2.4 Formula and Substitution

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January 2018 1F

19 $A = p^2 + 7q$

(a) Work out the value of A when $p = -7$ and $q = 5$

$A =$ .....

(2)

$A = p^2 + 7q$

(b) Work out the value of q for which $A = 100$ when $p = 11$

$q =$ .....

(3)

January 2018 2F

12 $P = 3d - 2e$

(a) Work out the value of P when $d = 7$ and $e = 9$

$P =$ .....

(2)

January 2018 2F

15 Mike buys c pens and r rulers.

Each pen costs 24 cents.
Each ruler costs 37 cents.

Mike spends a total of T cents buying pens and rulers.

Write down a formula for T in terms of c and r.

.....

(Total for Question 15 is 3 marks)

January 2018 1FR

13 $y = 2w$

(a) Work out the value of y when $w = 30$

$y =$ .....

(1)

$t = 2c + 3d$
$c = 8$
$d = 5$

(b) Work out the value of t.

$t =$ .....

(2)

8 (a) Find the value of $25 - 4g$ when $g = -3$

.....

(2)

June 2018 2F

13 Tenzin walks in the mountains.
She has a rule to estimate the temperature at different heights on a mountain.

Temperature decreases by 2 °C for every increase of 300 metres in height.

The temperature at a height of 800 metres on a mountain is 6 °C.

(a) Use Tenzin's rule to work out an estimate of the temperature at a height of 2000 metres on the mountain.

..... °C

(3)

Tenzin also has a rule to estimate the time it will take her to complete a walk in the mountains.

She uses

an average speed of 5 km / h for the distance she will walk

and then

adds on 1 minute for every increase of 10 metres in height.

Tenzin plans to walk 12 km in the mountains with an increase of 800 metres in height.

(b) Use Tenzin's rule to work out an estimate for the time it will take her to complete this walk.
Give your answer in hours and minutes.

..... hours ..... minutes

(3)

June 2018 2F

18 (a) Make a the subject of the formula $M = ac - bd$

.....

(2)

14 $y = c - dx$

$c = 15$
$d = 8$
$x = -4$

(a) Work out the value of y.

$y =$ .....

(2)

$t = 4(p - q)$

$t = 18$
$q = 6$

(b) Work out the value of p.

$p =$ .....

(2)

June 2018 1FR

20 $E = n^2 + n + 5$

(a) Work out the value of E when $n = 3$

$E =$ .....

(1)

Ali thinks that the value of E will be a prime number for any whole number value of n.

(b) Is Ali correct?
You must give a reason for your answer.

.....

.....

(2)

June 2018 2FR

21

(d) Make e the subject of the formula $h = 3e + f$

.....

(2)

January 2019 1F

9 $h = 6q - 2u$

(a) Work out the value of h when $q = 3$ and $u = -5$

$h =$

(2)

$B = 3m + 2p$

(b) Work out the value of p when $B = 2$ and $m = 5$

$p =$

(2)

January 2019 2F

11

(b) Make t the subject of $k = \dfrac{t - e}{2}$

(2)

11

$C = 5a + 4d$

(c) Work out the value of C when $a = -3$ and $d = 6$

$C =$

(2)

$P = 3t^2 + 7t$

(d) Work out the value of P when $t = -4$

$P =$

(2)

13

(b) Make w the subject of $t = 7w + 3$

(2)

Pencils cost 2 dollars each.
Rulers cost 3 dollars each.

Edith buys p pencils and r rulers.
The total cost is T dollars.

(c) Write down a formula for T in terms of p and r.

(3)

June 2019 1F

16 $P = 2g + 3h$

(a) Work out the value of P when $g = 7$ and $h = -4$

.....

(2)

June 2019 2F

9 Simon has x sweets.
Yuen has 2 more sweets than Simon.
Giulia has 3 times as many sweets as Yuen.

Simon, Yuen and Giulia have a total of T sweets.

