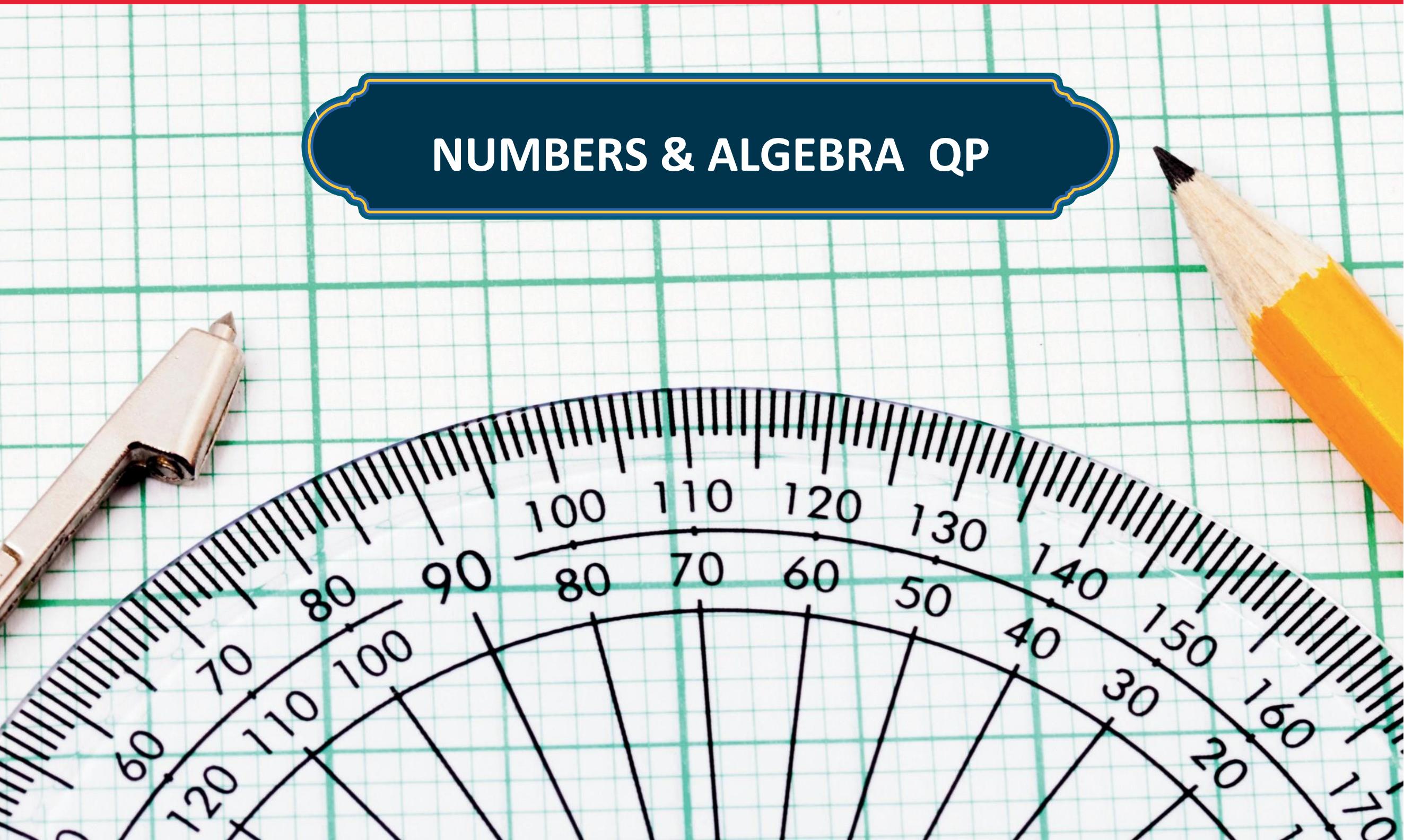# POIN7S

Your International Curriculum Expert

# ELEVATE

## MATH TOPICAL WORKSHEETS

### NUMBERS & ALGEBRA QP

## Numbers

**1.** A museum records the value of a picture every 5 years.
The picture increases in value by $60\%$ every 5 years.
The value the museum recorded in 2020 was $20000.
**(a)** Calculate the value recorded in 2015.

