

WRITTEN SOLUTIONS

Please write clearly, in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

GCSE MATHEMATICS

F

Foundation Tier Paper 3

Exam Date

Morning

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a calculator
- mathematical instruments.



Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- 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.
- 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.

Advice

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

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

- 1 Circle the decimal that has the same value as $\frac{4}{5}$ MEANS $4 \div 5$

[1 mark]

0.04

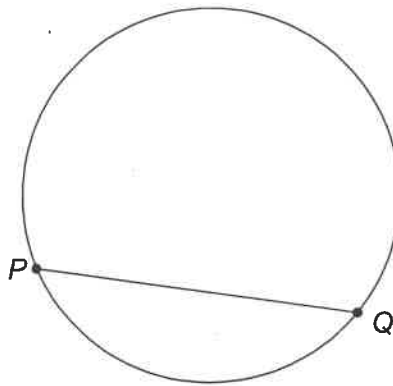
0.4

0.45

0.8

USE CALCULATOR: $4 \div 5 = 0.8$

- 2 Circle the word that describes the straight line PQ :



[1 mark]

chord

diameter

radius

tangent

3

 $x = 2500$ to the nearest 100

HALF OF 100 = 50

Circle the smallest possible value of x .

SUBTRACT 50 FROM 2500

[1 mark]

2449

2450

2495

2499

$$2500 - 50 = 2450$$

4

What is one quarter of 5 hours? = 4 HOURS + 1 HOUR

Tick a box.

 $\frac{1}{4}$ OF 4 HOURS = 1 HR $\frac{1}{4}$ OF 1 HOUR = 15 MIN

[1 mark]

1 hour 15 minutes

115 minutes

1 hour 25 minutes

125 minutes

Turn over for the next question

5

Simplify $6w - 5x - 4w - 2x$

[2 marks]

COLLECT LIKE TERMS

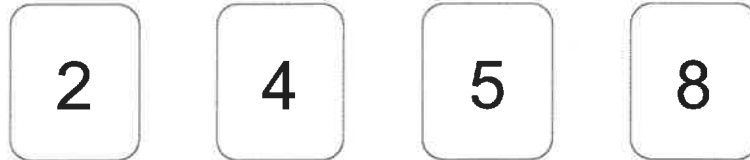
$$6w - 4w - 5x - 2x$$

$$= 2w - 7x$$

Answer 2w - 7x

6

Beth uses these four cards to make 4-digit numbers.

How many **different** 4-digit numbers can she make that are greater than 8000?

MUST START WITH 8 EACH TIME

[2 marks]

8 2 4 5 8 4 2 5 8 5 2 4
 8 2 5 4 8 4 5 2 8 5 4 2

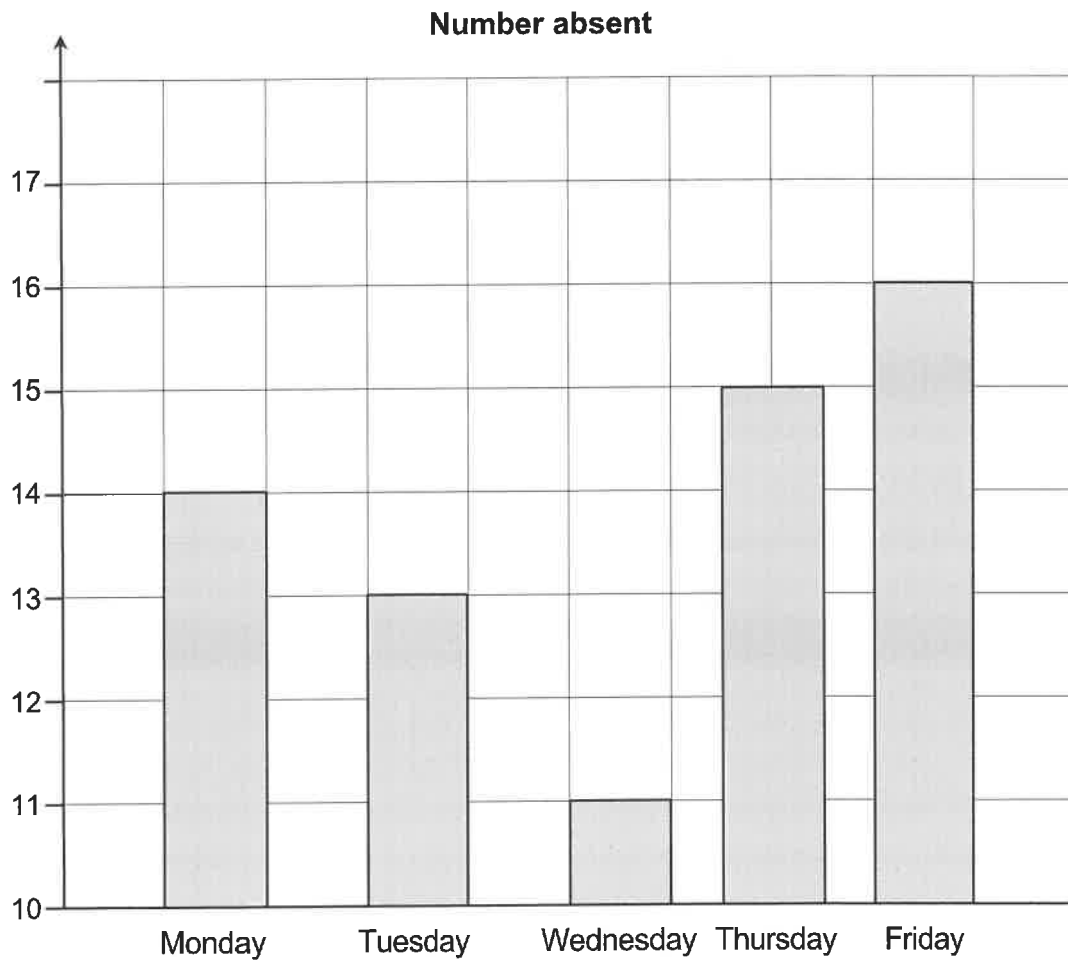
Answer 6 numbers

7

The table shows the number of Year 11 students who were absent in one week.

