

1. (a) Look at the equation.

$$5x + 1 = 2x - 8$$

Complete the sentence below by ticking (✓) the correct box.

The value of x is ...



... one particular number.

... any number less than zero.

... any number greater than zero.

... any whole number.

... any number at all.

1 mark

- (b) Now look at this equation.

$$y = 3x - 2$$

Complete the sentence below by ticking (✓) the correct box.

The value of x is ...



... one particular number.

... any number less than zero.

... any number greater than zero.

... any whole number.

... any number at all.

1 mark



2. Gita threw three darts.

Use the information in the box to work out what numbers she threw.

The lowest number was 10

The range was 10

The mean was 15

Gita's numbers were 10, 15 and 20

1 mark

3. A cookery book shows this conversion table.

Mass in ounces	Mass in grams
1	25
2	50
3	75
4	110
5	150
10	275

Use the table to explain how you can tell the conversions **cannot all be exact**.

If 1 ounce = 25 grams exactly, the table would show

1	25	
2	50	
3	75	
4	$4 \times 25 = 100$	(not 110g)
5	$5 \times 25 = 125$	(not 150)
10	$10 \times 25 = 250$	(not 275).

1 mark

4. Concorde could travel 1 mile every 3 seconds.

How many miles per hour (mph) is that?

Would get 1 method mark for working without final value eg

$$\frac{1 \text{ mile}}{3 \text{ sec}} \times \frac{3600 \text{ sec}}{1 \text{ hr}} \quad \text{or } 20 \text{ miles/minute}$$

or 20×60

1200 mph

2 marks

5. In a bag, there are only red, white and yellow counters.

I am going to take a counter out of the bag at random.

The probability that it will be red is more than $\frac{1}{4}$
It is **twice as likely** to be white as red.

Give an example of how many counters of each colour there could be.

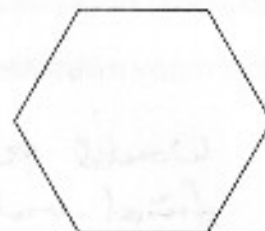
Write numbers in the sentence below.

There could be 2 red, 4 white and 1 yellow counters.
or 3 6 1 or 2
or 4 8 1, 2 or 3

2 marks

6. (a) The **perimeter** of a regular hexagon is $42a + 18$

Write an expression for the length of **one** of its sides.



$$\frac{7a + 3}{1}$$

1 mark

- (b) The **perimeter** of a different regular polygon is $75b - 20$

The length of one of its sides is $15b - 4$

How many sides does this regular polygon have?

$$\frac{75b - 20}{15b - 4} = 5, \quad 75b - 20 = 5(15b - 4)$$

$$\frac{5}{1}$$

1 mark

- (c) The **perimeter** of a square is $4(c - 9)$

Find the perimeter of the square when $c = 15$

$$\frac{24}{1}$$

1 mark

7. A dessert has both fruit and yoghurt inside.



Altogether, the mass of the fruit and yoghurt is **175g**.

The **ratio** of the mass of **fruit** to the mass of **yoghurt** is **2 : 5**

What is the mass of the yoghurt?

$$\begin{aligned} \therefore 1 \text{ part} &= \frac{175}{7} = 25\text{g} \\ 5 \text{ parts} &= 5 \times 25 = 125 \end{aligned}$$

$$2:5, \quad 7 \text{ parts} = 175\text{g}.$$

1 mark if $\frac{5}{7} \times 175$,
 $175 \div 7, 25$ or 50 seen

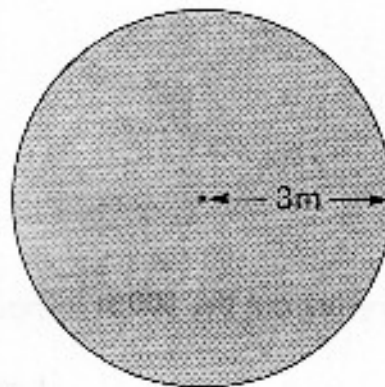
$$\underline{125} \text{ g}$$

2 marks

8. The diagram shows a plan of Luke's new lawn.

The lawn is a circle with radius 3m.

Work out the area of the lawn.



$$\text{Area} = \pi r^2$$

$$\underline{28} \text{ m}^2$$

or 9π

2 marks

9. To find the n th triangular number, you can use this rule.

$$n\text{th triangular number} = \frac{n}{2}(n+1)$$

Example: 3rd triangular number = $\frac{3}{2}(3+1)$

$$= 6$$

- (a) Work out the **10th** triangular number.

$$\frac{10}{2}(10+1) = 5 \times 11$$

$$\underline{\underline{55}}$$

1 mark

- (b) Now work out the **100th** triangular number.

