
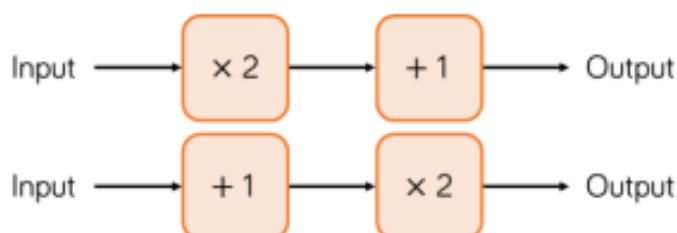


01.02.21 Forming Expressions

Reasoning and problem solving—Maths extension

Answer and reason the questions below to deepen your mathematical understanding. Once complete, self-mark using the answer sheet.

- 1) Amir inputs m into these function machines. 

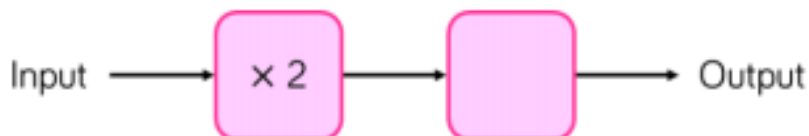


He says the outputs of the machines will be the same.

Do you agree?

Explain your answer.

-
- 2) This function machine gives the same output for every input.
For example if the input is 5 then the output is 5 and so on.




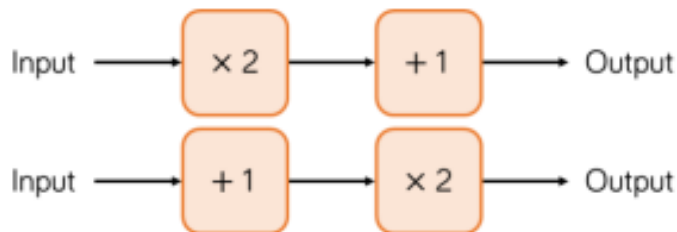
What is the missing part of the function?

What other pairs of functions can you think that will do the same?

01.02.21 Forming Expressions

ANSWER SHEET

- 1) Amir inputs m into these function machines. 



He says the outputs of the machines will be the same.

Do you agree?

Explain your answer.

No, because $2m + 1$ isn't the same as $2m + 2$

$2m + 1$

Input



$\times 2$



$+ 1$



$2m + 2$

Input



$+ 1$

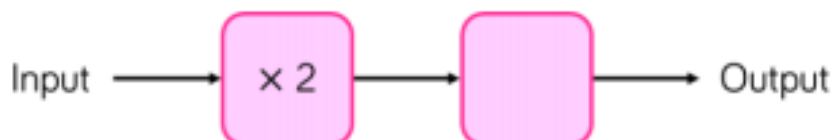


$\times 2$



Children may use examples with numbers to show this.

- 2) This function machine gives the same output for every input.
For example if the input is 5 then the output is 5 and so on.



What is the missing part of the function?

What other pairs of functions can you think that will do the same?

$\div 2$

Other pairs of functions that will do the same are functions that are the inverse of each other e.g. $+ 3, - 3$

02.02.21 Substitution

Reasoning and problem solving—Maths extension

Answer and reason the questions below to deepen your mathematical understanding. Once complete, self-mark using the answer sheet.

1) Here are two formulae.

$$p = 2a + 5$$

$$c = 10 - p$$

Find the value of c when $a = 10$

2)

$$x = 2c + 6$$

Whitney says,



$x = 12$ because c must be equal to 3 because it's the 3rd letter in the alphabet

Is Whitney correct?

Amir says,

When $c = 5$, $x = 31$



Amir is wrong.

Explain why.

What would the correct value of x be?

Answers can be found on the next page.

