The Haberdashers' Aske's Boys' School Elstree

11+ Entrance Examination 2016

MATHEMATICS
One Hour

Full Name..

Examination Number ....

INSTRUCTIONS

1.   DO NOT OPEN THIS PAPER UNTIL YOU ARE TOLD TO DO SO.

2.   There are 30 questions on this paper. DO NOT FORGET TO TURN OVER.

3.   Work quickly but accurately. You are recommended to use pencil, but you can use pen or biro if you wish.

Write your answers to the questions in the spaces provided.
You may use the space at the bottom on each page for working.   Answer

1.   Add: $36 + 27$ _____

2.   Subtract: $53 - 14$ _____

3.   Multiply: 56×8 _____

4.   Divide: $108 \div 4$ _____

5.   Find the cost of downloading 5 apps if each one costs £2.98   _____

6.   Work out the sum of: 9, 99, 999 and 9999   _____

7.   Divide 3 by 0.5   _____

8.   Shade 15% of this shape
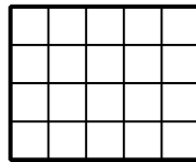
9.   There is an even chance that I will pick a toffee from a large bag
       of sweets containing toffees, jellies and chocolates.
       If the bag contains 17 jellies and 8 chocolates, how many toffees
       are there?   _____

10.   The total attendance at Premier League football matches last
       season was 13,766,753
       Round this number to the nearest ten thousand.   _____

11   Pens cost 7p each and pencils cost 5p each.
       I buy some pens and pencils which cost 55p exactly.
       How many of each did I buy?   _____ pens and _____ pencils

12.   Use the fact that $96,815 \times 123 = 11,908,245$ to work out
       $96,816 \times 123$ _____

SPACE FOR WORKING

13. Fill in the spaces with one of $+, -, \times, \div$ to make each statement correct

$$8 \underline{\quad} 2 = 5 \underline{\quad} 2$$

$$4 \underline{\quad} 3 = 60 \underline{\quad} 5$$

14 The three-digit number shown below can be divided by 3 without a remainder.
Fill in the box to show the largest possible value that the last digit could be.

5	3	

15. At a busy railway station trains leave from platform 5 every 6 minutes and
from platform 8 every 10 minutes. Trains leave from both platforms at 15:57.
When do trains next leave both platforms at the same time?

_____

16. The price of a one-day ticket to a theme park is £37.60.
Joe buys a ticket and experiences 8 rides during the day.
Work out the average cost per ride.   _____

Rishi pays an additional £31 for a special pass which gives
front of line access to all rides throughout the day.
He experiences 14 rides. Does the special pass provide value
for money? Give reasons for your answer.

_____

_____

SPACE FOR WORKING

3

17.   Draw lines to link each object to its correct height.

Oak Tree

0.324 km

Eiffel Tower

1.41m

Can of soda

2390 cm

Car

122 mm

18.   Mrs Catchpole gives the following instructions to her Year 6 class:

Think of a number.
Subtract 13 from this number to get the first result.
Go back to the original number and subtract 5 to get the second result.
Multiply the first and second results together to get the final answer.

Savan follows Mrs Catchpole's instructions starting with the number 23.
Work out Savan's final answer.   _____

Richard obtains a final answer of 0. What number might he have thought of?
Give all possibilities.

                                                    _____

SPACE FOR WORKING

19.   Write the words, square, rectangle, parallelogram, trapezium, kite and rhombus
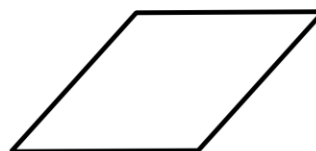   in the spaces below.
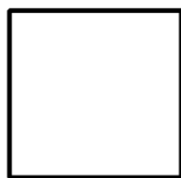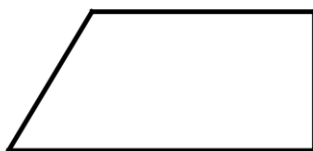
_____   _____   _____

_____   _____   _____

      List all possible quadrilaterals from the list above which have the following
      properties:

      Diagonals are of equal length.

      _____
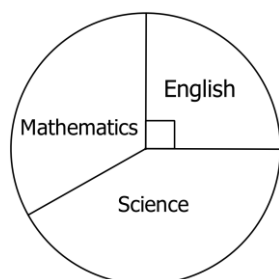
      There is exactly one pair of parallel sides.

      _____

      Opposite angles are equal but are not right angles.

      _____

SPACE FOR WORKING

20. A group of 48 children are asked to choose their favourite subject from a list of three: English, Mathematics and Science.

The results are displayed on a pie chart:

What fraction of the group chose English?   _____

If $33\dfrac{1}{3}\%$ chose Mathematics work out the angle of the Mathematics

sector.   _____

How many children chose Science?   _____

21. If it is a cold rainy day then I wear a raincoat. If it is a warm rainy day then I carry an umbrella. If I wear my raincoat then I also wear either gloves or a hat but not both. If I carry an umbrella I always wear gloves and sometimes wear my hat as well. I never carry an umbrella and wear my raincoat on the same day. For each of the following, state whether it is definitely true, false or uncertain.

It is a warm rainy day. I wear my raincoat and a hat.   _____

It is a warm rainy day. I carry my umbrella and wear a hat but no gloves.   _____

It is a cold rainy day. I wear my raincoat, hat and no gloves.   _____


SPACE FOR WORKING

22. A sunflower seed takes a week to germinate after it has been sown in the ground. After germination it grows the same number centimetres each day.

    Maya sows a sunflower seed. She measures the height of the plant at midday on the 16th August and again at midday on the 21st August. These two measurements are recorded as 48 cm and 68 cm respectively.

