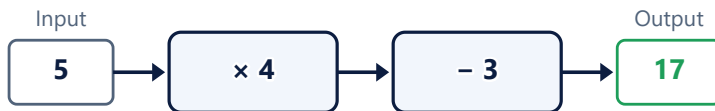




1 Here is a number machine.

- Work out the output when the input is 5.
- Work out the output when the input is 10.



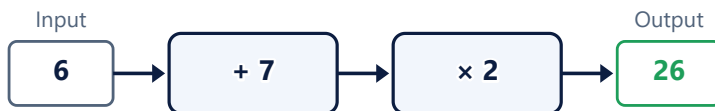
(2 marks)

$$a) 5 \times 4 = 20, \text{ then } 20 - 3 = 17$$

$$b) 10 \times 4 = 40, \text{ then } 40 - 3 = 37$$

2 Here is a number machine.

- Work out the output when the input is 6.
- Work out the output when the input is 3.5



(2 marks)

$$a) 6 + 7 = 13, \text{ then } 13 \times 2 = 26$$

$$b) 3.5 + 7 = 10.5, \text{ then } 10.5 \times 2 = 21$$

3 Here is a function machine.

input $\rightarrow \times 4 \rightarrow - 3 \rightarrow$ output

The input is 2.5. Work out the output.

(2 marks)

$$2.5 \times 4 = 10$$

$$10 - 3 = 7$$

7

- 4 A bike hire company uses this rule.

Cost in pounds = $6 \times \text{number of hours} + 10$

Sam hires a bike for 4 hours. Work out the cost.

(2 marks)

$$\text{Cost} = 6 \times 4 + 10$$

$$= 24 + 10$$

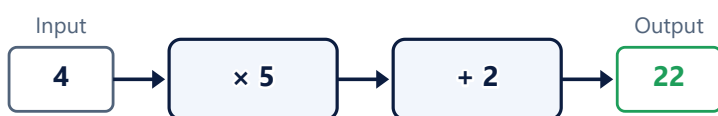
$$= 34$$

$$\boxed{\text{£}34}$$

- 5 Here is a number machine.

a. Work out the output when the input is 4.

b. Work out the input when the output is 37.



(3 marks)

To recover an input, undo the last operation first and work backwards. Addition is undone by subtraction; multiplication is undone by division

$$\text{a) } 4 \times 5 = 20, \text{ then } 20 + 2 = 22$$

b) Work backwards using inverse operations

$$37 - 2 = 35, \text{ then } 35 \div 5 = 7$$

Check

$$7 \times 5 + 2 = 37$$

- 6 Here is a function machine.

input $n \rightarrow \times 3 \rightarrow + 2 \rightarrow \text{output}$

Write an expression for the output.

(2 marks)

$$n \times 3 = 3n$$

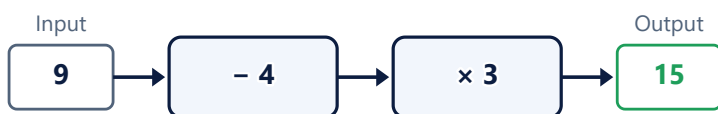
$$3n + 2$$

$$\boxed{3n + 2}$$

7

Here is a number machine.

- Work out the output when the input is 9.
- Work out the input when the output is 24.



(3 marks)

a) $9 - 4 = 5$, then $5 \times 3 = 15$

b) Work backwards

$24 \div 3 = 8$, then $8 + 4 = 12$

Check

$(12 - 4) \times 3 = 24$

8

A bike hire company uses this rule.

Cost in pounds = $6 \times \text{number of hours} + 10$

Fatima pays £58. For how many hours did she hire the bike?

(3 marks)

$$\begin{array}{rcl}
 6h + 10 & = & 58 \\
 -10 & & -10 \\
 \hline
 6h & = & 48 \\
 \div 6 & & \div 6 \\
 \hline
 h & = & 8
 \end{array}$$

8 hours

9

Here is a number machine.

- Work out the output when the input is 2.5
- Work out the input when the output is 31.



(3 marks)

a) $2.5 \times 6 = 15$, then $15 - 5 = 10$

b) Work backwards

$31 + 5 = 36$, then $36 \div 6 = 6$

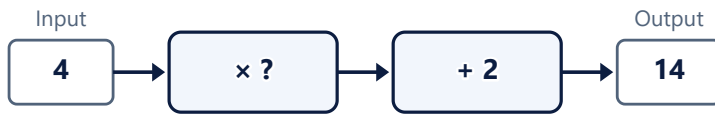
Check

$6 \times 6 - 5 = 31$

- 10 Here is a number machine with a missing number.

When the input is 4, the output is 14.

- Work out the missing number in the machine.
- Use the completed machine to work out the output when the input is 7.



(3 marks)

a) Before the + 2 step the number must be $14 - 2 = 12$

a) The input 4 is multiplied to give 12, so the missing number is

$$12 \div 4 = 3$$

$$b) 7 \times 3 = 21, \text{ then } 21 + 2 = 23$$

- 11 A plumber charges a fixed call-out fee of £40 plus £28 for each hour of work.

