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GCSE (9–1) Mathematics

J560/01 Paper 1 (Foundation Tier)

Thursday 24 May 2018 – Morning

Time allowed: 1 hour 30 minutes



You may use:

- a scientific or graphical calculator
- geometrical instruments
- tracing paper



First name										
Last name										
Centre number						Candidate number				

INSTRUCTIONS

- Use black ink. You may use an HB pencil for graphs and diagrams.
- Complete the boxes above with your name, centre number and candidate number.
- Answer **all** the questions.
- Read each question carefully before you start to write your answer.
- Where appropriate, your answers should be supported with working. Marks may be given for a correct method even if the answer is incorrect.
- Write your answer to each question in the space provided. Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the barcodes.

INFORMATION

- The total mark for this paper is **100**.
- The marks for each question are shown in brackets [].
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- This document consists of **16** pages.

Answer **all** the questions.

1 Here is a list of numbers.

2 8 5 12 6

(a) From this list, write down

(i) the odd number,

5 is odd - not a multiple of 2.

(a)(i) 5 [1]

(ii) the cube number.

$2^3 = 8$ so 8 is a cube number.

$2 \times 2 \times 2 = 8$

(ii) 8 [1]

(b) Using the same list of numbers, work out

(i) the median,

median is the number in the middle.

2 5 (6) 8 12
1 2 3 4 5

(b)(i) 6 [1]

(ii) the range.

range = highest - lowest
 $12 - 2 = 10$

(ii) 10 [2]

2 Here are the first four terms of a sequence.

2 $\xrightarrow{\times 2}$ 4 $\xrightarrow{\times 2}$ 8 $\xrightarrow{\times 2}$ 16

(a) What is the next term in the sequence?

$16 \times 2 = 32$
Each term is double
the previous term.

(a) 32 [1]

(b) Explain how you worked out your answer.

Multiply the previous term by 2.

[1]

3

- 3 (a) Write 48 as a percentage of 200.

$$\frac{48}{200} \times 100 = 24\%$$

$$\frac{\text{part of total}}{\text{total}} \times 100\%$$

(a) 24 % [1]

- (b) Work out $\frac{1}{4}$ of 80.

$$\frac{1}{4} \times 80 = \frac{80}{4} = 20$$

(b) 20 [1]

- (c) Decrease 650 by 40%.

$$0.6 \times 650 = 390$$

Decreasing by 40% is the same as 60% of 650.

$$60\% = \frac{60}{100} = 0.6$$

$$\begin{array}{l} 100\% = 650 \\ 10\% = 65 \\ 60\% = 390 \end{array} \begin{array}{l}) \div 10 \\) \times 6 \end{array}$$

(c) 390 [3]

- 4 Patrick writes down a number.

He says

If I find the square root of that number and then add 15, I get 27.

What number did Patrick write down?

$$27 - 15 = 12$$

-15 is the opposite of +15

$$12^2 = 144$$

Square is the opposite of square root.

..... 144 [2]

- 5 (a) Write 12:54 as a ratio in its simplest form.

$$\begin{array}{l} 12 : 54 \\ \div 6 \left(\begin{array}{l} 2 : 9 \end{array} \right) \div 6 \end{array}$$

6 is the HCF of both parts of the ratio.

(a) 2 : 9 [2]

- (b) The ratio 400g : 1 kg can be written in the form 1 : n.

Find the value of n.

$$\begin{array}{l} 400g : 1000g \quad 1kg = 1000g \\ \div 400 \left(\begin{array}{l} 1 : \frac{5}{2} \end{array} \right) \div 400 \end{array}$$

(b) $n = \dots\dots\dots \frac{5}{2} \dots\dots\dots$ [2]

- (c) Amanda and Wim share some money in the ratio 2:5.
Wim receives £115.

Calculate how much money was shared.

Wim: 5 parts = £115

so 1 part = $115 \div 5 = £23$

Total parts = $2 + 5 = 7$

$7 \times 23 = £161$

(c) £ 161 [3]

- 6 A leopard is running with a velocity of 3 m/s.
It then accelerates at 2 m/s^2 for 4 seconds.

Use the formula

$$v = u + at$$

to work out the final velocity of the leopard.