    Work out the height of the plant at midday on September 2nd. _____ cm

    On what date did Maya sow the seed in the ground? _____

23. The diagram shows a scale drawing of a rectangular school playground. The distance between consecutive marks shown on the diagram is 25 metres.
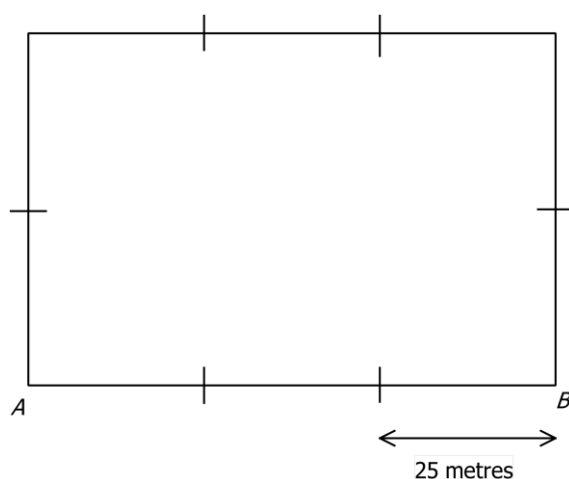
    Work out the distance along the side AB. _____ metres

    Work out the perimeter of the playground. _____ metres

    Ginny runs round and round the perimeter of the playground in a clockwise direction. She starts at the bottom left-hand corner labelled A on the diagram. Given that she runs a total distance of 1900 m, draw a cross on the diagram to show where she finishes her run.

SPACE FOR WORKING

24.   Write down the time shown on this clock.

_____
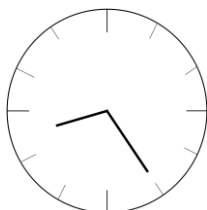
Alice looks at this clock in a mirror. Draw the hands on the clock face below to show the image that Alice sees.
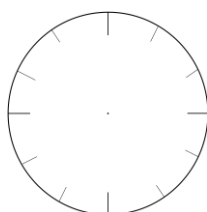
On another day Alice looks at the clock in the mirror and, without thinking, says that the time is 11:30. What time is it really? _____

25.   Once upon a time, in the Ancient Wizarding World of Haberdasher's

One pound = 20 shillings
One shilling = 12 pence

A large Margarine-beer costs 1 pound 4 shillings and 9 pence.
A small Margarine-beer costs 14 shillings and 5 pence.

Work out the difference in price between a small and large beer.
Give your answer in shillings and pence.

_____ shillings _____ pence

Work out the total cost of one large and two small beers.
Give your answer in pounds, shillings and pence.

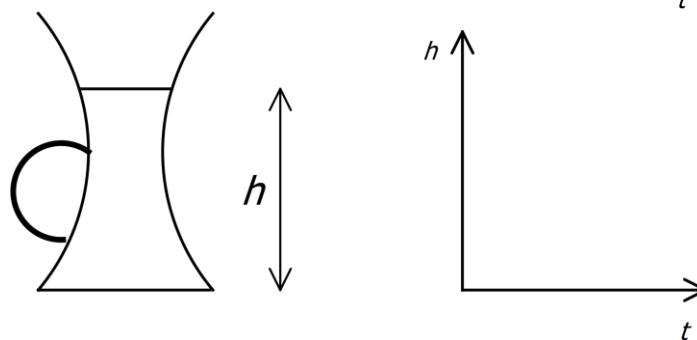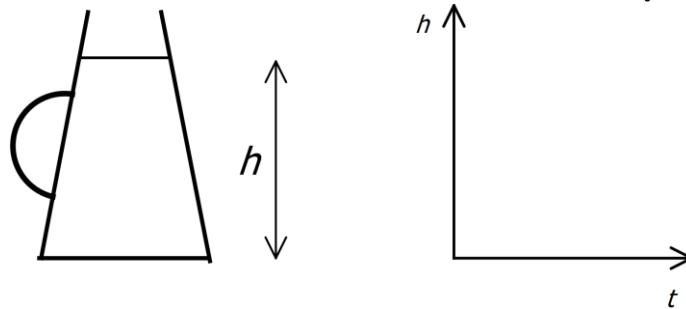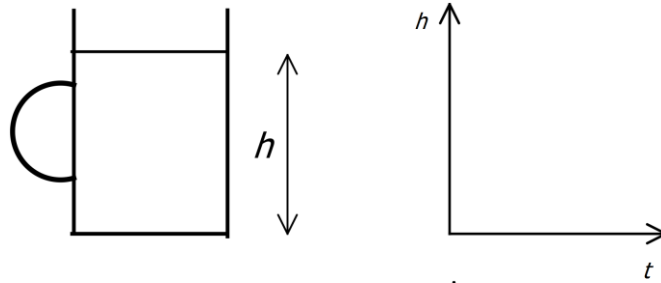_____ pounds _____ shillings _____ pence

SPACE FOR WORKING

26.   An empty jug is filled with water at a constant rate. The graph shows how the height, h of the level of water varies over time, t, as the jug fills up.
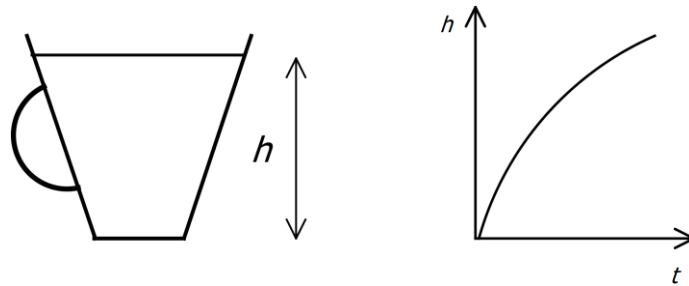
For each of the following jugs draw the graph which shows how the height of water varies with time.
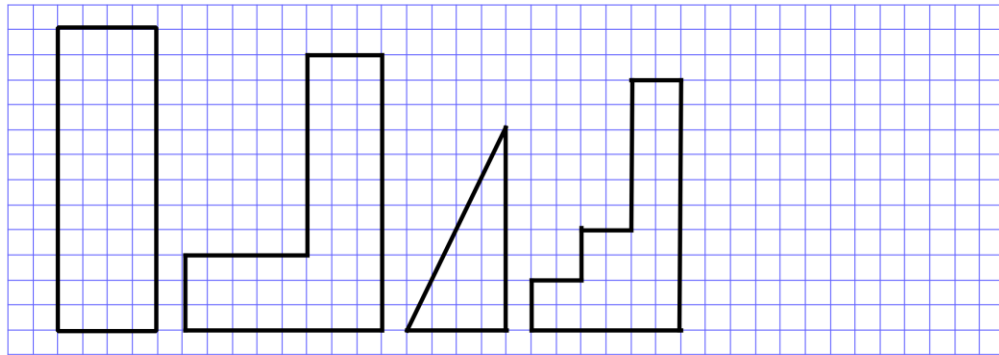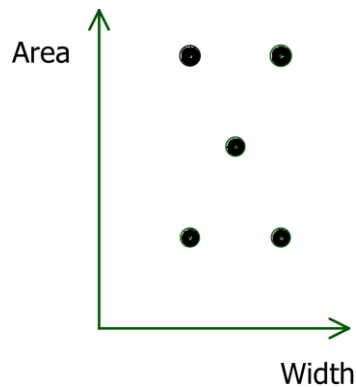
SPACE FOR WORKING

27.   Helen works out the width of the base and the area of each of the following four
       shapes and then draws a corresponding blob showing these measurements on a
       graph.