The plumber works for h hours on a job.

The total charge for the job is £ C .

Write a formula for C in terms of h .

(3 marks)

The hourly part of the charge is $28 \times h = 28h$ pounds

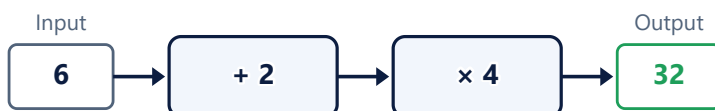
Add the fixed £40 call-out fee

$$C = 40 + 28h$$

$$C = 40 + 28h$$

- 12 Here is a number machine.

- Work out the output when the input is 6.
- Find the input when the output is 30.



(3 marks)

$$a) 6 + 2 = 8, \text{ then } 8 \times 4 = 32$$

b) Work backwards

$$30 \div 4 = 7.5, \text{ then } 7.5 - 2 = 5.5$$

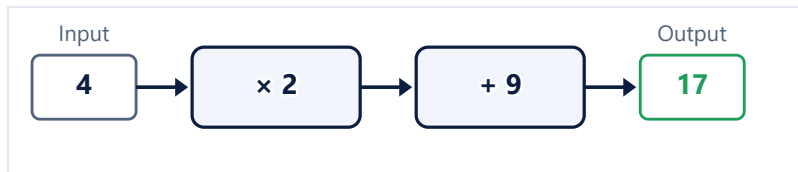
Check

$$(5.5 + 2) \times 4 = 30$$

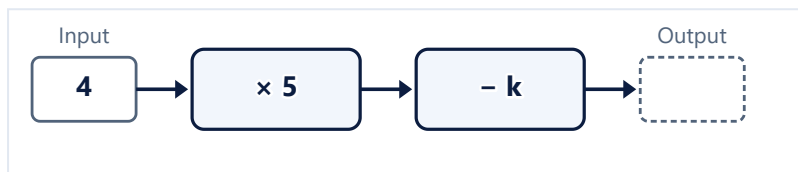
13

Here are two number machines.

- Work out the output of machine A when the input is 4.
- Work out the input of machine A when the output is 35.
- When the input is 4, machine B gives the same output as machine A.
Work out the value of k .



Machine A



Machine B

(4 marks)

a) $4 \times 2 = 8$, then $8 + 9 = 17$

b) Work backwards

$35 - 9 = 26$, then $26 \div 2 = 13$

c) Machine B with input 4

$4 \times 5 = 20$, then $20 - k$

c) This must equal 17, so $20 - k = 17$ and $k = 3$

14

A tool hire company uses this rule to work out the cost of hiring a floor sander.

Total cost = £45 × number of days + £60 deposit

- Meera hires the sander for 7 days.
Work out her total cost.
- Liam's total cost is £555.
Work out the number of days Liam hires the sander for.

(4 marks)

a) $45 \times 7 = 315$, then $315 + 60 = 375$. Total cost £375

b) Take off the deposit

$555 - 60 = 495$

b) Divide by the daily rate

$495 \div 45 = 11$ days

Check

$45 \times 11 + 60 = 555$

15

Here is a number machine.

- Work out the output when the input is 7.
- Write down an expression for the output when the input is n .
- Find the input when the output is 55.



(4 marks)

a) $7 \times 4 = 28$, then $28 - 1 = 27$

b) The input n is multiplied by 4 then 1 is subtracted, giving $4n - 1$

c) *Work backwards*

$55 + 1 = 56$, then $56 \div 4 = 14$

Check

$4 \times 14 - 1 = 55$

16

A taxi journey costs a fixed charge of £3 plus £2 for each mile travelled.

A journey of m miles costs £ C in total.

- Write a formula for C in terms of m .
- A journey costs £25 in total.
Work out the number of miles travelled.

(4 marks)

a) The mileage part costs $2 \times m = 2m$ pounds, plus the fixed £3, so $C = 3 + 2m$

b) Substitute $C = 25$: $25 = 3 + 2m$

b) $2m = 22$, so $m = 11$. The journey was 11 miles

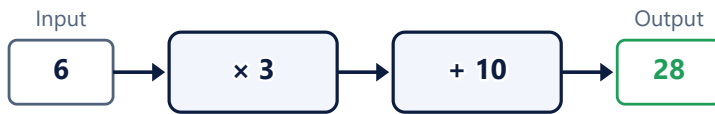
Check

$3 + 2 \times 11 = 3 + 22 = 25$

17

Here is a number machine.

- Work out the output when the input is 6.
- Work out the input when the output is 4.
- For one value of the input, the output of the machine is equal to the input.
Work out this value.



(5 marks)

a) $6 \times 3 = 18$, then $18 + 10 = 28$

b) *Work backwards*

$4 - 10 = -6$, then $-6 \div 3 = -2$

c) Call the input x . The output is $3x + 10$, so solve $3x + 10 = x$

c) $2x = -10$, so $x = -5$

Check

$-5 \times 3 + 10 = -5$, which equals the input