

# 1996 MCTM Elementary Mathematics Contest — Sample Test

Grades 4-6

sponsored by the  
Missouri Council of Teachers of Mathematics



## 1996 Sample Test Questions and Solutions

**Concepts Test:** This test will attempt to assess knowledge of and about mathematics. Recall of facts and understanding of relationships will be essential. Items involving Numbers and Number Sense, Geometry (including visualization, transformations and Logo), Measurement, Data Analysis, and Probability and Statistics will be included in this section of the test.

**Problem Solving Test:** This test will assess higher order thinking skills. These items should require an application of mathematics utilizing both concepts and/or computation. A wide variety of problems can be expected, all of which can be solved utilizing problem solving strategies found in current literature. Expect to spend more time on some items of this test than on items on the Concepts Test.

**Labels on Solutions:** Solutions will require labels when they involve money (\$ or ¢), time (a.m. or p.m.), or measurement (cm, in, cm<sup>2</sup>, ft & in, hours & minutes, weeks & days, ...).

**Student Tools:** Each student needs to bring sharpened pencils, an in/cm ruler, and a calculator (optional). Fifth grade students should also bring a protractor; and sixth grade students should also bring a protractor and a compass.

**Dr. Lynda M. Plymate**  
Department of Mathematics  
Southwest Missouri State University  
Springfield, MO 65804-0094  
(417) 836-4152  
e-mail: [lsm953f@mail.smsu.edu](mailto:lsm953f@mail.smsu.edu)  
fax: (417) 836-5610

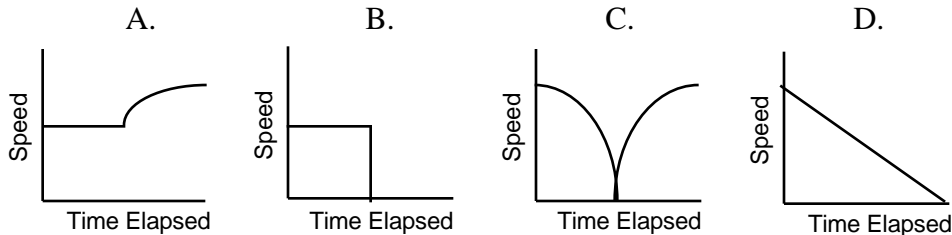
# 1996 MCTM Elementary Mathematics Contest — Sample Test

## 4th Grade Concepts

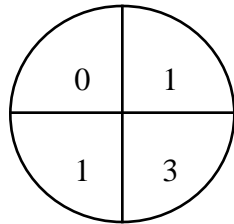
1. If the divisor is 15, and the dividend is a whole number, what is the largest possible remainder?
2. List all the factors of 29.
3. Which part of a pizza is the smallest piece?

$$\frac{1}{6} \quad \frac{1}{8} \quad \frac{1}{2} \quad \frac{1}{5}$$

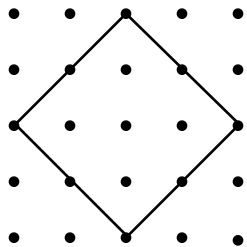
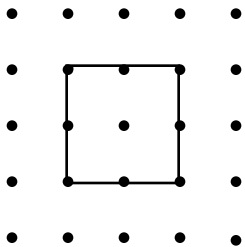
4. Choose the graph that best illustrates a wagon moving along a sidewalk and then crashing into a wall.



5. What is the probability of spinning a number less than 1?



6. Each square below touches eight pegs on the geoboard. Are their perimeters the same, or different?



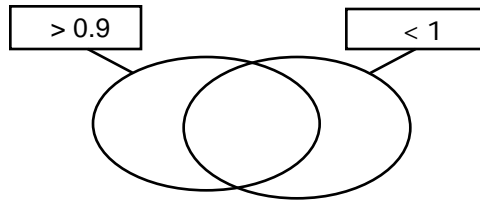
7. Use digits to write the number five million, sixty thousand, eight.
8. If a rattlesnake shakes its tail about 50 times each second, how many times would it shake in one minute?
9. Write the next two numbers in this sequence: 9, 18, 27, 36, 45, ...
10. Fold a piece of paper in half three times. Before you unfold it, shade one side of the folded paper. When you open it up, what fraction of the side of the paper with the shading on it would be shaded?



