OCR
Oxford Cambridge and RSA

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Monday 8 November 2021 – Morning

GCSE (9–1) Mathematics

J560/03 Paper 3 (Foundation Tier)

Time allowed: 1 hour 30 minutes

You can use:
- a scientific or graphical calculator
- geometrical instruments
- tracing paper

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

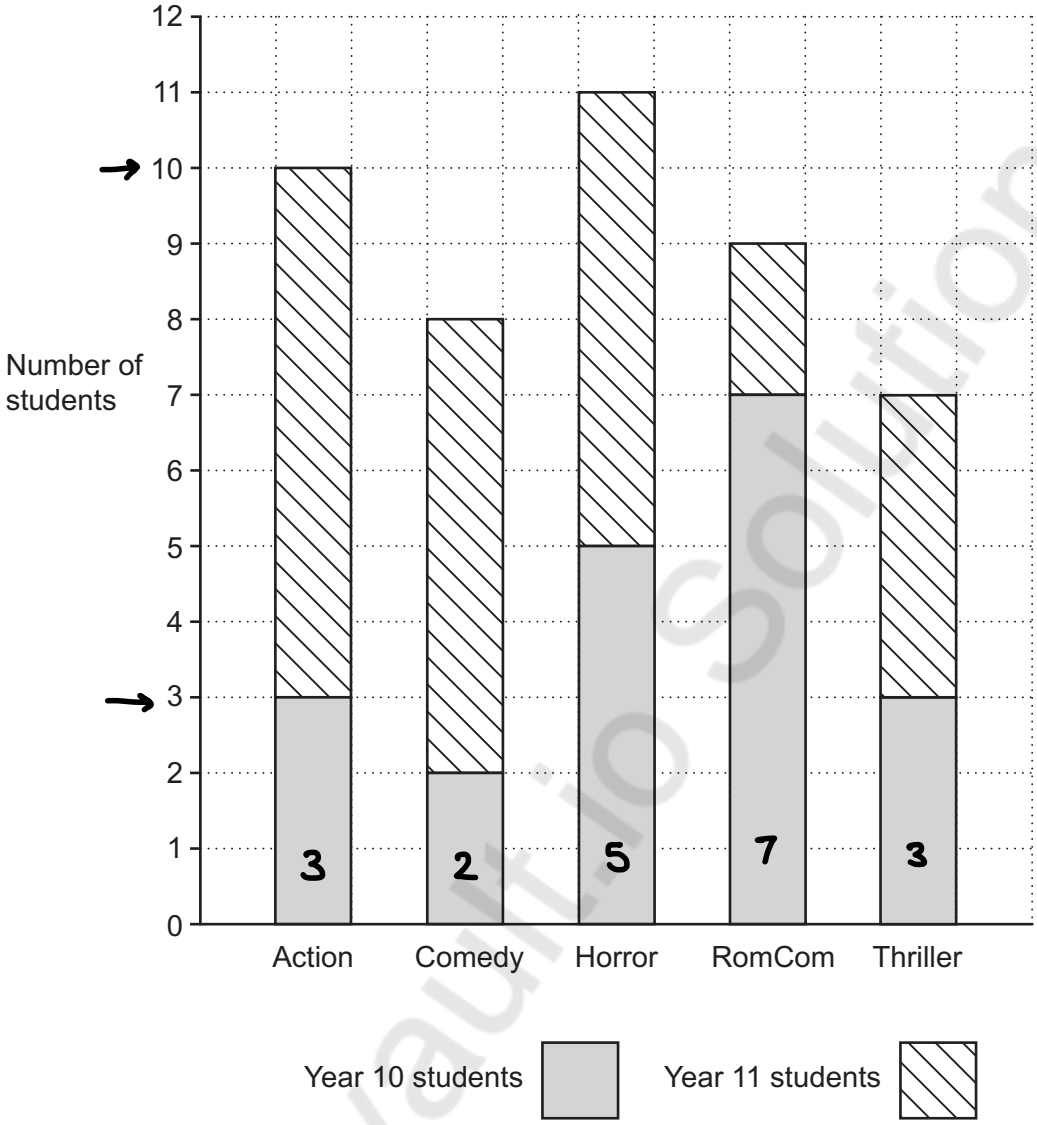
INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.
- Use the π button on your calculator or take π to be 3.142 unless the question says something different.

INFORMATION
- The total mark for this paper is **100**.
- The marks for each question are shown in brackets **[ ]**.
- This document has **24** pages.

ADVICE
- Read each question carefully before you start your answer.

Answer **all** the questions.

1 In a survey, some students chose their favourite type of film from a list of five.
The bar chart shows the results.



(a) (i) How many students chose Action films?

(a)(i) 10 **[1]**

(ii) How many Year 11 students chose Action films?

(ii) 7 **[1]**

(b) What type of film was chosen by the most Year 10 students?

(b) ..... Rom Com ..... **[1]**

(c) How many Year 10 students took part in the survey?

3 + 2 + 5 + 7 + 3

(c) ..... 20 ..... **[2]**

(d) 45 students took part in the survey.

Write the ratio

number of Year 10 students taking part : number of Year 11 students taking part

in its simplest form.

Year 10 = 20

Year 11 = 45 - 20 = 25

Y10 : Y11

20 : 25

÷5 ÷5

4 : 5

(d) ..... 4 ..... : ..... 5 ..... **[3]**

2 Use your calculator to work out.

(a) $\sqrt{196} + 29$

(a) 43 **[1]**

(b) 4^5

(b) 1024 **[1]**

3 There are 150 coins in a jar.
20% of the coins are 10p coins.
$\frac{3}{10}$ of the coins are 20p coins.
The rest of the coins are 50p coins.

Work out the total value, in £, of the 150 coins.
You must show your working.

20% of 150 = 0.2 × 150 = 30

30 × 10p = 300p $\xrightarrow{\div 100}$ £3

$\frac{3}{10}$ × 150 = 45

45 × 20p = 900p $\xrightarrow{\div 100}$ £9

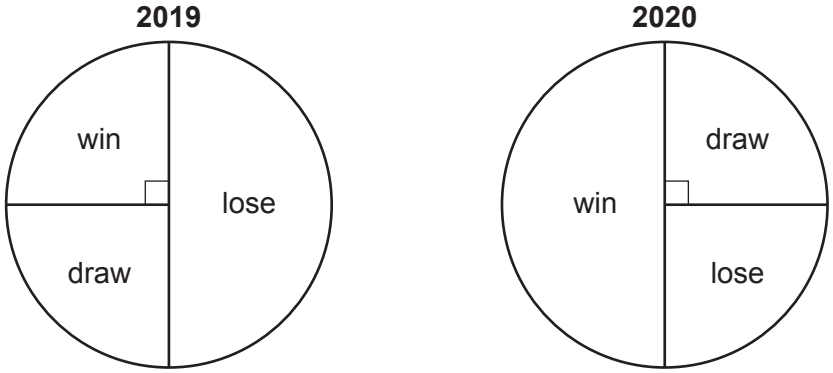
150 − 30 − 45 = 75

75 × 50p = 3750p $\xrightarrow{\div 100}$ £37.50

Total: £3 + £9 + £37.50 = £49.50

£ 49.50 **[6]**

4 A sports team played the same number of matches in 2019 and 2020.
The two pie charts summarise their results.



(a) What fraction of the matches did the team win in 2019?

$\frac{90}{360} = \frac{1}{4}$

(a) $\frac{1}{4}$ **[1]**

(b) Did the team's results improve in 2020?
Explain how you know.

Yes because $\frac{1}{2} > \frac{1}{4}$

[1]

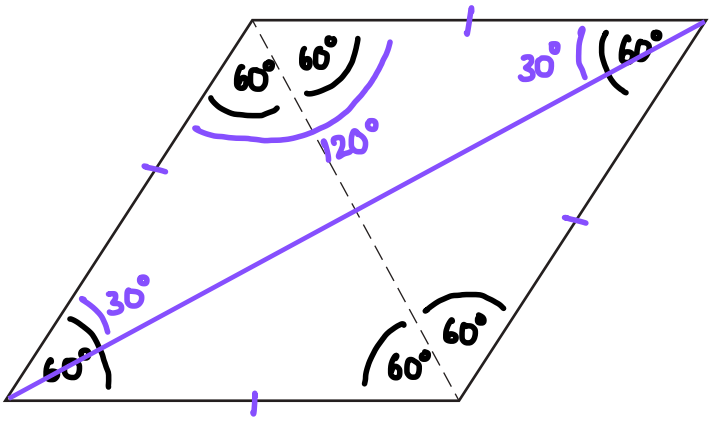
5 Increase 600 by 17%.

