

GCSE

3310U60-1

MATHEMATICS – NUMERACY

UNIT 2:

CALCULATOR – ALLOWED

HIGHER TIER

THURSDAY,

7 NOVEMBER 2019

– MORNING

1 hour 45 minutes

**(plus your additional
time allowance)**

**A CALCULATOR
WILL BE REQUIRED
FOR THIS PAPER**

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

Surname:	
First name(s):	
Centre Number:	
Candidate Number:	0

ADDITIONAL MATERIALS

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

ITEMS INCLUDED WITH QUESTION PAPER

A separate Formula Booklet.

A separate Diagram Booklet.

A spare Diagram Booklet.

Model for Question 2.

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball – point pen, black felt tip or your usual method.

Write your name, centre number and candidate number in the spaces on the front cover.

Answer ALL questions.

Write your answers in the spaces provided.

If you run out of space, use the additional pages at the back of the booklet.

Question numbers must be given for all work written on the additional page(s).

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

1. **Rowan lives in New Zealand.**
He is coming to Wales on holiday.
The currency used in New Zealand is
the New Zealand dollar (\$).

1 New Zealand dollar = 100 cents.

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.

(Turn over)

[6 marks]

(Turn over)

2. Ask for the model for Question 2.

The model is NOT made to scale.

The model represents a solid concrete step.

The step:

- **stands on horizontal ground,**
- **has all of its edges vertical or horizontal,**
- **has a uniform cross – section.**

**(a) Look at the diagrams for Question 2 (a)
in the separate Diagram Booklet.**

**Which diagram, X, Y or Z is the plan view
of the concrete step.**

Diagram _____

[1 mark]

continued on the next page . . .

(Turn over)

Question 2 continued

2. (b) The volume of concrete in the step is 66 000 cm³

(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.

(Turn over)

(Turn over)

Question 2 (b) continued

- 2. (b) (ii) Calculate the length of the step.**

Give your answer in cm.

You must show all your working.

This image shows a blank sheet of white paper with horizontal black ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. A small dark speck is located near the center of the page, between the eighth and ninth lines from the top.

(Turn over)

[5 marks]

(Turn over)

3. (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.

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

[1 mark]

(Turn over)

Question 3 (a) continued

- 3. (a) (ii) Calculate an estimate of the mean number of mugs these people have in their cupboards.**

This image shows a blank sheet of white paper with horizontal black ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. A small dark speck is present near the top center of the page.

[4 marks]

continued on the next page . . .

(Turn over)

Question 3 continued

3. (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.

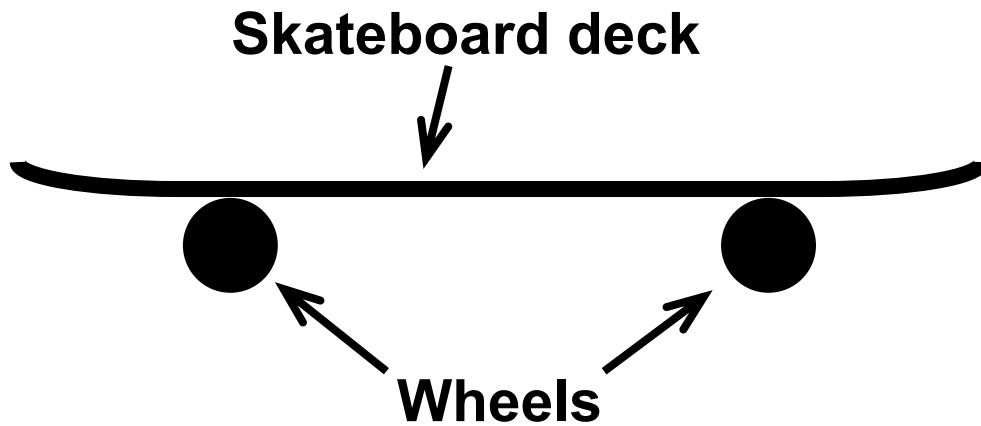
Calculate the volume of the tea in the mug.

(Turn over)

[3 marks]

(Turn over)

4. **Finbar's skateboard is shown below.**
The diagram is NOT drawn to scale.



- (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.

continued on the next page . . .

Question 4 (a) continued

- 4. (a) (i) IN THIS PART OF THE QUESTION, YOU WILL BE ASSESSED ON THE QUALITY OF YOUR ORGANISATION, COMMUNICATION AND ACCURACY IN WRITING.**

When Finbar visits Sab, how many times will each wheel on Finbar's skateboard rotate?

(Turn over)

[4 marks + 2 marks OCW]

- 4. (a) (ii) What assumption did you make
in answering (a) (i)?**

[1 mark]

continued on the next page . . .

(Turn over)

Question 4 continued

4. (b) A skateboard deck is usually made from one of maple wood, fibreglass or plastic.

The density of these materials is given in the table below.

Skateboard deck material	Density (g/cm ³)
Maple wood	0.7
Fibreglass	2.6
Plastic	1.8

Look at the table for Question 4 (b) in the separate Diagram Booklet. Finbar and Sab compare their skateboards.

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

continued on the next page . . .

(Turn over)

Question 4 (b) continued

How much heavier is Finbar's skateboard than Sab's skateboard?

Give your answer in grams.

You must show all your working.

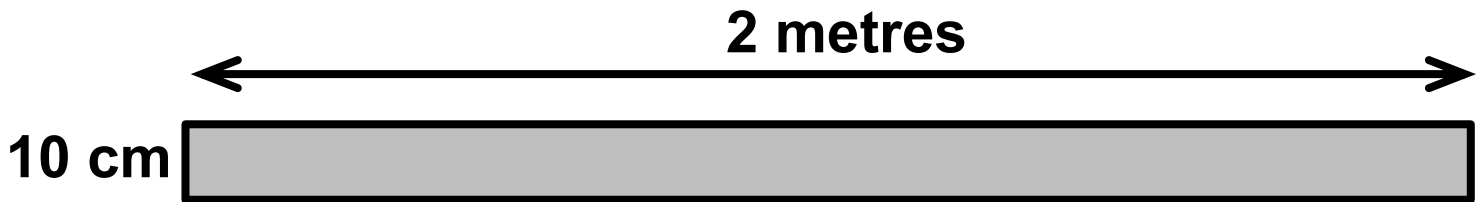
[illegible]

(Turn over)

[5 marks]

(Turn over)

5. Robyn has **5** planks of wood, each of length **2 m** and width **10 cm** as shown in the diagram below.
The diagram is NOT drawn to scale.



Look at Diagram 1 for Question 5
in the separate Diagram Booklet.
The diagram is NOT drawn to scale.

Robyn lays the **5** planks horizontally on the floor. She leaves a **15 cm GAP** between each plank, as shown in Diagram 1.

Look at Diagram 2 for Question 5
in the separate Diagram Booklet.
The diagram is 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 in Diagram 2.

Question 5 continued

- 5. (a) (i) Calculate an estimate of the length of the plank that is to be placed diagonally.
Give your answer in metres.**

[4 marks]

continued on the next page . . .

(Turn over)

Question 5 (a) continued

- 5. (a) (ii) What assumption did you make in calculating the length of the plank that is to be placed diagonally?**

[1 mark]

continued on the next page . . .

(Turn over)

Question 5 continued

- 5. (b) Look at the diagram for Question 5 (b) in the separate Diagram Booklet.**

The diagram is NOT drawn to scale.

Robyn finishes the gate with two end planks of wood.

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

**horizontal plank : diagonal plank : end plank
= 3 : 4 : 5**

An end plank costs £8.55

Calculate the total cost of the planks needed to make the gate.

(Turn over)

[4 marks]

6. Dafydd carries bags of gravel on the back of his lorry.

Each bag of gravel has a mass of **90 kg**, correct to the nearest **5 kg**.

The maximum mass the lorry can carry without overloading is **7500 kg**.

However, this measurement is only correct to the nearest **100 kg**.

Calculate the maximum number of bags that the lorry is **GUARANTEED** to be able to carry without overloading.

You must show all your working.

(Turn over)

**Maximum number of bags that the lorry is
guaranteed to be able to carry is _____**

[3 marks]

- 7. Look at the diagram for Question 7 in the separate Diagram Booklet.**

The diagram is NOT drawn to scale.

Llinos walks to the summit of Snowdon, passing the lake called Llyn Glaslyn.

Her height above sea level increases by 485 m from Llyn Glaslyn to the summit.

From the summit, she sees two small boats on Llyn Glaslyn.

Both boats are in the same direction from the summit.

The angles of depression of the two boats are 41° and 27° , as shown in the diagram.

Calculate the distance between the boats.

[5 marks]

(Turn over)

8. Gary and Carys are fire officers.

Last week, they recorded that **5** engines
were able to pump **26 000** gallons of water
onto a fire in **3** minutes.

- (a) Show that **9** engines would be able
to pump **143 000** gallons of water
in under **9** minutes **15** seconds.

(Turn over)

[4 marks]

continued on the next page . . .

(Turn over)

Question 8 continued

- 8. (b) Give one possible reason why the
9 engines MAY NOT be able to pump
143 000 gallons of water in under
9 minutes 15 seconds.**

[1 mark]

(Turn over)

9. Look at the diagrams for Question 9 in the separate Diagram Booklet.
The diagrams are NOT drawn to scale.

A company makes Welsh flags in mathematically similar sizes.

Two of their similar flags are shown.

The area of the larger flag is 96% greater than the area of the smaller flag.

The height of the smaller flag is 40 cm.

Calculate the height of the larger flag.

[4 marks]

10. On 1st January 2017, Samantha and Dyfan invested money into different savings accounts.

They did not make any further payments into their accounts or withdraw any money from their accounts.

- (a) Samantha invested £2000 in a savings account that paid interest at a rate of 0.95% every 3 months.**

Show that Samantha would have £2038.18 in the account after 6 months.

[1 mark]

continued on the next page . . .

(Turn over)

Question 10 continued

- 10. (b) Dyfan invested £3000 in a savings account that paid interest at a rate of 1.02% every 3 months.**

Interest is paid on the last day of each 3 – month period.

Calculate the date when Dyfan will first have over £3600 in his account.