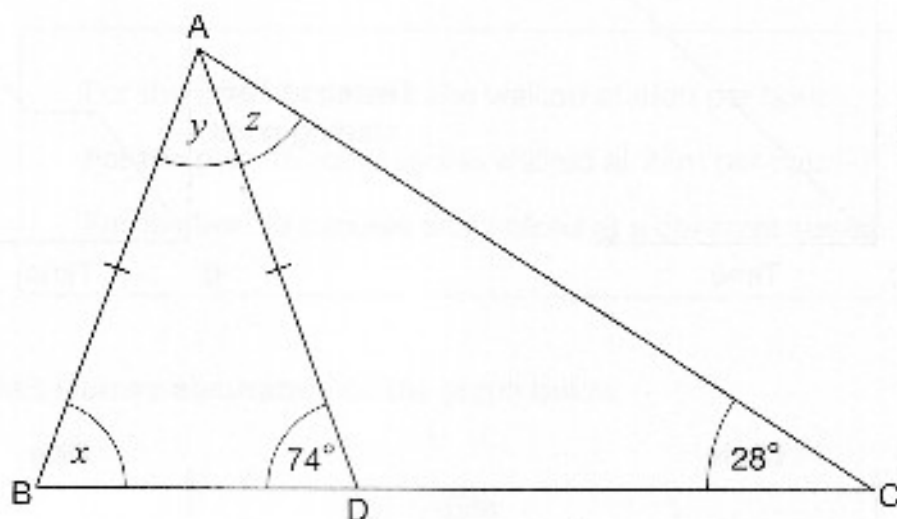
$$\frac{100}{2}(100+1) = 50 \times 101$$

$$\underline{\underline{5050}}$$

1 mark

10. Look at triangle ABC.

ABD is an **isosceles** triangle where $AB = AD$.



Not drawn accurately

Work out the sizes of angles x , y and z

Give reasons for your answers.

$x = 74^\circ$ because ABD is an isosceles triangle so
 x same as $\angle ADB$

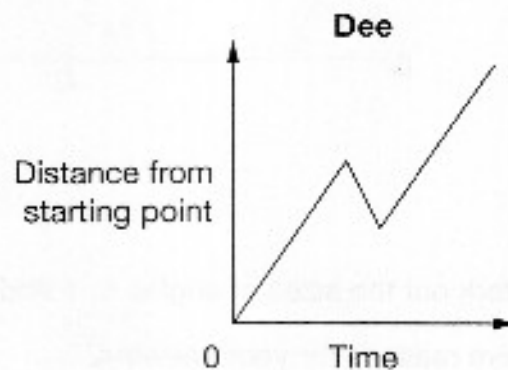
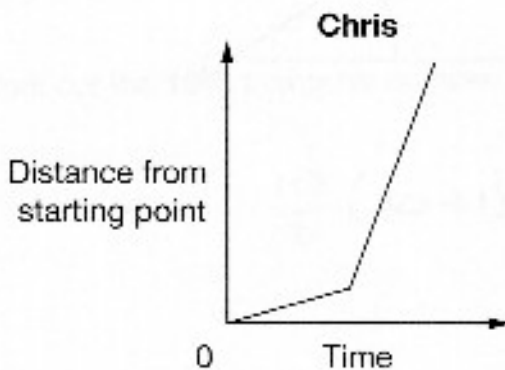
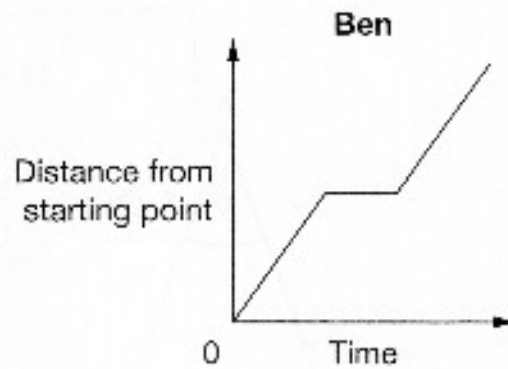
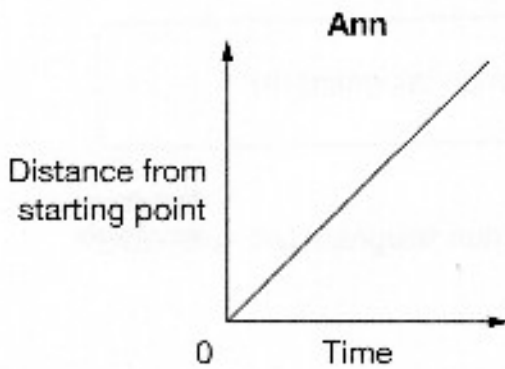
$y = 32^\circ$ because angles in a triangle add to 180° ,
 $180 - 74 - 74 = 32$
 or $74 + 74 = 148, 180 - 148 = 32$

