# KS2 Reasoning & Problem Solving Questions 2017

Each question now has a YouTube tutorial

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# Reasoning and Problem Solving Questions

KS2

## Information

This booklet contains over 40 reasoning and problem solving questions suitable for KS2 classes. These are the questions that we have been putting out each day in March 2017 on Twitter in the run up to SATS.

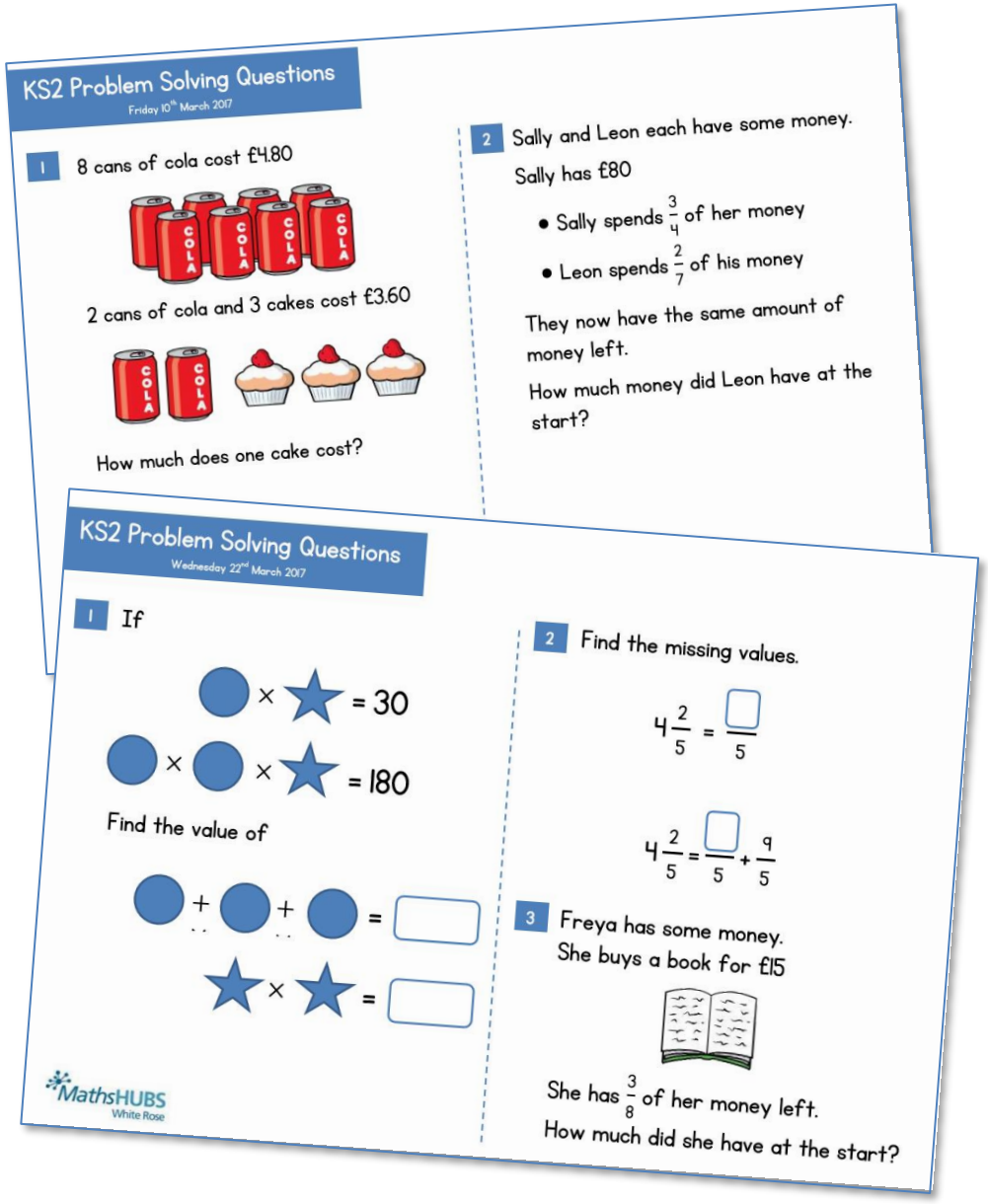
The answers are provided with some simple notes at the back of the booklet and for some questions supplementary questions and variation has been provided.

We hope to release more questions like this over the course of next year including some open ended problems. Please keep a look out for our work. If you have not seen our schemes and assessments for primary then please take a look at our website [www.whiterosemathshub.co.uk](http://www.whiterosemathshub.co.uk)

As always we welcome any feedback on the work we are doing and the materials that we are releasing.

Thank you for taking an interest in our work.

**The White Rose Maths Hub Team**

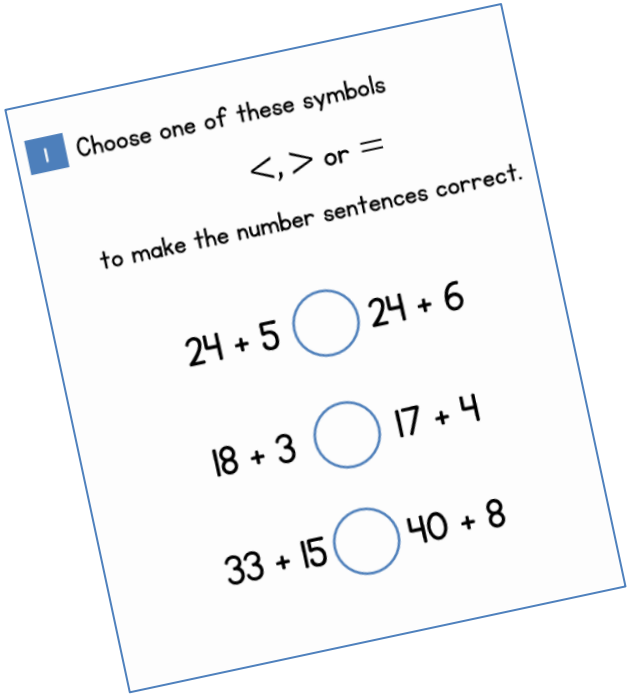



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## Children's Reponses

Children's responses will tell you a lot about their depth of understanding of a given topic. For example

