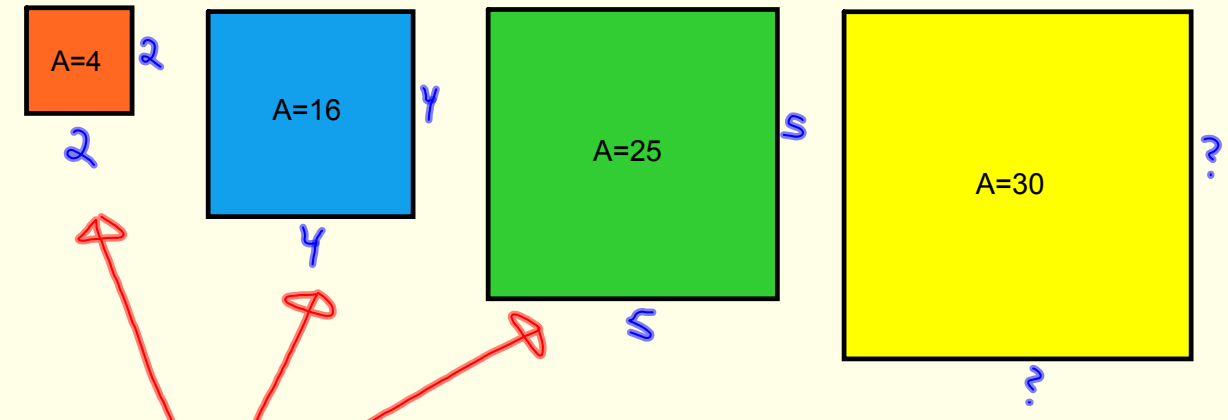
M10C E&R Ls 1: Perfect Squares & Square Roots

1. Define Perfect Square
2. Determine if a Number is a Perfect Square
3. Define Square Root
4. Evaluate and Estimate Square Roots

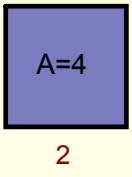
Define Perfect Square

What is the side length of each square?



Perfect Square: a number that has two equal integer factors.

eg. 4 is a perfect square



Think About it:
Are 2 and 2 the only equal factors of 4?

$(-2)(-2)=4$

Determine if a # is Perfect Square

Example: Determine if 256 is a perfect square.

$2 \mid 256$
$2 \mid 128$
$2 \mid 64$
$2 \mid 32$
$2 \mid 16$
$2 \mid 8$
$2 \mid 4$
$2 \mid 2$
1

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 256$

$16 \cdot 16 = 256$

$\therefore$ 256 is a perfect square.

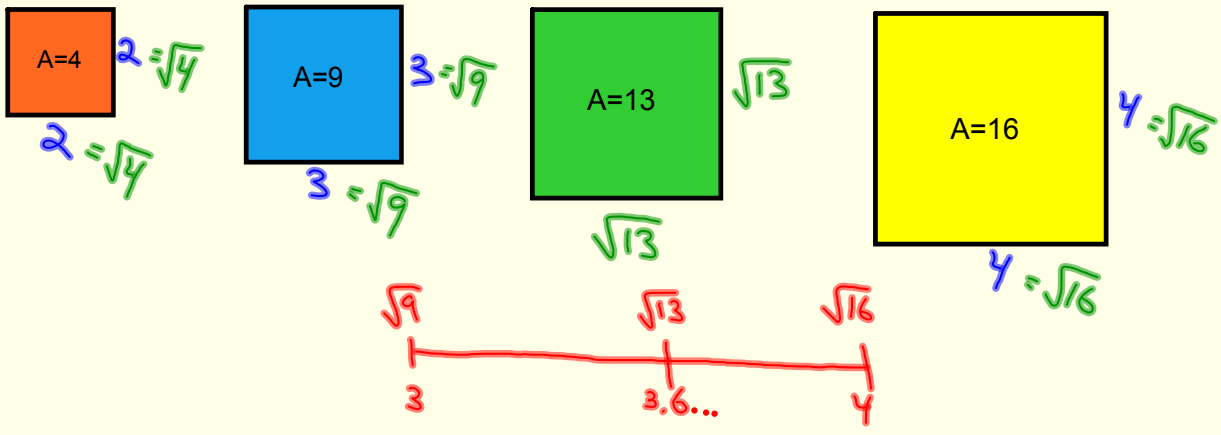
Skill
Use prime factorization.
If it is possible to make two equal groups out of the prime factors then the # is a perfect square.

Practice: Determine if the following numbers are perfect squares.

a) 196 ✓ b) 729 ✓ c) 512 ✗

Define Square Root

What is the side length of each square?



