

Chapter 1: Percents

Section 1.1 - Squares and square roots

Identifying perfect squares

Perfect square

- A number that is the **PRODUCT** of the same two **FACTORS**
- Has an **EVEN** number of each prime factor

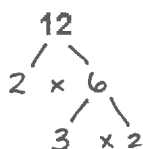
↳ prime #'s → a number who's only factor pair is 1 x itself

ex. $2 \rightarrow 2 \times 1$, $3 \rightarrow 3 \times 1$, $5 \rightarrow 5 \times 1$

Prime factorization

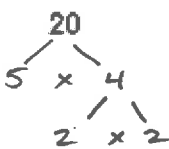
- A number written as the **PRODUCT** of its **PRIME FACTORS** 7, 11, 13, 17, 19...

Ex.



$$12 = 2 \times 3 \times 2$$

↓
prime factors



$$20 = 5 \times 2 \times 2$$



$$64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

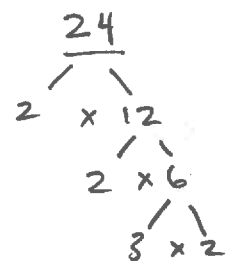
Example

Key Points

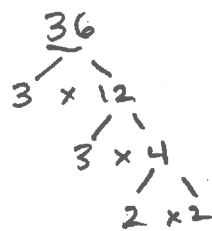
Which of the following are perfect squares?

24, 36, 81

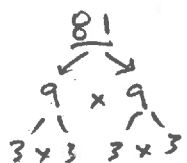
- Determine prime factors using a factor tree



$$24 = 2 \times 2 \times 3 \times 2$$



$$36 = 3 \times 3 \times 2 \times 2$$



$$81 = 3 \times 3 \times 3 \times 3$$

$$(3 \times 3) \quad (3 \times 3)$$

$$81 = 9 \times 9$$

$$\downarrow$$

$$9 \begin{array}{|c|} \hline 81 \\ \hline \end{array} \begin{array}{l} \text{perfect} \\ \text{square} \end{array}$$

$$6 \begin{array}{|c|} \hline 36 \\ \hline \end{array} \begin{array}{l} \text{perfect} \\ \text{square} \end{array}$$

Prime Factors

2 Equal groups

Yes

PERFECT SQUARE

No

NOT PERFECT

- Product of each group are the **SIDE LENGTHS** of the square/ rectangle

$$\begin{array}{c} (2 \times 2) \quad (3 \times 2) \\ (2 \times 2 \times 2) \quad (3) \\ (2 \times 2 \times 3) \quad (2) \end{array}$$

Cannot make two equal groups

$$9 \begin{array}{|c|} \hline 24 \\ \hline \end{array} \quad 2 \begin{array}{|c|} \hline 12 \\ \hline \end{array}$$

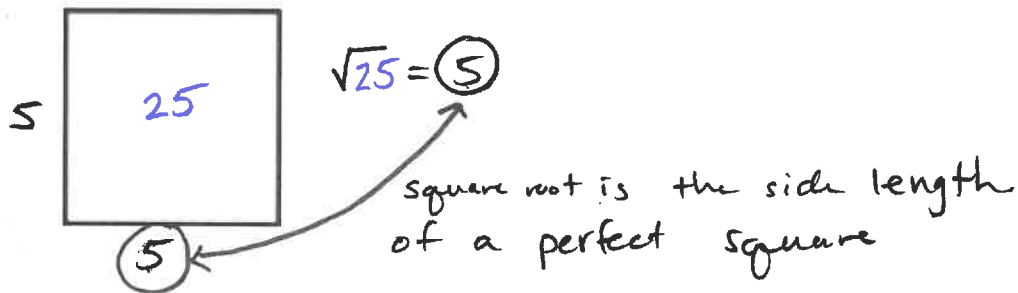
cannot make a square

$$3 \begin{array}{|c|} \hline 24 \\ \hline \end{array}$$

Determine the square root of a perfect square**Square root**

- A number that when multiplied by **ITSELF** equals a given value
- Symbol for square root ($\sqrt{\quad}$)

Ex.

ExampleKey Points

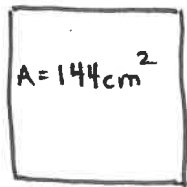
If the area of a square is 144cm^2 , what is its side length?

