

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname StemUp Model Solution

Forename(s) \_\_\_\_\_

Candidate signature \_\_\_\_\_

I declare this is my own work.

# GCSE MATHEMATICS

# F

Foundation Tier      Paper 3 Calculator

Monday 13 November 2023

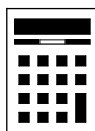
Morning

Time allowed: 1 hour 30 minutes

## Materials

For this paper you must have:

- a calculator
- mathematical instruments
- the Formulae Sheet (enclosed).



## Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

## Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

## For Examiner's Use

| Pages        | Mark |
|--------------|------|
| 2–3          |      |
| 4–5          |      |
| 6–7          |      |
| 8–9          |      |
| 10–11        |      |
| 12–13        |      |
| 14–15        |      |
| 16–17        |      |
| 18–19        |      |
| 20–21        |      |
| 22–23        |      |
| 24           |      |
| <b>TOTAL</b> |      |

## Advice

In all calculations, show clearly how you work out your answer.



N 0 V 2 3 8 3 0 0 3 F 0 1

Answer **all** questions in the spaces provided.

Do not write  
outside the  
box

- 1** Work out 10% of 170

[1 mark]

$$10\% \text{ of } 170 = 170 \div 10$$

Answer 17

- 2** Write down the value of the digit 7 in 34 728

[1 mark]

Answer 700

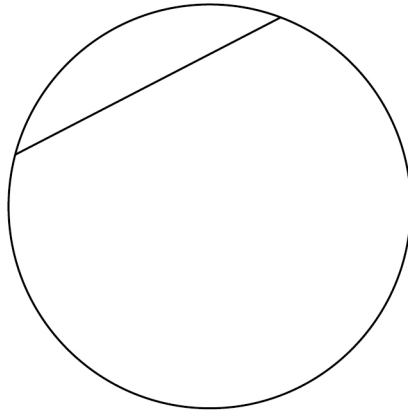


- 3 (a) Write down the name of a triangle with three **equal** sides.

[1 mark]

Answer Equilateral

- 3 (b) Write down the name for the straight line inside this circle.



[1 mark]

Answer Chord

- 4 Write down **all** the factors of 45

[2 marks]

$1 \times 45, 3 \times 15, 5 \times 9$

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Answer 1, 3, 5, 9, 15, 45

Turn over ►



5 (a)  $d = g^2 - 2h$

Work out the value of  $d$  when  $g = 15$  and  $h = 63$

[2 marks]

$$d = 15^2 - 2 \times 63$$

$$d = 225 - 126$$

$$d = 99$$

5 (b) Rearrange  $m = n + k$  to make  $n$  the subject.

[1 mark]

$$m - k = n$$

$$n = m - k$$



- 6 Here is a right-angled triangle on a centimetre grid.



- 6 (a) Write down the coordinates of the midpoint of the **longest** side.

[1 mark]

Answer ( 5 , 3 )

- 6 (b) Work out the area of the triangle.

[1 mark]

*Base 8, height 4:  $8 \times 4 \div 2 = 16$*

Answer 16 cm<sup>2</sup>

Turn over for the next question

Turn over ►



- 7 The total cost of broadband for 5 months is £99.20
- At the same monthly rate, work out the total cost of broadband for 2 **years**. **[3 marks]**

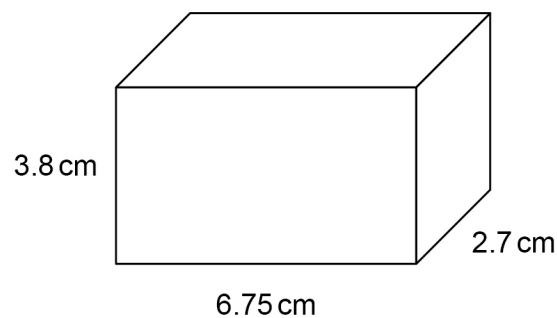
$$2 \text{ years} = 24 \text{ months}$$

$$1 \text{ month: } 99.20 \div 5 = \text{£}19.84$$

$$24 \text{ months: } 19.84 \times 24 = \text{£}476.16$$

Answer £ 476.16

- 8 Here is a cuboid.



