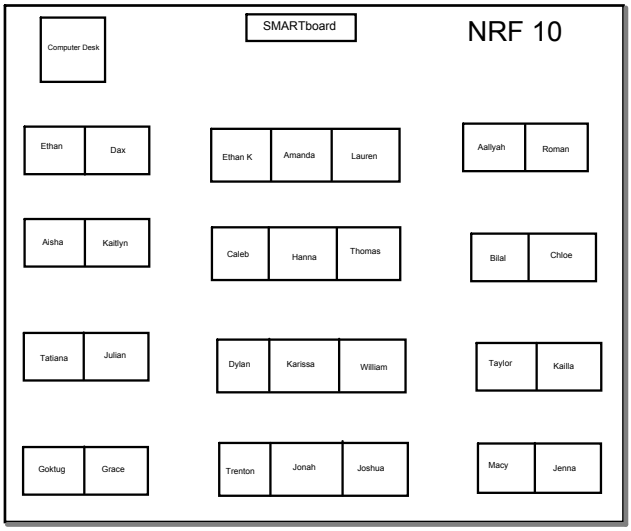
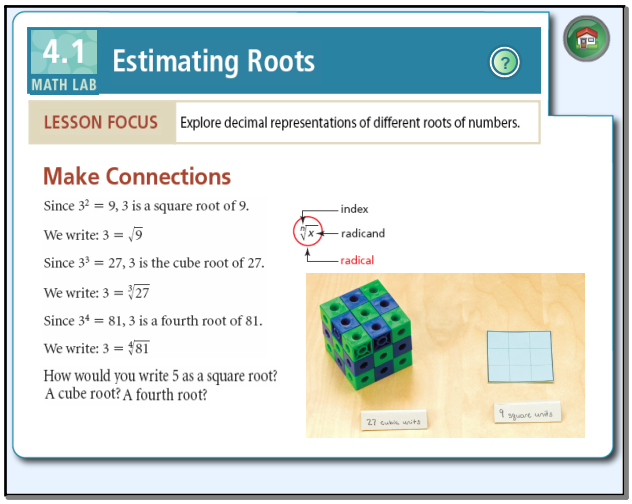
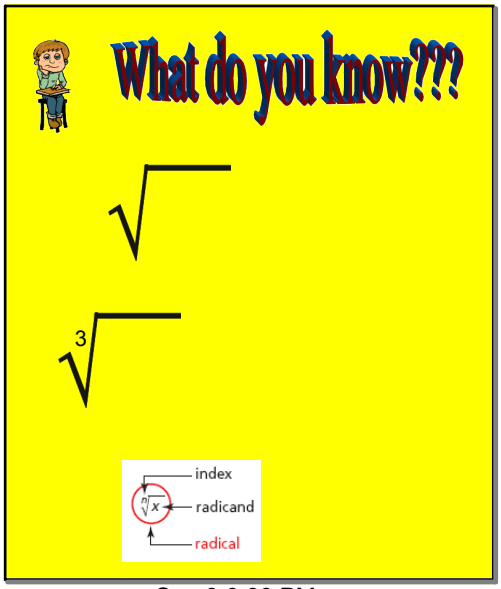


