Score	Check

1. _____ Gerry has 20 coins, all dimes and quarters, totaling \$2.75. How many dimes does Gerry have?

2. $x^{3n} =$ _____ If $\log_x 5 = n$, what is x^{3n}?

3. $ab =$ _____ If a and b are the distinct solutions for x to the equation $|x + 6| = 31$, find ab.

4. $m + n =$ _____ We can write $\dfrac{1 + 2\sqrt{15}}{4 - \sqrt{15}} = m + n\sqrt{15}$ for some integers m and n. What is $m + n$?
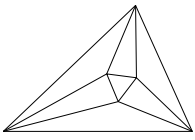
5. _____ Let a and b be positive integers. If the length of the solution interval for x to the inequality

$$\frac{a}{4}\,|x| - \frac{b}{3}\,|x| \leq \frac{1}{12}$$

is $\dfrac{1}{2022}$, what is the least possible value of $a + b$.?

Name: _____   Team: _____

1. area = _____

   $CDEF$, a 3 by 7 rectangle, is inscribed in isosceles right triangle ABC, as shown in Figure 1. Determine the area of triangle ABC.
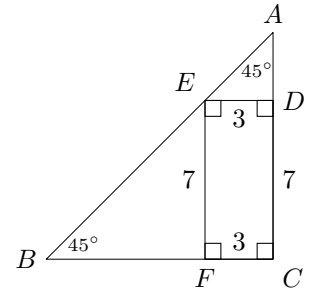
   Figure 1

2. $m + n =$ _____

   The line through $(1, 3)$ with slope 3 and the line through $(7, 11)$ with slope 1 intersect at the point (m, n). Find $m + n$.

3. $BC =$ _____

   In Figure 3, in $\triangle ABC$, $AB = 13$, $AC = 20$, and D is a point on $\overline{BC}$ such that $\overline{AD} \perp \overline{BC}$. If $AD = 12$, what is the length of $\overline{BC}$?
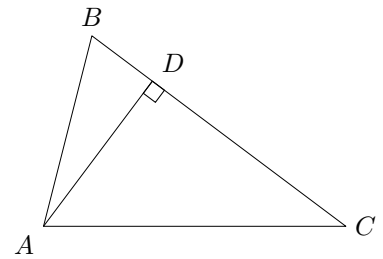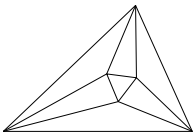
   Figure 3

4. _____

   If $x = \dfrac{1}{\sqrt{10}}$, determine the value of $\dfrac{\cos(\arcsin x)}{x}$.

   (Recall that $\arcsin x$ is the angle θ for which $\sin\theta = x$ and $-\dfrac{\pi}{2} \le x \le \dfrac{\pi}{2}$).

5. $n =$ _____

   In $\triangle ABC$, $AB = 12$, $BC = 14$, and $AC = 20$. Determine the sum of the squares of the lengths of its three medians.

Name: _____   Team: _____

1. _____ pizzas   Samantha needs to order enough pizza to feed 16 students. Each pizza is cut into 12 slices, and each student should get 3 slices. How many pizzas should Samantha order?

2. _____ ounces   Laszlo went online to shop for black pepper and found thirty different black pepper options varying in weight and price, shown in the scatter plot. In ounces, what is the weight of the pepper that offers the lowest price per ounce?
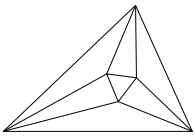
[Source: AMC 8]
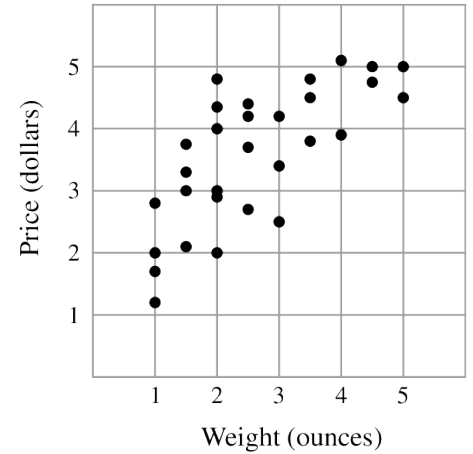
3. $p + q =$ _____   From the set $2, 4, 6, 7, 8, 11, 12, 13$ a number is chosen at random to be the numerator of a fraction F and then, from the remaining numbers, a second number is chosen to be the denominator of fraction F. The probability that F is in lowest terms (reduced) can be written as $\frac{p}{q}$, where p and q are relatively prime integers. Determine the value of $p + q$.

