

# Reasoning and Problem Solving

## Step 3: Forming Expressions

### National Curriculum Objectives:

Mathematics Year 6: (6A1) [Express missing number problems algebraically](#)

### Differentiation:

Questions 1, 4 and 7 (Problem Solving)

**Developing** Find the expression in a sequence which uses addition and multiplication.

**Expected** Find the expression in a multi-step sequence which uses all four operations.

**Greater Depth** Find the expression in a multi-step sequence which uses all four operations.

Includes decimals numbers.

Questions 2, 5 and 8 (Reasoning)

**Developing** Explain the mistake when forming an expression from a one-step function machine, using addition or multiplication.

**Expected** Explain the mistake when forming an expression from a two-step function machine, using all four operations.

**Greater Depth** Explain the mistake when forming an expression from a two-step function machine, using all four operations. Includes decimals numbers.

Questions 3, 6 and 9 (Problem Solving)

**Developing** Work out the output from a given input where the one-step function must be calculated first. Function machine uses addition or multiplication.

**Expected** Work out the output from a given input where the one-step function must be calculated first. Function machine can use all four operations.

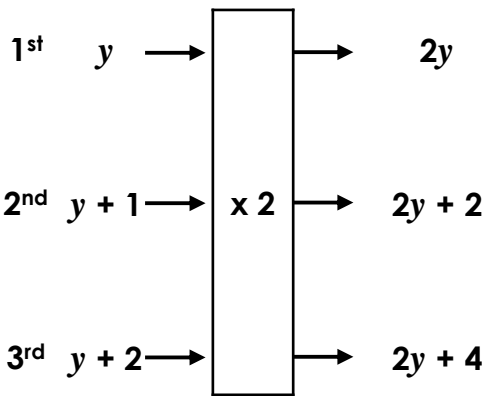
**Greater Depth** Work out the output from a given input where the two-step functions must be calculated first. Function machine can use all four operations and decimal numbers.

More [Year 6 Algebra](#) resources.

Did you like this resource? Don't forget to [review](#) it on our website.

## Forming Expressions

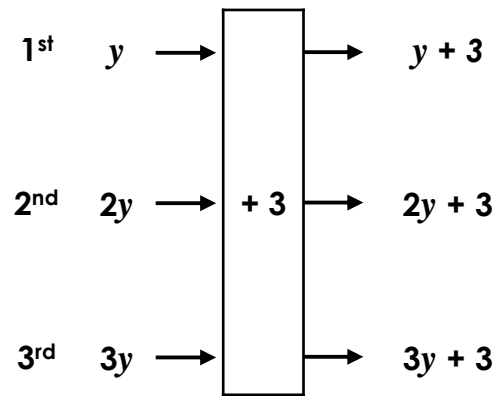
1a. What is the 5<sup>th</sup> expression in the sequence?



PS

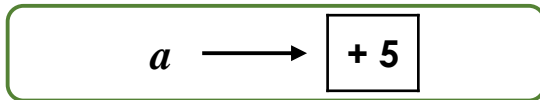
## Forming Expressions

1b. What is the 7<sup>th</sup> expression in the sequence?



PS

2a. Raza has created a function machine.



She says,



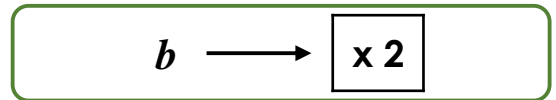
The expression formed from this function machine is  $5a$ .

Explain Raza's mistake.



R

2b. Leon has created a function machine.



He says,



The expression formed from this function machine is  $b \times 2$ .

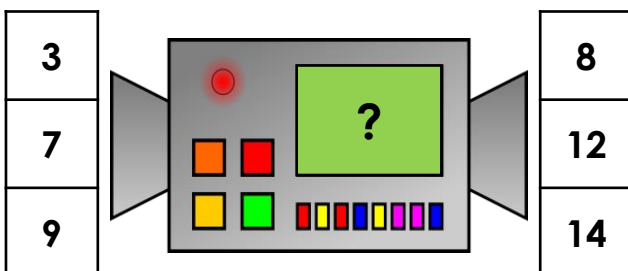
Explain Leon's mistake.



R

3a. Jim has put some terms into a function machine. What is the output if the input is 12?

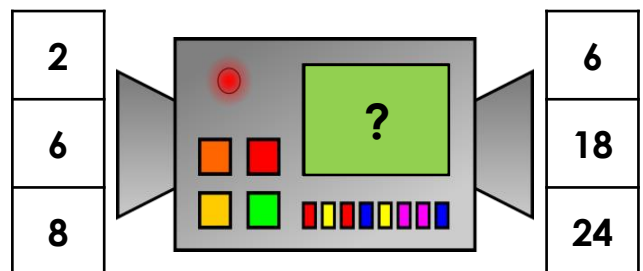
Inputs:                      Function:                      Outputs:



PS

3b. Caz has put some terms into a function machine. What is the output if the input is 9?

