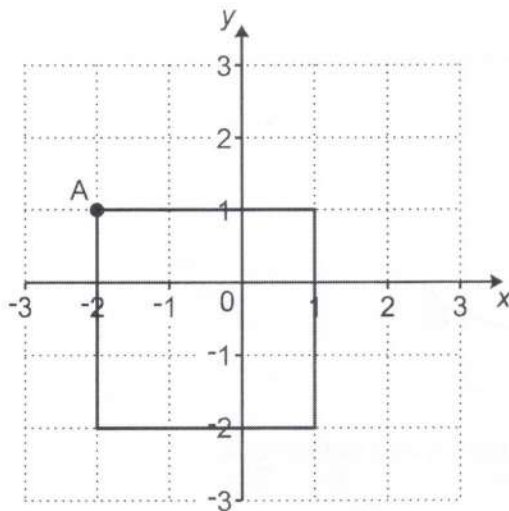1 The diagram shows a square drawn on a one-centimetre square grid.

(a) Write down the coordinates of point A.

(a) (-2 , 1) [1] ✓

(b) Find the perimeter of the square.

3 × 4

(b) ....12........................ cm [1]

2 (a) Write down all the factors of 15.

(a) ....1..,...3..,...5..,...15..... [2] ✓ ✓2

(b) Find the largest number that will divide exactly into 15 and 60.

(b) ....15........................ [1] ✓

3   60 people are asked if they have visited France (F) and if they have visited Greece (G).

The Venn diagram shows the results.
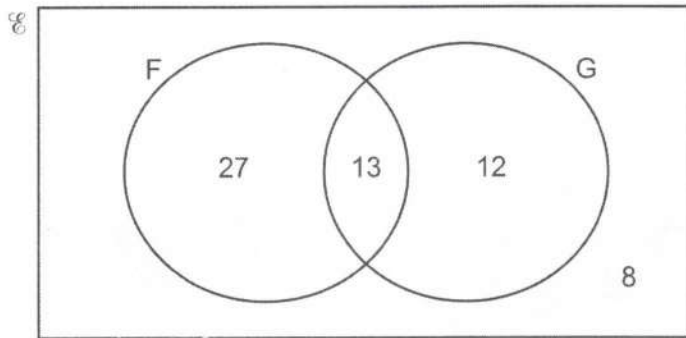
(a) How many of the 60 people have **not** visited either France or Greece?

8 ✓

(a) .... [1]

(b) How many of the 60 people have visited Greece?

25 ✓

(b) .... [1]

4   Ben thinks of a number.

Ben says,

When I square root my number and divide the result by 10 the answer is 1.3.

Find Ben's number.

$1.3 \times 10 = 13$

$13^2 = 169$

.... [2]

Turn over

5   These are the ingredients for making some scones.

Flour	360 g
Butter	90 g
Sugar	45 g
Milk	180 ml

10 ml of milk weighs 10.4 g.

Work out the **total** weight of all the ingredients.

$$\checkmark$$
$$(18 \times 10.4) + 360 + 90 + 45 \quad \checkmark$$

$$682.2 \quad \checkmark$$
.... g **[3]**

6 **(a)** By rounding each value to **one** significant figure, estimate the cost of 4.9 kg of carrots at 73p per kg.

$$\begin{array}{r} 70 \\ \times\ 5 \\ \hline 350p \end{array}$$

3·50 ✓

(a) £ .... **[2]**

(b) A student works out an estimate for this calculation.

$$\frac{13.7 + 1.28}{5.099}$$

Their method is to:
- round each number correct to the same number of significant figures and
- work out the approximation.

The student writes

$$\frac{14 + 1}{5} = \frac{15}{5} = 3.$$

What error has the student made in using their method?

14 is 2sf, 1 is 1sf, 5 is 1sf so not all same accuracy .... **[1]**

7 **(a)** Rearrange this formula to make x the subject.

$$y = x + 3$$

$x = y - 3$ ✓

(a) .... **[1]**

(b) Rearrange this formula to make w the subject.

$$p = 3w$$

$w = \dfrac{p}{3}$ ✓

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

Turn over

8 For each statement, tick (✓) whether the value of x is true or false.
The first one is done for you.

Statement	Value of x	True	False
$x > -1$	5	✓	
$x \leqslant -1$	-1	✓	
$\frac{x}{10} = 0.7$	70		✓
$x - 2 \neq 5$	3	✓	
$-1 < x < 0.7$	0	✓	

✓✓✓ all
✓✓ 3
✓ 2

[3]

9 This is a function machine.

Input → ⬡ -6 → ⬡ × 2 → Output

(a) (i) Find the output when the input is 9.