(Turn over)

Date when Dyfan will first have over £3600

in his account is _____

[4 marks]

(Turn over)

- 11. (a) Look at the diagram for Question 11 (a) in the separate Diagram Booklet.**

The diagram is NOT drawn to scale.

Two farmers have bought some farmland between them.

The farmland is in the shape of a quadrilateral $ABCD$, as shown in the diagram.

The farmers want to divide the farmland equally by building a straight fence.

One of the farmers has suggested building the fence from A to C .

Show that this does not divide the farmland equally.

(Turn over)

[3 marks]

continued on the next page . . .

(Turn over)

Question 11 continued

- 11. (b) Look at the diagram for Question 11 (b) in the separate Diagram Booklet.**

The diagram is NOT drawn to scale.

To divide the land equally, the fence is built from A to F where $CF = 17.9$ m.

To construct the fence, posts are placed at A and F .

Other posts are then located along AF , so that the posts are no more than 3 m apart.

Calculate the smallest number of posts needed, including the posts at A and F .

(Turn over)

(Turn over)

12. Laura and Matthew are buying a house priced at £150 000

In order to buy the house, they will need to have a mortgage.

A mortgage is a loan that is paid back over a number of years.

They have saved a deposit of £15 000

They need a mortgage of £135 000

A bank has offered them a mortgage of £135 000 at an interest rate of 2.4% per annum, with interest added monthly.

To calculate the monthly payments needed in order to pay back the mortgage, they use the formula on the next page.

continued on the next page . . .

Question 12 continued

$$M = \frac{r \times P}{1 - (1 + r)^{-12n}}$$

where:

M is the amount of each monthly payment,

P is the mortgage needed,

r is the MONTHLY interest rate as a decimal,

n is the number of years taken to pay back the mortgage.

(a) The annual interest rate is 2.4%

What is the monthly rate, as a decimal?

Circle your answer.

0.24	0.024	0.00002	0.002	0.2
------	-------	---------	-------	-----

[1 mark]

(Turn over)

Question 12 continued

Remember: To calculate the monthly payments needed in order to pay back the mortgage, they use the formula below.

$$M = \frac{r \times P}{1 - (1 + r)^{-12n}}$$

- 12. (b) Laura and Matthew are considering whether to take out a mortgage over 25 years or 30 years.**

They have correctly calculated their monthly payments to be £598.86 when paying back the mortgage over 25 years.

How much more will it cost IN TOTAL to pay back the mortgage over 30 years than over 25 years?

(Turn over)

[5 marks]

END OF PAPER

TOTAL 80 MARKS

(Turn over)

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

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MATHEMATICS – NUMERACY
UNIT 2: CALCULATOR – ALLOWED
HIGHER TIER

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Diagram Booklet

Surname:	
First name(s):	
Centre Number:	
Candidate Number:	0

Question 2 (a)

Diagram X

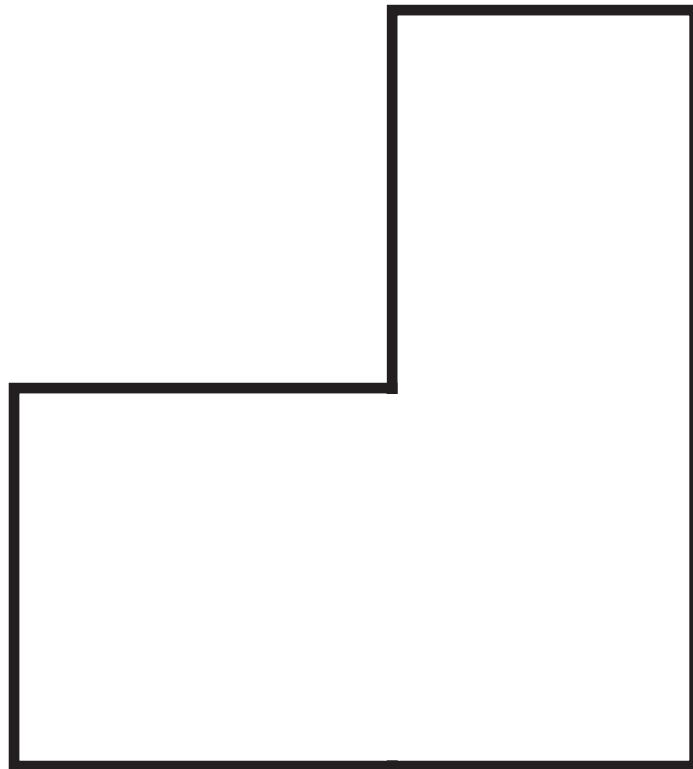


Diagram Y

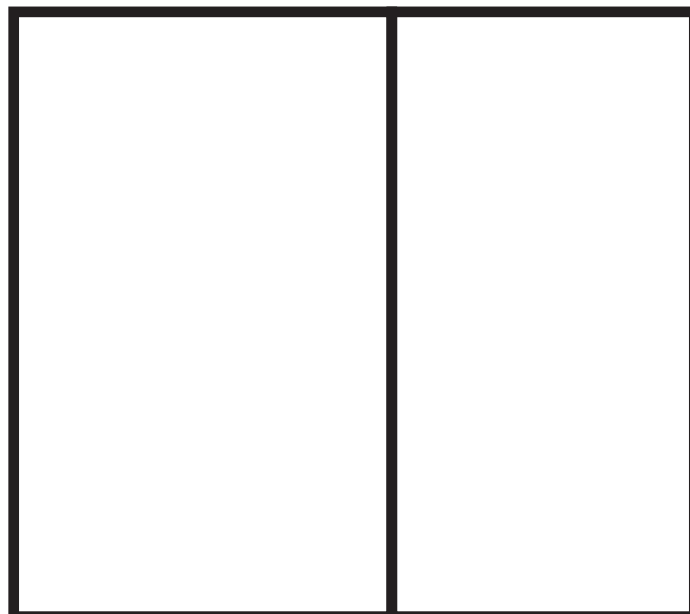
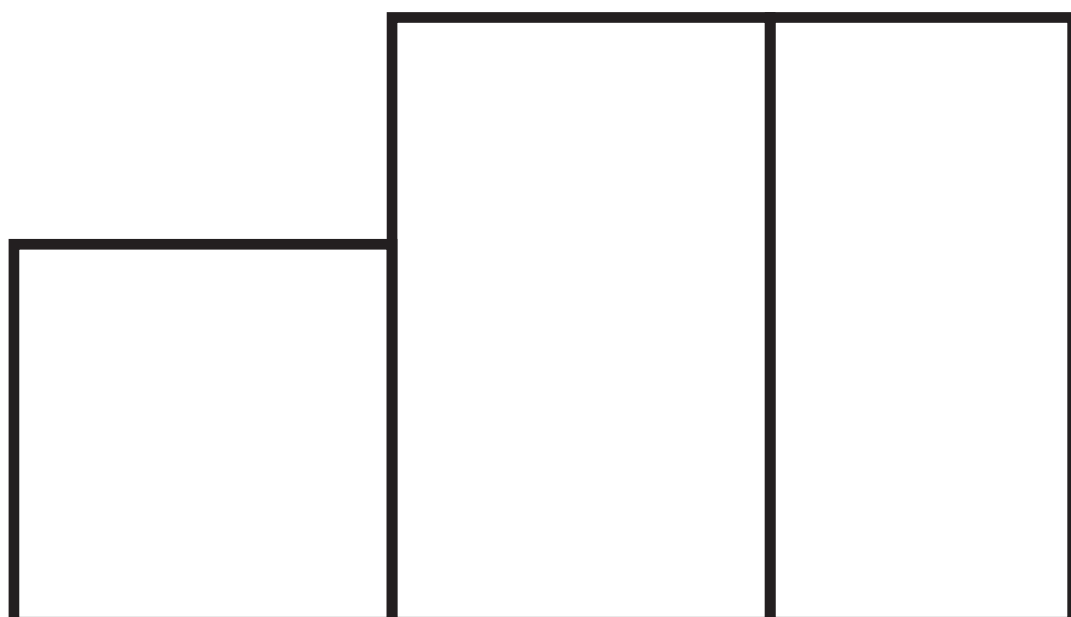


Diagram Z



Question 4 (b)