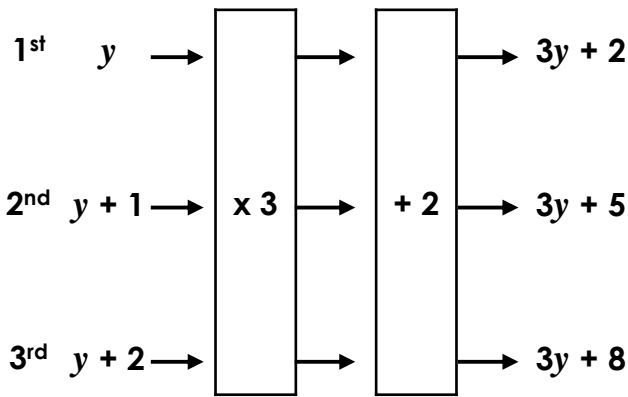
Inputs:                      Function:                      Outputs:



PS

## Forming Expressions

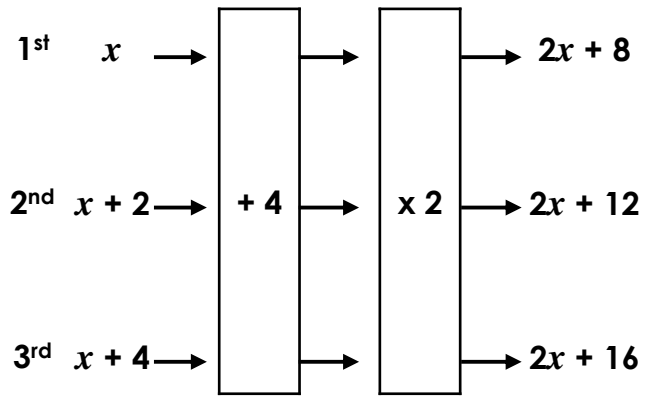
4a. What is the 9th expression in the sequence?



PS

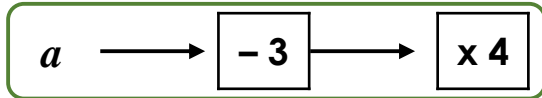
## Forming Expressions

4b. What is the 10th expression in the sequence?



PS

5a. Jane has created a function machine.



She says,



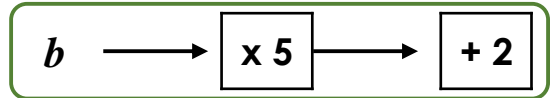
The expression formed from this function machine is  $4a - 3$ .

Explain Jane's mistake.



R

5b. Peri has created a function machine.



He says,



The expression formed from this function machine is  $b \times 5 + 2$ .

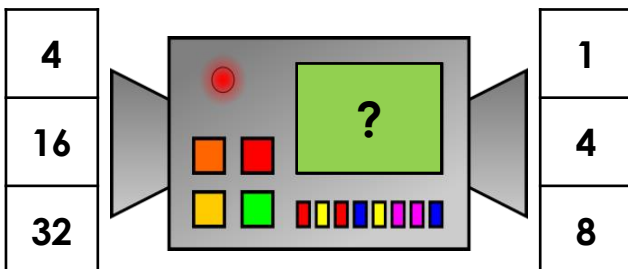
Explain Peri's mistake.



R

6a. Tom has put some terms into a function machine. What is the output if the input is 48?

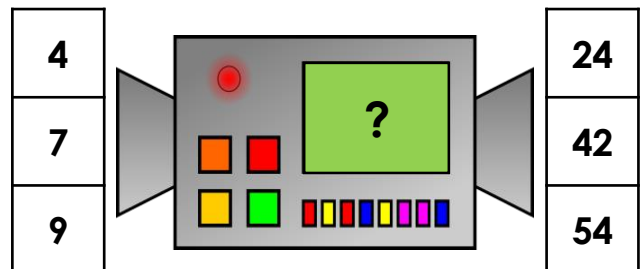
Inputs:                      Function:                      Outputs:



PS

6b. Leia has put some terms into a function machine. What is the output if the input is 12?