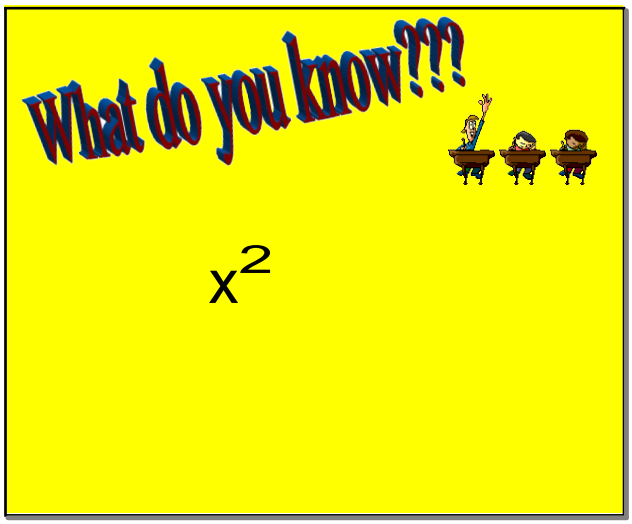

Sep 5-1:39 PM



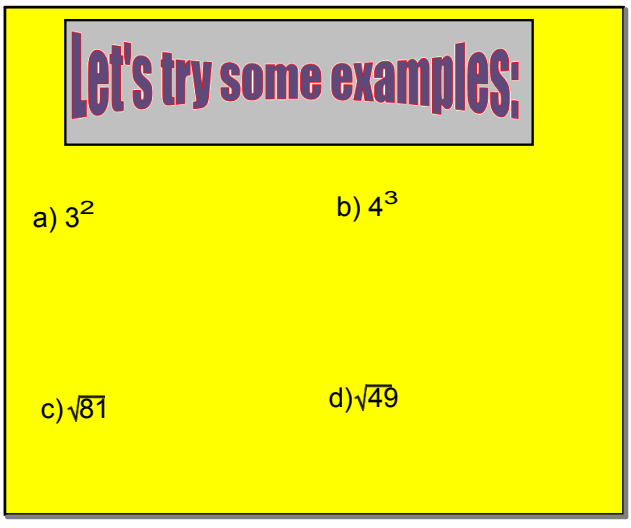

Introduction




Sep 6-9:38 PM




Sep 6-9:38 PM

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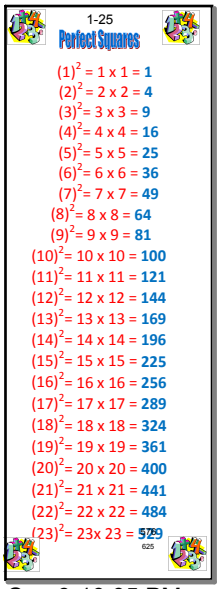



Sep 6-10:05 PM

## Perfect Cubes 1-12

$(1)^3 = 1 \times 1 \times 1 = 1$
$(2)^3 = 2 \times 2 \times 2 = 8$
$(3)^3 = 3 \times 3 \times 3 = 27$
$(4)^3 = 4 \times 4 \times 4 = 64$
$(5)^3 = 5 \times 5 \times 5 = 125$
$(6)^3 = 6 \times 6 \times 6 = 216$
$(7)^3 = 7 \times 7 \times 7 = 343$
$(8)^3 = 8 \times 8 \times 8 = 512$
$(9)^3 = 9 \times 9 \times 9 = 729$
$(10)^3 = 10 \times 10 \times 10 = 1000$
$(11)^3 = 11 \times 11 \times 11 = 1331$
$(12)^3 = 12 \times 12 \times 12 = 1728$
$(13)^3 = 13 \times 13 \times 13 = 2197$
$(14)^3 = 14 \times 14 \times 14 = 2744$
$(15)^3 = 15 \times 15 \times 15 = 3375$
$(16)^3 = 16 \times 16 \times 16 = 4096$
$(17)^3 = 17 \times 17 \times 17 = 4913$
$(18)^3 = 18 \times 18 \times 18 = 5832$
$(19)^3 = 19 \times 19 \times 19 = 6859$
$(20)^3 = 20 \times 20 \times 20 = 8000$
$(21)^3 = 21 \times 21 \times 21 = 9261$
$(22)^3 = 22 \times 22 \times 22 = 10648$
$(23)^3 = 23 \times 23 \times 23 = 12167$
$(24)^3 = 24 \times 24 \times 24 = 13824$
$(25)^3 = 25 \times 25 \times 25 = 15624$

Sep 6-10:05 PM

## Perfect Powers of Four

1

16

81

256

625

Sep 7-8:53 AM

## TRY THIS

Work with a partner.

You will need a calculator to check your estimates.

**A.** Write the two consecutive perfect squares closest to 20. Estimate the value of $\sqrt{20}$. Square your estimate. Use this value to revise your estimate. Keep revising your estimate until the square of the estimate is within 1 decimal place of 20.

**B.** Write the two consecutive perfect cubes closest to 20. Estimate the value of $\sqrt[3]{20}$. Cube your estimate. Use this value to revise your estimate. Keep revising your estimate until the cube of the estimate is within 1 decimal place of 20.

**C.** Write the two consecutive perfect fourth powers closest to 20.
Use a strategy similar to that in Steps A and B to estimate a value for $\sqrt[4]{20}$.

4.1 Math Lab: Estimating Roots

Try This p.1

## TRY THIS

Write the two consecutive perfect squares closest to 20.