$u = 3 \text{ m/s} \quad a = 2 \text{ m/s}^2 \quad t = 4 \text{ seconds}$

$$\begin{aligned} v &= 3 + (2 \times 4) \\ &= 3 + 8 \\ &= 11 \text{ m/s} \end{aligned}$$

..... 11 m/s [2]

7 (a) Solve.

(i) $4x = 56$

$x = 56 \div 4$
 $x = 14$

(a)(i) $x = \dots\dots\dots 14 \dots\dots\dots$ [1]

(ii) $\frac{126}{x} = 7$) $\times x$

$\therefore 7 (126 = 7x$
 $x = 126 \div 7$
 $x = 18$

(ii) $x = \dots\dots\dots 18 \dots\dots\dots$ [1]

(iii) $8x - 6 = 46$) $+6$

$8x = 52$
 $x = \frac{52}{8}$
 $x = \frac{13}{2}$

(iii) $x = \dots\dots\dots \frac{13}{2} \dots\dots\dots$ [2]

(b) Solve by factorising.

$x^2 + 11x + 30 = 0$

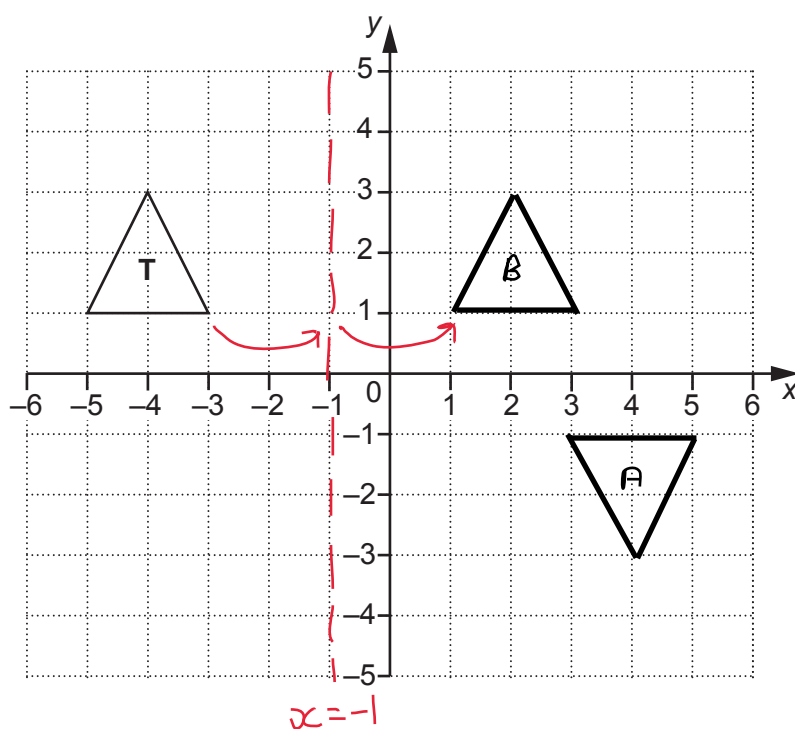
$5 \times 6 = 30$
 $5 + 6 = 11$
 $ax + bx + c = 0$
 A pair of numbers must add to the b-term and multiply to the c-term.

$x^2 + 5x + 6x + 30 = 0$
 $x(x + 5) + 6(x + 5) = 0$
 $(x + 6)(x + 5) = 0$
 Split the b-term.
 Factorise each side - the brackets must be the same.

$x + 6 = 0$ so $x = -6$
 $x + 5 = 0$ so $x = -5$

(b) $x = \dots\dots\dots -6 \dots\dots\dots$ or $x = \dots\dots\dots -5 \dots\dots\dots$ [3]

- 8 Triangle **T** is drawn on a coordinate grid.