$.....................................[2]

**(b)** Show that the value recorded in 2040 will be $131072.

[1]

**(c)** Calculate the year in which the value recorded will first be over $1000000.

**[4]**

**2. (a)** In 1911 the men's world record for the triple jump was 15.52 m. In 2021 the record was 18.29 m.

Find 15.52 m as a percentage of 18.29 m.

..........................................%[1]

**(b)** In 2021 the women's world record for running 800 m was 1 minute 53 seconds.

Find the average speed for this run in m's.

..........................................m/s[2]

**(c)** In 2021 the men's world record speed for running 100 m was 37.58 km/h.

Find the time taken, in seconds, for this run.

..........................................s [3]

**3. (a)** Jade and Kim share $160.
Jade receives $8 more than Kim.
Find the ratio Jade's money: Kim's money.
Give your answer in its simplest form.

[2]

**(b)** Each year the height of a bush increases by $x\%$ of its height at the start of the year. It takes 6 years for the bush to grow from 1.2 m to 1.664 m.
Find the value of $x$.

$x = \dotso\ \dots\dots\dots\dots\dots$ [3]

**(c)** Work out, giving each answer in standard form.
**(i)** $(4.5 \times 10^{55}) \times (3 \times 10^{36})$

[2]

**(ii)** $(2 \times 10^n) + (2 \times 10^{n-2})$

[2]

**4.** Expand and simplify.

$$(4 + 2\sqrt{3})(5 - \sqrt{3})$$

[2]

**5.** Work out the highest common factor (HCF) of 60 and 42.

..............................[1]

**6**. **(a)** Work out $\frac{3}{4} - \frac{1}{5}$.

[2]

**(b)** Work out $2\frac{3}{4} \times 2\frac{2}{3}$.
Give your answer as a mixed number in its simplest form.

[3]

**7**. **(a)** Write 1.8796 correct to 4 significant figures.

[1]

**(b)** Work out $(\sqrt{5})^4$.

[1]

**(c)** $x$ is an integer and $|x| \leqslant 1$.
Write down the values of $x$.

[1]

**(d)** Find the highest common factor (HCF) of 24 and 42.

[1]

**8.** A taxi fare, $\$F$, consists of a fixed charge of $\$x$ plus $\$0.65$ per kilometre travelled.
Find a formula for $F$ for a journey of $y$ kilometres.

[2]

**9.** Rationalise the denominator.

$$\frac{\sqrt{5}}{\sqrt{5} - 1}$$

[2]

**10.** Write 4049 correct to 2 significant figures.

[1]

**11.** Write 0.0301497
**(a)** correct to 3 decimal places

**(b)** Correct to 4 significant figures.

**12.**



NOT TO SCALE

The clock shows the time 0930 .
Work out the obtuse angle between the hands of the clock.

**13.** Lee cycles for 60 km at an average speed of 30 km/h. He then returns along the same route at an average speed of 20 km/h.

Find Lee's average speed for the whole journey.

Km/h[2]

14.

$$29 \quad 31 \quad 41 \quad 49 \quad 51 \quad 59$$

From this list, write down all the numbers that are prime numbers.

15.

**(a)** a square number between 101 and 150

[1]

**(b)** a fraction between $\frac{2}{3}$ and $\frac{3}{4}$

[1]

**(c)** an irrational number between 6 and 7 .

[1]

16.

**(a)** Kris and Laila share $200 in the ratio $2:3$.

**(i)** Show that Kris receives $80.

[1]

**(ii)** Kris spends 30.8% of his $80 on a book.
Calculate the cost of the book.

$..........................................[2]

**(iii)** Laila invests her $120 at a rate of 1.16% per year simple interest.
Calculate the total amount Laila has at the end of 5 years.

$ ……………………………. [3]

**(b)** On 1 January 2020, Sangita invests an amount of money at a rate of 2% per year compound interest.
On 1 January 2023 the value of the investment is $5306.04.
**(i)** Calculate the amount Sangita invested on 1 January 2020.

$ …………………………. [2]

**(ii)** Calculate the value of the investment on 1 January 2025.

$ ... ... ... ... ... ... ... ... ... ... ... ... . [2]

**(c)** Tomas invests an anount of money at a rate of 1.4% per year compound interest.
Find the number of complete years it takes for the value of his invesiment to increase by 50%.