$100\% + 17\% = 117\% \xrightarrow{\div 100} 1.17$

$1.17 \times 600 = 702$

702 **[3]**

6 The diagram shows how a rhombus is made by joining two **equilateral** triangles.



Not to scale

(a) Find the size of each interior angle of the rhombus.

(a) 60°, 60°, 120°, 120° **[1]**

(b) The same rhombus can be made by joining two copies of an **isosceles** triangle.

Find the size of each angle of the isosceles triangle.

(b) 120°, 30°, 30° **[2]**

7 Rowan's bath has a hot tap and a cold tap.
When turned on full, each tap on its own will fill the bath in 6 minutes.

Rowan turns **both** taps on full.

How long will it take to fill the bath?

$6 \div 2 = 3$

..... 3 ..... minutes **[2]**

8 Simplify.

$5t - 3u - t + 5u$

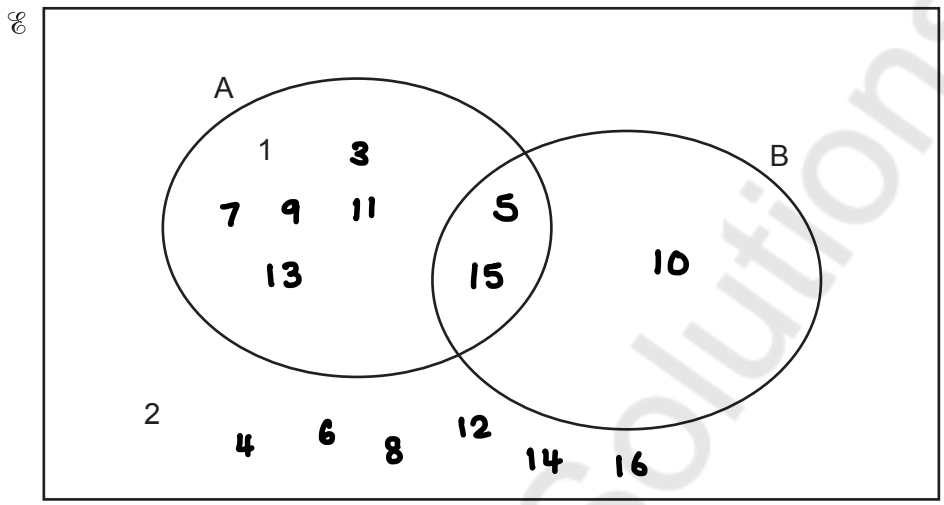
$4t \quad +2u$

..... $4t + 2u$ ..... **[2]**

9 $\mathscr{E}$ = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16}
Set A = {odd numbers} = {1, 3, 5, 7, 9, 11, 13, 15}
Set B = {multiples of 5} = {5, 10, 15}

(a) The elements 1 and 2 have been entered on this Venn diagram.

Complete the Venn diagram to show **all** of the elements.



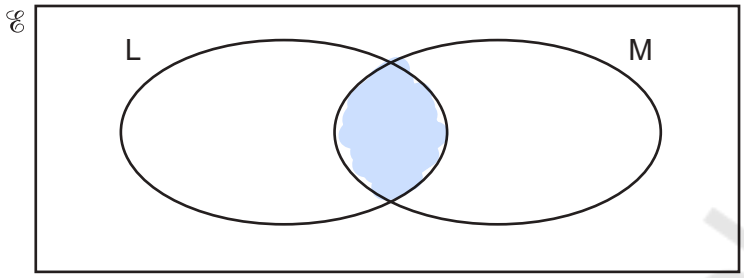
[3]

(b) $\mathscr{E}$ = {all positive integers}
Set L = {odd numbers}
Set M = {multiples of 2}

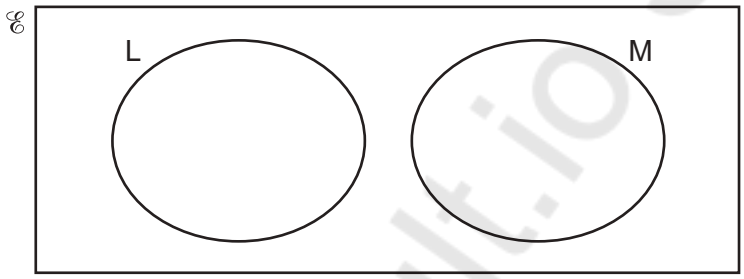
Three Venn diagrams, numbered 1 to 3, are shown below.