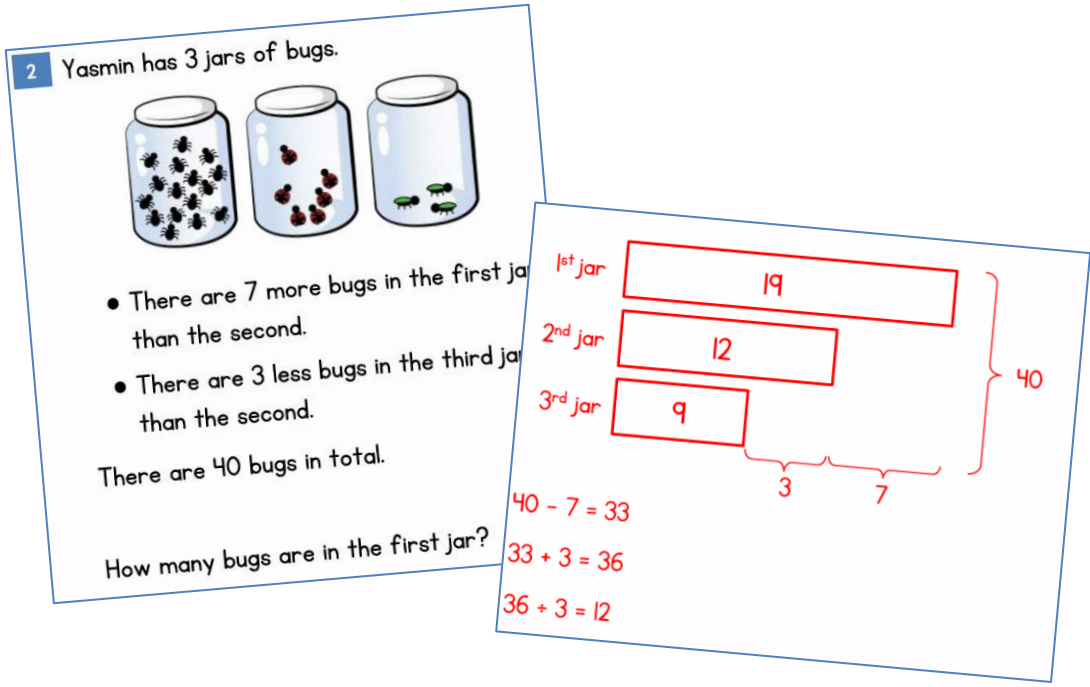



Children who reason verbally or written that 5 is less than 6 and then 24 is being added each time potentially indicate a deeper understanding of number than those who work out both sides of the inequality.

## Bar Modelling – Pictorial Methods

Many of the problem solving questions in this booklet can be solved using a bar modelling method. Encourage children to use diagrams to help them solve the problem.

Here is a problem where bar modelling would help.




If you want to find out more about bar modelling please contact the Hub.

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# KS2 Problem Solving Questions

Wednesday 1st March 2017

**1** Complete

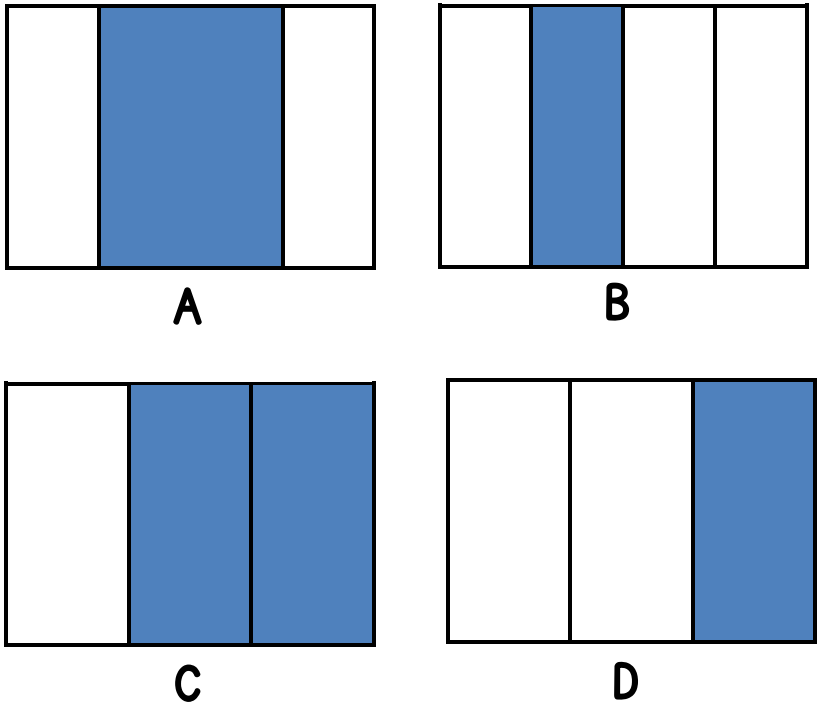
40,000 + 7,000 + 600 + 7 = ☐

6,000 + 50 + 300 + 1 = ☐

5,000 + 200 + ☐ = 5,280

30,000 + 900 + 3 + ☐ = 36,905

**2** Which diagram has $\frac{1}{3}$ shaded?




Explain the reason for your choice.

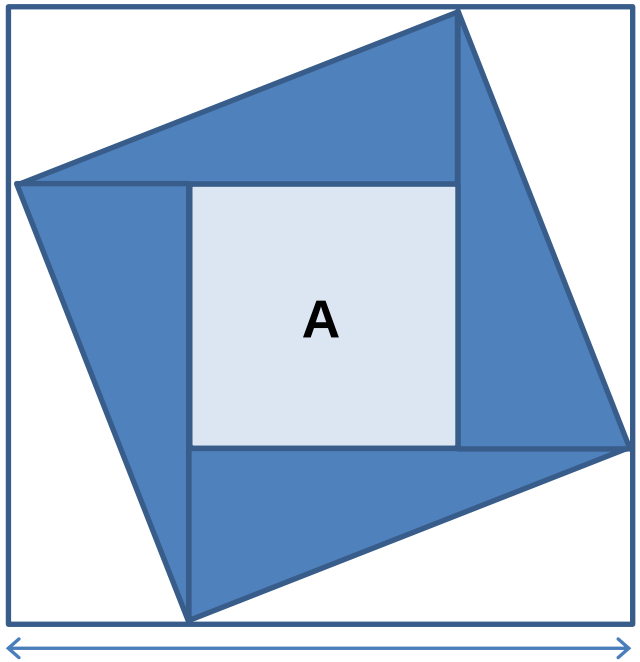
Explain why the other diagrams do not have $\frac{1}{3}$ shaded.

