

EXPONENTS



extracted from **The Answer Series Grade 7 Mathematics 3-in-1 Class Text & Study Guide**



Calculators should not be used in any part of this worksheet.

Essentials (routine)

Exercise 1

Solutions on p. A76

Express the following in exponential form.

5. $2 \times 2 \times 2 \times 2 \times 3 \times 3$

9. $c \times c \times c$



Exercise 2

Solutions on p. A76

2. Using only prime factors, write 48 in expanded form and in exponential form.

Exercise 5

Show, by calculation, that:

1. $(5 + 7)^2 \neq 5^2 + 7^2$



Solutions on p. A78

Exercise 8

Solutions on p. A81

1. Simplify each of the expressions below.

1.7 $\sqrt{5^2 - 3^2}$

1.8 $\sqrt{5^2} - \sqrt{3^2}$

Exercise 9

Solutions on p. A82

Fully simplify each expression.

1. $\sqrt{3 \times 12}$

2. $\sqrt{49 \times 121}$

Elevation (complex)

Exercise 12

Solutions on p. A84

3. Write down the value of:

3.7 $\sqrt[3]{8^2}$

3.8 $\sqrt{1^3 + 2^3 + 3^3}$

4. Fully simplify the expression below.

4.6 $2^3 + 5 \times 2^4 - 4 \times \sqrt[3]{125}$

Exercise 14

Solutions on p. A87

2. Using prime factors, determine $\sqrt[3]{3\ 375}$

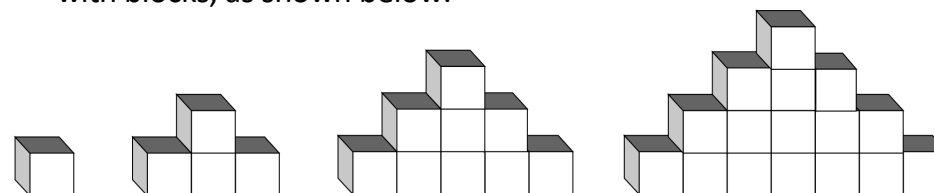
Extension (problem solving)

Exercise 16 [link to video](#)



Solutions on p. A88

4. Bulelani builds four towers with blocks, as shown below.



Tower 1

Tower 2

Tower 3

Tower 4

He continues building towers, using the same pattern.

- 4.1 Find the number of blocks used to build Tower 20.
4.2 Find the total number of blocks used to build the bottom rows of all 20 towers.

Essentials (routine)

Exercise 1 Solutions

Learner Book Part 1, p. 77

5. $2 \times 2 \times 2 \times 2 \times 3 \times 3 = 2^4 \times 3^2$

9. $c \times c \times c = c^3$

Exercise 2 Solutions

Learner Book Part 1, p. 77

2.

2	48
2	24
2	12
2	6
3	3
	1



$$48 = 2 \times 2 \times 2 \times 2 \times 3$$

$$= 2^4 \times 3$$

Exercise 5 Solutions

Learner Book Part 1, p. 79

1. $(5 + 7)^2$ but $5^2 + 7^2$

$$= 12^2$$

$$= 144$$

$$= 25 + 49$$

$$= 74$$

$$\therefore (5 + 7)^2 \neq 5^2 + 7^2$$

Elevation (complex)

Exercise 8 Solutions

Learner Book Part 1, p. 81

1.7 $\sqrt{5^2 - 3^2}$

$$= \sqrt{25 - 9}$$

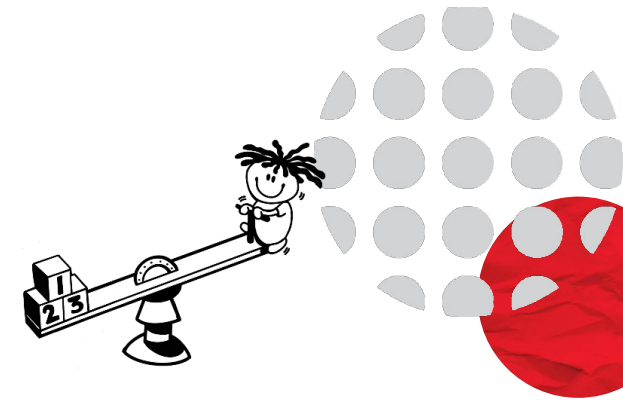
$$= \sqrt{16}$$

$$= 4$$

1.8 $\sqrt{5^2} - \sqrt{3^2}$

$$= 5 - 3$$

$$= 2$$



Exercise 9 Solutions

Learner Book Part 1, p. 82

1. $\sqrt{3 \times 12}$

$$= \sqrt{36}$$

$$= 6$$

2. $\sqrt{49 \times 121}$

$$= \sqrt{49} \times \sqrt{121}$$

$$= 7 \times 11$$

$$= 77$$



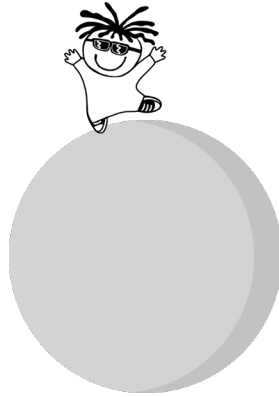
Exercise 12 Solutions

Learner Book Part 1, p. 85

$$\begin{aligned} 3.7 \quad & \sqrt[3]{8^2} \\ &= \sqrt[3]{64} \\ &= 4 \end{aligned}$$

