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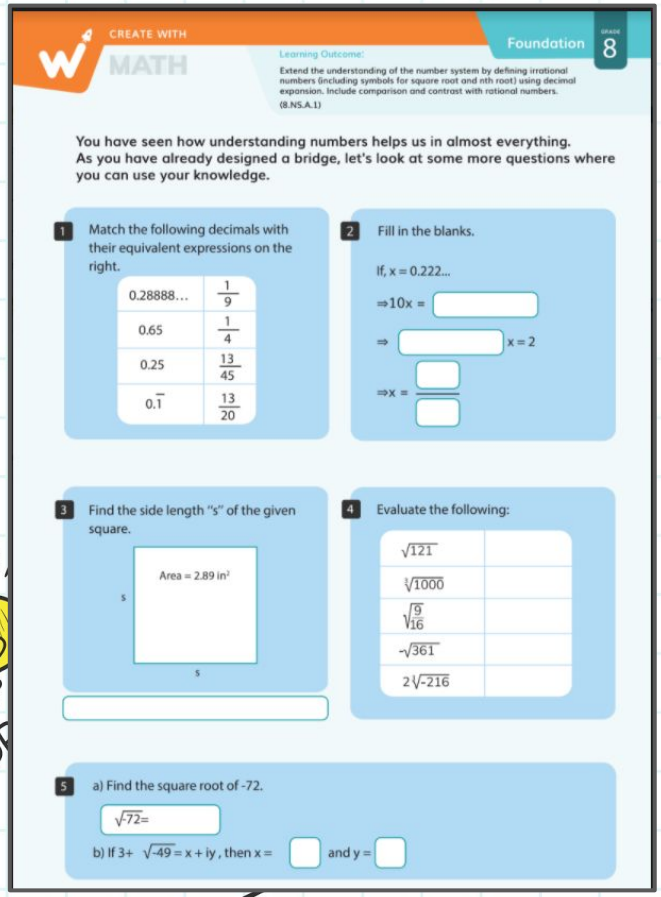
CREATE WITH MATH

Worksheet Solutions



CREATE WITH MATH

Foundation

GRADE 8

Learning Outcome:

Extend the understanding of the number system by defining irrational numbers (including symbols for square root and nth root) using decimal expansion. Include comparison and contrast with rational numbers. (8.NS.A.1)

You have seen how understanding numbers helps us in almost everything. As you have already designed a bridge, let's look at some more questions where you can use your knowledge.

1 Match the following decimals with their equivalent expressions on the right.

0.28888...	$\frac{1}{9}$
0.65	$\frac{1}{4}$
0.25	$\frac{13}{45}$
$0.1\overline{}$	$\frac{13}{20}$

2 Fill in the blanks.

If, x = 0.222...

$\Rightarrow 10x =$ ☐

$\Rightarrow$ ☐ $x = 2$

$\Rightarrow x = \frac{\square}{\square}$

3 Find the side length "s" of the given square.

Area = 2.89 in²

s

s

☐

4 Evaluate the following:

$\sqrt{121}$	
$\sqrt[3]{1000}$	
$\sqrt{\frac{9}{16}}$	
$-\sqrt{361}$	
$2\sqrt{-216}$	

5 a) Find the square root of -72.

$\sqrt{-72} =$ ☐

b) If $3+\sqrt{-49} = x + iy$, then x = ☐ and y = ☐

Foundation

1 Match the following decimals with their equivalent expressions on the right.

0.28888…	$\frac{1}{9}$
0.65	$\frac{1}{4}$
0.25	$\frac{13}{45}$
$0.\overline{1}$	$\frac{13}{20}$

Solution:

1/9 = 0.1111111 = $0.\overline{1}$

1/4 = 0.25

13/45 = 0.28888…

13/20 = 0.65

0.28888	1/9
0.6	1/4
0.25	13/45
$0.\overline{1}$	13/20

2 Fill in the blanks.

If, x = 0.222...

⇒10x = ☐

⇒ ☐ x = 2

⇒x = ☐/☐

Given:

x = 0.222...

