

2008 MCTM Elementary Mathematics Contest – Sample Test

Grades 4-6

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Missouri Council of Teachers of Mathematics



2008 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^2 , 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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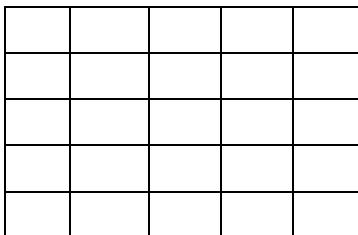
1. What is the value of the missing term? 106, 92, 78, ____, 50, 36, 22.
2. A rectangle is divided into two squares of the same size by a line segment joining two of its opposite sides. If the area of one square is 16, what is the perimeter of the rectangle?
3. The average of 5 numbers is 7, and the average of 6 other numbers is 9. To the nearest hundredth, what is the average of all 11 numbers?
4. Twenty-three 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?
5. How many 3" x 3" x 3" cubes packed in the most efficient manner will fit into a 6" x 6" x 6" box?
6. A newspaper advertisement reads, "If you buy 5 T-shirts of the same kind, we will take \$8 off the total price." Let t represent the cost of one T-shirt. Write an algebraic expression that describes the situation described by the advertisement.
7. Invert each fraction below and then list the resulting fractions in order from smallest to largest value as mixed numbers, in the simplest form: $7/8$, $8/9$, $5/6$, $2/3$.
8. Write an expression, involving N , to describe the outcome of the data in the table

N	Outcome
44	11
56	14
72	18
84	21

9. Write the next three terms in the number pattern.
1.7, 2.75, 3.8, 4.85, ____, ____, ____.

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10. How many meters are in the perimeter of this block of 25 rectangles? Assume each rectangle has a length of 3 meters and a width of 2 meters.



Key for 4th Grade Concepts

1. 64

2. 24

3. 8.09

4. 1155

5. 8

6. $5t - 8$

7. $1 \frac{1}{8}, 1 \frac{1}{7}, 1 \frac{1}{5}, 1 \frac{1}{2}$

8. $\frac{N}{4}$ or $\frac{1}{4} * N$

9. $5.9, 6.95, 8$

10. 50

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4th Grade Problem Solving

1. Sue had \$5.65 worth of quarters and dimes. There were 3 more quarters than dimes. How many quarters and dimes were there?
2. Two positive numbers are such that their difference is 6 and the difference of their squares is 48. What is their sums?
3. A square is folded in half to form a rectangle. If the resulting rectangle has a perimeter of 18 inches, how many square inches of area are in the original square?
4. A length of string 180 cm long is cut into three pieces. The second piece is 25% longer than the first, and the third piece is 25% shorter than the first. How long is each piece?
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 operation \odot relates two numbers according to a certain rule. The table below contains examples for the relation \odot . What is the answer for the problem $5 \odot 2$?

$7 \odot 4 = 24$
$3 \odot 6 = 12$
$7 \odot 2 = 12$
$4 \odot 4 = 12$

7. The ratio of the length of a rectangle to its width is 4 to 3. Its area is 300 square inches. How many inches long are its length and width?
8. What is the largest possible sum for all Wednesday dates in a 31-day month?
9. 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?

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10. During the 8 days of Hanukkah, one more candle per day is lighted on a menorah. The menorah includes a ninth candle that is used for lighting the others. All lit candles are allowed to burn down completely each day and are replaced for the next day(including the lighting candle). How many candles are needed for the 8 days?

KEY

Name 4th Grade Problem Solving

1. 17 quarters 14 dimes

2. 8

3. 36

4. 75 cm, 60 cm, 45 cm (any order)

5. 45

6. 8

7. 15 by 20

8. 85

9. 16

10. 44

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5th Grade Concepts

1. What is the number that is one more than one-fifth of one-third of one-half of three-tenths of 2,700?
2. Find the probability of flipping a coin and getting tails and then tossing a six-sided number cube and getting a number greater than 1.
3. In a group of 60 students taking math or science or both, exactly 39 are taking math and exactly 36 are taking science. How many are enrolled in both science and math?
4. If the angles of a triangle are in the ratio 1:3:5, then how many degrees are in the measure of the smallest angle.
5. If two adjacent edges of a given square were made to be 2 cm longer, the area of the resulting square contains 84 more square centimeters than the original. How long is an edge of the original square?
6. The following table lists the inches of snow in January.

Year	Inches of snow
1970	15
1971	16
1972	17
1973	15
1974	15
1975	16

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1976	16
1977	18
1978	15
1979	17
1980	15
1981	17
1982	16
1983	17
1984	15

What is the mode, median and mean?

7. What three consecutive even numbers have a product of 728640?
8. Suppose an airline leaving New York City at 8:43 a.m. Eastern time takes five hours and twenty-eight minutes to arrive in Los Angeles, which is in Pacific time zone. At what time does it land?
9. Evaluate $x^3 - 3y^4 + 7$, when $x = 22$ and $y = 7$.
10. How many times must you roll a six sided die to be sure that at least one face comes up twice?

