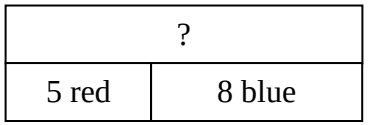
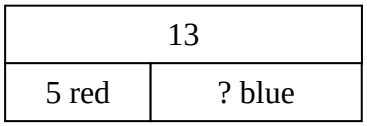
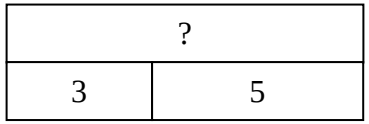
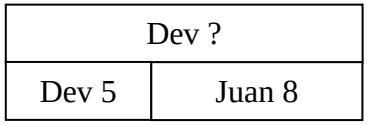
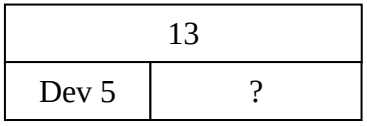
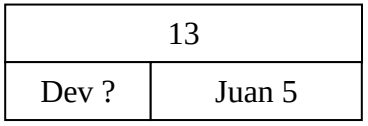
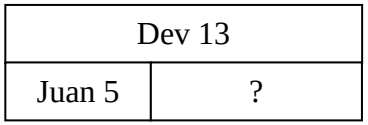
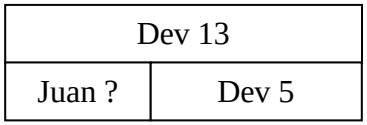
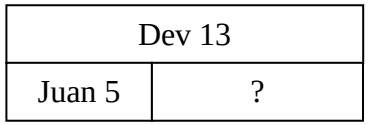
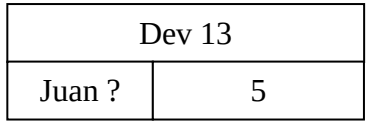
Introduction of bar models for additive reasoning: Year 1/2

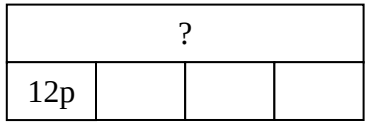
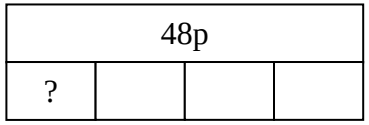
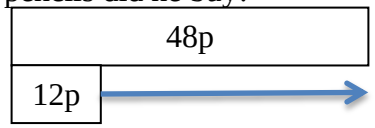
<table>
<tr>
<td>Part-whole problems
Present calculations in this way sometimes.</td>
<td colspan="2">(Whole unknown)
Dev has 5 red marbles and 8 blue marbles. How many marbles does he have?
 
</td>
<td colspan="2">(Part unknown)
Dev has 13 marbles. Five are red and the rest are blue. How many blue marbles does Dev have?
 
</td>
</tr>
<tr>
<td>Joining problems
Present addition calculations in this way sometimes:
3 + 5 = ?
 

3 + ? = 8
 
</td>
<td>(Result Unknown)
Dev had 5 marbles. Juan gave him 8 more marbles. How many marbles does Dev have now?
 
</td>
<td>(Change Unknown)
Dev has 5 marbles. How many more marbles does he need to have 13 marbles altogether?
 
</td>
<td>(Start Unknown)
Dev had some marbles. Juan gave him 5 more marbles. Now he has 13 marbles. How many marbles did Dev have to start with?
 
</td>
</tr>
<tr>
<td>Separating problems
Present subtraction calculations in this way sometimes:
8 - 5 = ?
 

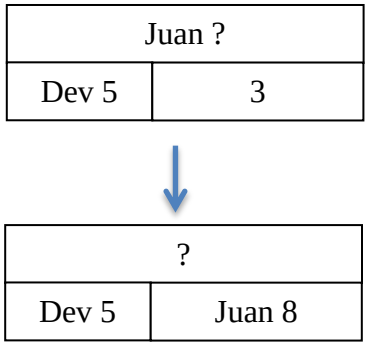
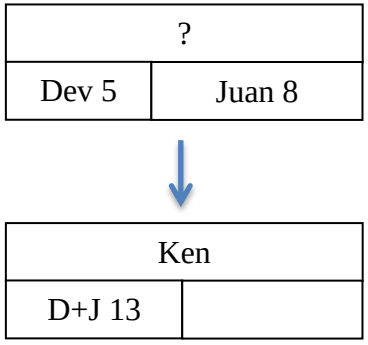
8 + ? = 5
 
</td>
<td>(Result Unknown)
Dev had 13 marbles. He gave 5 to Juan. How many marbles does Dev have left?
 
</td>
<td>(Change Unknown)
Dev had 13 marbles. He gave some to Juan. Now he has 5 marbles left. How many marbles did Dev give to Juan?
 
</td>
<td>(Start Unknown)
Dev had some marbles. He gave 5 to Juan. Now he has 8 marbles left. How many marbles did Dev have to start with?
 