Solution:

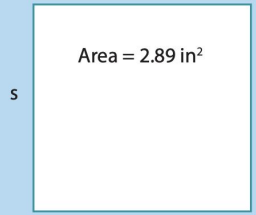
⇒ 10x = 2.222…

⇒ 10x - x = 2.22… - 0.222...

⇒ 9x = 2

⇒ x = 2/9

3 Find the side length "s" of the given square.



Given:
Area of square = 2.89 in^2

Side length of square = 's' inches

Solution:

We know that

Area of square = side × side

$\Rightarrow 2.89 = s \times s$

$\Rightarrow 2.89 = s^2$

$\Rightarrow s = \sqrt{2.89}$

$\Rightarrow s = 1.7$ inches

Answer: s = 1.7 inches

4 Evaluate the following:

$\sqrt{121}$	
$\sqrt[3]{1000}$	
$\sqrt{\frac{9}{16}}$	
$-\sqrt{361}$	
$2\sqrt[3]{-216}$	

$\sqrt{121}$	11
$\sqrt[3]{1000}$	10
$\sqrt{(9/16)}$	3/2
$-\sqrt{361}$	-19
$2\sqrt[3]{(-216)}$	-12

Solution:

- $\sqrt{121} = \sqrt{(11 \times 11)}$
  $\Rightarrow \sqrt{121} = 11$
- $\sqrt[3]{1000} = \sqrt[3]{(10 \times 10 \times 10)}$
  $\Rightarrow \sqrt[3]{1000} = 10$
- $\sqrt{(9/16)} = \sqrt{(3/2 \times 3/2)}$
  $\Rightarrow \sqrt{(9/16)} = 3/2$
- $-\sqrt{361} = -\sqrt{(19 \times 19)}$
  $\Rightarrow -\sqrt{361} = -19$
- $2 \times \sqrt[3]{(-216)}$
  $2 \times \sqrt[3]{(-6 \times -6 \times -6)}$
  2×-6
  $\Rightarrow -12$

5 a) Find the square root of -72.

$\sqrt{-72}$=

b) If $3+\sqrt{-49} = x + iy$, then x = ☐ and y = ☐

Solution:

a. $\sqrt{(-72)}$

$= \sqrt{(36 \times (-2))}$

$= 6\sqrt{(-2)}$

$= 6\sqrt{2}i$ (Since, $\sqrt{-1} = i$)

b. $3 + \sqrt{(-49)} = x + iy$

$\Rightarrow 3 + 7\sqrt{(-1)} = x + iy$

$\Rightarrow 3 + 7i = x + iy$ (Since, $\sqrt{-1} = i$)

$\Rightarrow x = 3$ & $y = 7$

(a) $6\sqrt{2}\,i$

(b) $x = 3$ & $y = 7$

CREATE WITH MATH

Application

GRADE 8

Learning Outcome:

Extend the understanding of the number system by defining irrational numbers (including symbols for square root and nth root) using decimal expansion. Include comparison and contrast with rational numbers. (8.NS.A.1)

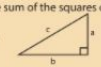
As you have already become an expert in constructing bridges, can you explore more on irrational numbers by answering the following questions?

1. Miya has 124.8 g of fertilizer and she needs to put it uniformly in four rose plants. How much fertilizer should she put in each pot?

2. James realizes that some of the chocolates he saved are missing. When he asks his brother, he replies that he ate just 0.1666... of the total number of chocolates.
   a. Can you express 0.1666... in the form of p/q?
   b. Can you help James find the exact number of chocolates his brother ate, if he had 24 chocolates in the beginning?

3. According to various studies, in a right triangle the square of the hypotenuse (longest side) is equal to the sum of the squares of the other two sides.

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



$c = \sqrt{a^2 + b^2}$

In the given triangle, if a = 4 inches and b = 5 inches, find the value of c.

4. Tom's room, which is cube-shaped, has a volume of 2662 cubic feet. If Tom wants to replace one of the four walls of his room with glass, find the length of the glass pane needed.

5. You have a cube-shaped gift box whose volume is 343 cubic inches. However, you realize that you just have 275 square inches of wrapping paper left with you. Will it be sufficient to wrap the gift box?

6. After a deep analysis in the working of Global Positioning System (GPS), the processor displayed the given expression as the result.

