SQUARE ROOTS & PERFECT SQUARES

To understand square roots, first let's take a look at squares.

How to Square a Number: Just multiply it by itself.

Squares from 1^2 to 12^2

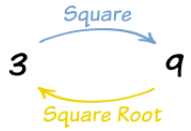
1 Squared	= 1^2	= 1×1	=	**1**
2 Squared	= 2^2	= 2×2	=	**4**
3 Squared	= 3^2	= 3×3	=	**9**
4 Squared	= 4^2	= 4×4	=	**16**
5 Squared	= 5^2	= 5×5	=	**25**
6 Squared	= 6^2	= 6×6	=	**36**
7 Squared	= 7^2	= 7×7	=	**49**
8 Squared	= 8^2	= 8×8	=	**64**
9 Squared	= 9^2	= 9×9	=	**81**
10 Squared	= 10^2	= 10×10	=	**100**
11 Squared	= 11^2	= 11×11	=	**121**
12 Squared	= 12^2	= 12×12	=	**144**

PERFECT SQUARES

X	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

Square Roots:

A square root goes the other way:



3 squared is 9, so a **square root** of 9 is 3

A square root of a number is a value that can be **multiplied by itself** to give the original number.
A square root of **9** is **3**, because **when 3 is multiplied by itself** we get **9**.
It is like asking "what can we multiply by itself to get this?"

The Square Root Symbol
√ This is the special symbol that means "square root". It is called the **radical.**

To Help You Remember: Think of the root of a tree.

2 2 Or -2 -2 | 3×3 or -3×-3 | 5×5 -5×-5 | 6×6 -6×-6 | 7×7 -7×-7 | 8×8 -8×-8 | 9×9 -9×-9

$\sqrt{4} = \pm 2$ $\sqrt{9} = \pm 3$ $\sqrt{25} = \pm 5$ $\sqrt{36} = \pm 6$ $\sqrt{49} = \pm 7$ $\sqrt{64} = \pm 8$ $\sqrt{81} = \pm 9$

OPERATIONS WITH SQUARE ROOTS

Just follow the same BEDMAS rule when operating with fractions.

Simplify each expression:

a) $\sqrt{25} + \sqrt{16}$ Read: Add the square roots of 25 and 16.

$= 5 + 4$

$= 9$

b) $\sqrt{3 + 6}$ Read: Square root the sum of 3 and 6.

$= \sqrt{9}$

$= 3$

c) $\sqrt{31 + \sqrt{25}}$ Read: Square root the sum of 31 and square root of 25.

$= \sqrt{31 + 5}$

$= \sqrt{36}$ $= 6$

d) $\sqrt{\sqrt{169} + \sqrt{144}}$ Read: Square root the sum of square root of 169 and square root of 144.

$= \sqrt{13 + 12}$

$= \sqrt{25}$ $= 5$

e) $2\sqrt{25}$ Read: 2 times square root 25.

$= 2 \cdot (5)$

$= 10$

f) $3\sqrt{100} + 2\sqrt{16}$

$= 3 \cdot (10) + 2(4)$

$= 30 + 8$

$= 38$

g) $\sqrt{12 - \sqrt{6 + \sqrt{8 + 1}}}$ start simplifying from Right to left

$= \sqrt{12 - \sqrt{6 + \sqrt{9}}}$

$= \sqrt{12 - \sqrt{6 + 3}}$

$= \sqrt{12 - \sqrt{9}}$

$= \sqrt{12 - 3}$

$= \sqrt{9}$ $= 3$