Warm-Up   Nov. 5

A. $\dfrac{3}{6} \times \dfrac{3}{6} = \dfrac{9}{36}$ $\left(\dfrac{3}{6}\right)^2$

B.   Which of the following are perfect squares?[show your work]

Yep $\dfrac{8}{32} = \dfrac{1}{4}$ $\xleftarrow{}$ 1×1 $\underset{2×2}{}$ $\dfrac{24}{36}$ NO $\underset{6×6}{}$ $\dfrac{2}{3}$ NO $\underset{10×10}{\underset{}{\dfrac{169}{100}}}$ $\xleftarrow{}$ 13×13

C.   Is the following a perfect square? 1.69

Answer using fractions!

$\sqrt{1.69}$ $\sqrt{\dfrac{169}{100}} = \dfrac{13}{10} = 1.3$

D. What is number that has a square root of 0.3?

$$\sqrt{?} = 0.3$$

$$\sqrt{?} = \dfrac{3}{10} \quad \times \dfrac{3}{10}$$

$$\dfrac{9}{100}$$
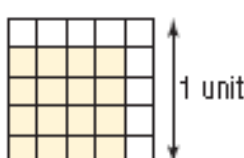
Check

3. Use each diagram to determine the value of the square root.

a) $\sqrt{0.25}$

↕ 1 unit

b) $\sqrt{\dfrac{9}{16}}$

↕ 1 unit

c) $\sqrt{\dfrac{16}{25}}$

↕ 1 unit

4. a) List all the whole numbers from 1 to 100 that are perfect squares.

b) Write a square root of each number you listed in part a.

5. Use your answers to question 4. Determine the value of each square root.

a) $\sqrt{0.36}$ b) $\sqrt{0.49}$

c) $\sqrt{0.81}$ d) $\sqrt{0.16}$

e) $\sqrt{\dfrac{1}{36}}$ f) $\sqrt{\dfrac{25}{9}}$

g) $\sqrt{\dfrac{64}{100}}$ h) $\sqrt{\dfrac{36}{16}}$

6. a) List all the whole numbers from 101 to 400 that are perfect squares.

b) Write a square root of each number you listed in part a.

7. Use your answers to questions 4 and 6. Determine the value of each square root.

a) $\sqrt{\dfrac{169}{16}}$ b) $\sqrt{\dfrac{400}{196}}$

c) $\sqrt{\dfrac{256}{361}}$ d) $\sqrt{\dfrac{225}{289}}$

e) $\sqrt{144}$ f) $\sqrt{0.0225}$

g) $\sqrt{0.0121}$ h) $\sqrt{3.24}$

i) $\sqrt{0.0324}$ j) $\sqrt{0.0169}$

Apply

8. Which decimals and fractions are perfect squares? Explain your reasoning.

a) 0.12   b) 0.81   c) 0.25

d) 1.69   e) $\dfrac{9}{12}$ f) $\dfrac{36}{81}$

g) $\dfrac{81}{49}$ h) $\dfrac{75}{27}$ i) 0.081

j) $\dfrac{25}{10}$ k) 2.5   l) $\dfrac{8}{50}$

9. Calculate the number whose square root is:

a) 0.3   b) 0.12

c) 1.9   d) 3.1

e) $\dfrac{2}{3}$ f) $\dfrac{5}{6}$

g) $\dfrac{1}{7}$ h) $\dfrac{2}{5}$

10. Determine the value of each square root.

a) $\sqrt{12.25}$ b) $\sqrt{30.25}$

c) $\sqrt{20.25}$ d) $\sqrt{56.25}$

11. a) Write each decimal as a fraction. Which fractions are perfect squares?
   i) 36.0   ii) 3.6   iii) 0.36
   iv) 0.036   v) 0.0036   vi) 0.000 36

b) To check your answers to part a, use a calculator to determine a square root of each decimal.

c) What patterns do you see in your answers to parts a and b?

d) When can you use the square roots of perfect squares to determine the square roots of decimals?

12. a) Use the fact that $\sqrt{9} = 3$ to write the value of each square root.
   i) $\sqrt{90\,000}$ ii) $\sqrt{900}$
   iii) $\sqrt{0.09}$ iv) $\sqrt{0.0009}$

b) Use the fact that $\sqrt{25} = 5$ to write the value of each square root.
   i) $\sqrt{0.0025}$ ii) $\sqrt{0.25}$
   iii) $\sqrt{2500}$ iv) $\sqrt{250\,000}$

c) Use the patterns in parts a and b. Choose a whole number whose square root you know. Use that number and its square root to write 3 decimals and their square roots. How do you know the square roots are correct?

13. Assessment Focus
a) Which letter on the number line below corresponds to each square root? Justify your answers.
   i) $\sqrt{12.25}$ ii) $\sqrt{\frac{121}{25}}$ iii) $\sqrt{16.81}$
   iv) $\sqrt{\frac{81}{100}}$ v) $\sqrt{0.09}$ vi) $\sqrt{\frac{841}{25}}$

b) Sketch the number line in part a. Write 3 different decimals, then use the letters G, H, and J to represent their square roots. Place each letter on the number line. Justify its placement.