	Monday	Tuesday	Wednesday	Thursday	Friday
Number absent	14	13	11	15	16

Jack uses this information to draw a bar chart.



Write down **two** mistakes that he has made.

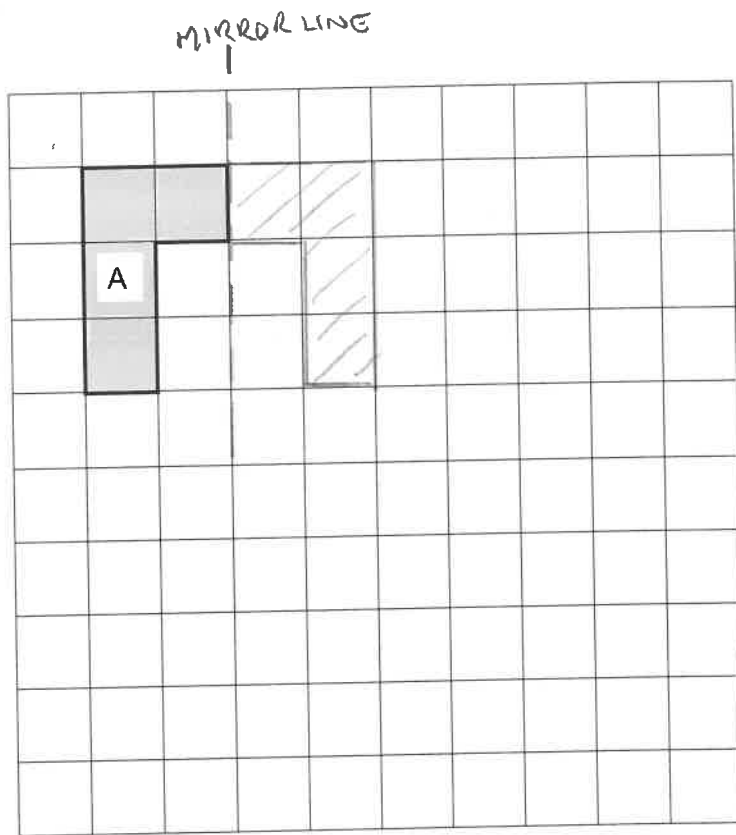
[2 marks]

Mistake 1 VERTICAL SCALE DOES NOT START AT '0'

Mistake 2 GAPS BETWEEN BARS NOT EQUAL

- 8 (a) On the grid draw a shape that is a reflection of shape A.
Show your mirror line.

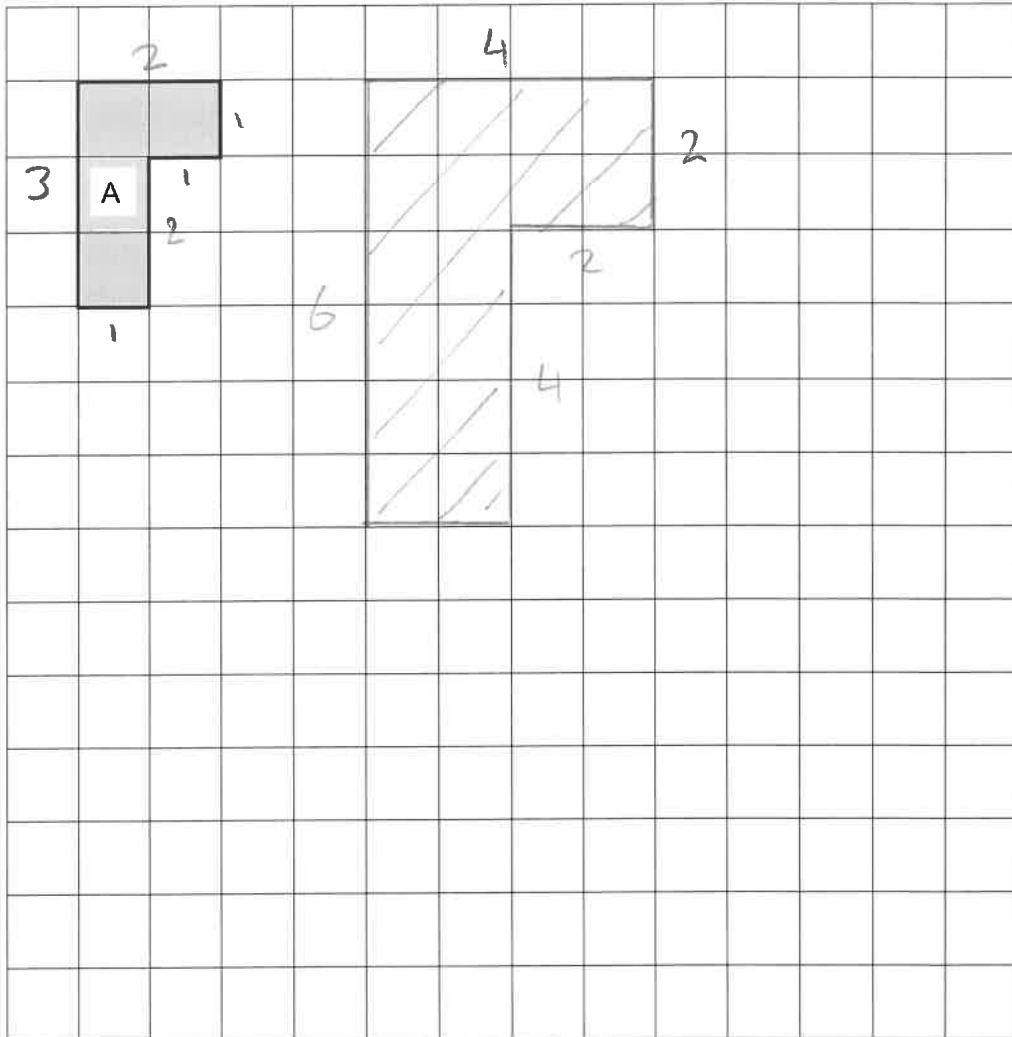
[1 mark]



- 8 (b) On this grid draw a shape that is an enlargement of shape A.

