

CHAPTER 4

Patterns



Review 3

Percentages, Fractions & Decimals



1. Change each percentage to a decimal and then to a fraction in its simplest form :-

- a 25% b 45% c 78% d 71%
e 75% f 12.5% g 0.5% h 100%

2. Change each of the following into a percentage :-

- a 0.32 b 0.8 c 0.02 d 0.9
e $\frac{3}{10}$ f $\frac{4}{5}$ g 0.003 h 1.5

3. Find :-

- a $\frac{3}{8}$ of £240 b two thirds of 450 g c 2% of £1600
d 75% of 480 ml e 12.5% of \$1600 f 0.4 of 130 km.

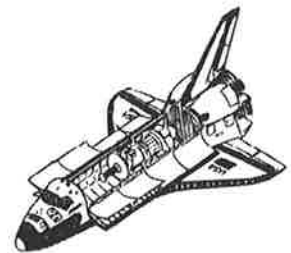
You may use a calculator for questions 4 to 6.

4. Find :-

- a 35% of £260 b 12.5% of £1800 c 7% of £18 000
d 0.85 of £28.60 e $\frac{7}{13}$ of £715 f 0.3 of 16% of £800.

5. a A spaceship tries to reach a speed of 4500 mph.
The spaceship could only manage 34% of the required speed.
What speed could the spaceship manage ?

b A space station has 1400 workers living on it.
Twenty seven percent of the workers have caught a virus.
How many workers have the virus ?



6. List the height of each plant in order, beginning with tallest.

- A Sunflower was 160 cm has grown by 45%
- A Gladiola was 1.35 m has grown by two thirds.
- A Clematis was 1400 mm has grown by 0.6.



Exercise 1

Sequences & Patterns



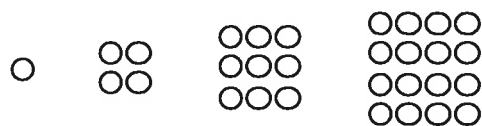
1. Give a rule for each of these sequences :- (begin with "start at ... and then").

| | | |
|-------------------------|-----------------------|-----------------------|
| a 2, 5, 8, 11, 14, | b 7, 13, 19, 25, | c 25, 20, 15, 10, ... |
| d 98, 81, 64, 47, | e 3, 9, 27, 81, | f 1, 6, 36, 216, ... |
2. Write down the next two numbers in each sequence from question 1.
3. Find the next two numbers in each sequence :-

| | | |
|-------------------------|-----------------------|----------------------|
| a 7, 9, 11, 13, | b 5, 9, 13, 17, | c 24, 22, 20, |
| d 70, 58, 46, 34, | e 1, 3, 9, | f 2, 4, 8, 16, |

4. Shown is the pattern for **square numbers**.

Write down the first 12 square numbers.



5. A pattern of numbers is defined as :- (2×3) , (3×4) , (4×5) , (5×6)

Write down the :- a 10th term b 1000th term c n^{th} term.

Exercise 2

Simple Linear Patterns



1. Each door has six window panes.

- a Copy and complete the table.
- b Copy and complete the formula :- $P = \dots \times D$
- c How many panes would there be in 11 doors ?
- d How many doors are there if there are 78 panes ?

| | | | | | |
|----------------------|---|----|---|---|---|
| No. of Doors (D) | 1 | 2 | 3 | 4 | 5 |
| No. of Panes (P) | 6 | 12 | ? | ? | ? |

rises by : \longrightarrow $\underbrace{\hspace{1cm}}$ 6 $\underbrace{\hspace{1cm}}$ 6 $\underbrace{\hspace{1cm}}$? $\underbrace{\hspace{1cm}}$? $\underbrace{\hspace{1cm}}$?

2. For the tables below :- (i) complete each one (ii) construct a formula.

- a No. of toys and price

| | | | | | | |
|-----|---|----|----|-----|-----|-----|
| T | 1 | 2 | 3 | 4 | 5 | 6 |
| P | 9 | 18 | 27 | ... | ... | ... |

$P = \dots \times T$

- b No. of seconds and no. of minutes

| | | | | | | |
|-----|----|-----|-----|-----|-----|-----|
| M | 1 | 2 | 3 | 4 | 5 | 6 |
| S | 60 | 120 | 180 | ... | ... | ... |

$S = \dots \times M$

- c No. of pentagons and no. of vertices

| | | | | | | |
|-----|---|----|----|-----|-----|-----|
| P | 1 | 2 | 3 | 4 | 5 | 6 |
| V | 5 | 10 | 15 | ... | ... | ... |

- d No. of tables to legs

| | | | | | | |
|-----|---|----|----|-----|-----|-----|
| T | 1 | 2 | 3 | 4 | 5 | 6 |
| L | 8 | 16 | 24 | ... | ... | ... |

3. **Linear Graphs** - For each of the tables below :-

- (i) complete each table
- (ii) construct a formula
- (iii) take each pair of numbers as coordinates
- (iv) plot on a coordinate graph
- (v) draw a line through the points and label the line with your formula.