Multiple methods

- ~~Inspection -~~

Same as guess and check

- Guess and check -



$$10 \times 10 = 100$$

$$11 \times 11 = 121$$

$$12 \times 12 = 144 \checkmark$$

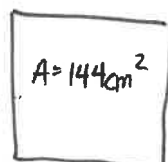
- Prime factorization -

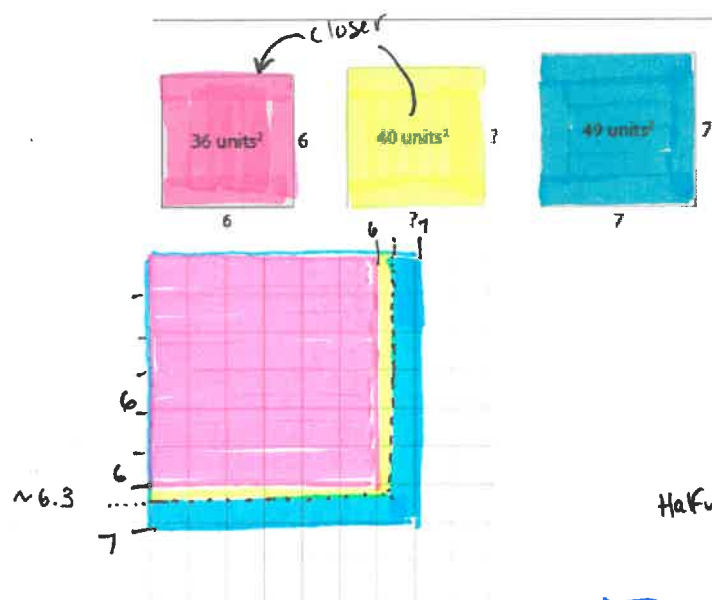
$$\begin{array}{c}
 144 \\
 \hline
 6 \times 24 \\
 \swarrow \quad \searrow \\
 3 \times 2 \quad 2 \times 12 \\
 \quad \quad \swarrow \quad \searrow \\
 \quad \quad 3 \times 4 \\
 \quad \quad \quad \swarrow \quad \searrow \\
 \quad \quad \quad 2 \times 2
 \end{array}$$

$$144 = (3 \times 2 \times 2) \times (3 \times 2 \times 2)$$

$$144 = 12 \times 12$$

Side length of the square is 12cm.

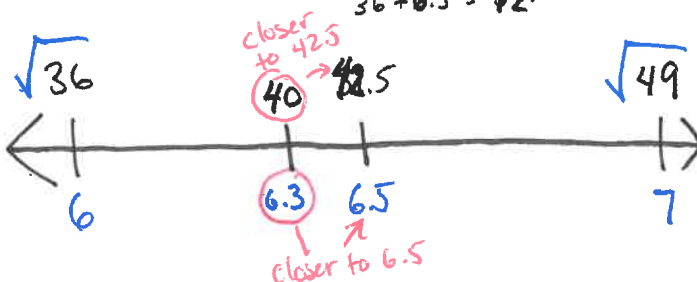


Estimating the square root of a numberExampleKey PointsDraw a number line

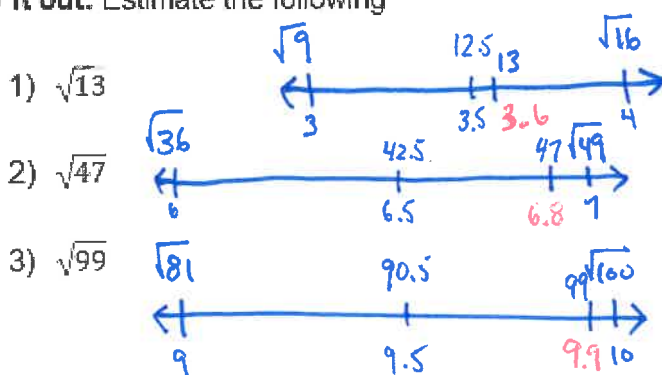
- Find the two **PERFECT SQUARES** that the number falls between
- Find **HALFWAY** point to increase accuracy

Perfect squares: 1 4 9 16 25 36 49

Halfway point $\rightarrow 49 - 36 = 13$
 $13 \div 2 = 6.5$
 $36 + 6.5 = 42.5$



Try it out: Estimate the following



Practice assignment - page 10 # 1, 2, 4, 7, 10, choose two apply questions (challenge: # 27)

