



Gunnar Goes Pillaging

Moderate Level Maths Paper

Optional time limit: 1 hour

This sample paper shows the style of resources available from 11 Plus Lifeline. If you're looking for harder maths, have no fear: there's plenty of that too, including advanced and scholarship-level papers!

*For more resources, visit **www.11pluslifeline.com**. Detailed solutions begin on page 19.*

1. $886 + 224$

Answer: (2)

2. $886 - 294$

Answer: (2)

3. 243×7

Answer: (2)

4. $3492 \div 9$

Answer: (2)

5. Write these numbers from smallest to largest:

$\frac{4}{5}$

0.4

0.6

84%

$\frac{19}{25}$

Answer: (3)

6. Complete the following sequences. (10)

(a) 58 71 84 110

(b) 169 144 121 100

(c) -11 -5 3 25

(d) 3 2 5 4 7

(e) -1 -11 -12 -23 -35

7. How much greater is three and a sixth than one and three quarters?
Write your answer **as a fraction**.

Answer: (3)

8. An Oscar statuette is 34.29cm tall.

(a) Which of the following describes the position of the digit 2 in the number above?

Circle the correct answer. (1)

units

tens

hundredths

hundreds

tenths

thousandths

thousands

(b) Round the number 34.29 to the nearest tenth.

Answer: (1)

(c) The actor Bread Pith has a giant copy of the Oscar statuette made for his sitting room.

His copy is 700% the height of the original.

How much taller is the copy than the original? Write your answer in **millimetres**.



Answer: (3)

9. Here are four variations of the word **INTERVIEW**.

(i) **WEIVRETN**

(ii) **WEIVRETN**

(iii) **INTEVIEW**

(iv) **MEIVRETN**

(a) Which **one** of the options above is an accurate **rotation** of the word **INTERVIEW**?

Write "(i)", "(ii)", "(iii)" or "(iv)".

Answer: (1)

(b) Which **two** of the options above are **reflections** of the word **INTERVIEW**?

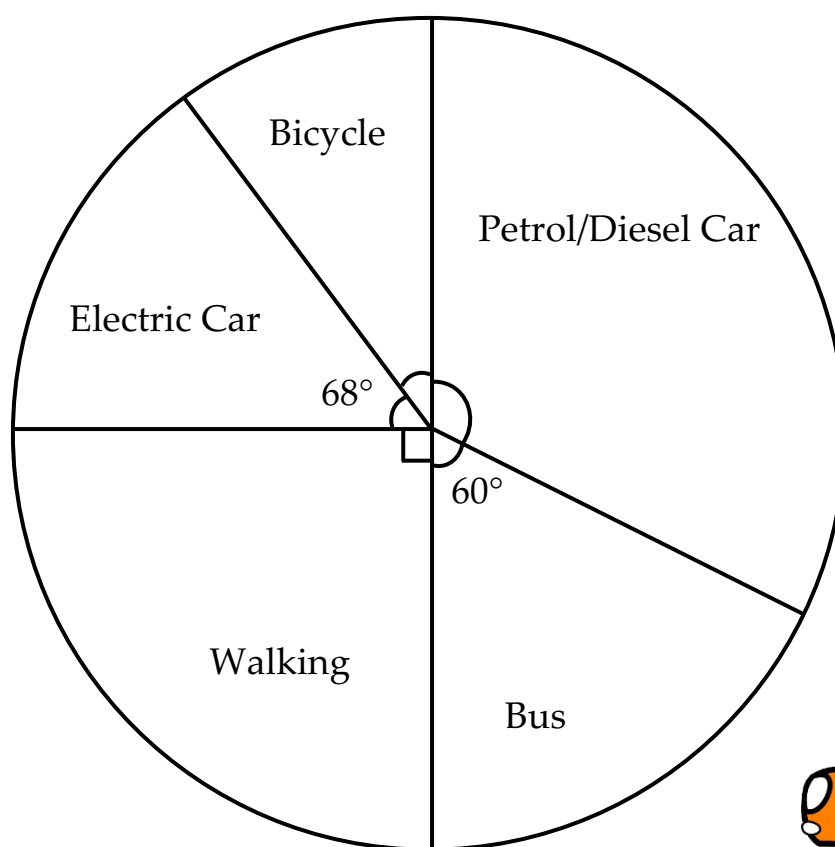
Answer: and (2)

10. West Hogrotshire County Council conducts a survey to discover how schoolchildren in the county travel to school.

The survey involves asking a random sample of 600 children how they travelled to school that morning.

The results are given in the following pie chart, which is not drawn to scale.

Exactly half of the children surveyed travelled to school by petrol/diesel car or by bus.



- (a) What is the angle of the section representing children who travelled to school by bicycle?

Answer: (1)

(b) What fraction of the children surveyed travelled to school by petrol/diesel car?

Answer: (2)

(c) How many of the children surveyed travelled to school by bus?

Answer: (2)

(d) There are 45,000 schoolchildren in West Hogrotshire.

Using the information in the pie chart, estimate as accurately as possible how many of these children travelled to school by electric car on the day of the survey.



Answer: (2)

11. (a) Write seven twentieths as a decimal.

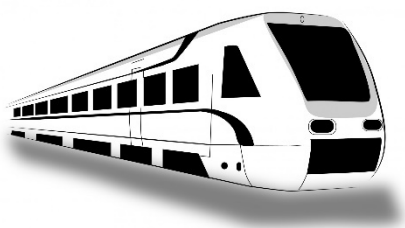
Answer: (2)

- (b) Write three sixteenths as a percentage.

Answer: (3)

-
12. (a) A train leaves Hamburg at 20:26 and arrives in Bozen at 07:49 the next morning.

How long does the journey last in hours and minutes?



Answer: (2)

(b) A train leaves Nice at 12:30pm on Saturday. It arrives in Vladivostok 8 days, 13 hours and 42 minutes later.



Vladivostok is 8 hours ahead of Nice: when it is midnight in Nice, it is 8am in Vladivostok.

At what time and on which day of the week will the train arrive in Vladivostok?

Give your answer in Vladivostok's local time.

Answer: (3)

13. Gunnar the Viking works out that if he pillages 25 monastic candlesticks worth 24 silver pennies each, he will exceed his monthly target by 20 silver pennies.

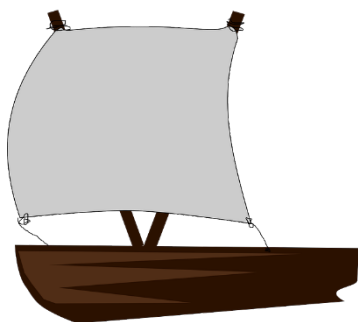
(a) What is Gunnar's monthly target for pillaging? Give your answer in silver pennies.

