THE KING'S SCHOOL
CHESTER

ENTRANCE EXAMINATION

MATHEMATICS

Specimen Paper

Time allowed: 45 minutes

- Answer as many questions as you can.
- Write your answers in the spaces provided.
- Show any working in the spaces between the questions.
- If you cannot answer a question, go on to the next one. Return to it later if you have time.
- Calculators may not be used.

1. Calculate the following, showing your working clearly

(i) $12.31+1.75$

Answer…….....

(ii) $2.76-1.842$

Answer…….....

(iii) 128×47

Answer…….....

(iv) 110×0.2

Answer…….....

2. Place the following numbers in order of size from smallest to largest:

4.2101 4.1021 4.0121 4.0211

Answer ……. ……. ……. ……

3. Circle the amounts below which can be made using three UK coins

71p 72p 73p 74p 75p

4. Divide 623 by 8, giving your answer and the remainder.

Answer……remainder .....

5. Complete the boxes with $+, -, \times, \div$ to make the statements correct. The first one has been done for you as an example.

8 [×] 3 = 28 [–] 4

(i) 21 [ ] 3 = 5 [ ] 2

(ii) 18 [ ] 6 = 120 [ ] 12

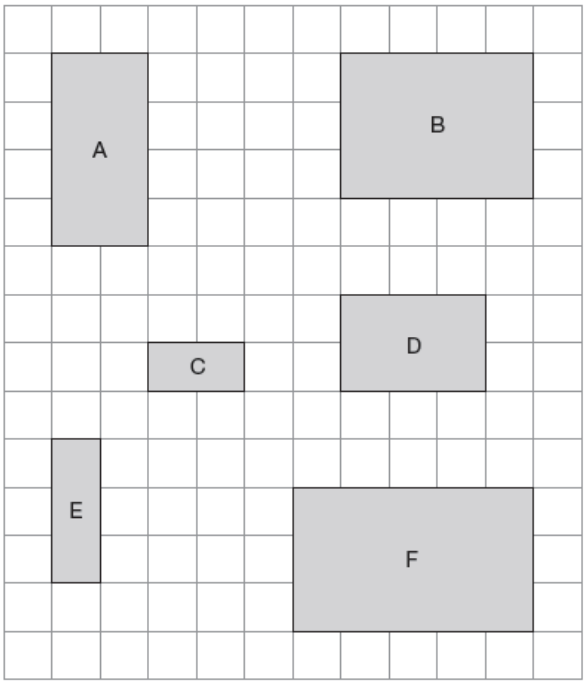
6. (i) Round 12.7 to the nearest whole number

Answer…….....

(ii) Round 44 350 to the nearest 1000

Answer…….....

7. Two of the shapes below fit together to make a square. Which are they?



Answer…… and ….....

8. Write these fractions in order of size from the smallest to the largest.

$\frac{1}{2}$ $\frac{3}{8}$ $\frac{1}{3}$ $\frac{5}{12}$ $\frac{7}{24}$

……. ……. ……. ……. …….

9. Write down the next term for each of these sequences.

(i) 3 7 11 15 ……

.

(ii) 303 300 297 294 ……

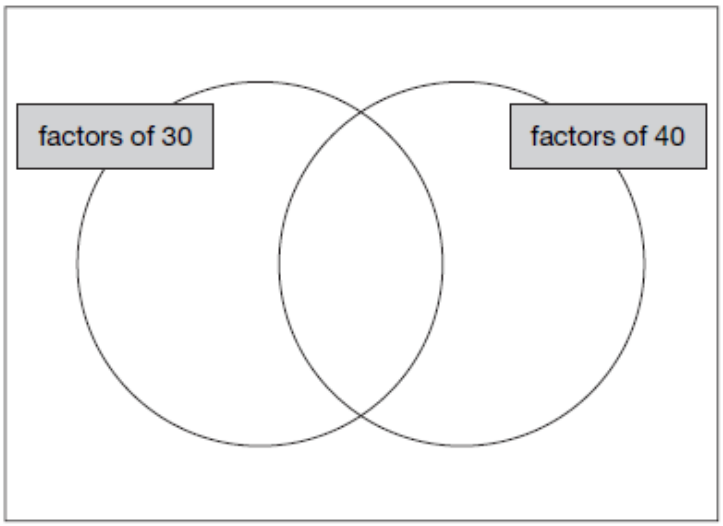
(iii) 1 1 2 3 5 8 ……

Find the 100^{th} term of the sequence in part (ii).

Answer…….....

10. Put the following numbers into the correct positions in the diagram below:

5 6 7 8

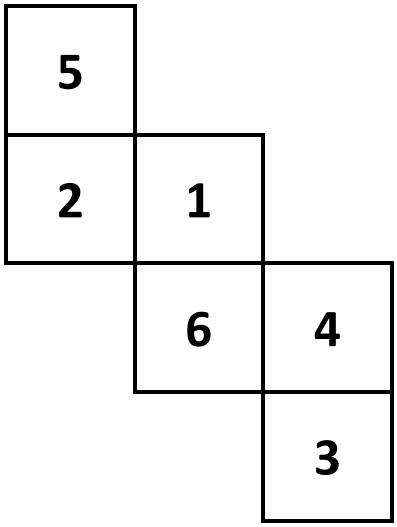


11. Fill in the missing values in the table below to show the fraction, decimal and percentage equivalents of the numbers.

Give the fractions in their simplest form.

	Fraction	Decimal	%
A	$\frac{3}{10}$	0.3	30%
B	$\frac{1}{5}$		
C			24%
D		0.34	

12. Alice makes a die from the net below.



Which number will be opposite

(i) The number 1

Answer…….....**.....**

(ii) The number 2

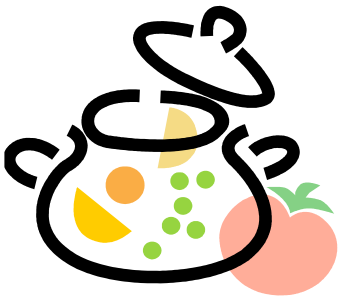
Answer…….....

13. Mayur is making vegetable soup.

$\frac{1}{3}$ of the soup is made from carrots

$\frac{1}{2}$ is made from lentils

$\frac{1}{12}$ is made from parsnips



The rest is made from tomatoes.

If he makes 600g of soup in total,

(i) How much carrot does he need?

Answer……..... g

(ii) How much tomato does he need?

Answer……..... g

14. James counts down in 9's starting from 345 until he passes zero. Which will be the last positive number which he counts?

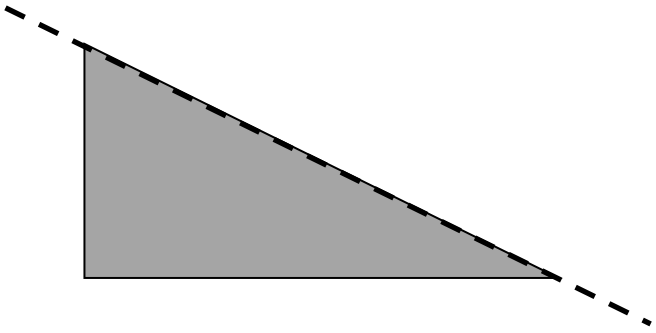
Answer…….....

15. A website advertises that, as a special offer, a new mobile phone game will cost 40% less to download next week.

If the game costs 80p this week, how much will it cost next week?

Answer…….....