Table

	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

Question 5

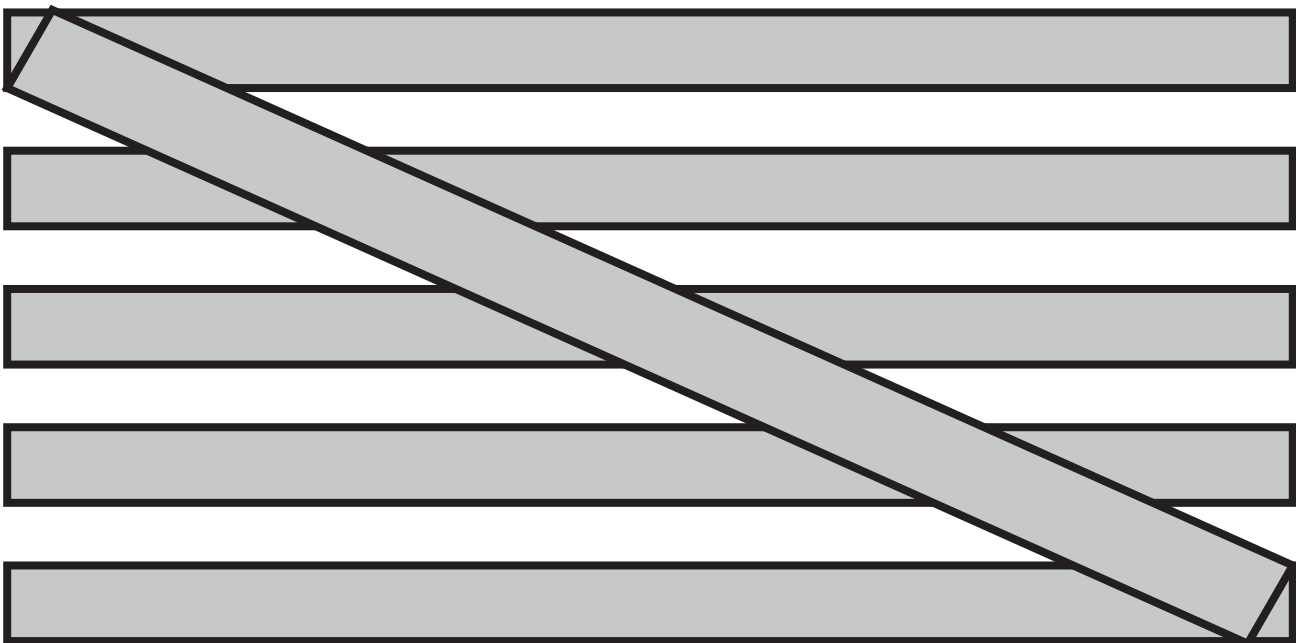
Diagram 1

Diagram NOT drawn to scale



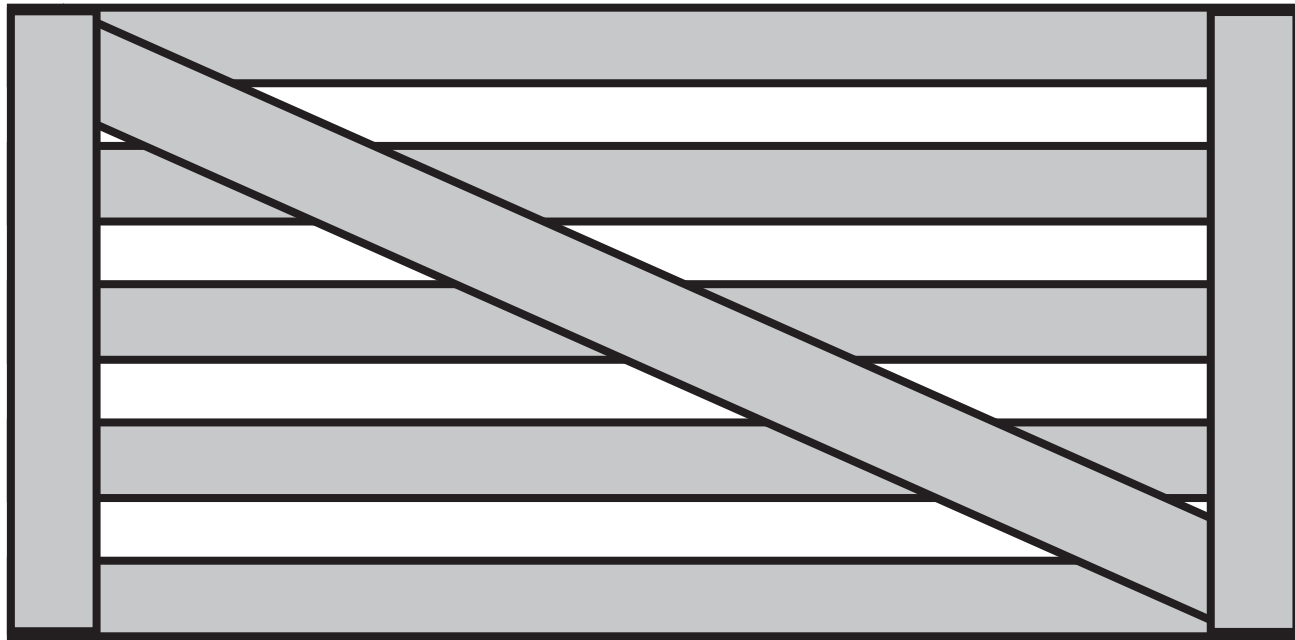
Diagram 2

Diagram NOT drawn to scale



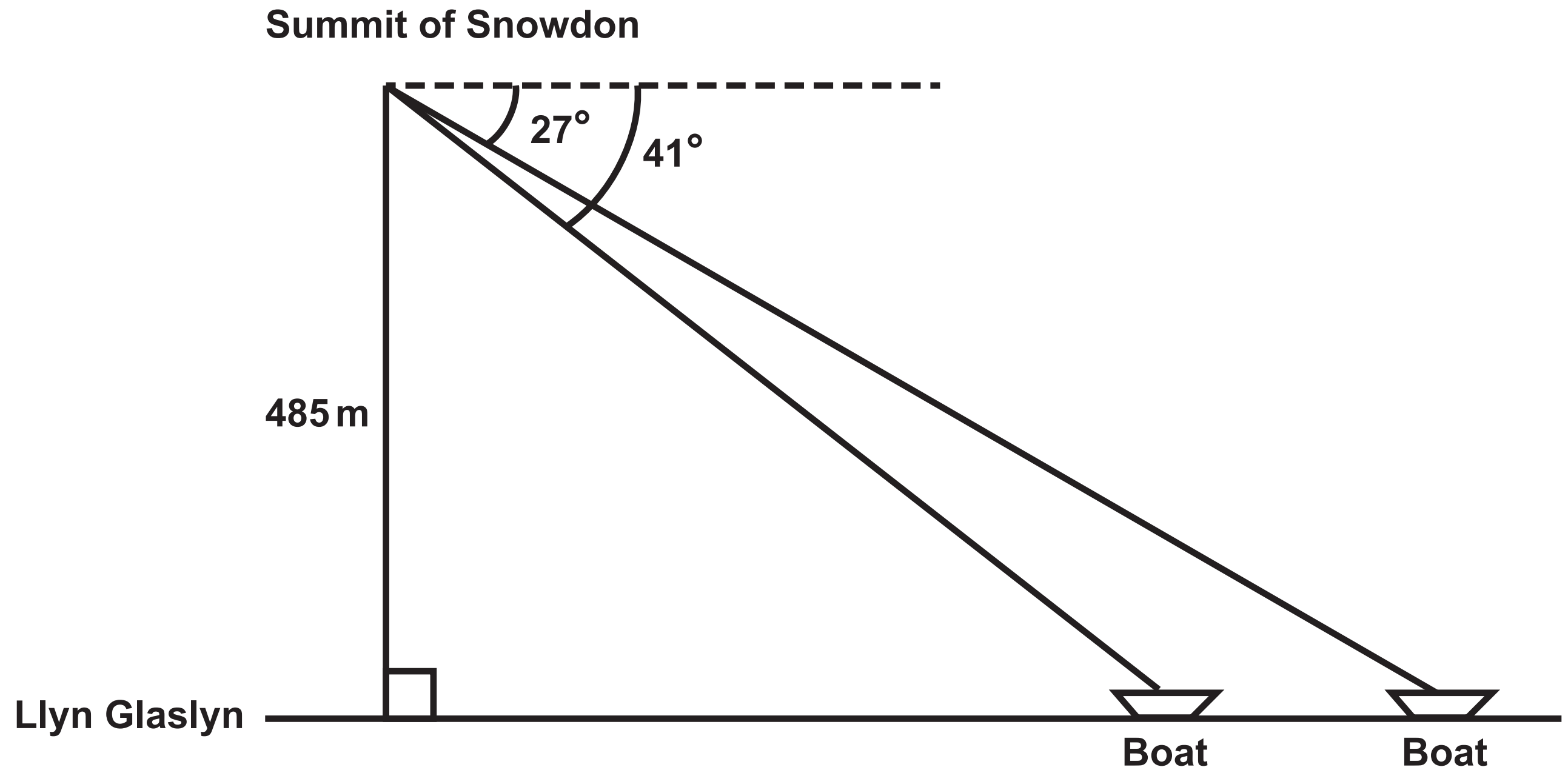
Question 5 (b)

Diagram NOT drawn to scale



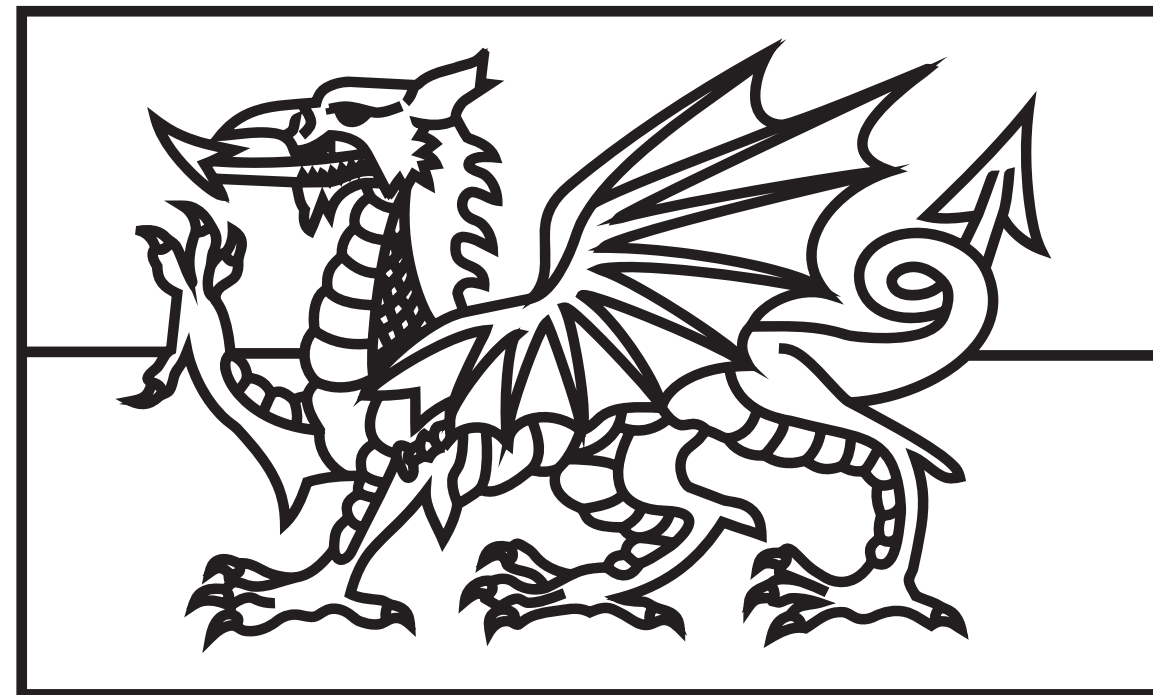
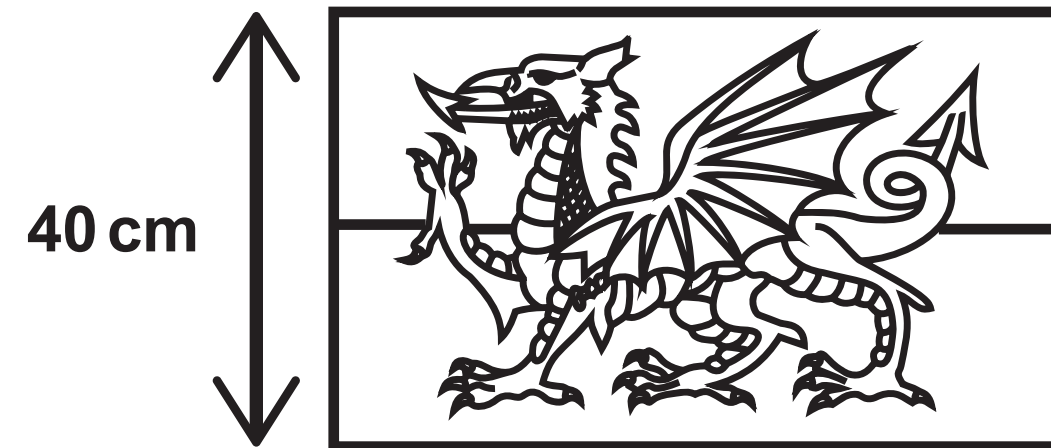
Question 7