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# KS2 Problem Solving Questions

Thursday 2nd March 2017

**1**




The area of square A is $36cm^2$.

Find the area of one of the triangles.

**2** Find the missing values

$$\frac{1}{3} + \frac{\square}{9} = 1$$

$$\frac{1}{4} + \frac{1}{8} + \frac{\square}{16} = 1$$

**3** Calculate

22 tens minus 22 tenths

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# KS2 Problem Solving Questions

Friday 3rd March 2017

**1** Complete

$$2\frac{\square}{6} = 3\frac{5}{6}$$

**2** A bottle is a third full.



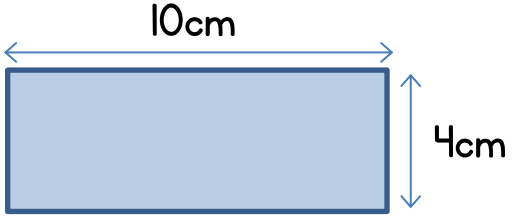
Mary puts 320ml of juice into the bottle.



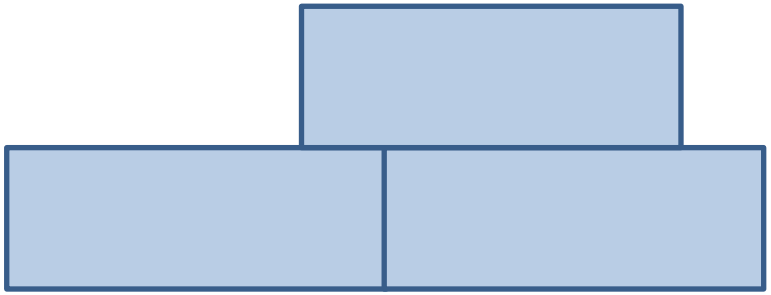
The bottle is now full.

How much juice does the bottle hold when full?

**3** Here is a rectangle.




A new shape is made up of three of these rectangles.



What is the perimeter of the new shape?

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# KS2 Problem Solving Questions

Monday 6th March 2017

## 1 Complete

$4 \times 6 + 5 \times 6 = \square \times 6$

$7 \times 6 + 12 = \square \times 6$

$6 + 60 + 600 = \square \times 6$

$12 \times 6 + 7 \times 6 = \square \times 6 - 24$

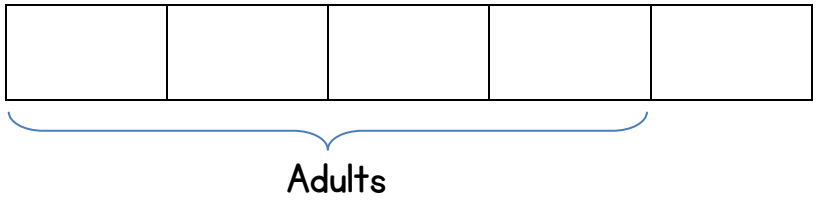
## 2 Yesterday at a museum



- $\frac{4}{5}$ of the visitors were adults.
- 120 children visited the museum.
- $\frac{3}{8}$ of the adults were male.

How many male adults visited the museum yesterday?

*(You may find the bar model diagram below helpful)*

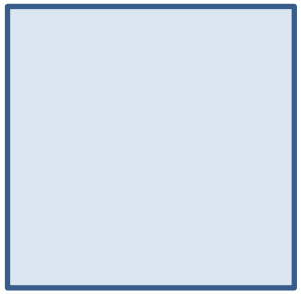



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# KS2 Problem Solving Questions

Tuesday 7th March 2017

**1** (a) The area of a square is $64m^2$



What is the perimeter of the square?

(b) A rectangle is 2cm longer than it is wide.

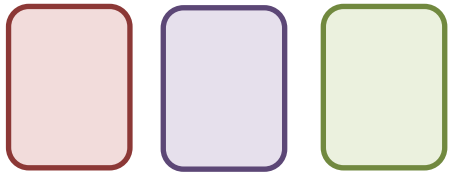


The perimeter of the rectangle is 44cm.

Find the area of the rectangle.

*(You may find it useful to draw a bar model)*

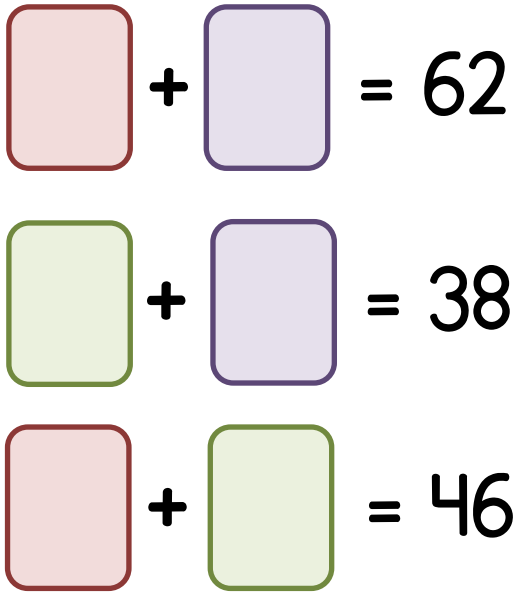
**2** Maria has three number cards.



One of the cards has a value of 35

The other cards have a smaller value.

When you add the cards you get.




What is the value of each card?

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# KS2 Problem Solving Questions

Wednesday 8th March 2017

**1** Mr Singh parks his car.



Here are the charges.

| White Rose Car Park | |
|---|---|
| First hour | £2.50 |
| Every additional 30 minutes (or less) | £1.80 |

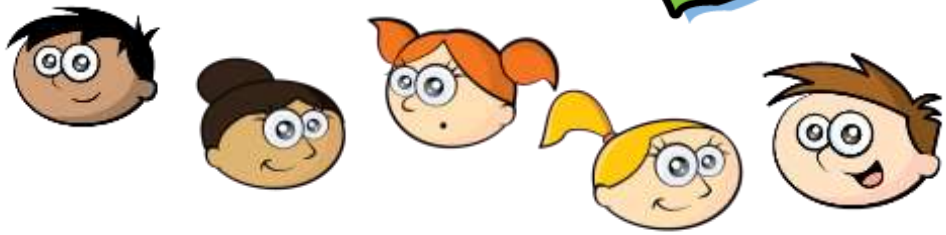
Mr Singh arrives at 10.45am

He leaves the car park at 2.30pm

How much did he pay to park?

