Surname StemUp Model Solution	Centre Number	Candidate Number
First name(s)		0

GCSE

3310U40-1

A19-3310U40-1

THURSDAY, 7 NOVEMBER 2019 – MORNING

MATHEMATICS – NUMERACY
UNIT 2: CALCULATOR-ALLOWED
INTERMEDIATE TIER

1 hour 45 minutes

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

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 additional page at the back of the booklet. Question numbers must be given for all work written on the additional page.

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 **7***(a)*, the assessment will take into account the quality of your linguistic and mathematical organisation, communication and accuracy in writing.

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01

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CJ*(A19-3310U40-1)

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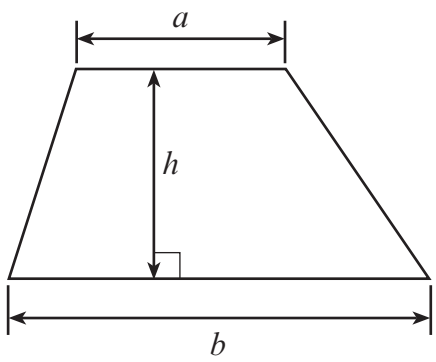
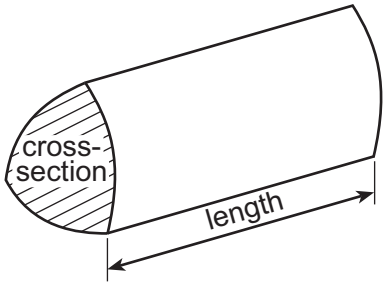
Formula List – Intermediate Tier

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



Volume of prism = area of cross-section × length



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1. Ceri and Paulo both sit the same mathematics test.
The test is marked out of 125.

Ceri scores 78 marks in the test.
Paulo's result is 64%.

Who has the higher result in this mathematics test?
You must show all your working. [3]

Ceri as a percentage = 78 ÷ 125 × 100

= 62.4%

Paulo = 64%

64% > 62.4%, so Paulo has the higher result.

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2. Barrels are used to store liquid.
Glass containers are filled with liquid from a barrel.

The table below gives the capacity of some glass containers and their traditional names.

(a) Complete the table to give the number of bottles equivalent to all the traditional sizes. [2]

Capacity in litres	Number of bottles	Traditional name
0·75	1	Bottle
1·5	2	Magnum
3	4	Jéroboam
4·5	6	Réhoboam
6	8	Methuselah
9	12	Salmanazar
12	16	Balthazar

$3 \div 0.75 = 4$, $4.5 \div 0.75 = 6$, $12 \div 0.75 = 16$

(b) A barrel contains just enough liquid to fill 3 Salmanazars and 1 Magnum.
Which of the following amounts does the barrel hold?
Circle your answer. [1]

4 bottles 28·5 bottles 10·5 bottles 36 bottles 38 bottles

3 Salmanazars + 1 Magnum = $3 \times 12 + 2 = 38$ bottles

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(c) A different barrel contains just enough liquid to fill 30 Magnums.
How many Salmanazars can be filled from this barrel? [2]

30 Magnums = 30 × 2 = 60 bottles

Number of Salmanazars = 60 ÷ 12 = 5

5 Salmanazars

3. Five pupils attended a dance class every Thursday.

For these five pupils:
- the median of their ages is 17 years,
- the mode is 18 years,
- the range of their ages is 8 years,
- one pupil is 2 years older than the youngest pupil.

Coleen now joins this class.
She is two years younger than the mean age of the other 5 pupils.

How old is Coleen?
You must show all your working. [4]

Mode 18 so two pupils are 18. Median 17 so middle age is 17.

Range 8: youngest = 18 − 8 = 10.

One pupil is 2 years older than the youngest: 10 + 2 = 12.

Ages: 10, 12, 17, 18, 18

Mean = (10 + 12 + 17 + 18 + 18) ÷ 5

= 75 ÷ 5 = 15 years

Coleen = 15 − 2 = 13

Coleen is 13 years old.

