Cover Sheet

Name: ______________________________________________________

Home Address: ______________________________________________

City: _______________ State: _______ Zip: _______________

Home Phone: (____) ________________________________

School: ________________________________________________

Teacher First Name: ____________ Last Name: ________________

Current Grade in School: _______________

Math Courses Taken:
Pre-Algebra_____ Algebra 1 _____ Algebra 2 __ Geometry _____

Birth date (Including year): _______ – _______– _______

Gender: ______ Male ______ Female

Social Security Number: __________________________

Are you a U.S. Citizen? Yes_____ No ____
Directions: This test has 15 problems, with a time limit of 120 minutes. Do not use a calculator. Show all your work on the test, and how you obtained each answer. Partial credit will be given even if you do not obtain an answer. Do not worry if you cannot do all the problems. We are interested in how you approached each problem.

1. It takes 15 hours to fill up a tank when both taps A and B are turned on together. If tap A is turned on for 8 hours, then turned off, tap B will then take 50 hours to fill up the tank. How long will it take for the tank to be filled up by tap B alone?

   Answer: _________________

   Work:
2. Amy leaves home at the same time every morning and gets to school exactly at 8 AM. If she traveled at 70 meters per minute she would arrive 10 minutes early. If she traveled at 60 meters per minute she would arrive 8 minutes early. What time does Amy leave home each morning?

Answer: _________________

Work:
3. A magic square is a square array of numbers such that the sum of the numbers in each row, column, and diagonal is the same. What is the value of the difference \((e - b)\) if the six missing numbers a, b, c, d, e, f complete the square below to form a magic square?

<table>
<thead>
<tr>
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<th>a</th>
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<tbody>
<tr>
<td>34</td>
<td>a</td>
<td>b</td>
</tr>
<tr>
<td>15</td>
<td>c</td>
<td>d</td>
</tr>
<tr>
<td>e</td>
<td>f</td>
<td>20</td>
</tr>
</tbody>
</table>

Answer: _________________

Work:
4. ABCD is a square with sides of length 15 cm. E and F are the mid-points of AB and AD respectively. Let X be the intersection of BF and DE. Find the area of BCDX.

![Diagram of a square with points E, F, and X labeled]

Answer: _________________

Work:
5. There are 2007 oranges.
The first group of people consumed \( \frac{1}{2} \) of the oranges.

The second group of people consumed \( \frac{1}{3} \) of the remaining oranges.
.
.
.

The \( n \)th group of people consumed \( \frac{1}{(n+1)} \) of the remaining oranges.
.
.
.

The 2006th group of people consumed \( \frac{1}{2007} \) of the remaining oranges.

Find the number of oranges left.

Answer: _________________

Work:
6. There is a collection of 900 balls, each ball colored either red or blue. The number of red balls is at least as many as the number of blue balls. Two balls are selected from this collection without replacement. If the probability that both balls have the same color is the same as the probability that the balls have different colors, how many red balls are there?

Answer: _________________

Work:
7. From an unlimited supply of red, blue, and green balls, how many ways are there to choose 2007 balls if you must choose at least 2 red balls and 7 green balls?

Answer: ________________

Work:
8. How many integers are greater than or equal to 1 and less than or equal to 10,000 that are perfect squares, cubes, or fifth powers?

Answer: _________________

Work:
There are 10 points in the plane, no 3 are collinear. [i.e. no 3 points lie on one line.] The lines through every pair of points are drawn and the only points where 3 or more lines are concurrent (meet at a point) are the original 10 points. None of the lines are parallel. How many triangles are formed by the lines?

Answer: _________________

Work:
10. Bases AB and CD of trapezoid ABCD are 20 and 30 units long. The diagonals of the trapezoid intersect at X and the area of triangle BXC is 150 square units. What is the area of the trapezoid?

Answer: _________________

Work:
11. The medians to the legs of a right triangle are 14 and 13 units. What is the length of the hypotenuse? Note: A median from a vertex to a leg opposite is a line segment from the vertex to the midpoint of that leg.

Answer: _________________

Work:
12. A frog can move forward 2 feet or 3 feet on a hop and can also move back 1 foot on a hop. How many sequences of hops are possible that will have moved the frog forward 15 feet after exactly 8 hops?

Answer: _________________

Work:
13. Amos rolls a 4 sided die with the numbers 3, 5, 7, or 9 on its faces while Bob rolls a regular 6 sided die with the numbers 1 through 6 on its faces. Amos finds the sum of the 3 visible numbers on his die and Bob finds the sum of the five visible numbers on his die. The winner is the person with the highest sum. If Bob and Amos keep playing until someone wins, what is the probability that Amos will win?

Answer: _________________

Work:
14. What is the area of triangle ABC if AB = 6 and angles A and B are respectively 135° and 30°?

Answer: ___________________

Work:
15. Beginning with a score of zero, Kevin rolls a regular die. If the top number is odd he adds it to his score; if the top number is any of the even numbers he subtracts 1 from his score. The probability that after 5 rolls his total is 7 can be expressed as $\frac{X}{6^5}$. What is the value of $X$?

Answer: _________________

Work: