

# 2007 MCTM Elementary Mathematics Contest – Sample Test

Grades 4-6

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Missouri Council of Teachers of Mathematics



## 2007 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 Number 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.

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4<sup>th</sup> Grade Concepts

1. There is only one positive integer that is exactly twice the sum of its digits. What is this two digit number?
2. Seventeen per cent of 1500 people surveyed said they got their pet from a pet store. How many people got their pet from means other than a pet store?
3. Invert each fraction and then list in order from smallest to largest in value as mixed numbers in the simplest form:  $7/8$ ,  $8/9$ ,  $5/6$ ,  $2/3$ .

4. Write an expression involving N to describe the relationship of the data in the table

N	Outcome
42	7
54	9
72	12
84	14

5. When is a Square not a Rhombus?
6. If a math class of 24 students has a 3:1 ratio of boys to girls and 2 boys leave, then the ratio of the remaining boys to girls would be what?
7. A football field is 110 meters long and 49 meters wide. How many square meters of artificial turf are needed to cover the field?
8. Given the following table, determine the missing value.

Input	Output
1	3
2	9
3	27
4	81
5	243
6	?

9. Which measure - mean, median, or mode - is always an actual data value?

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10. On a blueprint, the scale indicates that 2 cm represents 5 feet. What are the actual dimensions in feet of a room that is 4.8 cm by 6 cm on the blueprint?

**KEY**

**Name 4th Grade Concepts**

1. 18
2. 1245
3. 1 1/8, 1 1/7, 1 1/5, 1 1/2
4.  $\frac{N}{6}$
5. Never
6. 8:3 or 16/6 or 2 2/3 : 1 or 2 2/3

7. 5390
8. 729
9. Mode
10. 12 by 15

**4<sup>th</sup> Grade Problem Solving**

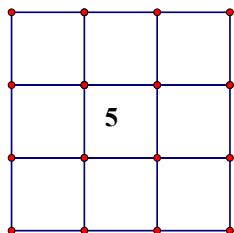
1. Given that A,B,C and D represent a different whole number, supply the missing number.

A	B	C	D	10
A	C	D	A	9
A	C	C	B	9
B	C	D	B	11
5	11	14	?	

2. A kangaroo chases a rabbit, which starts 150 feet ahead of the kangaroo. For every 12 foot leap of the kangaroo, the rabbit makes a 7-foot leap. How many leaps will the Kangaroo have to make to catch up with the rabbit?
3. A square is folded in half to form a rectangle. If the resulting rectangle has a perimeter of 12 inches, how many square inches of area are in the original square?

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4. Fill in the squares with the digits 1-9, given that the sum of the numbers in the rows, columns and diagonal must be 15?



5. In a round robin tournament, every team plays every other team once. How many games would need to be scheduled for a ten team league?
6. The Harveys keep their goat on a 3-meter chain connected on a metal hook to the corner of a shed that is rectangular in shape (5 meters by 4 meters). To the nearest tenth, what area of grass in square meters can the goat reach to eat? (use 3.14 for pi)
7. What is the largest possible sum for all Wednesday dates in a 30-day month?
8. Container A is half full of water. Container B will hold 12 cups of water. When the contents of container A are poured in container B, Container B is  $\frac{2}{3}$  full. How many cups of water will container A hold?
9. If a bouquet of 6 tulips and 8 daisies cost \$10, but a bouquet of 8 tulips and 6 daisies costs \$11, how much does each flower cost?
10. Four fair coins are tossed. What is the probability that you will get no tails?

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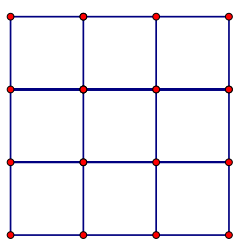
**KEY**

Name 4<sup>th</sup> Grade Problem Solving

1. **9**  
\_\_\_\_\_

2. **30**  
\_\_\_\_\_

3. **16**  
\_\_\_\_\_



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

5. **45**  
\_\_\_\_\_

6. **21.2**  
\_\_\_\_\_

7. **80**  
\_\_\_\_\_

**16**  
8. \_\_\_\_\_

**Tulips \$1.00**  
**Daisies \$.50**  
9. \_\_\_\_\_

**6.25% or .0625 or 1/16**  
10. \_\_\_\_\_

**5<sup>th</sup> Grade Concepts**

1. If it is equally likely that an earthquake in California will occur on any day of the week, what is the probability that the next large Pacific earthquake occurs on a weekend (Saturday or Sunday)?
2. In a group of 60 students taking both math and science, exactly 39 are taking math and exactly 36 are taking science. How many are enrolled in both science and math?
3. A fifth grade class picnic has a boy-girl ratio of 5:3. Three more girls join the class, changing the ratio to 10:7. How many students are now in the class?

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4. When the circumference of a toy balloon is increased from 20 to 30 inches, the radius is increased by?
  
5. One news carrier can deliver 75 newspapers in 2 hours. How many newspapers can 4 news carriers deliver in 4 hours? Assume that each can deliver at the same rate as the first news carrier described here.
  
6. Which is larger and by how much: the number of inches in a mile or the number of weeks in 1200 years?
  
7. How many  $2'' \times 2'' \times 2''$  cubes will fit into a  $3'' \times 3'' \times 3''$  box?
  
8. If a 7-sided die with its sides numbered 1 through 7 is tossed 49 times, how many times would you expect an even number to come up?
  
9. Mark was surprised to find that the mean, mode and median were the same for the 5 scores his teacher had given him on his 100 point exams. Unfortunately, before he could show his mom his work, he spilled hot chocolate on the paper. All that remained were three of the scores: 85, 65, and 70. What pair of scores did the chocolate cover?
  
10. If the angles of a triangle are in the ratio of 1:2:3, then find the measure of the smallest angle.

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**KEY**

**Name**    5th Grade Concepts

1.                    **2/7 or 28.57% or .2857**  
\_\_\_\_\_

2.                    **15**  
\_\_\_\_\_

3.                    **51**  
\_\_\_\_\_

4.                    **10/2pi inches**  
\_\_\_\_\_

5.                    **600**  
\_\_\_\_\_

6.                    **Inches in a mile, 960**  
\_\_\_\_\_

7.                    **1**  
\_\_\_\_\_

8.                    **21**  
\_\_\_\_\_

9.                    **(70,60) or (65,40) or (73.3, 73.3)**  
\_\_\_\_\_

10.                    **30 degrees**  
\_\_\_\_\_

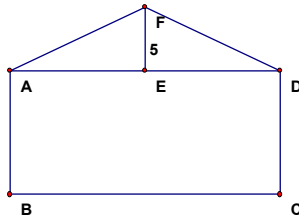
**5<sup>th</sup> Grade Problem Solving**

1. A waitress at a Chinese restaurant must pay 10% of her tips to the hostess, 25% to the busboy, and 5% to the cashier. If the waitress earns \$65.50 in tips on Friday night, how much money in tips does she get to take home?
  
2. On a 40 question test, three points are deducted for each wrong answer and five points are added for every correct answer. You answer all the questions and get a score of 0. How many questions did you get wrong?
  
3. Find the probability of flipping a coin and getting tails and then tossing a 6-sided number cube and getting a number greater than 1.
  
4. You have an equal number of pennies, nickels and dimes. You have \$3.20. How many of each coin do you have?
  
5. Ashley has won a radio contest that includes a chance to win money. A box is filled with \$100, \$50, \$20, \$10, and \$5 bills. Ashley will be blindfolded and allowed to draw bills, one at a time, until he has drawn five bills of the same denomination. He then will add up all the money he has drawn. What is the most amount of money Ashley can win?

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6. A man is 50 miles north of Springfield. If he walks south 15 days at the rate of 16 miles a day, how many miles would he be from Springfield?

7. An isosceles triangle and a rectangle share a common base. The area of the rectangle is 5 times the area of the triangle. If the area of the triangle is  $60 \text{ cm}^2$  and its height is 5 cm, find the dimensions in centimeters of the rectangle.



8. Due to melting, an ice sculpture loses one-half of its weight every hour. After 8 hours, it weighs  $\frac{5}{16}$  of a pound. How many pounds did it weigh in the beginning?

9. Place the digits 9, 4, 7, 6, 5, 1 into the boxes so that the greatest result is obtained.

$$\square \square \times \square \square + \square \square = ?$$

10. Working together Dave and Gay can dig a hole 2 meters wide by 2 meters long, and 2 meters deep in one hour. How many hours would it take Dave and Gay to dig a hole that is 4 meters wide by 4 meters long by 4 meters deep?

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**KEY**

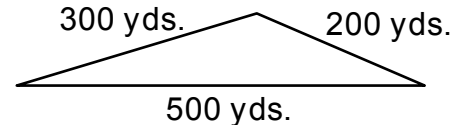
Name: 5<sup>th</sup> Grade Problem Solving

1. \$39.30
2. 25
3. 5/12 or 42% or .42
4. 20
5. \$840

6. 190.
7. 24 by 12.5
8. 80
9. 95 X 76 + 41 or 76 X 95 + 41
10. 8

**6<sup>th</sup> Grade Concepts**

1. A digital clock shows either 3 digits or 4 digits at a time. At what time do the digits on a digital clock have the greatest sum?
2. List all the possible lengths for the sides of a triangle if the triangle's perimeter is 13 and the lengths of the sides are integers?
3. A realtor found an advertisement for the plot of land shown at the right. What is the area of this plot of land?