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4. *(a)* $\frac{6}{11}$ of Jenna's friends have pets.

Of these friends with pets, $\frac{2}{3}$ of them have a dog.

Use this information to answer each of the following questions.

(i) Jenna has 33 friends.
How many of her friends have a pet? [2]

Friends with a pet $= \frac{6}{11} \times 33 = 18$

18 friends

(ii) What fraction of Jenna's friends have a dog? [2]

Fraction with a dog $= \frac{2}{3} \times \frac{6}{11} = \frac{12}{33} = \frac{4}{11}$

(Check: dogs = 2/3 × 18 = 12 friends, 12 out of 33)

(b) 120 people were surveyed.
They were each asked which is their favourite pet: dog, cat or fish.
The numbers who answered dog, cat and fish were in the ratio 63 : 39 : 18.

Express this ratio in its simplest terms. [1]

63 : 39 : 18 (divide each by 3)

= 21 : 13 : 6

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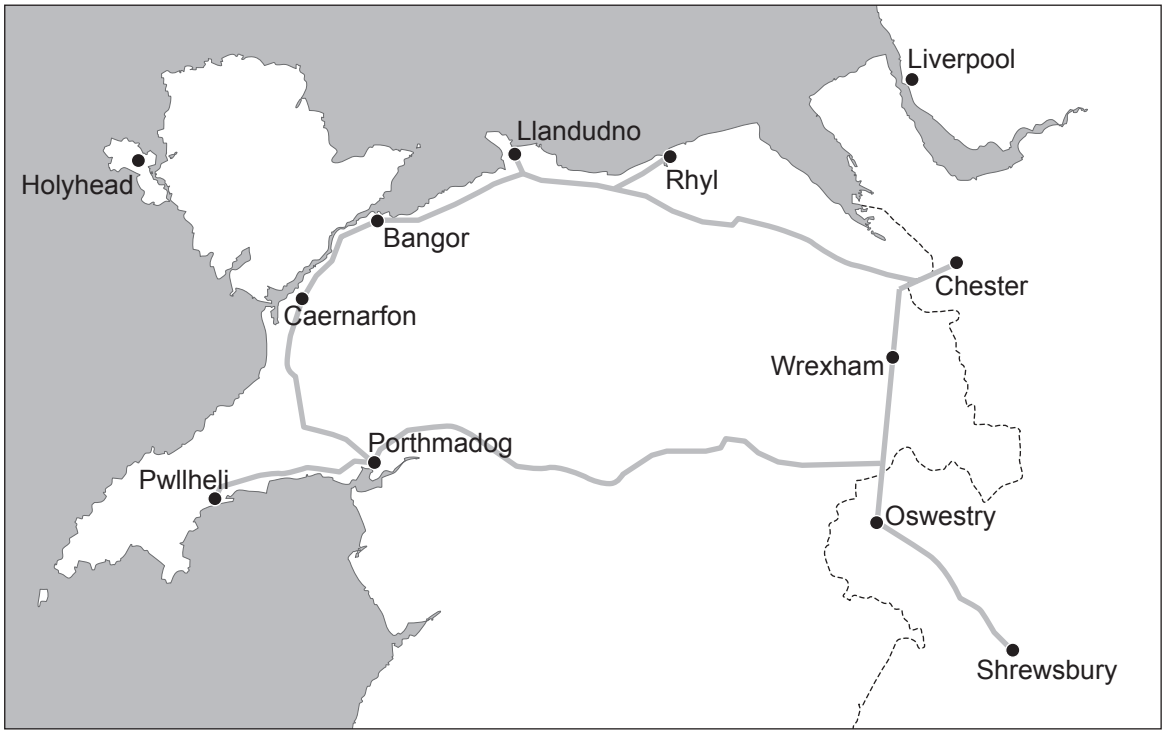
5. A map of north Wales and the border with England is shown below.
The distance between Wrexham and Oswestry is approximately 22 km by road.