</td>
</tr>
</table>

Comparing problems	*(Difference unknown)* Dev has 13 marbles. Juan has 5 marbles. How many more marbles does Dev have than Juan? 	*(Smallest part unknown)* Dev has 13 marbles. He has 5 more marbles than Juan. How many marbles does Juan have? 	*(Largest part unknown)* Juan has 5 marbles. Dev has 8 more than Juan. How many marbles does Dev have? 

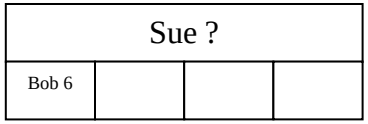
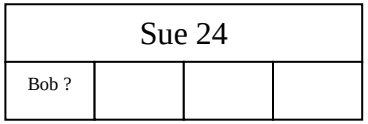
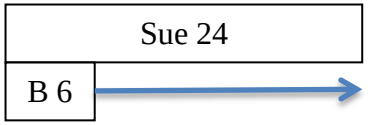
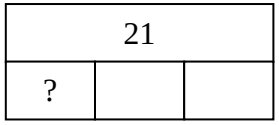
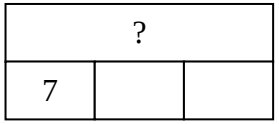
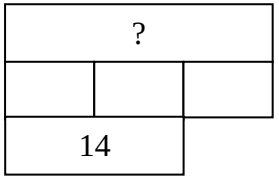
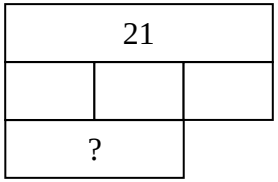
Introduction of bar models for multiplicative reasoning: Year 1/ 2

Part-whole problems Present calculations in this way sometimes.	*(Whole unknown)* Pencils cost 12p each. How much do 4 pencils cost? 	*(Value of one part unknown)* Dev bought 4 pencils for 48p. How much does 1 pencil cost? 	*(Number of parts unknown)* Pencils cost 12p each. Dev bought some pencils for 48p. How many pencils did he buy? 

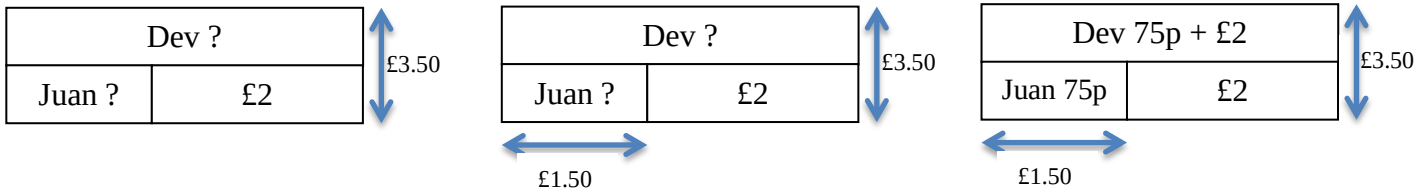
Introduction of bar models for additive reasoning: Year 3/4

<table>
<tr><td colspan="3">Check on mastery of additive reasoning problems from KS1, revising as necessary.</td></tr>
<tr><td>Two step joining / separating problems
Pose problems using a variety of combinations, for example:</td><td>Dev has 5 marbles. Juan has 3 more than Dev. How many marbles do they have altogether?
 
</td><td>Dev has 5 marbles and Juan has 8 marbles. Ken says, “I have double the number of marbles that you have together.” How many marbles does Ken have?
 
</td></tr>
</table>

Introduction of bar models for multiplicative reasoning: Year 3/4

<table>
<tr><td colspan="4">Check on mastery of multiplicative reasoning problems from KS1, revising as necessary.</td></tr>
<tr><td>Comparing problems</td><td>(Larger quantity unknown)
Bob picked 6 apples. Sue picked four times as many apples as Bob. How many apples did Sue pick?
 
</td><td>(Smaller quantity unknown)
Sue picked 24 apples. She picked four times as many apples as Bob. How many apples did Bob pick?
 
</td><td>(Multiplier unknown)
Sue picked 24 apples. Bob picked 6 apples. How many times as many apples did Sue pick than Bob?
 
</td></tr>
<tr><td rowspan="2">Fractions problems
Present calculations in this way sometimes.</td><td>(Value of one part unknown)
What is 1/3 of 21?
 
</td><td>(Whole unknown, one part known)
1/3 of a number is 7. What is the number?
 
</td><td>(Whole unknown, more than one part known)
2/3 of a number is 14. What is the number?
 
</td></tr>
<tr><td>(Value of one part unknown)
What is 2/3 of 21?
 
</td><td></td><td></td></tr>
</table>

Introduction of bar models for additive reasoning: Year 5/6

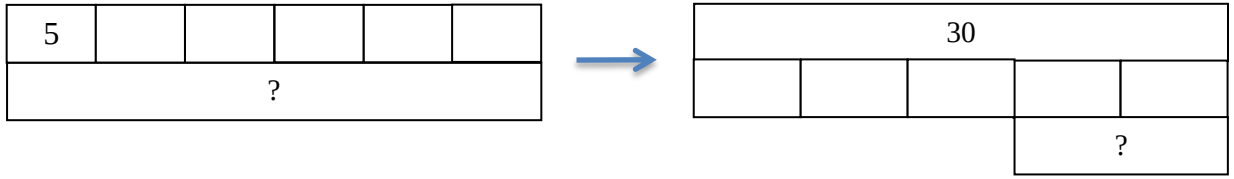
Check on mastery of additive reasoning problems from KS1, revising as necessary. Check on mastery of two step additive reasoning from Year 3/4, revising as necessary.	
Comparing problems	*(Difference known, total known, parts unknown)* Dev has £2 more than Juan and together they have £3.50. How much does each person have? 