$z = 46^\circ$ because $z + 28 = 74$, external angle = sum
of opposite internal angles, or
 $\angle ADC = 180 - 74 = 106^\circ$
 $180 - 106 - 28 = 46^\circ$, angles
 in $\triangle ADC$ add to 180°

2 marks



11. (a) The graphs show information about the different journeys of four people.



Write the correct names next to the journey descriptions in the table below.

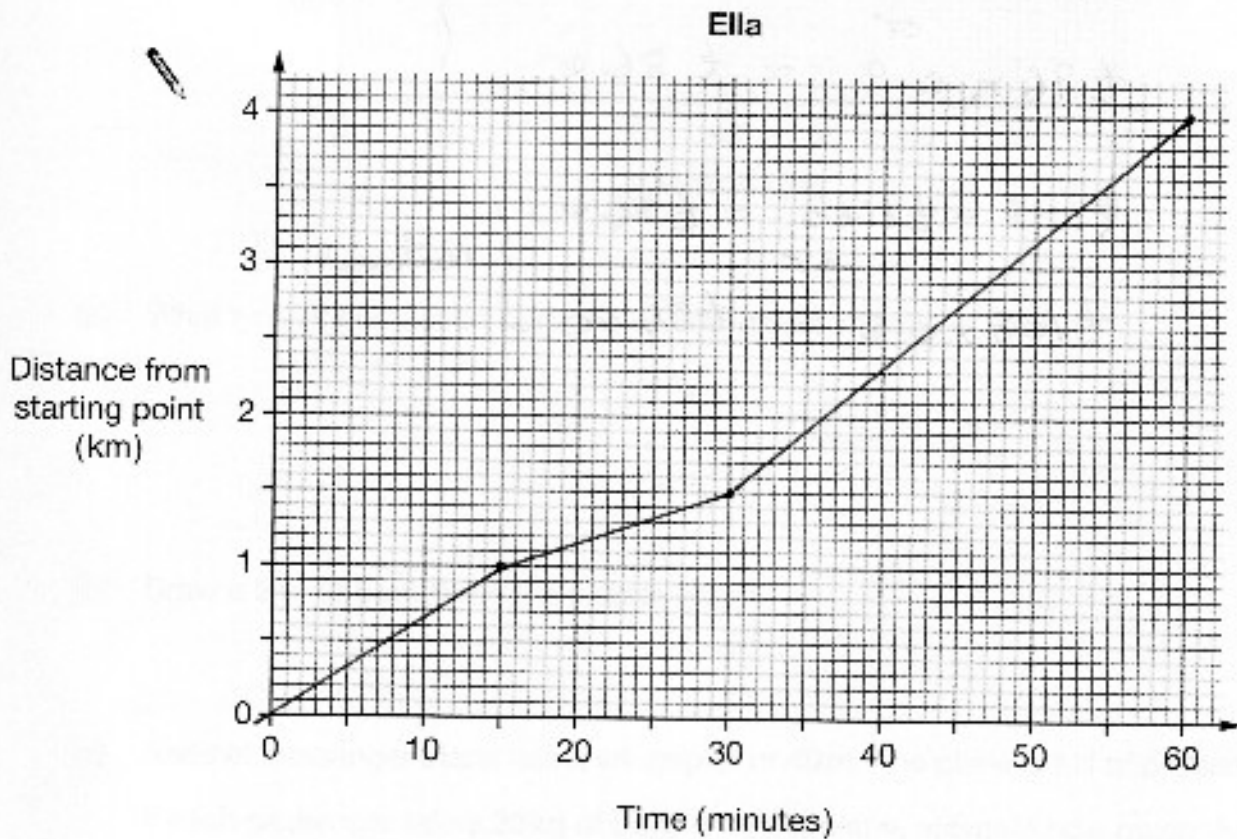
Name	Journey description
Chris	This person walked slowly and then ran at a constant speed.
Dee	This person walked at a constant speed but turned back for a while before continuing.
Ann	This person walked at a constant speed without stopping or turning back.
Ben	This person walked at a constant speed but stopped for a while in the middle.