$-6 - \sqrt{-36} =$ ☐

Try simplifying it further. Which of these set of numbers does the answer belong to?

- Rational numbers
- Irrational numbers
- Real numbers
- Complex numbers

Application

1 Miya has 124.8 g of fertilizer and she needs to put it uniformly in four rose plants. How much fertilizer should she put in each pot?

Given:

Total quantity of fertilizer = 124.8 g

Solution:

Quantity of fertilizer in each pot =
Total quantity of fertilizer / Total number of pots

= 124.8 / 4

= 31.2 g

Answer: 31.2 g

2 James realizes that some of the chocolates he saved are missing. When he asks his brother, he replies that he ate just 0.1666... of the total number of chocolates.

a. Can you express 0.1666… in the form of p/q?

b. Can you help James find the exact number of chocolates his brother ate, if he had 24 chocolates in the beginning?

Answer:

a. 1/6

b. 4 chocolates

Given:

x = 0.1666...

Solution:

⇒ 10x = 1.666…

⇒ 10x - x = 1.666… - 0.1666...

⇒ 9x = 1.5

⇒ x = 1.5/9 = 15/90 = 1/6

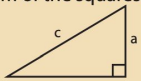
(b) His brother ate 0.1666 chocolates of the total number of chocolates or $1/6^{th}$ of all the chocolates

Therefore, number of chocolates eaten by his brother = ⅙ × 24

= 4 chocolates

3 According to various studies, in a right triangle the square of the hypotenuse (longest side) is equal to the sum of the squares of the other two sides.

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



$c = \sqrt{a^2 + b^2}$

In the given triangle, if a = 4 inches and b = 5 inches, find the value of c.

Given:

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

$c = \sqrt{(a^2 + b^2)}$

a = 4 inches & b = 5 inches

Solution:

Substituting the given values in equation:

$c = \sqrt{(a^2 + b^2)}$

$\Rightarrow c = \sqrt{(4^2 + 5^2)}$

$\Rightarrow c = \sqrt{(16 + 25)}$

$\Rightarrow c = \sqrt{41}$ inches

$c = \sqrt{41}$ inches

4 Tom's room, which is cube-shaped, has a volume of 2662 cubic feet. If Tom wants to replace one of the four walls of his room with glass, find the length of the glass pane needed.

Given:

Shape of Tom's room = cuboid

Volume of room = 2662 cm^3

Solution:

We know that volume of cube = $side^3$

$\Rightarrow 2662 = side^3$

$\Rightarrow \sqrt[3]{2662} = side$

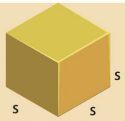
$\Rightarrow side = \sqrt[3]{(1331 \times 2)}$

$\Rightarrow side = 11 \sqrt[3]{2}$ cm

The length of glass pane needed is $11 \sqrt[3]{2}$ cm.

Answer: $11 \sqrt[3]{2}$ cm

5 You have a cube-shaped gift box whose volume is 343 cubic inches. However, you realize that you just have 275 square inches of wrapping paper left with you. Will it be sufficient to wrap the gift box?



No

Given:

Volume of cube shaped gift box = 343 in^3

Gift paper left = 275 in^2

Solution:

We know that volume of cube = $side^3$

$343 = side^3 \Rightarrow \sqrt[3]{343} = side$

$\Rightarrow$ side = 7 in

Surface area of cube = $6(side)^2$
$= 6 \times (7)^2$
$= 6 \times 49 = 294\ in^2$

Since we require 294 in^2 gift paper to wrap the cube but we have only 275 in^2. It won't be sufficient to wrap the cube.

6 After a deep analysis in the working of Global Positioning System (GPS), the processor displayed the given expression as the result.

$-6-\sqrt{-36}=$ ☐

Try simplifying it further. Which of these set of numbers does the answer belong to?