Work out the volume of the cuboid.  
Give your answer to 1 decimal place.

**[2 marks]**

$$\text{Volume} = 3.8 \times 6.75 \times 2.7$$

$$= 69.255$$

Answer 69.3 cm<sup>3</sup>



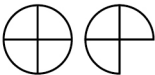
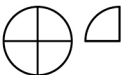
9

Nicki asked 30 people to name their favourite crisp flavour.  
Here are the results.

|                  |    |
|------------------|----|
| Salt and Vinegar | 16 |
| Ready Salted     | 7  |
| Cheese and Onion | 5  |
| Prawn Cocktail   | 2  |

Nicki drew this pictogram to represent the results.

**Favourite crisp flavour**

|                  |                                                                                     |
|------------------|-------------------------------------------------------------------------------------|
| Salt and Vinegar |   |
| Ready Salted     |   |
| Cheese and Onion |  |
| Prawn Cocktail   |  |

What **two** mistakes has Nicki made?

**[2 marks]**

Mistake 1 There is no key to show what one circle represents.

Mistake 2 Prawn Cocktail (2 people) should be half a circle,  
not a whole circle, as a whole circle stands for 4 people.



10 Sanjit buys 1.75 kg of potatoes and 4 kg of leeks.

The total cost is £9.03

The potatoes cost 84p per kg

Work out the cost per kg of the leeks.

[4 marks]

$$\text{Potatoes: } 1.75 \times 0.84 = \text{£}1.47$$

$$\text{Leeks: } 9.03 - 1.47 = \text{£}7.56$$

$$\text{Per kg: } 7.56 \div 4 = \text{£}1.89$$

Answer £ 1.89 per kg



- 11 (a) Simplify fully  $2x + 9y + 1 + 8x - 5y - 7$

[3 marks]

$$2x + 8x = 10x$$

$$9y - 5y = 4y$$

$$1 - 7 = -6$$

Answer  $10x + 4y - 6$

- 11 (b) Circle the expression that is equivalent to  $0.5a^2$

[1 mark]

$$a$$

$$\frac{a}{2}$$

$$\frac{a^2}{2}$$

$$\frac{a^2}{4}$$

Turn over for the next question

Turn over ►



12

Here are the subjects available in year 12 at a school.

| Block 1     | Block 2       | Block 3     | Block 4     |
|-------------|---------------|-------------|-------------|
| Maths (M)   | Geography (G) | English (E) | Spanish (S) |
| History (H) | Drama (D)     | Physics (P) | Biology (B) |
| French (F)  | Chemistry (C) | ICT (I)     | Art (A)     |

Students choose **three** subjects.

They **cannot** choose more than one subject from a block.

Lian decides

to study Maths

**not** to study Geography, Chemistry, Physics or ICT.

By listing, show that there are **seven** groups of three subjects that Lian could choose.

**[3 marks]**

| Subject 1    | Subject 2      | Subject 3      |
|--------------|----------------|----------------|
| <i>Maths</i> | <i>Drama</i>   | <i>English</i> |
| <i>Maths</i> | <i>Drama</i>   | <i>Spanish</i> |
| <i>Maths</i> | <i>Drama</i>   | <i>Biology</i> |
| <i>Maths</i> | <i>Drama</i>   | <i>Art</i>     |
| <i>Maths</i> | <i>English</i> | <i>Spanish</i> |
| <i>Maths</i> | <i>English</i> | <i>Biology</i> |
| <i>Maths</i> | <i>English</i> | <i>Art</i>     |



- 13** There are 1400 students at a college.  
A student is chosen at random.

- 13 (a)** The probability that the student is taking a GCSE resit is 0.09  
How many of the students are taking a GCSE resit?

**[2 marks]**

$$0.09 \times 1400 = 126$$

Answer 126

- 13 (b)** The probability that the student is studying  
A-levels is 0.67  
Core Maths is 0.48  
Show that some students are studying A-levels **and** Core Maths.