Answer: (2)

(b) If Gunnar pillages only 20 monastic candlesticks, he can reach his monthly target exactly by also taking four slaves.

By what percentage is a slave more valuable than a monastic candlestick?

Give your answer to the nearest whole percent.



Answer: (5)

14. What fraction of the numbers from 1 to 30 inclusive are not prime, square or cube numbers?

Answer: (2)

15. It takes a watchmaker eight days to make a watch.

How long would it take six watchmakers to make 30 watches?

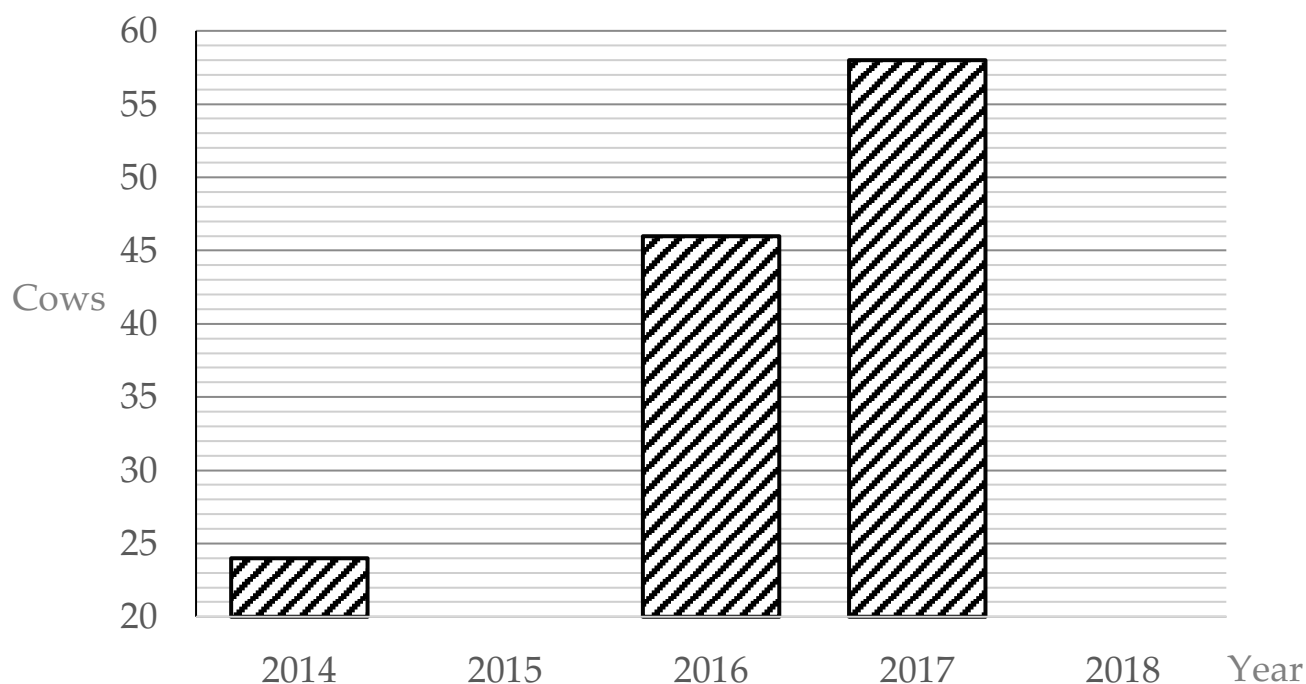
You should assume that it takes each watchmaker exactly the same length of time to make a watch.



Answer: (3)

16. The bar chart and table show the number of cows on Farmer Steve's farm on June 1st each year, for five years. Some data is missing.

Year	2014	2015	2016	2017	2018
Cows	24	30		58	



- (a) Complete the entries for 2016 in the table and 2015 in the bar chart. (2)

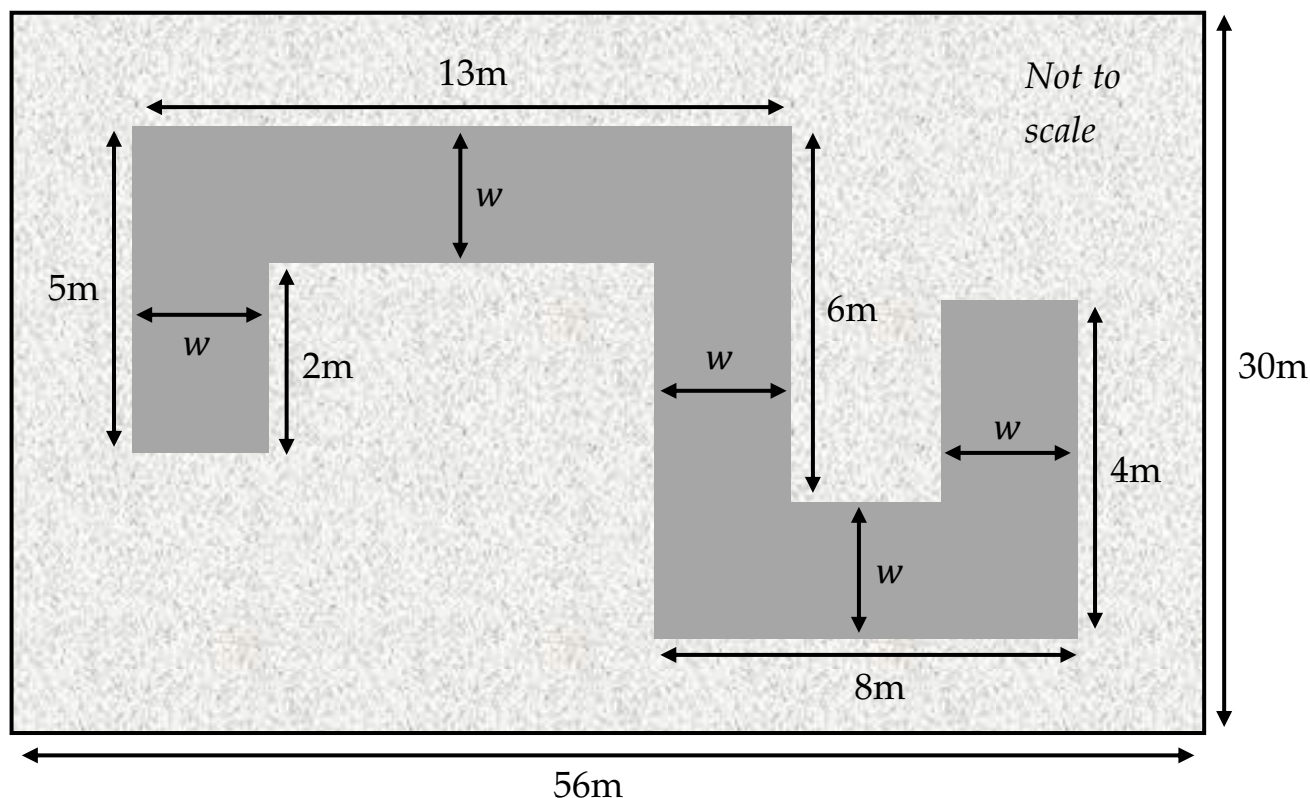
- (b) The mean number of cows is 39.