- (b) Ella made a different journey of **4 km**.
 She walked to a place 4 km away from her starting point.

Here is the description of her journey.

For the first 15 minutes she walked at 4 km per hour.
 For the next 15 minutes she walked at 2 km per hour.
 For the last 30 minutes she walked at a constant speed.

Show Ella's journey **accurately** on the graph below.



2 marks

- (c) For the last 30 minutes of her journey, what was Ella's speed?

5 km per hour

1 mark



12. A shop has this special offer.

Reduction of 10% when your bill is between £50 and £100
 Reduction of 20% when your bill is more than £100

Before the reductions, Marie's bill is **£96** and Richard's bill is **£108**

After the reductions, who paid more?

You **must** show working to explain your answer.

$$\begin{array}{l} \pounds 96 - \pounds 9.60 = \pounds 86.40 \\ \text{or} \\ \pounds 96 \times 0.9 = \pounds 86.40 \end{array} \left. \vphantom{\begin{array}{l} \pounds 96 - \pounds 9.60 = \pounds 86.40 \\ \pounds 96 \times 0.9 = \pounds 86.40 \end{array}} \right\} \text{Marie}$$

$$\begin{array}{l} \pounds 108 - \pounds 21.60 = \pounds 86.40 \\ \text{or} \\ \pounds 108 \times 0.8 = \pounds 86.40 \end{array} \left. \vphantom{\begin{array}{l} \pounds 108 - \pounds 21.60 = \pounds 86.40 \\ \pounds 108 \times 0.8 = \pounds 86.40 \end{array}} \right\} \text{Richard}$$

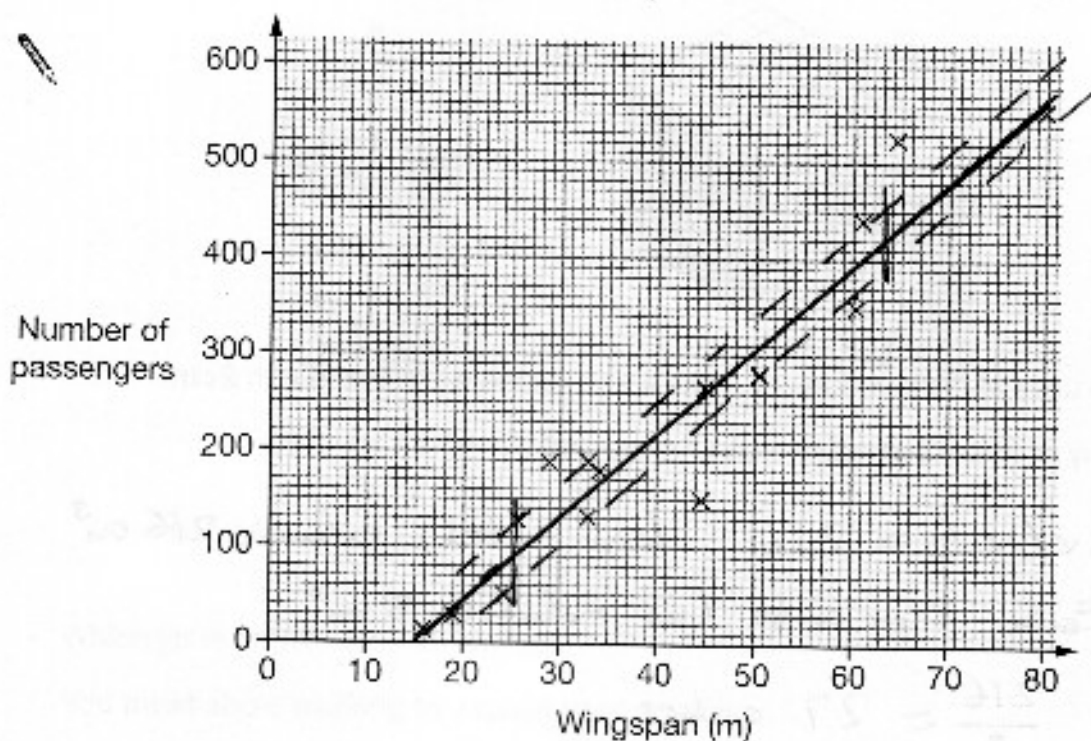
Tick (✓) the correct answer.