Fill in the table until the square of the estimate is within 1 decimal place of 20.

| Estimated value of $\sqrt{20}$ | Square of estimate |
|---|---|
| | |
| | |
| | |
| | |
| | |

4.1 Math Lab: Estimating Roots

Try This p.4

## TRY THIS

Write the two consecutive perfect cubes closest to 20.

Fill in the table until the cube of the estimate is within 1 decimal place of 20.

| Estimated value of $\sqrt[3]{20}$ | Cube of estimate |
|---|---|
| | |
| | |
| | |
| | |
| | |

4.1 Math Lab: Estimating Roots

Try This p.5

## TRY THIS (continued)

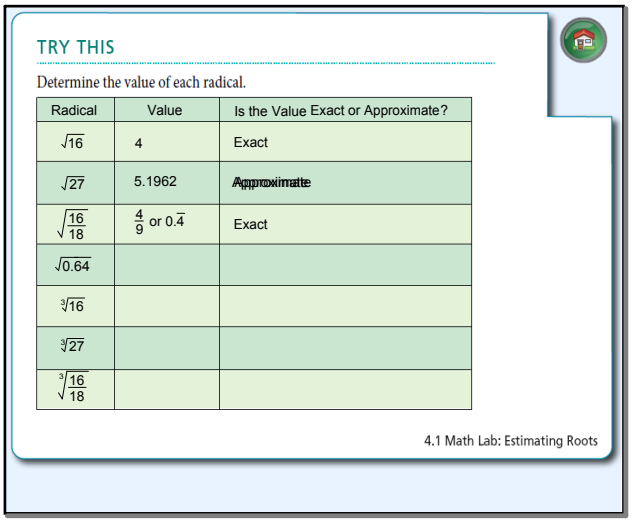
**D.** Copy and complete this table. Use the strategies from Steps A to C to determine the value of each radical.

| Radical | Value | Is the Value Exact or Approximate? |
|---|---|---|
| $\sqrt{16}$ | 4 | Exact |
| $\sqrt{27}$ | 5.1962 | Approximate |
| $\sqrt{\frac{16}{81}}$ | $\frac{4}{9}$ or $0.\overline{4}$ | Exact |
| $\sqrt{0.64}$ | | |
| $\sqrt[3]{16}$ | | |
| $\sqrt[3]{27}$ | | |
| $\sqrt[3]{\frac{16}{81}}$ | | |
| $\sqrt[3]{0.64}$ | | |
| $\sqrt[3]{-0.64}$ | | |
| $\sqrt[4]{16}$ | | |
| $\sqrt[4]{27}$ | | |
| $\sqrt[4]{\frac{16}{81}}$ | | |
| $\sqrt[4]{0.64}$ | | |

Choose 3 different radicals.
Extend then complete the table for these radicals.

4.1 Math Lab: Estimating Roots

Try This p.2



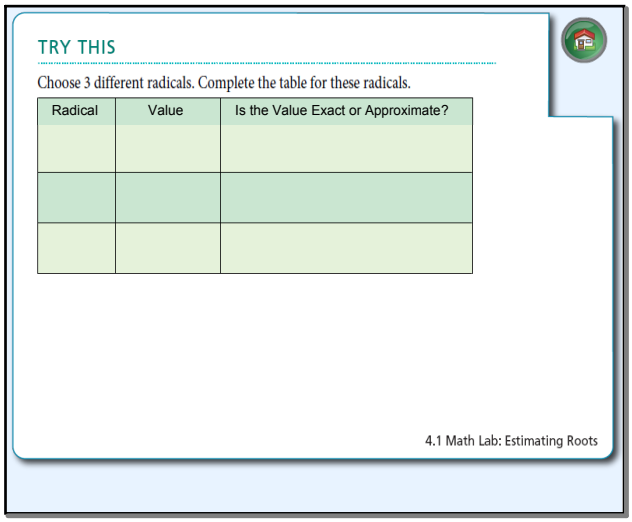
TRY THIS

Determine the value of each radical.

| Radical | Value | Is the Value Exact or Approximate? |
|---|---|---|
| $\sqrt{16}$ | 4 | Exact |
| $\sqrt{27}$ | 5.1962 | ~~Approximate~~ |
| $\sqrt{\frac{16}{18}}$ | $\frac{4}{9}$ or $0.\overline{4}$ | Exact |
| $\sqrt{0.64}$ | | |
| $\sqrt[3]{16}$ | | |
| $\sqrt[3]{27}$ | | |
| $\sqrt[3]{\frac{16}{18}}$ | | |

