

Question 1

Write down the letters of all true statements

- A. All integers are rational.
- B. All whole numbers are integers.
- C. All whole numbers are natural numbers.
- D. Between any two rational numbers there is at least one irrational number.
- E. Between any two irrational numbers there is at least one rational number.
- F. If n is an integer, then $|n|$ is a natural number.

Question 2

Find the perimeter of the triangle whose vertices are $(1, 3)$, $(5, 10)$ and $(-3, 9)$, in simplest radical form.

Question 3

If:

$$A = (7x - 2)(5x + 1)$$

$$B = (2 + 5x)(1 - 3x)$$

$$C = (7x - 2)(9x + 5)$$

$$D = (4 + 3x)(5x - 1)$$

Then find $(A + B + C + D) - 48x^2$

Question 4

Define an operation \otimes as follows: $x \otimes y = (3x^2 + y)(y^2 - 3x)$

$$\text{Let } A = 3 \otimes -4$$

$$\text{Let } B = 15(1 \otimes 0)$$

$$\text{Let } C = 4 \otimes 1$$

$$\text{Let } D = -2 \otimes 4$$

What is $A + B + C - D$?

Question 5

If $A = (x^4 y^3 z t^2)^3 (x^{-4} y^2 z^{-3} t^{-5})^2 (x^{-2} y^2 z^{-3} t^3)$ and

$B = (x^2 y t^{-1})^2 (y^2)^3 (x^{-2} y^4 z)$, then find $\frac{A}{B}$ in simplest form.

Question 6

Jeff decides to go for a run. He warms up by running at a constant rate of 2 miles per hour for 5 minutes. He then increases his speed and runs at a constant rate of 8 miles per hour for 25 minutes. Finally, he cools down by walking at a constant rate of 1 mile per hour for 10 minutes. Assuming that the time Jeff spends speeding up and slowing down is negligible, how far (in miles) did Jeff run? Give your answer as an improper fraction in lowest terms.

Question 7

Find the sum of all integer solutions to the following two inequalities: $6 - 2|x + 4| > -10$ and $3 + 5|x - 2| < 18$

Question 8

If $3x + u = y$, $v + 3y = 2$ and $v^2 = u$ then solve for x in terms of y .

Question 9

Jenny is throwing a party and needs to decide how much juice to buy. She knows she needs 3 times as much orange juice as cranberry juice, and twice as much cranberry juice as pineapple juice. Orange juice costs \$1.49 per bottle, cranberry juice costs \$2.39 per bottle, and pineapple juice costs \$3.99 per bottle (all prices include sales tax). Jenny has \$50 to spend on juice for the party and wants to buy as much juice as she can in exactly the ratio she needs.

Let A be the change she will receive after buying the juice.
Let B be the number of bottles of juice she will need to carry home.

Find B - A

Question 10

Find the sum of all the roots of the following four equations:

$$3 - 2|x + 3| = 7$$

$$3 - |2x| = -13$$

$$|4x + 3| = 4$$

$$|-2| + |7x + 1| = -1$$

Question 11

Let A, B, C, D, E, F, and G be defined as below. List the letters in DECREASING order, from the letter whose value is greatest to the letter whose value is least.

$$A = \frac{40}{3} \quad B = \sqrt{157} \quad C = |-4\pi|$$

$$D = -|4\pi| \quad E = 2 + 2\sqrt{3} \quad F = 10\frac{2}{3}$$

$$G = \text{The sum of all the roots of } f(x) = x^2 - 7$$

Question 12

Let $A = (-4, -2)$ and $B = (26, 50)$

Let C be the midpoint of \overline{AB}

Let D be the midpoint of \overline{AC}

Let E be the midpoint of \overline{DC}

What are the coordinates of E?

Question 13

Which of the following statements are true?

- A. The domain of the function $f(x) = |x|$ is the set of all real numbers.
- B. The range of the function $f(x) = |x|$ is the set of all real numbers.
- C. The domain of the function $f(x) = x^2 - 3$ is the same as the domain of the absolute value function
- D. The range of the function $f(x) = x^2 - 3$ is the same as the domain of the absolute value function
- E. The domain of the function $f(x) = \sqrt{x}$ is the same as the domain of the absolute value function
- F. The range of the function $f(x) = \sqrt{x}$ is the same as the domain of the absolute value function

Question 14

What is the 49th digit to the right of the decimal point in the decimal representation of $\frac{1}{7}$?