02.02.21 Substitution

ANSWER SHEET

- 1) Here are two formulae.

$$p = 2a + 5$$

$$c = 10 - p$$

$$c = -15$$

Find the value of c when $a = 10$

2)

$$x = 2c + 6$$

Whitney says,



$x = 12$ because c must be equal to 3 because it's the 3rd letter in the alphabet

Is Whitney correct?

Amir says,

When $c = 5$, $x = 31$



Amir is wrong.

Explain why.

What would the correct value of x be?

No Whitney is incorrect. c could have any value.

Amir has put the 2 next to the 5 to make 25 instead of multiplying 2 by 5

The correct value of x would be 16

03.02.21 Formulae

Reasoning and problem solving—Maths extension

Answer and reason the questions below to deepen your mathematical understanding. Once complete, self-mark using the answer sheet.

- 1) Jack and Dora are using the following formula to work out what they should charge for four hours of cleaning.

$$\text{Cost in pounds} = 20 + 10 \times \text{number of hours}$$

Jack thinks they should charge £60

Dora thinks they should charge £120

Who do you agree with?

Why?

-
- 2) The rule for making scones is use 4 times as much flour (f) as butter (b).

Which is the correct formula to represent this?

A

$$f = \frac{b}{4}$$

B

$$f = 4b$$

C

$$f = b + 4$$

D

$$4f = b$$

Explain why the others are incorrect.

03.02.21 Formulae

ANSWER SHEET

- 1) Jack and Dora are using the following formula to work out what they should charge for four hours of cleaning.

$$\text{Cost in pounds} = 20 + 10 \times \text{number of hours}$$

Jack thinks they should charge £60

Dora thinks they should charge £120

Who do you agree with?

Why?

Jack is correct as multiplication should be performed first following the order of operations.

Dora has not used the order of operations – she has added 20 and 10 and then multiplied 30 by 4

- 2) The rule for making scones is use 4 times as much flour (f) as butter (b).

Which is the correct formula to represent this?

A

$$f = \frac{b}{4}$$

B

$$f = 4b$$

C

$$f = b + 4$$

D

$$4f = b$$

Explain why the others are incorrect.

B is correct.

A shows the amount of flour is a quarter of the amount of butter.

C shows the amount of flour is 4 more than butter.

D shows butter is 4 times the amount of flour.

04.02.21 Forming Equations

Reasoning and problem solving—Maths extension

Answer and reason the questions below to deepen your mathematical understanding. Once complete, self-mark using the answer sheet.

- 1) Rosie thinks of a number. She adds 7 and divides her answer by 2

Teddy thinks of a number. He multiplies by 3 and subtracts 4

Rosie and Teddy think of the same number.

Rosie's answer is 9

What is Teddy's answer?

Rosie and Teddy think of the same number again. This time, they both get the same answer.

Use trial and improvement to find the number they were thinking of.

-
- 2) Eva spends 92p on yo-yos and sweets

She buys y yo-yos costing 11p and s sweets costing 4p.

Can you write an equation to represent what Eva has bought?

How many yo-yos and sweets could Eva have bought?

Can you write a similar word problem to describe this equation?

$$74 = 15t + 2m$$

Answers can be found on the next page.

04.02.21 Forming Equations

ANSWER SHEET

- 1) Rosie thinks of a number. She adds 7 and divides her answer by 2
- Teddy thinks of a number. He multiplies by 3 and subtracts 4
- Rosie and Teddy think of the same number.
Rosie's answer is 9
What is Teddy's answer?
- Rosie and Teddy think of the same number again. This time, they both get the same answer.
- Use trial and improvement to find the number they were thinking of.
- 2) Eva spends 92p on yo-yos and sweets
- She buys y yo-yos costing 11p and s sweets costing 4p.
- Can you write an equation to represent what Eva has bought?
- How many yo-yos and sweets could Eva have bought?
- Can you write a similar word problem to describe this equation?

They both think of 11, therefore
Teddy's answer is 29

They think of 3
and the answer they both get is 5

$$92 = 11y + 4s$$

She could have bought 1 sweet and 8 yo-yos or 4 yo-yos and 12 sweets.