Diagram NOT drawn to scale



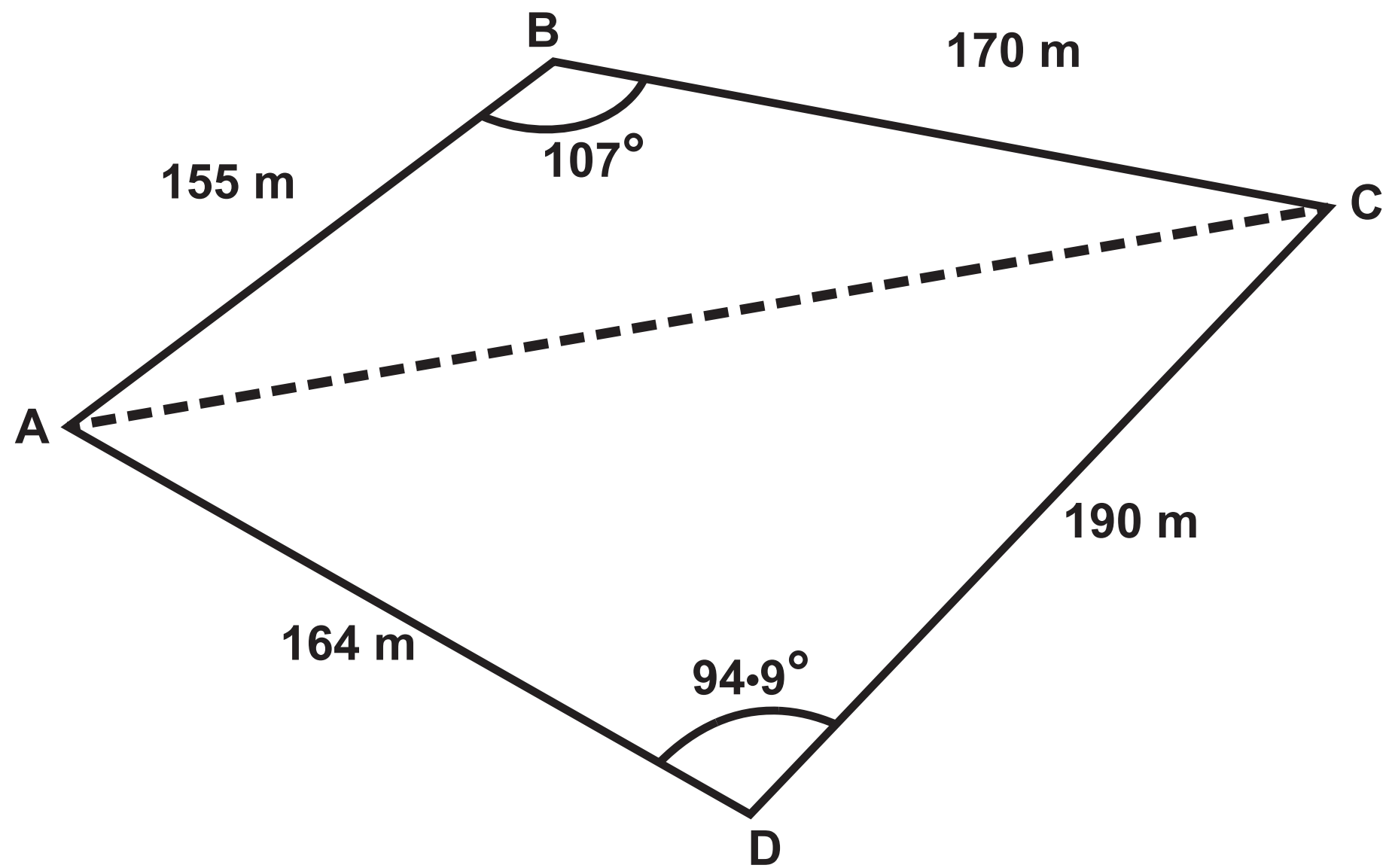
Question 9

Diagrams are NOT drawn to scale



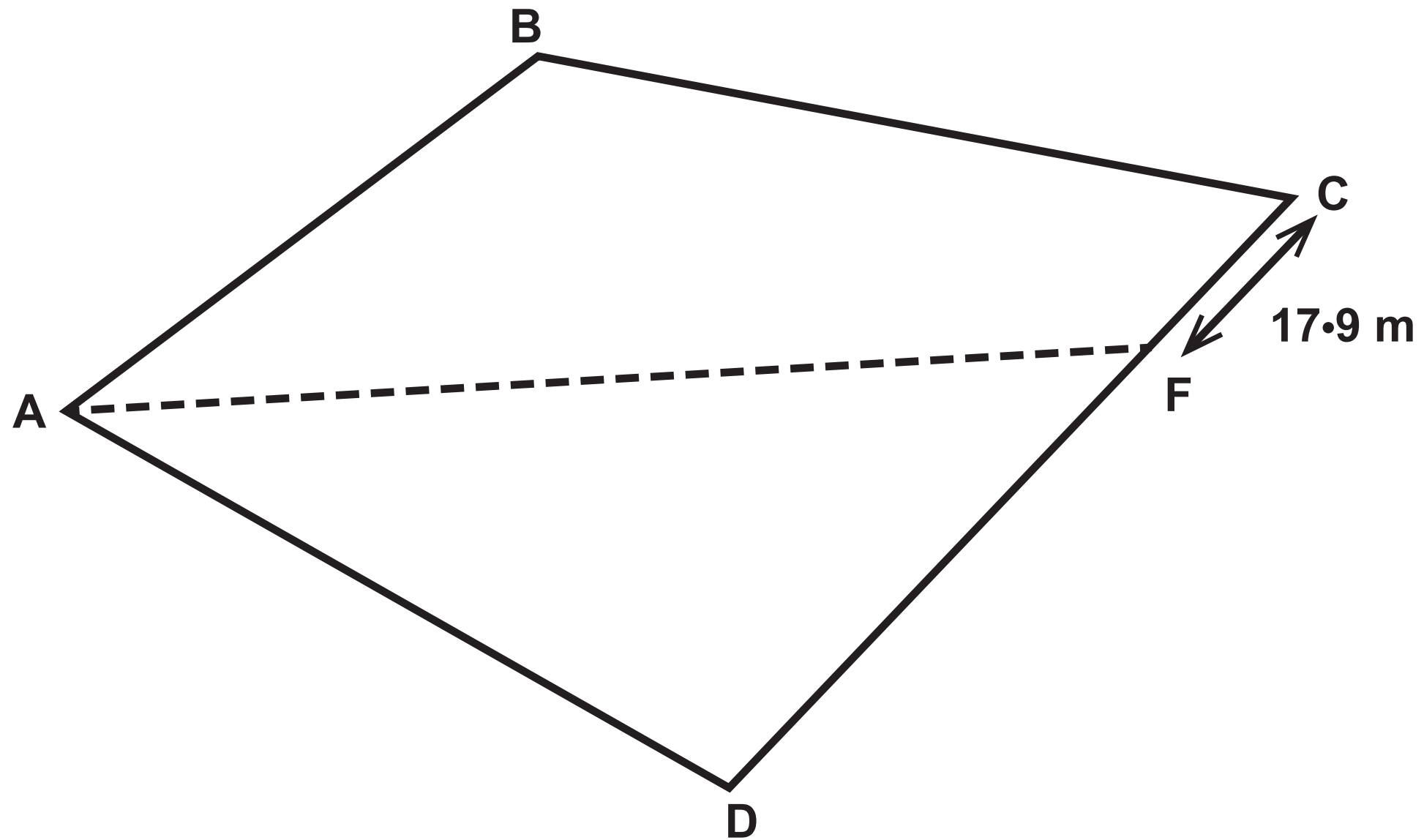
Question 11 (a)

Diagram NOT drawn to scale



Question 11 (b)

Diagram NOT drawn to scale



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MATHEMATICS – NUMERACY
UNIT 2: CALCULATOR – ALLOWED
HIGHER TIER

THURSDAY, 7 NOVEMBER 2019 – MORNING

Spare Diagram Booklet

Surname:	
First name(s):	
Centre Number:	
Candidate Number:	0

Question 2 (a)