**2** A group of 5 friends share a bag of sweets.



They each receive 6 sweets and there are 3 left over.



Two more friends arrive.

They share the sweets again between all 7 of them.

(a) How many do they each receive?

(b) How many are left over?

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# KS2 Problem Solving Questions

Thursday 9th March 2017

**1** Anna, Zoe and Carl donated some money to charity.

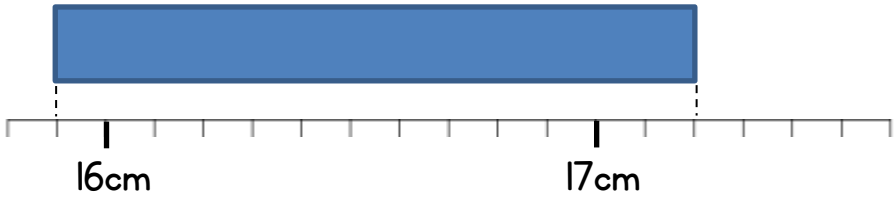


- Carl donated twice as much as Anna
- Zoe donated £12 more than Anna
- Altogether they donated £188

How much money did Carl donate?

*(You may find it useful to draw a bar model)*

**2** A blue strip of paper is shown above part of a ruler.




What is the length of 6 of these strips of paper?

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# KS2 Problem Solving Questions

Friday 10th March 2017

**1** 8 cans of cola cost £4.80




2 cans of cola and 3 cakes cost £3.60




How much does one cake cost?

**2** Sally and Leon each have some money.

Sally has £80

- Sally spends $\frac{3}{4}$ of her money
- Leon spends $\frac{2}{7}$ of his money

They now have the same amount of money left.

How much money did Leon have at the start?

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# KS2 Problem Solving Questions

Monday 13th March 2017

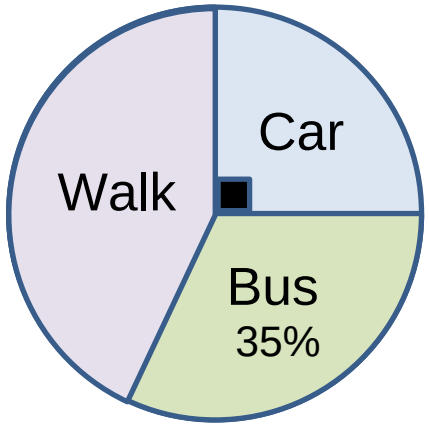
**1** A number is made up of the following digits.

| 2 | 3 | 8 | 8 | 0 |
|---|---|---|---|---|

- The digit in the tenths place is the same as the digit in the ones place.
- The digit in the hundreds place is one more than the digit in the hundredths place.

What is the number?

**2** The pie chart shows how children in Y6 travel to school.




35% of children travel by bus.

8 **more** children travel by bus than by car.

(a) How many children are in Y6?

(b) How many walk to school?

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# KS2 Problem Solving Questions

Tuesday 14th March 2017

**1** Work out

23 seconds + $\frac{1}{12}$ of a minute = ☐ seconds

7 hours + 150 minutes = ☐ hours

**2** Here are some digit cards.




(a) What is the largest 2-digit number you can make that is divisible by 4?

(b) What is the largest 2-digit number you can make that is divisible by 8?

**3** A jar contains 30 sweets.




The weight of the jar and sweets is 620g.

David eats 12 sweets.

The weight of the jar and sweets is now 440g.

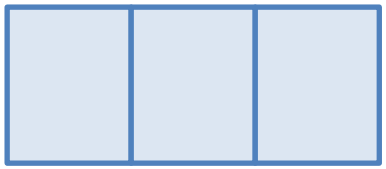
How much does the jar weigh?

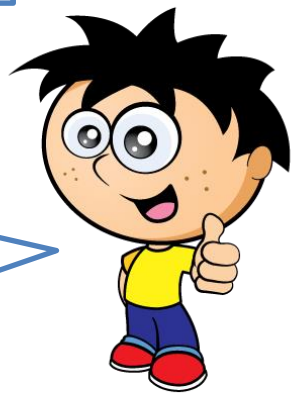
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# KS2 Problem Solving Questions

Wednesday 15th March 2017

**1** Henry makes a 3-digit number.





My number lies between 209 and 220

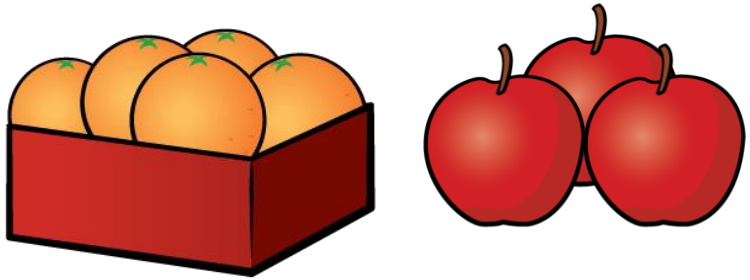


The digits sum to 9

What number did Henry make?

**2** A shopkeeper sells fruit.

At the start of the week she has 150 oranges and 220 apples.



On Monday, she sells

- 10% of the oranges.
- $\frac{1}{5}$ of the apples

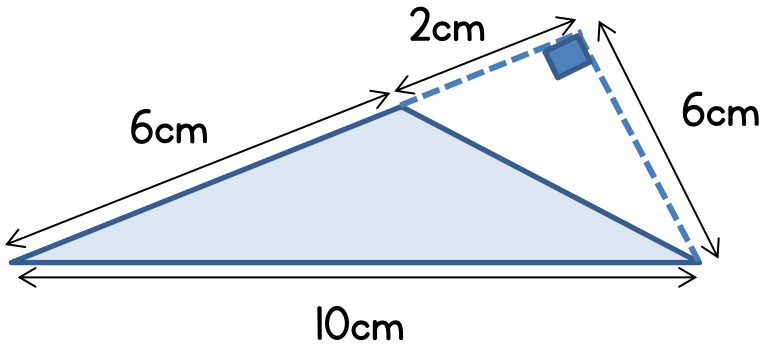
How many more apples than oranges are now left?