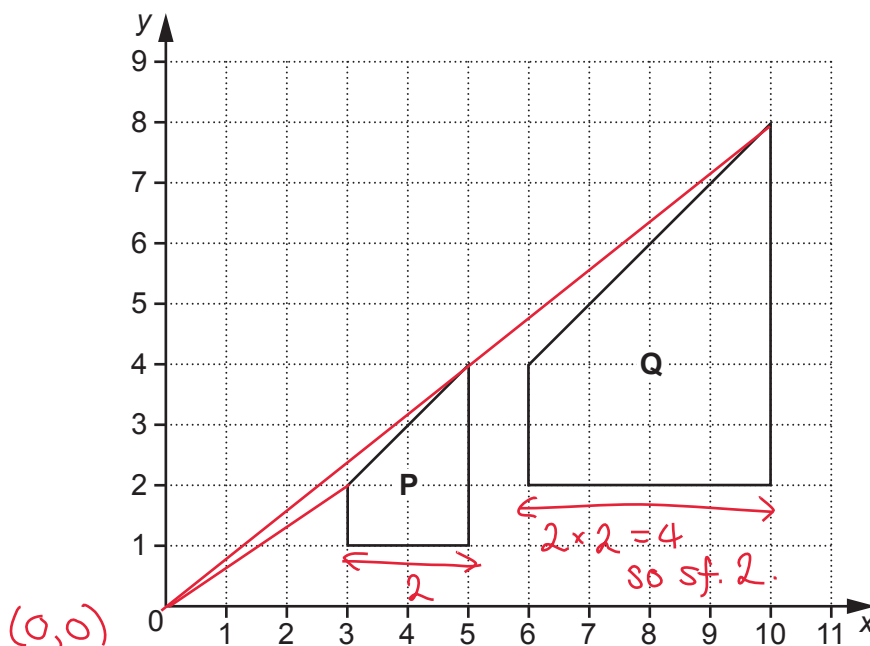
- (a) Rotate triangle **T** through 180° about $(0, 0)$.
Label your image **A**.

[2]

- (b) Reflect triangle **T** in the line $x = -1$.
Label your image **B**.

[2]

9 Two shapes are drawn on the grid below.



Describe fully the **single** transformation which maps shape **P** onto shape **Q**.

Enlargement scale factor 2 about (0,0).....

[3]

10 Reuben hires a car.
It costs £150, **plus** 85p for each mile he travels.

When Reuben hires the car, its mileage is 27612 miles.
When Reuben returns the car, its mileage is 28361 miles.

How much did Reuben pay to hire the car?

miles travelled: $28361 - 27612 = 749$ miles

cost: cost to hire car + 85p per mile

$$= £150 + (£0.85 \times 749)$$

$$= £786.65$$

£ 786.65 [4]

11 Pippa owns a snack bar.

(a) She uses $\frac{3}{5}$ of a kilogram of spread each day.

Spread costs £3.20 for a 1 kilogram tub and £6.15 for a 2 kilogram tub.

Pippa buys enough spread to last for 14 days.

What is the lowest price Pippa can buy this spread for?

Show your working.

$$\frac{3}{5} \times 14 = 8.4 \text{ kg}$$

9 tubs (because it must be a whole number)

$$8 \div 2 = 4 \text{ 2kg tubs } (+ 1 \times 1 \text{ kg tub})$$

$$4 \times 6.15 + 3.2 = £27.80$$

(a) £ 27.80 [4]

(b) In 2016, Pippa paid £1650 rent.
In 2017, the rent increased by 14%.

Calculate the amount of rent she paid in 2017.

$$1650 \times 1.14 = £1881$$

Increased by 14% is the same as 114% of £1650.

$$114\% = \frac{114}{100} = 1.14$$

(b) £ 1881 [3]

12 A circle has radius 6 cm.

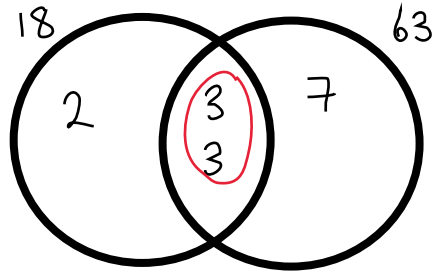
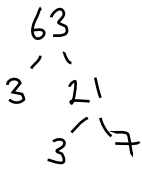
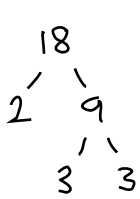
Calculate its circumference.

Give your answer in centimetres, correct to 1 decimal place.

$$\begin{aligned} \text{Circumference} &= 2 \times \pi \times r \\ &= 2 \times \pi \times 6 \\ &= 12\pi \\ &= 37.7 \text{ cm (1.d.p)} \end{aligned}$$

..... 37.7 cm [3]

13 (a) Show that the highest common factor (HCF) of 18 and 63 is 9. [2]



$HCF = 18 \wedge 63 = 3 \times 3 = 9$
 $18 = 1, 2, 3, 6, 9, 18$
 $63 = 1, 3, 7, 9, 21, 63$
 No factors higher than 9.