Diagram X

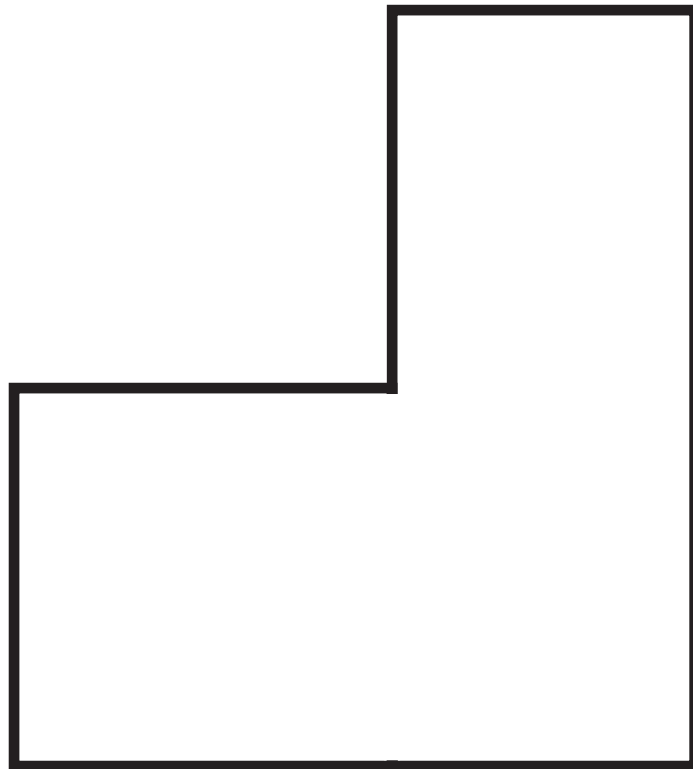


Diagram Y

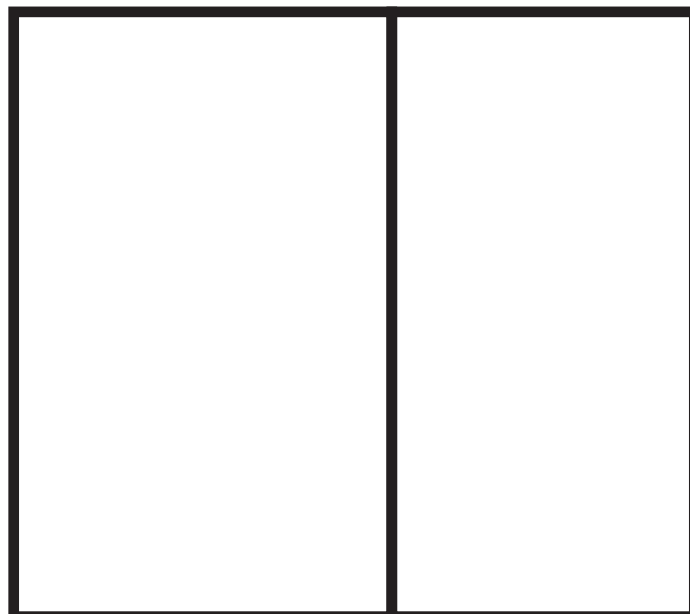
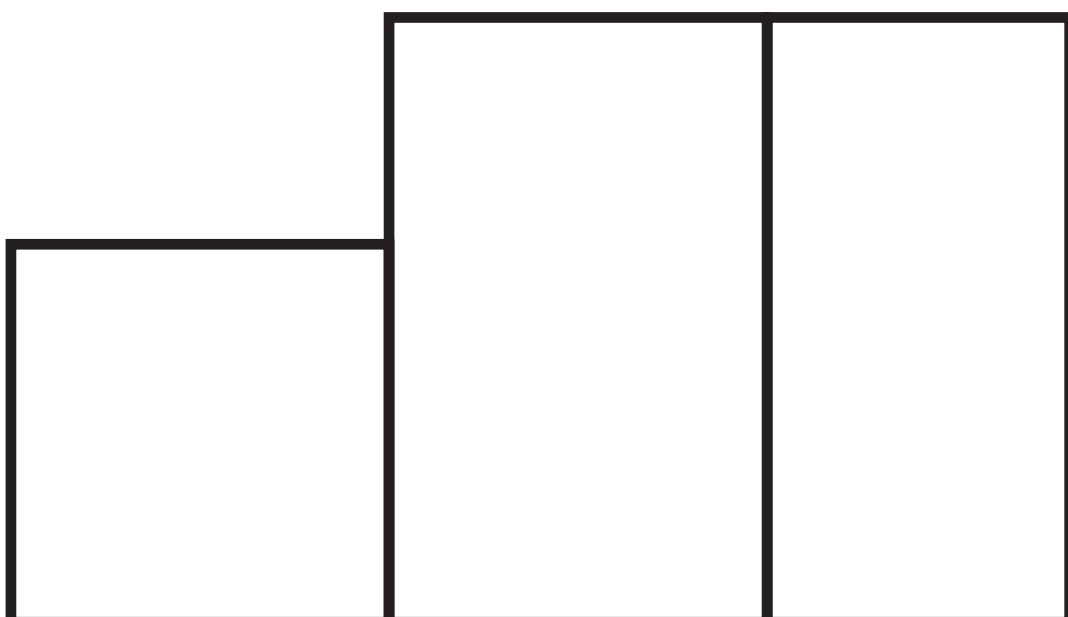


Diagram Z



Question 4 (b)