9 - 6 = 3

3 × 2 = 6

(a)(i) .... [1]

(ii) Find the input when the output is 36.

36/2 = 18 ✓

18 - 6 = 24 ✓

(ii) .... [2]

(b) Complete this function machine to show the equation $y = 8 + 3x$.

x → ×3 → +8 → y

[2]

✓✓ all
✓ any 2.

10 100 students vote in a school election.

1 vote is spoiled and is not counted. $\rightarrow 99$
The remaining votes are for Jamal or Layla and are in the ratio 3 : 8.

$= 11$

How many **more** votes does Layla have than Jamal?

$$\text{difference} = \frac{5}{11}$$

✓ OE

$$99 \times \frac{5}{11}$$

✓

$$= 45 \qquad ✓$$

.... **[3]**

Turn over

11 In a particular town last year:

- it rained on 17 of the 30 days in November
- it rained on 18 of the 31 days in December.

(a) Which month, November or December, had the highest proportion of rainy days? Show how you decide.

$$N = \frac{17}{30} = 0.566...$$

$$D = \frac{18}{31} = 0.580$$

✓✓

December .... because .... $0.58 > 0.56$ .... ✓

.... **[3]**

(b) Sam says,

I think the probability it will rain on December 25th next year is $\frac{18}{31}$.

What assumption has Sam made?

That relative frequency can be used **[1]** for an estimate of probability

or same proportion next year etc

12 The table shows some numbers each written as a power of 4.

Number	... as a power of 4		... as a power of 2	
4	4	4^1	2×2	2^2
16	4×4	4^2	$2 \times 2 \times 2 \times 2$	2^4
64	$4 \times 4 \times 4$	4^3	$2 \times 2 \times 2 \times 2 \times 2 \times 2$	2^6

(a) Complete the table to show 16 and 64 each written as a power of 2. **[2]**

(b) A number is written as 4^{20}.

Use a pattern in the table to help you write this number as a power of 2.

(b) .... 2^{40} .... **[1]**

13 (a) Write 0.001 025 in standard form.

1.025×10^{-3} ✓

(a) .... [1]

(b) A weather blogger writes:

- 1.655×10^{12} raindrops fall in a storm
- the mass of each raindrop is 6×10^{-5} grams.

$\div 1000$

$g \longrightarrow kg$

Calculate the total mass of all of the raindrops that fall in the storm.
Give your answer in standard form in kilograms.

$$\frac{(1.655 \times 10^{12}) \times (6 \times 10^{-5})}{1000}$$ ✓ ✓

$$= 99300$$ ✓

9.93×10^{4} ✓

(b) .... kilograms [4]

14 (a) Machine A makes enough lollipops to fill 300 packs.

There are 8 lollipops in each pack.

Show that 2400 lollipops are made by machine A. [1]

$$
\begin{array}{r}
300 \\
\times \quad 8 \\
\hline
2400
\end{array}
$$

✓

(b) Machine B makes 3600 lollipops in the same time it took by machine A to make 2400 lollipops.

Machine B makes lollipops one at a time and at a constant rate.

What fraction of the time needed to fill 300 packs is saved if machine B is used rather than machine A?
Give your answer in its simplest form.

$$1 - \frac{2400}{3600}$$

✓

✓

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

(b) .... $\frac{1}{3}$ .... ✓ [3]

Turn over

15 Shop A and shop B have special offers on the same cupcakes.

Shop A	Shop B
£1.25 each or get 4 for the price of 3	£1.40 each or get 3 for the price of 2

(a) Show that the special offer cost of 6 cupcakes from Shop A is £6.25. **[1]**

$$6c = 4c + 2c$$
$$= (3 \times 1.25) + (2 \times 1.25) = 6.25 ✓$$

(b) Gabi wants 25 cupcakes for a party.

Which shop will be cheapest and by how much?
Show how you decide.