... ... ... ... ... ... ... ... ... ... ... . [4]

17.
$$1 \text{ m}^2 = 10^n \text{ cm}^2$$

Find the value of $n$.

n = ... ... ... ... ... ... ... ... ... ... ... . [2]

18.

Alana, Bev and Cara work as decorators

**(a)** The total amount of money they earn is shared in the ratio of the time each person works. During one week Alana works for 16 hours 40 minutes, Bev works for 30 hours and Cara works for 1200 minutes.

They earn a total of $1680.80

Change all the times into minutes and find the amount of money each person earns.

Alana $ =
Bevs $=
Caras $ =

[4]

**(b)** Alana pays a weekly rent of $255 for her apartment. The price of this weekly rent is 2% higher than one year ago.
Find the price of her woekly rent one year ago.

[3]

19.

**(a)** Work out $(1.5 \times 10^1) \times (7 \times 10^{-3})$. Give your answer in standard form.

[2]

**(b)** Work out $(6.5 \times 10^{-2}) + (7.8 \times 10^{-3})$. Give your answer in standard form.

[2]

20.

Work out $1\frac{1}{3} - \frac{5}{6}$.

..................................... [2]

## ALGEBRA

1

Gaya spends $48 to buy books that cost $$x$ each.

**(a)** Write down an expression, in terms of $x$, for the number of books Gaya buys.

.................................................. [1]

**(b)** Myra spends $60 to buy books that cost $$(x + 2)$ each.
Gaya buys 4 more books than Myra.

Show that $x^2 + 5x - 24 = 0$.

[4]

**(c)** Solve by factorisation.
$x^2 + 5x - 24 = 0$

$x =$ ............................. or $x =$ ............................. [3]

**(d)** Find the number of books Myra buys.

.................................................. [1]

[Total: 9]

2

Darpan runs a distance of 12 km and then cycles a distance of 26 km.
His running speed is $x$ km/h and his cycling speed is 10 km/h faster than his running speed.
He takes a total time of 2 hours 48 minutes.

**(a)** An expression for the time, in hours, Darpan takes to run the 12 km is $\dfrac{12}{x}$.

Write an equation, in terms of $x$, for the total time he takes in hours.

.................................................... [3]

**(b)** Show that this equation simplifies to $7x^2 - 25x - 300 = 0$.

[4]

**(c)** Use the quadratic formula to solve $7x^2 - 25x - 300 = 0$.
You must show all your working.

$x = $ ............................. or $x = $ ............................. [4]

**(d)** Calculate the number of minutes Darpan takes to run the 12 km.

................................................. min    [2]

[Total: 13]

3

Simplify.

$$\frac{2x^2 + x - 15}{ax + 3a - 2bx - 6b}$$

................................................. [5]

[Total: 5]

4

Solve the simultaneous equations.
You must show all your working.

$$3x + y = 11$$
$$x^2 - 2y = 18$$

..................................................................

.............................................................. [5]

[Total: 5]

5

Solve.

$$\frac{1}{x+1} + \frac{9}{x+9} = 1$$

$x =$ ............................ or x = ............................ [5]

[Total: 5]

6

17  Solve the simultaneous equations.
    You must show all your working.
    $$y = 4 - x$$
    $$x^2 + 2y^2 = 67$$

$x = $ ............................ , $y = $ ............................

$x = $ ............................ , $y = $ ............................   [6]

[Total: 6]

**7**

These are the first four terms of a sequence.

$$1 \qquad 23 \qquad 45 \qquad 67$$

**(a)** Write down the next two terms.

.................... , .................... [2]

**(b)** Find the $n$th term.

.......................................... [2]

[Total: 4]

**8**

The $n$th term of a sequence is $n^2 + 7$.

Find the first three terms of this sequence.

.................... , .................... , .................... [2]

[Total: 2]

9

These are the first five terms of a sequence.

$$25 \quad 18 \quad 11 \quad 4 \quad -3$$

Find the $n$th term of this sequence.