Table

	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

Question 5

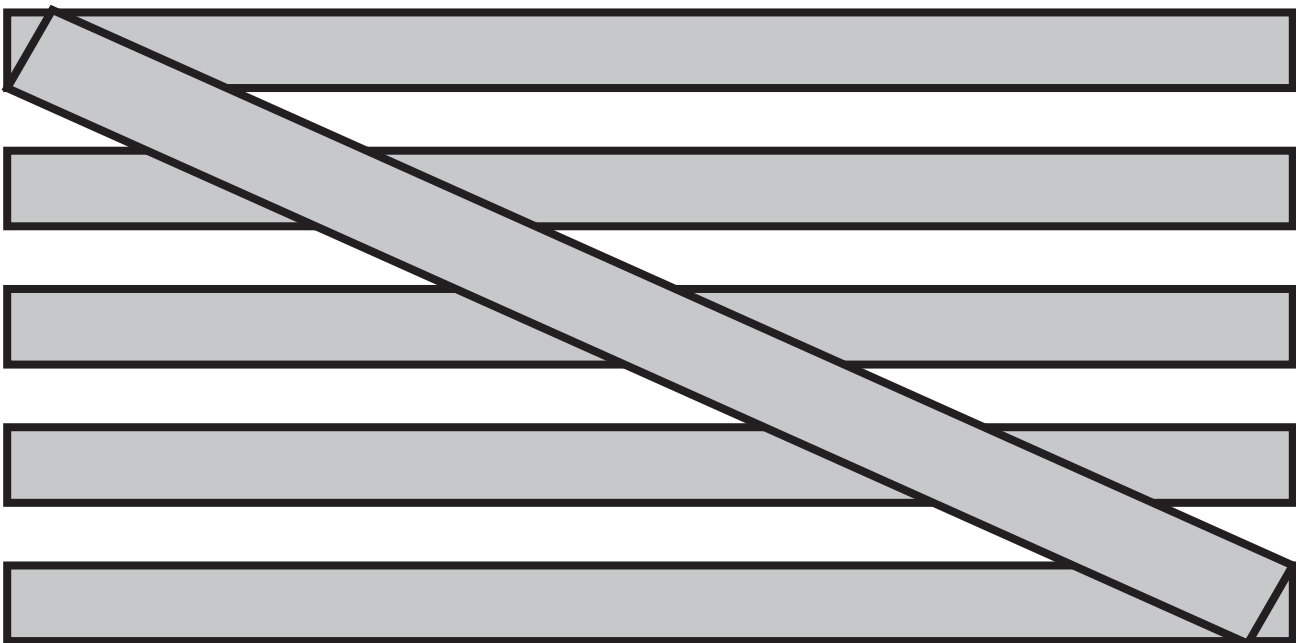
Diagram 1

Diagram NOT drawn to scale



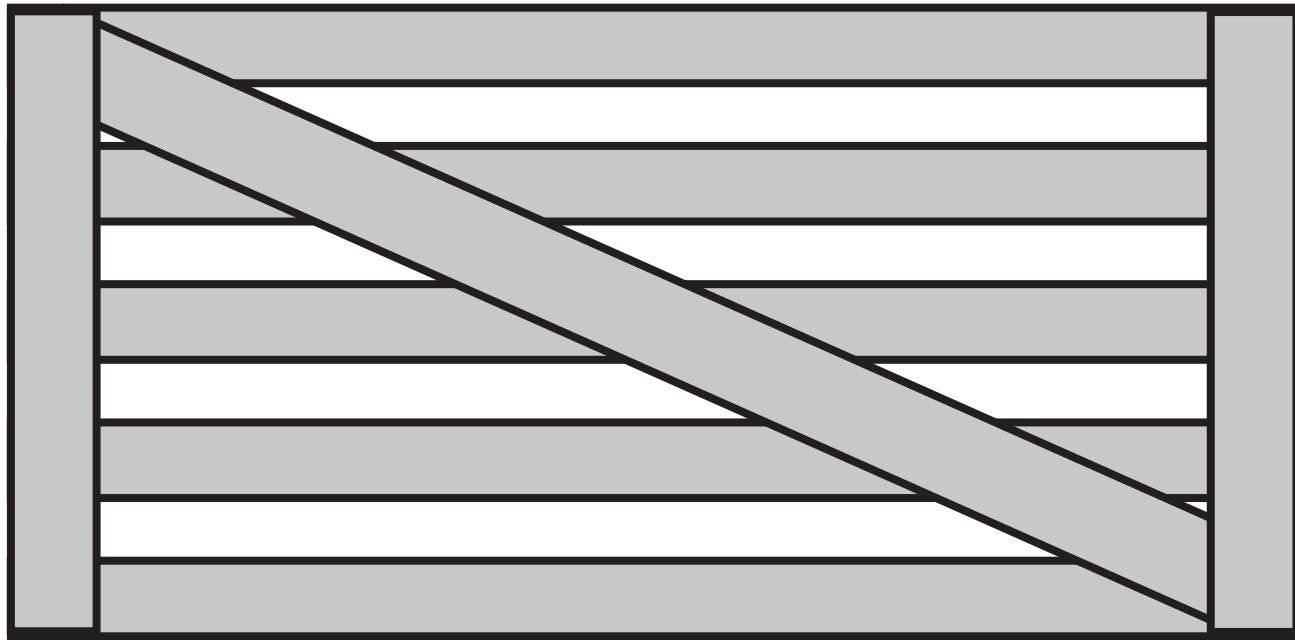
Diagram 2

Diagram NOT drawn to scale



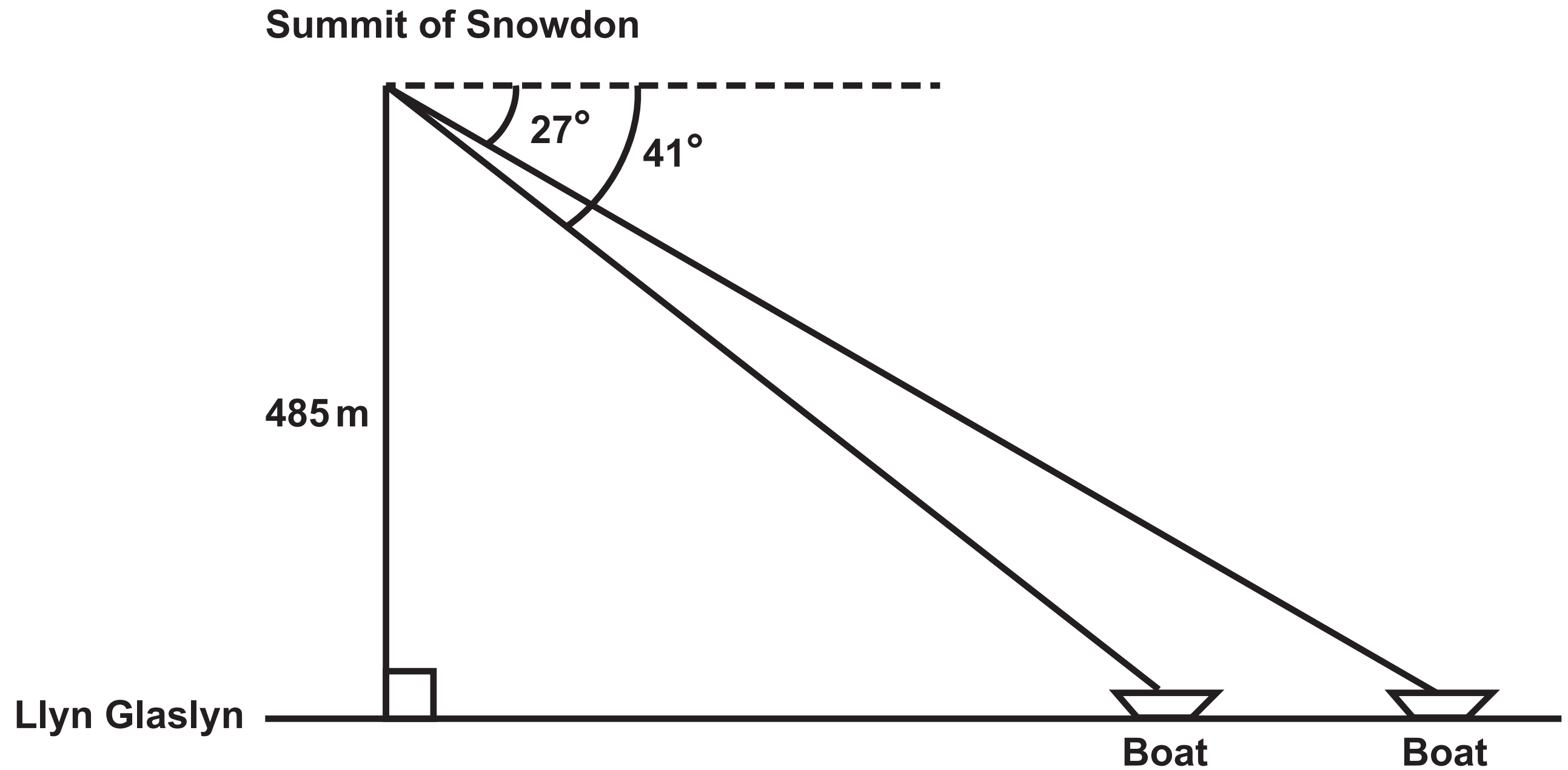
Question 5 (b)

Diagram NOT drawn to scale



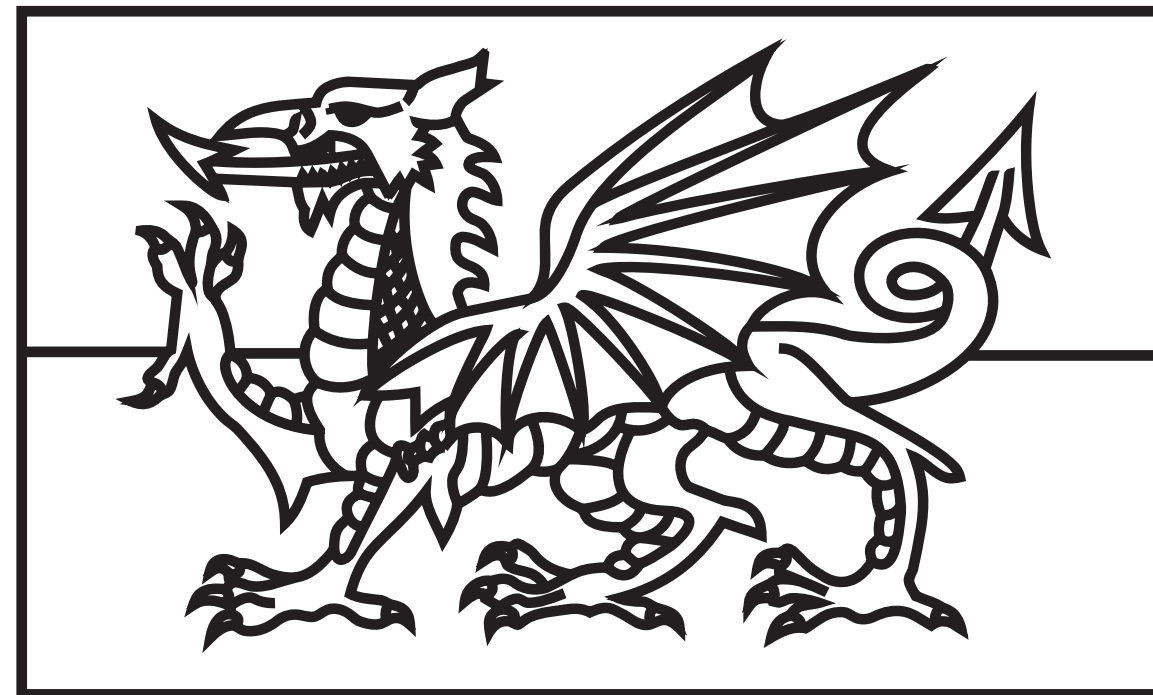
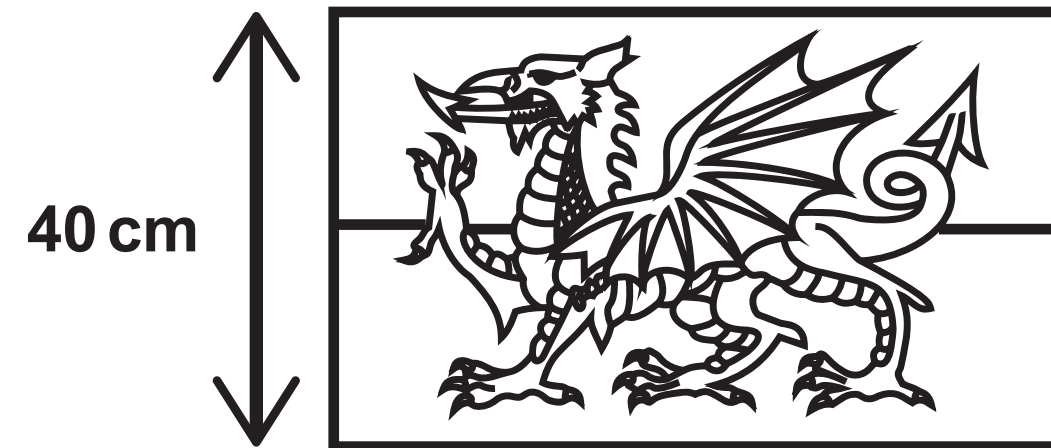
Question 7