16. The diagram shows part of a shape together with its line of symmetry. Draw in the remainder of the shape.

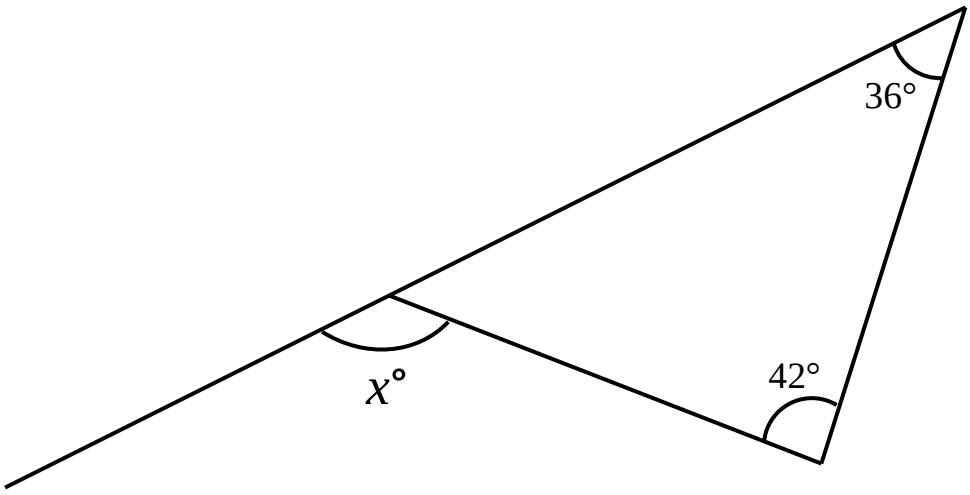


17. 3 *x*'s balance with 10 *y*'s.

If one *x* weighs 1.5g, how much does one *y* weigh?

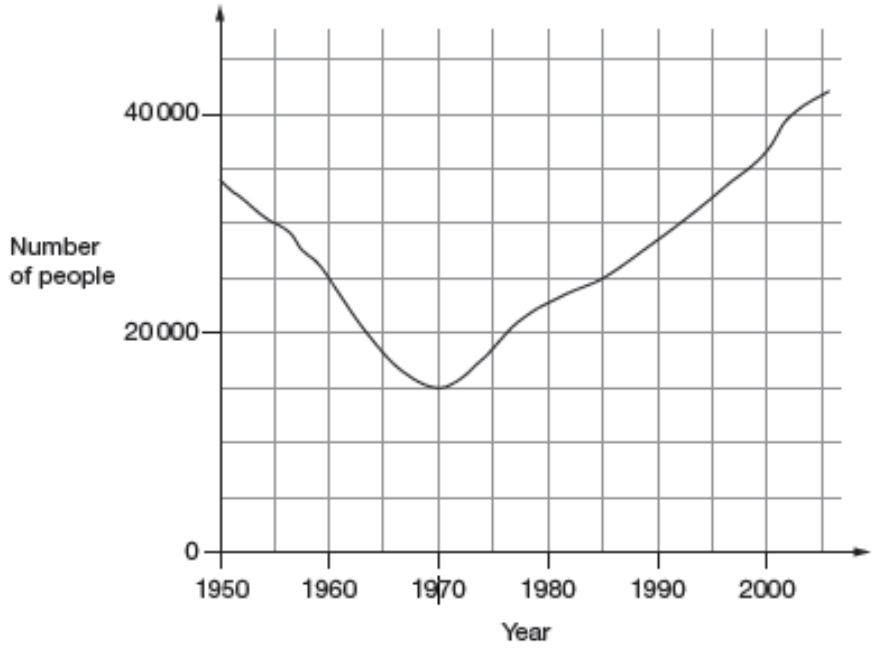
Answer…….....

18. Work out the value of the angle labelled *x* in the diagram below. The diagram is **NOT** drawn to scale.



Answer……..... °

19.



The graph shows the number of people living in Puddletown from 1950 onwards.

(i) How many people lived in Puddletown in 1955?

Answer…….....

(ii) In which other year was the number of people the same as in 1960?

Answer…….....

(iii) When did the population first fall below 30 000?

Answer…….....

(iv) On the graph, mark the point at which the population is growing fastest.

20. In a lucky dip there are 10 envelopes.

6 envelopes contain a note saying “Better luck next time!”

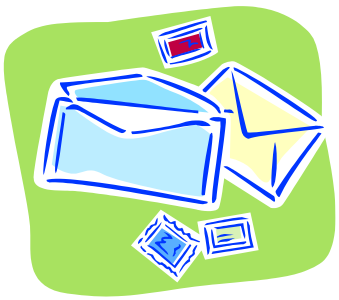
The other 4 envelopes contain prizes:

One contains £1

One contains £2

One contains £5

One contains £10



(i) Nina pulls one envelope from the lucky dip.
What is the probability that she has won a prize?

Answer……

(ii) Find the mean average of £1, £2, £5 and £10.

Answer £…….

21. Jack has thought of two numbers.
When he multiplies them together he gets 96.
When he takes one number away from the other, he gets 4.

What are the two numbers?

Answer…….....

22. A farmer wants to put a fence along one edge of his field, which is 480m long. Every 4m, a post is needed to hold the rails up.

How many posts does he need?

Answer…….....

23.