[1 mark]

EXAMPLE: SCALE FACTOR 2 (DOUBLE IN SIZE)



Turn over for the next question

9 (a)



How many DVDs do you get for £35?

[3 marks]

$$\begin{array}{r}
 \pounds 10 \text{ GIVES } 2 + 1 \text{ FREE} \\
 \pounds 10 \text{ GIVES } 2 + 1 \text{ FREE} \\
 \pounds 10 \text{ GIVES } 2 + 1 \text{ FREE} \\
 \pounds 5 \text{ GIVES } 1 \\
 \hline
 \pounds 35 \qquad 10 \text{ DVDs}
 \end{array}$$

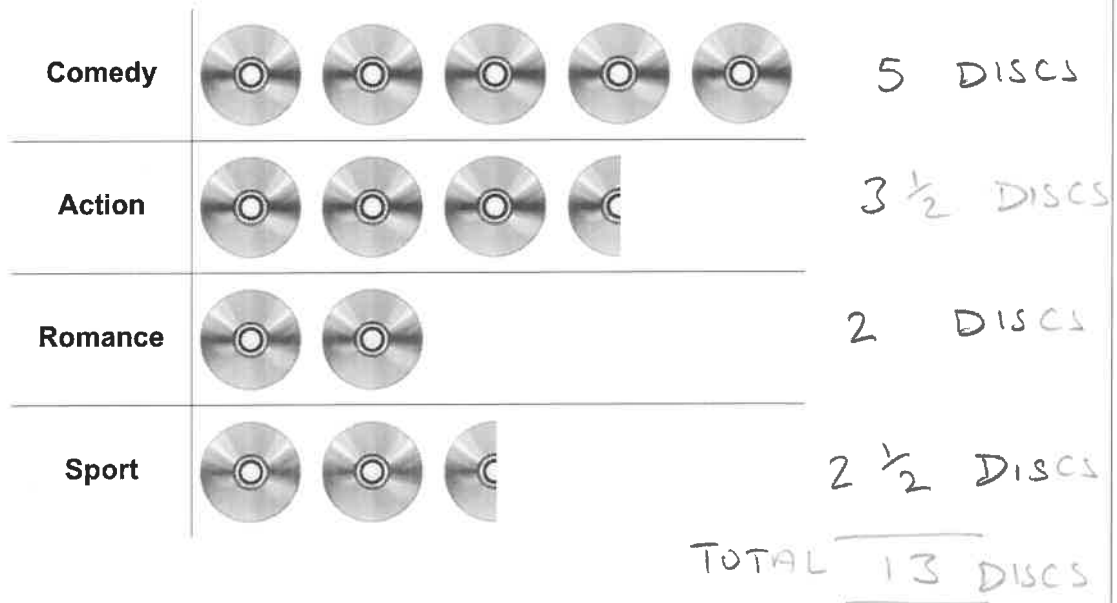
Answer 10

2nd method

$$\pounds 35 \div \pounds 5 = 7 \text{ DVDs}$$

$$\begin{array}{r}
 \text{But } 2 \text{ DVDs} + 1 \text{ FREE} \\
 2 \text{ DVDs} + 1 \text{ FREE} \\
 2 \text{ DVDs} + 1 \text{ FREE} \\
 1 \text{ DVD} \\
 \hline
 10 \text{ DVDs}
 \end{array}$$

- 9 (b) The pictogram shows some information about DVDs.
The key is missing.



The total number of DVDs is 260

Work out the number of **Sport** DVDs.

[4 marks]

$$260 \div 13 \text{ DISCS} = 20$$

$$\text{EACH PICTURE DISC} = 20 \text{ DVDS}$$

$$\text{HALF DISC} = 10 \text{ DVDS}$$

$$\text{SPORT} = 2\frac{1}{2} \text{ DISCS}$$

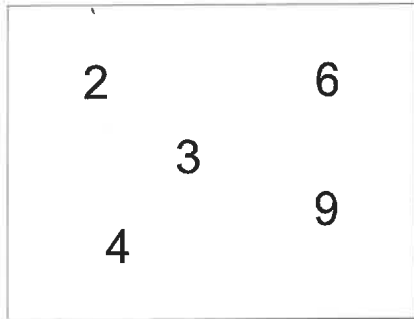
$$= 20 + 20 + 10 \text{ DVDS}$$

$$= 50 \text{ DVDS}$$

Answer 50

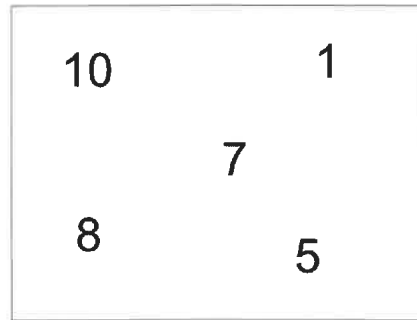
10

Box A



$$\text{TOTAL} = 2 + 6 + 3 + 4 + 9 \\ = 24$$

Box B



$$\text{TOTAL} = 10 + 1 + 8 + 7 + 5 \\ = 31$$

Two of the numbers move from Box A to Box B.

The total of the numbers in Box B is now **four** times the total of the numbers in Box A.

Which **two** numbers move?

[2 marks]

TRY TAKING TWO NUMBERS FROM A AND
ADDING TO B'S TOTAL

TRY 9 AND 6 FROM A, SO B BECAME $31 + 9 + 6$

A BECAME $24 - 9 - 6 = 9$ DOESN'T WORK = 46

TRY 9 AND 4

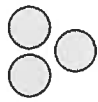
B BECAME $31 + 9 + 4 = 44$

A BECAME $24 - 9 - 4 = 11$ ✓

44 IS FOUR TIMES 11

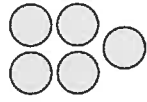
Answer 9 and 4

- 11 The diagram shows a sequence of patterns.



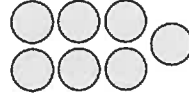
Pattern 1

3 circles



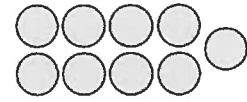
Pattern 2

5



Pattern 3

7



Pattern 4

9

- 11 (a) Work out the number of circles in Pattern 6

[1 mark]

RULE IS ADD 2. PATTERN 5 = 11

PATTERN 6 = 13

Answer 13

- 11 (b) Complete the rule below.