(a) The straight-line distance between Wrexham and Oswestry on the map is 2·2 cm.
Which of the following represents the scale of the map?
Circle your answer. [1]

1 : 10 1 : 1000 1 : 10 000 1 : 100 000 1 : 1 000 000

2.2 cm represents 22 km = 2 200 000 cm, so 1 cm : 1 000 000 cm

(b) Lauren travels by road directly from Wrexham to Oswestry.
This journey takes 25 minutes.
Calculate the average speed for Lauren's journey.
Give your answer in km/h. [3]

Time = 25 minutes = 25 ÷ 60 hours = 0.41666... hours

Average speed = distance ÷ time

= 22 ÷ (25 ÷ 60)

= 52.8 km/h

Average speed 52.8 km/h

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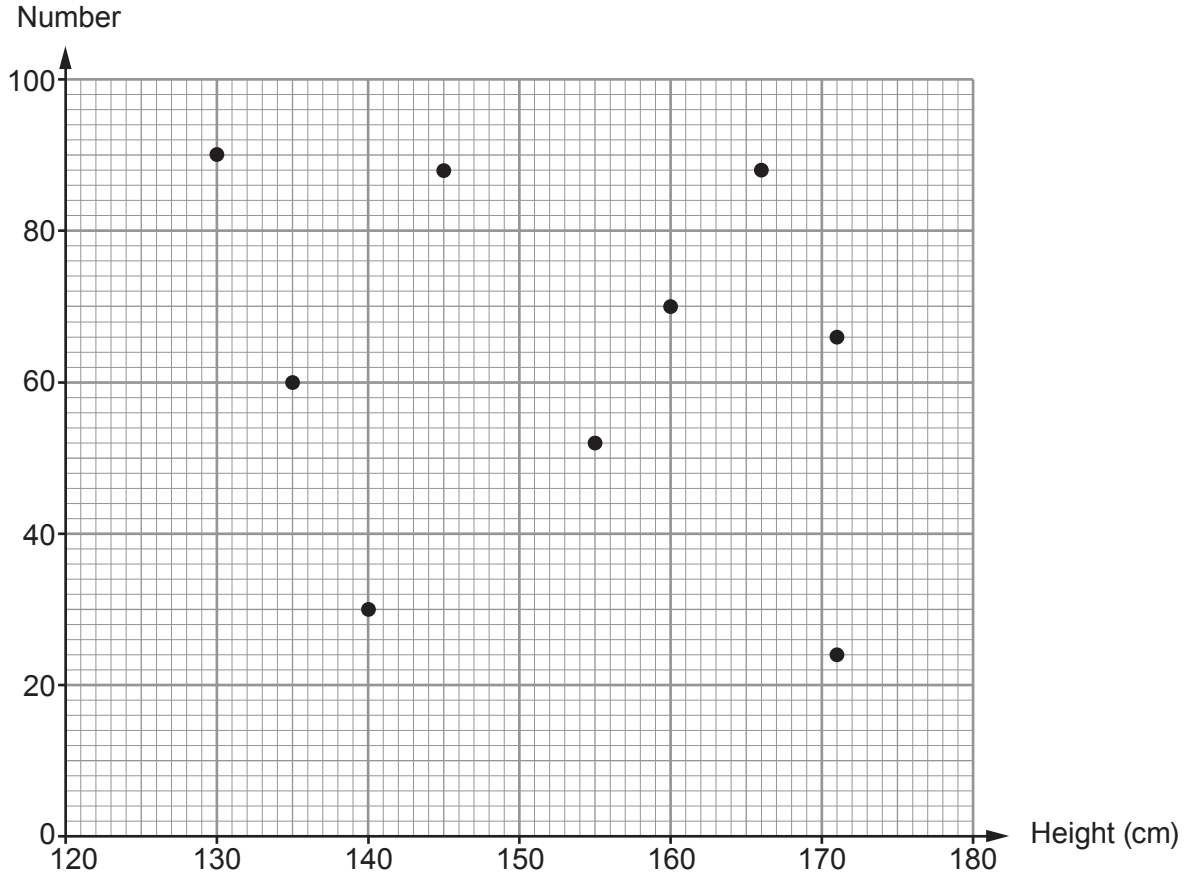
6. Some students were asked to select an even number between 0 and 100.
The heights of these students and the number they each selected are shown in the scatter diagram below.