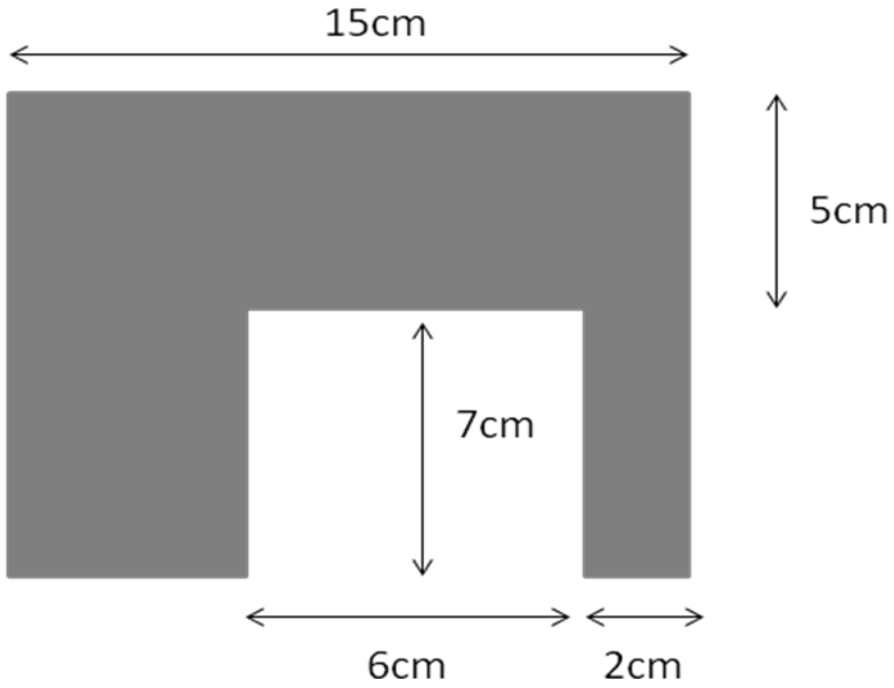


Diagram NOT to scale

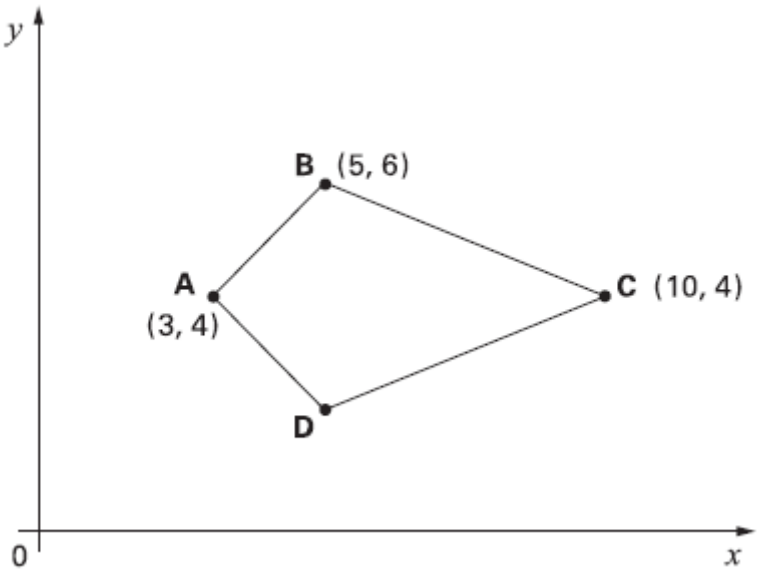
(i) Find the perimeter of the shape above.

Answer…… cm

(ii) Find its area.

Answer…… cm^2

24.



ABCD is a kite**.**
Write down the coordinates of vertex D.

Answer…….....

25. How many minutes are there from 11:11 until 23:23 on the same day?

Answer…….... minutes

26. In Matt's pocket there are 8 watermelon jellybeans, 4 vanilla jellybeans and 4 butter popcorn jellybeans. What is the smallest number of jellybeans that he must take out of his pocket to be certain that he takes at least one of each flavour?

Answer…….....

END OF EXAMINATION

Marking Guide

The solutions which follow over the next 24 pages 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!)

The King's School, Chester – Maths Specimen Paper

This is a standard-difficulty 11 Plus maths paper: an excellent opportunity to consolidate your core knowledge.

Because the question paper doesn't specify a number of marks for each question, I have included suggested marks in each answer box. Along with the mark scheme above, these should help you to assess your work.

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1. (i) **[2 marks]**

$$\begin{array}{r} 12.31 \\ +\ 1.75 \\ \hline 14.06 \\ {\scriptstyle 1\ \ \ \ \ } \end{array}$$

14.06

When you add decimal numbers together, it's essential to line up the decimal points.

- (Remember **not** to do this when **multiplying**.)

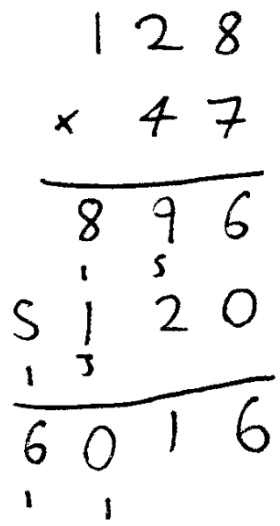
(ii) **[2 marks]**

$$\begin{array}{r} {\scriptstyle 1\ \ \ \ \ \ 5} \\ 2.\not{7}\not{6}0 \\ -\ 1.842 \\ \hline 0.918 \end{array}$$

0.918

Notice how I add a zero to the end of 2.76, so that the decimal points and the right-hand column of digits both align.

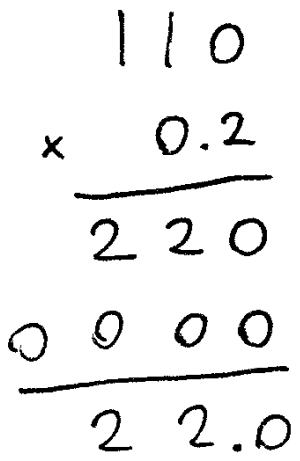
(iii) **[2 marks]**



6016

Even if your handwriting is a bit wonky, like mine, make sure that **your columns are very clear** (it must be obvious which number is beneath which) and that you leave **lots of space between rows**, for your carried digits.

(iv) **[2 marks]**



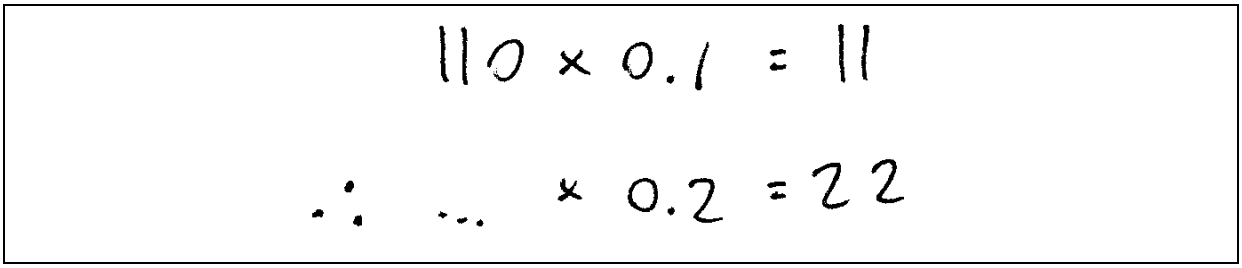
22

When you multiply decimals, do the whole calculation **ignoring the decimal point**.

- At the end, count **the total number of digits after decimal points in the question**: 110 has none, and 0.2 has one, so the total is 1 digit after decimal points.

- **Count back this many places from the right hand end of the answer**, and add a decimal point there.

You could also think of the solution like this:



A tenth of 110 is 11, so 0.2 (two tenths) must be 22.

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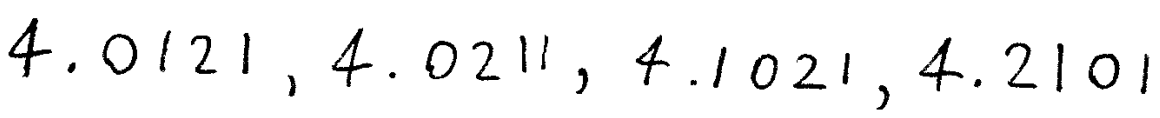
2. **[2 marks]**



Start with the tenths column: immediately after the decimal point.

The two numbers with **4 and 0 tenths** (4.0…) must come first; then the number with **4 and 1 tenth** (4.1…), and finally the number with **4 and 2 tenths** (4.2…).

Looking at the numbers with 0 tenths:

- 4.0121 has 1 hundredth, whereas 4.0211 has 2 hundredths.
- Therefore, 4.0121 is smaller.