Which diagram best shows the relationship between Set L and Set M?
Give a reason for your choice.

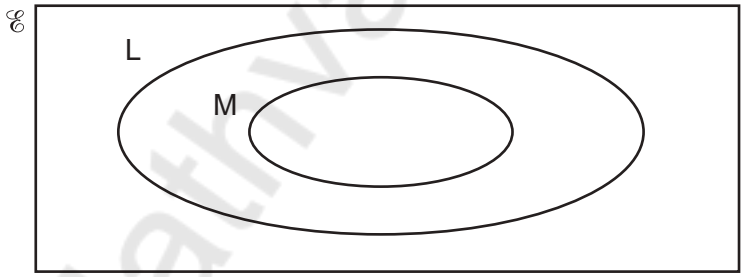
Venn diagram 1:



Venn diagram 2:



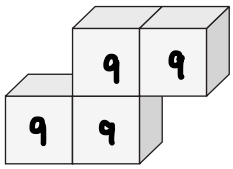
Venn diagram 3:



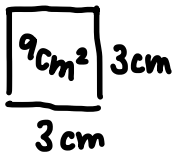
Venn diagram ..... 2 ..... because ..... odd numbers cannot be multiples ..... of 2. ..... **[2]**

10 A student has some cubes that are all the same size.
Each cube is 3 cm by 3 cm by 3 cm.

They put 4 of these cubes together to make this shape.



Calculate the surface area of the shape.



Front : 4
Back : 4
Top : 3
Bottom: 3
RHS : 2
LHS = 2

= 18 faces

S.A. = 18 x 9
= 162 cm²

..... 162 ..... cm^2 **[4]**

11 Here are some algebraic statements.

$v = u + at$ $a + 2b$ $3(x + 2) = 3x + 6$ $2y < x$ $2x = 5$.

formula identity equation

From the list above, write down an example of each of the following.

(a) An expression.

(a) $a + 2b$ **[1]**

(b) An inequality.

$<$ $>$ $\leq$ $\geq$

(b) $2y < x$ **[1]**

(c) An equation.

(c) $2x = 5$ **[1]**

12 Rearrange this formula to make w the subject.

$P = 2w + 2h$

$-2h \quad -2h$

$P - 2h = 2w$

$\div 2 \qquad \div 2$

$\frac{P - 2h}{2} = w$

$w = \frac{P - 2h}{2}$ **[2]**

13 Ellis has 28 m of ribbon.
They cut the ribbon into lengths of 60 cm.

What is the least length of ribbon, in cm, that can be left over?
You must show your working.

$1\text{m} = 100\text{cm}$ (×100)

$28\text{m} \times 100 = 2800\text{cm}$

$2800 \div 60 = 46\frac{2}{3}$

$\frac{2}{3} \times 60 = 40$

40 cm **[5]**

14 This table shows the names and areas of five lakes.

Name of Lake	Area in km^2	
Ladoga	1.81×10^4	4
Mweru	5.12×10^3	3
Tana	3.20×10^3	2
Topozero	9.86×10^2	1
Victoria	6.89×10^4	5

(a) Write the area of Lake Mweru as an ordinary number.

5.12 x 1000 = 5120

(a) ..... 5120 ..... km^2 **[1]**

(b) Write the lakes in the order of their area, starting with the **smallest**.

Topozero ..... Tana ..... Mweru ..... Ladoga ..... Victoria ..... **[2]**

smallest *largest*

(c) Calculate the difference between the areas of Lake Ladoga and Lake Tana.
Give your answer in standard form, correct to **2** significant figures.

$1.81 \times 10^4 - 3.2 \times 10^3 = 14900$

$= 15000$

1.5×10^4

(c) ..... 1.5×10^4 ..... km^2 **[4]**

15 Azmi, Beth and Callum share a flat.

(a) The monthly rent is £760.
They share the rent in the ratio 2 : 3 : 3.

How much does Beth pay for rent each month?

A : B : C

2 : 3 : 3 = 8 parts

£760 ÷ 8 = £95

x 95

£285

(a) £ 285 **[2]**

(b) Azmi, Beth and Callum also share the fuel bill in the ratio 2 : 3 : 3.
Callum pays £36 for fuel each month.

How much does Azmi pay for fuel each month?