4. _____   How many four-digit numbers (not starting with 0) are odd and have distinct digits?

5. $a =$ _____ $(83_{16})^2 = \underline{a}\,\underline{b}\,\underline{c}\,\underline{d}_{16}$, where $a, b, c,$ and d are digits in base 16. Determine $a + b + c + d$ (expressing the sum in base 10).

Name: _____   Team: _____

Score	Check

1. $x + y =$ _____   If $x - \dfrac{9}{y-2} = 3$ and $3x + \dfrac{12}{y-2} = 22$, find $x + y$.

2. _____   25 points are labeled consecutively 1 through 25. How many lines must be drawn to connect each pair of points whose sum is odd, assuming each line connects exactly two points?

3. _____   Some people are standing in a line in order of their age. The leftmost person is 3 years old and the rightmost person is 45 years old. Everyone else's age is one more than the average of their immediate neighbors. What is the age of the person in the middle of the line (i.e. the person with three people on either side)?

4. _____   Let ABC be a right triangle with hypotenuse $AC = 10$ and area 11. What is the perimeter of $\triangle ABC$?

5. $m + n =$ _____   Four numbers a, b, c, and d are chosen at random with replacement from the set $S = \{1, 2, 3, 4, 5, 6\}$. The probability that lines $ax + by = 1$ and $cx + dy = 1$ intersect in exactly one point can be written as $\frac{m}{n}$ where m and n are relatively prime positive integers. Determine $m + n$.

6. $S =$ _____   In triangle ABC, $AB = 7$, $BC = 5$, and $AC = 6$. Locate points P_1, P_2, P_3, and P_4 dividing $\overline{BC}$ into five equal segments of length 1. If $S = (AP_1)^2 + (AP_2)^2 + (AP_3)^2 + (AP_4)^2$, find S

Team: _____
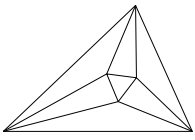
Minnesota State High School Mathematics League
2024-25 Sample Meet 2.1, Answers

Event A:

1. **15**
(20-21 2A1, 92% correct)

2. **125**
(22-23 SI7, 99% correct)

3. **-37**
(23-24 2A2, 48% correct)

4. **43**
(22-23 3D2, 44% correct)

5. **1355**
(22-23 2A4, 1.5% correct)

Event B:

1. **50**
(21-22 2B1, 78% correct)

2. **8**
(22-23 2D2, 77% correct)

3. **21**
(20-21 1B1, 65% correct)

4. **3**
(21-22 3C2, 43% correct)

5. **555**
(20-21 2B4, 5.9% correct)

Event C:

1. **4**
(22-23 1A1, 94% correct)

2. **3**
(22 AMC 8 #15, 38% correct)

3. **23**
(20-21 5C2, 24% correct)

4. **2240**
(23-24 5C3, 11% correct)

5. **16**
(21-22 1A4, 11% correct)

Team Event:

1. **11**
(23-24 3T2, 92% correct)

2. **156**
(22-23 SI4, 71% correct)

3. **33**
(21-22 5T4, 67% correct)

4. **22**
(22-23 1T4, 37% correct)

5. **1253**
(21-22 5C4, 2.4% correct)

6. **150**
(22-23 3T6, 8.3% correct)