       Label four of the blobs on the graph with the letters A, B, C and D.

       Draw a possible right-angled triangle, E, which corresponds to the remaining blob
       on the graph.
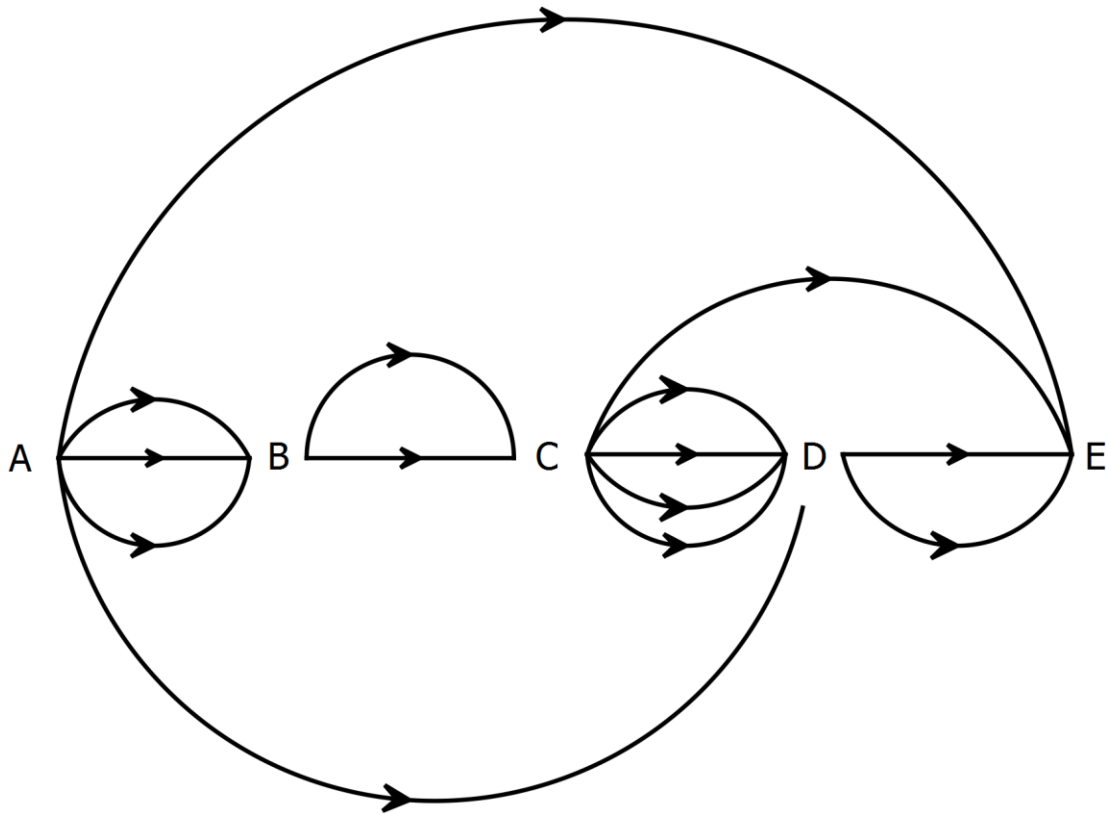

A   B   C   D   E

Area

Width

SPACE FOR WORKING

28. The diagram shows the one-way cycle paths in a park.

Work out the total number of possible routes to go

from A to C   _____

from A to D   _____

from A to E   _____

A   B   C   D   E

SPACE FOR WORKING

29.   A sequence of numbers which get multiplied (or divided) by a fixed amount each time is called a **geometric progression** (**GP**). For example, the sequence

1ˢᵗ term = 6,   2ⁿᵈ term = 12,   3ʳᵈ term = 24,   4ᵗʰ term = 48

is a GP because you multiply by 2 to go from one term to the next.

The 1ˢᵗ term of a GP is 8 and the 2ⁿᵈ term is 24. Work out the 3ʳᵈ term.   _____

The 1ˢᵗ term of a GP is 20 million and the 2ⁿᵈ term is 2 million.
Work out the 9ᵗʰ term.   _____

The 1ˢᵗ term of a GP is 8 and the 3ʳᵈ term is 200. Work out the 2ⁿᵈ term.   _____

30.   Snow White and the seven dwarves work in a mining company. As Chief Executive, Snow White earns as much as all the dwarves put together. Sneezy gets 24 gold galleons a day. Sleepy earns 50% more than Happy. Bashful earns twice as much as Grumpy who earns one more galleon than Sneezy. Doc gets 24 galleons a day more than Dopey and between them they get four times that of Sneezy. Sleepy earns seven-eighths of Sneezy's salary.

Complete the table below to work out how much Snow White earns in a day.

	Gold Galleons
Bashful	
Doc	
Dopey	
Grumpy	
Happy	
Sleepy	
Sneezy	
Snow White	

Snow White earns _____ galleons

SPACE FOR WORKING

Now go back and check all of your answers carefully.

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!)