(b) Find the lowest common multiple (LCM) of 18 and 63.

$$LCM = 2 \times 3 \times 3 \times 7 = 18 \vee 63 = 126$$

.....126..... [2]

14 Aditi, Becky and Calli collect coins.
 Aditi has 6 more coins than Becky.
 Calli has 1 less coin than Aditi.
 Altogether they have 71 coins.

How many coins do they each have?
 Show all your working.

$a = \text{Aditi}$ $b = \text{Becky}$ $c = \text{Calli}$

$$a = b + 6$$

$$c = a - 1$$

$$= (b + 6) - 1$$

$$= b + 5$$

$$a + b + c = 71$$

$$(b + 6) + b + (b + 5) = 71$$

$$3b + 11 = 71$$

$$3b = 60$$

$$b = 20$$

) -11
) ÷3

$$a = b + 6 = 20 + 6 = 26$$

$$c = b + 5 = 20 + 5 = 25$$

Aditi has26..... coins
 Becky has20..... coins
 Calli has25..... coins

[5]

- 15 Lee wishes to find out if there is a relationship between a person's age and the time it takes them to complete a puzzle.

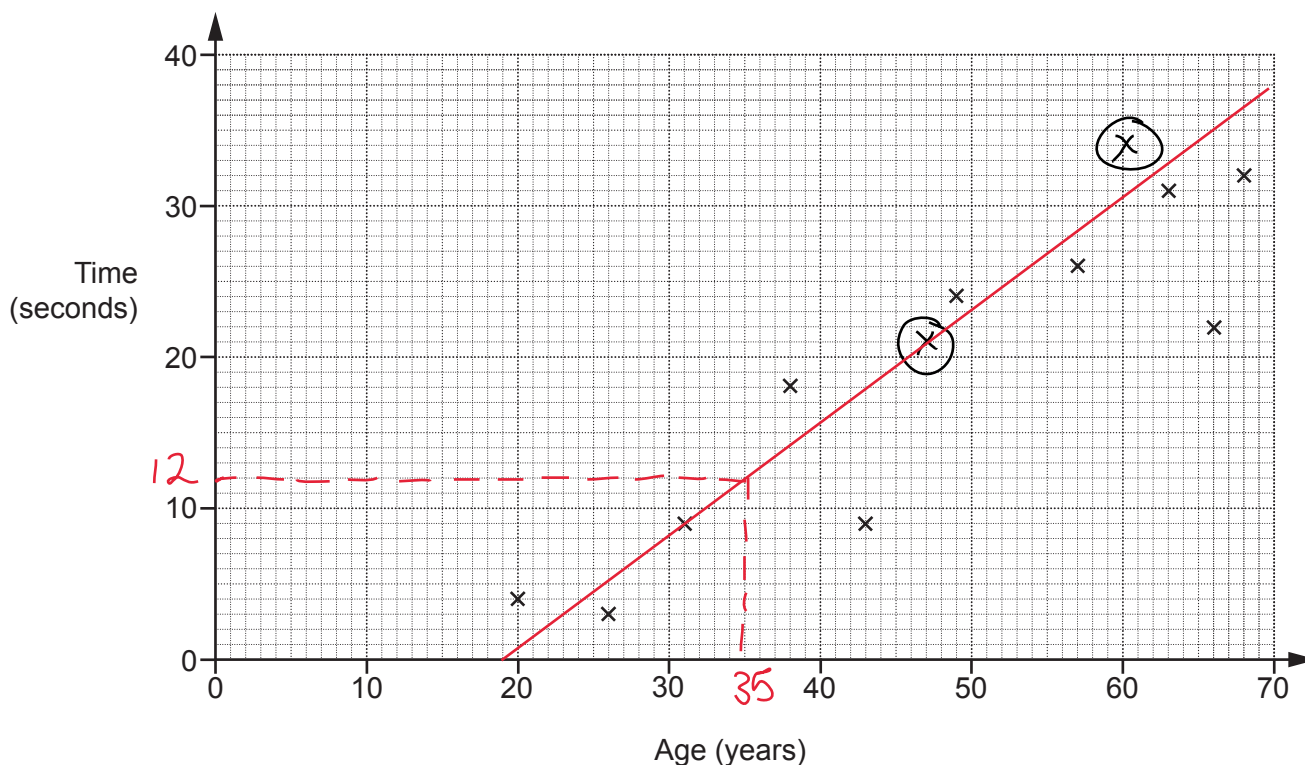
Lee decides to conduct an experiment.
 She asks 12 people to complete the puzzle.
 She records each person's age and the time taken to complete the puzzle.

