Reasoning and Problem Solving
Step 1: Find a Rule – One Step

National Curriculum Objectives:

Mathematics Year 6: (6A1) Express missing number problems algebraically
Mathematics Year 6: (6A2) Use simple formulae

Differentiation:

Questions 1, 4 and 7 (Problem Solving)
Developing Create 3 possible functions and outputs using the given clues. Use of whole numbers.
Expected Create 3 possible functions and outputs using the given clues. Use of all four operations where an input or output may be a decimal number, or a negative number.
Greater Depth Create 3 possible functions and outputs using the given clues. Use of all four operations where an input or output may be a decimal number, a fraction, or a negative number. Functions may also include decimal numbers.

Questions 2, 5 and 8 (Reasoning)
Developing Find the missing input using the given clue. Use of whole numbers.
Expected Find the missing input using the given clue. Use of all four operations where an input or output may be a decimal number, or a negative number.
Greater Depth Find the missing output in a word problem. Use of all four operations where an input or output may be a decimal number, a fraction, or a negative number. Functions may also include decimal numbers.

Questions 3, 6 and 9 (Reasoning)
Developing Explain why a given value is the odd one out. Use of whole numbers.
Expected Explain why a given value is the odd one out. Use of all four operations where an input or output may be a decimal number, or a negative number.
Greater Depth Explain why a given value is the odd one out. Use of all four operations where an input or output may be a decimal number, a fraction, or a negative number. Functions may also include decimal numbers.

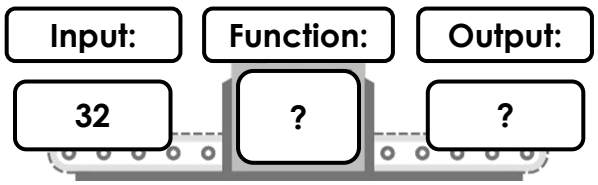
More Year 6 Algebra resources.

Did you like this resource? Don't forget to review it on our website.

Find a Rule – One Step

1a. If Jill has 32 stickers and Lark has more than 17, but fewer than Jill, how many stickers could he have?

What function could be used to show this?



Find 3 possible solutions.

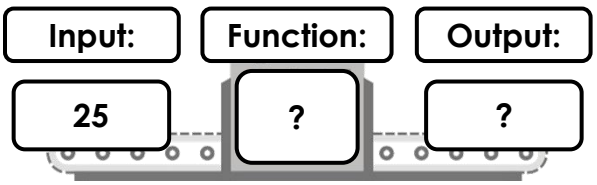
D

PS

Find a Rule – One Step

1b. If Molly has 25 berries and James has fewer than 40, but more than Molly, how many berries could he have?

What function could be used to show this?



Find 3 possible solutions.

D

PS

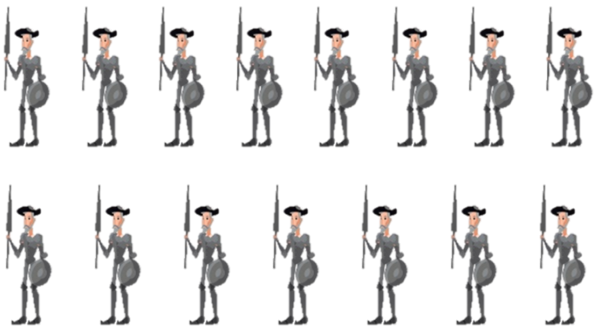
2a. If the function for the number of horses is the number of Spartans + 13, how many horses are there?

Explain your reasoning.

D

R

2b. If the function for the number of dragons is the number of knights – 9, how many dragons are there?



Explain your reasoning.

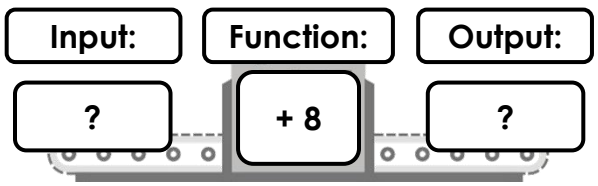
D

R

3a. Four of the cards are inputs or outputs of the function machine below.

Circle the odd one out.

6	16	5	8	14



Explain your reasoning.

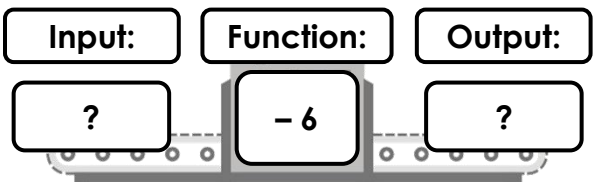
D

R

3b. Four of the cards are inputs or outputs of the function machine below.