Marie

Richard

Both paid the same

13. The scatter graph shows the maximum number of passengers plotted against the wingspans of some passenger planes.



- (a) What type of correlation does the scatter graph show?

positive

1 mark

- (b) Draw a **line of best fit** on the scatter graph.

1 mark

- (c) Another passenger plane has a **wingspan** of **40m**. The plane is full of passengers. If each passenger takes **20kg** of bags onto the plane, estimate how much their bags would weigh altogether.

Perhaps 220 passengers so 4400 kg

(3600 to 5200 kg)

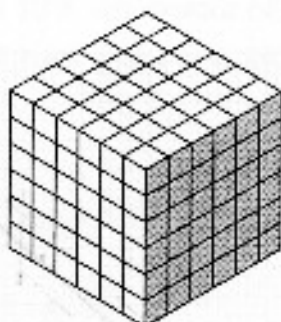
4400 kg

2 marks



14. Kaylee has some 1cm cubes.

She makes a solid cube with side length **6cm** out of the cubes.



Not drawn
accurately

Then she uses all these cubes to make some cubes with side length **2cm**.

How many of these **2cm** cubes can Kaylee make?

$$6 \times 6 \times 6 = 216 \text{ 1cm cubes, volume } 216 \text{ cm}^3$$

Each 2cm cube has volume 8 cm^3

$$\frac{216}{8} = 27 \text{ cubes}$$

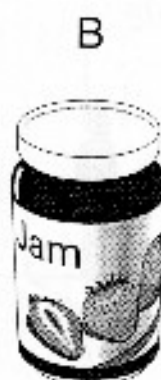
(or split into $3 \times 3 \times 3$ pattern).

27

15. You can buy jars of the same jam in two sizes.



454g for £1.59



340g for £1.25

- Which jar is better value for money?

You **must** show working to explain your answer.

Jar A $\frac{454\text{g}}{159\text{p}} = 2.86\text{ g/p}$

Jar B $\frac{340\text{g}}{125\text{p}} = 2.72\text{ g/p}$

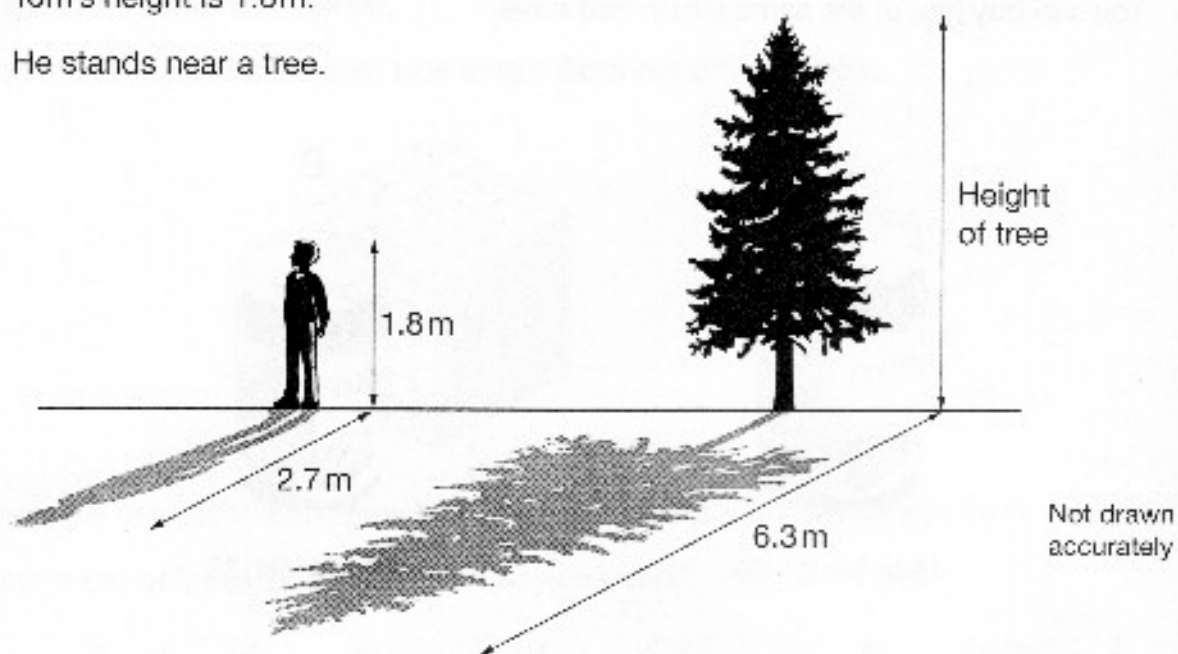
Tick (✓) your answer.