- (a) Make one criticism of Lee's method.

Her sample size is too small.

[1]

This scatter diagram shows the results for ten of the people in Lee's experiment.



- (b) Here are the other two results.

Age (years)	47	60
Time (seconds)	21	34

Plot these results on the scatter diagram.

[2]

- (c) What type of correlation is shown in the scatter diagram?

As age increases, so does time, so correlation is positive.

(c) *Positive*

[1]

- (d) Estimate the time it would take a person aged 35 to complete the puzzle.
Show your working to justify your answer.

Draw a line of best fit. Find the time when age is 35 years.

(d) 12 seconds [2]

- (e) Lee says that at least 80% of the 12 people completed the puzzle in under 30 seconds.

Is Lee correct?

Show working to support your answer.

$$\frac{9}{12} \times 100 = 75\%$$

75% < 80% so Lee is incorrect.

..... [3]

- 16 Finn has two bags of counters.
He takes a counter at random from each bag.

The probability that he takes a red counter from the first bag is 0.3.
The probability that he takes a red counter from the second bag is 0.4.

What is the probability that he takes **at least** one red counter?

$$\begin{aligned} & P(\text{red and red}) \text{ or } P(\text{red and NOT red}) \text{ or } P(\text{NOT red and red}) \\ &= (0.3 \times 0.4) + (0.3 \times 0.6) + (0.7 \times 0.4) \\ &= 0.58 \end{aligned}$$

..... 0.58 [4]

- 17 The price of a computer was £750.

In a sale the price is reduced by 20%.
On the final day the **sale price** is reduced by a further 12%.

How much is saved in total by buying the computer on the final day of the sale?

$$750 \times 0.8 \times 0.88 = £528$$

$$750 - 528 = £222$$

Reduced by 20% is the same as 80% of £750.

$$80\% = \frac{80}{100} = 0.8$$

Reduced by 12% is the same as 88% of [previous answer].

$$88\% = \frac{88}{100} = 0.88$$

£ 222 [5]

- 18 The table below shows the weight, w kg, of the bags that people took on a plane.

Weight of bag (kg)	Frequency	Mid-Point	F X Mid-Point
$0 < w \leq 10$	16	5	80
$10 < w \leq 15$	10	12.5	125
$15 < w \leq 20$	20	17.5	350
$20 < w \leq 25$	8	22.5	180
$25 < w \leq 30$	6	27.5	165

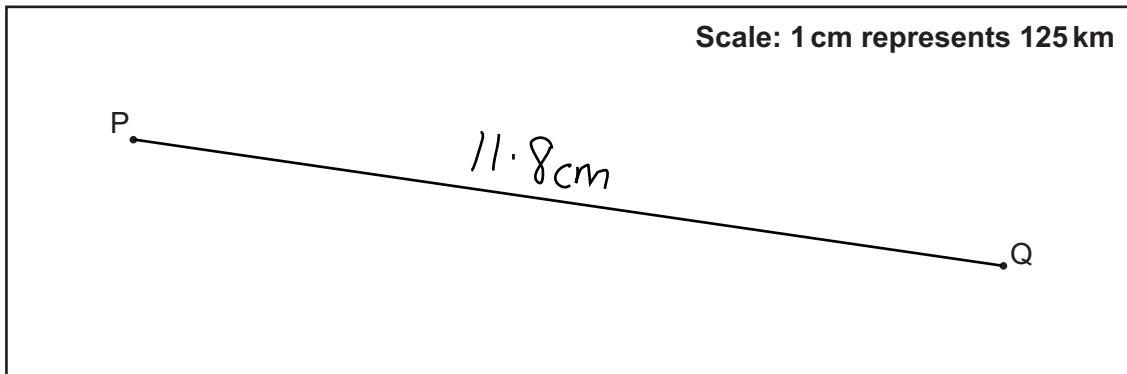
Calculate an estimate of the mean weight of the 60 bags.

$$\frac{80 + 125 + 350 + 180 + 165}{60} = 15$$

$$\text{mean} = \frac{\text{total sum of terms}}{\text{number of terms}}$$

..... 15 kg [4]

19 The scale diagram below shows two cities, P and Q.



A plane departs from P at 0947 and arrives at Q at 1207.