DOUBLE THE PATTERN NUMBER
THEN ADD 1

[1 mark]

Number of circles = Pattern number \times $\boxed{2}$ + $\boxed{1}$

- 11 (c) Which Pattern number has 51 circles?

[1 mark]

PATTERN 25 BECAUSE $25 \times 2 + 1$
 $= 51$

Pattern 25

12 In 2012 electricity cost 15p per unit.
A family used 3729 units.

In 2013 electricity cost 17p per unit.
The family used 3506 units.

How much **more** did the family pay for electricity in 2013?

[3 marks]

$$2012 : 15p \times 3729 = 55935p$$

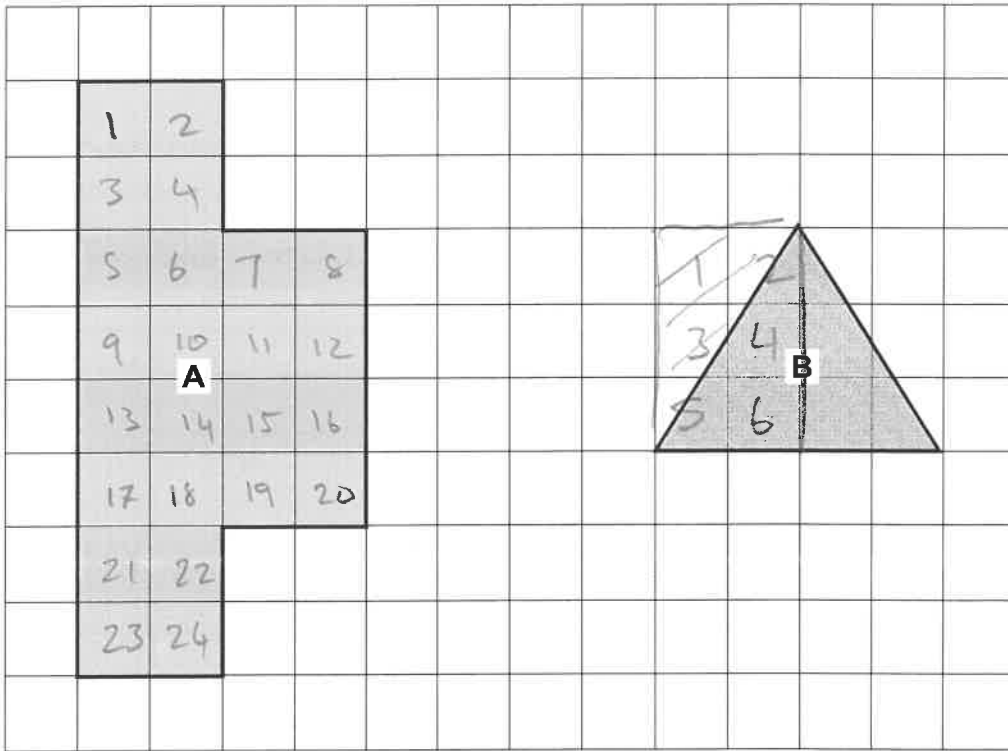
$$2013 : 17p \times 3506 = 59602p$$

$$59602 - 55935 = 3667p$$

$$3667p \div 100 = \pounds 36.67$$

Answer \pounds 36.67

13



Work out area of shape A : area of shape B

Give your answer in its simplest form.

[3 marks]

$$24 : 6$$

$$12 : 3$$

$$4 : 1$$

Answer 4 : 1

14 Work out 258% of 6300

[2 marks]

Find 1%:

$$6300 \div 100 = 63$$

Then: $63 \times 258 = 16254$

(2nd Method: $6300 \times 2.58 = 16254$)

Answer 16254

15 You are given that

$$a = 3 \text{ and } b = 5$$

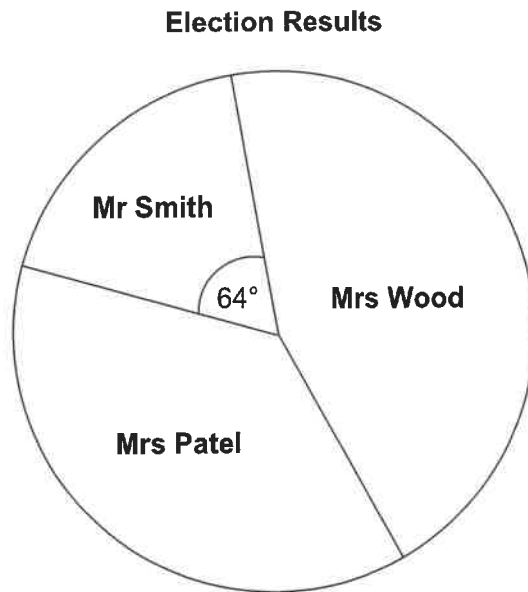
Tick whether each statement is true or false.

Give a reason for each answer.

[2 marks]

Statement	True	False	Reason
$ab = 35$		✓	ab means $a \times b$ so $3 \times 5 = 15$
$2b^2 = 100$		✓	$2b^2$ means $2 \times b \times b$ so $2 \times 5 \times 5 = 50$

- 16 The pie chart shows some information about the share of votes for candidates in an election.



The angle for Mrs Wood would be 24° more than the angle for Mrs Patel.
There were 5220 votes in total.

Work out the number of votes for Mrs Patel.