Complete the table and the bar chart by adding the correct data for 2018. (4)

17. Tiger Woods decides to build a crazy golf course in his garden.

He does not like any form of irregularity, so insists that every corner must be a right-angle.

The rest of Tiger's garden is a rectangular grass lawn.



- (a) What is the length w ?

Answer: (2)

(b) What is the perimeter of the crazy golf course?

Answer: (3)

(c) What is the area of the crazy golf course?

Answer: (3)

18. I have a draw containing 50 socks, which are not paired.
80% are blue. 60% of these are striped and the rest are spotty.
The rest of my socks are yellow with white stars.
(a) How many of my socks are blue and striped?

Answer: (2)

- (b) What percentage of my socks are blue and spotty?

Answer: (2)

- (c) How many socks do I need to take out in order to be certain that I will have at least one matching pair?

Answer: (2)

19. I have 6 sunflowers in my garden. Their heights, to the nearest cm, are 135cm, 210cm, 212cm, 184cm, 215cm and 100cm.

(a) What is the mean height of my sunflowers?

Answer: (2)

(b) What is the range of my sunflowers' heights?

Answer: (2)

(c) What is the median height of my sunflowers?

Answer: (2)

(d) By what percentage is my largest sunflower taller than my smallest?

Answer: (2)

(e) If I round each height to the nearest 10cm, what is the new modal height?

Answer: (2)

(f) I'm very jealous of my neighbour's sunflower.

She's on holiday, so later on the day when I take the measurements given above, I sneak into her garden, dig the flower up and steal it. I add it to my sunflower patch: out of sight from her house, in the place where my hedge is tallest.

Now the mean height of my sunflowers is 202cm, which makes me very happy.

What is the height of the stolen sunflower?



Answer: (3)

Total 100 marks

Marking Guide

The following solutions focus on the *maths* needed to answer each question. Here is a simple guide to marking, which should lead to a fair and broadly accurate overall score. Not all schools will mark in exactly this way (for example, some won't remove a mark for missing units, and others won't use half marks), but a student who can work to this marking style will be prepared for any exam.

A correct answer with correct units (£, kg, etc.) will get **full marks**, irrespective of the student's working out – or lack of it – unless the question directly asks for working to be provided.

If units are missing, a mark should be deducted; half a mark if it is a one-mark question.

If the answer is slightly wrong but the working is almost completely correct, deduct only one mark. (Your working might be different from my suggested method, but still be valid.)

If the answer is wrong and the working is substantially wrong, look for correct moments in the working: for example, the first stage of the method is right, after which it veers off course. Correct moments in a substantially wrong answer might together be worth up to half a mark in a two-mark question, one mark in a three-mark question, two marks in a four-mark question, and so on.

If an answer requires drawing, deduct marks when the drawing is so messy or inaccurate that the answer can no longer reasonably be called correct – for example, if a line does not pass through a specified coordinate, or if it is supposed to be straight but bends noticeably.

Follow-through marking

If the answer to e.g. part **(b)** of a question is based on an incorrect answer from part **(a)**, but is otherwise correct, award **(b)** full marks: *a single mistake shouldn't be penalised again in a different section of the same question*. (If the student makes the same mistake **again** in **(b)**, of course that's a different matter!)

Solutions

1. $886 + 224$

(2)

$$\begin{array}{r} 886 \\ + 224 \\ \hline 1110 \end{array} \quad \underline{\underline{1110}}$$

Be careful to line up your columns exactly, and to write large enough digits that you have space to write the carried numbers clearly.

2. $886 - 294$

(2)

$$\begin{array}{r} 7\cancel{8}86 \\ - 294 \\ \hline 592 \end{array} \quad \underline{\underline{592}}$$

As 8 is smaller than 9, you must take ten from the next column (changing 8 in the left-hand column into 7), giving you 18 from which to subtract 9.

3. 243×7

(2)

$$\begin{array}{r} 243 \\ \times 7 \\ \hline 1701 \end{array} \quad \underline{\underline{1701}}$$

This ought to be fairly simple, but take care!

Having excellent times tables will save you a lot of time in maths exams and help you to avoid mistakes. The 7-times table is a good example of one that many people do not know as well as they might!

4. $3492 \div 9$

(2)

$$\begin{array}{r} 388 \\ 9 \overline{) 3492} \\ \underline{27} \\ 79 \\ \underline{72} \\ 72 \\ \underline{72} \\ 0 \end{array} \quad \underline{\underline{388}}$$

9 goes into 34 three times ($9 \times 3 = 27$), with 7 left over. This 7 carries, making 79; and so on.

5. Write these numbers from smallest to largest:

(3)

$$\frac{4}{5} = 0.8$$

0.4

0.6

84%

$$\frac{19}{25} = \frac{76}{100} = 0.76$$

(4)

(1)

(2)

(5)

(3)

$$0.4, 0.6, \frac{19}{25}, \frac{4}{5}, 84\%$$

Notice how I translate each number into a decimal for easy comparison.

Make sure that you write each number in your answer **in its original form**.

6. Complete the following sequences. (10)

(a) 58 ¹³ 71 ¹³ 84 ¹³ 97 ¹³ 110 ¹³ 123

(b) 169 ⁻²⁵ 144 ⁻²³ 121 ⁻²¹ 100 ⁻¹⁹ 81 ⁻¹⁷ 64

(c) -11 ⁶ -5 ⁸ 3 ¹⁰ 13 ¹² 25 ¹⁴ 39

(d) 3 ⁻¹ 2 ⁺³ 5 ⁻¹ 4 ⁺³ 7 ⁻¹ 6 ⁺³ 9

(e) -1 -11 ⁻¹⁺⁽⁻¹¹⁾ -12 ⁻¹¹⁺⁽⁻¹²⁾ -23 ⁻¹²⁺⁽⁻²³⁾ -35 -58 -93

Writing differences makes most sequences straightforward. By this point in the 11 Plus Lifeline course, you have learnt how much this method helps!

You could treat (d) as two overlapping sequences: 3, 5, 7... involves adding 2 each time, and 2, 4... also involves adding 2 ... *or does it?*

Because you only have two numbers for the second sequence, *how do you know* that it will carry on like this, and that it won't be 2, 4, 8, 16... or something of that sort?