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KEY

Name 5th Grade Concepts

1. _____
28
2. _____
5/12 or .42% or .42
3. _____
15
4. _____
20
5. _____
20 cm
6. _____
Mode 15
Median 16
Mean 16
7. _____
88,90,92
8. _____
11:11 a.m.
9. _____
3452
10. _____
7

5th Grade Problem Solving

1. Trina and Mariel were paid \$60 in total to paint the garage. Mariel started at 8 a.m., and Trina did not arrive until 10 a.m. The work was completed at 2 p.m. What is Mariel's fair share of the earnings?
2. A bath tub can be filled by the hot water and cold water pipes on together in four minutes, and when full it can be emptied by the waste pipe in five minutes. If it is already half full, and all three pipes are opened, how many minutes will it take to completely fill the tub?
3. If 50 gallons of cream with 20% butterfat is mixed with 150 gallons of milk with 4% butterfat, what percent butterfat is the mixture?

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4. 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. Was their a profit or loss and how much?

5. The entire family chartered a boat for the day for \$840. Unfortunately, one couple had severe colds and had to cancel, so the remaining members had to chip in another \$35 each. How many people were there originally?

6. Ninety-six ballots were cast in the fifth grade presidential election. Brett received twice as many votes as Stacy. How many votes did each student receive?

7. The sum of the squares of the lengths of all the sides of a square is 72. What is the length of the diagonal of the square?

8. Ryan was trying to arrange his toy soldiers in even rows. At five across, he had four left over, at six he had one left over, and at twelve he had one left over. What is the smallest number of soldiers that he could have?

9. You have an equal number of pennies, nickels and dimes. You have \$1.60. How many of each coin do you have?

10. The length of a rectangle is increased by 20% and its width is increased by 50%. By what percentage does the area increase?

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KEY

Name: 5th Grade Problem Solving

1. \$36

2. 10 minutes

3. 8

4. Profit of \$34.32

5. 8

6. Brett 64 Stacy 32

7. 6

8. 49

9. 10

10. 80

6th Grade Concepts

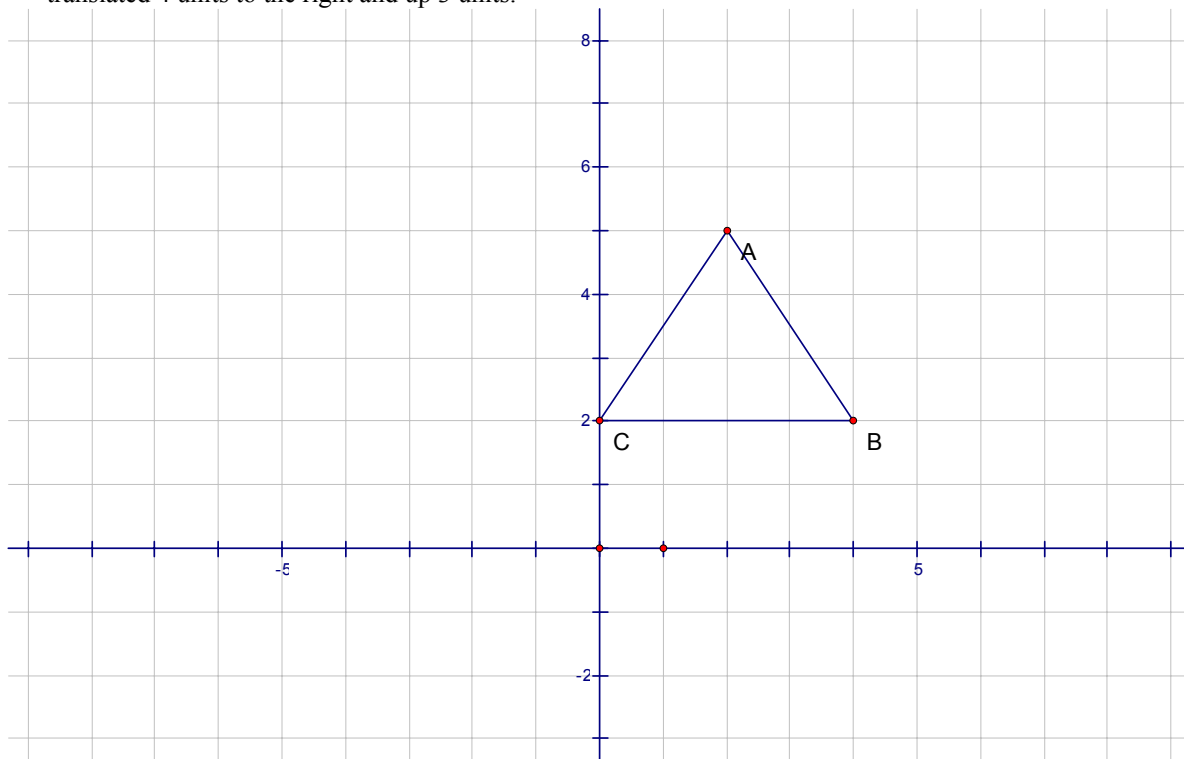
1. To make the following statement true, the question mark between the 6 and the 3 should be replaced by what operation?

$$(6 ? 3) + 4 - (2 - 1) = 5$$

2. Which has a greater volume and **by how many cubic inches (accurate to hundredths)**, a cube with sides of 5.5 inches or a cylinder with a height of 6 inches and a diameter of 6 inches? (Use 3.14 for pi)
3. Gay randomly chooses a whole number less than 10. What is the probability that Gay's number is a multiple of 3?