Introduction of bar models for multiplicative reasoning: Year 5/6

Check on retention of part-part-whole, comparing and fractions problems from Year 3/4, revising as necessary.

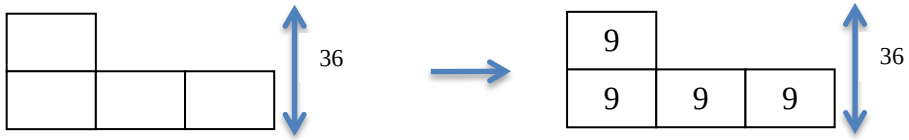
Multi-step part-whole, comparing and fractions problems
Pose problems using a variety of combinations, for example:

There are 5 people living in each of the 6 houses on Green Street. 3/5 of these people are children and the rest are adults. How many adults live on Green Street?



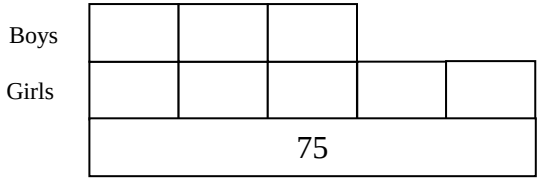
Comparing problems
For example:

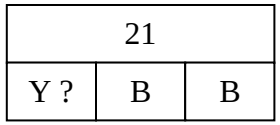
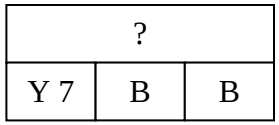
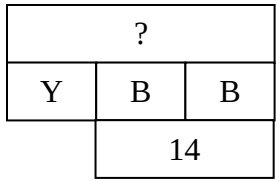
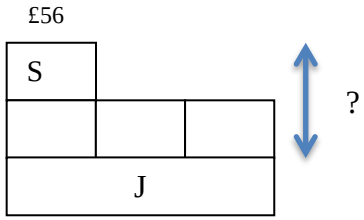
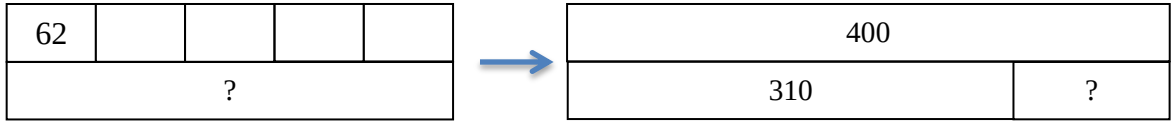
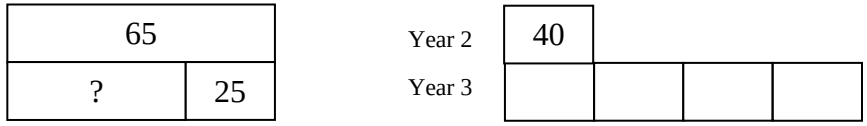
The sum of two numbers is 36. The larger number is 3 times the smaller number. What are the two numbers?



Lisa had 1750 stamps. Minah had 480 fewer stamps than Lisa. Lisa gave some stamps to Minah. Now Minah has 3 times as many stamps as Lisa. How many stamps did Minah have at first? How many stamps does Lisa have now?

There are 3/5 as many boys as girls. If there are 75 girls, how many boys are there?



<table>
<tr>
<td>Ratio problems</td>
<td>(Whole known, value of one part unknown)
To make green paint, you need yellow and blue in the ratio of 1:2. How much yellow paint is needed to make 21 liters of green?
 
</td>
<td>(Whole unknown, value of one part known)
To make green paint, you need yellow and blue in the ratio of 1:2. How much green paint can be made from 7 liters of yellow?
 
</td>
<td>(Whole unknown, value of more than one part known)
To make green paint, you need yellow and blue in the ratio of 1:2. How much green paint can be made from 14 liters of blue?
 
</td>
</tr>
<tr>
<td rowspan="3">Multi-step additive and multiplicative reasoning problems
Pose problems using a variety of combinations, for example:</td>
<td colspan="3">A jacket costs 3 times as much as a pair of shoes. If the pair of shoes costs £56, what is the total cost of the jacket and the pair of shoes?
 
</td>
</tr>
<tr>
<td colspan="3">Susan has 400 sheets of paper. She gives 5 sheets of paper to every student in a class. There are 62 students in the class. How many sheets of paper has she left?
 
</td>
</tr>
<tr>
<td colspan="3">Year 2 collect 65 books for the book drive. They put some of the books in boxes and have 25 books left to pack. Year 3 have 4 times as many books in boxes. There are none left to pack. How many books does Year 3 collect?
 
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