**[2 marks]**

$$0.67 + 0.48 = 1.15$$

$1.15 > 1$ , but the total probability cannot be more than 1

so  $1.15 - 1 = 0.15$  of the students ( $0.15 \times 1400 = 210$ )

must be studying both A-levels and Core Maths.

Turn over for the next question

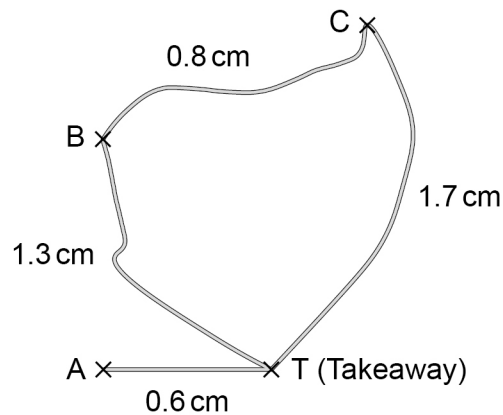
Turn over ►



- 14 Des delivers takeaways to houses A, B and C.

**Scale:** 1 cm represents 3 miles

Not drawn  
accurately



Des drives

from T to A and back  
and  
from T to B, then B to C, then C to T.

Des is paid

40p for each mile he drives  
and  
£1.35 for each house he delivers to.

How much is Des paid in total for this work?

**[4 marks]**

$$\text{Map distance} = 0.6 + 0.6 + 1.3 + 0.8 + 1.7 = 5 \text{ cm}$$

$$\text{Real distance} = 5 \times 3 = 15 \text{ miles}$$

$$\text{Miles: } 15 \times 0.40 = \text{£}6.00$$

$$\text{Houses: } 3 \times 1.35 = \text{£}4.05$$

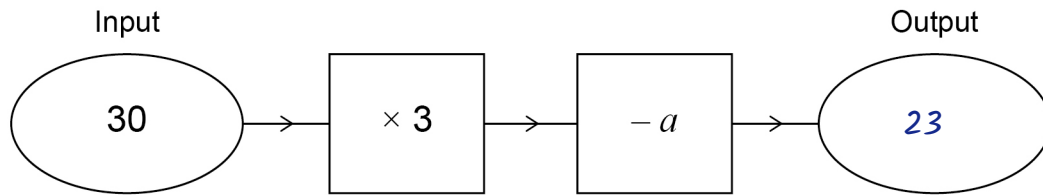
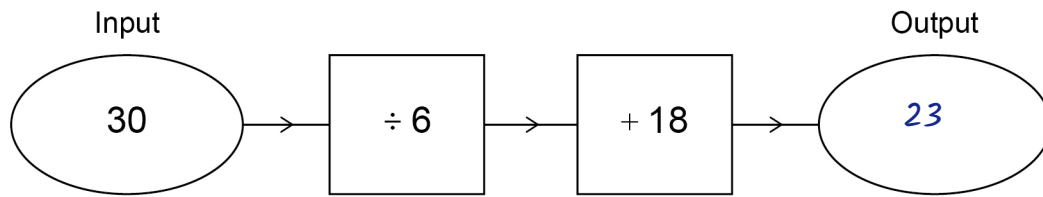
$$\text{Total} = 6.00 + 4.05 = \text{£}10.05$$

Answer £ 10.05



15

Here are two number machines.



The outputs are the same.

Work out the value of  $a$ .**[4 marks]**

First machine:  $30 \div 6 = 5$ ,  $5 + 18 = 23$

Second machine:  $30 \times 3 = 90$

$90 - a = 23$

$a = 90 - 23$

$a = 67$

$a = 67$

Turn over ►



16

Which is closer in value to 2.5

$$\frac{3}{4} \text{ or } 4\frac{1}{5} ?$$

You **must** show your working.**[3 marks]**

$$3 \div 4 = 0.75$$

$$4 + 1 \div 5 = 4.2$$

$$2.5 - 0.75 = 1.75$$

$$4.2 - 2.5 = 1.7$$

1.7 is less than 1.75

so  $4\frac{1}{5}$  is closer to 2.5

Answer  $4\frac{1}{5}$



17

A computer game has five levels.