Diagram NOT drawn to scale



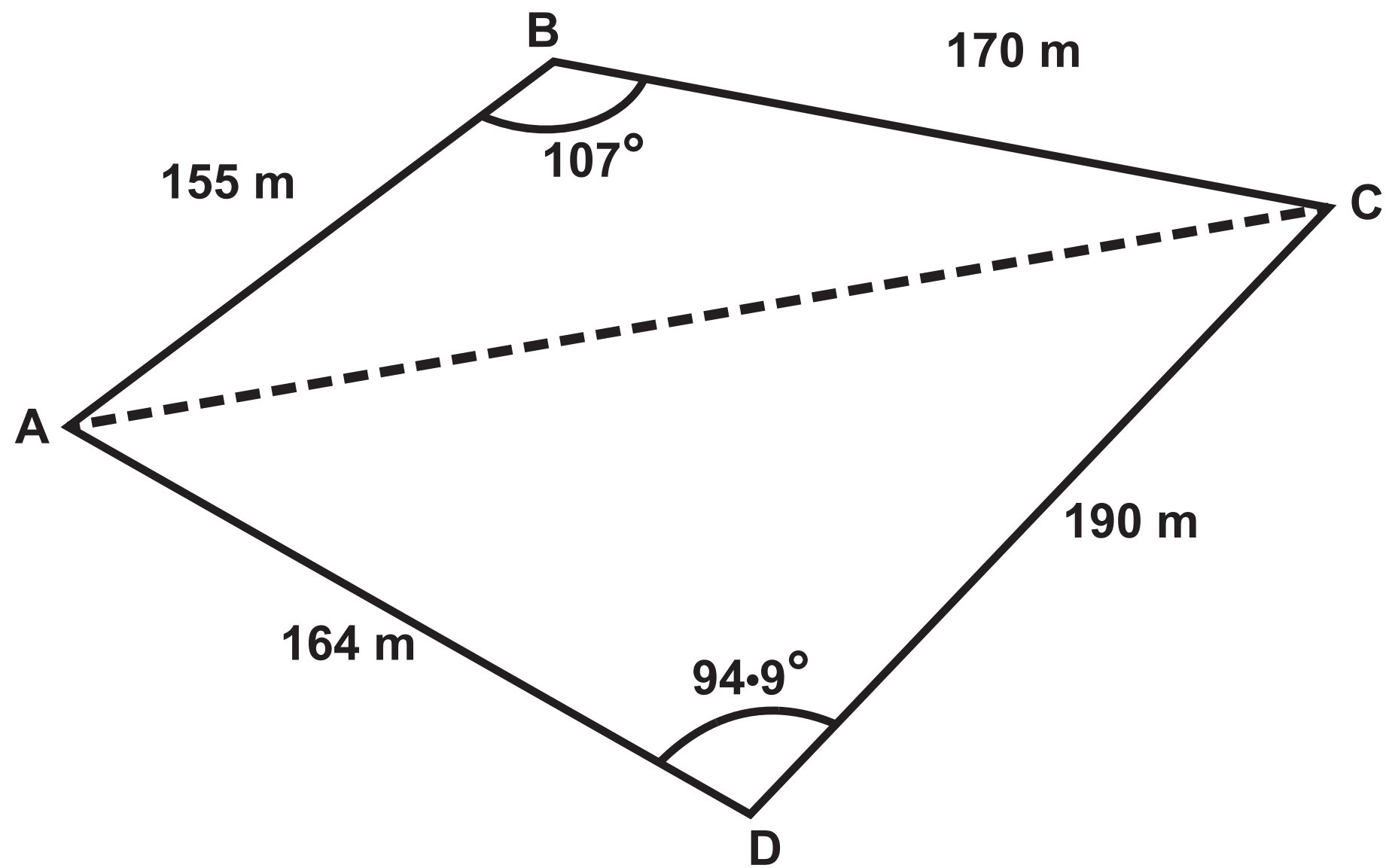
Question 9

Diagrams are NOT drawn to scale



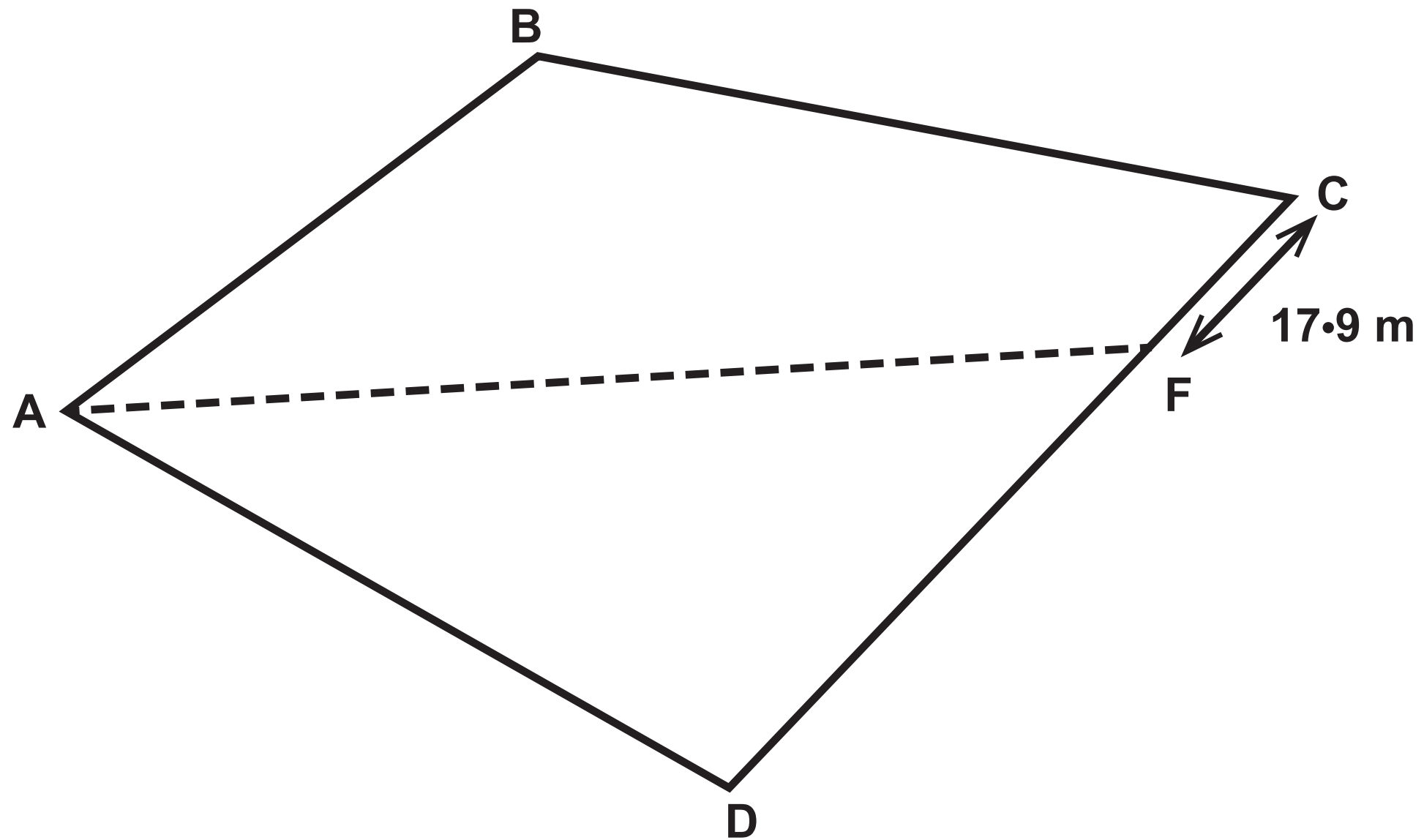
Question 11 (a)

Diagram NOT drawn to scale



Question 11 (b)

Diagram NOT drawn to scale



**GCSE
MATHEMATICS
and
NUMERACY**



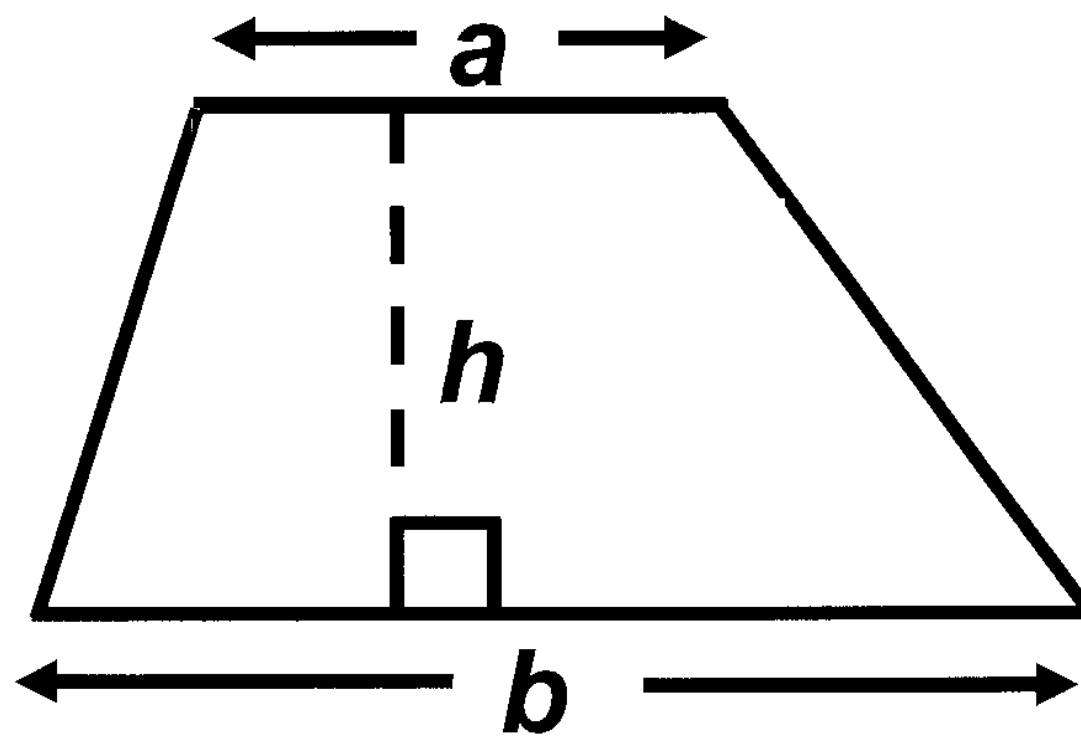
**FORMULA LIST
HIGHER TIER
GCSE**

You must not write on these formula pages.

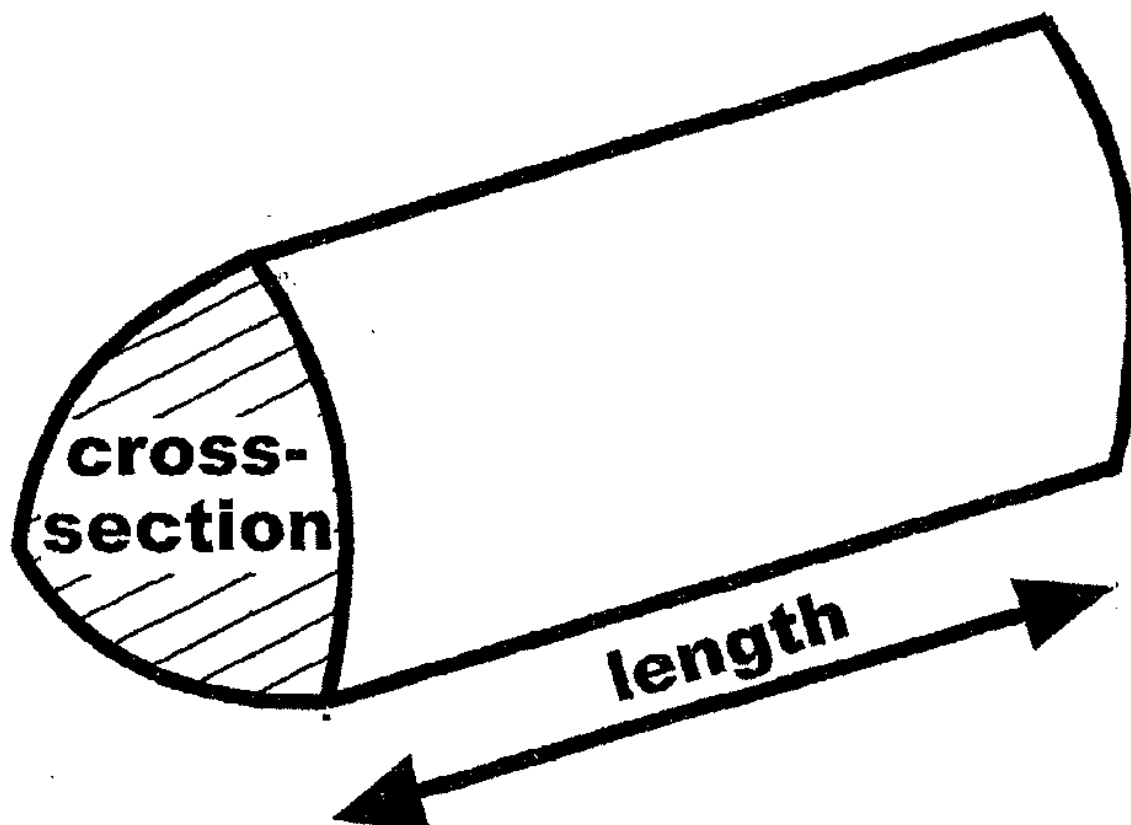
Anything you write on these formula pages will gain NO credit.

