Centennial Mu Alpha Theta

April 11, 2026

General Round

Do not begin until instructed to do so.

This is the General Round test for the 2026 DECAGON Math Tournament. You will have 45 minutes to complete 10 problems. All problems are weighted equally, but ties will be broken based on the hardest question solved (not necessarily highest numbered question). Express all answers in simplest form. Only answers recorded on the answer sheet below will be scored. Only writing tools and plain scratch paper are allowed. Assume all questions are in base 10 unless otherwise indicated. We designed this test so that most people will not be able to finish all the questions in time, so don't worry if you are struggling! Feel free to skip questions and come back to them later.

Name: _____ Competitor ID: _____ Team ID: _____

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

7. _____ 8. _____ 9. _____

10. _____

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1. Find the value of $2 + 0 + 2 + 6 + 2026 + 2 \times 0 \times 2 \times 6 \times 2026$
2. Three years ago, Jennifer's father was three years younger than three times Jennifer's age. In 8 years, Jennifer will be half her father's age. How old is Jennifer right now?
3. How many ordered pairs of integers (x, y) satisfy $x^2 + y^2 = 25$?
4. In a triangle, all the angle measures are prime numbers, in degrees. What is the smallest possible degree measure of the largest angle of the triangle?
5. In a game of 3v3 basketball, six players (Aevin, Bevin, Kevin, Devin, Evin, Fevin) want to form two teams of 3. How many distinct ways can this be done?
6. Anne, Bert, Cassie, Derek, and Elaine need to seat themselves in a row of 5. Anne and Elaine refuse to sit next to each other, while Bert must sit at one of the end seats. How many ways are there to arrange the group of 5 students?
7. A quadratic equation is written in the form $Ax^2+Bx+C = y$. In a certain equation, $C = -6$. The x-coordinate of the vertex is 2, and the product of the roots is equal to 3. What is the value of $A + B + C$?
8. A man needs \$1.75 for a jumbo-sized candy bar. He only has pennies, dimes, and quarters. He has unlimited dimes and quarters, but only 10 pennies. He wants to pay the exact amount due and does not want to receive change.

   How many different ways can the man pay exactly \$1.75 using the money he has?
9. Find the least positive integer n for which $5^n - 2^n - n$ is a multiple of 10.
10. In triangle ABC, AB = AC = BC = $60\sqrt{3}$. What is the radius of the circle that is tangent to $\overline{AB}$, $\overline{BC}$, and the inscribed circle of $\triangle ABC$?

General Answers

1. 2036
2. 17
3. 12
4. 89
5. 10
6. 12
7. 0
8. 11
9. 7
10. 10

General Solutions

1. Since anything multiplied by 0 is 0, this simplifies to $2 + 2 + 6 + 2026 = 2036$

2. Using j to represent Jennifer's age and f to represent her father's, we can construct two equations: $3(j-3) = (f-3)+3$, and $2(j+8) = f+8$. Solving for j, we obtain j = $\boxed{17}$ (and f = 42).

3. There are 2 unique pairs, disregarding sign and order: (0,5), and (3,4). For each, there are two ways to order them, as both contain unique numbers. Additionally, the 5, 3, and 4 can all be positive or negative. Therefore, the pair (0,5) has 4 unique cases and (3,4) has 8, leading to a total of $\boxed{12}$.

4. One of the angles must be 2 degrees, as 2 is the only even prime number and three odd numbers cannot add up to 180, which is an even number. The other 2 angles must add up to 178, and to minimize the largest number, we want them to be as close to each other as possible. If both angles are 178/2 = $\boxed{89}$, this satisfies this condition.

5. Notice that once we choose Kevin's teammates then the other team is determined. There are $\binom{5}{2}$ ways to do this, so the answer is $\frac{5\times4}{2\times1} = \boxed{10}$.

6. Bert has only 2 choices of seating. Furthermore, as it is one of the edge seats, the 4 remaining seats are consecutive. Considering this, we are able to easily count that there are only 6 ways Anne and Elaine are not seated next to each other. This can be accomplished through complementary counting [12 - 6 (the number of ways Anne and Elaine can be seated next to each other)] or casework depending on where one of the girls is seated. Either way yields 6. With two remaining seats and two remaining students, there are 2 ways they can be seated. 2 * 6 * 2 = $\boxed{24}$.

7. By the vertex x-coordinate formula, $2 = \frac{-B}{2A}$. Knowing that C is -6, and applying Vieta's formula, the coefficient of the first term is -2 as $\frac{-6}{A} = 3$. Finally, using that information, we find that B equals 8 by the first formula. The final sum of the coefficients becomes $8 - 6 - 2$, so the result is 0.

8. The man needs \$1.75. He may use at most 10 pennies, so the only possible penny amounts are 10, 5, 0. We now consider each case.

   Case 1: 10 pennies
   Then the dimes and quarters must total:

   $$1.75 - 0.10 = 1.65.$$

   Any amount made with dimes always ends in 0, so for the total to end in 5, the number of quarters must be odd. Now list the possible odd numbers of quarters whose value does not exceed \$1.65:

   1, 3, 5 quarters.

7 quarters would be \$1.75, which is already the amount, so the 10 pennies would make it too large.

So there are 3 possibilities in this case.

Case 2: 5 pennies
Now the dimes and quarters must total:

$$1.75 - 0.05 = 1.70.$$

To end in 0, the number of quarters must be even. Now list all even numbers of quarters whose value is at most \$1.70:

$$0,\ 2,\ 4,\ 6 \text{ quarters.}$$

So there are 4 possibilities in this case.

Case 3: 0 pennies
Now the dimes and quarters must total:

$$1.75.$$

Again, to end in 5, the number of quarters must be odd. Now list all odd numbers of quarters whose value does not exceed \$1.75:

$$1,\ 3,\ 5,\ 7 \text{ quarters.}$$

So there are 4 possibilities in this case.

$3 + 4 + 4 = 11$, so there are 11 total solutions.

9. This problem is easy to guess and check. All powers of 5 end in 5, and powers of 2 cycle through 2-4-8-6 as their last digit. We only need to check odd values of n since 5 is odd and a power of 2 is always even. There are also only 10 of them before we repeat. We quickly find n = $\boxed{7}$.

10. Let the incenter of ABC be point O and the midpoint of BC be point M. We draw perpendicular lines from the centers of both circles to side $\overline{BC}$, and extend a line from B to the incenter. Let the center of the smaller circle be P and the point where the line perpendicular to BC going through P intersects BC be Y. BOX is a 30-60-90 triangle, giving us OM = 30. BOX is also similar to BPY. We set the two ratios of side - hypotenuse equal: 60/30 = (30-r)/r. Solving for r yields that the radius is r = $\boxed{10}$.