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# KS2 Problem Solving Questions

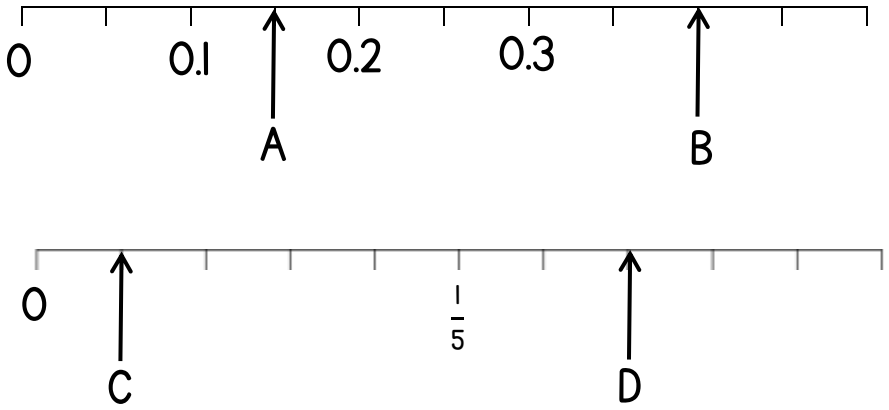
Thursday 16th March 2017

**1**




What is the area of the shaded triangle?

**2** Here are 2 number lines.




A, B, C and D are points on the lines.

Work out

(a) B – A = ☐

(b) D – C = ☐

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# KS2 Problem Solving Questions

Friday 17th March 2017

**1** A toy shops sells these items.



Toy Aeroplane £12

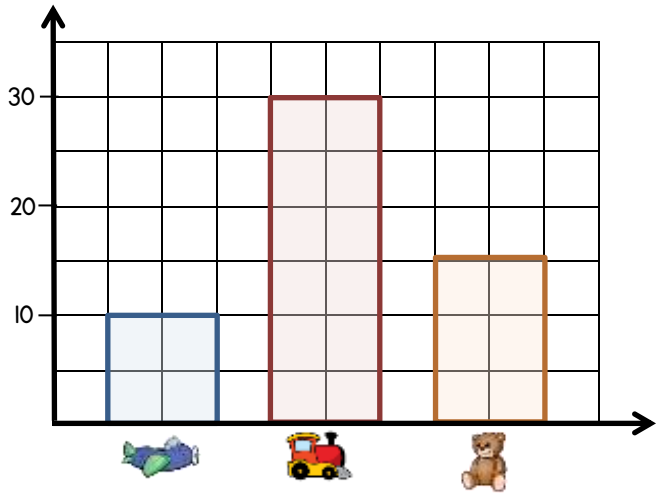


Toy Train £23



Teddy £8

The bar chart shows how many of each item was sold last week.




How much money did the toy shop make last week for these items?

**2** Mel, Martina and Pat have the **same** number of cards.



Mel and Martina each give Pat a **quarter** of their cards.

Pat now has 24 cards.

How many cards do they have altogether?

(You might find it helpful to draw a bar model)

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# KS2 Problem Solving Questions

Monday 20th March 2017

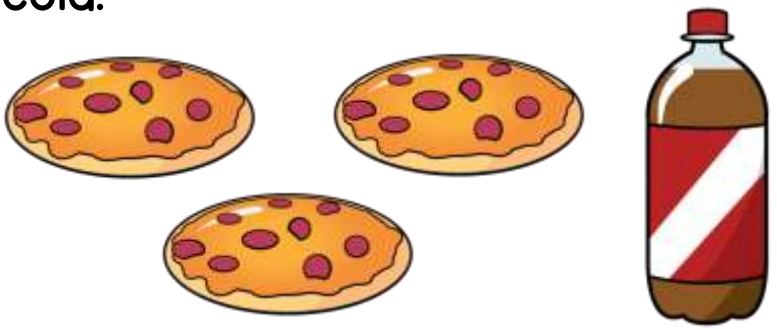
**1** Dev has a 3kg bag of flour.




He uses $\frac{7}{10}$ kg of the flour to make a cake and uses 0.65kg to make some bread.

How much flour has he left?

**2** Mina buys 3 pizzas and a bottle of cola.



A pizza costs £3.20 more than a bottle of cola.

The total cost of the items is £19.40

How much does a pizza cost?

(You might find it helpful to draw a bar model)

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# KS2 Problem Solving Questions

Tuesday 21st March 2017

**1** Gavin has a tin of paint.



The tin is $\frac{1}{2}$ full and weighs 5.8kg.

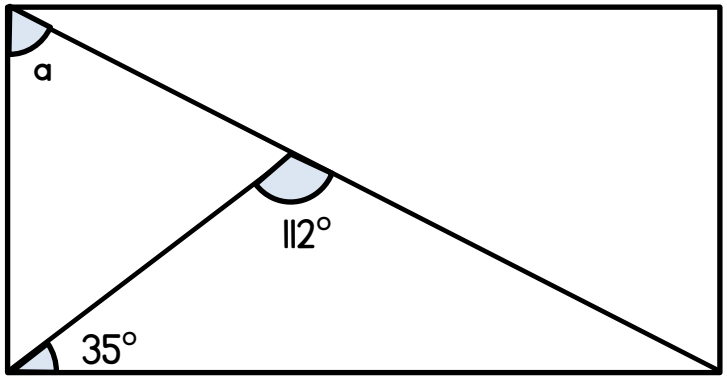
He paints a wall in his house.

The tin is now $\frac{1}{3}$ full and weights 4.4kg

How much does the empty tin weigh?

**2** Here is a rectangle.

Some lines have been drawn inside.




Work out the size of the angle marked a.