Ⓐ   24   +   1

pay for
$(18 \times 1.25) + 1.25 = £23.75$ ✓✓

Ⓑ   24   +   1
$(16 \times 1.40) + 1.40 = £23.80$ ✓✓

(b) Shop ..... A ..... by ..... 5 .....p **[5]** ✓

16 Sasha has these two sets of number cards.

Set A: | 1 | 2 | 3 | 4 |

Set B: | 8 | 9 | 10 |

One card is taken at random from each set.
Sasha adds the numbers on the two cards to get a total.

(a) Complete the table to show all the possible totals.

Set A

Total	1	2	3	4
8	9	10	11	12
Set B 9	10	11	12	13
10	11	12	13	14

✓✓ all
✓ 3+

[2]

(b) Find the probability that the total is a prime number.
Give your answer as a fraction.

$\dfrac{5}{12}$

(b) .... **[2]**

17 The price of a holiday increases from £320 to £340.

Work out the percentage increase in the price of the holiday.

✓ $\dfrac{20}{320} \times 100$

✓

6·25 ✓

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

Turn over

18 Darcie invests £x at a rate of 1.5% per year simple interest for 5 years.
Ivan also invests £x but at a rate of 1.1% per year simple interest for 6 years.

Darcie earns £108 more interest than Ivan.

Work out the value of x.
You must show your working.

(D) $x \times 0.015 \times 5 - 108 = x \times 0.011 \times 6$ ✓ ✓ ✓

$0.075x - 108 = 0.066x$ ✓

$0.009x = 108$

$x = \dfrac{108}{0.009}$ ✓

$= 12000$ ✓

x = ... **[6]**

19 Kai spins a fair five-sided spinner.
The sectors of the spinner are numbered 1, 2, 3, 4 and 5.

Kai also throws a fair four-sided dice.
Two of the dice faces are red, one is blue, and one is yellow.

(a) Complete this tree diagram.

Coloured dice

Numbered spinner

$\frac{2}{4}$ — Red

$\frac{1}{4}$ — Blue

$\frac{2}{5}$ — Even

$\frac{1}{4}$ — Yellow

$\frac{3}{5}$ — Odd

$\frac{2}{4}$ — Red

$\frac{1}{4}$ — Blue

$\frac{1}{4}$ — Yellow

ⓑ

√√√ All

√√ red/y

√ any 3
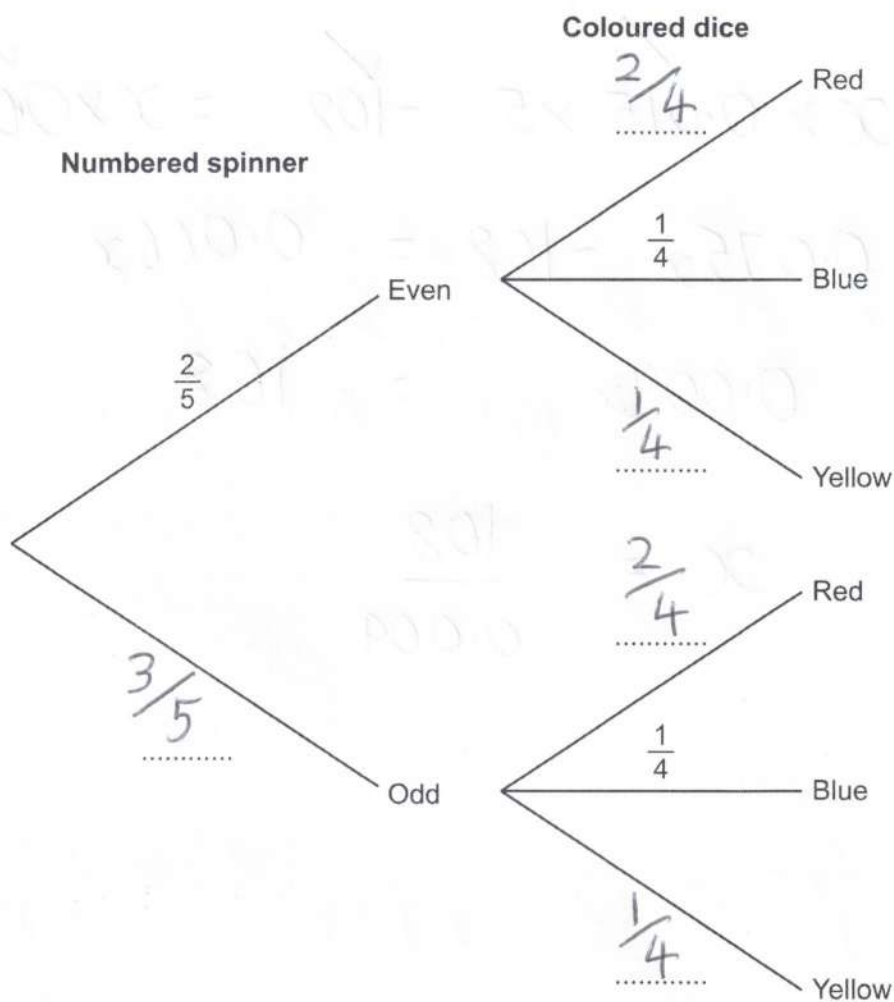
[3]