Each level has a maximum number of points.

These maximum numbers form an **arithmetic progression**.

The table shows the numbers for the first three levels.

|         |      |
|---------|------|
| Level 1 | 400  |
| Level 2 | 750  |
| Level 3 | 1100 |
| Level 4 | 1450 |
| Level 5 | 1800 |

Your score is the **total** of the points you achieve in **each** of the five levels.

Isaac's best score is 1250 points **less** than the highest possible score.

Work out his best score.

[4 marks]

$$\text{Common difference} = 750 - 400 = 350$$

$$\text{Level 4} = 1100 + 350 = 1450$$

$$\text{Level 5} = 1450 + 350 = 1800$$

$$\text{Highest possible} = 400 + 750 + 1100 + 1450 + 1800$$

$$= 5500$$

$$\text{Best score} = 5500 - 1250 = 4250$$

Answer 4250

Turn over ►

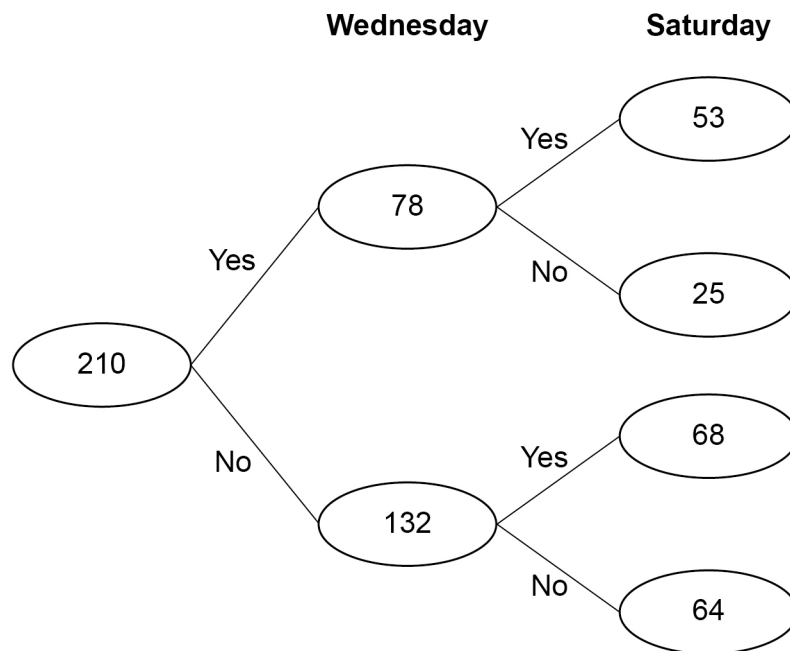


18

A walking group has 210 members.

One week, the group organised a walk on Wednesday and a walk on Saturday.

The frequency tree shows how many members went on the walks.



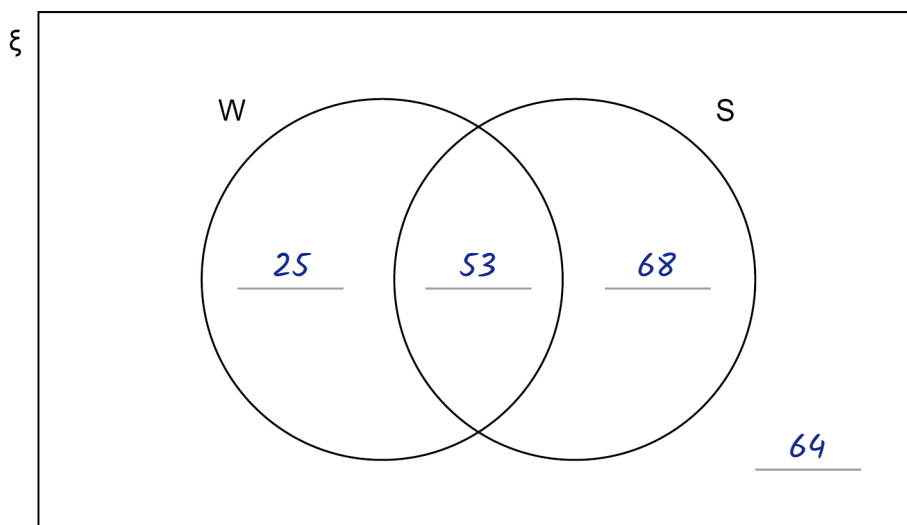
Show the information on the Venn diagram.