However, if you treat the sequence **as a whole**, the pattern of -1, +3, -1, +3 is enough for you to write the next two numbers with confidence.

(e), meanwhile, is the trickiest sequence here because writing differences won't help you. Instead, you need to notice that each term is formed by **adding the two previous numbers**. For this reason, there is *no rule linking the first two terms*, -1 and -11.

7. How much greater is three and a sixth than one and three quarters?

Write your answer as a fraction.

(3)

$$3\frac{1}{6} = \frac{18}{6} + \frac{1}{6} = \frac{19}{6}$$

$$1\frac{3}{4} = \frac{4}{4} + \frac{3}{4} = \frac{7}{4}$$

$$\frac{19}{6} - \frac{7}{4} = \frac{38}{12} - \frac{21}{12} = \frac{17}{12} \text{ or } 1\frac{5}{12}$$

This problem is simplest if you first convert the two **mixed numbers** into **improper fractions**.

This makes the subtraction simple, especially if you recognise that the two **denominators**, 6 and 4, are factors of 12.

8. An Oscar statuette is 34.29cm tall.

(a) Which of the following describes the position of the digit 2 in the number above?

Circle the correct answer.

(1)

tenths

The number could be expressed as “three tens, four units, **two tenths** and nine hundredths”.

(b) Round the number 34.29 to the nearest tenth.

(1)

34.3

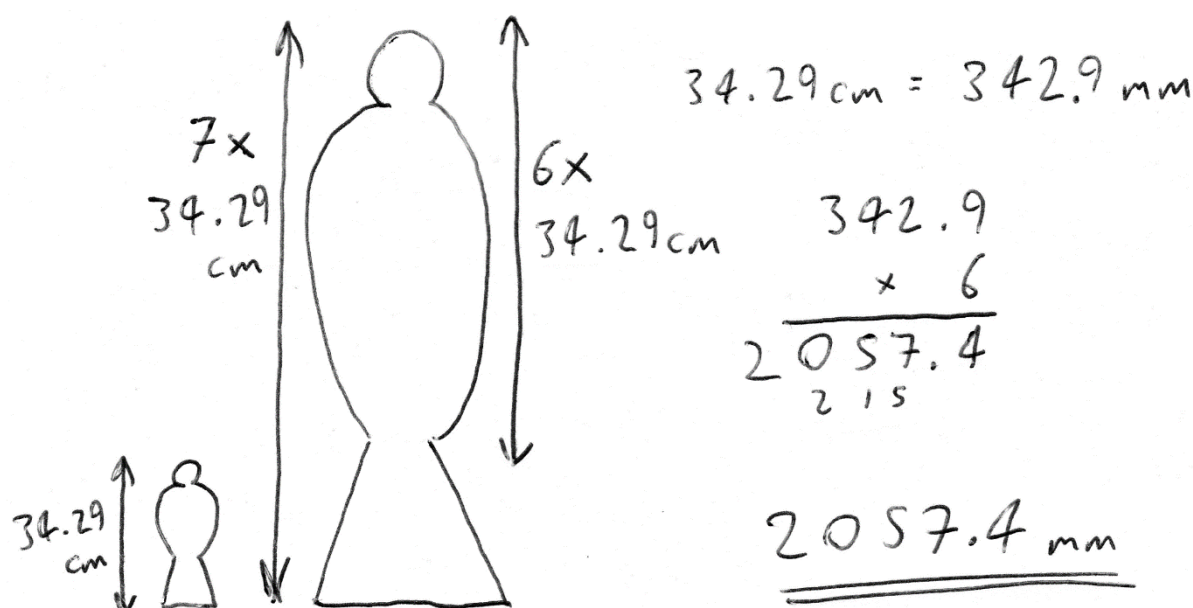
Because the 2 is followed by 9 hundredths, you need to **round up** to 3 tenths.

Remember: *5 or above rounds up.*

(c) The actor Bread Pith has a giant copy of the Oscar statuette made for his sitting room.

His copy is 700% the height of the original.

How much taller is the copy than the original? Write your answer in **millimetres**. (3)



If it is 700% (or 7 times) the height of the original, the new statue is **taller** by **6 times its height**.

- Remember that there are **10mm in a cm!**

9. Here are four variations of the word **INTERVIEW**.

(i) **WEIVRETI**

(ii) **WEIVRETN**

(iii) **INTEBVIEM**

(iv) **MEIVRETN**

(a) Which **one** of the options above is an accurate **rotation** of the word **INTERVIEW**?

Write "(i)", "(ii)", "(iii)" or "(iv)".

(1)

(iv)

Look how the original word can be rotated to give option (iv):



(b) Which **two** of the options above are **reflections** of the word **INTERVIEW**?

(2)

(i) and (iii)

(i) **INTERVIEW** | **WEIVRETI**

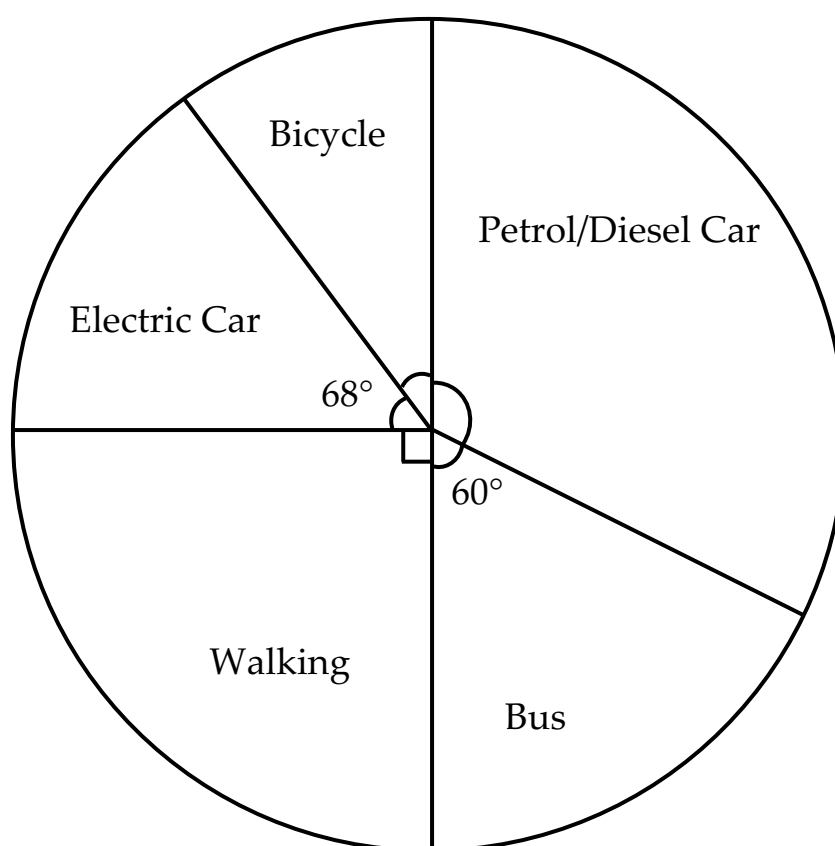
(iii) **INTERVIEW**
- **INTEBVIEM**

10. West Hogrothshire County Council conducts a survey to discover how schoolchildren in the county travel to school.

The survey involves asking a random sample of 600 children how they travelled to school that morning.