(b) Calculate the probability that Kai gets an even number on the spinner and a blue face on the dice.

$$\frac{2}{5} \times \frac{1}{4} = \frac{2}{20} \quad \text{or} \quad \frac{1}{10}$$

✓

(b) .... $\frac{1}{10}$ .... **[2]**

✓

Turn over

20 (a) The diagram shows the cross-section of a triangular prism.

9 cm

Not to scale

12 cm
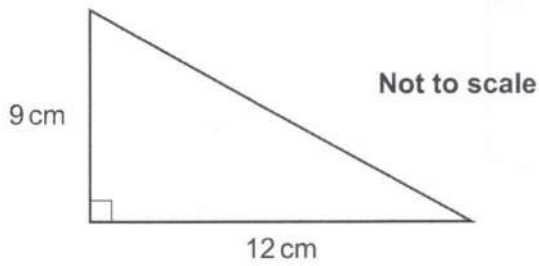
$A = \frac{1}{2} \times 12 \times 9$ ✓

Work out the area of the cross-section.

54

(a) .... cm² **[2]** ✓

(b) This diagram shows the triangular prism.

x

Not to scale

9 cm

20 cm

12 cm
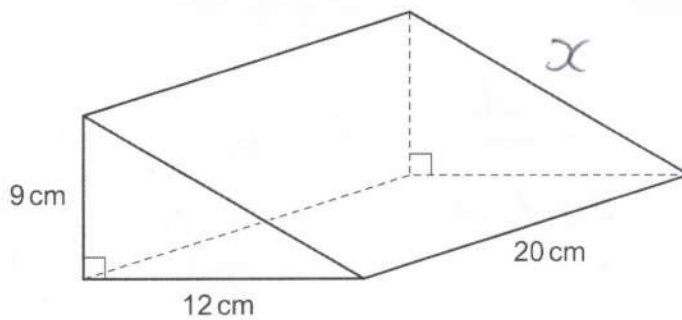
$x = \sqrt{12^2 + 9^2}$ ✓

$= \sqrt{225} = 15$ ✓

Work out the total surface area of the triangular prism.
You must show your working.

2 Triangles + Slope + Back + Base

(54×2) $+ (20 \times 15) + (20 \times 9) + (20 \times 12)$ ✓✓

828 ✓

(b) .... cm² **[5]**

(c) Two of these triangular prisms are joined to make a new prism.
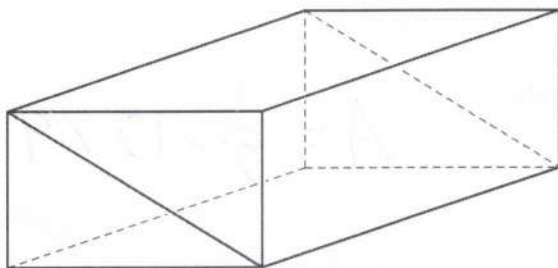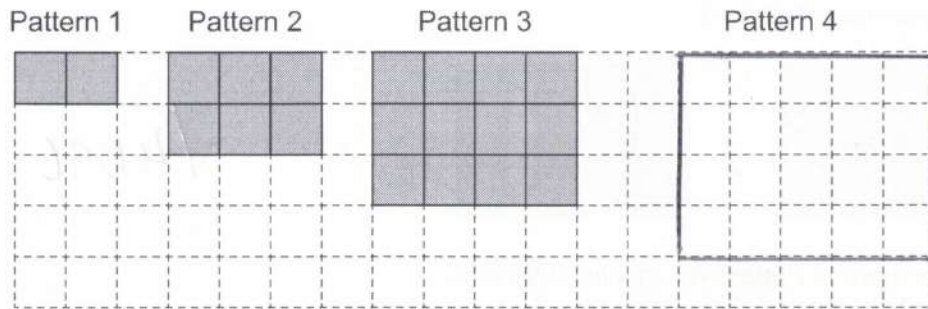

Give a reason why the total surface area of this prism is **not** two times your answer in **part (b)**.