Circle the odd one out.

1	9	10	7	15



Explain your reasoning.

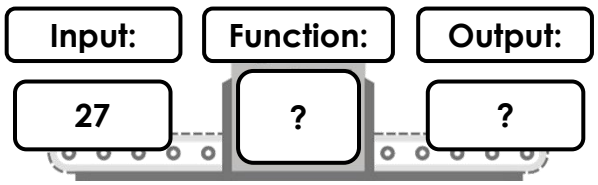
D

R

Find a Rule – One Step

4a. If Sandra has 27 marbles and Kai has more than 20, but fewer than Sandra, how many marbles could he have?

What function could be used to show this?



Find 3 possible solutions.

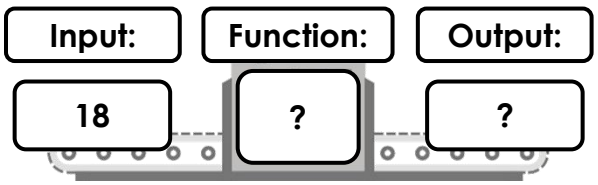
E

PS

Find a Rule – One Step

4b. If Gina has 18 sweets and Abdul has fewer than 29, but more than Gina, how many sweets could he have?

What function could be used to show this?



Find 3 possible solutions.

E

PS

5a. If the function for the number of wizards is the number of ninjas x 7, how many wizards are there?

Explain your reasoning.

E

R

5b. If the function for the number of orcs is the number of barbarians ÷ 3, how many orcs are there?

Explain your reasoning.

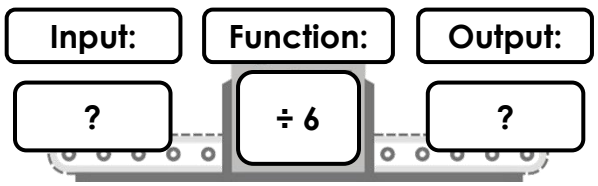
E

R

6a. Four of the cards are inputs or outputs of the function machine below.

Circle the odd one out.

42	4.1	54	24.6	7



Explain your reasoning.

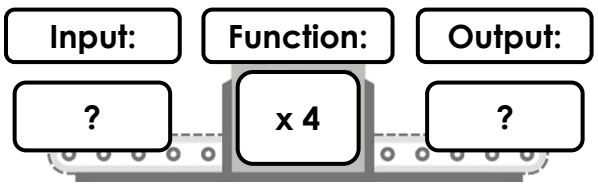
E

R

6b. Four of the cards are inputs or outputs of the function machine below.

Circle the odd one out.

20.8	8	36	5.2	9



Explain your reasoning.

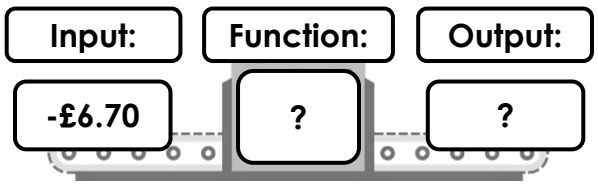
E

R

Find a Rule – One Step

7a. If Mika has -£6.70 in his account, and Yasmin has more than -£17.50, but less than Mika, how much money could she have in her account?

What function could be used to show this?



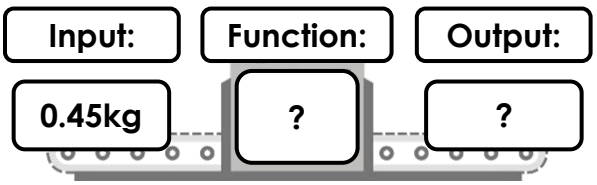
Find 3 possible solutions.

GD

PS

7b. If Davina has used 0.45kg of a bag of flour and Jackson has used less than 0.55kg, but more than Davina, how much flour could he have used?

What function could be used to show this?



Find 3 possible solutions.

GD

PS

8a. If a 2.8L bottle of pop is shared between 20 cups, what would the output per cup be?

Explain your reasoning.

GD

R

8b. If $\frac{5}{8}$ of a 10m carpet is cut into 10 strips, what would the output of each strip of carpet be?

Explain your reasoning.