The results are given in the following pie chart, which is not drawn to scale.

Exactly half of the children surveyed travelled to school by petrol/diesel car or by bus.



- (a) What is the angle of the section representing children who travelled to school by bicycle? (1)

$$90 - 68 = \underline{\underline{22^\circ}}$$

Because the total of children who came to school in a petrol/diesel car or a bus is represented by 180° (half the children), and those who walked occupy 90° (a right-angle), there are 90° left.

68 of these 90° represent electric car journeys: there are 22° remaining.

(b) What fraction of the children surveyed travelled to school by petrol/diesel car? **(2)**

$$180 - 60 = 120^\circ$$

$$\frac{120}{360} = \frac{1}{3}$$

We know from the question that petrol/diesel car and bus journeys combine to give half the overall total: 180° .

Without the bus journeys (60°), we have 120° of this left.

120° is $\frac{1}{3}$ of 360° .

(c) How many of the children surveyed travelled to school by bus? **(2)**

$$\frac{60}{360} = \frac{1}{6} \quad \frac{1}{6} \times 600 = \underline{\underline{100}}$$

60° is $\frac{1}{6}$ of 360° , and we know that there were 600 children surveyed.

(d) There are 45,000 schoolchildren in West Hogrotshire.

Using the information in the pie chart, estimate as accurately as possible how many of these children travelled to school by electric car on the day of the survey. (2)

$$\frac{68}{360} = \frac{34}{180} = \frac{17}{90}$$

$$\frac{17}{90} \times 45000$$

$$\begin{array}{r} 500 \\ \times 17 \\ \hline 3500 \\ 5000 \\ \hline 8500 \end{array}$$

Using the same method as in (b) and (c), we find that the fraction of children arriving by electric car was $\frac{17}{90}$. Unfortunately, this can't be simplified further.

We can estimate the total number of children in the county who came by electric car if we assume that the "random sample of 600 children" have a similar pattern of behaviour to the rest of the 45,000 children in the county.

It's a good-sized sample, so that isn't an unreasonable thing to assume.

$\frac{17}{90}$ of 45,000 looks like a difficult calculation, but a bit of cancelling makes it fairly easy:

- The 0 of 90 and the last 0 of 45,000 cancel, giving 9 and 4,500.
- 9 goes into 45 **5 times**, so 9 goes into 4500 **500 times**.

500×17 is a straightforward multiplication.

11. (a) Write seven twentieths as a decimal.

(2)

$$\frac{7}{20} = \frac{35}{100} = \underline{\underline{0.35}}$$

$\begin{array}{c} \times 5 \\ \curvearrowright \end{array}$
 $\begin{array}{c} \curvearrowright \\ \times 5 \end{array}$

You could also solve this using division: divide 7.00 by 20, or (even more straightforwardly) 0.70 by 2. This method is used in the second solution for part (b).

(b) Write three sixteenths as a percentage.

(3)

$$\frac{3}{16} = \frac{30}{160} = \frac{15}{80} = \frac{7.5}{40}$$

$$= \frac{3.75}{20} = \frac{37.5}{200} = \frac{18.75}{100} = \underline{\underline{18.75\%}}$$

or

$$16 \overline{) 3.0000} \begin{array}{l} 0.1875 \\ \underline{16} \\ 14 \\ \underline{16} \\ 20 \\ \underline{16} \\ 40 \\ \underline{40} \\ 0 \end{array} \quad 0.1875 = \underline{\underline{18.75\%}}$$

The first method involves multiplying or dividing the top and bottom of the fraction (when you multiply or divide the bottom by a certain amount, you must always do the same to the top), until you have **a fraction over 100**: a percentage.

The second method, division, is always available to you.

12. (a) A train leaves Hamburg at 20:26 and arrives in Bozen at 07:49 the next morning.

How long does the journey last in hours and minutes? (2)

$$\begin{array}{ccccccc}
 20:26 & \rightarrow & 21:00 & \rightarrow & 00:00 & \rightarrow & 07:00 & \rightarrow & 07:49 \\
 & & 34 \text{ mins} & & 3 \text{ hrs} & & 7 \text{ hrs} & & 49 \text{ mins} \\
 & & & & & & & & \\
 & & & & & & 10 \text{ hrs}, 34 + 49 \text{ mins} & = & 10 \text{ hrs}, 83 \text{ mins} \\
 & & & & & & = & & \underline{\underline{11 \text{ hrs } 23 \text{ mins}}}
 \end{array}$$

Always write a timeline when you need to find time differences involving a mixture of hours, minutes and seconds. **Time is not divided up in groups of 100**, so ordinary subtraction can lead you into big problems!

Just remember to convert any number of minutes above (and including) 60 into hours and minutes. Writing "10 hours 83 minutes" would be an unfortunate way to lose a mark.

- (b) A train leaves Nice at 12:30pm on Saturday. It arrives in Vladivostok 8 days, 13 hours and 42 minutes later.

Vladivostok is 8 hours ahead of Nice: when it is midnight in Nice, it is 8am in Vladivostok.

At what time and on which day of the week will the train arrive in Vladivostok?

Give your answer in Vladivostok's local time. (3)

$$\begin{array}{ccccccc}
 12:30 \text{ Sat} & \rightarrow & 12:30 \text{ Sunday} & \rightarrow & 01:30 \text{ Monday} & \rightarrow & 02:12 \text{ Mon} \\
 \text{Nice} & & 8 \text{ days} & & 13 \text{ hours} & & 42 \text{ mins} \\
 & & & & & & \\
 & & & & & & \\
 02:12 \text{ Monday (Nice time)} & = & \underline{\underline{10:12 \text{ am Monday (Vladivostok)}}}
 \end{array}$$

If you break your solution into clear steps, it's unlikely to cause you any problems.

13. Gunnar the Viking works out that if he pillages 25 monastic candlesticks worth 24 silver pennies each, he will exceed his monthly target by 20 silver pennies.

(a) What is Gunnar's monthly target for pillaging? Give your answer in silver pennies. (2)

$$\begin{array}{r}
 25 \\
 \times 24 \\
 \hline
 100 \\
 500 \\
 \hline
 600
 \end{array}$$

$$600 - 20 = \underline{\underline{580 \text{ silver pennies}}}$$

You will probably get away with not writing "silver pennies" (they aren't a standard unit!), but don't take the risk.