The Haberdashers' Aske's Boys' School

2016 Maths paper - Solutions

*I offer **suggested marks** beside each answer. The question paper doesn't usually provide adequate space for full working, so this will need to be carried out on another sheet. Because of this, it's unclear whether working is marked, or just the answers. I suggest treating working in the same way as in most 11 Plus maths exams – as set out in my marking guidance, above.*

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1. **[2 marks]**

$$\begin{array}{r} 36 \\ +\ 27 \\ \hline 63 \\ \end{array}$$
1

63

---

2. **[2 marks]**

$$\begin{array}{r} {}^4\!5\,{}^13 \\ -\ 1\ 4 \\ \hline 3\ 9 \\ \end{array}$$

39

---

3. **[2 marks]**

$$\begin{array}{r} 56 \\ \times\quad 8 \\ \hline 4\ 4\ 8 \\ 4 \end{array}$$

448

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4.   **[2 marks]**

$$\begin{array}{r} 27 \\ 4\overline{\smash)10^28} \end{array} \qquad \underline{\underline{27}}$$

5.   **[2 marks]**

$$\begin{array}{r} 2.98 \\ \times\ 5 \\ \hline 1\ 4.90 \\ _4\quad _+ \end{array} \qquad \text{£}14.90$$

or

$$\begin{array}{r} 1\ 4.\ 9 \\ 2\overline{\smash)29.^18} \end{array} \qquad \text{£}14.90$$

The first option multiplies £2.98 by 5.

The second option uses that the fact that **5 times an amount is half as much as 10 times an amount**. 2.98 × 10 = 29.8, so you can find 2.98 × 5 if you divide 29.8 by 2.

Because £2.98 is 2p less than £3, there is also a shortcut available:

- £3 × 5 is £15.
- Minus 10p, because 2p × 5 is 10p.

6. [2 marks]

$$
\begin{array}{r}
9\,9\,9\,9 \\
9\,9\,9 \\
9\,9 \\
+\quad\ 9 \\
\hline
1\,1\,1\,0\,6 \\
2\ \ 3\ \ 3
\end{array}
$$

11,106

Another approach is based on the fact that 9,999 is 1 less than 10,000, 999 is 1 less than 1,000, 99 is 1 less than 100 and 9 is 1 less than 10:

$$10{,}000 + 1{,}000 + 100 + 10 = 11{,}110$$

Because each of the numbers in the question is 1 less than these, we need to subtract 4:

$$11{,}110 - 4 = 11{,}106$$

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7. [2 marks]

$$\frac{3}{0.5} = \frac{6}{1} = 6 \quad (\times 2)$$

or

$$\frac{3}{0.5} = \frac{30}{5} = 6 \quad (\times 10)$$

This problem is easiest to work with using fractions. Indeed, a fiddly division can often start like this: cancelling/simplifying a fraction will leave you with a simpler division problem than you started with, even if it doesn't take you all the way to the solution.

If you know that **dividing a number by 0.5 is the same as doubling it**, you can skip the working out.

8.　　　　　　　　　　　　　　　　　　　　　　　　**[2 marks]**
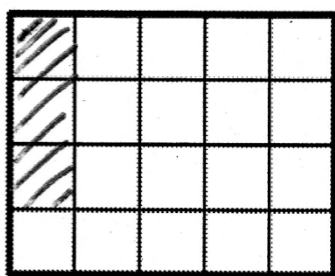
15% of 20 squares

0.15 × 20

$$
\begin{array}{r}
20 \\
\times\ 0.15 \\
\hline
100 \\
200 \\
\hline
3.00
\end{array}
$$

or　15% of 20 squares:

10% is　2

∴ 5% is　1

∴ 15% is　3

You could shade **any 3 squares** on the diagram.

The first method uses the fact that finding 15% of 20 means **multiplying 20 by 0.15**.

You could also use fractions to do this:

$$\frac{15}{100} \times \frac{20}{1} = \frac{15}{10} \times \frac{2}{1} = \frac{3}{2} \times \frac{2}{1} = \frac{6}{2} = 3$$

The second method uses a "building blocks" approach: if you add 10% of 40 to 5% (half of 10%), you get 15%.

9. [2 marks]

$$17 + 8 = 25$$

If there's an even chance (50% or $1/2$) of picking a toffee, this means that the number of toffees must be the same as the total number of jellies and chocolates.

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10. [1 mark]

$$13,770,000$$

The "ten thousands" column in 13,766,753 contains a 6 (worth 60,000).

Because the next ("thousands") number is greater than 5, we need to **round up** to 70,000.

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11. [2 marks]

$\div 7$? 55 50 45 40 35

$7p \times 5 = 35p$ $5p \times 4 = 20p$

∴ 5 pens   ∴ 4 pencils

If each pencil is worth 5p (if only things were that cheap!), then the leftover amount must be a multiple of 5: 15p or 30p, for instance.

Because the leftover amount is made up by 7p pens, we need to find **a multiple of 7p which is also a multiple of 5**.

The only possibility below 50 is 35p, meaning that there are 5 pens ($5 \times 7p = 35p$).

There is 20p left in order to make 50p, and this can be made with 4 5p pencils.

---

12.   **[2 marks]**

$$11\,908\,245$$
$$+ \qquad 123$$
$$\overline{11\,908\,368}$$

$$11,908,368$$

If $96{,}815 \times 123 = 11{,}908{,}245$, then $96{,}816 \times 123$ contains **one more 123**: it is 123 larger than 11,908,245.

---

13.   **[2 marks]**

$$8 + 2 = 5 \times 2$$

$$4 \times 3 = 60 \div 5$$

The question doesn't say whether you can use a given sign more than once; but there's no way to solve these without using "$\times$" in both solutions.

Questions of this sort inevitably involve a fair amount of playing with numbers. However, **logic will also help**. For instance, 60 is a lot bigger than 4 or 3, so it makes sense to make it as small as possible: dividing by 5. This leaves 12, which is also the product of 4 and 3.

14.   **[1 mark]**

54 divides by 3 ∴ so does 540

540 − 3 = 537

| 5 | 3 | 7 |

Rather than dividing each number between 530 and 539 by 3 (working down from 539, because you are looking for the largest number which divides by 3), it makes sense to look for a shortcut.

Because 54 is a multiple of 3 ($18 \times 3 = 54$), 540 must also be.

Therefore, **the highest number below 540 which also divides by 3 is 537**.

---

15.   **[2 marks]**

LCM of 6 and 10 is 30

∴ 16:27

The lowest common multiple of 6 minutes and 10 minutes is 30 minutes.

- Notice that this is not the same as 6×10, which produces a common multiple, but not in this case the lowest one.

Therefore, the two trains will next leave at the same time 30 minutes later, at 16:27 (4:27pm).

16.

$$8\overline{)37.560} \quad 4.70$$

£4.70

[2 marks]

The average here is the **mean**: the total cost divided by the number of rides.