A : B : C

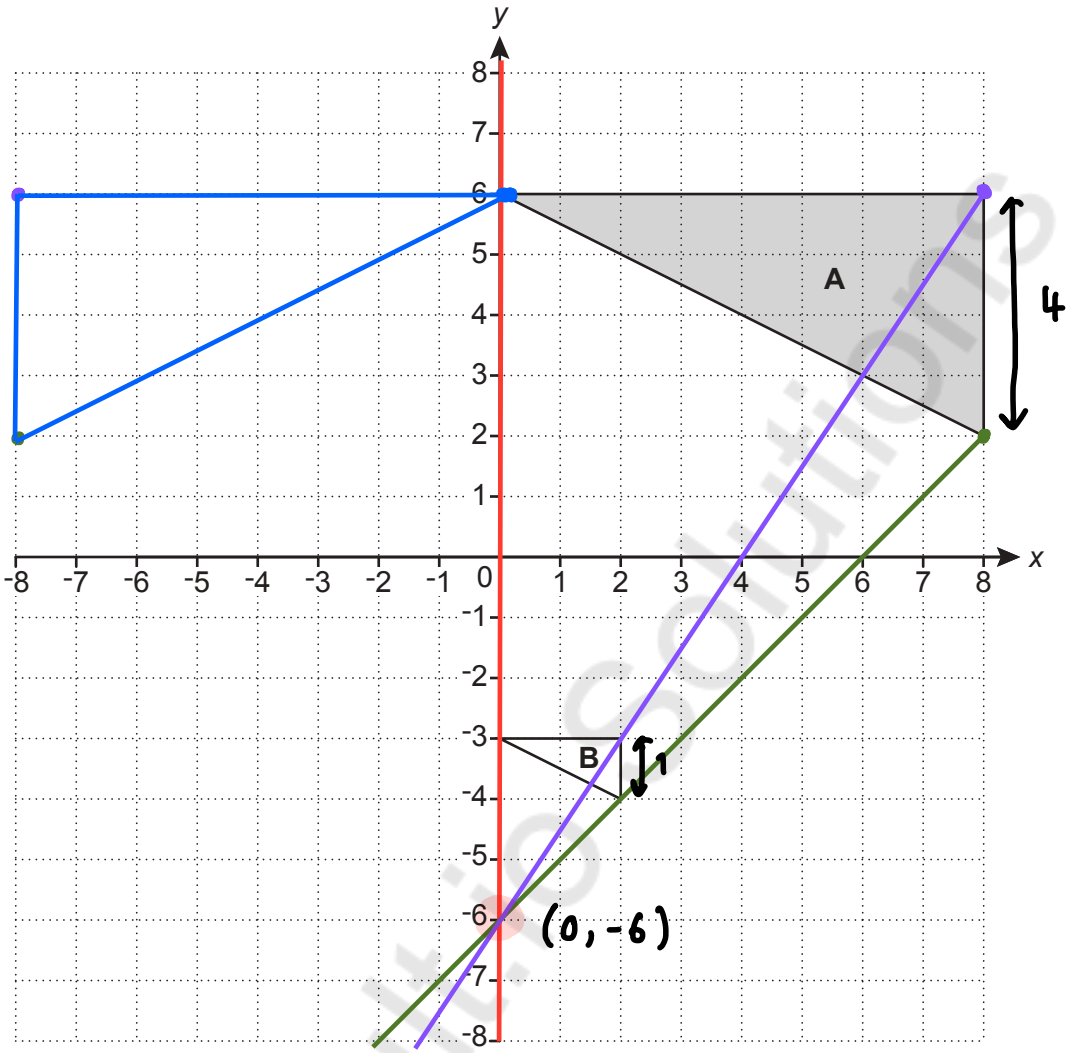
2 : 3 : 3

x12 → £24

£36 ← x12

(b) £ 24 **[2]**

16 Triangle **A** and triangle **B** are drawn on the coordinate grid.



(a) Reflect triangle **A** in the line $x = 0$. **[2]**

(b) Describe fully the **single** transformation that maps triangle **A** onto triangle **B**.

Enlargement , Scale factor $\frac{1}{4}$, centre (0, -6)

..... **[3]**

17 Ling throws a six-sided dice 300 times.
The table shows the frequencies of their results.

(a) Complete the table to show the relative frequencies.

Number on dice	1	2	3	4	5	6
Frequency	42	27	57	60	39	75
Relative frequency	0.14	0.09	0.19	0.2	0.13	0.25

[2]

(b) Ling thinks that the dice may be biased.