(a) Write down a formula for T in terms of x.
Give your formula in its simplest form.

.....

(3)

(b) Make g the subject of the formula $r = 4g + 7$

.....

(2)

June 2019 1FR

8

(f) Make y the subject of $H = 3y - w$

.....

(2)

June 2019 2FR

13

$y = 5e^2 + 20$

(c) Work out the value of y when $e = -3$

$y =$ .....

(2)

January 2020 1F

8 $P = 2a + 3b$

(b) Work out the value of P when $a = 5$ and $b = 8$

$P =$ .....

(2)

$P = 2a + 3b$

(c) Work out the value of a when $P = 16$ and $b = 20$

$a =$ .....

(3)

January 2020 2F

13

(c) Make p the subject of the formula $f = 3p - d$

.....

(2)

Sergio buys m boxes of seeds and n packets of seeds.

Each box contains 10 seeds.
Each packet contains 6 seeds.

The total number of seeds that Sergio buys is T.

(d) Write down a formula for T in terms of m and n.

.....

(3)

January 2020 1FR

6 $P = 7w - 5y$

(c) Find the value of P when $w = 2$ and $y = 4$

$P =$ .....

(2)

$Q = 2u^2 - 5$

(d) Find the value of Q when $u = -3$

$Q =$ .....

(2)

16 (a) Make a the subject of $d = g + 2ac$

(2)

9 $c = 4$
$d = 7$

(a) Work out the value of $3c + 2d$

(2)

$p = -6$
$m = -2$

(b) Work out the value of $2p^2 + 3m$

(2)

There are 6 eggs in a small box of eggs.
There are 12 eggs in a large box of eggs.

Alex buys g small boxes of eggs and h large boxes of eggs.
He buys a total of T eggs.

(c) Write down a formula for T in terms of g and h.

(3)

June 2020 2F

14

(b) Make y the subject of the formula $c = 5y - h$

.....

(2)

January 2021 1F

12

$t = ab - c$

$a = 1.5$ $b = 2.4$ $c = -5.6$

(b) Work out the value of t.

$t =$ .....

(2)

(c) Make d the subject of $y = dx - e$

.....

(2)

7

$18^2 + 15^2 - 5^3 = 4n$

(f) Work out the value of n.

$n =$ .....

(2)

January 2021 1FR

21 (a) Make c the subject of $A = \frac{c}{y} - 5z$

.....

(2)

January 2021 2FR

11 $w = 5y^2 - y^3$

(a) Work out the value of w when $y = -2$

$w =$ .....

(2)

7

Here are five times, in a single day, using the 24-hour clock.

A	B	C	D	E
11 53	15 20	08 20	18 12	16 45

Francesco uses the rule below to find the time, in minutes, to cook a chicken in his oven.

Number of minutes to cook a chicken
Multiply the weight of the chicken, in kg, by 40 and then add 15

The clock on Francesco's oven shows time **B**.
Francesco starts cooking a chicken at this time.
He stops cooking the chicken when the clock on his oven shows time **E**.

(c) Work out the weight of the chicken.

..... kg

(3)

(d) Use Francesco's rule to write down a formula for the time, T minutes, to cook a chicken of weight k kilograms.

.....

(2)

20

(b) Make t the subject of the formula $p = at - d$

.....

(2)

12 This formula can be used to work out the cost, in riyals, of hiring a bicycle in Qatar for a number of days.

Cost = 65 × number of days + 44

Ghalia hired a bicycle in Qatar for 14 days.

(a) Work out the cost.

..... riyals

(2)

This formula can be used to work out the cost, in riyals, of hiring a helmet in Qatar for a number of days.

Cost = 12.5 × number of days

Kasun wants to hire a bicycle and a helmet for the same number of days.
He wants to hire them for as many days as he can.
He has 750 riyals to spend.

(b) Work out how much of the 750 riyals is not spent.

..... riyals

(4)

12 $T = 6p - 4d$

(a) Work out the value of T when $p = 8$ and $d = 3$

$T =$ .....

