

Chapter 14

Patterns

Simple Linear Patterns

Be able to spot a pattern from a table and make up a simple rule for extending it

It is fairly easy to spot a **number pattern** from a diagram or a table.

Example :-

Each chocolate sponge has 4 candles.



Drawing up a table helps you see the pattern :-

No. of Sponges (S)	1	2	3	4	5	6
No. of Candles (C)	4	8	12	?	?	?

4 4 4

Can you see that for every new sponge \Rightarrow the number of candles **rises by 4**?

\Rightarrow We can write, in words :-

Number of Candles = 4 \times no. of Sponges

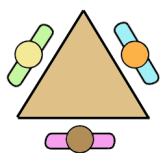
\Rightarrow or in symbol form :-

$C = 4 \times S$

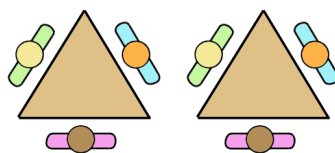
* For 12 sponges, you would need $C = 4 \times 12 = 48$ candles.

Exercise 1

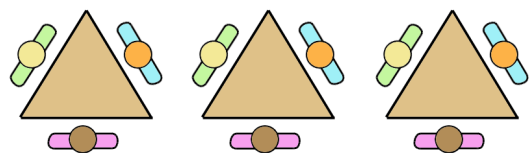
1. In a school library, the tables are set out so that 3 children sit around each table.



1 table
3 children



2 tables
6 children



3 tables
9 children

- a Draw the next pattern of children sitting around 4 tables.
- b Copy the following table and complete it :-

No. of Tables (T)	1	2	3	4	5	6
No. of Children (C)	3	6	9	?	?	?

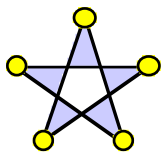
? ? ?

- c For every extra table, how many extra children are seated?
- d Copy and complete the formula :- **Number of children = \times Number of tables.**

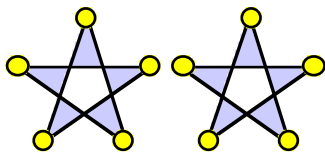
- e Now write down the formula using symbols :- $C = \dots \times T$.
- f Use your formula to decide how many children the library can take if there are 20 tables in it.



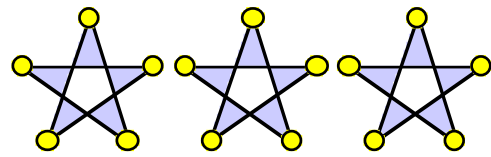
2. Look at the star shapes with circles at each end point.



1 star
5 circles



2 stars
10 circles



3 stars
15 circles

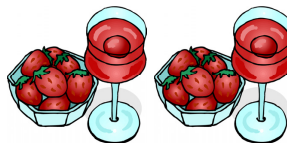
- a Draw the next pattern of stars and circles.
- b Copy the following table and complete it :-

No. of Stars (S)	1	2	3	4	5	6
No. of Circles (C)	5	10	?	?	?	?

$\underbrace{\quad\quad\quad}_{?}$
 $\underbrace{\quad\quad\quad}_{?}$
 $\underbrace{\quad\quad\quad}_{?}$

- c For every extra star, how many extra circles are needed ?
- d Copy and complete the formula :- **number of circles** = **\times** **number of stars**.
- e Write down the formula using symbols :- $C = \dots \times S$.
- f Use your formula to decide how many circles are needed for 40 stars.

3. Here is a glass of strawberry juice which needs 6 strawberries per glass to make it.



- a Copy and complete the table below listing the number of strawberries per 1 glass.

No. of Glasses (G)	1	2	3	4	5	6
No. of Strawberries (S)	6	?	?	?	?	?

$\underbrace{\quad\quad\quad}_{?}$
 $\underbrace{\quad\quad\quad}_{?}$
 $\underbrace{\quad\quad\quad}_{?}$

- b How many strawberries are needed for 7 glasses ?
- c Copy and complete :- "the number of strawberries = \times the number of glasses".
- d Write the formula using symbols connecting S and G .
- e Use your formula to say how many strawberries would be needed to make 10 glasses of the juice.

4. Look at the price DJ Sports are charging for World Cup footballs :-



1 ball
£7



2 balls
£14



3 balls
£21

a Copy and complete the table below showing the cost of buying the footballs.

No. of Footballs (F)	1	2	3	4	5	6
Cost in £'s (C)	7	?	?	?	?	?