A

B

8 marks

16. Tom's height is 1.8m.
He stands near a tree.



At 4pm, the length of Tom's shadow is 2.7m.

At 4pm, the length of the tree's shadow is 6.3m.

What is the height of the tree?

We expect $\frac{\text{height}}{\text{shadow length}} = \text{constant}$

$$\frac{1.8\text{m}}{2.7\text{m}} = \frac{\text{height}}{6.3\text{m}}$$

(man) (tree)

$$\text{Height} = 6.3 \times \frac{1.8}{2.7} = 6.3 \times \frac{2}{3} = 4.2\text{m}$$

4.2 m

17. Here are the n th term expressions for three different sequences.

$$2^{(n-1)}$$

Sequence A

$$\frac{n^2 - n + 2}{2}$$

Sequence B

$$\frac{n(n^2 - 3n + 8)}{6}$$

Sequence C

The first three terms of each sequence are 1, 2 and 4

What is the **4th** term of each sequence?

You **must** show your working.

You should check you understand the formulae - that's what the 1, 2, 4 is for!

(A) First term $n=1 \Rightarrow 2^{1-1} = 2^0 = 1 \checkmark$
 $n=2 \Rightarrow 2^{2-1} = 2^1 = 2 \checkmark$
 $n=3 \Rightarrow 2^{3-1} = 2^2 = 4 \checkmark$

OK? Now fourth term, $n=4$, $2^{4-1} = 2^3 = 8$

(B) $n=1 \Rightarrow \frac{1^2 - 1 + 2}{2} = \frac{1 - 1 + 2}{2} = 1 \checkmark$
 $n=2 \Rightarrow \frac{4 - 2 + 2}{2} = 2 \checkmark$ $n=3, \frac{9 - 3 + 2}{2} = 4 \checkmark$

Now $n=4$ $\frac{16 - 4 + 2}{2} = \frac{14}{2} = 7$

(C) $n=1, \frac{1(1-3+8)}{6} = \frac{6}{6} = 1 \checkmark$, $n=2, \frac{2(4-6+8)}{6} = \frac{2 \times 6}{6} = 2 \checkmark$
 $n=3, \frac{3(9-9+8)}{6} = \frac{24}{6} = 4 \checkmark$

Now $n=4$

$$\frac{4(16-12+8)}{6} = \frac{4 \times 12}{6} = 8$$

Sequence A 8

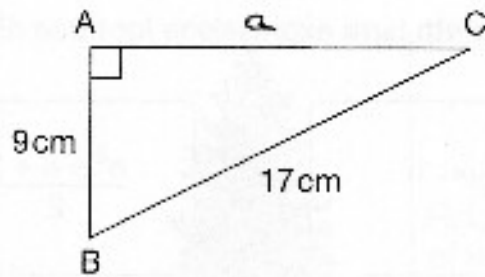
Sequence B 7

Sequence C 8

3 marks

18. (a) Look at this triangle.

Work out length AC.



Not drawn accurately

Pythagoras $a^2 + b^2 = c^2$ so $a^2 = b^2 - c^2$

$$a^2 = 17^2 - 9^2 = 289 - 81 = 208$$

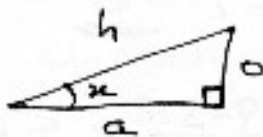
$$a = \sqrt{208} = 14.42$$

(4 significant figures is more than enough).

$$AC = \underline{14.42} \text{ cm}$$

(b) Look at this triangle.

Work out length DF.