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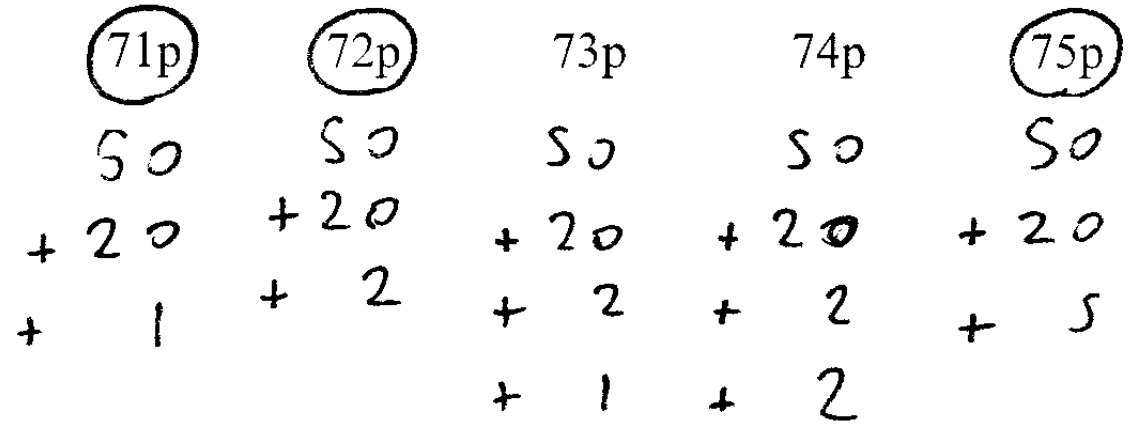
3. **[2 marks]**



Notice how I've used the space beneath each sum of money for my additions.

The best approach with these problems is usually to try the biggest coin which will fit in (50p, in all these cases), then the next biggest which will still fit (20p), and so on.

73p and 74p can only be achieved in four steps, because there's no such thing as a 3p or 4p coin.

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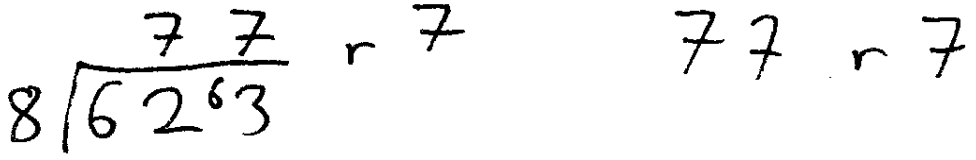
4. **[2 marks]**



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5. (i) **[2 marks]**

21 ÷ 3 = 5 + 2

(ii) **[2 marks]**

18 × 6 = 120 − 12

18
× 6
108

Part **(ii)**, which is not very obvious, still allows a logical solution.

- 18 and 120 are a long way from each other.
- There's nothing you can do with 18 and 6 which will land us somewhere mid-way between 18 and 120. We're either going to end up near 18 (e.g. 18 + 6), or we're going to land near 120 with 18 × 6.
- The same applies to 120 and 12, but the other way round.

We either need to make 120 much smaller – so that it is near to 18 – or vice versa.

- Therefore, our only likely options are going to be based on 120 ÷ 12 or 18 × 6.

120 ÷ 12 = 10, but there's no way of making 10 using just 18 and 6.

However, 18 × 6 = 108, and we can make that by calculating 120 − 12.

---

6. (i) 13 **[1 mark]**

12.7 rounds up to 13:

- Rounding to the nearest whole number, you need to look at **the first digit after the decimal point**.
- If this is **5 or more**, you **round your whole number up**.

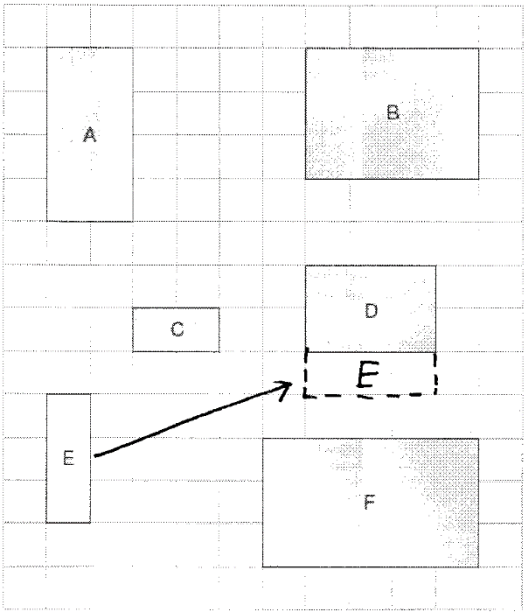
(ii) 44,000 **[1 mark]**

We're dealing with the same principle here as in **(i)**.

- Rounding to the nearest thousand, you need to look at **the first digit after the thousands column** (i.e. look at the hundreds column).
- If this is **5 or more**, you **round up**…
- … and if it isn't (like here), you round down …

… which means that the thousands stay the same, but the digits afterwards become zeros.

7. **[1 mark]**



D and E

The question isn't clear that you're allowed to turn a shape to make it fit; but there isn't any other option, so you must be!

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8. **[3 marks]**

$\frac{1}{2} = \frac{12}{24}$ $\frac{3}{8} = \frac{9}{24}$ $\frac{1}{3} = \frac{8}{24}$ $\frac{5}{12} = \frac{10}{24}$ $\frac{7}{24}$

$\frac{7}{24}$ $\frac{1}{3}$ $\frac{3}{8}$ $\frac{5}{12}$ $\frac{1}{2}$

Sometimes this kind of question is horribly fiddly.

However, this one isn't so bad: the fractions are easy to compare, because **all their denominators are factors of 24**.

Always look for useful patterns of this sort before you leap into your working.

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9. (i) 3 +4→ 7 +4→ 11 +4→ 15 +4→ ...19...

(ii) 303 −3→ 300 −3→ 297 −3→ 294 −3→ 291

(iii) 1 1 2 3 5 8 13 (+1 = 2; +2 = 3; +3 = 5; +5 = 8; +8 = 13)

[3 marks]

(iii) might be trickier to spot than the others.

However, if you are used to writing differences in the gaps, like I have for **(i)** and **(ii)**, you'll notice that the differences here are 0, 1, 1, 2 and 3 – rather similar to the main sequence – so not very helpful!

If this sort of pattern emerges, it's a clue that you probably need to be adding the terms together in twos (as here), or something similar.

Find the 100th term of the sequence in part (ii). **[3 marks]**

3 x 99 = 297 303 - 297 = 6

For the second term, you subtract 3 once; for the third term, you subtract it twice; and so on.

It follows that, for the 100th term, you must need to subtract 3 **99 times**.

If you do this, you will subtract 297 in total, and $303 - 297 = 6$.

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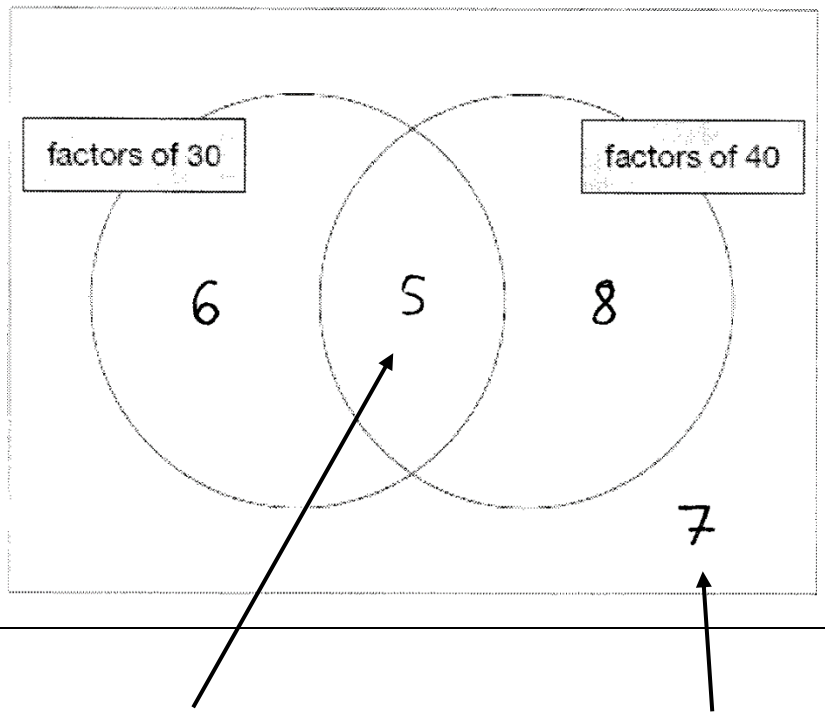
10. **[2 marks]**



A factor of both 30 and 40.

