Pre-Calculus 11 - VLN

Chapter 5: Radicals

Lesson 1: The Number System

Question #1: Number System01

Reference Q.45569
Which operations are "closed" within the set of natural and whole numbers? Explain why.

Question #2: Number System02

Reference Q.45572
Explain why subtraction is not a closed operation within the set of whole and natural numbers.

Question #3: Number System03

Reference Q.45575
Explain why division is not a closed operation within the set of whole/natural numbers.

Question #4: Number System04

Reference Q.20467

a. Will subtracting one whole/natural number from another whole/natural number always result in another number that is **not** a whole/natural number?

b. Will dividing one whole/natural number with another whole/natural number always result in another number that is **not** a whole/natural number?

Question #5: Number System05

Reference Q.20468
Determine which number system the result of each operation belongs to:

a. $16 - 5$

b. $14 - 17$

c. $12 - 20$

Question #6: Number System06

Reference Q.20469
Determine which number system the result of each operation belongs to:

a. $16 \div 5$

b. $14 \div 7$

c. $12 \div 20$

Question #7: Number System

Reference Q.19081
State whether the following statement is true or false. Explain your answer.
$-\frac{2}{3}$ **is a natural number.**

Question #8: Number System

Reference Q.19080
State whether the following statement is true or false. Explain your answer.
"1 is a rational number."

Question #9: Number System

Reference Q.19082
State whether the following statement is true or false. Explain your answer.
π **is a rational number.**

Question #10: Number System

Reference Q.19083
State whether the following statement is true or false. Explain your answer.
$\sqrt{2}$ is an irrational number.

Question #11: Number System

Reference Q.19084
State whether the following statment is true or false. Explain your answer.
The sum of two irrational numbers is irrational.

Question #12: The Number System

Reference Q.19086

Evaluate $\sqrt{3}$. (Round to eight decimal places.)

Question #13: The Number System

Reference Q.19087

Evaluate $\sqrt[3]{2}$. (Round to eight decimal places.)

Question #14: The Number System

Reference Q.19088

Find an example where the product of two irrational numbers is rational.

Question #15: The Number System

Reference Q.19097

Find the two consecutive negative even integers, where their product is 24.

Question #16: The Number System

Reference Q.19098

Prove that the product of two odd numbers is odd.

Question #17: The Number System

Reference Q.19100

Prove that the sum of two rational numbers is rational.

Question #18: The Number System

Reference Q.19089

Find an example where two irrational numbers a and b such that a^b is rational.

Question #19: The Number System

Reference Q.19090

Place the following numbers to the appropriate sets of numbers. You may write these numbers multiple times if necessary.

$$7, 0, 0.\overline{11}, -\frac{\sqrt{2}}{2}, -5, \left(\frac{5}{\sqrt[3]{2}}\right)^3$$

_____ $\in \mathbb{Q}$
_____ $\in \mathbb{Z}$
_____ $\in \mathbb{W}$
_____ $\in \mathbb{N}$

_____ $\in \overline{\mathbb{Q}}$

Question #20: The Number System

Reference Q.19091

Place the following numbers to the appropriate sets of numbers. You may write these numbers multiplie times if necessary.

$$\pi, -\frac{2}{3}, \left(\sqrt{2}\right)^4, \pi + (-\pi), -\left(\sqrt[3]{5}\right)^6$$

_____ $\in \mathbb{Q}$
_____ $\in \mathbb{Z}$
_____ $\in \mathbb{W}$
_____ $\in \mathbb{N}$

_____ $\in \overline{\mathbb{Q}}$

Question #21: The Number System

Reference Q.19099

Prove that $\sqrt{2}$ is irrational.

Question #22: The Number System

Reference Q.19092

We say two rational numbers $\frac{a}{b}$ and $\frac{c}{d}$ are in the same equivalence class if $ad = bc$, where a, b, c, d are integers and b, d are nonzero integers. Find a number that is in the same equivalence class as $\frac{1}{2}$. Explain your answer.

Question #23: The Number System

Reference Q.19093

We say two rational numbers $\frac{a}{b}$ and $\frac{c}{d}$ are in the same equivalence class if $ad = bc$, where a, b, c, d are integers are b, d are nonzero integers. Find a number that is in the same equivalence class as $\frac{256}{1024}$. Explain your answer.

Question #24: The Number System

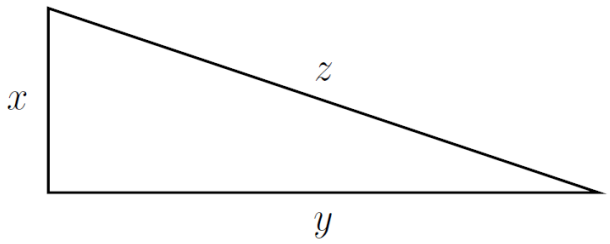
Reference Q.19094

We say two rational numbers $\frac{a}{b}$ and $\frac{c}{d}$ are in the same equivalence class if $ad = bc$, where a, b, c, d are integers and b, d are nonzero integers. Find a number that is in the same equivalence class as -3. Explain your answer.

Question #25: The Number System

Reference Q.19095

The ancient Greek mathematician Pythagoras (over 2000 years ago) discovered the proof of the special relationship between the sides of a right angled triangle.



a. State the Pythagorean Theorem.

b. Find the three triples (x, y, z) which satisfy the Pythagorean Theorem.

c. Use the Pythagorean Theorem to show that z may not be rational.

d. (Optional!) Give a geometric proof and an algebraic proof of the Pythagorean Theorem.

Question #26: The Number System

Reference Q.19096

There are two sets of numbers.

$\text{Set 1} := \{2n \mid n \in \mathbb{Z}\}$ "The set of all even integers"

$\text{Set 2} := \{2m + 1 \mid m \in \mathbb{Z}\}$ "The set of all odd integers"

A student picks an unknown number from each set. His teacher asked the student what is the parity of the product of the two chosen numbers and explain. Here is the student's explanation

Step 1: Let x be the unknown number chosen from set 1, and let y be the unknown number chosen from set 2.

Step 2: Since x is from the set 1 and y is from the set 2, we may write $x = 2n$ and $y = 2n + 1$ for some n an integer.

Step 3: The product of xy is $(2n)(2n + 1) = 4n^2 + 1.$

Step 4: Which can be rewritten as

$2(2n^2) + 1 = 2z + 1, \$where\$z = 2n^2.$

Step 5: Therefore, the parity of the product of x and y is odd.

His teacher says that there are two mistakes in his explanation, and ask you to figure out. Find his mistakes and rewrite the proof.