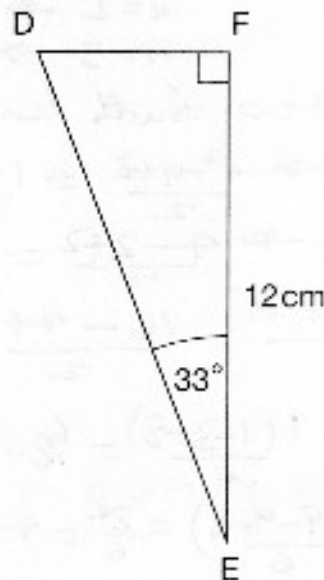


$$\tan(x) = \frac{h}{a}$$

$$h = a \times \tan(x)$$

$$DF = 12 \times \tan(33^\circ)$$

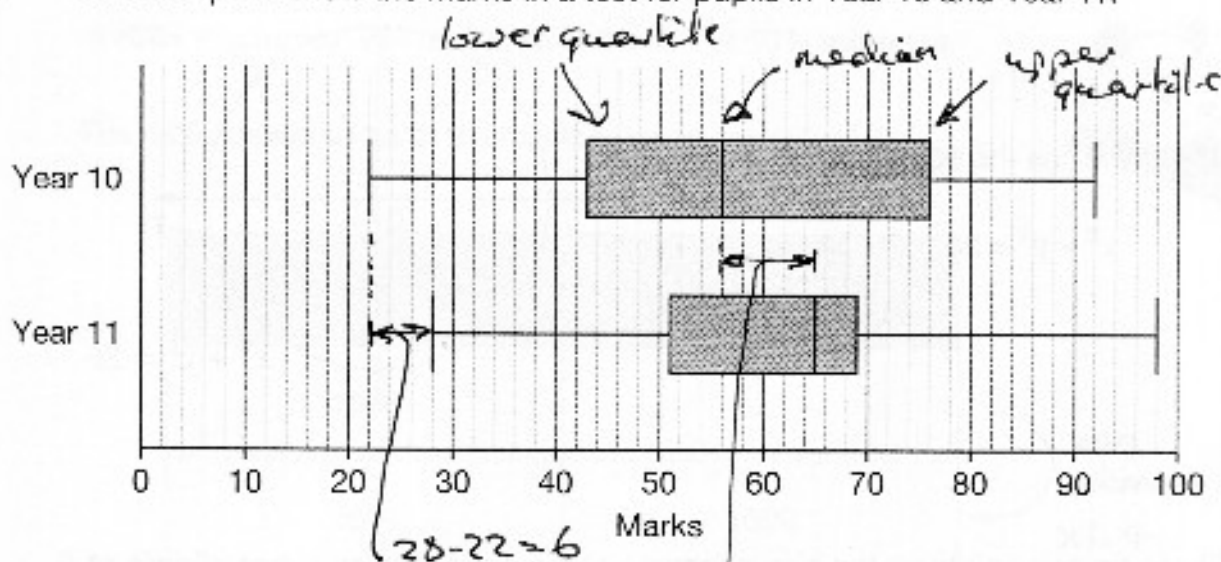
$$= 7.793$$



Not drawn accurately

$$DF = \underline{7.79} \text{ cm}$$

19. The box plots show the marks in a test for pupils in Year 10 and Year 11.



- (a) The **lowest** mark in Year 11 was greater than the lowest mark in Year 10.
How much greater?

6 marks

1 mark

- (b) Show that the **median** mark in Year 11 is **9 marks greater** than the median mark in Year 10.

$$\begin{aligned} 65 - 56 \\ = 9 \end{aligned}$$

1 mark

- (c) The teacher says:

The marks were **more consistent** in Year 11 than in Year 10.

Do you agree?

Yes

No

Explain your answer.

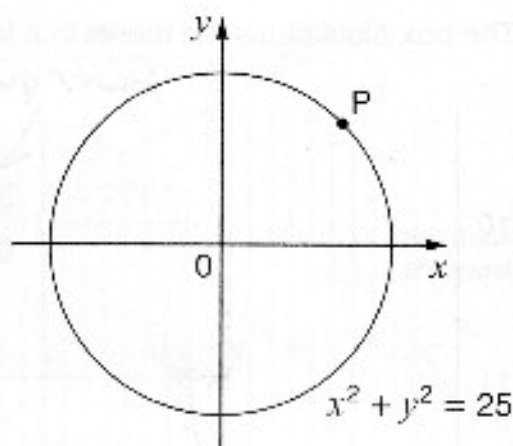
The interquartile range is smaller for year 11
($76 - 43 = 33$ in year 10, $69 - 51 = 18$ in year 11).

1 mark

20. The graph shows a circle with centre $(0, 0)$

The circle has the equation:

$$x^2 + y^2 = 25$$



- (a) There are two points on the circumference of the circle with an **x-coordinate of 3**

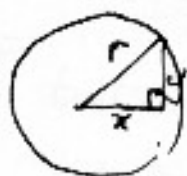
Complete the coordinates of these two points.

$$x = 3, \quad 3^2 + y^2 = 25, \quad y^2 = 25 - 9 = 16$$

$$y = \pm\sqrt{16} = \pm 4$$

$$(3, \underline{-4}) \text{ and } (3, \underline{4})$$

- (b) What is the **radius** of the circle?



$$x^2 + y^2 = r^2 \text{ (Pythagoras)}$$

$$= 25$$

$$\therefore r = 5$$

$$\underline{5}$$

- (c) Point P is on the circumference of the circle.