4.1 Math Lab: Estimating Roots

Try This p.7



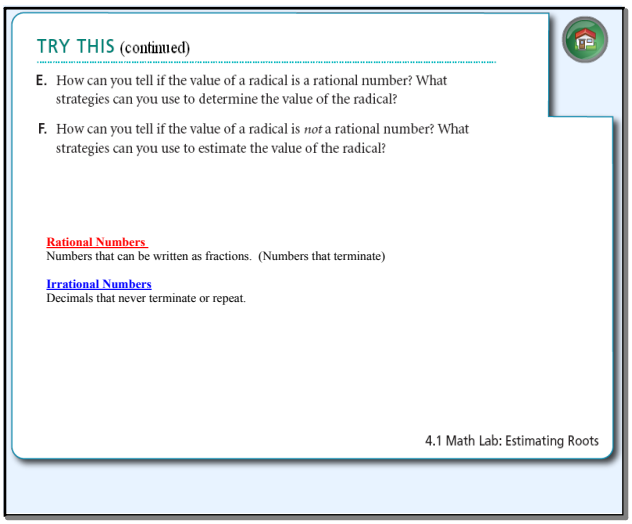
TRY THIS

Choose 3 different radicals. Complete the table for these radicals.

| Radical | Value | Is the Value Exact or Approximate? |
|---|---|---|
| | | |
| | | |
| | | |

4.1 Math Lab: Estimating Roots

Try This p.9



TRY THIS (continued)

E. How can you tell if the value of a radical is a rational number? What strategies can you use to determine the value of the radical?

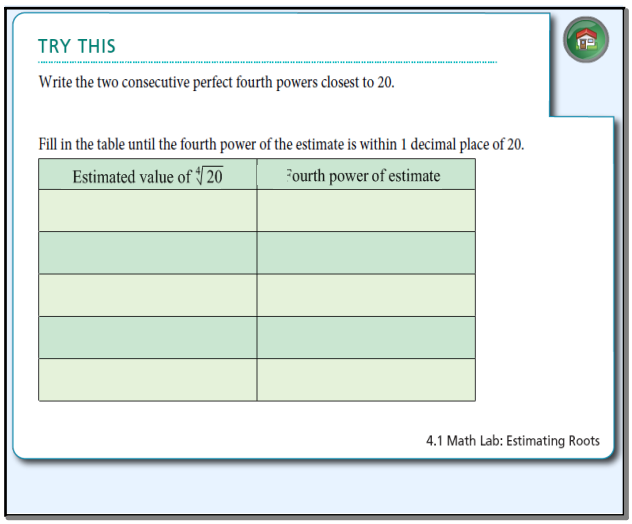
F. How can you tell if the value of a radical is *not* a rational number? What strategies can you use to estimate the value of the radical?

**Rational Numbers**
Numbers that can be written as fractions. (Numbers that terminate)

**Irrational Numbers**
Decimals that never terminate or repeat.

4.1 Math Lab: Estimating Roots

Try This p.3



TRY THIS

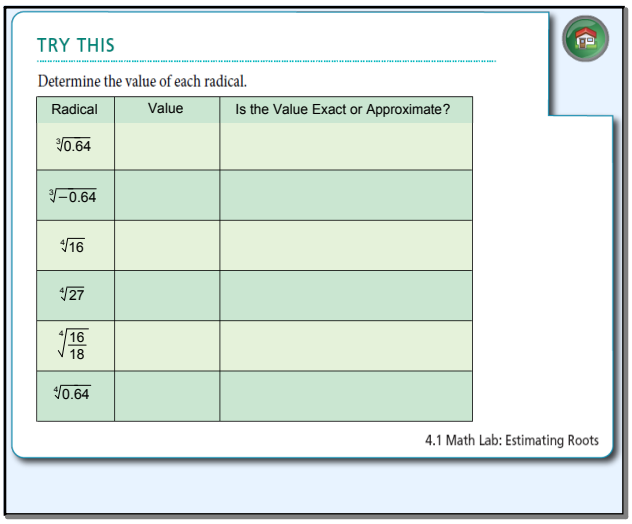
Write the two consecutive perfect fourth powers closest to 20.