(i) Explain why evidence from the table could support their opinion.

Relative frequencies are very unequal.

[1]

(ii) Explain why the dice may, in fact, **not** be biased.

Need a larger sample

[1]

18 A carpenter measures the length, k metres, of a piece of wood.

They write

$3.35 \leqslant k < 3.45$.

(a) Put rings around all possible values of k in the list below.

3.349 3.39 3.44 3.45 3.55

[2]

(b) The carpenter says

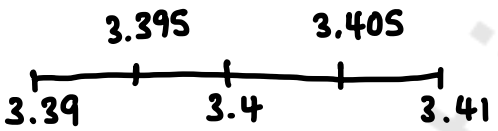
3.35 ⩽ k < 3.45 means that the length of the piece of wood is 3.4 metres correct to the nearest centimetre.

(i) Explain how you know that she is incorrect.

3.35m does not round to 3.4m to the nearest centimetre

[1]

(ii) Complete the interval for 3.4 m, correct to the nearest centimetre.



$3.395 \leqslant k <$ 3.405 **[1]**

19 (a) Amit says

My normal typing speed is 40 words per minute.
Therefore, I estimate that my normal typing speed is about 210 characters per minute.

Each letter, space and piece of punctuation counts as a character.

How many letters per word is Amit most likely to have used in making the estimate?
Show how you decide.

$210 - 40 = 170$

$\frac{170}{40} = 4.25$

(a) 4 **[3]**

(b) Amit starts some homework at their normal typing speed.
Amit types 52 words in 1 minute 12 seconds.

What may be true about the length of the words that Amit has just typed?
Show how you decide.

1 min 12 secs
$\div 60$
$= 0.2$ min

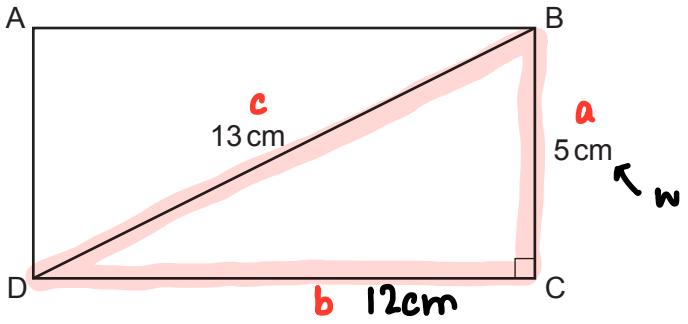
60 secs = 1 min
$\div 60$

$= 1.2$ mins

$52 \div 1.2 = 43.\dot{3}$ words per minute

The average word length may be less than 4 characters. **[3]**

20 The diagram shows rectangle ABCD.



Not to scale

DB = 13 cm and BC = 5 cm.

Calculate the area of the rectangle.
You must show your working.

Area = l x w

= 12 x 5

= 60 cm^2

$a^2 + b^2 = c^2$

$5^2 + b^2 = 13^2$

$-5^2 \quad -5^2$

$b^2 = 13^2 - 5^2$

$\sqrt{} \quad \sqrt{}$

$b = \sqrt{13^2 - 5^2}$

$= 12$

.....60..... cm^2 **[5]**

21 **(a)** A straight line has the equation $y = 2x - 1$.

gradient

$y = mx + c$

Write down the gradient of the line.

(a) 2 **[1]**

(b) Here are the equations of four straight lines.

$y = 2x + 3$ $y = 1 - x$ $y = \frac{1}{2}x + 4$ $y = x - 1$

Same gradient

(i) Which of the four straight lines is parallel to $y = 2x - 1$?