[4 marks]

For Mrs Wood AND Mrs Patel:

$$360^\circ - 64^\circ = 296^\circ$$

DIFFERENCE BETWEEN Mrs Wood AND Mrs Patel
is 24°

$$\text{SPLIT } 296^\circ \text{ IN TWO} = 148^\circ$$

$$\text{SPLIT DIFFERENCE OF } 24^\circ \text{ IN TWO} = 12^\circ$$

$$148^\circ - 12^\circ = 136^\circ$$

$$\text{VOTES FOR MRS PATEL} = \frac{136}{360} \times 5220$$

$$\text{Answer} = 1972$$

17 White paint and red paint are mixed together in the ratio 2 : 3

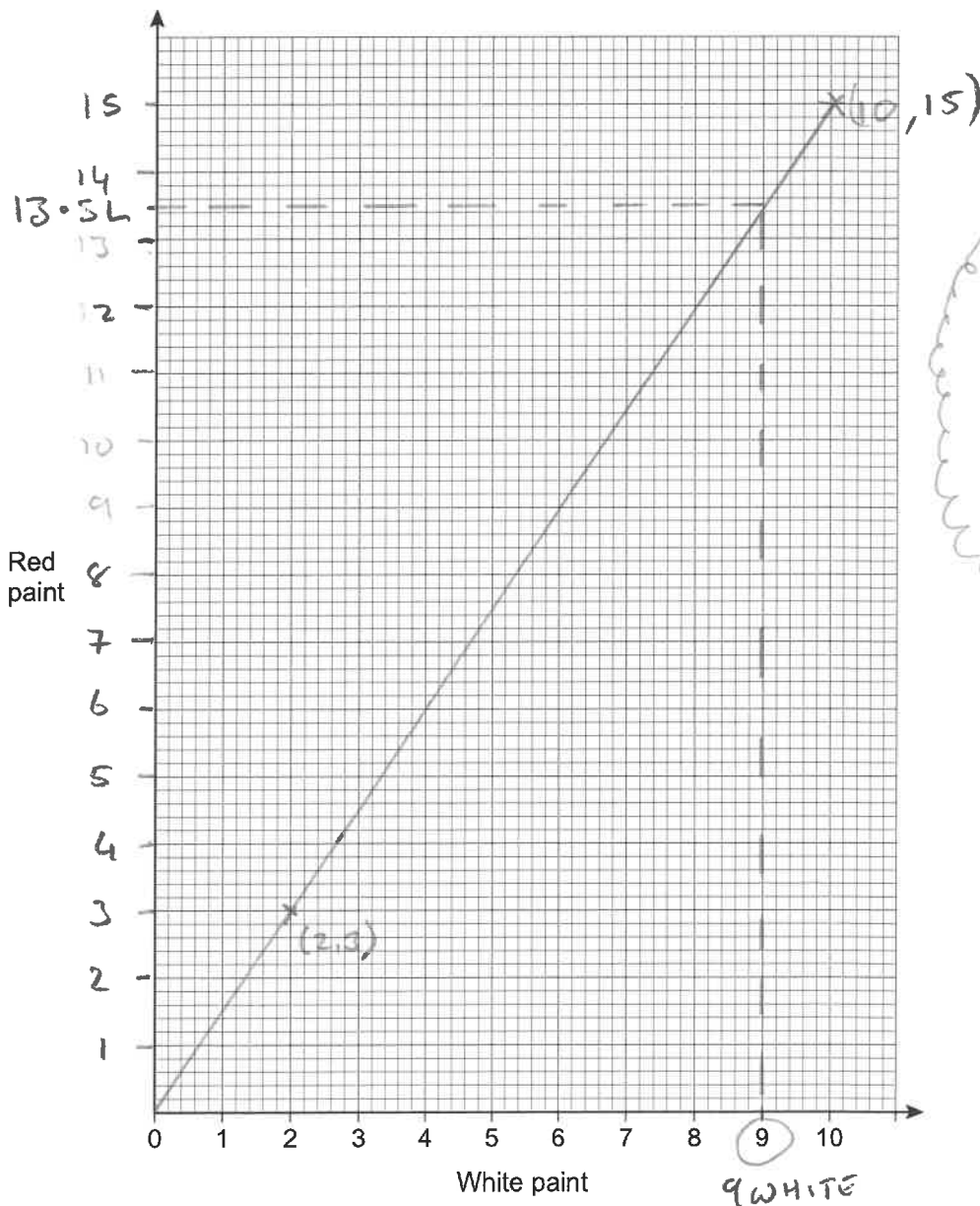
17 (a) Draw a graph that can be used to work out the amount of red paint needed given the amount of white paint.

Your graph **must** show up to 10 litres of white paint.

[3 marks]

$$\times 5 \left(\begin{array}{l} 2:3 \\ \downarrow \\ 10:15 \end{array} \right) \times 5$$

RED SCALE MUST GO UP TO 15L IF WHITE IS UP TO 10L



PLOT GRAPH
THROUGH
POINTS (0,0)
AND (2,3)
AND DRAW
STRAIGHT
LINE

17 (b) How much red paint needs to be mixed with 9 litres of white paint?

[1 mark]

Answer 13.5 L litres

- 18 The perimeter of an isosceles triangle is 25 cm
The length of each side, in cm, is a prime number.

Work out the lengths of the sides of the **two** possible isosceles triangles.

[4 marks]

PRIME NUMBERS 2, 3, 5, 7, 11, 13, 17, 19, 23

TWO SIDES MUST BE THE SAME,
ALL THREE SIDES MUST BE PRIME NUMBERS.

TRY DIFFERENT COMBINATIONS:

$$5 + 5 = 10 \quad 25 - 10 = 15 \text{ (NOT PRIME)}$$

$$3 + 3 = 6 \quad 25 - 6 = 19 \text{ PRIME! SO WORKS}$$

$$2 + 2 = 4 \quad 25 - 4 = 21 \text{ (NOT PRIME)}$$

$$7 + 7 = 14 \quad 25 - 14 = 11 \text{ PRIME SO WORKS}$$

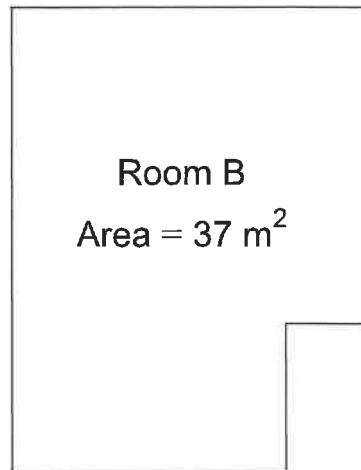
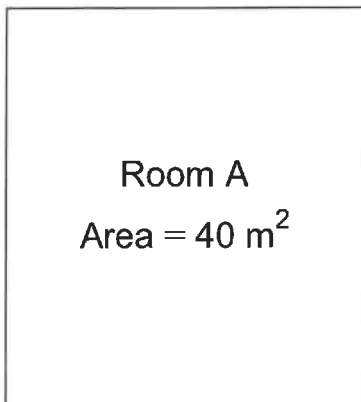
Also

$$11 + 11 = 22 \quad 25 - 22 = 3 \text{ PRIME, SO ALSO WORKS}$$

First triangle 3 cm 3 cm 19 cm

Second triangle 7 cm 7 cm 11 cm

- 19 A children's nursery uses one room for babies and one room for toddlers.