Its **x-coordinate is equal** to its **y-coordinate**.

What are the coordinates of point P, correct to **1 decimal place**?

$$x = y \quad \therefore x^2 + x^2 = 25, \quad x^2 = \frac{25}{2} = 12.5$$

$$x = \sqrt{12.5} = 3.5355$$

$$P \text{ is } (\underline{3.5}, \underline{3.5})$$

21. In 1988 there was a survey of giant pandas seen in the wild in China.
In 2004 the survey was repeated. There was a **40% increase**.



The table shows some of the results.

Year	Approximate number of giant pandas seen
1988	x
2004	1600

40% increase,
 $\times 1.4$

About x giant pandas were seen in 1988.

Work out the value of x and give your answer to the **nearest 100**

$$1.4x = 1600, \quad x = \frac{1600}{1.4} = 1142.86$$

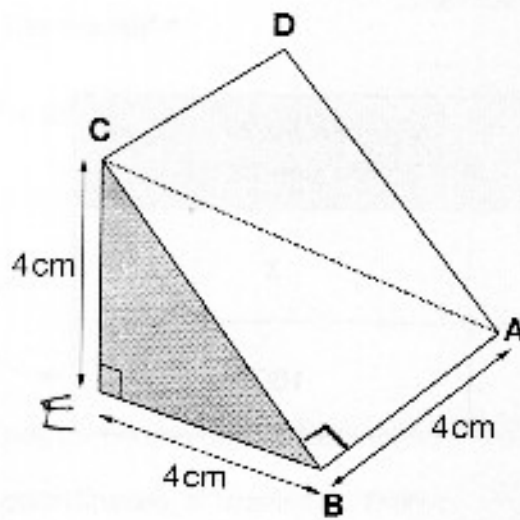
Round to nearest 100 $x = 1100$

$$x = \underline{1100}$$

2 marks



22. A cube is cut through four of its vertices, A, B, C and D, into two identical pieces. The diagram below shows one of the pieces.



Not drawn accurately

Find the length of the line AC.

$$BC^2 = 4^2 + 4^2 = 16 + 16 = 32$$

$$AC^2 = BC^2 + 4^2 = 32 + 16 = 48$$

$$AC = \sqrt{48} = 6.9282$$

6.93 cm

3 marks

23. A teacher has number cards, numbered from 1 to n



The teacher says:

I have n number cards, numbered from 1 to n
 $\frac{1}{5}$ of the cards show square numbers.

What could the value of n be?

There are three possible answers. Give them all.

Square numbers 1, 4, 9, 16, 25, 36, 49, 64, 81, 100...
 n must be a multiple of 5.

$n=5$, 1, 4 square = $\frac{2}{5}$ of them \times

$n=10$ 1, 4, 9 " , $\frac{3}{10}$ of them \times

$n=15$ 1, 4, 9 " , $\frac{3}{15}$ of them = $\frac{1}{5}$ \checkmark

$n=20$ 1, 4, 9, 16 " , $\frac{4}{20} = \frac{1}{5}$ \checkmark

$n=25$ 1, 4, 9, 16, 25, $\frac{5}{25} = \frac{1}{5}$ \checkmark

$n = \underline{15}$

or $n = \underline{20}$

or $n = \underline{25}$

24. A window is made with two pieces of glass.
One piece is a square, the other is a semicircle.



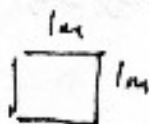
Not drawn
accurately

The area of the square is 1 m^2

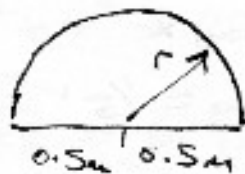
What is the area of the semicircle?

Give your answer in cm^2 to the nearest whole number.

Square



Semicircle



$$= 50\text{ cm}$$

↑
use centimetres so
area units are cm^2

$$\begin{aligned} \text{area} &= \text{half a circle} \\ &= \frac{1}{2} \pi r^2 \\ &= \frac{1}{2} \pi \times 50^2 \text{ cm}^2 \\ &= 3926.99 \text{ cm}^2 \end{aligned}$$

Round up: 3927 cm^2

3 marks

END OF TEST