WINMAC

Name: _____ Score: _____ / 160

Grade: _____ Team: _____

This is a round consisting of 10 challenging problems to be done in 30 minutes. You may communicate and discuss problems with people on your team. Problems are in roughly ascending difficulty, and each problem is worth 16 points. Any figures in the test may not be to scale.

No aids are permitted aside from pencils, pens, and provided scratch paper. In particular, no calculators or other computers are permitted. Communication with other people on your own team is allowed.

Record your answers in the box corresponding to the correct problem. Only answers printed in the boxes below will be scored.

Your Answers

1.	3.	5.	7.	9.
2.	4.	6.	8.	10.

1. A triangle has sides 14 cm, 48 cm, and 50 cm. What is the area of the triangle in cm^2?

2. A train travels from Winchester to Losechester at a speed of 60 km/h. On its return journey from Losechester to Winchester, it travels at a speed of 40 km/h. If the distance between the two towns is 120 km, what is the average speed of the train, in km/h, for the entire round trip?

3. Herbert rolls 3 dice and sums up the numbers together. How many possible sums are there?

4. Suppose you have a bag containing 10 red balls, 5 blue balls, and 5 green balls. You draw three balls from the bag without replacement. What is the probability that you draw no red balls?

5. When the product of the first 98 whole numbers is subtracted by the sum of the first 98 whole numbers, you get a number n. What is the unit digit of n?

6. How many ways are there to rearrange the letters of ADDITION to create an eight-letter "word"? (The "word" doesn't have to be a real word in the English language.)

7. A cube and a cylinder have the same volume. If the side length of the cube is tripled and the radius of the cylinder is doubled, the ratio of the volume of the new cube to the volume of the new cylinder can be expressed as the fraction $\frac{a}{b}$, where a and b are both relatively prime positive integers. Find $a + b$.

8. A sculptor has a slab of wood that is 2 inches high, 8 inches long, and 14 inches wide. The sculptor paints the sides of the slab red and then cuts the slab into 1-inch cubes. By rearranging the pieces, what is the volume of the largest cube that the sculptor can make that is completely red on the outside?

9. A factor, also known as a divisor, is a number that divides into another number with no remainder. For example, 1, 2, and 600 are all factors of 600 because $1 \times 600 = 600$, $2 \times 300 = 600$, and $600 \times 1 = 600$. What is the third smallest positive integer that has the same number of factors as 2023?

10. A number is considered "powerful" if it can be expressed in the form x^n, where x is a natural number and n is a prime number. How many powerful numbers are there between 1 and 514, inclusive?