$\underbrace{\hspace{1.5cm}}_{?}$
 $\underbrace{\hspace{1.5cm}}_{?}$
 $\underbrace{\hspace{1.5cm}}_{?}$

b Copy and complete :- **Cost** = x the number of footballs.

c Write the formula using symbols connecting C and F .

d Use your formula to find the cost to a football club wanting to buy 30 footballs.

5. Copy and complete this table which shows how many roses are expected to flower on each rose bush in early spring.

No. of Bushes (B)	1	2	3	4	5	6
No. of Roses (R)	8	16	?	?	?	?

$\underbrace{\hspace{1.5cm}}_{?}$
 $\underbrace{\hspace{1.5cm}}_{?}$
 $\underbrace{\hspace{1.5cm}}_{?}$



a Copy and complete :- **number of roses** = x the number of bushes.

b Write a formula using symbols connecting R and B .

c Use your formula to find how many roses should flower from 50 rose bushes.

6. Copy and complete the following table which shows the number of marigolds in a pot.

No. of Pots (P)	1	2	3	4	5	6
No. of Marigolds (M)	10	20	30	?	?	?



a Copy and complete :- **number of marigolds** = x the number of pots.

b Write a formula using symbols connecting M and P .

c Use your formula to find the total number of marigolds in 15 pots.

7. This table shows the number of small cherries there are to 1 large one on a cherry cake.

No. of Large Cherries (L)	1	2	3	4	5	6
No. of Small Cherries (S)	14	?	?	?	?	?



a Copy and complete the table.

b Write a formula connecting S and L and use it to find how many small cherries there are to 20 large ones.

8. The table below indicates how many school minibuses, full of pupils, arrive at Belloch Academy each school day.

No. of Buses (B)	3	4	5	6	7	8
No. of Pupils (P)	60	80	100	?	?	?



- 3 school minibus can carry 60 pupils in total. How many pupils are allowed on one bus ?
- Write a formula connecting the number of pupils (P) and the number of buses (B).
- 18 minibuses, similar to those used by Belloch Academy, arrive at Ainsley High School each school day. Use your formula to calculate how many pupils in total are on these buses.

9. For each of the tables below, find a formula (or rule) connecting the two letters :-

a

No. of Newspapers (N)	1	2	3	4	5	6
No. of Pages (P)	30	60	90	?	?	?

$$P = ? \times N$$



b

No. of Trees (T)	1	2	3	4	5	6
No. of Pineapples (P)	18	36	54	?	?	?

$$P = ? \times T$$



c

No. of Days (D)	1	2	3	4	5	6
No. of Hours (H)	24	48	72	?	?	?

$$H = ? \times D$$



d

No. of Pounds (N)	2	3	4	5	6	7
No. of Pence (p)	200	300	400	?	?	?

$$p = ? \times N$$



e

No. of Muffins (M)	2	3	4	5	7	8
Cost in £'s (C)	2.50	3.75	5.00	?	?	?

$$C = ? \times \dots$$



f

No. of Jars (J)	3	4	5	6	7	8
No. of Jelly Beans (B)	450	600	750	?	?	?

$$\dots = ? \times \dots$$



g

No. of Tubes (T)	2	4	6	8	10	12
Cost in £'s (C)	7	14	21	?	?	?

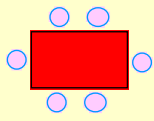
$$\dots = ? \times \dots$$



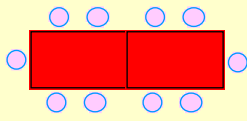
More Difficult Linear Patterns

Look for a pattern in a table and make up a more complicated rule to extend it

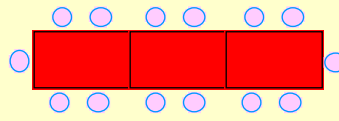
Here is a pattern, showing children sitting around tables in their school dining area.



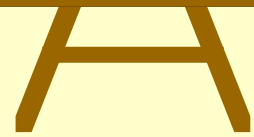
1 table
6 children



2 tables
10 children



3 tables
14 children



Drawing up a table will help you see a pattern.

No. of Tables (T)	1	2	3	4	5	6
No. of Children (C)	6	10	14	?	?	?

$\underbrace{\quad\quad\quad}_4$
 $\underbrace{\quad\quad\quad}_4$
 $\underbrace{\quad\quad\quad}_4$

For each additional table \Rightarrow the number of children rises by 4.

... but **No. of Children = $4 \times$ no. of Tables** or **$C = 4 \times T$** doesn't work here!

