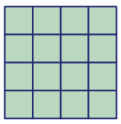
'Powerful numbers'

Daniel drew  ,  and  ← This figure has 16 small squares.

His teacher said that these figures model the square numbers

$2 \times 2 = 2^2$, $3 \times 3 = 3^2$ and $4 \times 4 = 4^2$.

So, $2^2 = 4$, $3^2 = 9$ and $4^2 = 16$.

EXERCISE 1C.10

1 **a** Draw a figure to represent 5^2. **b** What is the value of 5^2?

2 **a** Find **i** 6^2 **ii** 7^2 **iii** 8^2 **iv** 9^2 **v** 10^2

b Check your answer to **a** using the x^2 key of a calculator.

3 **a** $4^2 = 16$. Use your calculator to find $\sqrt{16}$ by pressing $\sqrt{}$ 16 $=$. What do you notice?

b Looking at the figures above, what does $\sqrt{16}$ give you?

c Repeat **a** for $6^2 = 36$.

4 Use your calculator to find:

a 12^2 **b** 20^2 **c** 50^2 **d** $\sqrt{64}$ **e** $\sqrt{576}$ **f** $\sqrt{5184}$

5 What sized square would have 5184 small squares on subdivision?

6 **a** Copy and complete this table:

Number	2^1	2^2	2^3	2^4	2^5	2^6	2^7	2^8	2^9	2^{10}
Value		4	8		32					1024

b Notice that as $4 \times 8 = 32$, $2^2 \times 2^3 = 2^5$.

Is it true that **i** $2^2 \times 2^4 = 2^6$ **ii** $2^3 \times 2^4 = 2^7$ **iii** $2^4 \times 2^5 = 2^9$?

c Explain to your neighbour what you have discovered in **b**.

d Use your discovery to calculate:

i 8×32 **ii** 4×128 **iii** 8×64 **iv** 16×64

7 **a** Copy and complete this table:

Number	3^1	3^2	3^3	3^4	3^5	3^6	3^7	3^8
Value	3		27					

b Use your table to explain that $3^2 \times 3^4 = 3^6$.

c Use your table to find: **i** 9×81 **ii** 3×243 **iii** 27^2

'Little bites at big multiplication'

In this strategy we split one of the numbers into its factors and then multiply by each factor in turn.

For example, $4 \times 9 = 4 \times 3 \times 3$
$= 12 \times 3$
$= 36$

and $17 \times 6 = 17 \times 2 \times 3$
$= 34 \times 3$
$= 102$

EXERCISE 1C.11

1 Split into factors which are as small as possible:

For example, $12 = 2 \times 6$, but 6 could be written as 2×3
So, $12 = 2 \times 2 \times 3$ where the factors are as small as possible.

a 15 **b** 30 **c** 8 **d** 24 **e** 36

2 Use the above strategy to find:

a 25×8 **b** 5×42 **c** 17×6 **d** 13×12

3 Also use the method above to find:

a 16×63 **b** 58×24 **c** 143×9

EXERCISE 1C.12

1 Luke saves \$6 from his earnings every week for 64 weeks. How much does he save?

2 Slade drives 98 kilometres every hour for 9 hours. How far does he travel?

3 Four trucks each carry 278 sheep to a market. How many sheep are carried altogether?

4 Karina picks 23 cartons of apples. Each carton holds 375 apples. How many apples did she pick altogether?

5 Joseph scored 94 baskets in a basketball season. 61 of them were two pointers and the rest were three pointers. How many points did he score in the season?

6 Hamish has 782 two dollar coins in a tin. What is their total value?

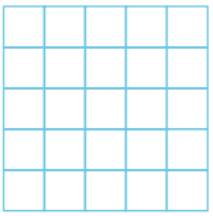
7 Greer is training for a mini-marathon on the school's 400 m track.

a If she runs around the track 24 times, how far does she run?

b If she does this every day for one week, what is her total training distance?

8 Lisa washes dishes in a local cafe. If she washes 183 dishes each night for three weeks, how many does she wash altogether?

EXERCISE 1C.10

1 **a**  **b** 25

2 **a** **i** 36 **ii** 49 **iii** 64 **iv** 81 **v** 100

3 **a** $\sqrt{16} = 4$ is the reverse of $4^2 = 16$.

b $\sqrt{16}$ is the length of the side of the 4 by 4 square.

c As $6^2 = 36$, $\sqrt{36} = 6$.

4 **a** 144 **b** 400 **c** 2500 **d** 8 **e** 24 **f** 72

5 72 units by 72 units

6 **a**

Number	2^1	2^2	2^3	2^4	2^5
Value	2	4	8	16	32
Number	2^6	2^7	2^8	2^9	2^{10}
Value	64	128	256	512	1024

b **i** yes **ii** yes **iii** yes

c **i** 256 **ii** 512 **iii** 512 **ii** 1024

7 **a**

Number	3^1	3^2	3^3	3^4	3^5
Value	3	9	27	81	243
Number	3^6	3^7	3^8		
Value	729	2187	6561		

c **i** 729 **ii** 729 **iii** 729

EXERCISE 1C.11

1 **a** $15 = 3 \times 5$ **b** $30 = 2 \times 3 \times 5$ **c** $8 = 2 \times 2 \times 2$
d $24 = 2 \times 2 \times 2 \times 3$ **e** $36 = 2 \times 2 \times 3 \times 3$

2 **a** 200 **b** 210 **c** 102 **d** 156

3 **a** 1008 **b** 1392 **c** 1287

EXERCISE 1C.12

1 \$384 **2** 882 km **3** 1112 sheep

4 8625 apples **5** 221 points **6** \$1564

7 **a** 9600 m **b** 67 200 m **8** 3843 dishes