desmos

Unit 8.8, Family Resource

Unit 8 Summary

Prior Learning	Grade 8, Unit 8	High School
Grade 6 ● Solving problems involving area Grades 6 & 7 ● Using operations with rational numbers Grade 6 ● Converting fractions to decimals using long division	● Estimate square and cube roots. ● Understand and use the Pythagorean theorem. ● Approximate irrational numbers using rational numbers.	● Rational exponents (e.g., $5^{\frac{1}{4}}$) ● Solve equations involving roots and exponents. ● Solve right triangles in applied problems. ● Imaginary numbers

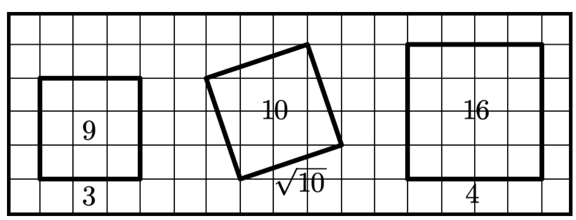
Square Roots and Cube Roots

We call the length of the side of a square whose area is a square units $\sqrt{a}$ (pronounced "the square root of a").

$\sqrt{9} = 3$ because $3^2 = 9$.

$\sqrt{16} = 4$ because $4^2 = 16$.

$\sqrt{10}$ is between 3 and 4 because 10 is between 9 and 16.

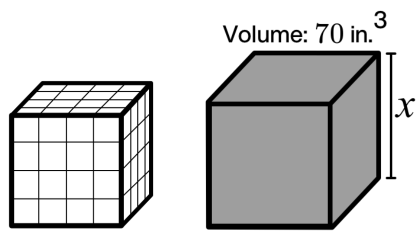


We call the length of the edge of a cube whose volume is a cubic units $\sqrt[3]{a}$ (pronounced "the cube root of a").

$\sqrt[3]{64} = 4$ because $4^3 = 64$.

$\sqrt[3]{70} > 4$ because $\sqrt[3]{70} > \sqrt[3]{64} = 4$.

$\sqrt[3]{70} \approx 4.12$ because $(4.12)^3 \approx 69.93 \approx 70$.

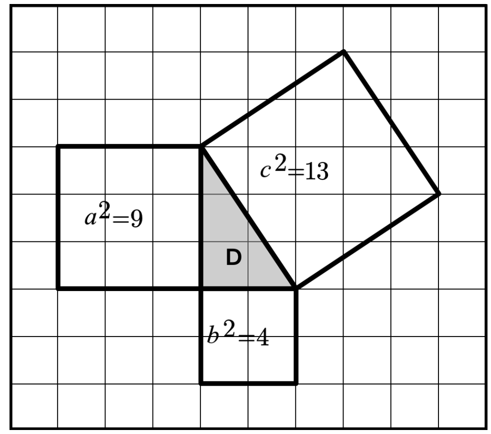


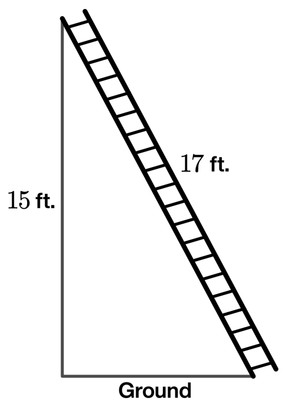
Pythagorean Theorem

In triangle D, the square of the hypotenuse is equal to the sum of the squares of the legs.

This relationship is true for all **right triangles**.

We can describe this relationship as $a^2 + b^2 = c^2$, where a and b are the lengths of the legs, and c is the length of the hypotenuse of a right triangle.





What can the Pythagorean theorem be used for?

- Deciding if a triangle is a right triangle.
- Calculating one side length of a right triangle if we know the other two side lengths.

Rational and Irrational Numbers

Rational numbers are numbers that can be written as a fraction of two integers. We call numbers that cannot be written this way irrational numbers.