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

No correlation (no relationship between height and number chosen)

(b) Gwenda and Daniel selected the same number.
Gwenda is shorter than Daniel.
Lotte is the shortest student.
Iona and Steffan are both the same height.
Iona selected a number greater than 40.

Complete the table. [4]

Name	Height (cm)	Number
Gwenda	145	88
Daniel	166	88
Lotte	130	90
Iona	171	66
Steffan	171	24

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7.

Arianna's pizzeria

All pizzas £8.80 each

Special offers

Buy 1 pizza, get 1 pizza free OR 35% off the price of every pizza

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

Lowri orders 3 pizzas.
She wants to pay the least amount possible.
Which offer should Lowri ask for?

Buy 1 pizza, get 1 pizza free ☐ 35% off the price of every pizza ☑

You must give the total cost of each of the offers.
You must show all your working. [5 + 2 OCW]

Buy 1 get 1 free: Lowri pays for 2 pizzas and gets 1 free.

Cost = 2 × £8.80 = £17.60

35% off every pizza: price of 3 pizzas = 3 × £8.80 = £26.40

Discount = 0.35 × £26.40 = £9.24

Cost = £26.40 − £9.24 = £17.16 (or 0.65 × 3 × £8.80 = £17.16)

Buy 1 get 1 free costs £17.60 and 35% off costs £17.16.

£17.16 is less than £17.60, so Lowri should ask for the

35% off offer. She saves £17.60 − £17.16 = £0.44.

(b) Noah wants to order 10 pizzas.
Explain why 'buy 1 pizza, get 1 pizza free' would be the better of the 2 offers.
Do not use any calculations. [1]

With an even number of pizzas he pays for only half of them, which

is 50% off, and 50% off is better than 35% off.

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8. *(a)* Rowan lives in New Zealand.

Rowan wants to post a number of packages.
He has 10 of each of the following stamps.

1 New Zealand dollar ($1) = 100 cents (100c)

Rowan wants to:
- put the correct postage on each package,
- use as **few** of his stamps as possible.

Select the stamps he needs to post each of the following packages.

(i) Documents, postage $3.60 [2]

$1.80 + $1.80 = $3.60

Two $1.80 stamps

(ii) Birthday present, postage $7.40 [2]

$2.80 + $2.80 + $1.80 = $7.40

Two $2.80 stamps and one $1.80 stamp

(two stamps give at most $5.60, so 3 stamps is the fewest)

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(b) Rowan is coming to Wales on holiday.
The conversion rate at the exchange shop is $1 = £0.53.
The exchange shop only has £10 and £20 notes.

Rowan only has $550 saved.
He wants to exchange as close to $550 as possible.
He asks for as few notes as possible.

Calculate:
- how many of each British note Rowan gets,
- how much he pays for his currency, correct to the nearest cent.

You must show all your working. [6]

Pounds for $550 = 550 × 0.53 = £291.50

Only £10 and £20 notes, so he can get at most £290.

Fewest notes for £290: 290 ÷ 20 = 14 remainder 10

14 × £20 = £280, plus 1 × £10 = £290

Rowan gets 14 £20 notes and 1 £10 note.

Cost in dollars = 290 ÷ 0.53

= 547.1698...

= $547.17 (to the nearest cent)

He pays $547.17 for his currency.

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9. The picture shows a solid concrete step.
The step:
- stands on horizontal ground,
- has all of its edges vertical or horizontal,
- has a uniform cross-section.

