÷ adjacent = 146 ÷ 180

tan x = 0.81111...

x = $\tan^{-1}$(0.81111...)

x = 39.04...° = 39.0°

39.0° is less than 42°, so it is not safe for Ursula to stand:

she is too far out at sea.

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13. Marta buys a new television.

(a) Marta wants to fit the television in a bookcase on the wall.
In the shop she forgot to write down the length of the television.
She did write down the height and the diagonal of the screen.

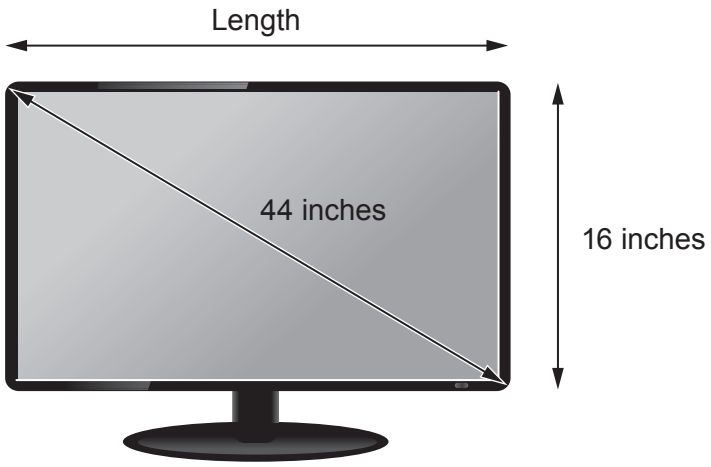

Diagram not drawn to scale

Marta needs to know the length of the screen before she opens the box, in case she wants to return the television.
Calculate the length of the screen.
Give your answer correct to 2 significant figures. [4]

Pythagoras' theorem: $44^2 = L^2 + 16^2$

$L^2 = 44^2 - 16^2 = 1936 - 256$

$L^2 = 1680$

$L = \sqrt{1680} = 40.9878...$

$L = 41$ inches (2 significant figures)

Length is 41 inches, correct to 2 significant figures.

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(b) The television was reduced in the sale by 26% of its original price.
It cost Marta £710.40 in the sale.
What was the original price of the television? [2]

100% − 26% = 74%, so 74% of the price = £710.40

1% = 710.40 ÷ 74 = £9.60

100% = 9.60 × 100 = £960

Original price £ 960

(c) A television uses 1 unit of electricity every 10 hours.
A unit of electricity costs 9.8 p.

(i) Calculate the cost of having a television turned on for 24 hours.
Circle your answer. [1]

£23.52 £2.35 40.83 p 23.52 p 2.45 p

24 ÷ 10 = 2.4 units, 2.4 × 9.8p = 23.52p

(ii) On average, Marta watches 4 hours of television each day.
On average, how much **a week** does it cost her to watch television?
Circle your answer. [1]

27.44 p £27.44 £39.20 39.2 p 10.78 p

4 × 7 = 28 hours = 2.8 units, 2.8 × 9.8p = 27.44p

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14. Elin's old fish tank is leaking.

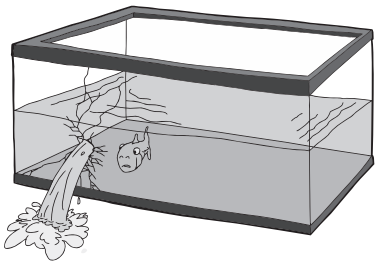

Diagram not drawn to scale

This old fish tank is in the shape of a cuboid.
The base of this tank measures 60 cm by 40 cm.
Before the leak, the height of the water level in Elin's old fish tank was 45 cm.

Elin decides to replace her fish tank with a cylindrical one.

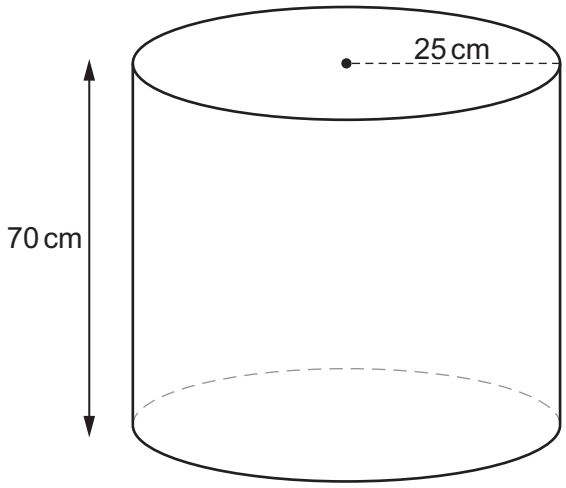

Diagram not drawn to scale

She selects a new cylindrical fish tank that has a radius of 25 cm and a height of 70 cm.