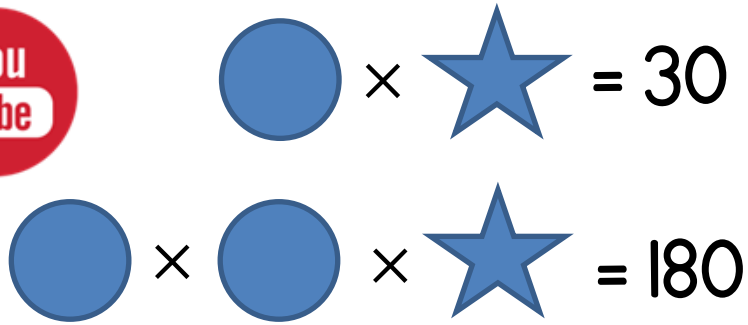
Explain your reasoning.

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# KS2 Problem Solving Questions

Wednesday 22nd March 2017

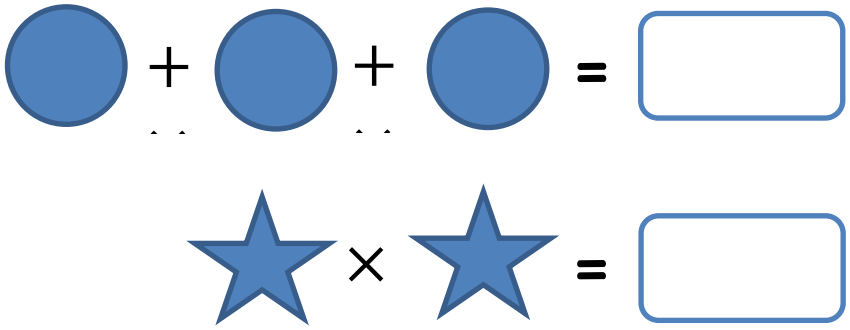
**1** If



$\bigcirc \times \bigstar = 30$

$\bigcirc \times \bigcirc \times \bigstar = 180$

Find the value of



$\bigcirc + \bigcirc + \bigcirc = \square$

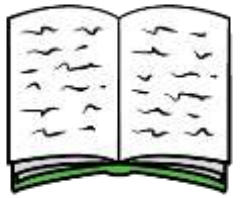
$\bigstar \times \bigstar = \square$

**2** Find the missing values.

$$4\frac{2}{5} = \frac{\square}{5}$$

$$4\frac{2}{5} = \frac{\square}{5} + \frac{9}{5}$$

**3** Freya has some money.
She buys a book for £15



She has $\frac{3}{8}$ of her money left.

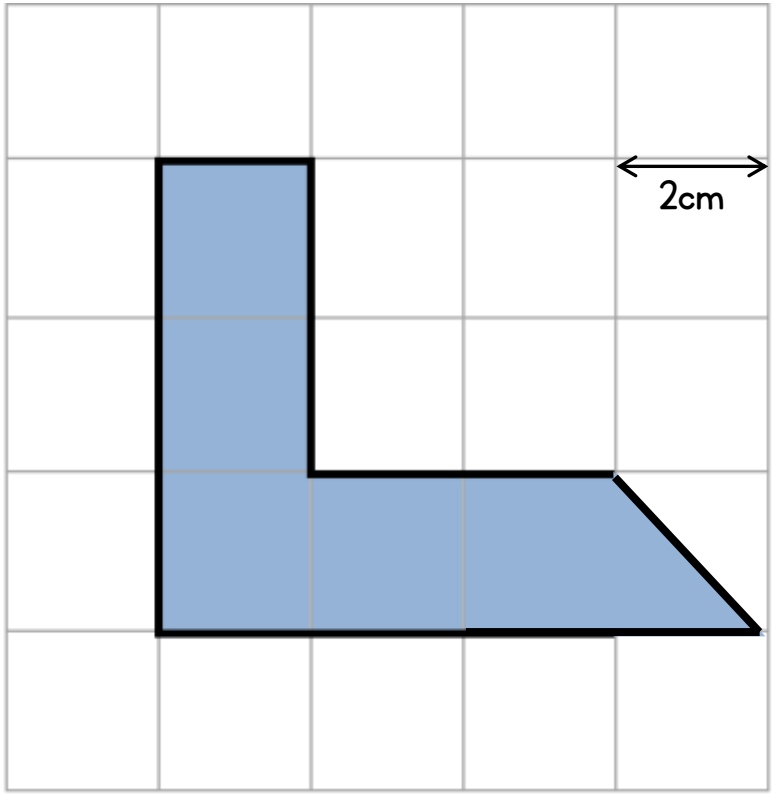
How much did she have at the start?

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# KS2 Problem Solving Questions

Thursday 23rd March 2017

**1** A shape has been drawn on a 2cm by 2cm square grid.

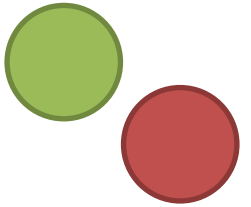



Find the area of the shape.

**2** Sue has some counters.

A quarter of the counters are green.





She gives $\frac{2}{5}$ of the green counters to her friend.

She has 24 green counters left.

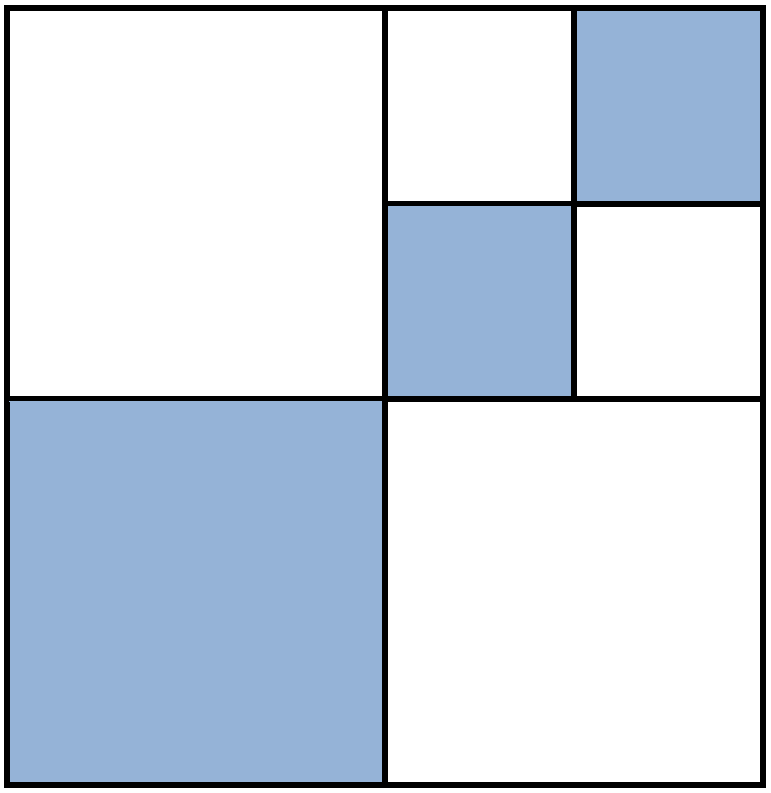
How many red counters does she have?

