

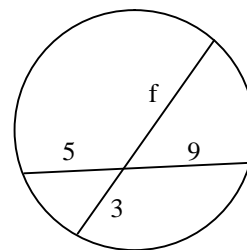
2009 Rocket City Junior Math Mania  
Algebra Test – 7th Grade

1. Evaluate:  $8 + 2 \times (9 - 6 \div 3) + 7^2$
2. What is the sum of the number of feet in a mile, the number of sides on an octagon, and the number of minutes in an hour?
3. Express the number 987 in scientific notation.
4. Evaluate:  $137^2 - 123^2$
5. Express in simplest radical form:  $\sqrt{63}$
6. When six liters of a 66% acid solution are mixed with nine liters of a 21% acid solution, what percent of the resulting solution is acid?
7. What values of  $m$  satisfy  $3m^2 - 11m - 4 = 0$  ?
8. What value of  $p$  satisfies  $2(p + 3) - 9 = 5(p - 1) - 22$  ?
9. What is the equation of the axis of symmetry of the parabola  $y = 2x^2 - 24x + 3$  ?
10. What is the solution, as an ordered pair  $(m, n)$ , of the equations  $3m - n = 17$  and  $m + n = 15$  ?

2009 Rocket City Junior Math Mania  
Geometry Test – 7th Grade

1. What is the hypotenuse, in centimeters, of a right triangle with legs measuring 9 and 12 cm?
2. If two legs of a triangle measure 31 and 21 cm, how many integers could be the length of the third side in centimeters?
3. How many diagonals can be drawn in a convex 11-gon?
4. A cow is tied to an outside corner of a rectangular barn with sides measuring 30 by 50 m. If the cow's tether is 40 meters long, what is the area, in square meters, of the region the cow can graze?
5. What is the volume, in cubic centimeters, of a right circular cylinder with a base radius of 4 cm and a height of 5 cm?

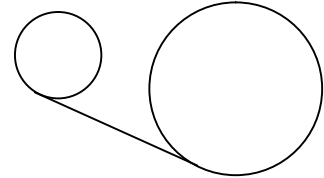
6. In the figure shown, what is the value of  $f$ ?



7. What is the perimeter, in centimeters, of a square that is inscribed in a circle with a diameter of 16 cm?
8. In a right triangle with sides measuring 5, 12, and 13 cm, what is the radius, in centimeters, of its inscribed circle?
9. What is the measure, in degrees, of an interior angle in a regular nonagon (9-gon)?
10. When four lines are drawn in a plane, what is the largest number of regions into which they can divide the plane?

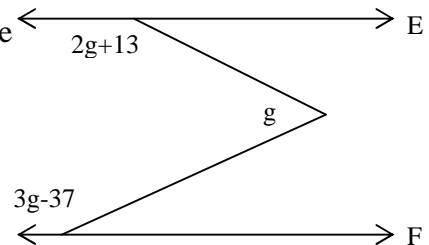
## 2009 Rocket City Junior Math Mania Potpourri Test – 7th Grade

1. What are the coordinates, in the form  $(x, y)$ , of the reflection of the point  $(-3, -7)$  across the line  $x = 4$ ?
2. If four mice can eat six wheels of cheese in nine days, how many days would it take three mice to eat eight wheels of cheese?
3. Two circles with radii of 4 and 14 cm have their centers 26 cm apart. What is the length, in centimeters, of their common external tangent?



4. My piggy bank contains fifteen coins and is worth \$1.21. If each coin is either a penny, nickel, or dime, how many nickels are in the piggy bank?

5. In the figure shown, where lines E and F are parallel and angle measures are given in degrees, what is the value of  $g$ ?



6. In the cryptarithm below, each instance of a letter represents the same digit (0-9) and different letters represent different digits (e.g. if one A is an 8, all A's are 8 and B cannot be 8). What is the largest possible value of the four-digit integer ABCD?

$$\begin{array}{r} AB \\ -BC \\ \hline CD \end{array}$$

7. If a sequence is defined recursively as  $k_1 = 3$  and  $k_n = 2k_{n-1} - 1$ , what is the value of  $k_5$ ?
8. Using the numbers 3, 4, 6, and 9 exactly once each and the operators  $+$ ,  $-$ ,  $\times$ , and  $\div$  (as well as parentheses) as many times as you like, write an expression which evaluates to 49.
9. What is the sum of the number of faces on a right square pyramid, the number of positive one-digit prime numbers, and the number of positive perfect squares less than 100?
10. How many positive three-digit numbers have three different digits, one of which is a three?  
Note: a number cannot start with the digit 0.

# 2009 Rocket City Junior Math Mania

## Probability Test – 7th Grade

1. What is the mode of the data set 4, 4, 7, 9, 9, 13, 15, 23, 32, 32, 32, 41, 41?
2. When trying to plan a family reunion for the 123 members of my extended family, 44 can come in June, and 45 can come in August. 22 can come in June and July, 19 can come in July and August, and 23 can come in June and August, while 9 can come in June, July, or August and 11 cannot come in any of those months. How many of them can come in July?
3. The probability that I eat breakfast in the morning is  $\frac{5}{6}$  and the probability that I take a nap in the afternoon is  $\frac{2}{9}$ . If these events are independent, what is the probability that I do neither?
4. A trusted friend draws two marbles from a bag containing five blue and three white marbles, examines them, and tells you that they are not both blue. What is the probability that they are both white?
5. What is the mean of the data set 3, 7, 19, 31?
6. In the game of Domjot, a player pays \$4 to roll a fair six-sided die. If the player rolls a 3 or less, they receive \$3 back. If they roll a 4 or 5 they receive \$2 back. If they roll a 6, they receive \$8 back. What is the expected value of the player's gain in dollars (perhaps negative) in this game?
7. When six fair coins are flipped, what is the probability that exactly four of them show tails?
8. When two fair six-sided dice are rolled, what is the probability that the product of their numbers is a multiple of six?
9. What is the median of the data set 5, 6, 6, 8, 10, 11, 12, 14, 16, 17, 18, 19, 20, 21, 22?
10. Two people play a game in which they take turns removing marbles from a bag containing three red and four white marbles. If the first person to remove a white marble is declared the winner, what is the probability that the second player wins the game?