14. A square has area 5.76 cm².
a) What is the side length of the square?
b) What is the perimeter of the square? How do you know?

15. A square piece of land has an area not less than 6.25 km² and not greater than 10.24 km²
a) What is the least possible side length of the square?
b) What is the greatest possible side length of the square?
c) A surveyor determined that the side length is 2.8 km. What is the area of the square?

16. A student said that $\sqrt{0.04} = 0.02$. Is the student correct?
If your answer is yes, how could you check that the square root is correct?

$A = 16$ 4
?4

$A = 5.76$ 2.4
2.4

$\sqrt{\dfrac{576}{100}}$ $\dfrac{24}{10}$

2.4

Side length = $\sqrt{\text{Area}}$

Section 1.2
Square Roots of Non-Perfect Squares

A.   List the first five perfect squares:

$$1, 4, 9, 16, 25$$

B.   What are the square roots of these numbers?

$$\sqrt{1}, \sqrt{4}, \sqrt{9}, \sqrt{16}, \sqrt{25}$$
$$1, 2, 3, 4, 5$$

C.   Which numbers are between the first three perfect squares?

$$\sqrt{1}, \sqrt{2}, \sqrt{3}, \sqrt{4}, \sqrt{5}, \sqrt{6}, \sqrt{7}, \sqrt{8}, \sqrt{9}$$

1   2   3

Estimate $\sqrt{8.5}$

$\sqrt{4}$ $\sqrt{9}$ ← Benchmarks

2   3

2.85 ← Estimate

When a number can not be written as a product of two identical whole numbers or identical fractions are called *non-perfect squares.*

What is the square root of 10.2? $\sqrt{10.2}$

$\longrightarrow$ $\sqrt{9}$ $\sqrt{16}$
            3   4

1. Benchmarks-- find the two perfect squares that 10.2 is closest to.

2. Then estimate

1.   Using a benchmark $\sqrt{17.5}$ Estimate.

**perfect
squares** $\sqrt{16}$ $\sqrt{25}$

                     4   5

Use Benchmarks:

$\sqrt{1.6}$

$$\sqrt{\dfrac{8}{5}}$$

$\sqrt{\dfrac{8}{5}} = \sqrt{\dfrac{160}{100}}$

$\sqrt{\dfrac{144}{100}}$ $\sqrt{\dfrac{169}{100}}$

$\dfrac{12}{10}$ $\dfrac{13}{10}$

1.2 1.3

$\sqrt{\dfrac{8}{5}}$ $\sqrt{\dfrac{9}{4}}$

$\dfrac{3}{2}$

$1\frac{1}{2}$

Use Benchmarks

$$\sqrt{0.30}$$

Fractions

$$\sqrt{\frac{3}{10}}^{\times 10}_{\times 10} \qquad \sqrt{\frac{30}{100}}$$

$$\sqrt{\frac{25}{100}} \qquad \sqrt{\frac{36}{100}}$$

$$\frac{5}{10} \qquad\qquad \frac{6}{10}$$

Decimals

$$\sqrt{0.30}$$

$$\sqrt{0.25} \qquad\qquad \sqrt{0.36}$$

$$0.5 \qquad\qquad 0.6$$

Show Benchmarks

a) $\sqrt{2.1}$

$\sqrt{1}$ $\sqrt{4}$

1   2

b) $\sqrt{\dfrac{7 \times 5}{20 \times 5}}$

$\sqrt{\dfrac{35}{100}}$

$\sqrt{\dfrac{25}{100}}$ $\sqrt{\dfrac{36}{100}}$

$\dfrac{5}{10}$ $\dfrac{6}{10}$

Use Fractions to estimate:

$$\sqrt{\dfrac{3}{50} \begin{array}{c} \times 2 \\ \times 2 \end{array}}$$

$$\sqrt{\dfrac{6}{100}}$$

$$\sqrt{\dfrac{4}{100}}$$

$$\sqrt{\dfrac{9}{100}}$$

$$\dfrac{2}{10}$$

$$\dfrac{3}{10}$$

Estimate

a. $\sqrt{0.4}$

b. $\sqrt{\dfrac{495}{10}}$

Fraction   Decimal

$\sqrt{\dfrac{4}{10}} = \sqrt{\dfrac{40}{100}}$ $\sqrt{0.40}$ $\sqrt{49.5}$

$\sqrt{\dfrac{36}{100}} \quad \sqrt{\dfrac{49}{100}}$ $\sqrt{0.36} \quad \sqrt{0.49}$ $\sqrt{49} \qquad \sqrt{64}$

$\dfrac{6}{10} \quad \dfrac{7}{10}$ $0.6 \qquad 0.7$ $7 \qquad\qquad 8$

What could you use as a bench mark to find

$$\sqrt{\frac{15}{26}}$$

$$\sqrt{\frac{16}{25}}$$

$$\frac{4}{5}$$

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4, [a,c,e]
5 [a,c,e],
6 [a,b]
7 [a,c,e]

4. b. $\sqrt{13.5}$

$\sqrt{9}$ $\sqrt{16}$

3   4

No Calculators make sure you include your benchmarks!!!