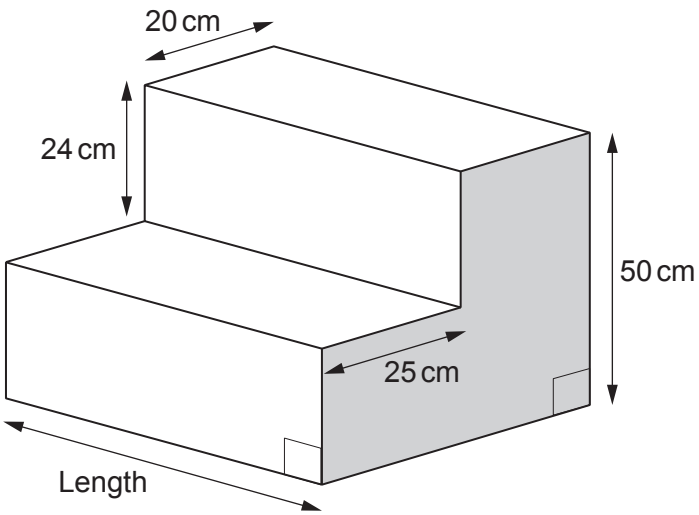
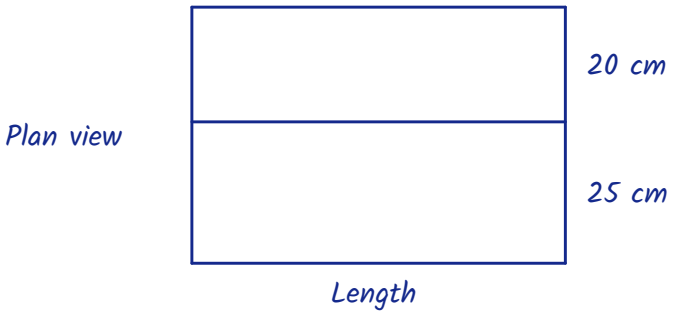


Diagram not drawn to scale

(a) Draw a sketch of the plan view of the concrete step. [1]



(b) The volume of concrete in the step is 66 000 cm^3.

(i) The concrete to make the step costs 39p per litre.

A builder charges a rate of £27 per hour.
Any fraction of an hour is charged as that fraction of his hourly rate.
(For example, half an hour is charged at half of £27.)

It takes him 1 hour 20 minutes to make the step.

There were no other costs.
Calculate the total cost of making the step. [3]

66 000 cm^3 = 66 000 ÷ 1000 = 66 litres

Concrete cost = 66 × 39p = 2574p = £25.74

1 hour 20 minutes = 1⅓ hours

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Builder charges = £27 + ⅓ × £27 = £27 + £9 = £36

Total cost = £25.74 + £36 = £61.74

Total cost of making the step = £61.74

(ii) Calculate the length of the step.
Give your answer in cm.
You must show all your working. [5]

Cross-section is an L shape (split into two rectangles):

Top part: 20 × 50 = 1000 cm^2

Lower part: 25 × (50 − 24) = 25 × 26 = 650 cm^2

Area of cross-section = 1000 + 650 = 1650 cm^2

Volume = area of cross-section × length

Length = 66 000 ÷ 1650

= 40 cm

The length of the step is 40 cm.

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10. *(a)* 40 people were asked how many mugs they have in their cupboards.
The results are shown below.

Number of mugs	Frequency
1 to 5	3
6 to 10	7
11 to 15	12
16 to 20	18

(i) From this data, which group contains the **median** number of mugs?
Circle your answer. [1]

Can't tell 1 to 5 6 to 10 11 to 15 16 to 20

(ii) Calculate an estimate of the mean number of mugs these people have in their cupboards. [4]

Midpoints: 3, 8, 13, 18

$\Sigma fx = 3 \times 3 + 8 \times 7 + 13 \times 12 + 18 \times 18$

$= 9 + 56 + 156 + 324 = 545$

Mean $= 545 \div 40$

$= 13.625$

Estimate of mean ≈ 13.6 mugs

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(b) A cylindrical mug has an inner radius of 4·3 cm and an inner height of 11·8 cm.

