

Answer **all** the questions.

INVESTIGATION CHANGING THE ORDER OF OPERATIONS

This investigation is about the results of two calculations when you change the order of operations.

Each calculation uses three integers, x , y and z .

Calculation 1

Add y and z .
Multiply the answer by x .

Calculation 2

Multiply y and z .
Add the answer to x .

Example

$x = 3$, $y = 5$, $z = 7$.

Calculation 1

$$y + z = 5 + 7 = 12$$

$$12 \times x = 12 \times 3 = 36$$

$$\text{Result} = 36$$

Calculation 2

$$y \times z = 5 \times 7 = 35$$

$$35 + x = 35 + 3 = 38$$

$$\text{Result} = 38$$

1 In this question $x = 2$, $y = 4$, $z = 6$.

Complete calculation 1 and calculation 2.

Calculation 1

$$y + z = 4 + 6 = \dots\dots\dots$$

$$\dots\dots\dots \times x = \dots\dots\dots \times 2 = \dots\dots\dots$$

$$\text{Result} = \dots\dots\dots$$

Calculation 2

$$y \times z = 4 \times 6 = \dots\dots\dots$$

$$\dots\dots\dots + x = \dots\dots\dots + 2 = \dots\dots\dots$$

$$\text{Result} = \dots\dots\dots$$

[4]

2 (a) Work out the results of calculation 1 and calculation 2 when $x = 3$, $y = 4$, $z = 9$.

Result of calculation 1:

Result of calculation 2: [2]

(b) What do you notice about your results in **part (a)**?

..... [1]

3 In this question x and z do not change in each part.

(a) In this part $x = 2$ and $z = 4$.

Complete the table.

| | | | Calculation 1 | | Calculation 2 | |
|-----|-----|-----|---------------|----------------------------|---------------|-----------------------|
| x | y | z | $y+z$ | $\times x = \text{result}$ | $y \times z$ | $+ x = \text{result}$ |
| 2 | 1 | 4 | 5 | | 4 | |
| 2 | 2 | 4 | | 12 | | 10 |
| 2 | 3 | 4 | | | | |

[3]

(b) In this part $x = 3$ and $z = 6$.
 y increases by 1 each time.

Continue the table until the two results are the same.
You may not need all the rows.

| x | y | z | $y+z$ | $\times x = \text{result}$ | $y \times z$ | $+ x = \text{result}$ |
|-----|-----|-----|-------|----------------------------|--------------|-----------------------|
| 3 | 1 | 6 | 7 | 21 | 6 | 9 |
| 3 | 2 | 6 | 8 | 24 | 12 | 15 |
| 3 | 3 | 6 | | | | |
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[3]

(c) In this part $x = 4$ and $z = 8$.

Find the value of y that makes the results of calculation 1 and calculation 2 the same.
Use this table to help you.

| | | | Calculation 1 | | Calculation 2 | |
|-----|-----|-----|---------------|----------------------------|---------------|----------------------|
| x | y | z | $y+z$ | $\times x = \text{result}$ | $y \times z$ | $+x = \text{result}$ |
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$y = \dots\dots\dots$ [3]

4 The results of calculation 1 and calculation 2 are the same.

(a) Complete the table.

Use your answers to **Question 3** and any patterns you notice to help you.

| x | y | z |
|-----|-----|-----|
| 2 | | 4 |
| 3 | | 6 |
| 4 | | 8 |
| 5 | | |
| 6 | | |
| | | |
| | 17 | |

[3]

(b) Find expressions in terms of x for y and for z .

$y =$

$z =$ [2]

5 In this question $x = 1$ and $y = 1$.

(a) Write down expressions for calculation 1 and for calculation 2 in terms of z .
Show that these results are the same.

[2]

(b) What do your results in **part (a)** tell you about the value of z ?

..... [1]

6 In this question x , y and z are consecutive. For example 15, 16 and 17.

(a) Complete the table.

| x | y | z |
|-----|-----|-----|
| 15 | 16 | 17 |
| 12 | | |
| | | 20 |

[1]

(b) Write y and z in terms of x .

$$y = \dots\dots\dots$$

$$z = \dots\dots\dots [1]$$

(c) Show that the result of calculation 1 is $2x^2 + 3x$.

[2]

(d) Find the result of calculation 2 in terms of x .
Give your answer in its simplest form.

..... [3]

(e) The results of calculation 1 and calculation 2 are the same.

Show that $x^2 = x + 2$.

[1]

Question 6(f) is printed on the next page.

- (f) The results of calculation 1 and calculation 2 are the same.
 x , y and z are consecutive.
 x , y and z are all between -5 and 5 .

Find two sets of values for x , y and z .

..... [4]

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