[4 marks]

$\xi$  = 210 members

W = members who went on the Wednesday walk

S = members who went on the Saturday walk



- 19** The length of a line is 8 cm to the nearest centimetre.  
Complete the error interval. **[2 marks]**

*Half of 1 cm = 0.5 cm:  $8 - 0.5 = 7.5$ ,  $8 + 0.5 = 8.5$*

Answer 7.5 cm  $\leq$  length < 8.5 cm

- 20** Which of these is an estimate?  
Tick **one** box. **[1 mark]**

☐

lowest value of **ungrouped** data

☐

range of **ungrouped** data

☐

modal class of **grouped** data

☒

mean of **grouped** data

Turn over for the next question



21 Carly's total annual pay = salary + bonus

|           | Salary      | Bonus       |
|-----------|-------------|-------------|
| Last year | £26 000     | £4000       |
| This year | 6% increase | 9% decrease |

Work out the percentage change in her total annual pay.

State whether it is an increase or a decrease.

[4 marks]

$$\text{Salary: } 26000 \times 1.06 = £27560$$

$$\text{Bonus: } 4000 \times 0.91 = £3640$$

$$\text{Last year: } 26000 + 4000 = £30000$$

$$\text{This year: } 27560 + 3640 = £31200$$

$$31200 \div 30000 = 1.04$$

$$1.04 = 104\%, \text{ so a } 4\% \text{ increase}$$

Answer 4% increase



22

The first two cube numbers are 1 and 8

Show that

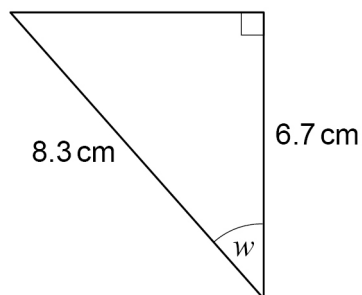
the 3rd cube number can be written as the sum of three different prime numbers.

**[3 marks]**

$$\boxed{27} = \boxed{3} + \boxed{5} + \boxed{19}$$

*3rd cube number =  $3 \times 3 \times 3 = 27$  (3, 5 and 19 are prime)*

23

Use trigonometry to work out the size of angle  $w$ .**[3 marks]**Not drawn  
accurately

$$\cos w = \text{adjacent} \div \text{hypotenuse} = 6.7 \div 8.3$$

$$w = \cos^{-1}(6.7 \div 8.3)$$

$$w = 36.1739\dots$$

$$w = 36.2^\circ \text{ (1 dp)}$$

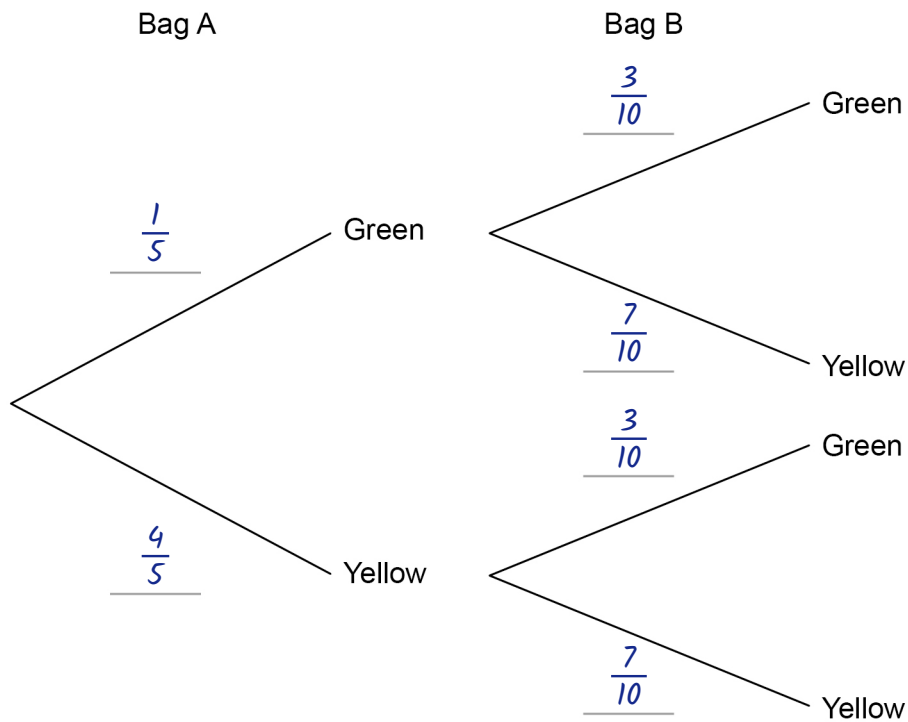
$$w = \underline{\quad 36.2 \quad}^\circ$$