Tea is poured into the mug.
The level of the tea is 2 cm below the top of the mug.

Calculate the volume of the tea in the mug. [3]

Height of tea = 11.8 − 2 = 9.8 cm

Volume = $\pi \times r^2 \times h$

$= \pi \times 4.3^2 \times 9.8$

$= 569.2628...$

Volume of tea = 569.3 cm^3 (to 1 d.p.)

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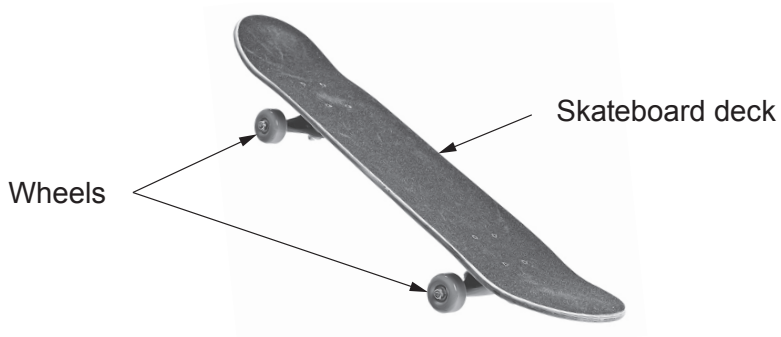
11. Finbar's skateboard is shown below.



(a) The diameter of each wheel on Finbar's skateboard is 6·4 cm.
He uses his skateboard to go to visit his friend Sab.
Sab lives 2340 metres from Finbar.

(i) When Finbar visits Sab, how many times will each wheel on Finbar's skateboard rotate? [4]

Circumference of a wheel = π × 6.4

= 20.1061... cm

Distance = 2340 m = 2340 × 100 = 234 000 cm

Number of rotations = 234 000 ÷ (π × 6.4)

= 11 638.205...

Each wheel rotates about 11 638 times.

(ii) What assumption did you make in answering *(a)*(i)? [1]

That he skated in a straight line all the way to Sab's house

(and the wheels do not slip).

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(b) A skateboard deck is usually made from one of maple wood, fibreglass or plastic. The density of these materials is given in the following table.

Skateboard deck material	Density (g/cm^3)
Maple wood	0·7
Fibreglass	2·6
Plastic	1·8

Finbar and Sab compare their skateboards.

	Finbar's skateboard	Sab's skateboard
Area of the skateboard deck	1800 cm^2	1600 cm^2
Thickness of the skateboard deck	1·2 cm	1·4 cm
Material used to make the deck	Fibreglass	Maple wood

The wheels and the fittings on both their skateboards are identical.

How much heavier is Finbar's skateboard than Sab's skateboard?
Give your answer in grams.
You must show all your working. [5]

Mass = density × volume, volume of deck = area × thickness

Finbar (fibreglass): volume = 1800 × 1.2 = 2160 cm^3

Mass = 2.6 × 2160 = 5616 g

Sab (maple wood): volume = 1600 × 1.4 = 2240 cm^3

Mass = 0.7 × 2240 = 1568 g

Wheels and fittings are identical, so difference = 5616 − 1568

= 4048 g

Finbar's skateboard is 4048 g heavier than Sab's.

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12. Robyn has 5 planks of wood each of length 2 m and width 10 cm.

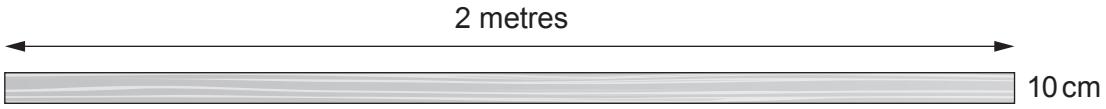

Diagram not drawn to scale

She lays the 5 planks horizontally on the floor. She leaves a **15 cm gap** between each plank, as shown below.