(a) Work out the average speed, in kilometres per hour, of the plane.

$$11.8\text{cm} = 11.8 \times 125 \text{ km} \\ = 1475\text{km}$$

$$09:47 \rightarrow 12:07 = 2 \text{ hours } 20 \text{ minutes}$$

$$20 \text{ minutes} = \frac{20}{60} = \frac{1}{3} \text{ hours}$$

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$= \frac{1475}{2\frac{1}{3}}$$

$$= 632 \text{ km/hour}$$

(a) 632 km/h [5]

(b) Give one reason why your answer may be inaccurate.

...The plane may not have flown in a straight line.....

..... [1]

20 The scale diagram below shows towns, A, B and C.
Line AB represents the road from A to B and line AC represents the road from A to C.

A shopping centre is to be built so that it is

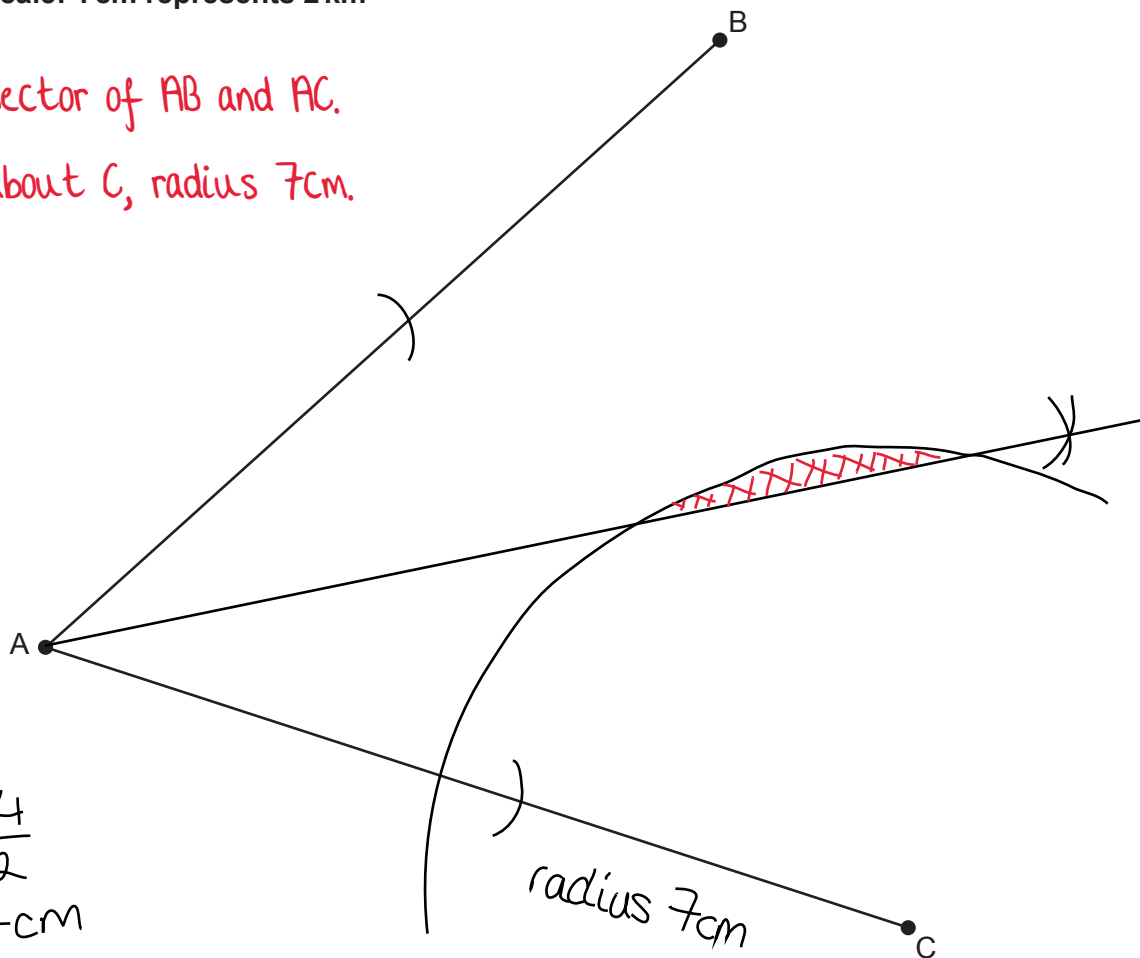
- nearer to the road from A to B than the road from A to C,
- less than 14 km from town C.