(b) If Gunnar pillages only 20 monastic candlesticks, he can reach his monthly target exactly by also taking four slaves.

By what percentage is a slave more valuable than a monastic candlestick?

Give your answer to the nearest whole percent. (5)

$$20 \times 24 = 480 \text{ s.p.}$$

$$580 - 480 = 100 \text{ s.p.}$$

$$\frac{100}{4} = 25 \text{ s.p. / slave}$$

$$\frac{25}{24} = 1 \frac{1}{24} \quad 24 \overline{) 0.041666 \dots} \quad \underline{\underline{4\%}}$$

You'll notice that I've abbreviated "silver pennies" to "s.p." to save myself time. If this unit were needed in the answer, I would write "silver pennies".

We know from (a) that Gunnar's pillaging target is 580 silver pennies.

20 candlesticks are worth 480 s.p.

This leaves 100 s.p., which we are told is the exact value of 4 slaves.

We aren't told that every slave is worth the same, but *because the question only works if this is the case, we should assume that it is true.*

In this case, each slave is worth $100/4$ or 25 s.p.

A candlestick is worth 24 s.p.

1 silver penny added to 24 silver pennies is an increase of $1/24$.

Dividing 1 by 24, we get the decimal 0.041..., which is 4% to the nearest whole percent: zero units, zero tenths and four hundredths, with a digit afterwards that is less than 5.

- It's essential to **calculate one decimal place further than the "4"**: if the decimal had been 0.045, the answer would have been 5%, because the 5 would have caused the 4 to round up.

14. What fraction of the numbers from 1 to 30 inclusive are not prime, square or cube numbers? (2)

1	S	11	P	(21)	
2	P	(12)		(22)	
3	P	13	P	23	P
4	S	(14)		(24)	
5	P	(15)		25	S
(6)		16	S	(26)	
7	P	17	P	27	C
8	C	(18)		(28)	
9	S	19	P	29	P
(10)		(20)		(30)	

$$\frac{13}{30}$$

You don't necessarily have to list all the numbers, but it is the best way to avoid mistakes.

I've written "S" for square numbers, "C" for cube numbers and "P" for prime numbers. Of course, 1 is both square and cube.

15. It takes a watchmaker eight days to make a watch.

How long would it take six watchmakers to make 30 watches?

You should assume that it takes each watchmaker exactly the same length of time to make a watch. (3)

Watchmakers	Days	Watches
1	8	1
$\times 6 \rightarrow 6$	$240 \downarrow \times 30$	$30 \downarrow \times 30$
	$\div 6 \rightarrow 40$	30
		<u>40 days</u>

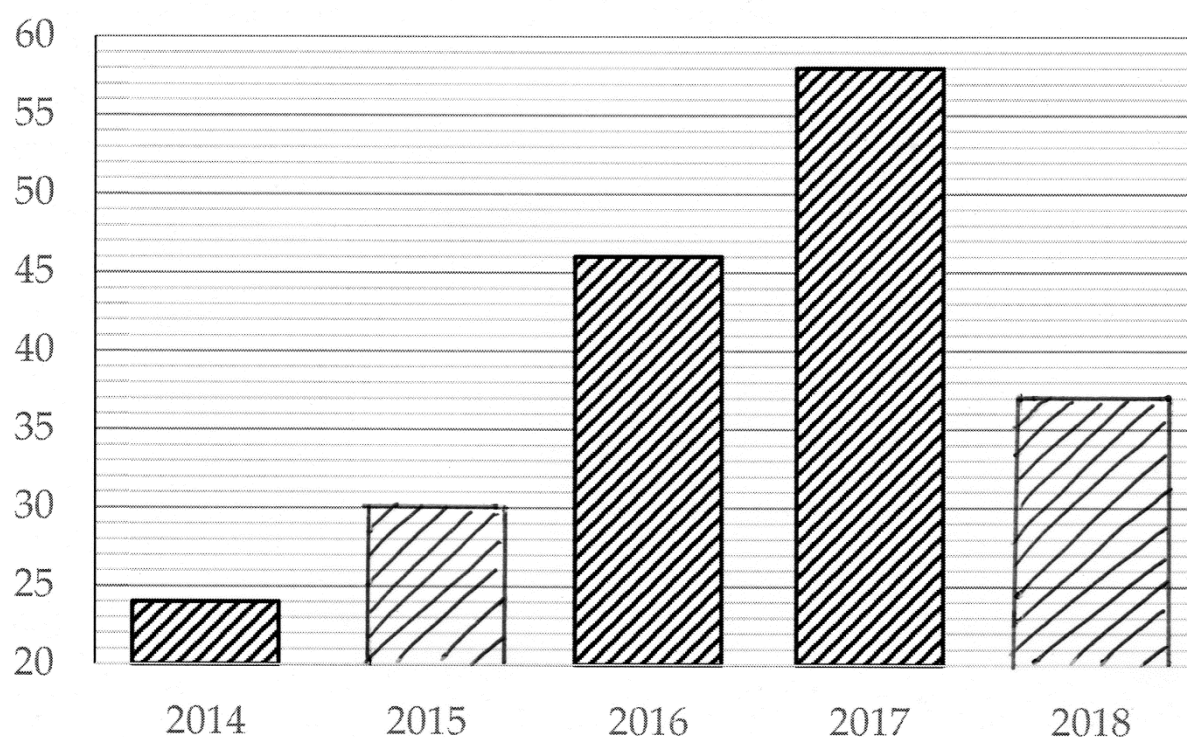
Always draw a table for this sort of question! It makes things so easy.

- If 1 watchmaker takes 8 days to make 1 watch, to make 30 watches will take them 30 times as many days: 240.
- 6 times as many watchmakers will take $\frac{1}{6}$ of that time to make the same number of watches.

You could change the columns in a different order: for example, working out that 6 watchmakers will make 6 watches in 8 days, than that they will take 40 days (5 times as long) to make 30 watches (5 times as many watches).

16. The bar chart and table show the number of cows on Farmer Steve's farm on June 1st each year, for five years. Some data is missing.

Year	2014	2015	2016	2017	2018
Cows	24	30	46	58	37



- (a) Complete the entries for 2016 in the table and 2015 in the bar chart. (2)

The shading isn't important, but making sure that your bar accurately shows 30 cows is!

(b) The mean number of cows is 39.