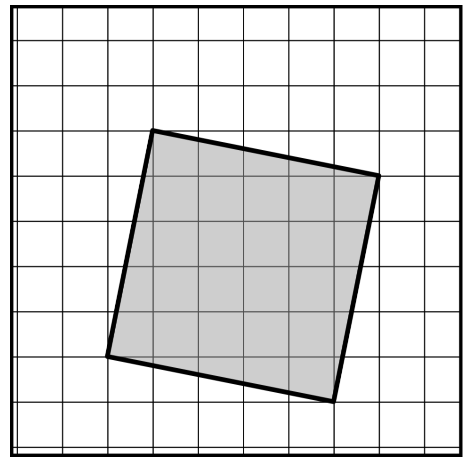
Irrational Number

Definition	Facts/Characteristics
A number that cannot be written as a fraction of two integers.	**Their decimal representations are neither terminating nor repeating.**
Examples	**Non-Examples**
$\sqrt{7}$ π $5(\sqrt[3]{15})$	$\sqrt{9}$ $\frac{3}{4}$ -5.34 $-5.\overline{34}$

Try This at Home

Square Roots and Cube Roots

1.1 If each grid square represents 1 square unit, what is the area of this titled square?

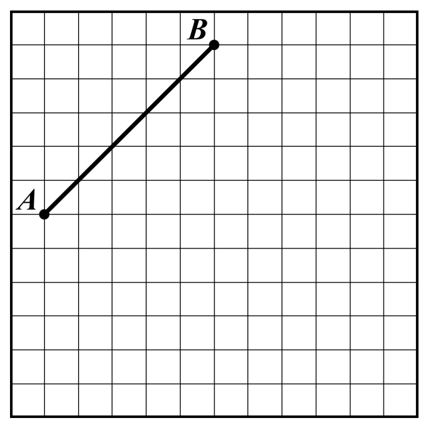


1.2 What is the side length of this tilted square?

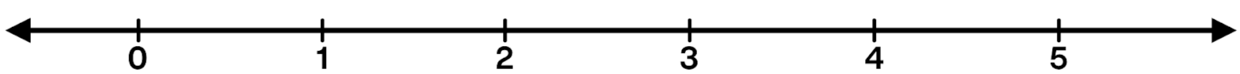
2. Draw a square so that segment AB is along one side of the square.

Exact length of AB :_________

Approximate length of AB :______________



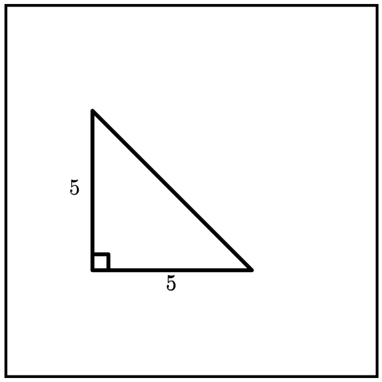
3. Plot the following numbers on the number line below: $\sqrt{27}$, $\sqrt[3]{27}$, $\sqrt[3]{5}$, $\sqrt{5}$



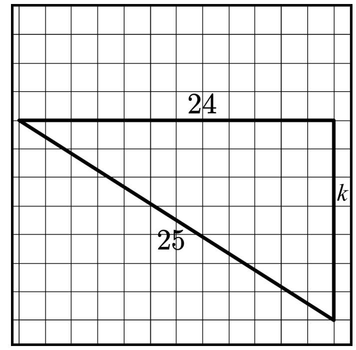
Pythagorean Theorem

4.1 Label the hypotenuse of this triangle with the letter c.

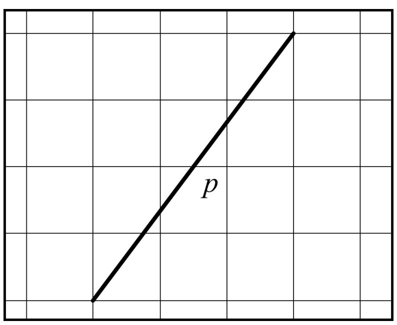
Then determine its length.



4.2 Calculate the length of k.

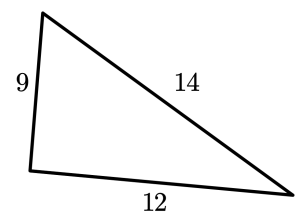


4.3 How long is line segment p?



4.4 Is this a right triangle?

Why or why not?



Rational and Irrational Numbers

5. Write each rational number as a decimal. $\frac{3}{5}$, $\frac{6}{11}$, $\frac{17}{6}$.

6.1 Write some examples of rational numbers. Try to include examples of numbers that are rational but that someone might think are irrational.