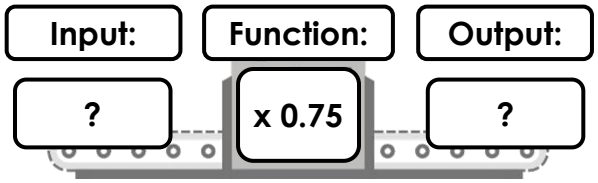
GD

R

9a. Four of the cards are inputs or outputs of the function machine below.

Circle the odd one out.

21	48	12	28	36



Explain your reasoning.

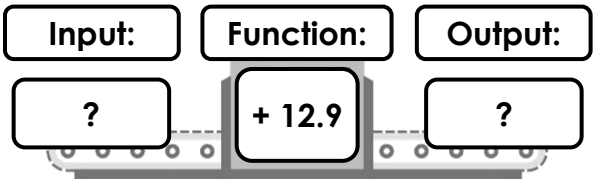
GD

R

9b. Four of the cards are inputs or outputs of the function machine below.

Circle the odd one out.

-18.3	-16.6	3.7	-5.4	16.6



Explain your reasoning.

GD

R

Reasoning and Problem Solving
Find a Rule – One Step

Developing

1a. Various answers, for example:
– 10, 22 stickers; – 9, 23 stickers; – 8, 24 stickers.

2a. There are 23 horses. Various answers, for example: This is because there are 10 Spartans; if the function for the number of horses is the number of Spartans + 13, then the calculation to work this out is 10 + 13 = 23.

3a. 5 is the odd one out because 6 + 8 = 14 and 8 + 8 = 16. 5 + 8 = 13, but there is no number card for 13 (to match 5).

Expected

4a. Various answers, for example:
– 6, 21 marbles; – 5, 22 marbles; – 4, 23 marbles.

5a. There are 63 wizards. Various answers, for example: This is because there are 9 ninjas; if the function for the number of wizards is the number of ninjas x 7, then the calculation to work this out is 9 x 7 = 63.

6a. 54 is the odd one out because 42 ÷ 6 = 7 and 24.6 ÷ 6 = 4.1. 54 ÷ 6 = 9, but there is no number card for 9 (to match 54).

Greater Depth

7a. Various answers, for example:
– £6, -£12.70; – £7, -£13.70; – £8, -£14.70.

8a. Various answers, for example:
The output per cup would be 0.14L or 140ml. This is because the function for the calculation would be ÷ 20 (because there are 20 cups), so the calculation to work this out is 2.8 ÷ 20 = 0.14.

9a. 12 is the odd one out because 28 x 0.75 = 21 and 48 x 0.75 = 36. 12 x 0.75 = 9, but there is no number card for 9 (to match 12).

Reasoning and Problem Solving
Find a Rule – One Step

Developing

1b. Various answers, for example:
+ 5, 30 berries; + 6, 31 berries; + 7, 32 berries.

2b. There are 6 dragons. Various answers, for example: This is because there are 15 knights; if the function for the number of dragons is the number of knights – 9, then the calculation to work this out is 15 – 9 = 6.

3b. 10 is the odd one out because 15 – 6 = 9 and 7 – 6 = 1. 10 – 6 = 4, but there is no number card for 4 (to match 10).

Expected

4b. Various answers, for example:
+ 10, 28 sweets; + 9, 27 sweets; + 8, 26 sweets.

5b. There would be 4 orcs. Various answers, for example: This is because there are 12 barbarians; if the function for the number of orcs is the number of barbarians ÷ 3, then the calculation to work this out is 12 ÷ 3 = 4.

6b. 8 is the odd one out because 5.2 x 4 = 20.8 and 9 x 4 = 36. 8 x 4 = 32, but there is no number card for 32 (to match 8).

Greater Depth

7b. Various answers, for example:
+ 0.01kg, 0.46kg of flour; + 0.02kg, 0.47kg of flour; + 0.03kg, 0.48kg of flour.

8b. Various answers, for example:
The output of each strip of carpet would be 62.5cm or 625mm. This is because $\frac{5}{8}$ of 10m is 6.25m or 625cm. This number is then ÷ 10 (because it is cut into 10 strips) which is the function of the calculation; the final calculation to work this out is 6.25 ÷ 10 = 0.625.

9b. -16.6 is the odd one out because -18.3 + 12.9 = -5.4 and 3.7 + 12.9 = 16.6. -16.6 + 12.9 = -3.7, but there is no number card for -3.7 (to match -16.6).