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- 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?
- If a/b is a fraction, and 2 is added to the numerator, the value of the fraction is $1/2$. If three is added to the denominator, the fraction has a value of $1/3$. The value of the sum of $a + b$ is?
- Write the next two numbers in this sequence: 5, 7, 12, 19, 31, 50, _____, ...
- Find the GCF (greatest common factor) of 125, 240, and 375.
- How many digits can replace c so that the number $7c2$ is divisible by 3?
- The vertices of a triangle are $A(2,5)$, $B(4,2)$, and $C(0,2)$. Give the vertices of triangle ABC translated 4 units to the right and up 3 units.



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10. A complete cycle of a traffic light takes 60 seconds. During each cycle, the light is yellow for 5 seconds and red for 30 seconds. At a randomly chosen time, what is the probability that the light will be green?

KEY

Name 6th Grade Concepts

Division or $\frac{1}{6}$ or $\frac{2}{12}$

1. _____

Cylinder, 3.14

2. _____

0.4 or $\frac{4}{10}$ or 40%

3. _____

1,6,6; 2,5,6; 3,5,5; 3,4,6; 4,4,5

4. _____

25

5. _____

81, 131

6. _____

5

7. _____

4

8. _____

A'(6,8), B'(8,5), and C'(4,5)

9. _____

$\frac{25}{60}$ or $\frac{5}{12}$ or .42 or 42% or .416

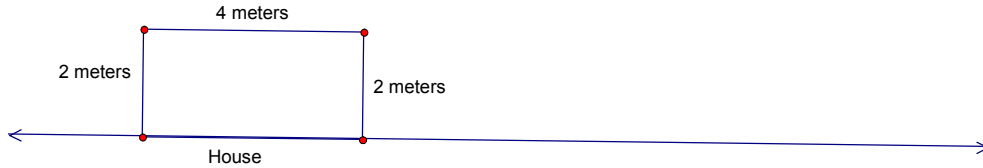
10. _____

6th Grade Problem Solving

1. Simon bought a number of pies. He gave $\frac{1}{8}$ th of the pies each to Fred and Mary, and $\frac{1}{4}$ th of the pies to Harry. He then gave four pies to his pet dog and was left with $\frac{1}{4}$ th of the original number. How many pies did he start with?

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2. 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 0.8 meters deep?

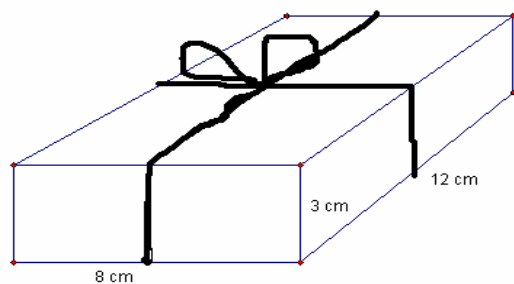


3. Clyde is trying to make chocolate milk for his whole class. So far he has made a 10% chocolate milk solution (this means that the solution is 10% chocolate and 90% milk). He has also made a 25% chocolate milk solution. Unfortunately, the 10% solution is too weak and the 25% solution has too much chocolate. He has a whole lot of 10% solution but only 30 gallons of the 25% solution. How many gallons of the 10% solution should he add to the 25% solution to make a mixture that is 15% chocolate?
4. 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?
5. 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?
6. 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?
7. Trina and Mariel were paid \$60 to paint the garage. Mariel started at 8 a.m., and Trina did not arrive until 10 a.m. The work was completed at 2 p.m. What is Mariel's fair share if the earnings?

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8. Connie had two boats. She sold both boats for \$6,000 each. On one boat Connie made a profit of 20 percent; on the other boat she lost 20%. Did Connie make money, lose money or break even and by what amount

9. Stu wants to wrap some ribbon around a box as shown below and have 25 centimeters left to tie a bow. How many centimeters of ribbon does he need?



10. In a go-cart race, Cindy was neither first nor last. Rose came in right after Cindy. Jean beat Roger. Roger beat Beth. Cindy beat Beth but not Roger. Who was last?

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Key

Name 6th Grade Problem Solving

16

1. _____

13.2

2. _____

60

3. _____

84,800

4. _____

25 and $16 \frac{2}{3}$ or $50 \frac{2}{3}$

5. _____

45

6. _____

\$36

7. _____

She lost \$500

8. _____

77

9. _____

Beth

10. _____