$$\begin{aligned} 3.8 \quad & \sqrt{1^3 + 2^3 + 3^3} \\ &= \sqrt{1 + 8 + 27} \\ &= \sqrt{36} \\ &= 6 \end{aligned}$$

$$\begin{aligned} 4.6 \quad & 2^3 + 5 \times 2^4 - 4 \times \sqrt[3]{125} \\ &= 8 + 5 \times 16 - 4 \times 5 \\ &= 8 + 80 - 20 \\ &= 68 \end{aligned}$$

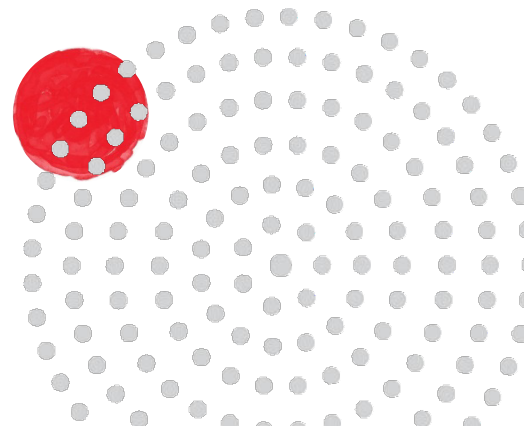
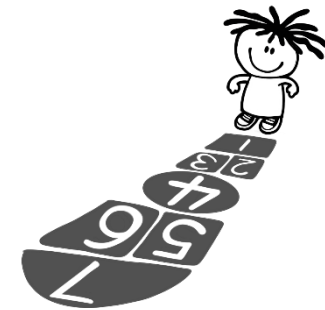


Exercise 14 Solutions

Learner Book Part 1, p. 87

$$\begin{array}{r|l} 3 & 3\ 375 \\ \hline 3 \leftarrow & 3\ 1\ 125 \\ \hline 3 & 375 \\ \hline 5 & 125 \\ \hline 5 \leftarrow & 5\ 25 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

$$\therefore \sqrt[3]{3\ 375} = 3 \times 5 = 15$$



Extension (problem solving)

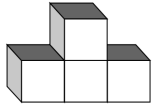
Exercise 16

Learner Book Part 1, p. 89

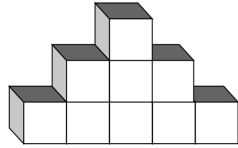
4.



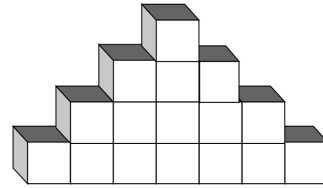
Tower 1



Tower 2



Tower 3



Tower 4

4.1 $20^2 = 400 \therefore$ 400 blocks are used to build Tower 20.

Explanation

Tower no.	Sum of blocks per row	Total number of blocks used
1	1	$1 = 1^2$
2	$1 + 3$	$4 = 2^2$
3	$1 + 3 + 5$	$9 = 3^2$
4	$1 + 3 + 5 + 7$	$16 = 4^2$
5	$1 + 3 + 5 + 7 + 9$	$25 = 5^2$
10		$100 = 10^2$
20		$400 = 20^2$

4.2 The total number of blocks used to build the bottom rows of all 20 towers is 400.

Explanation

This problem is best solved by inspection.



Tower 2 is made up of **2 rows** and it can be deconstructed to form the bottom rows of the first 2 towers.

- the sum of the blocks in the bottom rows of the first 2 towers equals the total number of blocks in Tower 2

Tower 3 is made up of **3 rows** and it can be deconstructed to form the bottom rows of the first 3 towers.

- the sum of the blocks in the bottom rows of the first 3 towers equals the total number of blocks in Tower 3

Tower 4 is made up of **4 rows** and it can be deconstructed to form the bottom rows of the first 4 towers.

- the sum of the blocks in the bottom rows of the first 4 towers equals the total number of blocks in Tower 4

Tower 20 is made up of **20 rows** and it can be deconstructed to form the bottom rows of the first 20 towers.

- the sum of the blocks in the bottom rows of the first 20 towers equals the total number of blocks in Tower 20