Square Root: one of two equal factors of a number.

eg. $9 = 3 \cdot 3$ therefore $\sqrt{9} = 3$

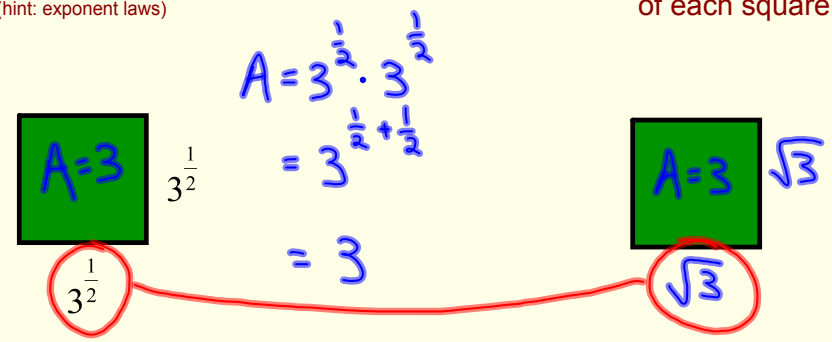
eg. $13 = \sqrt{13} \cdot \sqrt{13}$

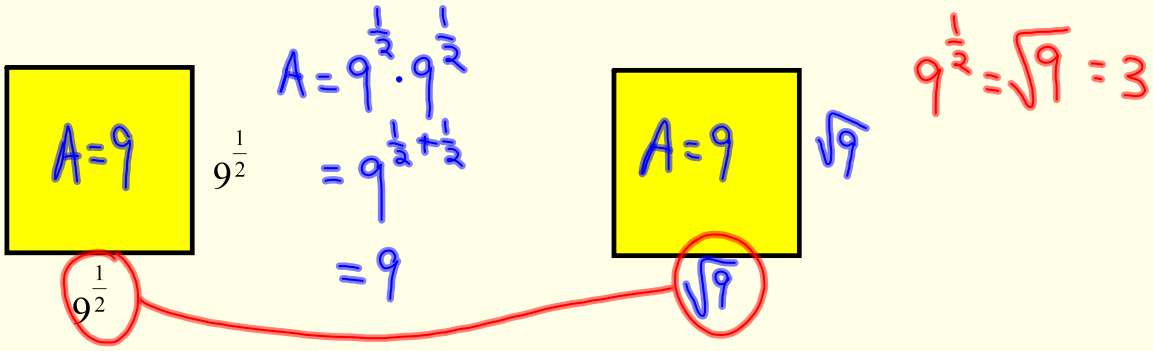
Exact vs. Approximate?

Investigate Square Roots and Exponents

Evaluate the Area of each square.
(hint: exponent laws)

Is there another way to write the dimensions of each square of the same area?





Practice: Square Roots in Exponent Form

Evaluate the following:

$4^{\frac{1}{2}} = \sqrt{4} = 2$ $\quad 25^{\frac{1}{2}} = \sqrt{25} = 5$ $\quad 64^{\frac{1}{2}} = 8$

$9^{\frac{1}{2}} = \sqrt{9} = 3$ $\quad 36^{\frac{1}{2}} = 6$ $\quad 81^{\frac{1}{2}} = 9$

$16^{\frac{1}{2}} = \sqrt{16} = 4$ $\quad 49^{\frac{1}{2}} = 7$ $\quad 100^{\frac{1}{2}} = 10$

Evaluate Square Roots

We can use our knowledge of Perfect Squares to help us evaluate Square Roots.

Perfect Squares: (list as many as you can) 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, ...

Evaluate the following:

a) $\sqrt{169} =$ 13

b) $\dfrac{144^{\frac{1}{2}}}{\sqrt{36}} = \dfrac{\sqrt{144}}{\sqrt{36}} = \dfrac{12}{6} = 2$

c) $\sqrt{9 \cdot 64} = \sqrt{9} \cdot \sqrt{64}$
$= 3 \cdot 8$
$= 24$

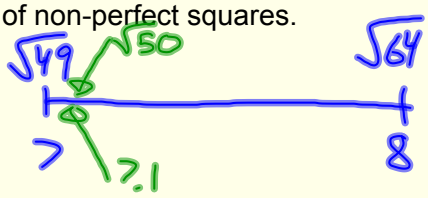
d) $\sqrt{121x^2} =$ $11x$

Practice: Text pg. 64: 3

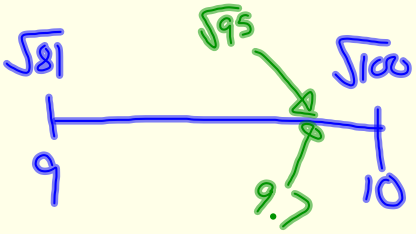
Estimate Square Roots

Examples of estimating square roots of non-perfect squares.

$\sqrt{50} \approx 7.1$



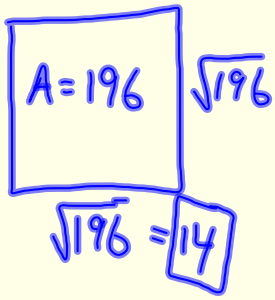
$\sqrt{95} \approx 9.7$



Problems Involving Square Roots

Most problems involving square roots relate to area.

e.g. A floor mat for gymnastics is a square with an area of 196 m^2.
What is its side length? MHR pg. 156



$A = s^2$

$\sqrt{196} = \sqrt{s^2}$

$14 = s$

Practice: Text pg. 64: 12, 13 (No Calculator - Evaluate or Estimate)