- 24** Two bags contain only green discs and yellow discs.  
 Bag A contains 1 green disc and 4 yellow discs.  
 Bag B contains 3 green discs and 7 yellow discs.  
 One disc is picked at random from each bag.

- 24 (a)** Complete the tree diagram with the correct probabilities.

**[2 marks]**



- 24 (b)** Work out the probability that **both** discs are green.

**[2 marks]**

$$\frac{1}{5} \times \frac{3}{10} = \frac{3}{50}$$

Answer  $\frac{3}{50}$



25

Solve these simultaneous equations.

$$7x + 2y = 100$$

$$3x + 2y = 48$$

[3 marks]

$$7x + 2y = 100$$

$$3x + 2y = 48$$

$$\text{Subtract: } 4x = 52$$

$$x = 13$$

$$3 \times 13 + 2y = 48$$

$$39 + 2y = 48$$

$$2y = 9$$

$$y = 4.5$$

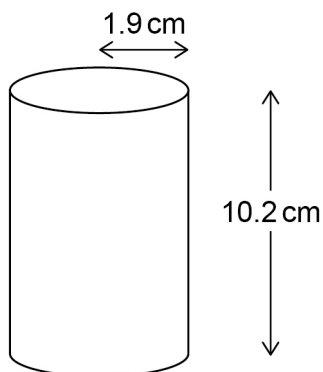
$$x = 13 \quad y = 4.5$$

Turn over for the next question

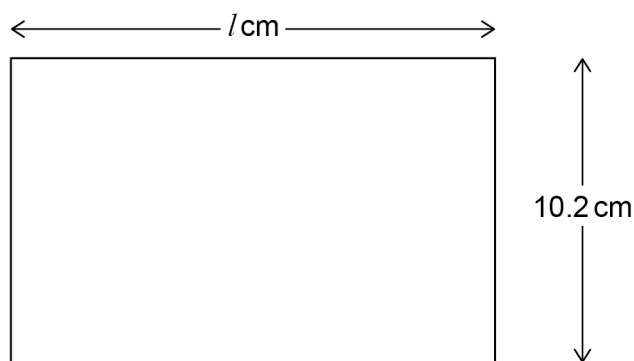
Turn over ►



- 26** An open cardboard cylinder has radius 1.9 cm and height 10.2 cm



- 26 (a)** Harry assumes that the net of the cylinder is a rectangle with length  $l$  cm



Not drawn  
accurately

Work out the area of this rectangle.