Not a factor of 30 or 40.

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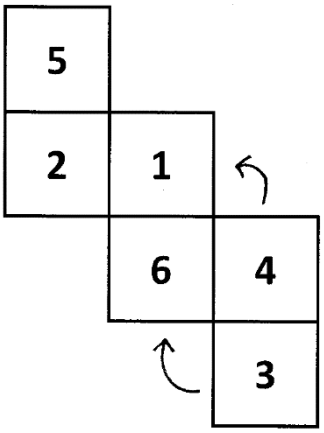
11. **[3 marks]**

	Fraction	Decimal	%
A	$\frac{3}{10}$	0.3	30%
B	$\frac{1}{5}$	0.2	20%
C	$\frac{24}{100} = \frac{12}{50} = \frac{6}{25}$	0.24	24%
D	$\frac{34}{100} = \frac{17}{50}$	0.34	34%

It's very helpful to know the most essential relationships, such as that $^1/_5 = 0.2 = 20\%$.

12. (i) 3

(ii) 4



[2 marks]

The number opposite 1 will be on the other side of the 6.

When you fold the net to make a cube, the edge of 3 will come round to meet the edge of 6.

Likewise, the number opposite 2 will be on the other side of 1, and 4 folds round into this position.

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13. (i) $\frac{1}{3} \times 600 = \frac{600}{3} = 200g$ **[2 marks]**

$^1/_3$ of the soup (we must assume that this is $^1/_3$ of the weight, not the volume) is made of carrots.

The whole soup weighs 600g.

Therefore, we need to find $^1/_3$ of 600 … and in maths, 'of' means '×'.

(I worry about the lack of water in this soup recipe. I fear that Mayur is more likely to end up with vegetable gloop.)

(ii) **[3 marks]**

Lentils: $\frac{1}{2} \times 600 = 300g$

Parsnips: $\frac{1}{12} \times 600 = 50g$

$600 - (200 + 300 + 50)$

$= 600 - 550 = 50g$

We already know the weight of carrots, but we need to work out the weights of the lentils and the parsnips.

The total weight (600g), minus the other three vegetables, gives us 50g.

Because 'the rest is made from tomatoes', we know that this is their weight.

You might also solve this problem as follows:

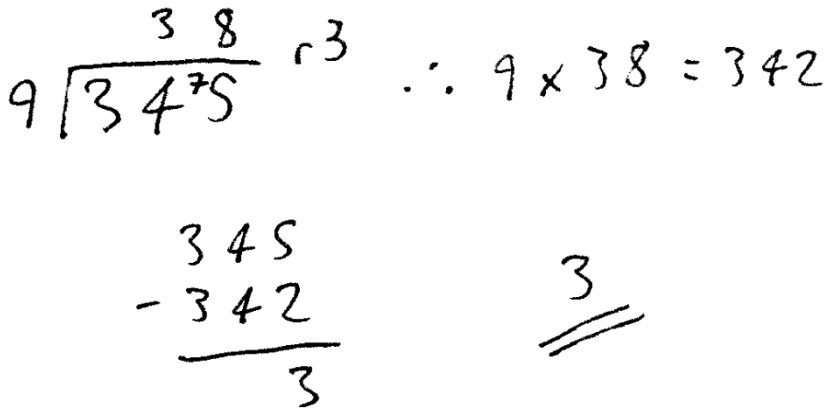
$1 - \left(\frac{1}{3} + \frac{1}{2} + \frac{1}{12}\right) = 1 - \left(\frac{4}{12} + \frac{6}{12} + \frac{1}{12}\right)$

$= 1 - \frac{11}{12} = \frac{1}{12}$ $\frac{1}{12} \times 600 = 50g$

The whole soup, minus $^1/_3$ (the carrots) and $^1/_2$ (the lentils) and $^1/_{12}$ (the parsnips), leaves $^1/_{12}$ … and this must be the tomatoes.

$^1/_{12}$ of 600g is 50g.

14. **[3 marks]**



This is surprisingly similar to the last part of **Question 9**.

There are 38 9s in 345.

If James counts down 38 9s, he counts down 342.

Counting down 342 from 345, you get to the number 3.

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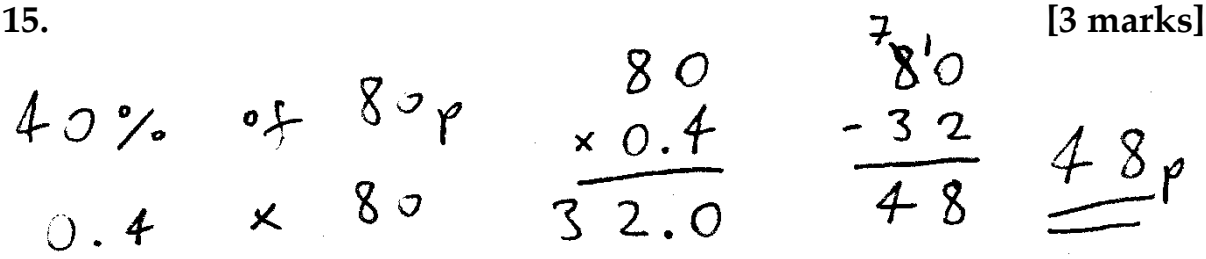
15. **[3 marks]**



I remember when I had a phone just like the one in the picture …

The example begins by finding what **40% of 80p** is: 32p.

Next, it **subtracts this from 80p**, to give the answer: 48p.

- Another way to find 40% of 80p would be to find 10% (8) and multiply this by 4 to give 32.

Here's a different approach:

100% - 40% = 60%

60% of 80p

0.6 × 80

80
× 0.6
48.0

48p

Rather than finding 40% of 80p and then subtracting it, you can just **find 60% of 80p** in the first place.

This is because 100% of an amount, minus 40%, is 60%.