£37.60 + £31 = £68.60

$$\frac{68.60}{14} = \frac{34.30}{7} \quad 7\overline{)34.{}^{6}30} \quad 4.90$$

Yes, because for only 20p extra per ride, he gets to experience many more of them.

[2 marks]

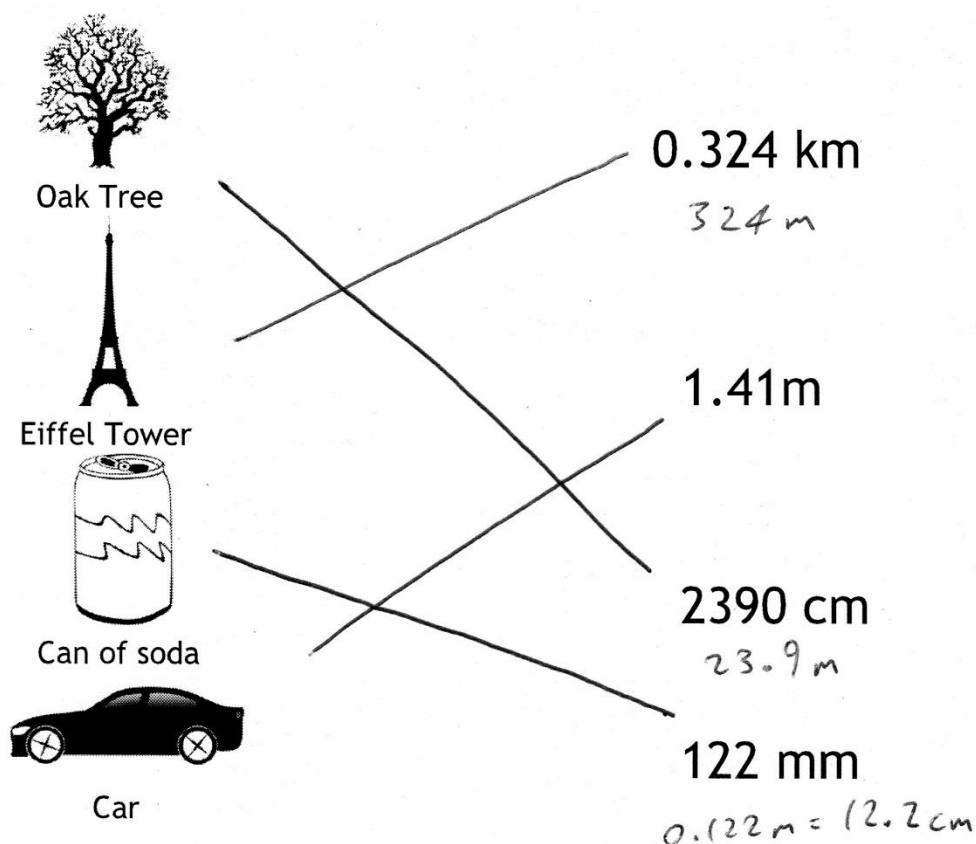When you add the ticket and special pass prices, Rishi pays £68.60, which is £4.90 for each of his 14 rides.

This looks like good value to me: for only slightly more money per ride than Joe pays, he gets to experience more of them (probably because he has to queue for less time).

However, it would probably also be a correct answer to say that *this is not good value for money, because he spends more money per ride*.

The important thing is **that your answer is clearly justified, based on mathematical reasoning** (although you do not need to provide calculations in the answer space – indeed, there isn't room).

17.   **[2 marks]**

Oak Tree — 0.324 km / 324 m

Eiffel Tower — 1.41m

Can of soda — 2390 cm / 23.9 m

Car — 122 mm / 0.122m = 12.2cm

Notice how I convert the measures in the right-hand column to more natural values before drawing the lines. For instance, it's difficult to work out whether 2390cm is the height of a car or a tree, until you see that it is 23.9 metres.

18.

$$23 - 13 = 10 \qquad 23 - 5 = 18 \qquad 18 \times 10 = \underline{\underline{180}}$$

or

$$(23 - 13) \times (23 - 5) = 10 \times 18 = \underline{\underline{180}}$$

[1 mark]

You can either work out the two parts of the problem separately, then combine them (first method), or do it all in one go (second method).

$$(R - 13)(R - 5) = 0$$

$$\text{If} \quad R - 13 = 0$$

$$\therefore \quad R = 13$$

$$\text{If} \quad R - 5 = 0$$

$$\therefore \quad R = 5$$

$$\underline{\underline{13}} \text{ or } \underline{\underline{5}}$$

[3 marks]

You don't need to use algebra for this, but it does help to make things clear.

If I subtract 13 from Richard's number (R), then subtract 5 from his number, and multiply the result, I get 0.

- This must mean that **one of my results was 0** (because you get 0 if you multiply any number by 0).

… but I don't know which one.

If $R - 13$ was 0, then R must have been 13.

If $R - 5$ was 0, then R must have been 5.
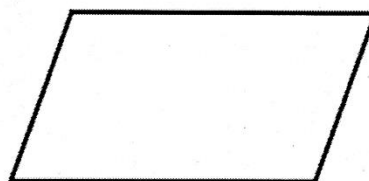
These are the "possibilities" which the question asks for.
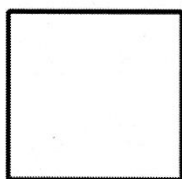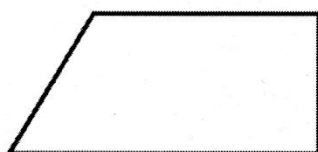
19.
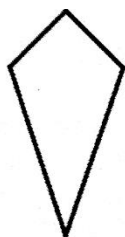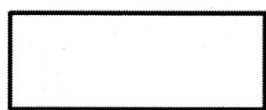
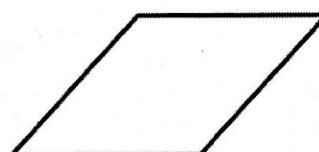kite   Rectangle   Parallelogram

Square   Trapezium   Rhombus

[3 marks]

List all possible quadrilaterals from the list above which have the following properties:

Diagonals are of equal length.

Rectangle ; Square

There is exactly one pair of parallel sides.

Trapezium

Opposite angles are equal but are not right angles.

