

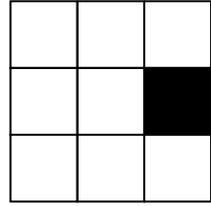
2010 Rocket City Junior Math Mania  
Individual Test – 8th Grade

1. What is the sum of twenty-nine and eighteen?
2. When the point  $(-4, -9)$  is reflected across the line  $x = 3$ , what are the coordinates of the reflection in the form  $(x, y)$ ?
3. What is the area, in square meters, of a right triangle with legs measuring 8 m and 9 m?
4. What is the sum of the positive odd numbers less than 25?
5. Using the numerals 2, 3, 4, and 6 exactly once each and the operations  $+$ ,  $-$ ,  $\times$ , and  $\div$  (and parentheses) as much as you like, write an expression equal to 23.
6. Round the number 123.456 to the nearest tenth.
7. When a positive, two-digit number is tripled and this result is reduced by two, the result is the same number except that its digits have been reversed. What was the original number?
8. An angle is supplementary to  $140^\circ$ . What is the measure, in degrees, of the angle's complement?
9. What are the coordinates, in the form  $(x, y)$ , of the center of the circle with equation  $x^2 + y^2 + 4x - 10y = 100$ ?
10. What is the median of the data set  $\{7, 3, 19, 4, 9, 11, 8, 15, 1\}$ ?
11. Evaluate:  $9^2 - 8 \times (7 + 6) \div 4$
12. What value(s) of  $b$  satisfy  $4b - 5 = 23$ ?
13. A cow is tethered to an external corner of a rectangular barn measuring 20 m by 35 m. If the cow's rope is 30 m long, what is the area, in square meters, which the cow can graze? Note: the barn door is closed; the cow cannot get into the barn.
14. Evaluate in terms of  $i$ , where  $i = \sqrt{-1}$ :  $(4 - 3i)(1 + 2i)$
15. What is the sum of the first six terms of the arithmetic sequence with first term 7 and common difference 8?
16. What is the sum of the number of vertices on a nonagon, the number of faces on a cube, and the number of seconds in an hour?
17. What is the equation, in slope-intercept ( $y = mx + b$ ) form, of the line through the points  $(-6, 2)$  and  $(-4, -4)$ ?
18. Convert the base 10 number  $87_{10}$  to base 4.

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19. In how many ways can five people sit relative to one another at a round table?

20. In the Psionic Square shown, the numerals 1-8 can be placed one per cell so that every row, column, and diagonal has the same sum. What numeral must be in the center cell?



21. Express the solution to the system of equations  $2c + d = 7$  and  $c - d = 2$  as an ordered pair  $(c, d)$ .

22. A right triangle has legs measuring 15 m and 20 m. What is the length, in meters, of the altitude to its hypotenuse?

23. Evaluate:  $\log_3 243$

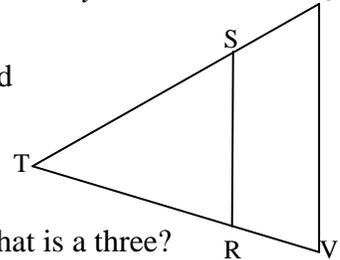
24. In a five-element data set of integer test scores from 0 to 100 inclusive, the mode is 84, the mean is 61, and the range is 76. What is the smallest possible value of the median?

25. How many subsets of the set  $\{2, 4, 8, 16\}$  contain the element 8?

26. Express in simplest radical form:  $\sqrt{126}$

27. What are the coordinates, in the form  $(x, y)$ , of the vertex of the parabola  $y = 2x^2 - 12x + 7$ ? U

28. In the triangle shown,  $\overline{SR} \parallel \overline{UV}$ ,  $TU = 12$  m,  $TV = 8$  m,  $UV = 6$  m, and  $RV = 2$  m. What is the length, in meters, of  $\overline{TS}$ ?



29. How many even positive four-digit numbers have at least one digit that is a three?

30. What is the third term of a recursive sequence defined by first term  $a_1 = 2$  and subsequent terms  $a_n = 3a_{n-1} + 4$ ?