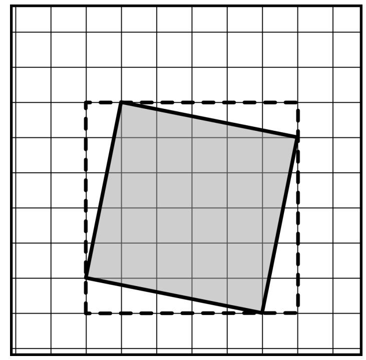
6.2 Write some examples of irrational numbers.

desmos

Unit 8.8, Family Resource

Solutions:

1.1 The area of the square is 26 square units.

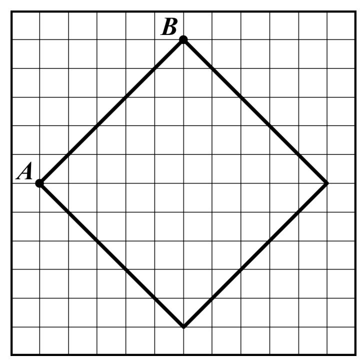


One way to find the area of a tilted square is to enclose the square in a larger square whose area you do know. The side length of this square is 6. Its area is $6 \cdot 6 = 36$ square units.

To find the area of the tilted square, subtract out the areas of the four triangles between the larger square and the original ($4 \cdot \frac{1}{2} \cdot 1 \cdot 5 = 10$ square units).

1.2 The side length of the square is $\sqrt{26}$ units because the square root of the area is the side length of a square.

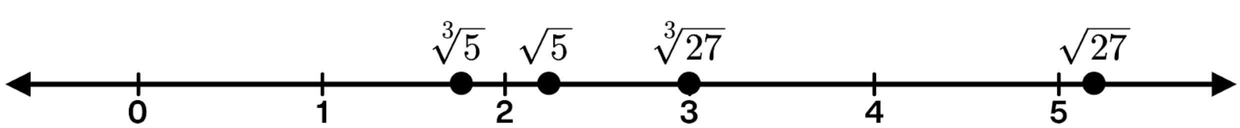
2. **Exact length of AB (as a square root):** $\sqrt{50}$ units



Area of the large square: $10^2 = 100$ square units
Area of the triangles: $4 \cdot \frac{1}{2} \cdot 5 \cdot 5 = 50$ square units
Area of the tilted square: $100 - 50 = 50$ square units
Side length of the tilted square: $\sqrt{50}$ units

Approximate length of AB: $\sqrt{50}$ is between 7 and 8 because 50 is between 49 or 7^2 and 64 or 8^2.

3. Plot the following numbers on the number line below: $\sqrt{27}$, $\sqrt[3]{27}$, $\sqrt[3]{5}$, $\sqrt{5}$



4.1 The length of the hypotenuse is $\sqrt{50}$ units.

$a^2 + b^2 = c^2$

$(5)^2 + (5)^2 = c^2$

$25 + 25 = c^2$

$50 = c^2$

$c = \sqrt{50}$

4.2 The length of k is 7 units.

$a^2 + b^2 = c^2$

$(k)^2 + (24)^2 = 25^2$

$k^2 + 576 = 625$

$k^2 = 49$

$k = 7$

4.3 Line segment p is 5 units long.

$a^2 + b^2 = c^2$

$(3)^2 + (4)^2 = p^2$

$9 + 16 = p^2$

$25 = p^2$

$p = 5$

4.4 This is **not** a right triangle because the Pythagorean theorem is not true.

$9^2 + 12^2 \neq 14^2$

$81 + 144 \neq 196$

$225 \neq 196$

If the hypotenuse were 15, the triangle would be a right triangle.

5.

$\frac{3}{5}$

$\frac{3}{5} = \frac{6}{10} = 0.6$

$\frac{6}{11}$

$$\begin{array}{r} 0.5454\ldots \\ 11 \overline{)\,6.00000} \\ -55 \\ \hline 50 \\ -44 \\ \hline 60 \\ -55 \\ \hline 50 \\ -44 \\ \hline 60 \end{array}$$

$\frac{17}{6}$

$$\begin{array}{r} 2.8333\ldots \\ 6 \overline{)\,17.00000} \\ 12 \\ \hline 50 \\ -48 \\ \hline 20 \\ -18 \\ \hline 20 \\ -18 \\ \hline 20 \end{array}$$

6.1 *Responses vary.* Some examples: $\frac{3}{5}$, 0.16, $\frac{\sqrt{16}}{\sqrt{100}}$, $\sqrt[3]{8}$, 7, $.1\overline{66}$

6.2 *Responses vary.* Some examples: $\frac{\sqrt{3}}{5}$, $\sqrt{8}$, $\sqrt[3]{16}$, 7π, $16 \cdot \sqrt{7}$