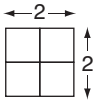
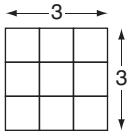
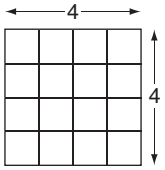
14. [Exponents / Square Roots]

Skill 14.1 Squaring whole numbers.

MM7 11 22 33 44
MM8 11 22 33 44

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

□'s can illustrate square numbers:

1^2	2^2	3^2	4^2
= One squared	= Two squared	= Three squared	= Four squared
= 1 sq	 = 4 sq	 = 9 sq	 = 16 sq
$= 1 \times 1$	$= 2 \times 2$	$= 3 \times 3$	$= 4 \times 4$
$= \mathbf{1}$	$= \mathbf{4}$	$= \mathbf{9}$	$= \mathbf{16}$

Q. $12^2 =$ **A.** 12^2 *Multiply 12 by itself.*
$= 12 \times 12$
$= \mathbf{144}$

Q. $30^2 =$ **A.** 30^2 *Multiply 30 by itself.*
$= 30 \times 30$
$= \mathbf{900}$

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.

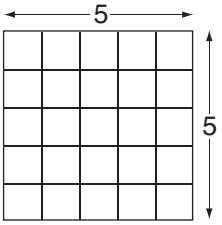
To find the square root of a number, reverse the procedure for squaring a number.
In other words look for a number which, when multiplied by itself, equals the original number.
The symbol for SQUARE ROOT is $\sqrt{}$

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) $\sqrt{4}$ $= \ldots\ldots$ $= \ldots\ldots$

c) $\sqrt{9}$ $= \ldots\ldots$ $= \ldots\ldots$

d) $\sqrt{16}$ $= \ldots\ldots$ $= \ldots\ldots$

e) $\sqrt{25}$ $= \ldots\ldots$ $= \ldots\ldots$

f) $\sqrt{36}$ $= \ldots\ldots$ $= \ldots\ldots$

g) $\sqrt{64}$ $= \ldots\ldots$ $= \ldots\ldots$

h) $\sqrt{81}$ $= \ldots\ldots$ $= \ldots\ldots$

i) $\sqrt{144}$ $= \ldots\ldots$ $= \ldots\ldots$

j) $\sqrt{225}$ $= \ldots\ldots$ $= \ldots\ldots$

k) $\sqrt{121}$ $= \ldots\ldots$ $= \ldots\ldots$

l) $\sqrt{900}$ $= \ldots\ldots$ $= \ldots\ldots$

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

n) $\sqrt{2500}$ $= \ldots\ldots$ $= \ldots\ldots$

o) $\sqrt{3600}$ $= \ldots\ldots$ $= \ldots\ldots$

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 $10^4 = 10\,000$.

Q. $10^2 =$

A. 10^2
$= 10 \times 10$
$= \mathbf{100}$

Multiply 10 by itself, or simply have two zeros in the result.

Q. $10^6 =$

A. 10^6
$= 10 \times 10 \times 10 \times 10 \times 10 \times 10$
$= \mathbf{1\,000\,000}$

Multiply 10 by itself.
Have 6 lots of 10 in the equation or simply have six zeros in the result.

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.

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
$= 2 \times 2 \times 2 \times 2 \times 2$
$= \mathbf{32}$

You need 5 lots of 2.

Q. $5^3 =$

A. 5^3
$= 5 \times 5 \times 5$
$= \mathbf{125}$

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) $5^1 =$ .....
$=$ .....