..................................... [2]

[Total: 2]

10
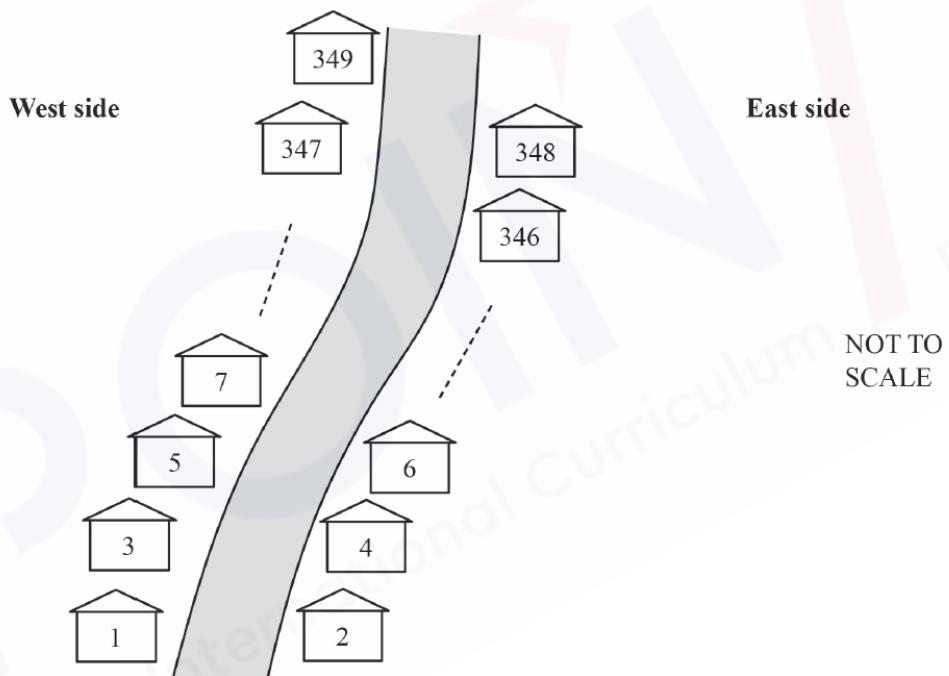


A road has 349 houses on it numbered from 1 to 349.
The diagram shows some of these houses.
The houses on the West side of the road have odd numbers.
The houses on the East side have even numbers.

**(a)** Put a ring around the numbers in this list that are on the West side.

25          87          126          178          252          329

[1]

**(b)** On the East side, how many houses are there **between** the house numbered 168 and the house numbered 184?

................................................... [1]

**(c)** How many houses on the road have a house number that is a multiple of 39?

................................................... [2]

**(d)** Tomaz delivers a leaflet to every house on the West side of the road.
He starts at house number 1 and then delivers to each house in order.

   **(i)** Find an expression, in terms of $n$, for the house number of the $n$th house he delivers to.

................................................... [2]

   **(ii)** Work out the house number of the 40th house he delivers to.

................................................... [1]

   **(iii)** Work out how many houses are on the West side of the road.

................................................... [2]

**(e)** Alicia delivers a leaflet to every house on the East side of the road.
She starts at house number 348 and then delivers to each house in order.

   **(i)** Find an expression, in terms of $n$, for the house number of the $n$th house she delivers to.

**(ii)** What is the largest value of $n$ that can be used in your expression?
Give a reason for your answer.

The largest value of $n$ is ................. because ........................................................................

.......................................................................................................................... [2]

[Total: 13]

**11**

Find the $n$th term of each sequence.

**(a)** $-1, \quad -3, \quad -5, \quad -7, \quad -9, \quad \dots$

.................................................. [2]

**(b)** $2, \quad 9, \quad 28, \quad 65, \quad 126, \quad \dots$

.................................................. [2]

[Total: 4]

12

Marco is making patterns with grey and white circular mats.



| Pattern 1 | Pattern 2 | Pattern 3 | Pattern 4 |
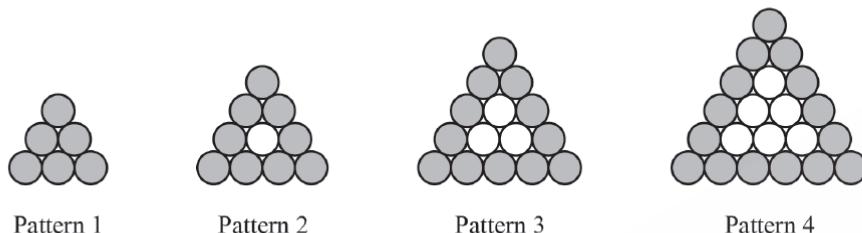
The patterns form a sequence.
Marco makes a table to show some information about the patterns.