(2)

$T = 6p - 4d$

(b) Work out the value of p when $T = -41$ and $d = 5$

$p =$ .....

(3)

12 Alisa, Jena and Mikael each pick cucumbers.

Alisa picks C cucumbers.
Jena picks 5 fewer cucumbers than Alisa.
Mikael picks twice as many cucumbers as Alisa.

The total number of cucumbers picked by Alisa, Jena and Mikael is T

Find a formula for T in terms of C
Give your formula in its simplest form.

.....

(Total for Question 12 is 3 marks)

13

There are 200 bolts in each box of bolts.
Samira buys c boxes of bolts.

Samira uses the bolts she bought to fill packets of bolts.
There are 50 bolts in each packet of bolts.
Samira sells d packets of bolts.

The total number of bolts Samira has left is T

(b) Write down a formula for T in terms of c and d

.....

(3)

January 2022 1F

16

(d) Make t the subject of $c = t^3 - 8v$

.....

(2)

January 2022 2FR

8 Danielle is going to print some business cards.

She uses this rule to work out the total cost, in euros, of printing the business cards.

Total cost = price per card × number of cards + fixed fee

price per card = 0.14 euros
fixed fee = 25 euros

Danielle is going to print 350 business cards.

Work out the total cost of printing the business cards.

..... euros

(Total for Question 8 is 3 marks)

January 2022 2FR

15

(d) Make g the subject of $k = 2g + t$

.....

(2)

June 2022 1F

8

$A = 3b - 5c$

(b) Work out the value of A when $b = 12$ and $c = 4$

$A =$ .....

(2)

June 2022 2F

11

Rosanna sells m small bags of marbles and p large bags of marbles.

Each small bag contains 15 marbles.
Each large bag contains 40 marbles.

The total number of marbles that Rosanna sells is T

(e) Write down a formula for T in terms of m and p

.....

(3)

June 2022 1FR

9

$A = 8x - 3y$

(b) Work out the value of A when $x = 5$ and $y = 4$

$A =$ .....

(2)

14 Jakub has bought a chicken.

He is going to use this rule to work out the number of minutes it will take to cook his chicken.

Cooking time (minutes)

Multiply the chicken's weight, in kg, by 40
Then add
30

The weight of Jakub's chicken is 2.6 kg

(a) Use the rule to work out the number of minutes it will take to cook Jakub's chicken.

..... minutes
(2)

The following week Jakub buys another chicken.

He uses the rule and works out that it will take 2 hours 40 minutes to cook this chicken.

(b) Work out the weight of this chicken.

..... kg
(3)

9

$Q = 5v^2 - w$

(d) Work out the value of Q when $v = \frac{1}{2}$ and $w = \frac{1}{4}$

$Q =$ .....

(2)

13 $p = t - ac$

$t = 18$
$a = -3$
$c = 5$

(a) Work out the value of p

$p =$ .....

(2)

(b) Make x the subject of the formula $d = 3x + 10$

.....

(2)

January 2023 2FR

14

(c) Make m the subject of the formula $h = \frac{m}{2} + 4$

.....

(2)

June 2023 2F

13

There are 8 slices of cheese in each small pack of cheese.
There are 20 slices of cheese in each large pack of cheese.

Afreen buys h small packs of cheese and j large packs of cheese.
She buys a total of T slices of cheese.

(c) Write down a formula for T in terms of h and j

.....

(3)

June 2023 2FR

16

$T = 5g + 4r$

(c) Work out the value of r when $T = 46$ and $g = 17$

$r =$ .....

(3)

$P = m^2 - 4c$

(d) Work out the value of P when $m = -5$ and $c = 3$

$P =$ .....

(2)

November 2023 1F

7

$T = 8e - 6f$

(c) Work out the value of T when $e = 9$ and $f = 5$

$T =$ .....

(2)

12

(c) Make e the subject of $y = eh - f$

.....

(2)