Parallelogram ; Rhombus

[3 marks]

You need to put each label next to the shape which **best** matches it. For instance:

- A rhombus is a kind of parallelogram … but a parallelogram **is not** a kind of rhombus.
- A square is a kind of rectangle … but a rectangle **isn't** a kind of square.

For the final part of the question, you might be tricked into writing "kite". A kite has one pair of equal opposite angles, but the other pair are different from each other. Although the question doesn't use say "all" or "each pair of", it is implied.

A note on marking: For both parts of this question, subtract a mark for each incorrect or missing name.

20.

English: $\frac{1}{4}$

[1 mark]

The question asks for a **fraction**, so you're unlikely to get the mark if you write "0.25" or "25%".

Maths: $33\frac{1}{3}\% = \frac{33\frac{1}{3}}{100} = \frac{1}{3}$ $\frac{1}{3} \times 360° = 120°$

[2 marks]

$33\frac{1}{3}\%$ is $\frac{1}{3}$.

There are **360° in a circle**, and $\frac{1}{3}$ of 360° is 120°

English: $\frac{1}{4} \times 48 = 12$
Maths: $\frac{1}{3} \times 48 = 16$

$48 - (16 + 12) = 48 - 28 = 20$

[2 marks]

There are 48 children; $\frac{1}{3}$ like Maths (16) and $\frac{1}{4}$ like English (12).

Out of 48, there are 20 students left who like Science best.

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21.   **[3 marks]**

If it is a cold rainy day then I wear a raincoat. If it is a warm rainy day then I carry an umbrella. If I wear my raincoat then I also wear either gloves or a hat but not both. If I carry an umbrella I always wear gloves and sometimes wear my hat as well. I never carry an umbrella and wear my raincoat on the same day. For each of the following, state whether it is definitely true, false or uncertain.

It is a warm rainy day. I wear my raincoat and a hat.   *False*

It is a warm rainy day. I carry my umbrella and wear a hat but no gloves.   *False*

It is a cold rainy day. I wear my raincoat, hat and no gloves.   *Uncertain*

This question is rather fun (and a break from numbers), but there is a lot of information to deal with.

- The question asks whether each statement is definitely true. It is referring to the **second part** of the statement ("I wear my raincoat and a hat"), **NOT** the first part ("It is a warm rainy day") – you are supposed to understand that the first part is always true. The question could have made this clearer!

If it's a warm rainy day, I carry my umbrella … and this means that I don't wear my raincoat. Therefore, the first statement is FALSE.

If it's a warm rainy day, I carry my umbrella, but this means that I always wear gloves. The second statement is also FALSE.

If it's a cold rainy day, I might wear a hat **or** gloves. The statement might be true, but it isn't necessarily true. UNCERTAIN.

22.

16th → 21st : 5 days

68 - 48 = 20 cm $\frac{20}{5}$: 4 cm/day

21st → 31st August : 10 days   31st Aug → 2nd Sep : 2 days

12 days × 4cm = 48 cm

68 cm + 48 cm = 116 cm

[3 marks]

Now we're into the fiddlier questions, which require more stages of working.

There are five days from the 16th till the same time on the 21st. The plant grows 20cm, which means that it grows 4cm per day (it grows **the same amount every day**).

There are 12 days from the 21st of August to the 2nd of September (remember that there are 31 days in August). This means that the plant must grow another 4 × 12 = 48 cm.

Add this to its height on the 21st, and we have the answer.

- It's very important to learn **how many days there are in each month of the year**: exam questions often depend on this knowledge.

- *30 days have September, April, June and November. All the rest have 31, except February – which has 28, or 29 in a leap year.*

$$\frac{48}{4} = 12 \text{ days before } 16\text{th Aug}, + 7 \text{ days' germination}$$

$$\therefore 19 \text{ days before}$$

$$-16 \text{ days} : 31\text{st July}$$

$$-3 \text{ days} : 28\text{th July}$$

[3 marks]

On the 16th of August, the plant is 48cm tall.

It grows 4 cm per day, so this means that it has been **growing for 12 days**.

Before that, **it was in the ground for 7 days**.

Therefore, we need to count back 19 days.

- 16 days back from the 16th of August take us to the 31st of July (**careful**: not the 1st of August!).
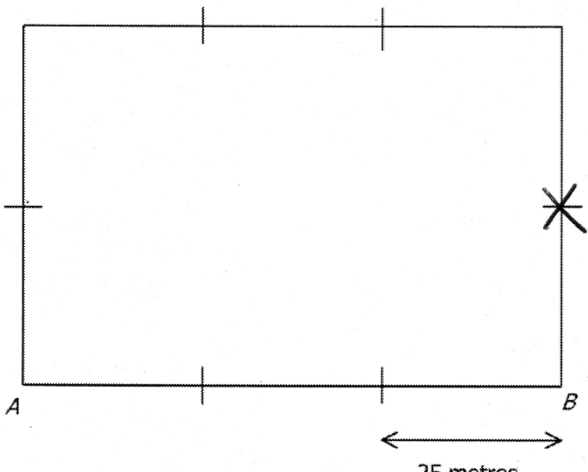- Another three days take us to the 28th.

23.

$$AB: \quad 25 \times 3 = 75 \text{ m}$$

$$\text{Perimeter}: 25 \times 10 = 250 \text{ m}$$

[2 marks]

One long side is made of **three 25m sections**, so is 75m long.

The perimeter is made of **ten 25m sections**, so it is 250m long.

$$\frac{1900}{25} = \frac{7600}{100} = 76$$

$$\frac{76}{10} = 7.6 \ (7 \ r \ 6)$$

[3 marks]
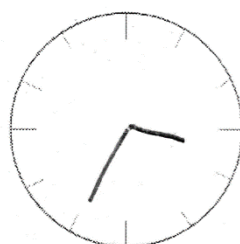
If Ginny runs 1900m, this is 76 25m sections.

Because there are 10 sections in a circuit, Ginny runs 7 complete circuits and **6 more 25m sections**. (Remember that she runs **clockwise** from **A**.)

24.

8 : 25

[1 mark]

We don't know whether it's the morning or the evening, so 24 hour clock times (08:25 or 20:25) are not correct here. However, you might get away with 08:25.

[1 mark]

12:30

[2 marks]

It might be worth sketching the clock and its reflection, if this isn't obvious to you.

25.