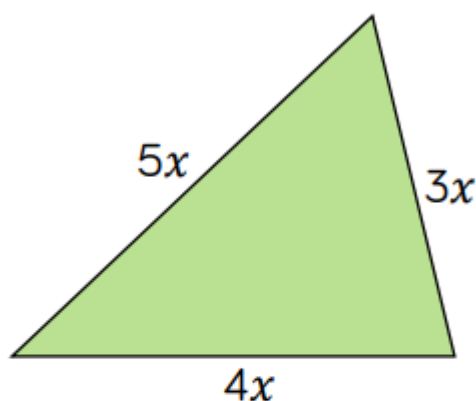
$$74 = 15t + 2m$$

05.02.21 One Step Equations

Reasoning and problem solving—Maths extension

Answer and reason the questions below to deepen your mathematical understanding. Once complete, self-mark using the answer sheet.

- 1) The perimeter of the triangle is 216 cm.



Form an equation to show this information.

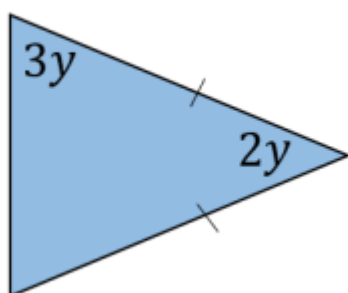
Solve the equation to find the value of x .

Work out the lengths of the sides of the triangle.

-
- 2) • Hannah is 8 years old
• Jack is 13 years old
• Grandma is $x + 12$ years old.
• The sum of their ages is 100

Form and solve an equation to work out how old Grandma is.

- 3) What is the size of the smallest angle in this isosceles triangle?



How can you check your answer?

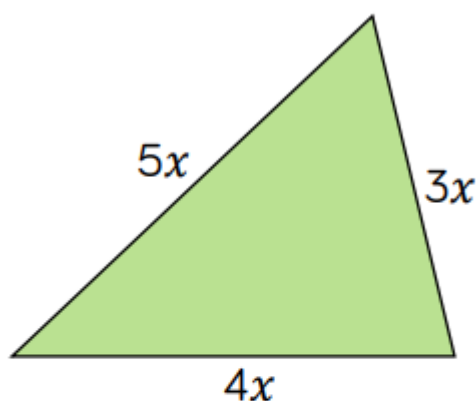
Answers can be found on the next page.

05.02.21 One Step Equations

ANSWER SHEET

Answer and reason the questions below to deepen your mathematical

- 1) The perimeter of the triangle is 216 cm.



Form an equation to show this information.

Solve the equation to find the value of x .

Work out the lengths of the sides of the triangle.

$$3x + 4x + 5x = 216$$

$$12x = 216$$

$$x = 18$$

$$5 \times 18 = 90$$

$$3 \times 18 = 54$$

$$4 \times 18 = 72$$

- 2) • Hannah is 8 years old
• Jack is 13 years old
• Grandma is $x + 12$ years old.
• The sum of their ages is 100

Form and solve an equation to work out how old Grandma is.

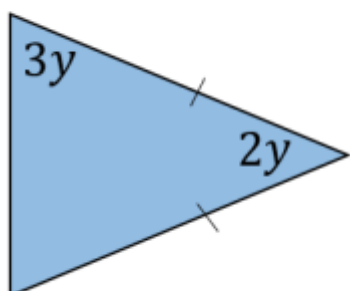
$$8 + 13 + x + 12 = 100$$

$$33 + x = 100$$

$$x = 77$$

Grandma is 77 years old.

- 3) What is the size of the smallest angle in this isosceles triangle?



How can you check your answer?

$$8y = 180$$

$$y = 22.5$$

Smallest angle = 45°

Check by working them all out and see if they add to 180°

Answers can be found on the next page.