Will all the original contents, including the water and the fish, fit into this cylindrical tank?
You must show all your working. [4]

Volume of old tank contents = 60 × 40 × 45 = 108 000 cm³

Volume of new tank = $\pi r^2 h$ = $\pi \times 25^2 \times 70$

= 137 444.67... cm³

137 444.67 cm³ > 108 000 cm³

Yes, all the original contents will fit into the cylindrical tank.

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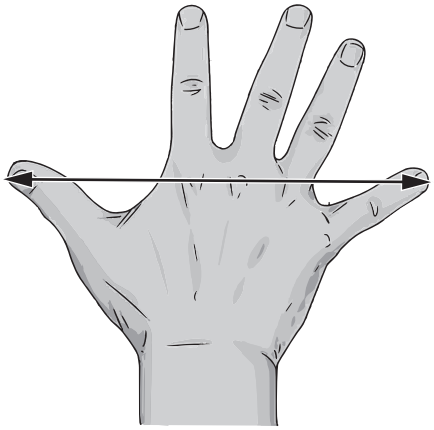
15. Simon plans to make gloves.

(a) One morning, Simon decided to carry out a survey to find the mean hand span of people in Wales.



He decided to sample systematically.
He decided to sample from the first 240 people who pass him in the street during the morning.

He wanted to take 20 people's hand span measurements.
Explain how Simon could use systematic sampling to obtain 20 measurements. [1]

240 ÷ 20 = 12. Choose one of the first 12 people at random, then measure every 12th person after that (e.g. 5th, 17th, 29th, ...) until he has 20 measurements.

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(b) Yesterday morning, Simon only managed to sample 10 people.
He calculated the mean hand span of these 10 people to be 22·8 cm.

Yesterday afternoon, Simon recorded the hand spans of a **further** 20 people.

The results for these 20 people are shown in the frequency table below.

Hand span, to the nearest mm	Frequency
20·0 cm to 20·8 cm	2
20·9 cm to 21·7 cm	3
21·8 cm to 22·6 cm	10
22·7 cm to 23·5 cm	5

Calculate an estimate of the mean of all **30 hand spans** that Simon measured yesterday. [6]

Midpoints: 20.4, 21.3, 22.2, 23.1

Afternoon total = 20.4 × 2 + 21.3 × 3 + 22.2 × 10 + 23.1 × 5

= 40.8 + 63.9 + 222 + 115.5 = 442.2 cm

Morning total = 10 × 22.8 = 228 cm

Total of all 30 hand spans = 228 + 442.2 = 670.2 cm

Mean = 670.2 ÷ 30 = 22.34 cm

Estimate of the mean of all 30 hand spans = 22.34 cm

(c) What could Simon do to improve his estimate of the mean hand span of people in Wales? [1]

Take a bigger sample, for example measure more people from different areas of Wales.

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16. The diagram below shows where Levi wants to attach a string of lights to his house.

Levi wants to attach a single string of lights from *B* to *A* and then from *A* to *C*.
The diagram below shows the measurements Levi has taken.

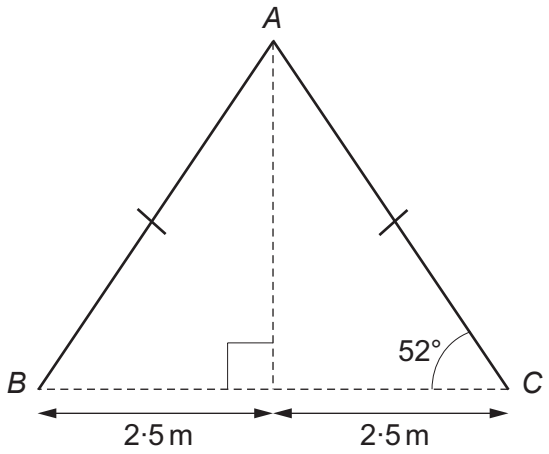

Diagram not drawn to scale

He spends £410 at the electrical store buying a string of lights.
After putting up the lights, Levi finds he has 6 metres of the string of lights left over at one end.

How much did the electrical store charge Levi, per metre, for the string of lights? [6]

cos 52° = adjacent ÷ hypotenuse = 2.5 ÷ AC

AC = 2.5 ÷ cos 52° = 4.06067... m, and AB = AC

Length B to A to C = 2 × 4.06067... = 8.12134... m

Total length bought = 8.12134... + 6 = 14.12134... m

Cost per metre = £410 ÷ 14.12134...

= £29.034...

= £29.03 per metre

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