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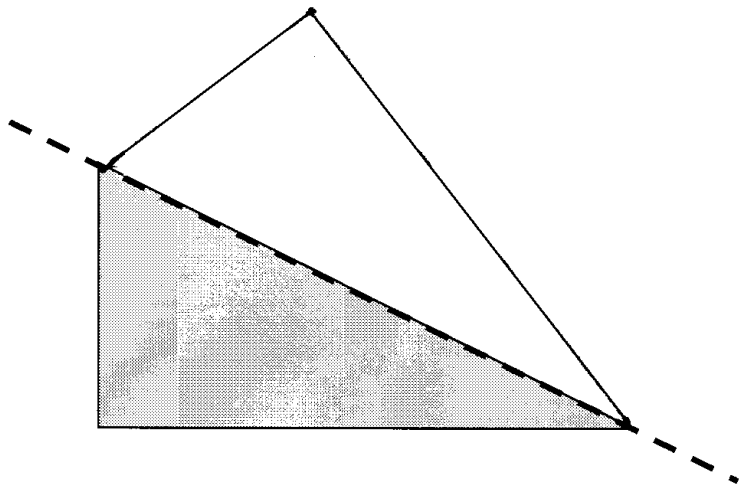
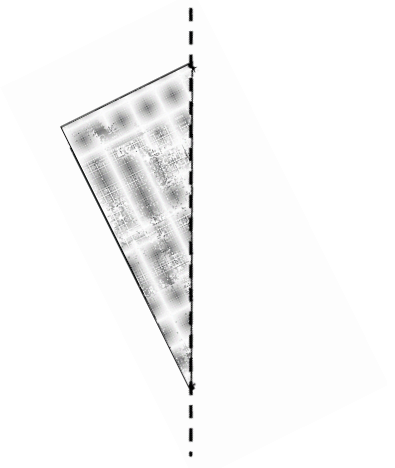
16. **[2 marks]**

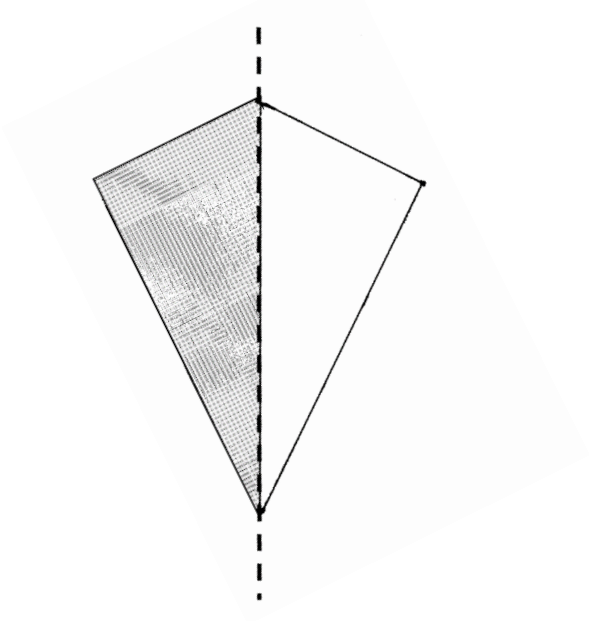


The first thing to do when reflecting a shape is to **turn the mirror line** until it is running directly away from you, up the table:



Now you need to imagine that you are **completing a face**, with the mirror line running down the forehead, the nose and the chin.

- (In my experience, students tend to find that a face is the easiest thing to think of when drawing symmetrically.)



Of course, in this case you might also think of a kite!

A more formal method is this:

- Take a point (corner, or **vertex**) on the figure to be reflected.
- Go **from this point to the mirror line** by the **shortest possible** distance. Your route will form a right-angle (90°) with the mirror line.
- Continue in the **same direction** for the **same distance** again.
- This is the reflected position for your point.
- Repeat this process for each point on the figure.

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17. **[3 marks]**

$1.5 \times 3 = 4.5$ (3x and 10y)

$\frac{4.5}{10} = 0.45$g (y)

One x weighs 1.5g so three xs weigh 4.5g.

This is the same as 10 ys.

If 4.5g is the weight of 10 ys, then one y weighs 0.45g.

You could also set your solution out algebraically:

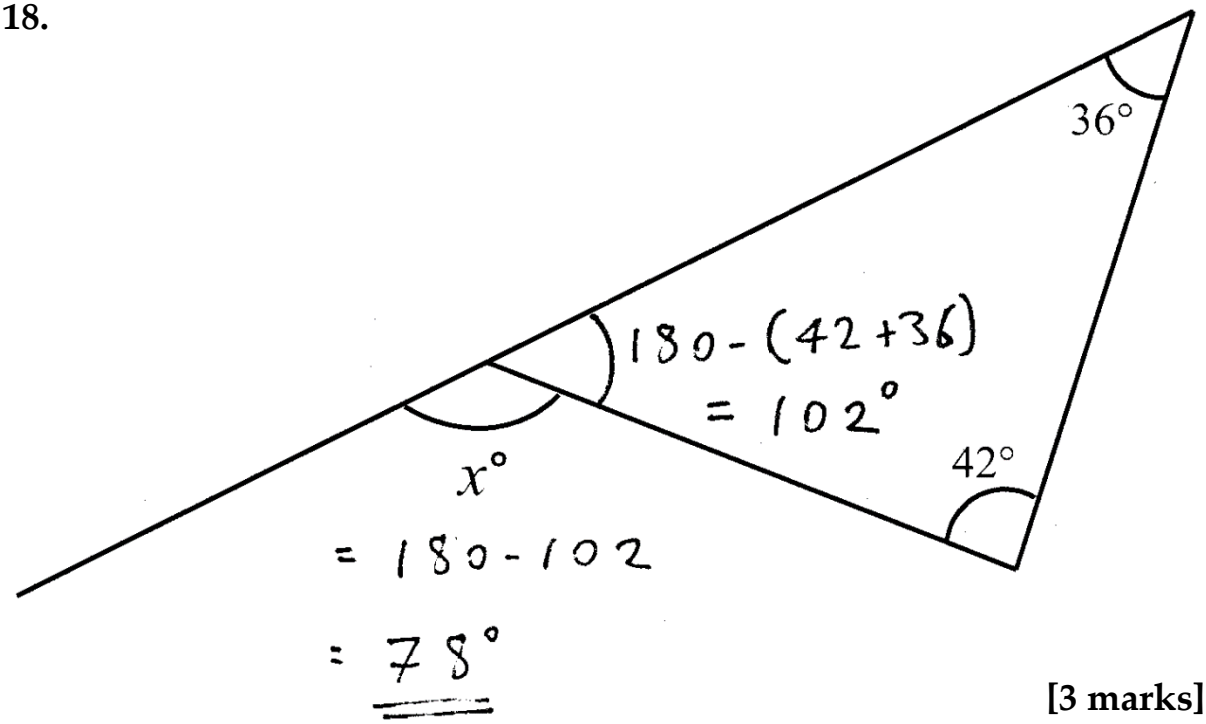
$3x = 10y$

$3 \times 1.5 = 10y$

$4.5 = 10y$

$\frac{4.5}{10} = y = 0.45$g

18.



[3 marks]

The question says that the diagram is not to scale. If anything, that is an understatement! The corner labelled 42° looks close to 90°, for instance.

Don't let that bother you: just focus on the numbers.

