1. Let $k = \sqrt{x-9}$ + 5089. If $0 < x < 60$, find the sum of all distinct values of x such that k is a **positive integer**.

2. By how much does the sum of the integers from 205 through *ANS* inclusive exceed the sum of the integers from 205 through 210 inclusive?

3. Let $k = ANS - 105$. You possess a certain number of pennies and quarters, and their total value is k cents. If you had a third as many quarters and three times as many pennies, the total value would be five cents less than half of k cents. Find the total number of coins that you possess that are pennies or quarters.

4. If $x > 43.1$, find the value of

$$\log\left(\frac{x^3 - 62x^2 + 1135x - 5250}{x^2 - 32x + 175}\right) - \log(x - 30) + ANS - 28.52.$$

Express your answer as a **decimal** rounded to the nearest hundredth.

1. Find the maximum number of internal regions into which 3 lines can divide a circle.

2. All diagonals of a regular hexagon are drawn. The hexagon is now divided internally into a maximum number of non-overlapping (disjoint) internal polygonal regions. If ANS of these disjoint internal polygonal regions are shaded, and the other disjoint internal polygonal regions are unshaded, find the number of these disjoint internal polygonal regions that are unshaded.

3. Let $k = ANS$. Tom has a k per cent chance of winning 0 promprins, a $(2k)$ per cent chance of winning 10 promprins; otherwise, he wins $\frac{860}{49}$ promprins. Find the number of promprins in his mathematical expectation.

4. An ellipse has an equation of $\frac{(x-1)^2}{(ANS)^2}+\frac{(y+1)^2}{121}=1$. One of the foci of this ellipse has coordinates $(1+\sqrt{k},-1)$ where k is a **positive** integer. Find the value of k.

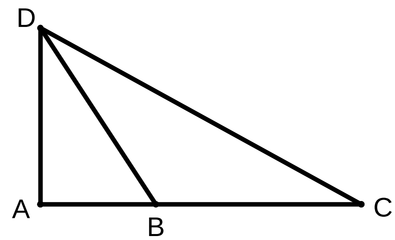
1. Adlai is now twice as old as his sister Christina was eight years ago. Find the number of years in Adlai's age twelve years from now if Christina then will be 21 years old.

2. A total of ANS distinct diagonals can be drawn in a certain convex polygon. Find the number of sides of this polygon.

3. There are exactly ANS distinct marbles in a bag—each of which is a different color. Karen picks two of these marbles at random (**with** replacement). If Karen names one of the colors of the marbles before drawing, find the probability that she picked two marbles of the same color but that the two marbles picked were not of the color that Karen named before drawing. Express your answer as a common fraction reduced to lowest terms.

4. ANS should be a common fraction of the form $\frac{k}{w}$ where k and w are relatively prime positive integers. Let p be a positive integer such that $0 < p \le k$. Find the sum of all distinct possible values of $\log(\frac{kp}{w})$. Express your answer as a **decimal** rounded to the nearest thousandth.

1. In right triangle DAC, $\angle DAC$ is a right angle. Point B lies on $\overline{AC}$ as shown. If $DA = 8$, $CD = 17$, and $DB = 10$, find BC.



2. ANS is the length of a leg in each of two right triangles. The hypotenuse of one right triangle has a length of 41, and the hypotenuse of the other right triangle has a length of 15. By how much does the length of the remaining leg of the larger right triangle exceed the length of the remaining leg of the smaller right triangle?

3. *ANS* is the sum of the terms of an infinite geometric sequence whose first term is 20. Find the ratio of the fourth term to the third term. Express your answer as a common fraction reduced to lowest terms.

4. The cosine of the largest **acute** angle of a right triangle is ANS. Find the sum of the sines of the other two angles of this right triangle. Express your answer as an improper fraction reduced to lowest terms.

1. Let $f(x) = 17x + 8$. By how much does $3f(2)$ exceed $2f(3)$?

2. Let k, w, and p represent integers. The quartic equation $x^4 + kx^3 + wx^2 + px - 144 = 0$ factors into $(x^2 + (ANS)x - 48)(x^2 + x + 3) = 0$. One of the roots of that quartic equation is a positive integer. That integer is the length of a side of an equilateral triangle. Find the area of that equilateral triangle.

3. The points $(\sqrt{45}, -8\sqrt{3})$ and $(3\sqrt{5}, ANS)$ are the endpoints of a diameter of a circle. Find the *y*-coordinate of the center of this circle.

4. When simplified, ANS should be in the form $k\sqrt{w}$. Find the real value of x which is a solution of the equation $\sqrt{\left(\frac{1}{x}+1\right)}+\frac{1}{x}+1+kw=0$.

2010 SAA JR/SR RELAY COMPETITION
PROCTOR ANSWER SHEET

ROUND 1

1. 212
2. 423
3. 30
4. 1.48 (Must be this decimal.)

ROUND 2

1. 7
2. 17
3. 12 (Promprins optional.)
4. 23

ROUND 3

1. 14 (Years optional.)
2. 7
3. $\frac{6}{49}$ (Must be this reduced common fraction.)
4. -2.615 (Must be this decimal.)

EXTRA ROUND 4

1. 9
2. 28
3. $\frac{2}{7}$ (Must be this reduced common fraction.)
4. $\frac{9}{7}$ (Must be this reduced improper fraction.)

EXTRA ROUND 5

1. 8
2. $4\sqrt{3}$
3. $-2\sqrt{3}$
4. $\frac{1}{3}$ or $.\overline{3}$ or $0.\overline{3}$