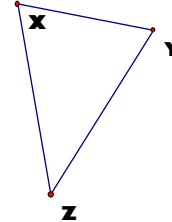


4. A packet of 25 \$1 bills weighs 9/10 of an ounce. What is the weight of one million \$1 bills in pounds?
5. The length of a rectangle is increased by 10% and the width is decreased by 20%. What percent is the new area compared with the original area?

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6. Find the fraction between  $\frac{2}{7}$  and  $\frac{5}{12}$  that has the smallest denominator.

7. Triangle  $XYZ$  is an isosceles triangle. (Assume the picture was produced accurately.) If the measurement of angle  $Y$  is  $62^\circ$ , how many degrees are in the measure of angle  $Z$ ?



8. How many grams should be placed on the scales **at B** to balance the scales?



9. The Bell System first planned in the 1940s for ten digit telephone numbers with the first three digits forming area codes. In the plan, the first digit could be a number from 2 through 9, the second digit could be either 0 or 1, and the third digit could be any number other than 0. How many area codes were possible under this plan?

10. In how many ways can 6 people be seated in a row in 6 chairs?

**KEY**

**Name**    6<sup>th</sup> Grade Concepts

- 1. 9:59  
1,6,6;2,5,6;3,5,5;3,4,6;4,4,5
- 2. Impossible, can't be done
- 3. \_\_\_\_\_
- 4. 2250  
12% less
- 5. \_\_\_\_\_

- 6. 1/3  
\_\_\_\_\_
- 7. 56  
\_\_\_\_\_
- 8. 22.5  
\_\_\_\_\_
- 9. 144  
\_\_\_\_\_
- 10. 720  
\_\_\_\_\_

**6<sup>th</sup> Grade Problem Solving**

## 2007 MCTM Elementary Mathematics Contest – Sample Test

1. Roger has a new rectangular patio (see below) that measures 2 meters by 4 meters. He wants to plant a garden that is 1.5 meters wide around the outside of his patio. How many cubic meters of soil does he need if the soil in his garden is 0.5 meters deep?



2. How many minutes does it take a one mile long train going 60 miles per hour to go completely through a 12 mile tunnel?
3. When you have 53,000 miles on your car, your mechanic tells you that your front brakes-your first set- are 50 percent gone and they should be replaced when 20 percent remains. Assuming constant wear, what will your mileage be when they need to be replaced?
4. Person A does  $\frac{2}{5}$  of a piece of work in 10 days. Person B joins in to help, and they finish the work in 6 more days. Assuming they each maintained a constant work rate, how many days would each have done it alone?
5. Charlie went out to buy some tools. He spent half of the money he had in his pocket plus \$10 for a drill, half of what was left plus \$4 for a sander, then half of what was left plus \$2 for a hammer, leaving him \$6. How much did Charlie start with?
6. On June 1, 2004, the average age of the 33 employees of Ajax Shoes was 47 years. On June 1, 2005, three of the staff aged 65, 58, and 62 retired and were replaced by four employees aged 24, 31, 26, and 28. What was the average age (to the nearest tenth) of the employees at Ajax Shoes on June 1, 2005?
7. A cask containing 63 gallons of juice was bought for \$4.54 a gallon. Six gallons leaked out and the remaining juice was sold at \$5.62 a gallon. How much profit was made?

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8. If a math class of 24 students has a 3:1 ratio of boys to girls and 2 boys leave, then the ratio of the remaining boys to girls would be what?
9. A ball is dropped 256 feet from the roof of a building. Suppose that with each bounce the ball goes up exactly half its previous height. A man is sitting at his desk on the second floor. How many times will he see the ball if his eye level is 15 feet above the ground?
10. A farmer wants to enclose a rectangular field (length and width are multiples of 10 feet) with fencing. He needs to put fence posts every 10 feet. How many posts will he need for 200 feet of fence?

**KEY**

**Name**    **6<sup>th</sup> Grade Problem Solving**

1.                    **8.25**  
\_\_\_\_\_

2.                    **13**  
\_\_\_\_\_

3.                    **84,800**  
\_\_\_\_\_

4.                    **25 and 16 2/3**  
\_\_\_\_\_

5.                    **\$100**  
\_\_\_\_\_

6.                    **43.4**  
\_\_\_\_\_

7.                    **\$34.32**  
\_\_\_\_\_

8.                    **8:3**  
\_\_\_\_\_

9.                    **9**  
\_\_\_\_\_

10.                    **20**  
\_\_\_\_\_