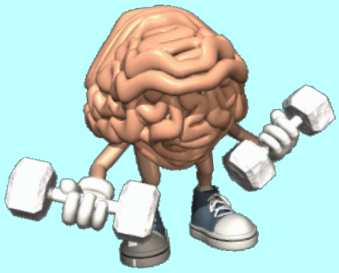


Warm Up

BEDMAS

1) $12 - 6 \times 7 - (5-3)^2 + 24 \div 3$

$= 12 - 6 \times 7 - (2)^2 + 24 \div 3$

$= 12 - 6 \times 7 - 4 + 24 \div 3$

$= 12 - 42 - 4 + 24 \div 3$

$= 12 - 42 - 4 + 8$

$= -26$

2) To attend the local fair the cost for admission is $5.25. If you plan to go on rides it is an additional $2.00 per ticket. How many rides could you go on if you have $47.00?

x = # of tickets
C = cost of fair

C goes with variable

$C = 2x + 5.25$

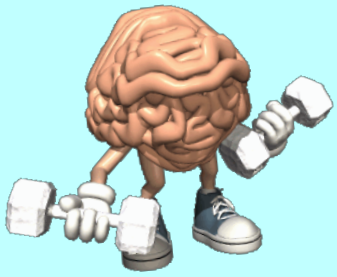
$47 = 2x + 5.25$

$47 - 5.25 = 2x + 5.25 - 5.25$

$\frac{41.75}{2} = \frac{2x}{2}$

$20.87 = x$

Only can buy 20 tickets



Warm Up

Review From Grade 9

1) $(2 + (5+1)^3 + (-2)^7) \div [2(-1+4^2)]$

2) $\frac{(6x14)}{7} + 100 \times 4 \div 5^2$

3) A taxi driver charges a flat fee of $9.00 and $3.00 for ever kilometre travelled.

a) Write an equation that represents the scenario.

b) If you travel 18 km how much would you have to pay the taxi driver? (use your equation from part a)

b) If you have $66.00 how far can you travel in the taxi? (use your equation from part a)

4.1 Estimating Roots

MATH LAB

LESSON FOCUS Explore decimal representations of different roots of numbers.

Make Connections

Since $3^2 = 9$, 3 is a square root of 9.

We write: $3 = \sqrt{9}$

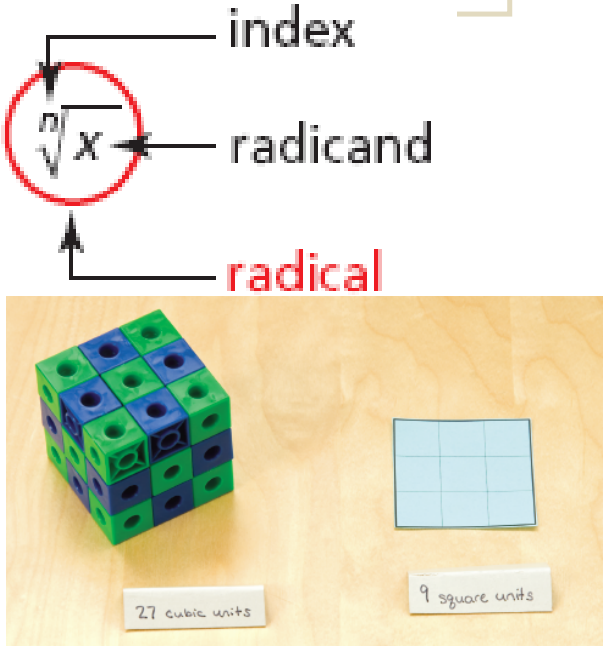
Since $3^3 = 27$, 3 is the cube root of 27.

