Minnesota State High School Mathematics League

2024-25 Sample Meet 1.2, Individual Event A

15 minutes

Score	Check

1. _____ Conner collects coints. One quarter of his coins are pennies, one fifth are nickels, one third are dimes, and the remaining 13 are quarters. In total, how many coins are in Conner's collection?

2. $n =$ _____ If $2^{12} \times 8^{12} = 4^n$, what is n?

3. _____ students Students at Marie Curie High School participated in three different field trips. Sixty percent of the students went on the first field trip, 90% went on the second trip, and 75% went on the third trip. A total of 135 student went on all three trips, and each of the other students went on exactly two trips. How many students attend Marie Curie High School?

4. _____ Find $\sqrt[3]{4} \cdot \left(\frac{1}{54}\right)^{-\frac{1}{3}}$.

5. _____ matches The addition puzzle shown below represents the valid sum OLD + OLD + SEÑOR = MAYOR, where all instances of a particular letter correspond to the same digit. What 5-digit number is represented by the word MAYOR?

$$\begin{array}{r} \text{O L D} \\ \text{O L D} \\ +\,\text{S E Ñ O R} \\ \hline \text{M A Y O R} \end{array}$$

Name: _____ Team: _____

Minnesota State High School Mathematics League

2024-25 Sample Meet 1.2, Individual Event B

15 minutes

Score	Check

1. _____ Find the slope of the line that passes through the points $(20, -22)$ and $(-5, 3)$.

2. $BC =$ _____ Figure 2 shows $\triangle ABC$ with $\angle ACB = 90°$ and $AB = 10$. If $\cos \angle ABC = 0.8$, determine the length of $\overline{BC}$.

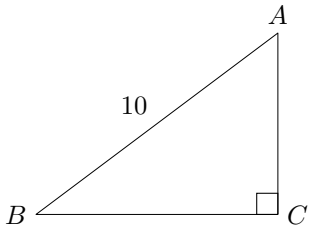

Figure 2

3. $\angle CFD =$ _____ ° Figure 3 shows regular pentagon $ABCDE$ and equilateral triangle DEF, which share common side DE, forming hexagon $AEFDCB$. What is the degree measure of $\angle CFD$?

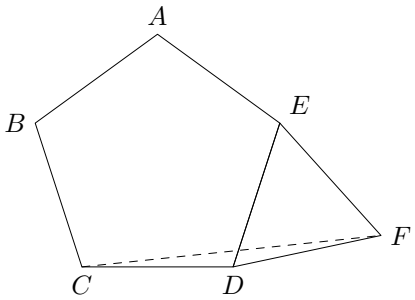

Figure 3

4. $x =$ _____ Certain side lengths and parallel line relationships are indicated in Figure 4. What is the length of the side indicated with an x?

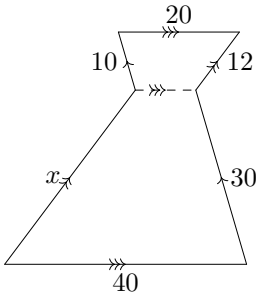

Figure 4

5. $n =$ _____ $A_1A_2A_3A_4 \ldots A_n$ is a regular n-gon, and diagonals $\overline{A_1A_4}$ and $\overline{A_2A_7}$ intersect at an angle of $16°$. Determine n.

Name: _____ Team: _____

Minnesota State High School Mathematics League

2024-25 Sample Meet 1.2, Individual Event C

15 minutes

Score	Check

1. _____ Four gatens make up a barsak, and a curbon is 16 gatens. How many barsaks are in a curbon?

2. _____ The average of two numbers is 7. When a third number is included, the average of the three numbers is 8. What is the third number?

3. _____ How many unique values result when each $\boxdot$ is replaced by either $+$ or $\times$ in the expression shown? (Order of operations applies!)

$$2 \boxdot 0 \boxdot 2 \boxdot 3$$

4. _____ How many digits are in the base-ten representation of $4^3 \cdot 12^6 \cdot 25^9$?

5. $a =$ _____ Suppose a and b are positive integers with $a + b = 2022$ and $a < b$. If $5 \cdot \gcd(a, b) = \text{lcm}(a, b)$, find a.

Name: _____ Team: _____

Minnesota State High School Mathematics League

2024-25 Sample Meet 1.2, Team Event

30 minutes

Score	Check

1. $B - A =$ _____

In a group of 62 students, 44 are taking physics and 52 are taking mathematics. If x is the number of students taking both physics and mathematics, then the minimum possible value of x is A and the maximum possible value of x is B. Find $B - A$.

2. _____ $^\circ$

The measures of the angles of a triangle are in the ratio $20 : 9 : 7$. Find the measure (in degrees) of the smallest angle.

3. _____

A computer science class consists of both juniors and seniors, with seniors comprising more than 94% of the class. What is the smallest size the class can be?

4. $\frac{1}{ab} =$ _____

Let $a = 0.\overline{18}$, and $b = 0.0\overline{3}$ (so $a = 0.181818\ldots$ and $b = 0.03333\ldots$). Find $\dfrac{1}{ab}$.

5. _____

Starting with a full tank of gas, Brenna's car can normally drive 330 miles at highway speed. By driving slower she can use 25% less gas per mile, but driving her car into a headwind always uses 10% more gas per mile than it would have otherwise. How far can Brenna drive her car, starting with a full tank of gas, if she drives slower but into a headwind?

6. _____

How many positive integers N are there such that the least common multiple of N and $4!$ equals 4 times the greatest common divisor of N and $8!$?

(As usual we define $k! = k \cdot (k-1) \cdot (k-2) \cdot \cdots \cdot 3 \cdot 2 \cdot 1$).

Team: _____

Minnesota State High School Mathematics League

2024-25 Sample Meet 1.2, Answers

Event A:

1. **60**
   (21-22 2A2, 71% correct)
2. **25**
   (23-24 SI3, 78% correct)
3. **540**
   (22-23 5A3, 10% correct)
4. **6**
   (23-24 3T1, 89% correct)
5. **31486**
   (21-22 5A3, 6.8% correct)

Event B:

1. **-1**
   (22-23 2D1, 87% correct)
2. **8**
   (21-22 1C1, 80% correct)
3. **6**
   (22-23 3B2, 37% correct)
4. **36**
   (23-24 5B3, 45% correct)
5. **45**
   (21-22 3B4, 3.9% correct)

Event C:

1. **4**
   (22-23 2A1, 94% correct)
2. **10**
   (22-23 SI3, 96% correct)
3. **7**
   (22-23 5A2, 51% correct)
4. **21**
   (23-24 5D2, 25% correct)
5. **337**
   (22-23 1A4, 9.6% correct)

Team Event:

1. **10**
   (20-21 5C3, 28% correct)
2. **35**
   (22-23 ST1, 100% correct)
3. **17**
   (20-21 5T1, 75% correct)
4. **165**
   (22-23 SA2, 40% correct)
5. **400**
   (21-22 1A3, 7.1% correct)
6. **16**
   (20-21 5T6, 9.3% correct)