**[3 marks]**

$$l = \text{circumference} = 2 \times \pi \times 1.9 = 11.9380\dots$$

$$\text{Area} = 11.9380\dots \times 10.2$$

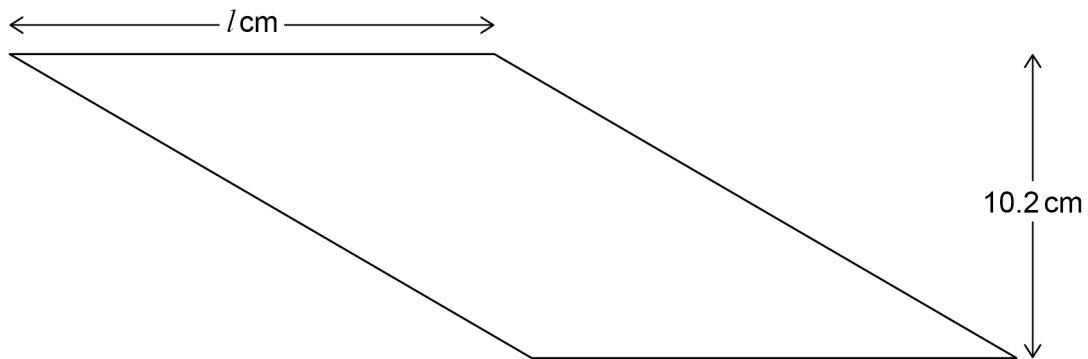
$$= 121.768\dots$$

Answer 121.8 cm<sup>2</sup>



In fact, the net is a parallelogram, not a rectangle.

Not drawn  
accurately



**26 (b)** What does this mean about the **area** of the net?

Tick **one** box.

[1 mark]

☐

It is less than the area of the rectangle

☒

It is equal to the area of the rectangle

☐

It is more than the area of the rectangle

**26 (c)** What does this mean about the **perimeter** of the net?

Tick **one** box.

[1 mark]

☐

It is less than the perimeter of the rectangle

☐

It is equal to the perimeter of the rectangle

☒

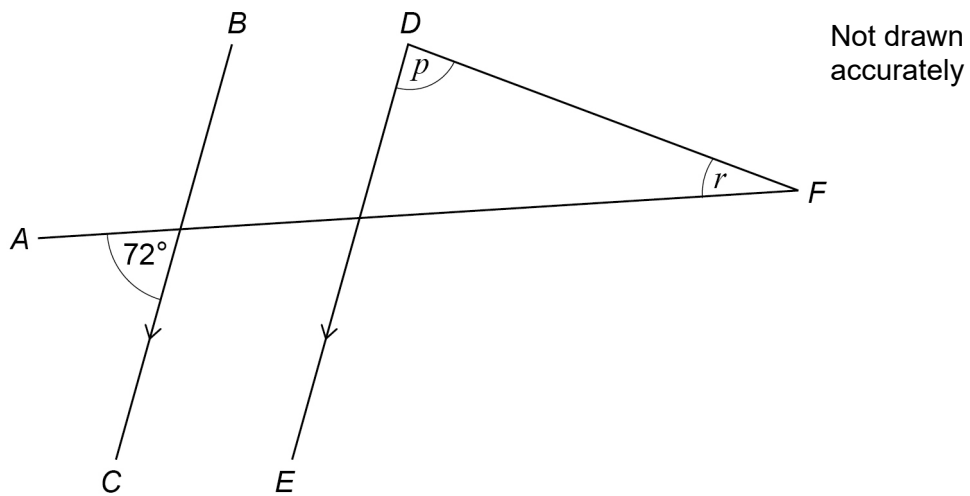
It is more than the perimeter of the rectangle



27

$AF$ ,  $BC$ ,  $DE$  and  $DF$  are straight lines.

$BC$  and  $DE$  are parallel.



$p$  is three times  $r$ .

Work out the size of angle  $p$ .

[3 marks]

*Angle between  $DE$  and  $AF = 72^\circ$  (corresponding angles)*

*Angle in the triangle at that point =  $72^\circ$  (vertically opposite)*

*Angles in a triangle add up to  $180^\circ$ :*

$$p + r = 180 - 72 = 108$$

$$3r + r = 108, \text{ so } 4r = 108$$

$$r = 27$$

$$p = 3 \times 27 = 81$$

$$p = \underline{\quad 81 \quad}^\circ$$

**END OF QUESTIONS**



**There are no questions printed on this page**

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outside the  
box*

**DO NOT WRITE ON THIS PAGE  
ANSWER IN THE SPACES PROVIDED**



[illegible]



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