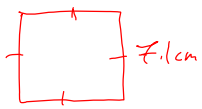
Mathematics9 Date _____

Unit 2: Working With Rational Numbers
2.4 Square Roots of Rationals

*Recall – to **square** a number is to multiply the number by itself (ie. exponent 2)

Ex. Estimate and calculate the area of a square with side lengths of 7.1 cm.



$A = s^2$

$A = 7.1^2 = 50.41\ cm^2$

$\approx 7^2 \approx 49\ cm^2$

A **square root** is the inverse (opposite) operation.

Ex. A square has an area of 81 m^2. What is the length of each side?

$A = s^2$

$81 = s^2$

$s = \sqrt{81} = 9m$

Ex. Evaluate:

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

b) $\sqrt{1}$ $= 1$

c) $\sqrt{576}$ $= 24$

Perfect Square: A number that can be expressed a product of two equal factors

Perfect Whole Number Squares: 1 4 9 16 25 36 49 64 81 100 121 144 169

Roots: 1 2 3 4 5 6 7 8 9 10 11 12 13

Ex. Which of the following are perfect rational squares? Determine the rational root if possible.

a) 169 ✓

$\sqrt{169} = 13$

b) $\frac{25}{49}$ ✓

$\sqrt{\frac{25}{49}} = \frac{5}{7}$

c) $\frac{2}{9}$ X

2 is not a perfect square

d) 0.4

$\frac{4}{10}$ X

e) $\frac{121}{64}$ ✓

$\sqrt{\frac{121}{64}} = \frac{11}{8}$

f) 12.1

$\frac{121}{10}$ X

g) 1.21

$\frac{121}{100}$ ✓

$\sqrt{\frac{121}{100}} = \frac{11}{10} = 1.1$

h) 0.121

$\frac{121}{1000}$ X

i) $0.0121 = \frac{121}{10000}$

$\frac{11}{100}$

Ex. Evaluate with and without a calculator:

a) $\sqrt{1.44}$

$\sqrt{\frac{144}{100}}$

$= \frac{12}{10}$

$= \boxed{1.2}$

b) $\sqrt{0.16}$

$\sqrt{\frac{16}{100}}$

$= \frac{4}{10}$

$= \boxed{0.4}$

The roots of non-perfect squares can be estimated and verified with our calculator.

1 4 9 16 21 36 49 64 81 100

Ex. Estimate & calculate:

a) $\sqrt{11}$

$\sqrt{9} < \sqrt{11} < \sqrt{16}$

3 < 2 < 4

≈ 3.2

$\sqrt{11} = 3.32$

b) $\sqrt{30}$

$\sqrt{25} < \sqrt{30} < \sqrt{36}$

5 < 4 < 6

≈ 5.4

$\sqrt{30} = 5.48$

c) $\sqrt{0.73}$

$\sqrt{0.64} < \sqrt{0.73} < \sqrt{0.81}$

0.8 < 2 < 0.9

≈ 0.85 or 0.86

$\sqrt{0.73} = 0.854$

d) $\sqrt{0.34}$

$\sqrt{0.25} < \sqrt{0.34} < \sqrt{0.36}$

0.5 < 2 < 0.6

≈ 0.58 or 0.59

$\sqrt{0.34} = 0.583$

Practice: pg. 78/ #7 – 9, 11 – 16, 19 – 21, 23, 26, 29, 32, 33