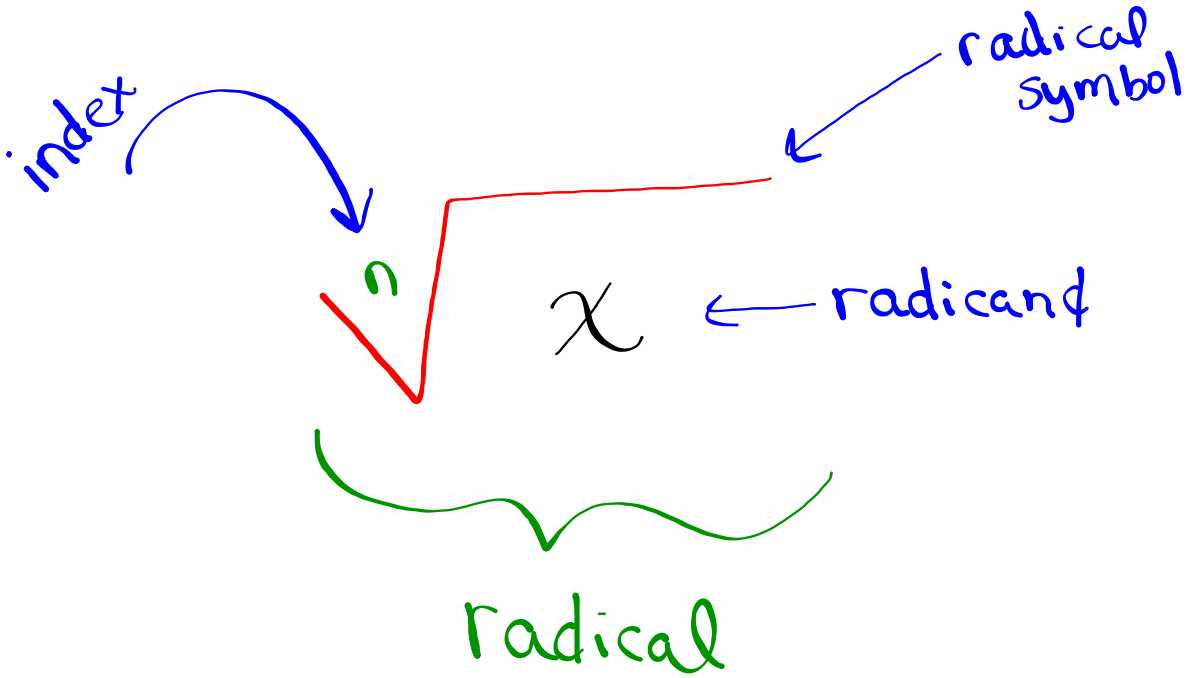
We write: $3 = \sqrt[3]{27}$

Since $3^4 = 81$, 3 is a fourth root of 81.

We write: $3 = \sqrt[4]{81}$

How would you write 5 as a square root? A cube root? A fourth root?




index
radical symbol
n
x
radicand
radical

What do you know???

$x^2 = x \cdot x$

$x^3 = x \cdot x \cdot x$

$x^4 = x \cdot x \cdot x \cdot x$

Let's try some examples:

a) 3^2

$= 3 \cdot 3$

$= 9$

b) 4^3

$= 4 \cdot 4 \cdot 4$

$16 \cdot 4$

64

c) $\sqrt{81} = \sqrt{9 \times 9}$

$= 9$

d) $\sqrt{49}$

$= 7$

index is understood to be "2"

$\sqrt{49}$

Exponent button

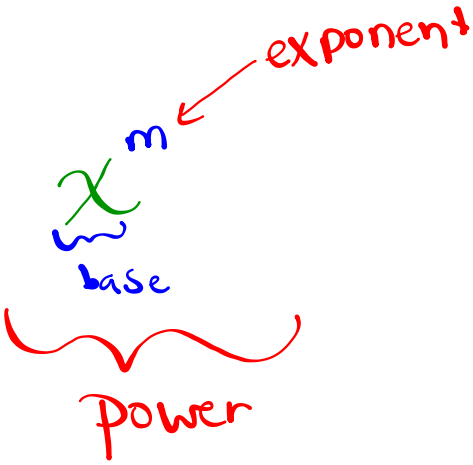
x^y or y^x or $\wedge$ $x^{\square}$

x^2 x^3

$\sqrt{}$

$7^4 = 2401$


Power
exponent
8
3
base



Ex) 3^2

Base = 3

exponent = 2

power 3^2

Exponents

- Exponents are shorthand for multiplication:
  $(5)\,(5) = 5^2$, $(5)\,(5)\,(5) = 5^3$.