Check :- $4 \times 1 \neq 6$, $4 \times 2 \neq 10$, $4 \times 3 \neq 14$, $4 \times 4 \neq 18$, $4 \times 5 \neq 22$

but $4 \times 1 + 2 = 6$ $4 \times 2 + 2 = 10$ $4 \times 3 + 2 = 14$ etc. does work

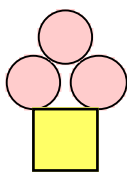
A correction number is required to make the pattern work. In this example, that number is 2.

$$\Rightarrow C = 4 \times T + 2$$

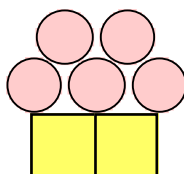
* With 10 tables, you can seat $C = 4 \times 10 + 2 = 42$ children.

Exercise 2

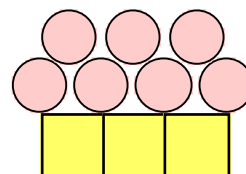
1. Here is a pattern made with circles and squares.



1 square
3 circles



2 squares
5 circles



3 squares
7 circles

- Draw the next pattern of circles and squares.
- Copy the following table and complete it :-

No. of Squares (S)	1	2	3	4	5	6
No. of Circles (C)	3	5	7	?	?	?

$\underbrace{\quad\quad\quad}_?$
 $\underbrace{\quad\quad\quad}_?$
 $\underbrace{\quad\quad\quad}_?$

- For every extra square, how many extra circles are needed?

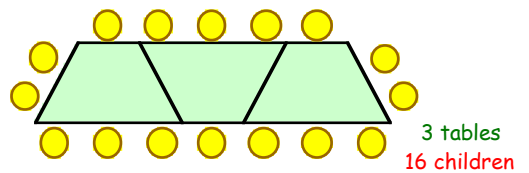
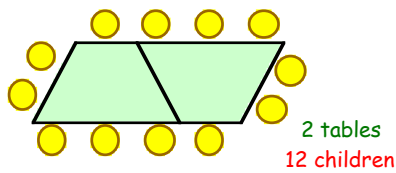
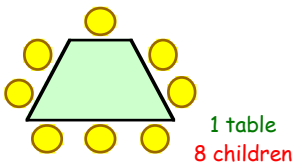
cont'd.....

d Write down the formula using **symbols** for calculating the number of circles needed if you know the number of squares.

$$C = \dots \times S + \dots$$

e Use your formula to decide how many circles are needed with 10 squares.

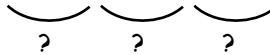
2. In another school, the dining area tables are set out differently :-



a Draw the next pattern, showing children sitting around 4 tables.

b Copy the following table and complete it :-

No. of Tables (T)	1	2	3	4	5	6
No. of Children (C)	8	12	16	?	?	?



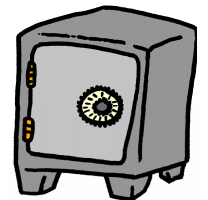
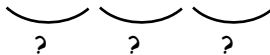
c For every extra table, how many extra children can be seated ?

d Write down the formula using symbols :- $C = \dots \times T + \dots$

e Use your formula to decide how many children can sit around 20 tables.

3. This table shows the cost of hiring a safety deposit box in a hotel :-

No. of Days Hired (D)	1	2	3	4	5	6
Cost in £'s (C)	8	11	14	17	20	23



a How much will it cost to hire the safe for :- (i) 4 days (ii) 5 days ?

b How much extra does it cost for each additional day of hire ?

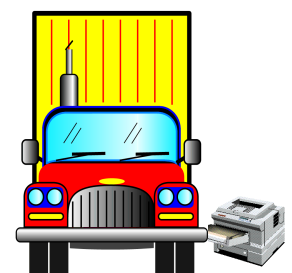
c Write down the formula for determining the cost of hiring the safe

$$C = \dots \times D + \dots$$

d How much will it cost to hire the safe for 2 weeks ?

4. The weight of a truck carrying identical photocopying machines is given in the table.

No. of Photocopiers (P)	1	2	3	4
Total weight in kilograms (W)	1250	1300	1350	1400



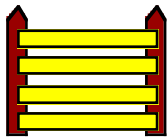
a How much does each extra photocopier weigh ?

b What is the total weight of a truck carrying 5 photocopiers ?

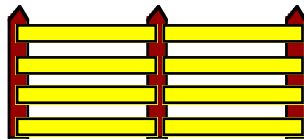
c Find a formula for the total weight $W = \dots \times P + \dots$

d What is the total weight of a truck with 10 photocopiers ?