There are 2 "slopes" not part of the surface area.

[1]

21 Here are the first three tile patterns of a sequence.

Pattern 1   Pattern 2   Pattern 3   Pattern 4

(a) Draw Pattern 4 in the space above. [1]

(b) Complete this table.

Pattern	Calculation	Number of tiles
1	1×2	2
2	2×3	6
3	3×4	12
4	4×5	20
5	5×6	30
10	10×11	110
n	$n \times (n+1)$	$n^2 + n$

✓ any line

[4]

✓✓✓✓ All
✓✓✓ 5

(c) Each pattern in the sequence can be split into a square of tiles and a single column of tiles.

For example, Pattern 3:
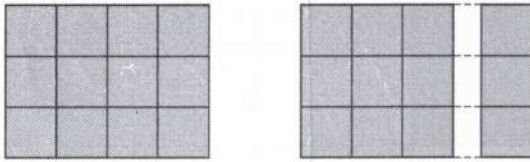
$\sqrt{4096} = 64$ ✓

The square in Pattern *n* contains 4096 tiles.

Work out how many tiles are in Pattern *n*.

64×65 ✓

$= $ 4160 ✓

(c) .... **[3]**
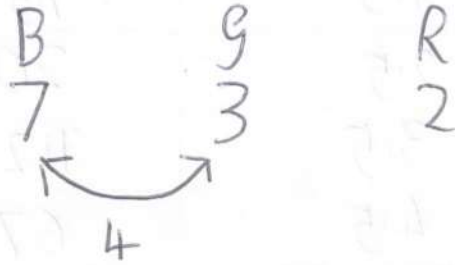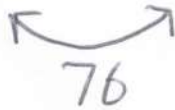
22 A bag contains only blue, green and red counters in the ratio 7 : 3 : 2.
    There are 76 more blue counters than green counters in the bag.

    Work out the **total** number of counters in the bag.

$$B \quad g \quad R$$
$$7 \quad 3 \quad 2$$

4

$$76 \div 4 = \underline{19} \qquad \checkmark$$

76

$$(7+3+2) \times 19 \qquad \checkmark\checkmark \, OE$$

$$= 228 \qquad \checkmark$$

.... [4]

23 A farmer has 60 pear trees.
The table shows the heights, h metres, of the pear trees.

Height (h metres)	Frequency	x	$f \times x$
$1 < h \leqslant 2$	5	1.5	7.5
$2 < h \leqslant 3$	8	2.5	20
$3 < h \leqslant 4$	32	3.5	112
$4 < h \leqslant 5$	15	4.5	67.5

(a) Calculate an estimate of the mean height of the 60 pear trees.　$Total = 207$

$$207 \div 60$$

$$3.45$$

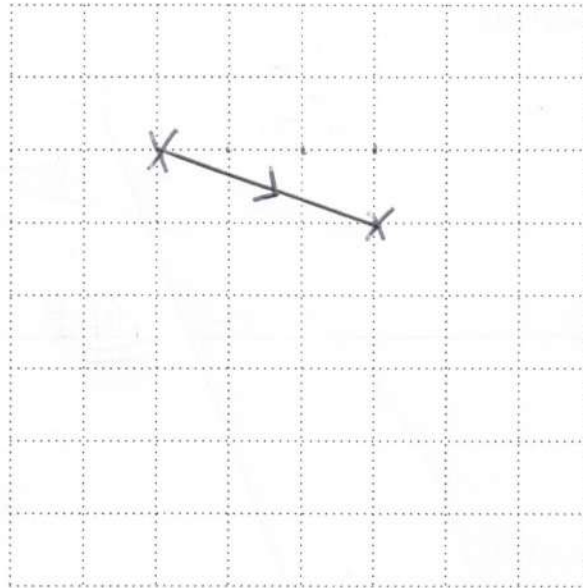**(a)** .... m **[4]**

(b) Explain why it is not possible to use the information from this table to calculate the **exact** value of the mean height. Exact heights are unknown

.... **[1]**

24 $\overrightarrow{AB} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ and $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 6 \end{pmatrix}$.