Formula List – Higher Tier

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

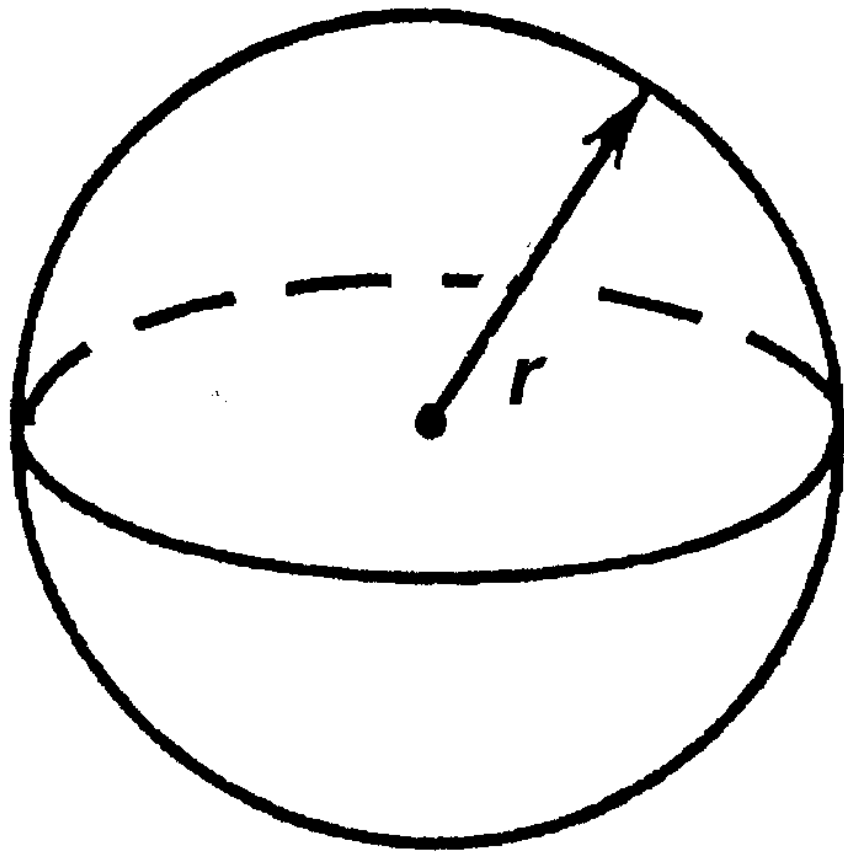


Volume of prism =
area of cross – section $\times$ length



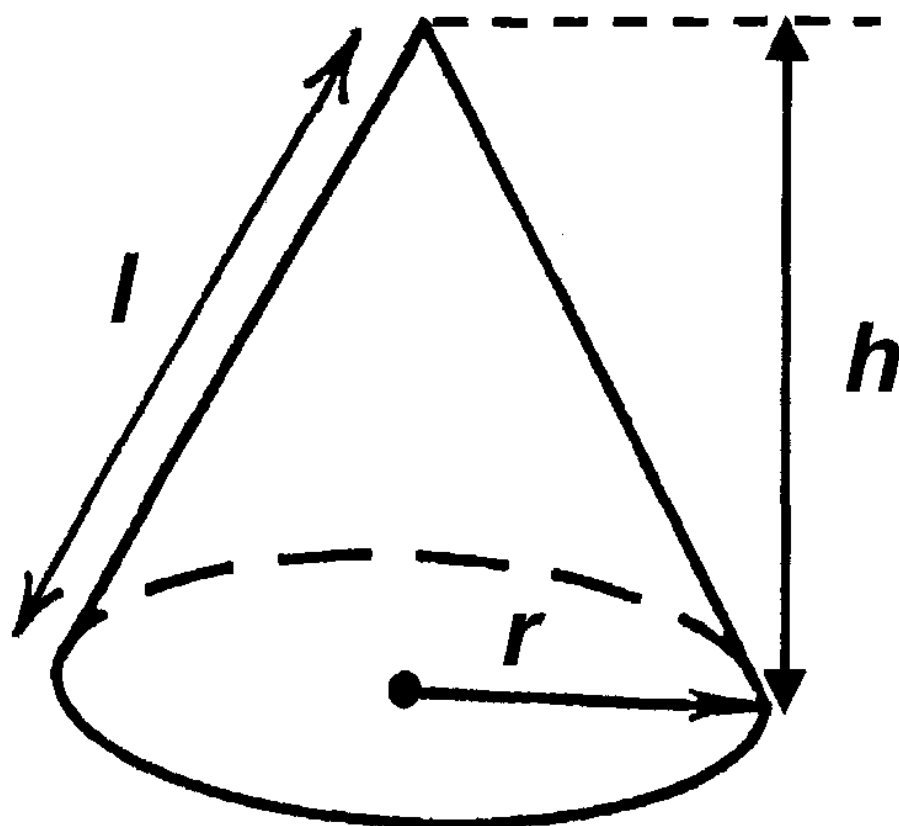
Volume of sphere = $\frac{4}{3}\pi r^3$

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

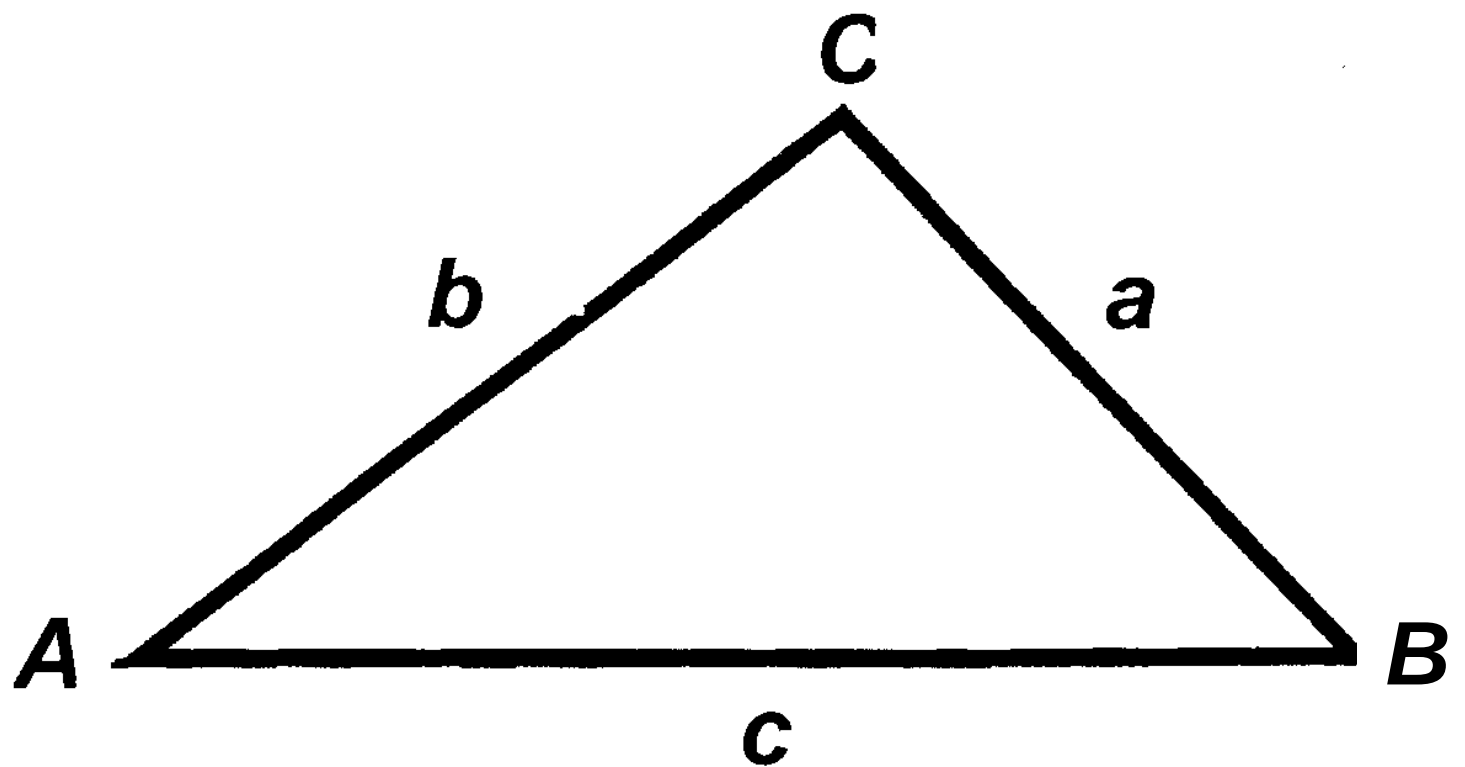


Volume of cone = $\frac{1}{3}\pi r^2 h$

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



In any triangle ABC



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 $= \frac{1}{2}ab \sin C$

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$, are given by

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

Annual Equivalent Rate (AER)

AER, as a decimal, is calculated using the formula $\left(1 + \frac{i}{n}\right)^n - 1$, where i is the nominal interest rate per annum as a decimal and n is the number of compounding periods per annum.