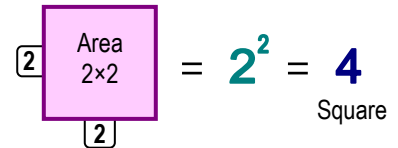


Square Roots

What is a Square?

- a) A figure with four equal right-angled sides whose Area = side \times side.
- b) A number or variable raised to the 2nd power, like 3^2 or x^2 .
- c) The result of multiplying a number by itself; 9 is the square of 3×3 .
- d) All of the above.



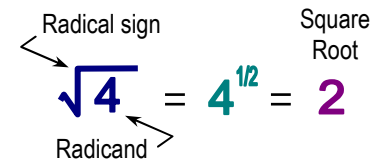
$$2 \times 2 = 2^2 = 4$$

Square

Answer: d

What is a Square Root?

- a) A number multiplied by itself to produce a square, like $2 \times 2 = 4$.
- b) A number or variable raised to the $\frac{1}{2}$ power, like $9^{1/2}$ or $x^{1/2}$.
- c) The result of taking the square root of a number; 3 is the root of $\sqrt{9}$.
- d) All of the above.




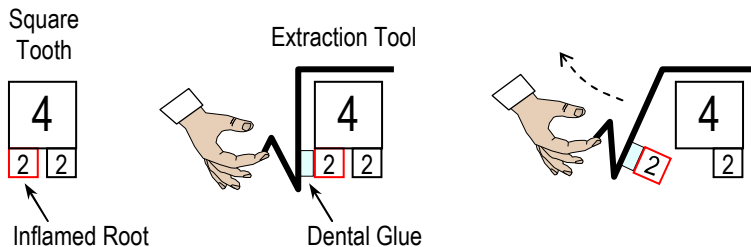
$$\sqrt{4} = 4^{1/2} = 2$$

Radical sign Square Root
Radicand

Answer: d

Extracting A Square Root

 **BrainAid** Imagine you have a square tooth with two identical roots. One root is inflamed, so you go to the dentist who removes it with a Root Extraction Tool.



Perfect Squares	
Root (r)	Square (r ²)
1	1
2	4
3	9
4	16
5	25
6	
7	
8	
9	
10	100
11	
12	
13	
14	
15	225
16	
17	
18	
19	
20	400
21	
22	
23	
24	
25	625

Perfect Squares

Teeth that are perfectly square have *integer* roots.
 Integers consist of whole numbers and their negatives: ...-2, -1, 0, 1, 2....
 Teeth can also have negative square roots since $- \times - = +$.
 Example: $-3 \times -3 = 9$, so -3 is a square root of 9. $\pm \sqrt{9} = \pm 3$

Non-Perfect Squares

Teeth that are *not* perfectly square have *irrational* roots.
 Irrational numbers never end and never repeat their digit patterns.
 Example: $\sqrt{2} = 1.4142135....$

To Estimate Roots of Non-Perfect Squares

Fit the non-perfect square between perfect squares. Try roots in between.
 Problem: Estimate the square root of 20 to one decimal place.
 Procedure: In the **Perfect Squares** table, 20 fits about halfway between squares 16 and 25, so its square root should be about halfway between their roots of 4 and 5.
 Trials: $4.4 \times 4.4 = 19.36$ $4.5 \times 4.5 = 20.25$ $4.6 \times 4.6 = 21.16$
 Closest Root: 4.5

To Do
 Fill in the missing Squares.