# 1996 MCTM Elementary Mathematics Contest — Sample Test

## 5th Grade Concepts

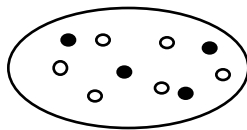
1. List three numbers that belong in the intersection of the string picture below.



2. What number does the Roman numeral **CDXXIV** stand for?  
 3. How long is this line segment to the nearest one-eighth inch?

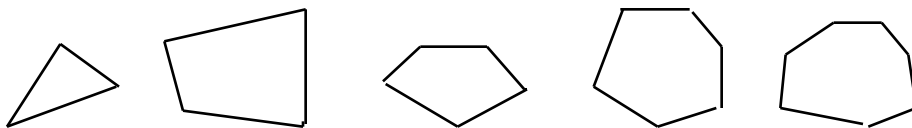


4. Write the part of this group that is NOT shaded as a fraction in simplest form, and as a decimal.



5. What number is missing in this LOGO procedure to draw a hexagon?  
 to picture  
 repeat 6 [fd 72 rt   ?   ]  
 end

6. You planted fifty seeds. Forty seven of your seeds germinated. What is the ratio of seeds that did germinate compared to the seeds that did NOT germinate?  
 7. Which factors of 116 are prime?  
 8. Describe the next figure that would continue this pattern.



9. How would you place the digits 4, 3, 8, 2, and 5 in this problem, in order to obtain the largest product?

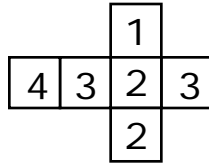
$$\begin{array}{r} \square\square\square \\ \times \square\square \\ \hline \end{array}$$

10. You need 14 feet of fabric to make a tablecloth for your dining room table. How many yards should you buy? (Express any part of a yard as a fraction.)

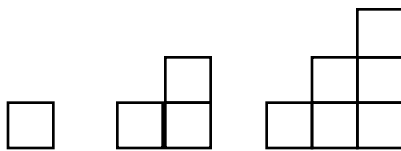
# 1996 MCTM Elementary Mathematics Contest — Sample Test

## 5th Grade Problem Solving

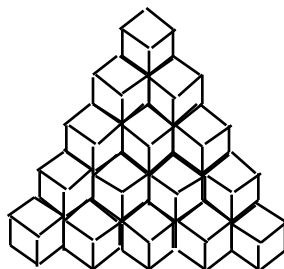
1. If the figure were folded to form a cube, what is the largest sum you can get by adding numbers from three faces which share a vertex?



2. On the first day of Jack's exercise program, he jogged  $\frac{1}{8}$  mile. Every day after that, he increases the distance he jogs by  $\frac{1}{8}$  mile. If he has jogged a total of  $3\frac{1}{2}$  miles so far, how far must he jog tomorrow?
3. The original price of a sweater is \$48. You buy the sweater on sale for 20% off. What is your total cost after adding on 6% sales tax?
4. What is the area of the largest rectangle with whole-number dimensions you can enclose with 56 feet of fencing?
5. A musical group started playing at 7:30 p.m. They finished playing at 11:10 p.m. How many hours did the group play?
6. A triangular number is a number that is associated with the number of squares or dots placed in a triangular pattern. Pictured below are the patterns for the first three triangular numbers, 1, 3 and 6.