a

| | | | | | | |
|---|---|---|---|---|-----|-----|
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| y | 0 | 3 | 6 | 9 | ... | ... |

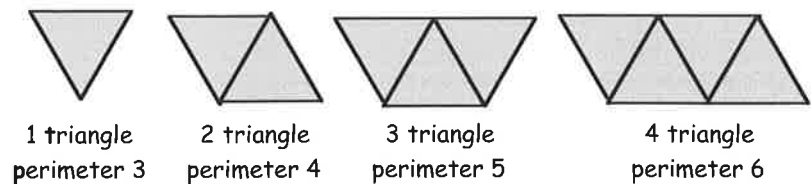
b

| | | | | | | |
|---|---|---|---|---|-----|-----|
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| y | 0 | 2 | 4 | 6 | ... | ... |

Exercise 3 Harder Linear Patterns



1. Look at the pattern shown.



a Copy and complete the table shown.

| | | | | | | |
|--------------------------|---|---|---|-----|-----|-----|
| No. of triangles (T) | 1 | 2 | 3 | 4 | 5 | 6 |
| Perimeter (P) | 3 | 4 | 5 | ... | ... | ... |

1
1
1

- b** Copy and complete the formula for the above pattern :- $P = \dots \times T + \dots$
- c** Find the perimeter of the pattern with 21 triangles.
- d** Find the number of triangles if the perimeter is 27.

2. For each of the tables below :-

(i) complete each table

a

| | | | | | | |
|---|---|---|---|---|-----|-----|
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| y | 3 | 5 | 7 | 9 | ... | ... |

(ii) construct a formula.

b

| | | | | | | |
|---|---|---|---|---|-----|-----|
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| y | 5 | 6 | 7 | 8 | ... | ... |

c

| | | | | | | |
|---|----|---|---|---|-----|-----|
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| y | -2 | 1 | 4 | 7 | ... | ... |

d

| | | | | | | |
|---|----|---|---|----|-----|-----|
| x | 0 | 1 | 2 | 3 | 4 | 5 |
| y | -1 | 4 | 9 | 14 | ... | ... |

e

| | | | | | | |
|---|-----|----|----|---|---|-----|
| x | -2 | -1 | 0 | 1 | 2 | 3 |
| y | ... | -4 | -2 | 0 | 2 | ... |

f

| | | | | | | |
|---|-----|-----|----|---|-----|-----|
| x | -2 | -1 | 0 | 1 | 2 | 3 |
| y | ... | -11 | -4 | 3 | ... | ... |

3. **Harder Linear Graphs** - For each of the tables below :-

- (i) complete each table
- (ii) construct a formula
- (iii) take each pair of numbers as coordinates
- (iv) plot on a coordinate graph
- (v) draw a line through the points and label the line with your formula.

a

| | | | | | | |
|---|----|----|---|-----|-----|-----|
| x | -2 | -1 | 0 | 1 | 2 | 3 |
| y | -1 | 2 | 5 | ... | ... | ... |

b

| | | | | | | |
|---|-----|-----|----|----|----|-----|
| x | -2 | -1 | 0 | 1 | 2 | 3 |
| y | ... | ... | -5 | -3 | -1 | ... |

Revisit - Review - Revise 4



1. Write down the next **two** numbers in these sequences :-

- a 80, 73, 66, 59, 52,
- b 225, 196, 169, 144, 121,
- c 2, 6, 12, 20, 30,
- d 1, 2, 5, 10, 20,

2. If you add any 2 **consecutive triangular** numbers together, you get a **square** number.

For example :- $(1 + 3 = 4)$, $(3 + 6 = 9)$, $(6 + 10 = 16)$, etc...

Which 2 consecutive triangular numbers add to give the square number 100 ?

3. This table shows the number of bags (*B*) with the number of sweets (*S*) in total.



| | | | | |
|----------|---|----|----|----|
| <i>B</i> | 1 | 2 | 3 | 4 |
| <i>S</i> | 7 | 14 | 21 | 28 |

a Write down the formula for the number of bags and the number of sweets.

$S = \dots\dots\dots$

b How many sweets are there in 11 bags ?



4. Shown below are four tables showing the connection between pairs of values. Write down a **formula** connecting the value of the 2nd letter to the 1st letter.

a

| | | | | |
|----------|---|---|---|---|
| <i>T</i> | 1 | 2 | 3 | 4 |
| <i>P</i> | 3 | 5 | 7 | 9 |

$P = \dots\dots T + \dots$

b

| | | | | |
|----------|---|----|----|----|
| <i>F</i> | 1 | 2 | 3 | 4 |
| <i>G</i> | 7 | 11 | 15 | 19 |

$G = \dots\dots$

c

| | | | | |
|----------|----|----|---|---|
| <i>C</i> | 1 | 2 | 3 | 4 |
| <i>K</i> | -5 | -1 | 3 | 7 |

d

| | | | | |
|----------|----|----|----|----|
| <i>X</i> | 1 | 2 | 3 | 4 |
| <i>Y</i> | -6 | -5 | -4 | -3 |