| Pattern number | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Number of grey mats | 6 | 9 | 12 | 15 | |
| Total number of mats | 6 | 10 | 15 | 21 | |

**(a)** Complete the table for Pattern 5. [2]

**(b)** Find an expression, in terms of $n$, for the number of grey mats in Pattern $n$.

..................................................... [2]

**(c)** Marco makes a pattern with 24 grey mats.

Find the total number of mats in this pattern.

..................................................... [2]

**(d)** Marco needs a total of 6 mats to make the first pattern.
He needs a total of 16 mats to make the first two patterns.

He needs a total of $\dfrac{1}{6}n^3 + an^2 + bn$ mats to make the first $n$ patterns.

Find the value of $a$ and the value of $b$.

$a = $ ...............................................

$b = $ ............................................... [6]

[Total: 12]

**13**

$y$ is directly proportional to the square of $(x-1)$.
$y = 63$ when $x = 4$.

Find the value of $y$ when $x = 6$.

*Answer y =*................................................. [3]

[Total: 3]

**14**

The cost of a circular patio, $\$ C$, varies as the square of the radius, $r$ metres.
$C = 202.80$ when $r = 2.6$ .

Calculate the cost of a circular patio with $r = 1.8$ .

*Answer $*................................................. [3]

**15**

Simplify.

**(a)** $\left(5x^4\right)^3$

.................................................. [2]

**(b)** $\left(256x^{256}\right)^{\frac{3}{8}}$

.................................................. [2]

[Total: 4]

**16**

Mrs Kohli buys a jacket, 2 shirts and a hat.
The jacket costs $\$x$.
The shirts each cost \$24 less than the jacket and the hat costs \$16 less than the jacket.
Mrs Kohli spends exactly \$100.

Write down an equation in terms of $x$.
Solve this equation to find the cost of the jacket.

$ .................................................. [3]

[Total: 3]

**17**

Solve the simultaneous equations.
You must show all your working.

$$x - y = 7$$
$$x^2 + y = 149$$

$x = $ .............................    $y = $ .............................

$x = $ .............................    $y = $ .............................    [5]

18

Solve the simultaneous equations.
You must show all your working.

$$y = 4 - x$$
$$x^2 + 2y^2 = 67$$

$x =$ ............................. , $y =$ .............................

$x =$ ............................. , $y =$ .............................   [6]

[Total: 6]

19

All the lengths in this question are in centimetres.
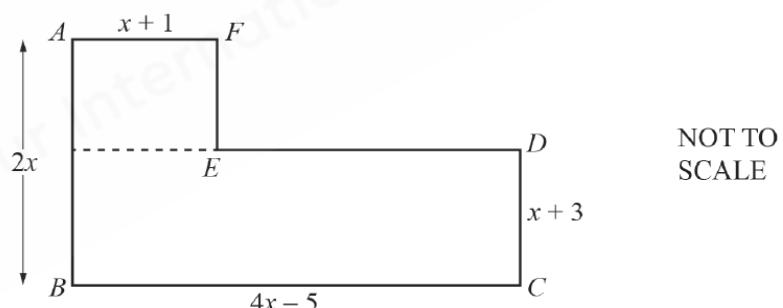


The diagram shows a shape $ABCDEF$ made from two rectangles.
The total area of the shape is $342 \text{ cm}^2$.

**(a)** Show that $x^2 + x - 72 = 0$.

[5]

**(b)** Solve by factorisation.
$$x^2 + x - 72 = 0$$

$x =$ ............................ or $x =$ ............................ [3]

**(c)** Work out the perimeter of the shape *ABCDEF*.

.................................................. cm [2]

**(d)** Calculate angle *DBC*.

Angle *DBC* = ................................................. [2]

[Total: 12]

20

Make *h* the subject of the formula   $2mh = g(1 - h)$.

*h* = ................................................. [4]

[Total: 4]