Not drawn
accurately

Each baby needs at least 3.5 m^2 of floor space.

Each toddler needs at least 2.5 m^2 of floor space.

Show that the **total** number of children allowed is larger if

the toddlers are in Room A

and the babies are in Room B.

[4 marks]

TODDLERS (2.5m^2) IN ROOM A (40m^2)

$$40\text{m}^2 \div 2.5\text{m}^2 = 16 \text{ TODDLERS}$$

BABIES (3.5m^2) IN ROOM B (37m^2)

$$37\text{m}^2 \div 3.5\text{m}^2 = 10.6 \text{ BABIES (BUT CAN ONLY HAVE 10)}$$

$$\text{TOTAL: } 16 \text{ TODDLERS AND } 10 \text{ BABIES} = 26$$

TODDLERS (2.5) IN ROOM B (37)

$$37 \div 2.5 = 14.8, \text{ so only } 14 \text{ TODDLERS}$$

BABIES (3.5) IN ROOM A (40)

$$40 \div 3.5 = 11.4 \text{ so only } 11 \text{ BABIES}$$

$$\text{TOTAL } 14 + 11 = 25 \text{ (LESS THAN 26)}$$

SO MOST CHILDREN IF TODDLERS IN ROOM A,
AND BABIES IN ROOM B.

Turn over for the next question

20

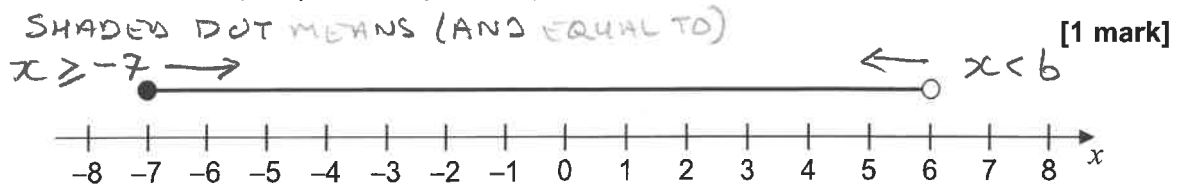
Work out the next term of this quadratic sequence.

[2 marks]

$$\begin{array}{ccccccccc} 4 & & 12 & & 24 & & 40 & & \underline{60} \\ & \frown & & \frown & & \frown & & \frown & \\ & +8 & & +12 & & +16 & & +20 & \\ & & \frown & & \frown & & \frown & & \\ & & +4 & & +4 & & +4 & & \end{array}$$

Answer 60

- 21 Circle the inequality shown by the diagram.



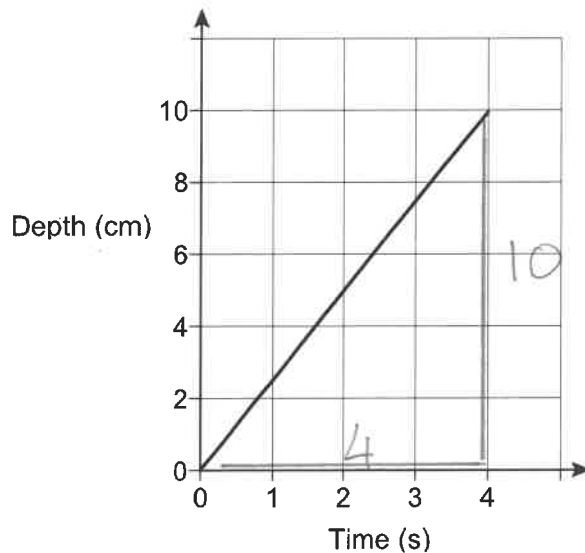
$$-7 < x < 6$$

$$-7 \leq x < 6$$

$$-7 < x \leq 6$$

$$-7 \leq x \leq 6$$

- 22 Water is poured into a glass for 4 seconds.
The graph shows the depth of the water in the glass.



RATE OF CHANGE
IS THE GRADIENT OF
THE LINE

$$= \frac{\text{RISE}}{\text{RUN}} = \frac{10}{4} = 2.5$$

OR

$$= \frac{\text{CHANGE IN } y \text{ VALUE}}{\text{CHANGE IN } x \text{ VALUE}}$$

$$= \frac{10}{4} = 2.5$$

- What is the rate of change of the depth of the water?
Circle your answer.

$$0.4 \text{ cm/s}$$

$$1.25 \text{ cm/s}$$

$$2.5 \text{ cm/s}$$

$$10 \text{ cm/s}$$

[1 mark]

23 Here is an ordinary dice.



23 (a) Ali is going to throw the dice six times.

He says,

"I will get one of each number."

Give a reason why he could be wrong.

[1 mark]

ALTHOUGH THEORETICAL PROBABILITY SAYS 1 OUT OF 6,
ACTUAL RESULTS ARE NOT ALWAYS LIKE THAT.

23 (b) Lucy throws the dice 50 times.

Her results are shown.

Number thrown	1	2	3	4	5	6
Frequency	7	4	12	5	9	13

Work out the relative frequency of throwing an odd number.

RELATIVE FREQUENCY IS THE NUMBER OF TIMES [2 marks]
SOMETHING HAPPENS OUT OF TOTAL NUMBER OF THROWS.