(a) Using construction, shade the region where the shopping centre could be built.
Show all your construction lines.

Scale: 1 cm represents 2 km

Find angle bisector of AB and AC.

Draw an arc about C, radius 7cm.



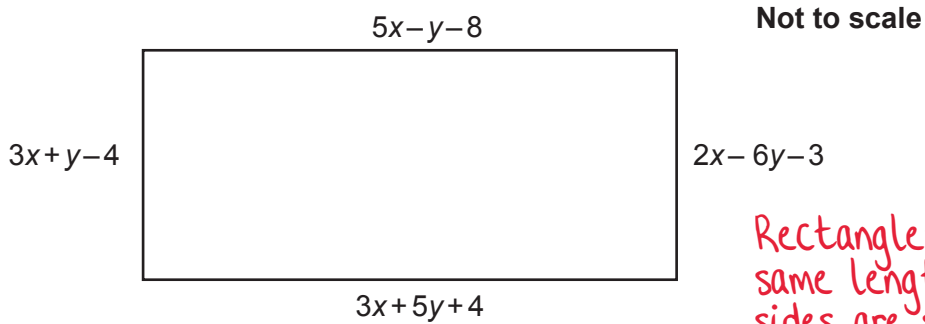
$$14\text{km} = \frac{14}{2} = 7\text{cm}$$

[5]

(b) Explain why the region found in part (a) may not be an appropriate site for the shopping centre.

The roads may not be straight.
.....
..... [1]

21 The dimensions, in centimetres, of this rectangle are shown as algebraic expressions.



Rectangle: vertical sides are same length and horizontal sides are same length.

Work out the length and width of the rectangle.

$$\begin{aligned}
 &5x - y - 8 = 3x + 5y + 4 \\
 -3x \left(&2x - y - 8 = 5y + 4 \\
 -5y \left(&2x - 6y - 8 = 4 \\
 +8 \left(&2x - 6y = 12 \\
 \div 2 \left(&x - 3y = 6 \quad \textcircled{1}
 \end{aligned}$$

$$\begin{aligned}
 &3x + y - 4 = 2x - 6y - 3 \\
 -2x \left(&x + y - 4 = -6y - 3 \\
 +6y \left(&x + 7y - 4 = -3 \\
 +4 \left(&x + 7y = 1 \quad \textcircled{2}
 \end{aligned}$$

$$\begin{aligned}
 \textcircled{1} - \textcircled{2} : & \quad x - 3y = 6 \\
 & \quad -x + 7y = 1 \\
 \hline
 & \quad \quad \quad 10y = 5
 \end{aligned}$$

$$\begin{aligned}
 \div (-10) \left(& \quad \quad \quad y = -\frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 x - 3\left(-\frac{1}{2}\right) &= 6 \quad \text{sub } y = -\frac{1}{2} \\
 & \quad \quad \quad \text{into } \textcircled{1}.
 \end{aligned}$$

$$\begin{aligned}
 -\frac{3}{2} \left(& \quad \quad \quad x + \frac{3}{2} = 6 \\
 & \quad \quad \quad x = \frac{9}{2}
 \end{aligned}$$

$$\text{width} = 3 \times \frac{9}{2} + \left(-\frac{1}{2}\right) - 4 = 9\text{cm}$$

$$\text{length} = 5 \times \frac{9}{2} - \left(-\frac{1}{2}\right) - 8 = 15\text{cm}$$

$$\text{length} = \dots\dots\dots 15 \dots\dots\dots \text{cm}$$

$$\text{width} = \dots\dots\dots 9 \dots\dots\dots \text{cm}$$

[6]

END OF QUESTION PAPER

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