# 2013 Rocket City Junior Math Mania
Algebra and Probability Test – 7th and 8th Grade

1. What is the median of the data set {1,-11,13,-3,5,-1,10,7,-8,12}?

2. 341 pencils are to be put in boxes that hold twelve pencils each. After as many boxes have been filled as possible, what is the product of the number of filled boxes and the number of pencils left over?

3. When two dice are rolled, what is the probability that the numbers shown have a sum of ten?

4. Write the letters A, B, C, and D in **ascending** order.
   A = 483 + 1722 B = 3598 – 1954
   C = 35 × 48 D = 12345 ÷ 3

5. A bag contains three blue and nine white marbles. If two marbles are randomly drawn without replacement, what is the probability that they are different colors?

6. Evaluate: $\frac{4! \times 4^4}{4^2 \times 3!}$

7. When a coin is flipped four times, what is the probability that exactly two of the flips show tails?

8. When the secret number is tripled and this result is decreased by 345, the final result is 972. What is the secret number?

9. JT rides his bike four miles uphill to the park, riding at an average speed of 8 miles per hour. When he goes home, he takes a shortcut and goes three miles at an average speed of 15 miles per hour. What is JT's average speed for the entire trip in miles per hour?

10. If $z\ y\ = 2y^2 – 3y – 4$, evaluate $z(5)$.

11. Evaluate: $9 × 8 – 7 + 6^2 – 5 ÷ 4$

12. Sally took 5 tests, and her average score was 77. What score must she earn on the next test to have an average score of 80?

13. In the array of unit squares to the right, how many different paths are there from the upper left corner to the lower right corner (moving only right or down with each move)?
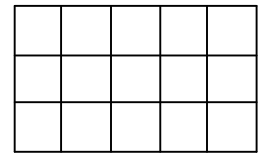
14. I have seventeen coins worth a total of $1.34. If each coin is either a penny, dime, or quarter, what is the smallest number of dimes I could have?

15. Mr. Kramer's class consists of seven seventh-graders and fifteen eighth-graders, and is trying to select three students to represent the class on the School Council. If they must choose at least one seventh-grader and one eighth-grader, how many different groups of three students could they choose?

16. If twice my number (an integer) is greater than 30, three times my number is less than 70, and five times my number is greater than 70, how many different integers could I be thinking of?

17. What value(s) of b satisfy
    $12 + 3\ 4b – 1\ = 6b + 7(3 – 2b)$?

18. Express in simplest radical form: $\sqrt{80}$

19. Evaluate as an improper fraction:
    $2\frac{3}{4} × 5.6 ÷ \frac{7}{8}$

20. In how many ways can the letters in the word "MATHTEST" be arranged?

21. The digits of a positive three-digit integer are reversed to produce another positive three-digit integer. If the new number is 693 less than the original number, what is the largest possible value of the new number?

22. If three Cheetos are equivalent to either four Doritos or five EatIts and two Falafels are equivalent to either three Gummis or four EatIts, how many Doritos are equivalent to 2700 Gummis?

23. What value(s) of h satisfy $\dfrac{h+2}{2h+3} = \dfrac{2h-3}{4h+1}$?

24. Seven years ago, Hatti was twice as old as Ivars. Next year, the sum of their ages will be 64. How many years old is Hatti now?

25. In a seven-element data set of integer test scores from 0 to 100 inclusive, the mean is 40, the range is 60, and the median is 30. What is the largest possible value of the unique mode?

TB1. How many integers between 100 and 1,000 are multiples of 17?

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Geometry and Potpourri Test –7th and 8th Grade

1. What is the area, in square meters, of a right triangle with legs measuring 14 m and 17 m?
2. What is the least common multiple of 54 and 72?
3. A triangle has two angles measuring x – 17 and $2x$ + 14. The other angle has a measure of 72°. What is the measure of the largest angle of the triangle (in degrees)?
4. The Pythagorean Pizza Palace has 3 pizza deals: (A) an 8-inch diameter pizza for 5 dollars, (B) a 12-inch diameter pizza for 10 dollars, and (C) a 16-inch diameter pizza for 15 dollars. Write the letter of the pizza choice that gives the customer the greatest amount of pizza per dollar?
5. What is the seventh term of a geometric sequence with first term 3 and common ratio $\frac{1}{2}$?
6. What is the area, in square meters, of a rectangle with a perimeter of 56 m and a length of 16 m?
7. An arithmetic sequence has an eighth term of 22 and a twelfth term of 38. What is the first term of the sequence?
8. What is the circumference, in meters, of a circle with an area of 64π? (Leave answer in terms of π.)
9. What is the sum of the positive integers that are factors of 135?
10. A right triangle has legs measuring 21 m and 28 m. What is the length, in meters, of the hypotenuse?
11. How many positive three-digit integers less than 750 are palindromes?
12. In a three-by-three "magic square", the integers from 1 to 9 inclusive are used once each to create three rows, three columns, and the two main diagonals (the ones with three blocks) that all have the same sum. In the magic square shown to the right, what is the value of a?

	1	
7		
		a

13. Express the base six number 3425_6 as a base ten number.
14. What is the maximum number of regions into which five lines can divide a plane?
15. What is the missing term of the sequence 2, 3, 6, 11, 18, 27, ___, 51, …?
16. What is the sum of the integers between 17 and 30 inclusive (including 17 and 30)?
17. In a "cryptarithm", an arithmetic problem is written using letters. Every "1" is changed to a certain letter, then every "2" is changed to a different letter, etc, until the entire problem is made up of letters. For example, the problem 7 + 70 = 77 might be written $Z + ZY = ZZ$. What is the smallest possible value of the sum in the cryptarithm shown?

$$\begin{array}{r} ABC \\ + CA \\ \hline CDB \end{array}$$

18. In a four-unit apartment building, Amy, Bella, Ciara, and Delia live in units 1, 2, 3, and 4, but not necessarily in that order. In addition, each of them owns one pet; there is a Zebra, a Yeti, a Xenops, and a Walrus. Neither Amy nor the Zebra lives in unit 1, the Yeti lives in unit 2, Ciara owns the Xenops, and Delia lives in unit 4. If Bella doesn't live in Unit 2, the Walrus doesn't live in unit 4, and Ciara doesn't live in unit 3, what person and pet live in Unit 3?
19. How many rectangles of any size and orientation are there in the three-by-five array of unit squares shown to the right?
20. How many subsets of {9, 5, 3, 6, 2} contain exactly one odd number?

21. How many four-digit numbers between 3729 and 5081 have four different digits that add up to 11?
22. How many positive integers are factors of 54?
23. How many four-digit integers greater than 3000 have four different digits that add up to 8?
24. Wilson has three pairs of pants, five shirts, and two ties. If an "outfit" is a pair of pants, a shirt, and a tie, how many different outfits can Wilson wear?
25. In a class of 30 students, 12 liked Alabama, 11 liked Auburn, and 10 liked Tennessee. If 4 liked Auburn and Alabama, 4 liked Alabama and Tennessee, 5 liked Auburn and Tennessee, and 3 students liked all three teams, how many students liked none of the three teams?
TB1. How many consecutive zeros are immediately to the left of the decimal in 2013!?