(a) On the grid below, draw $\overrightarrow{AB}$.

✓✓

✓ no
arrow

[2]

(b) Work out $\overrightarrow{AC}$.

$$\begin{bmatrix} 3 \\ -1 \end{bmatrix} + \begin{bmatrix} 2 \\ 6 \end{bmatrix}$$

$\begin{pmatrix} 5 \\ 5 \end{pmatrix}$ **[2]** ✓✓

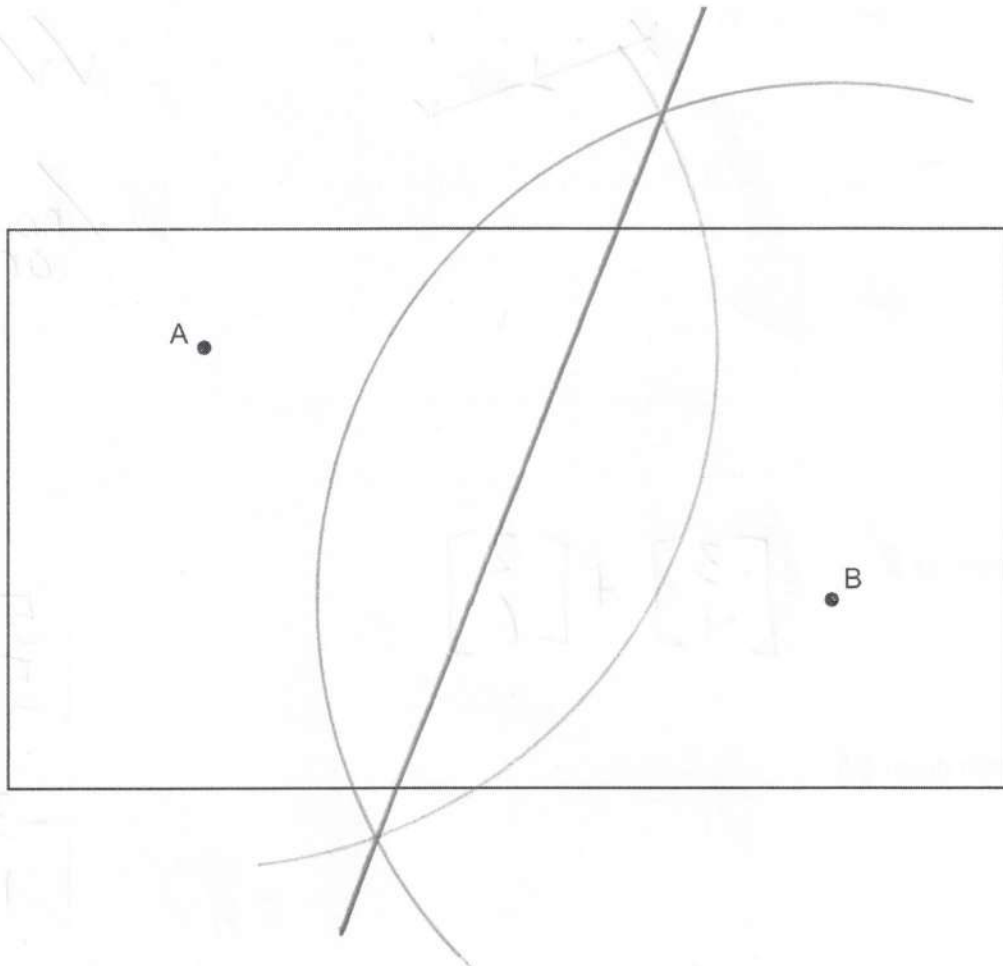**(c)** Write down $\overrightarrow{BA}$.

$\begin{pmatrix} -3 \\ 1 \end{pmatrix}$ **[1]** ✓

25 The diagram represents a rectangular field.
    A and B are two trees.

    A straight path goes across the field.
    The path is always the same distance from A and B.

    Construct the route followed by the path.
    Show all your construction lines.

[2]

END OF QUESTION PAPER