

Nassau County Interscholastic Mathematics League

Contest #1 Answers must be integers from 0 to 999, inclusive. 2022 – 2023

No calculators are allowed.

Time: 10 minutes

Name: _____

1. Compute the value of x if 40% of 30% of 20% of x is 12.

2. Each of x and y is a digit between 0 and 9 inclusive. Compute $3x + 2y$ such that the number $14x46535y$ is divisible by 72.

1.

2.

Nassau County Interscholastic Mathematics League

Contest #1 Answers must be integers from 0 to 999, inclusive. 2022 – 2023

No calculators are allowed.

Time: 10 minutes

Name: _____

3. Solution X contains an acid with a 10% concentration and solution Y contains an acid with a 25% concentration. If 3 liters of solution X is mixed with 2 liters of solution Y, the resulting mixture has a $k\%$ acid concentration. Compute k .

4. If the lengths of the legs of an isosceles triangle are each $12\sqrt{2}$ and the area of the triangle is 144, compute the length of the base.

3.

4.

Nassau County Interscholastic Mathematics League

Contest #1 Answers must be integers from 0 to 999, inclusive. 2022 – 2023


No calculators are allowed.


Time: 10 minutes

Name: _____

5. Compute the degree measure of an obtuse angle of a rhombus if an obtuse angle of the rhombus measures 12 degrees less than five times the degree measure of an acute angle of the rhombus.

6. The solution of $|x^2 - 3x - 4| \geq 6$ may be written as $(-\infty, a] \cup [b, c] \cup [d, \infty)$.
Compute $a + b + c + d$.

5. 

6. 

Solutions for Contest #1 Solutions for Contest #1

1. $0.4 \cdot 0.3 \cdot 0.2 \cdot x = 12 \rightarrow 0.024x = 12 \rightarrow x = \mathbf{500}$.
2. For a number to be divisible by 72, it must be divisible by both 8 and 9. For a number to be divisible by 8, the number formed from its last 3 digits must be divisible by 8. Thus, $y = 2$ (only). For a number to be divisible by 9, the sum of its digits must be divisible by 9. Thus, $x = 6$ and $3x + 2y = \mathbf{22}$.
3. There are $3(0.10) + 2(0.25) = 0.8$ liters of acid in a 5-liter solution. So, $0.8/5 = 0.16 = 16\%$. Thus, $k = \mathbf{16}$.
4. Since $\frac{1}{2}(12\sqrt{2})^2 = 144$, the area of the triangle, the triangle must be a right triangle. In a 45-45-90 degree triangle, the hypotenuse is $12\sqrt{2}\sqrt{2} = 24$ which is the base of the triangle. Alternatively, drop an altitude from the vertex angle to the base forming two right isosceles triangles. Since the hypotenuse of each triangle is $12\sqrt{2}$, the legs are each 12, so the base is $12+12=\mathbf{24}$.
5. In a rhombus, those angles are supplementary. If the degree measure of the acute angle is x , then $x + 5x - 12 = 180 \rightarrow 6x = 192 \rightarrow x = 32$. The degree measure of its supplement is $\mathbf{148}$.
6. Since $|x^2 - 3x - 4| \geq 6$, consider both $x^2 - 3x - 4 \geq 6$ together with $x^2 - 3x - 4 \leq -6$. The first inequality results in $x \geq 5$ or $x \leq -2$. The second inequality results in $1 \leq x \leq 2$. Then, $a = -2$, $b = 1$, $c = 2$, and $d = 5$ and the required sum is $\mathbf{6}$.