- Rational numbers
- Irrational numbers
- Real numbers
- Complex numbers

Given: $-6-\sqrt{-36}$

Solution:

$-6-\sqrt{-36}$

$= -6-(\sqrt{36}\times\sqrt{-1})$

$= -6-6i$

Since the expression results in a number with the imaginary component, i, the number belongs to the set of **complex numbers.**

Answer: -6 - 6i
Complex numbers

CREATE WITH MATH

Create

GRADE 8

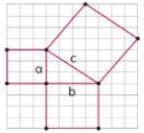
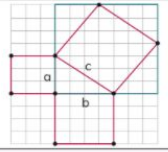
Learning Outcome:
Extend the understanding of the number system by defining irrational numbers (including symbols for square root and nth root) using decimal expansion. Include comparison and contrast with rational numbers.
8.NS.A.1

You saw how difficult the reconstruction of a bridge can be. To prevent it from happening again, let's build a diagonal structure to support the pillars. It would save a lot of money and trouble.

Let's start paper prototyping the design to find the length of this diagonal structure.
For that you need to follow these steps:

- Draw any right triangle on a square grid as shown.
- Build a square on each side of the triangle.

In a right triangle, the side opposite to 90° is called hypotenuse and the other two sides are called the legs of the triangle.

Step 1	Step 2	Step 3
		

Great! The drawing part is done. Now, it's time for some calculations.

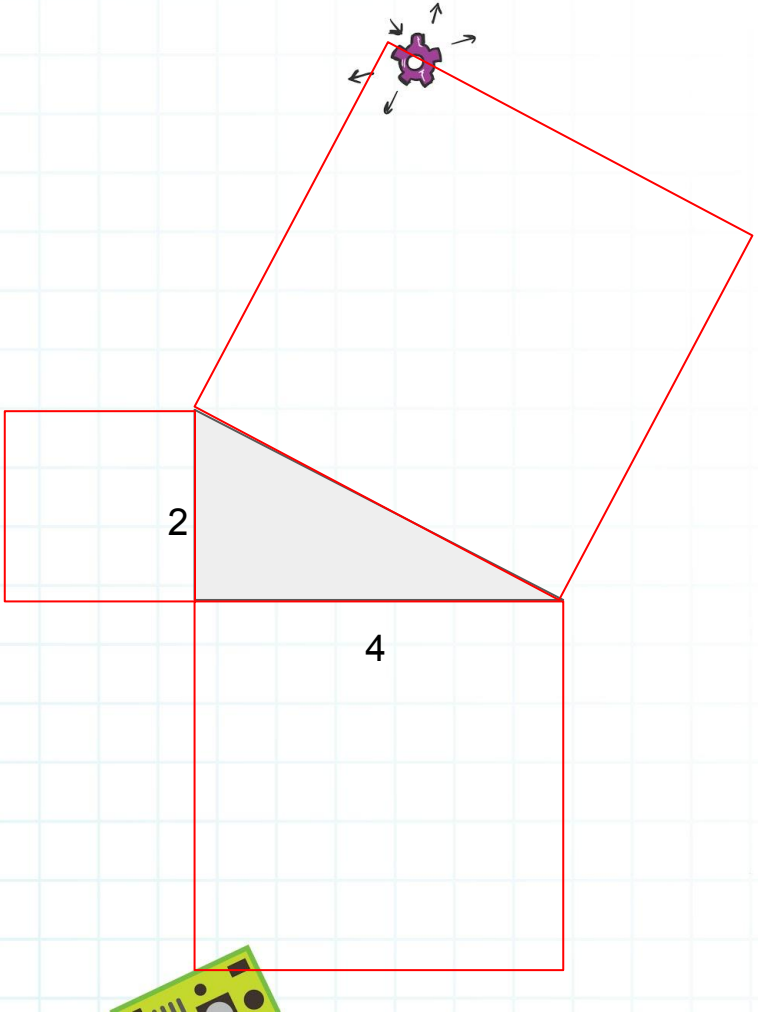
- Find the area of the squares built on the legs of the triangle.
- Find the area of the square sharing one side with the hypotenuse of the triangle.
  Hint: As you don't know the length of the hypotenuse, extend the legs as shown in step 3 and find the area of the larger square formed. Subtract the area of 4 right triangles the area of larger square. (You already know that area of a right triangle = $\frac{1}{2}$ x base x height)
- Try drawing a minimum of three right triangles and tabulate your findings. The more possible designs you have, better the results you get.
  (NOTE: Consider the length of legs and hypotenuse as a, b, and c, respectively, and fill the table below.)