Complete the table and the bar chart by adding the correct data for 2018. (4)

$$\begin{aligned}
 39 \times 5 &= 195 \\
 195 - (24 + 30 + 46 + 58) \\
 &= 195 - 158 = 37
 \end{aligned}$$

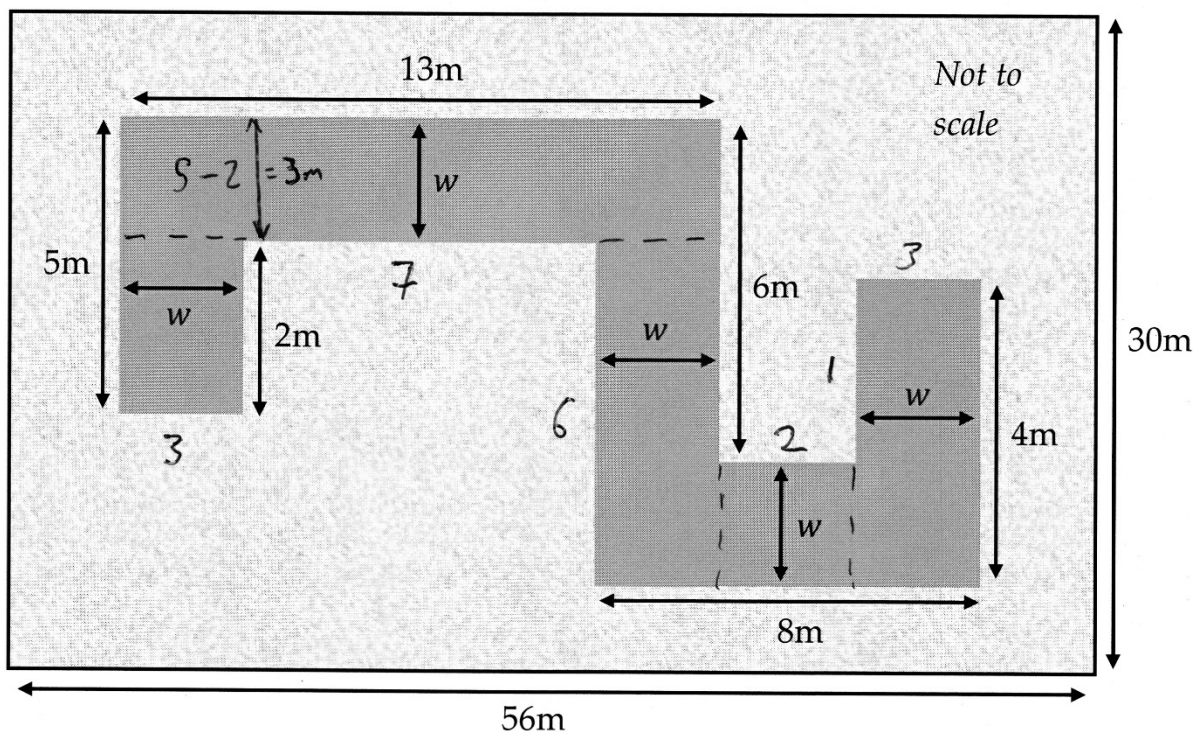
If the mean of 5 numbers is 39, then the total must be 5 times that mean: 195.

If you subtract the numbers we already know from 195, you'll be left with the missing figure: 37.

- Make sure that you actually add your answer to the table and chart!

17. Tiger Woods decides to build a crazy golf course in his garden. He does not like any form of irregularity, so insists that every corner must be a right-angle.

The rest of Tiger's garden is a rectangular grass lawn.



- (a) What is the length w ? (2)

$$5 - 2 = \underline{\underline{3m}}$$

The reason for this can be seen in the top-left corner of the diagram above: 2m and w are the same length as a 5m edge, so w must be 3m.

This looks wrong, because 2m seems longer than 3m on the diagram; but notice the label stating that the image is "Not to scale".

(b) What is the perimeter of the crazy golf course?

(3)

$$\begin{aligned}
 &5 + 13 + 6 + 2 + 1 + 3 + 4 + 8 + 6 + 7 + 2 + 3 \\
 = &24 + 6 + 18 + 12 \\
 = &\underline{\underline{60\text{m}}}
 \end{aligned}$$

Once you know w , you can go round the diagram writing in the missing lengths, as I've done on the picture above.

(c) What is the area of the crazy golf course?

(3)

$$\begin{aligned}
 &3 \times 2 + 3 \times 13 + 3 \times 6 + 3 \times 2 + 3 \times 4 \\
 = &6 + 39 + 18 + 6 + 12 \\
 = &45 + 24 + 12 \\
 = &69 + 12 = \underline{\underline{81\text{m}^2}}
 \end{aligned}$$

If you look at the dotted lines that I've added to the diagram, you'll see how I have divided it into rectangles.

Finding the area of each rectangle and adding these together, it's easy to find the area of the whole course.

(d) What is the area of the grass lawn?

(3)

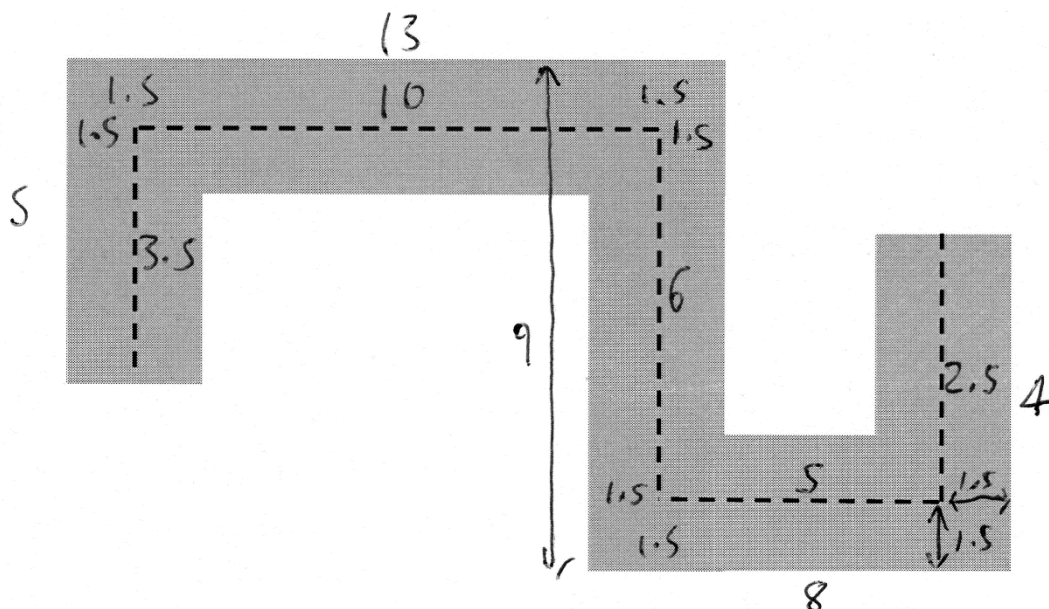
$$\begin{array}{r}
 56 \\
 \times 30 \\
 \hline
 00 \\
 1680 \\
 \hline
 1680
 \end{array}$$

$$\begin{array}{r}
 15990 \\
 - 81 \\
 \hline
 1599
 \end{array}$$

$$\underline{\underline{1599 \text{ m}^2}}$$

This is the area of the whole space, minus the area of the golf course.

