

# 14. [Exponents / Square Roots]

## Skill 14.1 Squaring whole numbers.

MMBlue 11 22 33 44  
MMGreen 11 22 33 44

To square a whole number means to multiply that number by itself.

□'s can illustrate square numbers:

$$1^2 = \text{One squared}$$

$$= \begin{array}{c} 1 \\ \square \end{array} 1 = 1 \text{ sq} \\ = 1 \times 1 \\ = 1$$

$$2^2 = \text{Two squared}$$

$$= \begin{array}{c} \leftarrow 2 \rightarrow \\ \square \square \\ \square \square \\ \updownarrow 2 \\ \square \square \end{array} = 4 \text{ sq} \\ = 2 \times 2 \\ = 4$$

$$3^2 = \text{Three squared}$$

$$= \begin{array}{c} \leftarrow 3 \rightarrow \\ \square \square \square \\ \square \square \square \\ \square \square \square \\ \updownarrow 3 \\ \square \square \square \end{array} = 9 \text{ sq} \\ = 3 \times 3 \\ = 9$$

$$4^2 = \text{Four squared}$$

$$= \begin{array}{c} \leftarrow 4 \rightarrow \\ \square \square \square \square \\ \square \square \square \square \\ \square \square \square \square \\ \square \square \square \square \\ \updownarrow 4 \\ \square \square \square \square \end{array} = 16 \text{ sq} \\ = 4 \times 4 \\ = 16$$

**Q.**  $12^2 =$

**A.**  $12^2$   
 $= 12 \times 12$   
 $= 144$

*Multiply 12 by itself.*

**Q.**  $30^2 =$

**A.**  $30^2$   
 $= 30 \times 30$   
 $= 900$

*Multiply 30 by itself.*

**a)**  $4^2 = 4 \times 4$   
 $= 16$

**b)**  $2^2 =$   
 $=$

**c)**  $1^2 =$   
 $=$

**d)**  $3^2 =$   
 $=$

**e)**  $8^2 =$   
 $=$

**f)**  $7^2 =$   
 $=$

**g)**  $6^2 =$   
 $=$

**h)**  $9^2 =$   
 $=$

**i)**  $5^2 =$   
 $=$

**j)**  $11^2 =$   
 $=$

**k)**  $13^2 =$   
 $=$

**l)**  $15^2 =$   
 $=$

**m)**  $16^2 =$   
 $=$

**n)**  $18^2 =$   
 $=$

**o)**  $14^2 =$   
 $=$

**p)**  $20^2 =$   
 $=$

**q)**  $40^2 =$   
 $=$

**r)**  $80^2 =$   
 $=$

**s)**  $10^2 =$   
 $=$

**t)**  $50^2 =$   
 $=$

## Skill 14.2 Finding square roots of whole numbers.

To find the square root of a number, reverse the procedure for squaring a number. In other words look for a number which, when multiplied by itself, equals the original number.

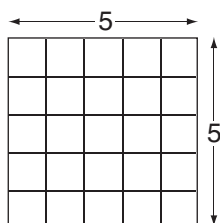
The symbol for SQUARE ROOT is  $\sqrt{\quad}$

1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25

$\square$ 's can illustrate square roots:

To find the square root of 25:

Arrange 25 equal square tiles to form a larger square.



Now, the square root of 25

$$= \sqrt{25}$$

= the number that when multiplied by itself equals 25. ( $5 \times 5 = 5^2 = 25$ )

= the number of squares along any one side length of the larger square.

$$= 5$$

**Q.**  $\sqrt{49} =$

**A.**  $\sqrt{49}$   
 $= \sqrt{7 \times 7}$   
 $= 7$

The square root of 49 means:  
 "which number when multiplied by itself equals 49".

**Q.**  $\sqrt{400} =$

**A.**  $\sqrt{400}$   
 $= \sqrt{20 \times 20}$   
 $= 20$

The square root of 400 means:  
 "which number when multiplied by itself equals 400".

