**Nathan Hale High School Math Invitational**

March 15, 2016



Junior Varsity

Event 1: Arithmetic

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Team \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ALL ANSWERS MUST BE IN FULLY SIMPLIFIED FORM AND EXACT (unless otherwise stated).**

1. Simplify



1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 2 points

1. Two-thirds of Sam’s coins are pennies. If she were given ten more pennies, three-fourths of her coins would be pennies. What is the greatest amount of money Sam could have in coins? (Assume that she does not have any coins that are not pennies, nickels, dimes, or quarters.)

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3 points

1. What is the greatest number that will divide 27, 48, 90 and 174 and leave the same remainder in each case?

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5 points

**Nathan Hale High School Math Invitational**

March 15, 2016



Junior Varsity

Event 2: Algebra

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Team \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ALL ANSWERS MUST BE IN FULLY SIMPLIFIED FORM AND EXACT (unless otherwise stated).**

1. Solve for x. 

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2 points

1. If ⅓ of the water in a dish evaporates the first day, ¼ of the remaining water evaporates the second day, and ½ of the remaining water evaporates the third day, what part of the original water is left at the end of the 3rd day?

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3 points

1. Suppose that a + b = 3 and a2 + b2 = 7. Then a4 + b4 = ?

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 5 points

**Nathan Hale High School Math Invitational**

March 15, 2016



Junior Varsity

Event 3: Geometry

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Team \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ALL ANSWERS MUST BE IN FULLY SIMPLIFIED FORM AND EXACT (unless otherwise stated).**

1. In a triangle, one angle is three times as large as the other and the third is 20 degrees greater than the sum of the other two. What are the measures of the angles of the triangle?

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2 points

1. If $ΔADB∼ΔBDC,$$\overline{BD} = 8$ and $\overline{CD} = 11$, find $m<A.$Round your answer to the nearest hundredth of a degree.

 

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3 points

1. In $ΔABC$, median $\overline{AM}$ is drawn to $\overline{BC.}$ If $\overline{AM}$= $\overline{MC}$, find the sum of the measures of angle B and angle C.

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5 points

**Nathan Hale High School Math Invitational**

March 15, 2016



Junior Varsity

Event 4: Team

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Team \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ School \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ALL ANSWERS MUST BE IN FULLY SIMPLIFIED FORM AND EXACT (unless otherwise stated).**

1. A certain family consists of a father, a mother, two school-aged children, and a baby. Around their circular dining table, there are four regular chairs and a high chair. Assuming the chairs are not rearranged and the baby sits in the high chair, determine how many seating arrangements there are such that the father and mother are sitting next to each other.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10 points

1. If $m$ and $n$ are two two-digit numbers formed by using each of the digits in the set {2, 3, 4, 7} exactly once, what is the largest possible value of $(m+11)(n+22)$?

2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10 points

1. Solve for x if x is a positive number.

 $\sqrt{4x+5}$ =$x$

3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10 points

1. The distance between $A$ and $B$ is 5 units. $A$ has coordinates of (2, 3) and $B$ has coordinates of ($x,$7). Find the exact value(s) of $x.$

4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10 points

1. If the ratio of $2x-y$ to $x+y$ is 2 to 3, what is the ratio of $x$ to $y$?

5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10 points

1. With the addition of the Houston Texans, the National Football League now has 32 teams. To conduct the annual draft, teams in each city must have a direct phone line to each of the other teams in order to discuss possible trades. How many direct phone lines must be installed

by the phone company to accomplish this?

6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10 points