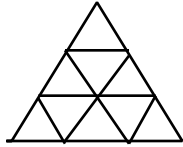
7. Sixteen children, numbered 1 to 16, stand in a circle. Starting with child 2, and continuing around and around the circle, every other child sits down. What is the number of the last child left standing?
8. Into every third package of a popcorn snack is placed a balloon. Into every tenth package is placed a baseball card. Into every twenty-fifth package is placed a ring. How many packages out of 1000 will contain all three prizes?
9. The average weight of 3 sacks is 13 pounds. Two of the sacks weigh 8 pounds each. How much does the third sack weigh?
10. How many blocks were used to construct the tower?



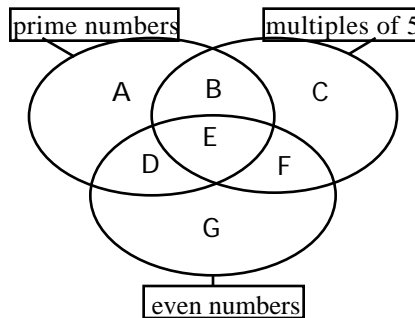
# 1996 MCTM Elementary Mathematics Contest — Sample Test

## 6th Grade Concepts

1. How many diagonals from one vertex, can be drawn in an octagon?
2. Find the value of P to make the sentence true:  $\frac{3}{P} + \frac{1}{3} = \frac{4}{9}$ .
3. How many triangles are there in the following picture?



4. Three children Amy, Brian, and Carol play a game flipping two coins. If the result is two heads, Amy wins. Two tails mean Brian wins. One head and one tail mean Carol wins. What is the probability that Amy wins?
5. Which of the following is equal to  $5^3$ ?  
 A.  $5 \times 3$                       B.  $3 \times 3 \times 3 \times 3 \times 3$                       C. 225                      D.  $5 \times 5 \times 5$
6. On your answer sheet, name the region(s) in this diagram that contain(s) exactly one number.



7. What percent of this quilt piece is not shaded?



8. Determine whether the following picture represents a flip, slide, or turn of the following basic unit.

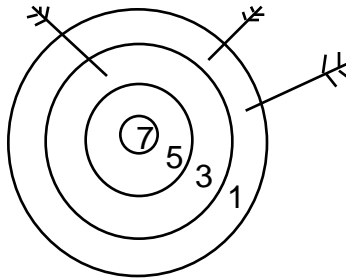


9. Write the reciprocal of  $3\frac{3}{4}$ .
10. Write the number 82 in base five.

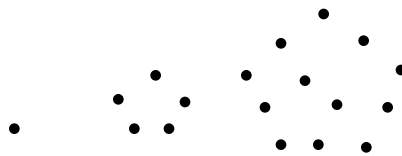
# 1996 MCTM Elementary Mathematics Contest — Sample Test

## 6th Grade Problem Solving

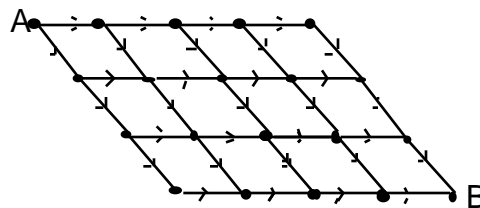
1. Given are the coordinates  $(4, -2)$ ,  $(3, 4)$ , and  $(-3, 3)$ . What are the coordinates of the point needed to complete a square?
2. How many  $2 \times 2 \times 2$  cubes can be placed into a  $5 \times 6 \times 7$  box?
3. If two additional arrows are shot and both hit the target, describe the set of all possible final scores.



4. If  $@ = * *$  and  $\# = @ @ @$ , how many  $@$  are represented by  $* * \# \# \#$ ?
5. A roller coaster takes a group of 48 people every 5 minutes. How long will you have to wait to ride the roller coaster if there are 150 people in front of you?
6. A pentagonal number is a number that is associated with the number of squares or dots placed in a pentagon pattern. Pictured below are the patterns for the first three pentagonal numbers, 1, 5 and 12. What is the sixth pentagonal number?