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# KS2 Problem Solving Questions

Friday 24th March 2017

**1** A square is divided into smaller squares.



What fraction of the shape is shaded?

**2** Sophie has some marbles.



The marbles are identical.

The mass of an **empty** jar is 480g



The mass of the jar when **full** with the marbles is 1.2kg

What is the mass of the jar when it is **half full** with marbles?

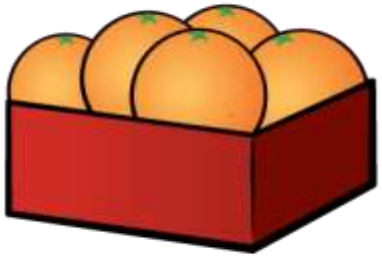
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# KS2 Problem Solving Questions

Monday 27th March 2017

**1** Nimesh has 60 boxes of oranges.

Each box contains 25 oranges.



Nimesh sells 800 oranges.

He packs the remaining oranges into boxes of 50

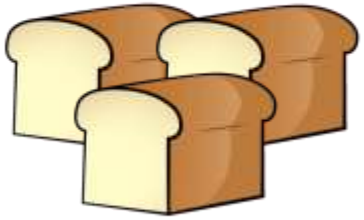
How many boxes does he pack?

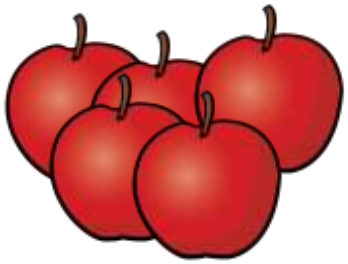
**2** A loaf of bread costs the same as 3 apples.





Millie buys 3 loaves of bread and 5 apples for £5.60





How much does each item cost?

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# KS2 Problem Solving Questions

Tuesday 28th March 2017

**1** The square and rectangle have the same area.




Find the perimeter of the rectangle.

**2** Calculate

$$3 - \frac{1}{2} - \frac{1}{4} - \frac{1}{8}$$

**3** Complete

$16 \times 40 = \square \times 8$

20% of $\square$ = 12

$\frac{2}{5}$ of $\square$ = 32

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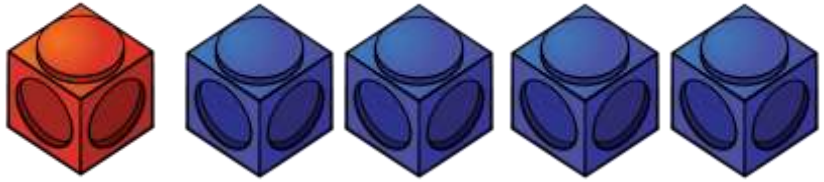
# KS2 Problem Solving Questions

Wednesday 29th March 2017

**1** A box contains 40 cubes.



For every one red cube there are four blue cubes.



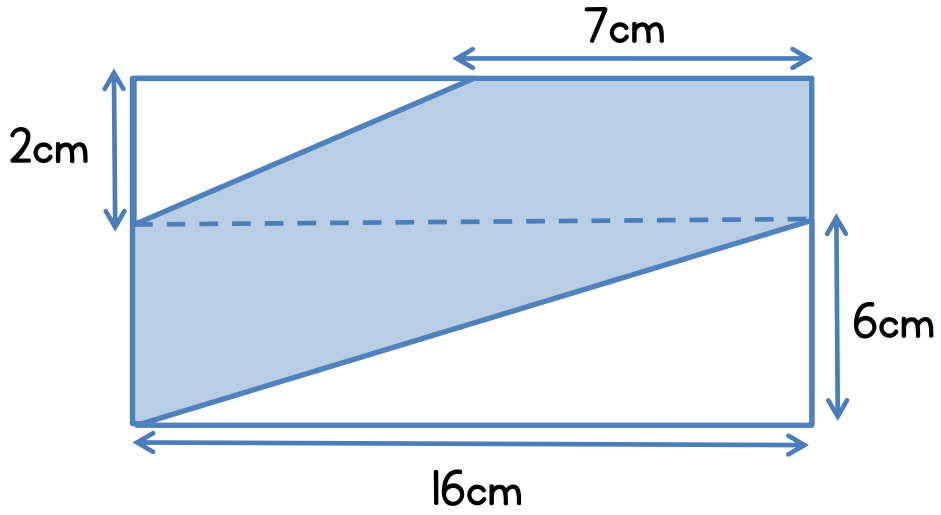
2 red cubes are removed from the box.

Some blue cubes are also removed.

There are now 3 times as many blue as red cubes.

How many blue cubes were removed?

**2** Find the area of the shaded region.




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# KS2 Problem Solving Questions

Thursday 30th March 2017

**1** Alex has a bag of sweets.




He eats the **same** number of sweets each day.

After 2 days he has $\frac{5}{6}$ of the sweets left.

After another 4 days he has 15 left.

How many sweets are in the bag?

**2** Mr Dexter buys the following.





The TV costs £130 more than the bike.

The total cost is £420

How much does the TV cost?

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# KS2 Problem Solving Questions

Friday 31st March 2017

**1** Fiona has a box of chocolates.

The box contains 60 chocolates.



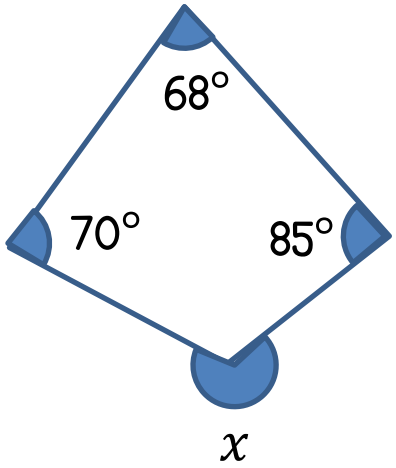

She eats $\frac{1}{5}$ of the chocolates.