(e) Tiger's greatest ambition is to complete the course perfectly: that is, by sending the ball from one end of the course to the other, exactly down the middle:



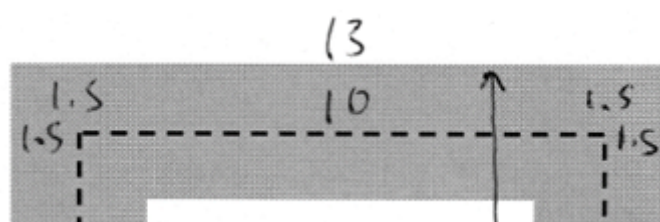
If Tiger manages to complete the course perfectly, what distance will the ball travel? Ignore any bumps: assume that the ball follows a flat course, rolling along the ground. (3)

$$\begin{aligned}
 &2.5 + 5 + 6 + 10 + 3.5 \\
 &= 2.5 + 21 + 3.5 \\
 &= 6 + 21 = \underline{\underline{27\text{ m}}}
 \end{aligned}$$

Writing distances on the diagram is very helpful here.

As the course is always 3m wide, the line down the middle is always 1.5m from an edge.

For example, look at the following section:



The section is 13m long, but the dotted route stops 1.5m short of each end.

In other words, this horizontal part of Tiger's perfect round is $13m - 1.5m - 1.5m$ long, which gives 10m.

Work out the length of each section of the dotted line, and add your results together.

18. I have a draw containing 50 socks, which are not paired.

80% are blue. 60% of these are striped and the rest are spotty.

The rest of my socks are yellow with white stars.

(a) How many of my socks are blue and striped? (2)

$$\frac{80}{100} \times 50 = 40 \text{ blue}$$

$$\frac{60}{100} \times 40 = \underline{\underline{24 \text{ striped}}}$$

80% of my 50 socks are blue, giving 40 socks.

60% of these are striped, giving 24.

(b) What percentage of my socks are blue and spotty?

(2)

$$40 - 24 = 16$$

$$\frac{16}{50} = \frac{32}{100} = \underline{\underline{32\%}}$$

or

$$\begin{aligned} &40\% \text{ of } 80\% \\ &= \frac{40}{100} \times \frac{80}{100} = \frac{32}{100} = \underline{\underline{32\%}} \end{aligned}$$

The first method works like this:

- If 24 of my 40 blue socks are striped (from (a)), then 16 must be spotty.
- This is 32% of the total, 50 socks, because $\frac{16}{50}$ is the same as $\frac{32}{100}$ or 32%.

The second method focuses on percentages rather than numbers of socks:

- 80% of my socks are blue. If 60% of these are striped, then 40% must be spotty.
- 40% of 80% is the same as $40\% \times 80\%$, or $\frac{40}{100} \times \frac{80}{100}$.
- (You could also calculate 0.4×0.8)

(c) How many socks do I need to take out in order to be certain that I will have at least one matching pair? (2)

4

There's no working out in the answer above, because this is one of those answers that it is possible to spot just from the information in the question.

Rather than thinking about matching pairs, think about *drawing socks without matching*.

How long could you keep this going for?

For example:

Sock 1 – Yellow

Sock 2 – Blue Striped

Sock 3 – Blue Spotty

Sock 4 – *Must be one of the options already drawn, so I will have a pair.*

19. I have 6 sunflowers in my garden. Their heights, to the nearest cm, are 135cm, 210cm, 212cm, 184cm, 215cm and 100cm.

(a) What is the mean height of my sunflowers? (2)

$$\begin{array}{r}
 135 \\
 210 \\
 212 \\
 184 \\
 215 \\
 100 \\
 \hline
 1056 \\
 11
 \end{array}$$

$$\begin{array}{r}
 176 \\
 6 \overline{) 1056} \\
 \hline
 176 \text{ cm}
 \end{array}$$

This is straightforward: add the heights together and divide by the number of flowers.

Just be careful with your adding up!

(b) What is the range of my sunflowers' heights? (2)

$$\begin{array}{r}
 215 \\
 - 100 \\
 \hline
 115
 \end{array}$$

$$115 \text{ cm}$$

This is the greatest height minus the smallest.

(c) What is the median height of my sunflowers?

(2)

$$\begin{array}{r}
 \cancel{100}, \cancel{138}, 184, 210, \cancel{212}, \cancel{215} \\
 \hline
 184 + 210 = 394 \\
 \hline
 2 \qquad \qquad 2 \\
 \hline
 197 \text{ cm}
 \end{array}$$

To find the median, **write the heights in order and find the middle value.**

Because there are two middle values, you need to go **half way between them.**

To do this accurately, **add the two heights and divide by 2.**

(d) By what percentage is my largest sunflower taller than my smallest?

(2)

$$\frac{115}{100} = \underline{\underline{115\%}}$$

The difference between the two flowers' heights (from (b)) is 115cm.

Because the shortest sunflower is 100cm high, this is a 115% difference: 115cm is 115% of 100cm.

(e) If I round each height to the nearest 10cm, what is the new modal height? (2)

140, 210, 210, 180, 220, 100

210 cm

When all the heights are rounded to the nearest 10cm, 210cm appears twice. It is the most common result – the **mode**.

(f) I'm very jealous of my neighbour's sunflower.

She's on holiday, so later on the day when I take the measurements given above, I sneak into her garden, dig the flower up and steal it. I add it to my sunflower patch: out of sight from her house, in the place where my hedge is tallest.

Now the mean height of my sunflowers is 202cm, which makes me very happy.

What is the height of the stolen sunflower? (3)

$$\frac{1056 + x}{7} = 202$$

$$1056 + x = 202 \times 7 = 1414$$

$$x = 1414 - 1056 = 414 - 56$$

$$= \underline{\underline{358 \text{ cm}}}$$

This is a common kind of averages question, hidden in a lot of words!

- From (a), we know that the total of my flowers' heights before the theft was 1056cm.
- The new total, including the new sunflower, would have to be divided by 7 (I now have 7 flowers) to give the new mean.
- ... and we are told that this new mean is 202cm.

This gives a simple equation, which can be solved to find the height of the new flower:

- If the total of all the heights divided by 7 is 202, then the total of all the heights if **not** divided by 7 would be 1414.
- This total of 1414 is formed of 1056 and an unknown number, x .
- Subtracting 1414 from 1056, we find the height of the new (or rather, stolen) flower, x .

END