7. How many different ways are there to get from point A to point B along the one-way paths above?



8. David has \$500 in a savings account. If his money earns 5% interest at the end of each year, how much money will he have after 3 years?
9. A ball is dropped from a height of 81 feet. On each bounce it rises two-thirds the height of the previous height. How many times will it bounce before it rises to a height less than ten feet?
10. What is the probability that a randomly placed "X" will win this game?

X	X
O	O
O	X

## 1996 MCTM Elementary Mathematics Contest — Sample Test Solutions

Grade 4	Grade 5	Grade 6						
<p><b><u>Concepts</u></b></p> <ol style="list-style-type: none"> <li>1. 14</li> <li>2. 1 and 29</li> <li>3. <math>\frac{1}{8}</math></li> <li>4. B</li> <li>5. <math>\frac{1}{4}</math></li> <li>6. different</li> <li>7. 5,060,008</li> <li>8. 3,000</li> <li>9. 54, 63</li> <li>10. <math>\frac{1}{8}</math></li> </ol>	<p><b><u>Concepts</u></b></p> <ol style="list-style-type: none"> <li>1. any 3 numbers between 0.9 &amp; 1.0</li> <li>2. 424</li> <li>3. <math>4\frac{5}{8}</math> inches</li> <li>4. <math>\frac{3}{5}</math> and 0.6</li> <li>5. 60</li> <li>6. <math>\frac{47}{3}</math></li> <li>7. 2 and 29</li> <li>8. octagon  <div style="text-align: center; margin: 5px 0;"> <table style="border: none; margin: auto;"> <tr> <td style="border: 1px solid black; padding: 2px 5px;">5</td> <td style="border: 1px solid black; padding: 2px 5px;">4</td> <td style="border: 1px solid black; padding: 2px 5px;">2</td> </tr> <tr> <td style="border: none; padding: 0 10px;">×</td> <td style="border: 1px solid black; padding: 2px 5px;">8</td> <td style="border: 1px solid black; padding: 2px 5px;">3</td> </tr> </table> </div> </li> <li>9.</li> <li>10. <math>4\frac{2}{3}</math> yards</li> </ol>	5	4	2	×	8	3	<p><b><u>Concepts</u></b></p> <ol style="list-style-type: none"> <li>1. 5</li> <li>2. 27</li> <li>3. 13</li> <li>4. <math>\frac{1}{4}</math></li> <li>5. D</li> <li>6. B and D</li> <li>7. 70%</li> <li>8. turn</li> <li>9. <math>\frac{4}{15}</math></li> <li>10. 312 (base 5)</li> </ol>
5	4	2						
×	8	3						
<p><b><u>Problem Solving</u></b></p> <ol style="list-style-type: none"> <li>1. 11</li> <li>2. \$6.40</li> <li>3. 23</li> <li>4. 21</li> <li>5. 60 hours</li> <li>6. 15</li> <li>7. \$1.18</li> <li>8. under the red cup</li> <li>9. 75</li> <li>10. 49</li> </ol>	<p><b><u>Problem Solving</u></b></p> <ol style="list-style-type: none"> <li>1. 9</li> <li>2. 1 mile</li> <li>3. \$40.71 or \$40.70</li> <li>4. 196 square feet</li> <li>5. <math>3\frac{2}{3}</math> hours (or <math>3\frac{4}{6}</math> hours)</li> <li>6. 56</li> <li>7. 1</li> <li>8. 6</li> <li>9. 23 pounds</li> <li>10. 35</li> </ol>	<p><b><u>Problem Solving</u></b></p> <ol style="list-style-type: none"> <li>1. (-2,-3)</li> <li>2. 18</li> <li>3. all odd integers from 7 to 19</li> <li>4. 10</li> <li>5. 15 minutes</li> <li>6. 51</li> <li>7. 35</li> <li>8. \$578.81</li> <li>9. 6</li> <li>10. <math>\frac{2}{3}</math></li> </ol>						