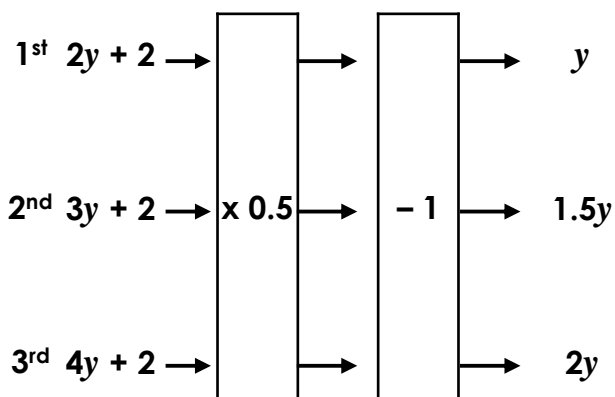
Inputs:                      Function:                      Outputs:



PS

## Forming Expressions

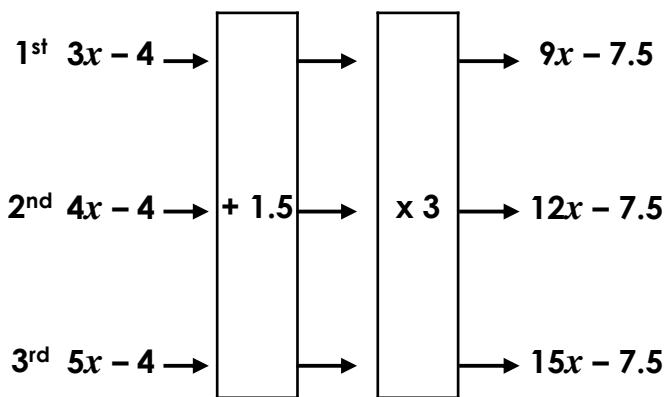
7a. What is the 16th expression in the sequence?



PS

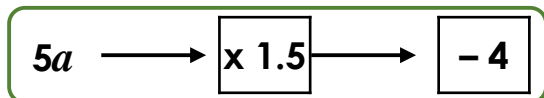
## Forming Expressions

7b. What is the 21st expression in the sequence?



PS

8a. Nya has created a function machine.



She says,



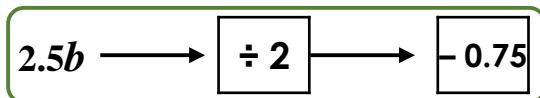
The expression formed from this function machine is  $6.5a - 4$ .

Explain Nya's mistake.



R

8b. Kia has created a function machine.



He says,



The expression formed from this function machine is  $1.5b - 0.75$ .

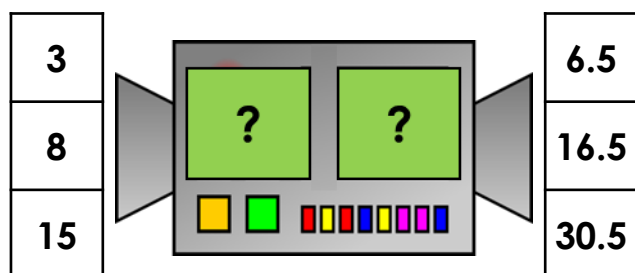
Explain Kia's mistake.



R

9a. Bill has put some terms into a function machine. What is the output if the input is 22?

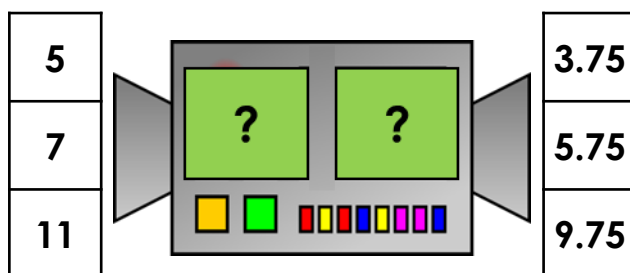
Inputs:                      Functions:                      Outputs:



PS

9b. Saul has put some terms into a function machine. What is the output if the input is 16?

Inputs:                      Functions:                      Outputs:



PS

## Reasoning and Problem Solving Forming Expressions

### Developing

- 1a.  $2y + 8$   
2a. Raza has multiplied instead of adding. Her expression should be  $a + 5$ .  
3a. The function is  $+ 5$  so the output will be 17.

### Expected

- 4a.  $3y + 26$   
5a. Jane has swapped the functions around but this changes the expression. Her expression should be  $a - 3 \times 4$ .  
6a. The function is  $\div 4$  so the output will be 12.

### Greater Depth

- 7a.  $8.5y$   
8a. Nya has added the 5 and 1.5 together to make 6.5. She should have multiplied them together. Her expression should be  $7.5a - 4$ .  
9a. The function is  $\times 2 + 0.5$  so the output will be 44.5.

## Reasoning and Problem Solving Forming Expressions

### Developing

- 1b.  $7y + 3$   
2b. Leon has forgotten that when multiplying in algebra we write the expression  $2b$ .  
3b. The function is  $\times 3$  so the output will be 27.

### Expected

- 4b.  $2x + 44$   
5b. Peri has forgotten that when multiplying in algebra we write the expression  $5b$ . His expression should be  $5b + 2$ .  
6b. The function is  $\times 6$  so the output will be 72.

### Greater Depth

- 7b.  $69x - 7.5$   
8b. Kia has tried to divide 2.5 by 2 to combine the steps but his dividing is inaccurate. His expression should be  $1.25b - 0.75$ .  
9b. The function is  $- 2 + 0.75$  so the output will be 14.75.