1 pound 4s 9p = 20s 4s 9p = 24s 9p

24s 9p − 14s 5p = 10 shillings 4 pence

[2 marks]

The old symbol for pence was "*d*", not "*p*" – but I've cheated, in order to keep things clear.

You need the answer in shillings and pence, so a good first step is to convert the cost of a large margarine beer into shillings and pence.

After this, it's easy to subtract the two prices.

```
       1 pound    4s      9p
                 14s      5p
  +
  +                14s     5p
       _____
       1 pound    32s     19p
  =    1 pound    33s      7p
  =    2 pounds   13s      7p  =  2 pounds  13 shillings  7 pence
```

[2 marks]

The first task here is to add the prices together.

Using "*d*" for pence this time:

£1 32*s* 19*d* is £1 33*s* 7*d*, because 12*d* = 1*s*.

£1 33*s* 7*d* is £2 13*s* 7*d*, because 20*s* = £1.

26.   **[3 marks]**
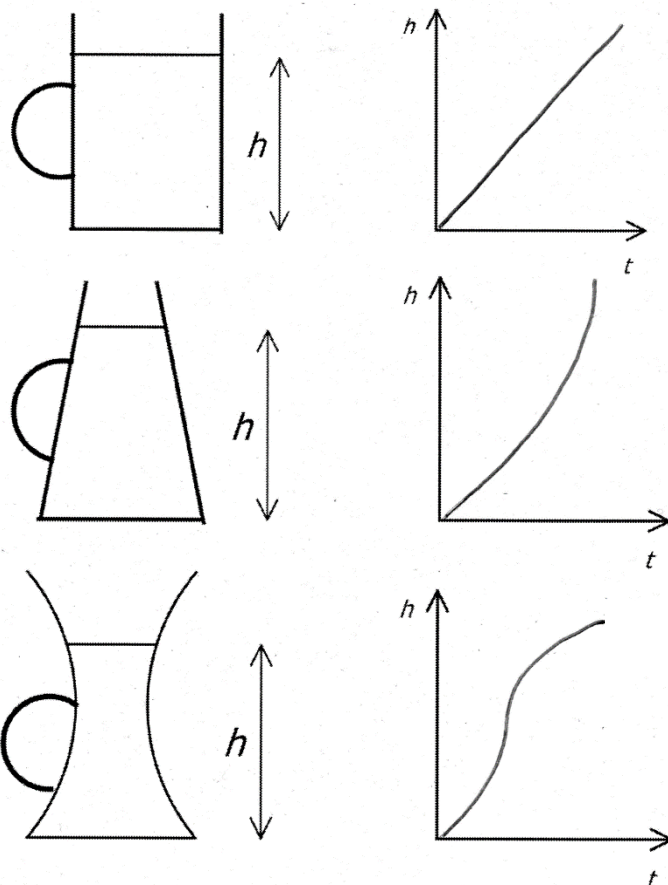
First graph: The jug is <u>the same width all the way up</u>, so it will fill at a constant rate.

Second graph: The jug <u>becomes narrower towards the top</u>. As it fills and the water has a narrower space to occupy, the level will rise ever more rapidly.

Third graph: The jug <u>becomes narrower</u>, so the level increases faster and faster … until the jug <u>widens again</u>, and the rate of increase slows again.
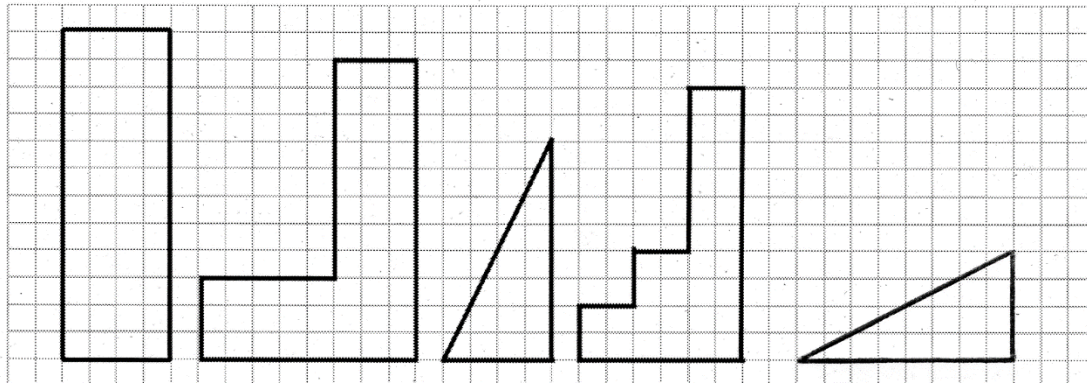
A couple of details, which are **very unlikely to affect your mark**, are still worth mentioning here:

- Each jug is the same width at the bottom, so each of my graphs departs/begins at the same angle.
- The second and third jugs seem to have less volume than the first, so they finish filling a little sooner.

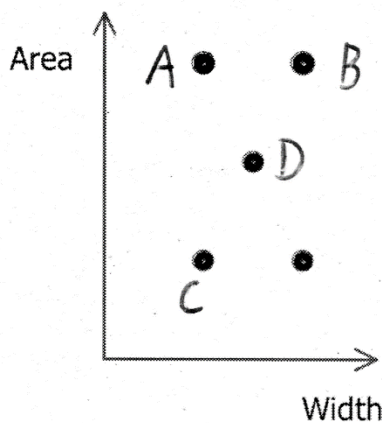**27.**   **[4 marks]**
                                                                  [2 marks]

A   B   C   D   E

Width of B: 8

Area of C: $\frac{4 \times 8}{2} = 16$

This is an ingenious question – I've never seen one quite like it elsewhere.

- **A** and **C** have the narrowest bases, but **A** has the larger area of the two.
- **B** has the widest base, and a large area (the same as **A**).
- **D** has a base of 6, half way between **A/C** and **B**.