- The "exponent" stands for however many times the term is being multiplied.

Exponent → 5^3 (3 times) $5 \times 5 \times 5 = 125$

- The term that's being multiplied is called the "base".

Base → 5^3

Write each power as a product, then evaluate.

#1

a) 3^4

$= 81$

b) 5^3

$= 125$

c) $\left(\frac{2}{3}\right)^3$

$\frac{2^3}{3^3}$

$= \frac{8}{27}$

d) $\left(\frac{4}{5}\right)^2$

$= \frac{4^2}{5^2}$

$= \frac{16}{25}$

c) $\frac{2}{3} \times \frac{2}{3} \times \frac{2}{3}$

$\frac{2^3}{3^3}$

$\frac{8}{27}$

Write each product as a power, then evaluate.

#2

a) (4)(4)(4)

4^3

$= 64$

b) (-6)(-6)(-6)(-6)(-6)

$= (-6)^5$

$= -7776$

here the "2" is tied to the 3 not the neg

-3^2 vs $(-3)^2$

$-3 \cdot 3$

-9

$(-3)(-3)$

$+9$

a^n

POWERS

x^t

$1^0 = 1$
$1^1 = 1$
$1^2 = 1$
$1^3 = 1$
$1^4 = 1$
$1^5 = 1$

$2^0 = 1$
$2^1 = 2$
$2^2 = 4$
$2^3 = 8$
$2^4 = 16$
$2^5 = 32$

$3^0 = 1$
$3^1 = 3$
$3^2 = 9$
$3^3 = 27$
$3^4 = 81$
$3^5 = 243$

$4^0 = 1$
$4^1 = 4$
$4^2 = 16$
$4^3 = 64$
$4^4 = 256$
$4^5 = 1024$

$5^0 = 1$
$5^1 = 5$
$5^2 = 25$
$5^3 = 125$
$5^4 = 625$
$5^5 = 3125$

$6^0 = 1$
$6^1 = 6$
$6^2 = 36$
$6^3 = 216$
$6^4 = 1296$
$6^5 = 7776$

$7^0 = 1$
$7^1 = 7$
$7^2 = 49$
$7^3 = 343$
$7^4 = 2401$
$7^5 = 16807$

$8^0 = 1$
$8^1 = 8$
$8^2 = 64$
$8^3 = 512$
$8^4 = 4096$
$8^5 = 32768$

$9^0 = 1$
$9^1 = 9$
$9^2 = 81$
$9^3 = 729$
$9^4 = 6561$
$9^5 = 59049$

$10^0 = 1$
$10^1 = 10$
$10^2 = 100$
$10^3 = 1000$
$10^4 = 10000$
$10^5 = 100000$

51^7

$(2x)^n$

Powers with a Twist

Can you see the difference?

-4^2

Negative is not being repeated only the #4

-4×4

-16

$(-4)^2$

Here both (-) and (4) are repeated

$(-4)(-4)$

$+16$

$(-1)^2 = (-1)(-1) = +1$

$(-1)^3 = (-1)(-1)(-1) = -1$

$(-1)^4 =$

$(-1)^5 =$

.
.
.

Did you see a pattern??

$(-1)^{10247} = -1$ (odd)

$(-1)^{29584} = +1$ (even)

$(-1)^{10247} = -1$ $(-1)^{29584} = 1$

Evaluating powers when the base is negative...

Study *

If the exponent is even the answer will be positive.

If the exponent is odd the answer will be negative.