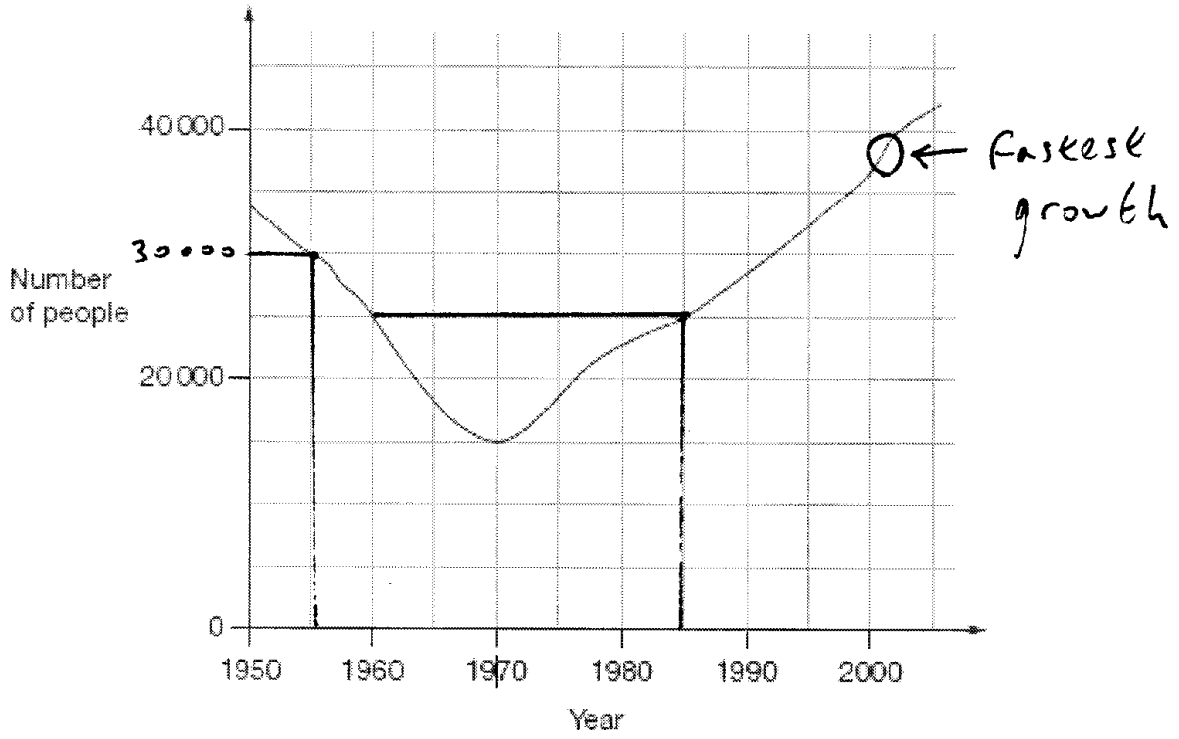
A triangle contains 180°.

- We are given two angles in the triangle: 42° and 36°.
- Therefore, the third angle must be 102°.

There are 180° in a straight line.

- The angle adjacent to x is 102°.
- Therefore, x must be 180° − 102°, which equals 108°.

19.



(i) 30,000 **[1 mark]**

(ii) 1985 **[1 mark]**

(iii) **[1 mark]**

1955 **or** 1956 **or** Between 1955 and 1956

(iv) [See graph] **[1 mark]**

If you find your results carefully (see the guidelines on the chart), **(i)** and **(ii)** aren't very hard.

(iii), however, presents some real problems:

- If the measurement of population took place **at the beginning of each year** (or even during it), then the population is very likely to have fallen below 30,000 for the first time in 1955.

- If measurements were taken **several times during each year**, then we can see from the graph that the population definitely dipped below 30,000 during 1955.
- On the other hand, if the measurement dates **from the end of each year**, then the population first dipped below 30,000 in 1956.

In summary, it is impossible to know the answer to this question, based only on the data given to us.

Because the graph **seems** to imply that the line dips below 30,000 people **at the start of 1955**, I suspect that 1955 is the answer anticipated by the examiner; but I really can't be sure.

(iv) requires a bit of care. You are looking for where the gradient of the line is **steepest** (in an upwards direction). The line is slightly steeper shortly after the year 2000 than it is in the 1970s.

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20. (i) **[2 marks]**

$\frac{4}{10} = \frac{2}{5}$ **or** 0.4

4 envelopes out of 10 are winners.

If you express your answer as a fraction, remember to simplify it!

An answer of 40% should also be acceptable.

(ii) **[2 marks]**

$$\frac{10 + 5 + 2 + 1}{4} = \frac{18}{4}$$

$$= \frac{9}{2} = 4.5 \quad £4.50$$

You find the **mean** of a set of data by **finding the total of the data** (£18) and **dividing this by the number of items** (£4).

Remember to express your result in pounds and pence.

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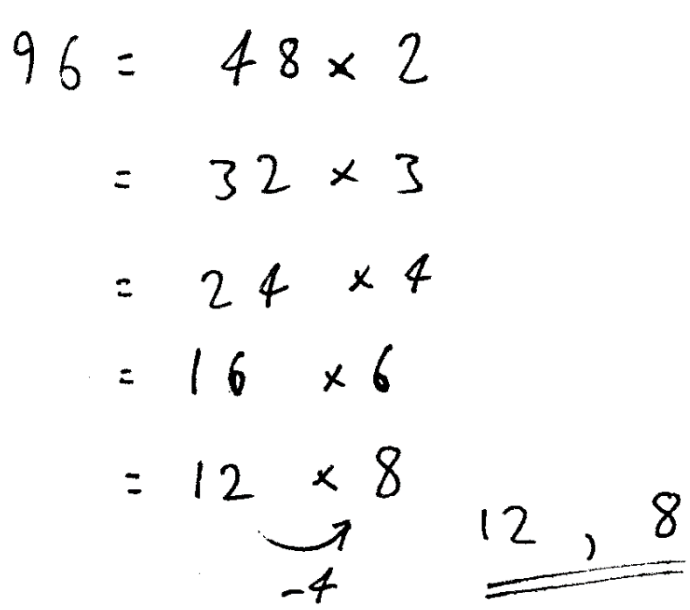
21. **[3 marks]**



In this method I **list the numbers which multiply to make 96**, until I find a pair with **a difference of 4**.

You could also use algebra, but it gets more complicated than is reasonable for a fairly straightforward question like this, and may touch on methods which 11 Plus students are unlikely to know.

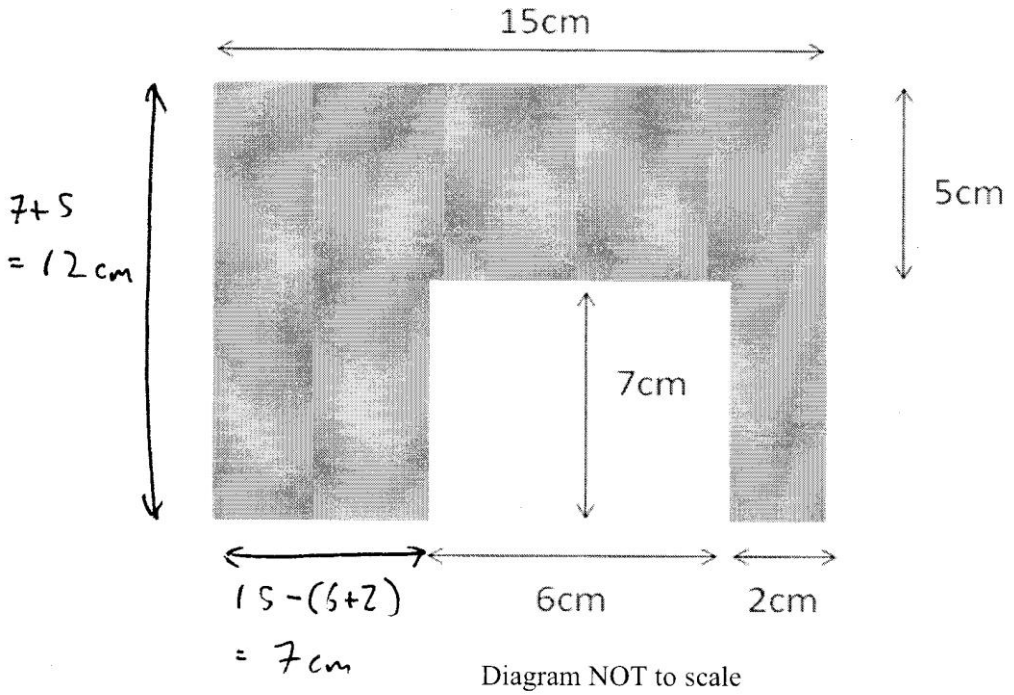
---

22. $\frac{480}{4} + 1 = 120 + 1 = 121$ **[3 marks]**

The farmer needs a post for every 4 metres (480 ÷ 4 gives 120 posts), and also an extra post because there needs to be one at the starting point.