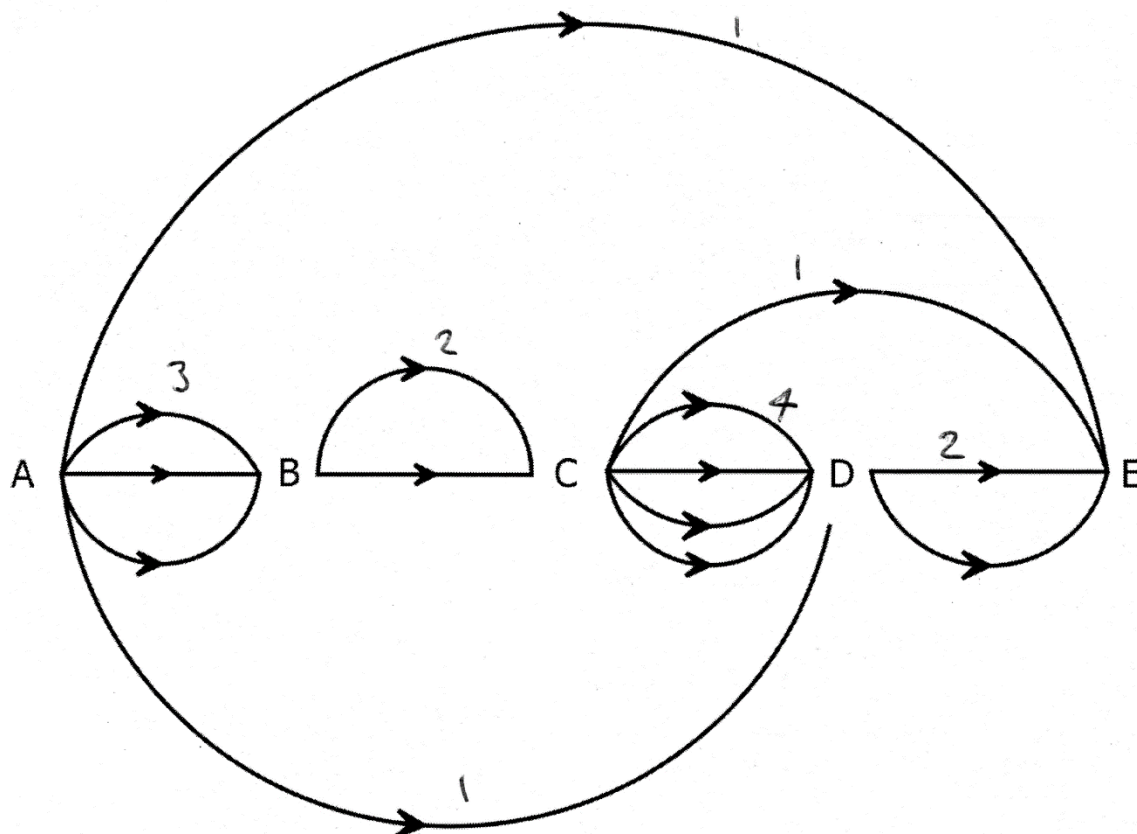**E** must have the width of **B** (8 squares) and the area of **C** (16 squares, because the area of a triangle is $\frac{1}{2} \times base \times height$).

Again applying the formula for a triangle's area, this means that its height is 4 squares: $\frac{1}{2} \times 8 \times 4 = 16$.

28. [5 marks]

from A to C $3 \times 2 = 6$ 6

from A to D $(3 \times 2 \times 4) + 1 = 25$ 25

from A to E $(25 \times 2) + 6 + 1 = 57$ 57

A to C: There are 3 ways to get from **A** to **B**, and for each of these there are another 2 routes from **B** to **C** (6 routes).

A to D: For each of the 6 routes from **A** to **C**, there are another 4 routes from **C** to **D** (24 routes). There's also a direct shortcut from **A** to **D** (1 route).

A to E: For each of the 25 routes from **A** to **D**, there another 2 routes from **D** to **E** (50 routes). You can also go from **A** to **C** (6 routes), then skip straight to **E**. Finally, there is the direct bypass route from **A** to **E** (1 route). Add these together, to get 57 routes.

29.

[1 mark]

We're told that this is a **geometric progression** – multiplying by the same amount each time – so because we multiply 8 by 3 to reach 24, we need to **multiply 24 by 3** to get 72.

[2 marks]

The first step involves dividing by 10, so you need to carry on like this until you reach the 9th term.

[3 marks]

Trial and improvement works well here: take a guess, then correct if you've gone too far, until you find the solution.

You could also use algebra, though this approach tests the limits of 11 Plus knowledge:

$$8 \times x = 200 \div x$$

$$x = \frac{200}{8} \div x$$

$$x^2 = \frac{200}{8} = 25$$

$$x = \sqrt{25} = 5$$

Of course, you are required to find **the second number in the sequence**, 40: if you give "5" as your answer, you will lose at least one mark.

30. [5 marks]

	Gold Galleons	
Bashful	50	5
Doc	60	6
Dopey	36	6
Grumpy	25	4
Happy	14	3
Sleepy	21	2
Sneezy	24	1
Snow White	230	

Snow White earns __230__ galleons

$$\frac{7}{8} \times 24 = \frac{7}{8_1} \times \frac{\overset{3}{24}}{1} = 21 \quad (Sleepy)$$

$$\frac{21}{1.5} = \frac{7}{0.5} = 14 \quad (Happy)$$

$$24 \times 4 = 96$$

48   48

/-12   \+12

36 (Dopey)   60 (Doc)

5 0
6 0
3 6
2 5
1 4
2 1
2 4
―――
2 3 0   (Snow White)

When faced with a question like this, you need to find a way in (which often won't be provided by the first information you're given), then work step by step.

I've numbered my stages of working alongside the answer table.

1. Sneezy gets 24 galleons a day. This is your "way in".

2. $\frac{7}{8}$ of 24 is 21.

3. If Sleepy earns 50% more than Happy, he earns 1.5 times as much. Dividing 21 by 1.5, we get 14. Perhaps if Happy was less cheerful and complained about this, he would be paid a fair rate.

4. Grumpy earns 1 more galleon than Sneezy.

5. Bashful earns twice as much as Grumpy. At least he's bashful about his unreasonable good fortune; on the other hand, it's no surprise that Grumpy is grumpy.

6. Between them, Doc and Dopey earn 96 galleons: 4 times as much as Sneezy. Halve this to get 48, then add and subtract 12 so that there is a difference of 24 between the salaries of Doc and Dopey (Doc earns the higher amount, 60 galleons). Dopey isn't doing too badly, bearing in mind his lack of focus and commitment.

Snow White earns as much as the rest put together: 230 galleons.

TOTAL 96