(b)(i) $y = 2x + 3$ **[1]**

(ii) A student says

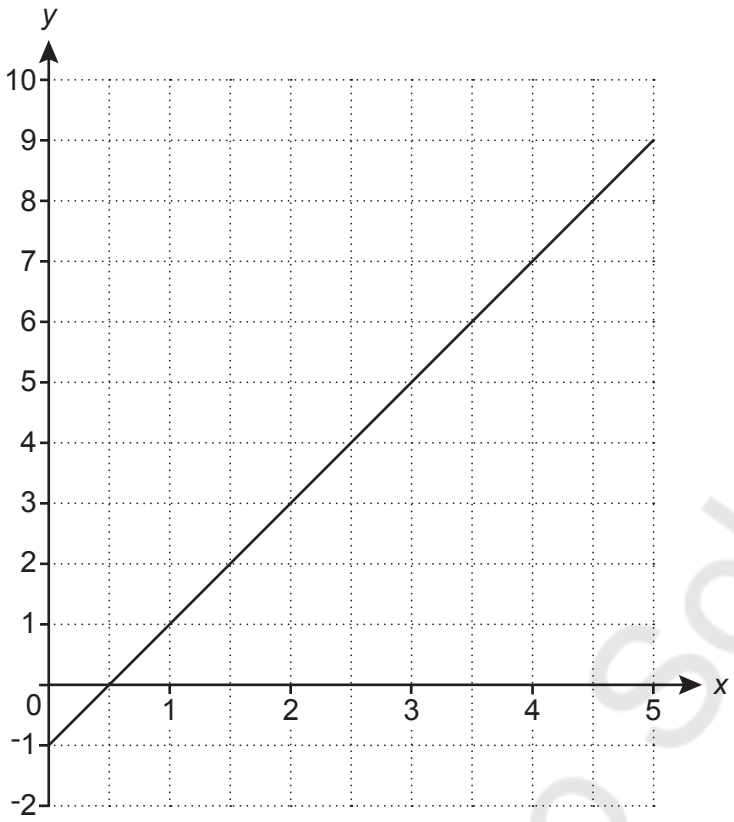
$y = \frac{1}{2}x + 4$ is the steepest of the four straight lines because it has the largest number added.

Explain why the student is wrong.

4 is the y-intercept, not the gradient.

[1]

(c) Here is part of the graph of $y = 2x - 1$.



The line continues to the right.

Will the line pass above, below or through the point (45, 90)?
Show how you decide.

x y

$y = 2x - 1$

$y = 2(45) - 1$

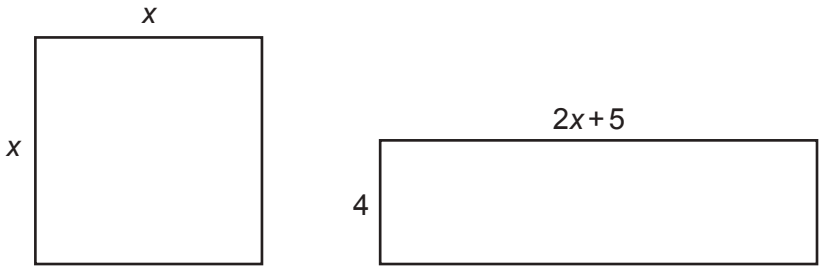
$y = 89$

$89 < 90$

The line $y = 2x - 1$ will pass ..... below ..... the point (45, 90) because ..... 89 < 90 .....

..... **[2]**

22 In this question, all measurements are in centimetres.



Not to scale

The square and the rectangle have the same area.

(a) Show that $x^2 - 8x - 20 = 0$. **[3]**

Area square = l x w
= x x x
= x^2

Area rectangle = l x w
= 4(2x+5)
= 8x + 20

$x^2 = 8x + 20$
$-8x \quad -20 \quad -8x \quad -20$

$x^2 - 8x - 20 = 0$

(b) Solve $x^2 - 8x - 20 = 0$.

20
1 20
+2 -10
4 5

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

$x + 2 = 0$ or $x - 10 = 0$
$-2 \quad -2 \qquad +10 \quad +10$

$x = -2 \qquad x = 10$

(b) $x =$ ..-2.. or $x =$ ..10.. **[3]**

(c) Explain why one of the answers in part **(b)** is not possible in the context of the question.

Length cannot be negative.

..... **[1]**

(d) Write down the following.

(i) The area of the square.

$x = 10$

$\text{Area} = x^2$

$= 10^2$

$= 100$

(d)(i) 100 cm^2 **[1]**

(ii) The length of the rectangle.

$2x + 5$

$2(10) + 5$

(ii) 25 cm **[1]**

Turn over for Question 23

23 A bag of sweets contains jellies, mints and toffees.

The ratio of jellies to mints is n : 2.
The ratio of mints to toffees is 5 : 3n.

Work out the ratio of jellies to toffees.
Give your answer in its simplest form.

J : m m : T

n : 2 5 : 3n

×5 ×5 ×2 ×2

5n : 10 10 : 6n

J : m : T

5n : 10 : 6n

J : T

5n : 6n

5 : 6

..... 5 : 6 ..... **[4]**

END OF QUESTION PAPER