	Area of square on leg 1 (a^2)	Area of square on leg 2 (b^2)	Area of square on hypotenuse (c^2)
Sample shown	9	16	25
Right triangle 1			
Right triangle 2			
Right triangle 3			
Observation:			

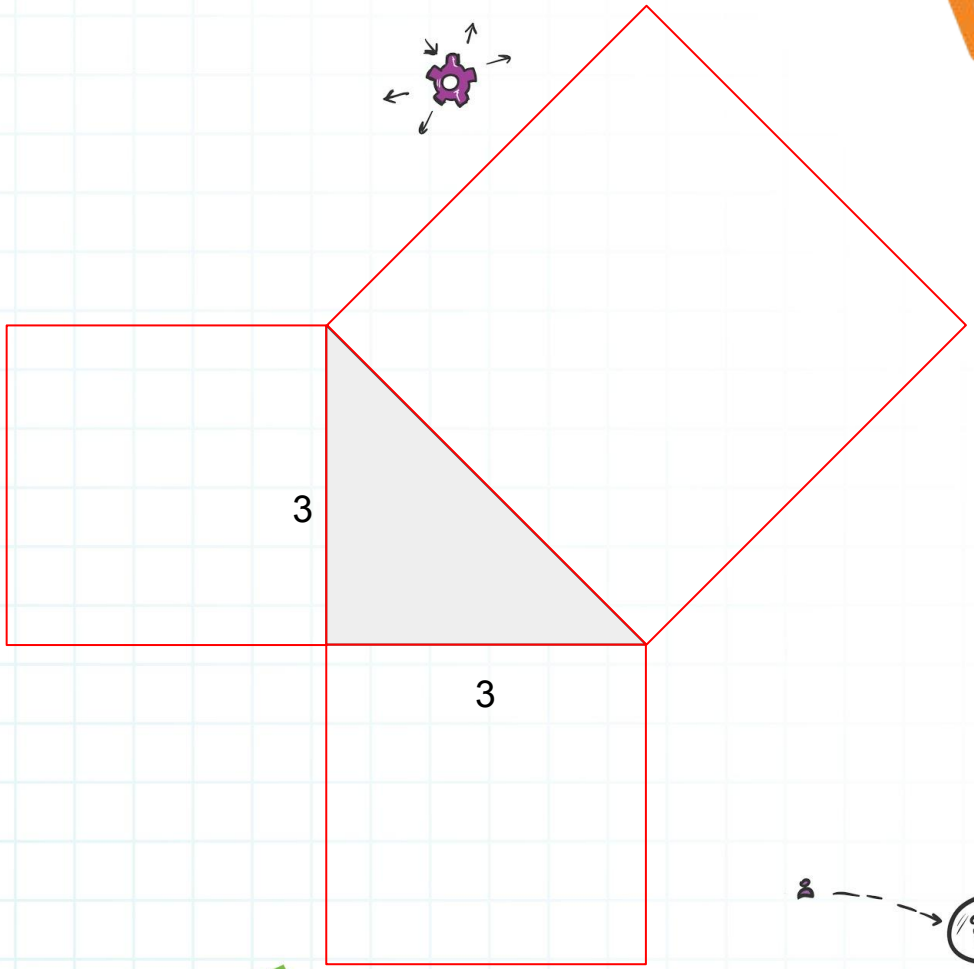
- Now, you can find the length of the diagonal structure required to support the pillars.

Create

	Area of square on leg 1 (a^2)	Area of square on leg 2 (b^2)	Area of square on leg 3 (c^2)
Sample shown	9	16	25
Right Triangle 1	4	16	18



	Area of square on leg 1 (a^2)	Area of square on leg 2 (b^2)	Area of square on leg 3 (c^2)
Sample shown	9	16	25
Right Triangle 2	9	9	18



	Area of square on leg 1 (a^2)	Area of square on leg 2 (b^2)	Area of square on leg 3 (c^2)
Sample shown	9	16	25
Right Triangle 3	4	4	8