Fill in the table until the fourth power of the estimate is within 1 decimal place of 20.

| Estimated value of $\sqrt[4]{20}$ | Fourth power of estimate |
|---|---|
| | |
| | |
| | |
| | |
| | |

4.1 Math Lab: Estimating Roots

Try This p.6



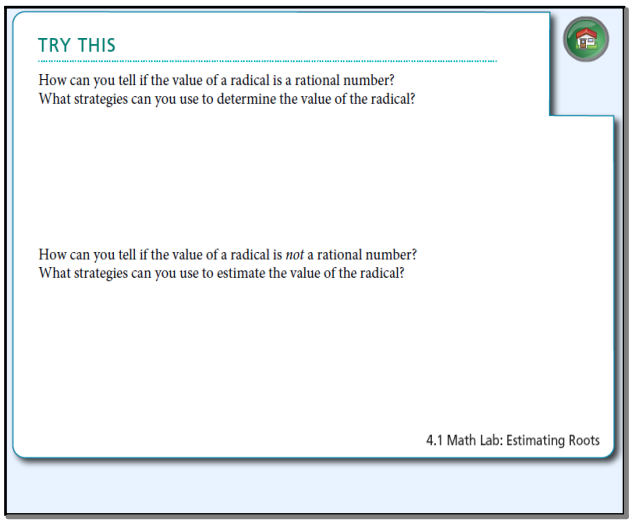
TRY THIS

Determine the value of each radical.

| Radical | Value | Is the Value Exact or Approximate? |
|---|---|---|
| $\sqrt[3]{0.64}$ | | |
| $\sqrt[3]{-0.64}$ | | |
| $\sqrt[4]{16}$ | | |
| $\sqrt[4]{27}$ | | |
| $\sqrt[4]{\frac{16}{18}}$ | | |
| $\sqrt[5]{0.64}$ | | |

4.1 Math Lab: Estimating Roots

Try This p.8



TRY THIS

How can you tell if the value of a radical is a rational number?
What strategies can you use to determine the value of the radical?

How can you tell if the value of a radical is *not* a rational number?
What strategies can you use to estimate the value of the radical?

4.1 Math Lab: Estimating Roots

Try This p.10

## Activate Prior Learning:
## Square Roots and Cube Roots

When a number $x$ can be written as the product of two equal factors, then the square root of $x$, represented by $\sqrt{x}$, is one of these factors.
For example, $\sqrt{64} = 8$ because $8^2 = 64$.

The cube root of a number $x$, represented by $\sqrt[3]{x}$, is one of three equal factors of the number.
For example, $\sqrt[3]{64} = 4$ because $4^3 = 64$.

Calculate each root: $\sqrt{144}$, $\sqrt[3]{27}$

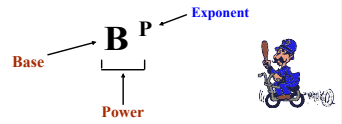
(Continues on next page.)

4.1 Math Lab: Estimating Roots

Activating Prior Learning p.1

## Activate Prior Learning:
## Powers with Integer Bases

**Powers**




A **power** with a positive integer exponent represents repeated multiplication:

Example:

$2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

**Example: Identify the base and the exponent for each expression**

a) $4^3$ Base: 4 Exponent: 3

b) $7^{23}$ Base: 7 Exponent: 23

c) $a^b$ Base: a Exponent: b

Sep 5-8:07 PM

## Activate Prior Learning:
## Powers with Integer Bases

**Express each expression as a power**

a) (7)(7)(7)(7) $7^4$

b) (4) (4) (4) (4) (4) (4) (4) (4)

c) (z)(z)(z)(z)(z)

d) (c)(c)(c)(c)(c)(c) + (a)(a)(a)(a)

Sep 5-8:12 PM

Can you see the difference?

$-4^2$ $(-4)^2$

Oct 10-1:45 PM

THINK

$(-1)^2 =$
$(-1)^3 =$
$(-1)^4 =$
$(-1)^5 =$
.
.
.

Did you see a pattern??

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

Oct 10-1:45 PM

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

THINK

Evaluating powers when the base is negative...

If the exponent is even the answer will be positive.
If the exponent is odd the answer will be negative.

Oct 10-1:45 PM