**a)**  $\sqrt{1} = \sqrt{1 \times 1}$   
 $= 1$

**b)**  $\sqrt{4} =$  .....  
 $=$  .....

**c)**  $\sqrt{9} =$  .....  
 $=$  .....

**d)**  $\sqrt{16} =$  .....  
 $=$  .....

**e)**  $\sqrt{25} =$  .....  
 $=$  .....

**f)**  $\sqrt{36} =$  .....  
 $=$  .....

**g)**  $\sqrt{64} =$  .....  
 $=$  .....

**h)**  $\sqrt{81} =$  .....  
 $=$  .....

**i)**  $\sqrt{144} =$  .....  
 $=$  .....

**j)**  $\sqrt{225} =$  .....  
 $=$  .....

**k)**  $\sqrt{121} =$  .....  
 $=$  .....

**l)**  $\sqrt{900} =$  .....  
 $=$  .....

**m)**  $\sqrt{1600} = \sqrt{40 \times 40}$   
 $= 40$

**n)**  $\sqrt{2500} =$  .....  
 $=$  .....

**o)**  $\sqrt{3600} =$  .....  
 $=$  .....

**Skill 14.3** Calculating powers of 10.

Powers of 10 are multiples of 10 like 10, 100, 1000 and so on. The exponent of a power of 10 gives the number of zeros in the result. For example,  $10^4$  ends in 4 zeros, or  $10^4 = 10,000$ .

<p><b>Q.</b> <math>10^2 =</math></p>	<p><b>A.</b> <math>10^2</math>  <math>= 10 \times 10</math>  <math>= 100</math></p>	<p><i>Multiply 10 by itself, or simply have two zeros in the result.</i></p>
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<p><b>Q.</b> <math>10^6 =</math></p>	<p><b>A.</b> <math>10^6</math>  <math>= 10 \times 10 \times 10 \times 10 \times 10 \times 10</math>  <math>= 1,000,000</math></p>	<p><i>Multiply 10 by itself.          Have 6 lots of 10 in the equation or simply have six zeros in the result.</i></p>
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a)  $10^1 = 10$  .....

b)  $10^3 = 10 \times 10 \times 10$  .....  
 $= 1000$  .....

c)  $10^5 =$  .....  
 $=$  .....

d)  $10^6 =$  .....  
 $=$  .....

e)  $10^8 =$  .....  
 $=$  .....

f)  $10^9 =$  .....  
 $=$  .....

g)  $10^0 =$  .....  
 $=$  .....

h)  $10^7 =$  .....  
 $=$  .....

i)  $10^4 =$  .....  
 $=$  .....

j)  $10^{12} =$  .....  
 $=$  .....

k)  $10^2 =$  .....  
 $=$  .....

i)  $10^{10} =$  .....  
 $=$  .....

## Skill 14.4 Finding powers of whole numbers.

MMBlue 1 1 2 2 3 3 4 4  
MMGreen 1 1 2 2 3 3 4 4

$5^4$ , which is read as “5 raised to the power of 4”, means there are 4 lots of 5 in the equation.

$$5^4 = 5 \times 5 \times 5 \times 5$$

5 is the BASE and 4 is the EXPONENT.

So the multiplication  $5 \times 5 \times 5 \times 5$  can be abbreviated using exponents.

Any number raised to the power of zero (except 0) equals 1. For example  $2^0 = 1$ .

Any number raised to the power of one equals the number itself. For example  $6^1 = 6$ .

**Q.**  $2^5 =$

**A.**  $2^5$   
 $= 2 \times 2 \times 2 \times 2 \times 2$   
 $= 32$

You need 5 lots of 2.

**Q.**  $5^3 =$

**A.**  $5^3$   
 $= 5 \times 5 \times 5$   
 $= 125$

Multiply 3 lots of 5.

**a)**  $3^4 = 3 \times 3 \times 3 \times 3$   
 $= 81$

**b)**  $2^3 =$  .....  
 $=$  .....

**c)**  $1^5 =$  .....  
 $=$  .....

**d)**  $7^1 =$  .....  
 $=$  .....

**e)**  $4^0 =$  .....  
 $=$  .....

**f)**  $4^3 =$  .....  
 $=$  .....

**g)**  $5^4 =$  .....  
 $=$  .....

**h)**  $3^5 =$  .....  
 $=$  .....

**i)**  $6^3 =$  .....  
 $=$  .....

**j)**  $7^3 =$  .....  
 $=$  .....

**k)**  $8^2 =$  .....  
 $=$  .....

**l)**  $5^4 =$  .....  
 $=$  .....

**m)**  $2^6 =$  .....  
 $=$  .....

**n)**  $9^0 =$  .....  
 $=$  .....

**o)**  $5^1 =$  .....  
 $=$  .....