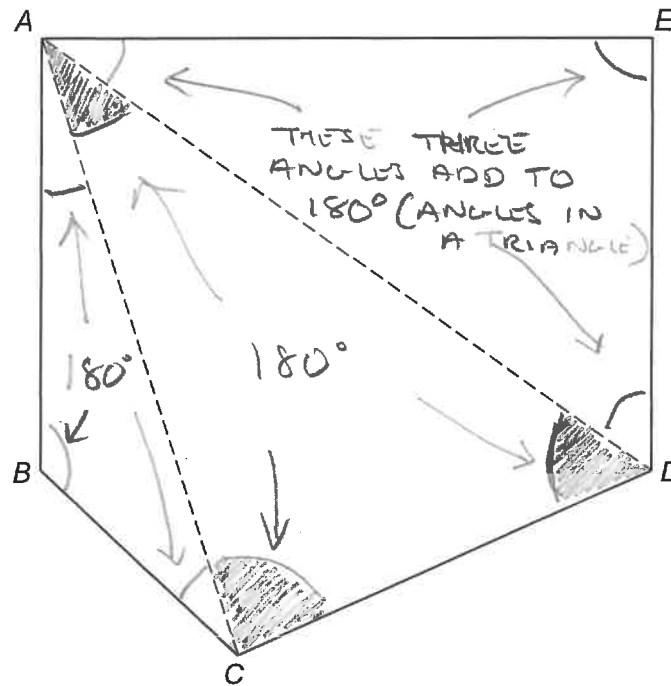
$$\text{TOTAL NUMBER OF ODD THROWS} = 7 + 12 + 9 = 28$$

$$\frac{28}{50}$$

Answer $\frac{28}{50} = \frac{14}{25}$

24

Polygon $ABCDE$ is divided into triangles as shown.



Not drawn accurately

INTERIOR ANGLES ARE THE ANGLES ON THE INSIDE OF THE CORNERS.

Use the triangles to work out the sum of the interior angles of polygon $ABCDE$.

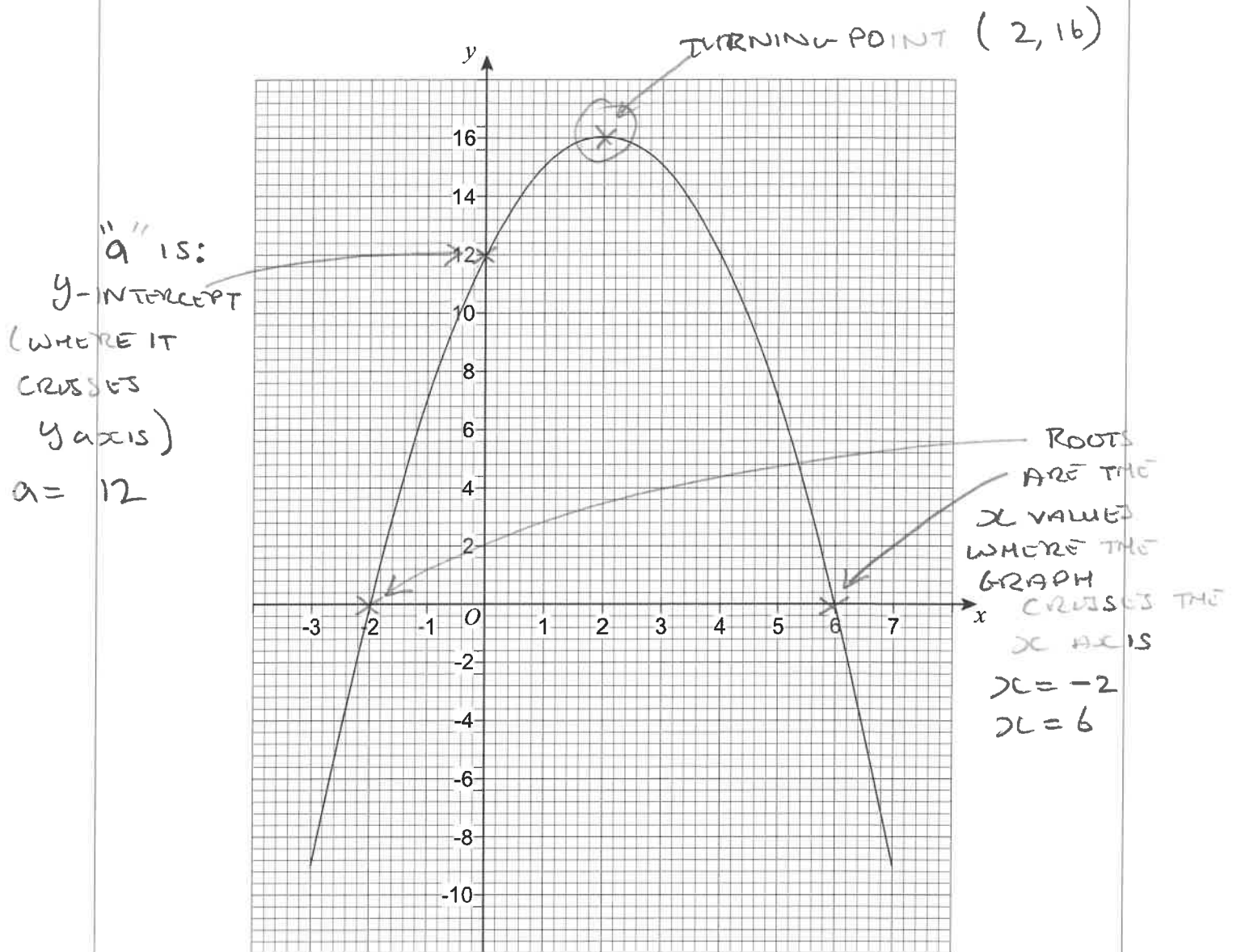
You **must** show your working.

[2 marks]

THE SUM (ADD THEM) OF THE INTERIOR ANGLES
IS THE SUM OF THE THREE TRIANGLE ANGLES,
EQUALS $180^\circ + 180^\circ + 180^\circ$
 $= 540^\circ$

Answer 540 degrees

25 The graph $y = a + bx - x^2$ is shown.



25 (a) Circle the coordinates of the turning point of the curve.

[1 mark]

(-2, 0)

(0, 12)

(2, 16)

(6, 0)

25 (b) Circle the value of a .