$(-\text{base})^{\text{even}} =$ positive

$(-\text{base})^{\text{odd}} =$ negative

Perfect Squares

$(1)^2 = 1 \times 1 = 1$

$(2)^2 = 2 \times 2 = 4$

$(3)^2 = 3 \times 3 = 9$

$(4)^2 = 4 \times 4 = 16$

$(5)^2 = 5 \times 5 = 25$

$(6)^2 = 6 \times 6 = 36$

$(7)^2 = 7 \times 7 = 49$

$(8)^2 = 8 \times 8 = 64$

$(9)^2 = 9 \times 9 = 81$

$(10)^2 = 10 \times 10 = 100$

$(11)^2 = 11 \times 11 = 121$

$(12)^2 = 12 \times 12 = 144$

$(13)^2 = 13 \times 13 = 169$

$(14)^2 = 14 \times 14 = 196$

$(15)^2 = 15 \times 15 = 225$

$(16)^2 = 16 \times 16 = 256$

$(17)^2 = 17 \times 17 = 289$

$(18)^2 = 18 \times 18 = 324$

$(19)^2 = 19 \times 19 = 361$

$(20)^2 = 20 \times 20 = 400$

$(21)^2 = 21 \times 21 = 441$

$(22)^2 = 22 \times 22 = 484$

$(23)^2 = 23 \times 23 = 529$

Perfect Cubes

$(1)^3 = 1 \times 1 \times 1 = \mathbf{1}$

$(2)^3 = 2 \times 2 \times 2 = \mathbf{8}$

$(3)^3 = 3 \times 3 \times 3 = \mathbf{27}$

$(4)^3 = 4 \times 4 \times 4 = \mathbf{64}$

$(5)^3 = 5 \times 5 \times 5 = \mathbf{125}$

$(6)^3 = 6 \times 6 \times 6 = \mathbf{216}$

$(7)^3 = 7 \times 7 \times 7 = \mathbf{343}$

$(8)^3 = 8 \times 8 \times 8 = \mathbf{512}$

$(9)^3 = 9 \times 9 \times 9 = \mathbf{729}$

$(10)^3 = 10 \times 10 \times 10 = \mathbf{1000}$

$(11)^3 = 11 \times 11 \times 11 = \mathbf{1331}$

$(12)^3 = 12 \times 12 \times 12 = \mathbf{1728}$

$(13)^3 = 13 \times 13 \times 13 = \mathbf{2197}$

$(14)^3 = 14 \times 14 \times 14 = \mathbf{2744}$

$(15)^3 = 15 \times 15 \times 15 = \mathbf{3375}$

$(16)^3 = 16 \times 16 \times 16 = \mathbf{4096}$

$(17)^3 = 17 \times 17 \times 17 = \mathbf{4913}$

$(18)^3 = 18 \times 18 \times 18 = \mathbf{5832}$

$(19)^3 = 19 \times 19 \times 19 = \mathbf{6859}$

$(20)^3 = 20 \times 20 \times 20 = \mathbf{8000}$

$(21)^3 = 21 \times 21 \times 21 = \mathbf{9261}$

$(22)^3 = 22 \times 22 \times 22 = \mathbf{10648}$

$(23)^3 = 23 \times 23 \times 23 = \mathbf{12167}$

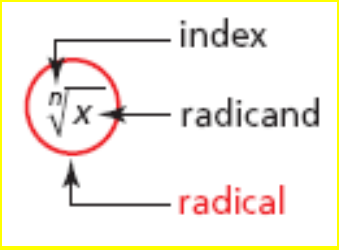
$(24)^3 = 24 \times 24 \times 24 = \mathbf{13824}$

$(25)^3 = 25 \times 25 \times 25 = \mathbf{15624}$

What do you know???

$\sqrt[2]{64} = 8$

$\sqrt[3]{27} = 3$



$\sqrt[4]{64}$

$\sqrt{98}$

$\sqrt[4]{64}$