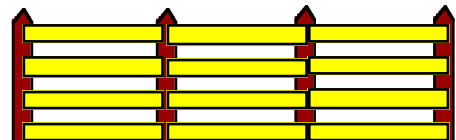
5. Look at the pattern of fence posts and support panels.



2 Posts
4 Panels



3 Posts
8 Panels



4 Posts
12 Panels

- a Draw the next pattern of fence posts and support panels.
- b Copy the table below and complete it :-

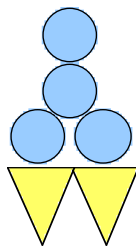
No. of Posts (P)	2	3	4	5	6	7
No. of Supports (S)	4	8	12	?	?	?

$\underbrace{\quad\quad\quad}_?$
 $\underbrace{\quad\quad\quad}_?$
 $\underbrace{\quad\quad\quad}_?$

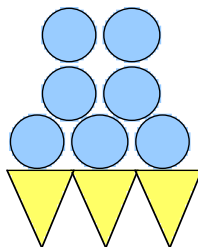
- c For every extra post, how many extra support panels are needed ?
- d Write down the formula using symbols $S = \dots \times P - \dots$
- e Use your formula to decide how many support panels are needed with 20 posts.

* note the correction number has to be *subtracted*

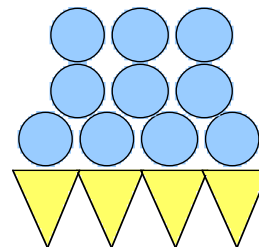
6. The designs below are made up of triangles and circles.



2 triangles
4 circles



3 triangles
7 circles



4 triangles
10 circles

- a Draw the next pattern of triangles and squares.
- b Copy the table below and complete it :-

No. of Triangles (T)	2	3	4	5	6	7
No. of Circles (C)	4	7	10	?	?	?

$\underbrace{\quad\quad\quad}_?$
 $\underbrace{\quad\quad\quad}_?$
 $\underbrace{\quad\quad\quad}_?$

- c For every extra triangle, how many extra circles are needed ?
- d Write down the formula using symbols $C = \dots \times T - \dots$
- e Use your formula to work out how many circles sit on 50 triangles.

f How many triangles are required if we have :-
 (i) 22 circles (ii) 34 circles (iii) 58 circles (iv) 88 circles ?

7. Shown below are some tables connecting pairs of values.

Determine a **formula** or rule connecting the second letter in the table to the first letter.

a Tubs of apples lying on a wagon.

Tub (T)	1	2	3	4
Weight (W) kg	10	13	16	19

$$W = \dots \times T + \dots$$



b Fares for boat trips.

No. km (K)	1	2	3	4
Fare £'s (F)	2	7	12	17

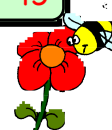
$$F = \dots \times K - \dots$$



c Bees appear as flowers bloom.

No. Flowers (F)	1	2	3	4
No. Bees (B)	15	25	35	45

$$B = \dots \times F \dots \dots$$



d Time taken to grill chops on a barbecue.

No. Chops (C)	1	2	3	4
Grilling (G) min	7.5	8	8.5	9

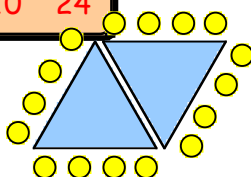
$$G = \dots \times C \dots \dots$$



e Circles round triangles.

Triangles (T)	1	2	3	4
Circles (C)	12	16	20	24

$$C = \dots \times T \dots \dots$$



f Time taken to print pages.

No. Pages (P)	1	2	3	4
Time (T) seconds	30	36	42	48

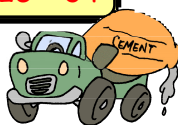
$$T = \dots \times P \dots \dots$$



g Hiring a cement mixer.

Days hired (D)	1	2	3	4
Cost in £'s (C)	7	16	25	34

$$C = \dots \times D \dots \dots$$



h Filling a paddling pool using a hose.

Time mins (T)	1	2	3	4
Depth (D) cm	1.3	2.1	2.9	3.7

$$D = \dots \times T \dots \dots$$



i Weight of plant pot and daffodil bulbs.

No. of bulbs (B)	1	2	3	4
Weight (W) g	240	300	360	420

$$C = \dots \times I \dots \dots$$



j A stamp collection grows each year.

No. Years (Y)	1	2	3	4
No. Stamps (S)	100	350	600	850

$$S = \dots \times Y \dots \dots$$



k The depth of water in a vase reduces as time goes on (evaporation).

$$D = \dots - \dots \times N$$



No. of days (N)	1	2	3	4
Water depth (D)	20	17	14	11