[1 mark]

-2

12

16

6

25 (c) Circle the two roots of $a + bx - x^2 = 0$

[1 mark]

-2 and 6

2 and -6

2 and 6

-2 and -6

26

In a school, 60% of the students are girls. SO 40% ARE BOYS

50% of the girls walk to school. THIS IS HALF ($\frac{50}{100}$)

20% of the boys walk to school. THIS IS $\frac{20}{100}$ OR $\frac{2}{10}$ OR $\frac{1}{5}$

What percentage of the students walk to school?

[3 marks]

FOR GIRLS: 50% OF GIRLS IS HALF OF 60% = 30%

FOR BOYS: 20% OF BOYS IS $\frac{1}{5}$ OF 40%
= $40 \div 5 = 8\%$

SO TOTAL WALKING IS $30\% + 8\% = 38\%$

Answer 38% %

Turn over for the next question

27 (a) Factorise fully $9a^2 - 6a$

$$= (3) \times 3 \times (a) \times a - (3) \times 2 \times (a)$$

[2 marks]

COMMON FACTORS ARE 3 AND a, SO...

$$3a(3a - 2)$$

Answer $3a(3a - 2)$

27 (b) Solve $x^2 - 12x + 20 = 0$

$$-10 \times -2 = 20$$

$$-10 + -2 = -12$$

[3 marks]

$$(x - 10)(x - 2) = 0$$

$$x = 10, x = 2$$

Answer 10 AND 2

28 Adam and six other men ran a race.

The times, in seconds, of the six other men are shown.

$$9.75 + 9.79 + 9.80 + 9.88 + 9.94 + 9.98 = 59.14$$

The mean time for all seven men was 9.83 seconds.

Did Adam win the race?

You must show your working.

[3 marks]

LET THE MISSING TIME BE CALLED x

$$\text{THE MEAN TIME} = 9.83 = \frac{\text{TOTAL OF ALL SEVEN TIMES}}{7}$$

$$\text{TOTAL OF ALL SEVEN TIMES} = 7 \times 9.83 = 68.81$$

$$68.81 = x + 9.75 + 9.79 + 9.80 + 9.88 + 9.94 + 9.98$$

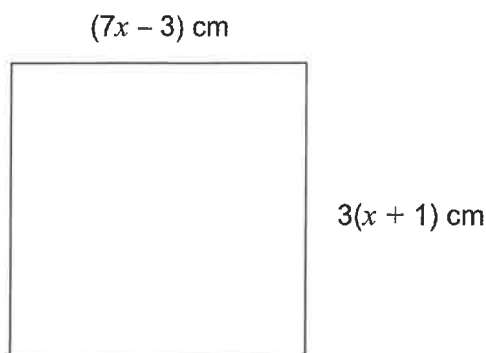
$$68.81 = x + 59.14$$

$$68.81 - 59.14 = x$$

$$9.67 = x$$

29

The diagram shows a square.



Work out the length of one side of the square.

[4 marks]

As the sides of a square equal each other,
 then $(7x - 3)$ must equal $3(x + 1)$

$$7x - 3 = 3(x + 1) \quad (\text{EXPAND THE BRACKET})$$

$$7x - 3 = 3x + 3$$

$$4x - 3 = 3$$

$$4x = 6$$

$$\div 4 \quad \div 4$$

Answer 7.5 or $7\frac{1}{2}$ cm

$$x = \frac{6}{4} = 1.5$$

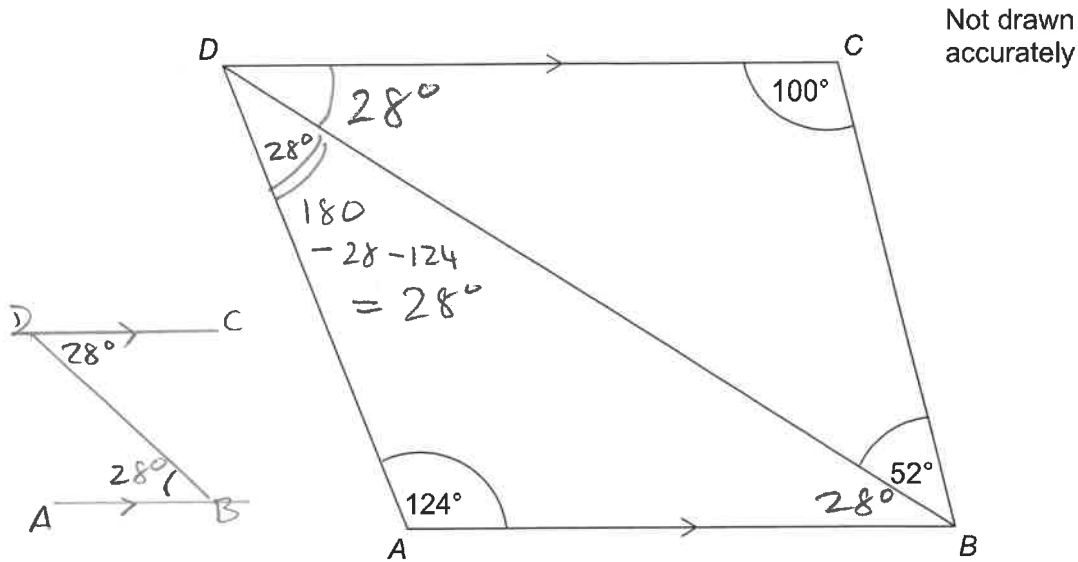
LENGTH OF SIDE: SUBSTITUTE $x = 1.5$
 INTO $3(x + 1)$

$$= 3(1.5 + 1)$$

$$= 3(2.5)$$

$$= (7.5)$$

30

In the diagram, DC is parallel to AB .Show that triangle ABD is isosceles.

[3 marks]

ANGLE CDB IS $180 - 52 - 100 = 28^\circ$

(ANGLES IN TRIANGLE ADD TO 180°)

ARROWS SHOW THAT LINES AB AND DC ARE PARALLEL, SO ANGLE $CDB =$ ANGLE $ABD = 28^\circ$

(ALTERNATE ANGLES IN PARALLEL LINES)

ANGLE $ADB = 180 - 28 - 124 = 28^\circ$

SO ANGLE $ADB =$ ANGLE $ABD = 28^\circ$, SO

TRIANGLE ADB MUST BE ISOSCELES (TWO ANGLES THE SAME).

END OF QUESTIONS

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