You might like to draw a diagram to help you visualise the problem. Another approach would be to test the concept with smaller values. For instance, how many posts would be needed for an 8 metre fence?

23.



(i) $15 + 12 + 7 + 7 + 6 + 7 + 2 + 12$ **[3 marks]**

$= 27 + 20 + 21 = 68\text{cm}$

The **perimeter** is the total distance round the outside of a shape.

See my notes on the diagram if you wonder how I worked out the missing lengths.

(ii) $15 \times 12 - 6 \times 7 = 180 - 42$ **[3 marks]**

$= 138\,cm^2$

This method finds the area of the outside rectangle ($15cm \times 12cm = 180cm^2$) and subtracts the area of the 'bitten out' section ($6cm \times 7cm = 42cm^2$).

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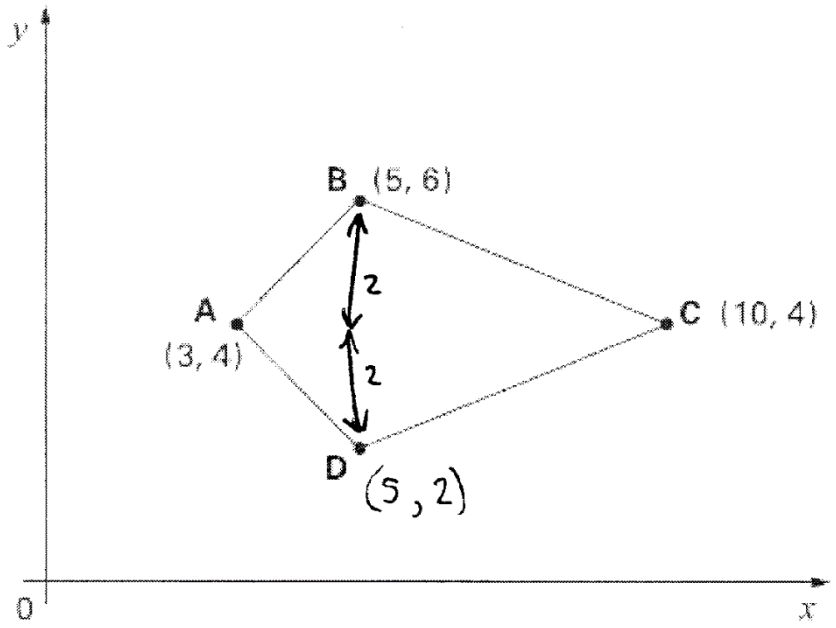
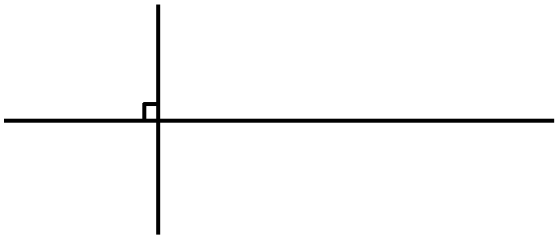
24. **[2 marks]**



(5, 2)

The figure is a kite, which means that the lines between the corners meet at 90° in the centre, like this:



Because the left and right ends, **A** and **C**, both have a y-coordinate of 4, the kite is lying horizontally. Therefore, the line connecting the top and

bottom vertices (corners), **B** and **D**, must be vertical, and therefore have the same x-coordinate throughout its length.

This means that **D** has an x-coordinate of 5.

The line **AC** has a y-coordinate of 4, and **B** has a y-coordinate of 6. This means that there is a distance of 2 between them.

Because a kite is symmetrical, the distance from the line **AC** to **D** must also be 2, so the y-coordinate of **D** is 2.

Therefore, the $(x\ ,y)$ coordinates of **D** are (5 , 2).

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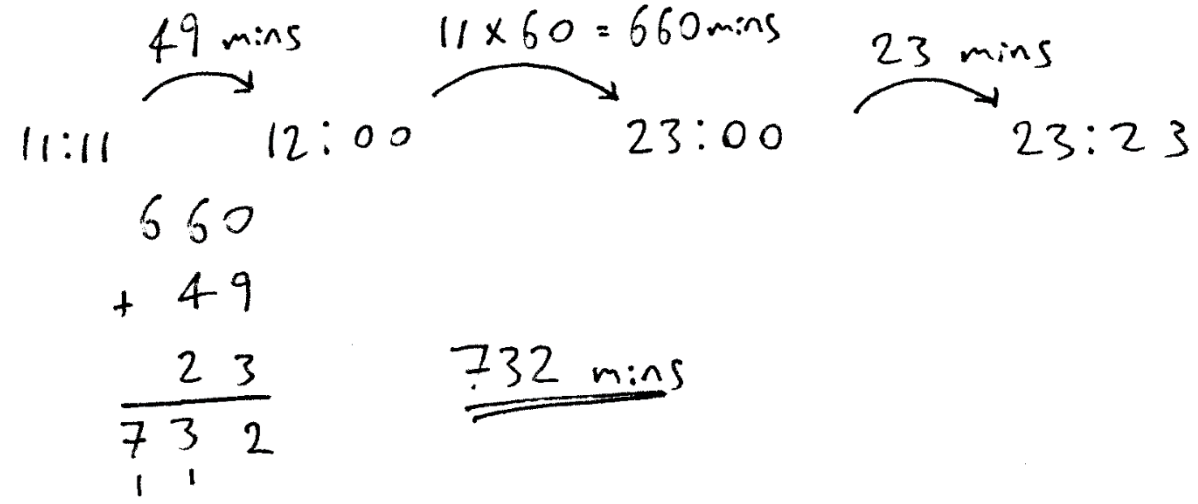
25. **[3 marks]**



Questions of this sort are easy if you **create a number line** like the one above.

Notice how I deal with the main block of 11 hours in one go, and the stray minutes at each end.

11 hours has 660 minutes (60 minutes per hour).

Be careful to exactly follow the wording of the question: this one asks for the answer to be in **minutes**, rather than hours and minutes.

Here's another way you could answer the question, taking about the same length of time:

- 11:11 to 23:11 is 12 hours.
- 12 lots of 60 minutes is 720 minutes.
- 23:11 to 23:23 is 12 minutes.
- 720 minutes plus 12 minutes is 732 minutes.

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26. **[2 marks]**

Up to 8 : Could all be watermelon.
" " 12 : Could be WM and 1 other flavour.

13

It would be possible (if unlikely) for Matt to pick out 8 sweets, and all of them be watermelon flavour.

It's also possible (though very unlikely) for him to pick out 12 sweets, and all of them be watermelon or vanilla flavour; or all watermelon or butter popcorn flavour.

The only way to be **certain** that Matt will pick at least one of each flavour is for him to pick one more than this: 13 sweets.

TOTAL SUGGESTED MARKS: 83