Diagram not drawn to scale

Robyn is planning to make a gate. She uses these 5 planks and one other plank that is to be placed diagonally, as shown below.

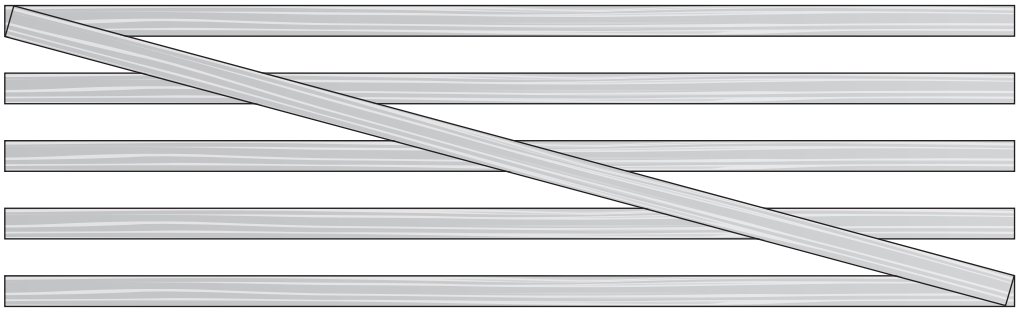

Diagram not drawn to scale

(a) (i) Calculate an estimate of the length of the plank that is to be placed diagonally. Give your answer in metres. [4]

Height of gate = 5 × 10 + 4 × 15 = 110 cm = 1.1 m

Diagonal^2 = 2^2 + 1.1^2 (Pythagoras)

= 4 + 1.21 = 5.21

Diagonal = √5.21 = 2.2825...

Length of diagonal plank ≈ 2.28 m

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(ii) What assumption did you make in calculating the length of the plank that is to be placed diagonally? [1]

That the diagonal plank goes exactly from corner to corner of the gate (the planks are treated as lines with no thickness).

(b) Robyn finishes the gate with two end planks of wood.

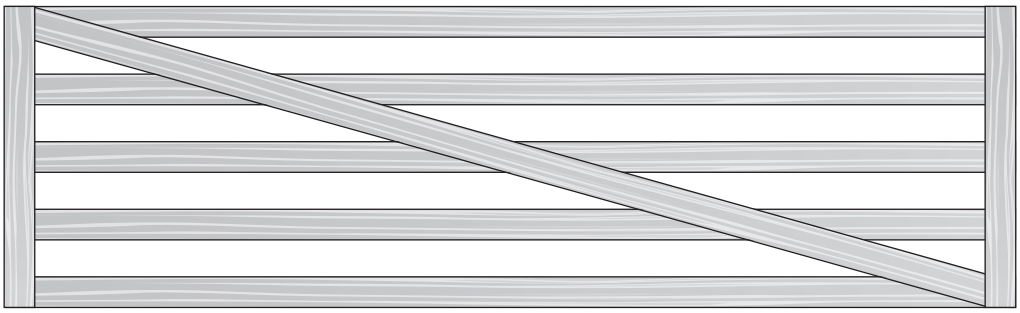

Diagram not drawn to scale

The costs of the different sizes of planks of wood are in the following ratio:

cost of 1 horizontal plank : cost of 1 diagonal plank : cost of 1 end plank

= 3 : 4 : 5

An end plank costs £8.55.
Calculate the total cost of the planks needed to make the gate. [4]

End plank = 5 parts = £8.55, so 1 part = 8.55 ÷ 5 = £1.71

Horizontal plank = 3 × £1.71 = £5.13

Diagonal plank = 4 × £1.71 = £6.84

Total = 5 × £5.13 + 1 × £6.84 + 2 × £8.55

= £25.65 + £6.84 + £17.10

= £49.59

Total cost of the planks for the gate = £49.59

END OF PAPER

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.	Examiner only

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