She gives 32 chocolates away.

What fraction of the chocolates does she have left?

Give your answer in its simplest form.

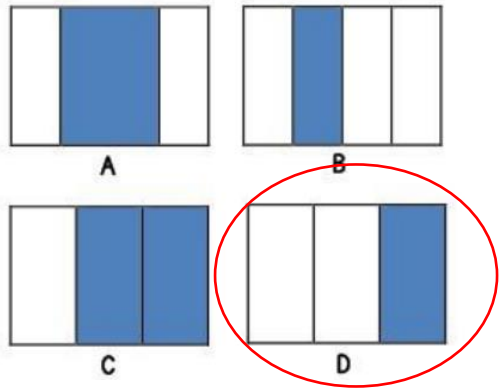
**2** Find the angle marked x




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KS2

# Reasoning and Problem Solving Questions

| Day | Question | Answer | Notes |
|---|---|---|---|
| 1 | 1 | 47,607 | |
| | | 6,351 | |
| | | 80 | |
| | | 6,002 | |
| | 2 |   | Because it is 1 part shaded out of 3 equal parts.<br><br>Discuss with children why the other three do not show $\frac{1}{3}$ |
| 2 | 1 | $8cm^2$ | Encourage children to find two different methods to get the answer. |
| | 2 | $\frac{6}{9}$<br><br>$\frac{10}{16}$ | |
| | 3 | 217.8 | |
| 3 | 1 | 11 | |
| | 2 | 480ml | What is 320ml equivalent to? |
| | 3 | 56cm | Would the perimeter change if the top rectangle moved? |
| 4 | 1 | 9 | |
| | | 9 | |

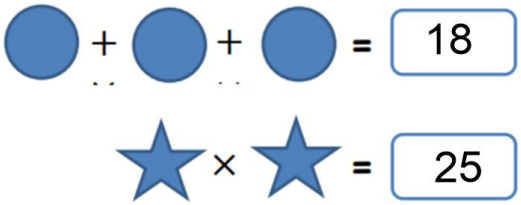
# Reasoning and Problem Solving Questions

| | | | |
|---|---|---|---|
| | | 111 | |
| | | 15 | |
| | 2 | 180 male adults | Encourage children to use a bar model. |
| **5** | 1 a | 32m | What is the length of each side? |
| | 1 b | $120cm^2$ | |
| | 2 |   | |
| **6** | 1 | £13.30 | |
| | 2 a | 4 | |
| | 2 b | 5 | |
| **7** | 1 | Carl donated £88 | Encourage children to draw a comparison bar model. |
| | 2 | 7.8cm | What is the length of one strip of paper? What would one marking be worth? |
| **8** | 1 | 80p | What does one can of cola cost? |
| | 2 | £28 | How much does Sally have left? It may be useful to draw a bar model. |
| **9** | 1 | 308.82 | |
| | 2a | 80 children | |
| | 2b | 32 children | |
| **10** | 1 | 28 seconds | |
| | | 9.5 hours /9 hours 30 minutes | Or equivalent |
| | 2a | 84 | |
| | 2b | 64 | |
| | 3 | 170g | What is the weight of one sweet? |

# Reasoning and Problem Solving Questions

| | | | |
|---|---|---|---|
| | | | What is the weight of 30 sweets? |
| **11** | 1 | 216 | |
| | 2 | 41 | How many oranges did she sell?<br>How many apples did she sell?<br>How many of each are left? |
| **12** | 1 | 18cm$^2$ | What is the area of the big right angled triangle?<br>What is the area of the small right angled triangle? |
| | 2a | B – A = 0.25 | Or equivalent |
| | 2b | D – C = $\frac{6}{25}$ | |
| **13** | 1 | £930 | Toy aeroplane = £120<br>Toy train = £690<br>Teddy = £120 |
| | 2 | 48 | How many cards does Pat have? |
| **14** | 1 | 1.65kg | The question says $\frac{7}{10}$ kilograms not $\frac{7}{10}$ of the bag of flour. |
| | 2 | £5.65 | How much does a bottle of cola cost? (£2.45) |
| **15** | 1 | 1.6kg | Subtract fractions to find what $\frac{1}{6}$ of the paint weighs. |
| | 2 | 57° | Encourage children to mark angles on the diagram.<br>What do angles on a straight line add up to?<br>What do angles in a rectangle add up to? |

# Reasoning and Problem Solving Questions

| | | | |
|---|---|---|---|
| **16** | 1 |   | What is a circle equal to?<br>What is a star equal to? |
| | 2 | 22<br><br>13 | |
| | 3 | £24 | What fraction of her money did the book cost? |
| **17** | 1 | $22cm^2$ | What is the area of one square?<br>How many squares are in the diagram?<br>How many half squares are in the diagram? |
| | 2 | 120 | What fraction does she keep?<br>How many green counters are there? |
| **18** | 1 | $\frac{3}{8}$ | Or equivalent |
| | 2 | 840g | What is the mass of the marbles?<br>What is the mass of half of the marbles? |
| **19** | 1 | 14 boxes | How many oranges does Nimesh have in total?<br>How many does he have left? |
| | 2 | Loaf of bread = £1.20<br>Apple = 40p | How many apples will 3 loaves of bread be equal to? |
| **20** | 1 | Perimeter of rectangle = 208cm | What is the area of the square?<br>What is the length of a side of the rectangle? |
| | 2 | $2\frac{1}{8}$ | |

# Reasoning and Problem Solving Questions

| | | | |
|---|---|---|---|
| | 3 | $16 \times 40 = \boxed{80} \times 8$<br>20% of $\boxed{60} = 12$<br>$\frac{2}{5}$ of $\boxed{80} = 32$ | |
| **21** | 1 | 14 blue cubes were removed | How many red cubes are there?<br>How many blue cubes are there? |
| | 2 | $71cm^2$ | |
| **22** | 1 | 30 sweets | |
| | 2 | £275 | |
| **23** | 1 | $\frac{4}{15}$ | How many chocolates does she eat?<br>How many chocolates does she have left? |
| | 2 | 223° | |