

2006 MCTM Elementary Mathematics Contest – Sample Test

Grades 4-6

Sponsored by the
Missouri Council of Teachers of Mathematics



2005 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, cm², 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.

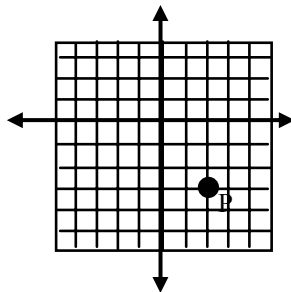
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4th Grade Concepts

- Mr. Kraus makes 6 funnel cakes from 1 quart of butter. Which number sentence can be used to find how many funnel cakes can be made from 9 quarts of butter?
A. $6 \times 9 = \square$
B. $6 \times \square = 9$
C. $9 - \square = 6$
D. $6 + 9 = \square$
- Write the next two number in this sequence: 3, 8, 11, 19, 30, 49, _____, _____.
- Seven 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?
- If $A = 7$, $B = -4$, and $C = 9$, how much is $A - C + B$?
- List all of the **prime** factors of 78.
- What ordered pair of coordinates names the location of point P?



- Phyllis wanted wall to wall carpeting. She needs 63 square feet. The carpet was \$40 a **square yard**. She got it on sale for half price. What did she pay for the carpeting?
- The big rectangle shown below is divided into four smaller rectangles A, B, C, and D. The area of rectangles A, B, and D are given. What is the area of rectangle C? .

A 20	B 8
C?	D 24

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9. A set of data includes 2, 5, 9, 4, 5, 8, 4, 2, 1, 4, 7, 8, 3, 2, 9, 4 and 0. What is the mode of this data?
10. The probability of rain is 20% on Friday, 10% on Saturday, and 60% on Sunday. What is the probability that it rains on all of these three days (to the nearest tenth of a percent)?

KEY

Name 4th Grade Concepts

1. A
2. 79, 128
3. 1395
4. -6
5. 2,3,13
6. (2, -3)

7. \$140
8. 60
9. 4
10. 1.2% or .012

4th Grade Problem Solving

1. What is the largest product you can obtain by placing the digits 2, 3, 4, 5, and 8 in the boxes?

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

2. What is the largest three-digit number whose digit product is 0 and whose digit sum is 9?
3. A line of ducks was walking along in single file with two ducks in front of a duck and two ducks behind a duck. What is the fewest number of ducks that could be in this line?

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4. The perimeter of a rectangle is 36 inches. If one side of the rectangle is twice as long as the other, what are the dimensions of the rectangle?

5. What is the smallest possible sum for all Wednesday dates in a 31-day month?

6. How much is saved by buying 36 ounces of cereal packaged in the larger box?

6 oz. \$1.09

12 oz. \$1.89

7. There are three pairs of white socks, four pairs of brown socks, and three pairs of black socks in a drawer. How many socks, without looking must I pull from the drawer to be certain that I have a pair of white socks?

8. What is the most precise name for the figure, with a square base, that would have 8 edges, 5 vertices, and 5 faces?

9. Find the largest of eight consecutive integers whose sum is 100.

10. Find the mean and median of the following data both accurate to tenths:
2, 9, 5, 5, 8, 4, 2, 1, 7, 8, 3, 2, 9, and 0.

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KEY

Name **4th Grade Problem Solving**

1.
$$\begin{array}{r} 542 \\ \times 83 \\ \hline 44986 \end{array}$$

2. **900** _____
3. **3** _____
4. **6 in by 12 in** _____
5. **58** _____
6. **\$.87 or 87 ¢** _____
7. **16** _____

- Square Pyramid**
8. _____
 9. **16** _____
 - median = 4.5**
 mean = 4.6
 10. _____

5th Grade Concepts

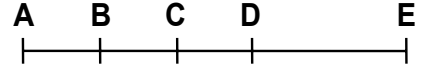
1. Give the possible whole number dimensions (width by length) of **all** of the **rectangles** with a perimeter of 18 inches.
2. What three consecutive **odd** numbers have a product of 12075?
3. The following is the composition of the Sacagawea gold coin.

Element	%
Copper	88.5
Zinc	6.0
Manganese	3.5
Nickel	2.0

Write the reduced improper fraction that names the ratio of Manganese to Nickel.

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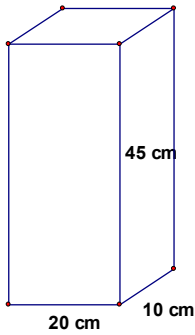
4. The length of AE is 20 centimeters. B is the midpoint of AC, C is the midpoint of BD, and D is the midpoint of BE. How many centimeters are there in the length of DE?



5. Write the next two numbers in this sequence: 120, 108, 98, 90, _____, _____.

6. Evaluate $x^2y + 4y$, when $x = 7$ and $y = 5$.

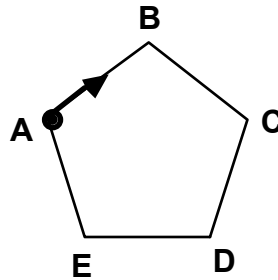
7. If this box is filled to capacity how many liters of water will it hold ($1\text{cm}^3 = 1\text{ ml}$)?



8. What is the probability of a computer choosing a “b”, if it picks the letter randomly from the word “probability”?

9. If $a \square = \frac{\triangle}{2}$ and $\frac{\triangle}{\square} * \triangle = 8$ then what does $\frac{\triangle}{\square} =$ exactly and what does $\square =$ exactly?

10. Harriet the centipede started crawling around the regular pentagon at the dot in the direction of the arrow. When Harriet has crawled $\frac{13}{20}$ of the perimeter of the pentagon, what side will she be on?



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KEY

Name **5th Grade Concepts**

1. **1x8, 2x7, 3x6, 4x5, 5x4, 6x3, 7x2, 8x1**

2. **21 x 23 x 25**

3. **7:4**

4. **8**

5. **84, 80**

6. **265**

7. **9**

8. **18.18% or .1818 or 2/11**

$\square = \text{sq rt } 2 \text{ or } (\text{sq rt } 8)/2$

$\overleftarrow{\leftarrow} = \text{sq rt } 8 \text{ or } 2 * (\text{sq rt } 2)$

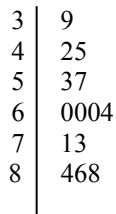
9. _____

DE or ED

10. _____

5th Grade Problem Solving

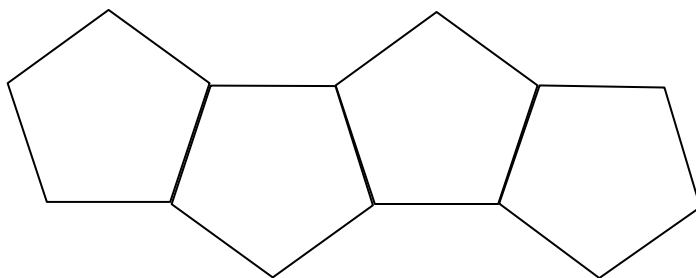
- The sum of two positive integers is 11. What is the smallest possible sum of their reciprocals? Express your answer as a common fraction.
- There are two birthday cakes, each 2 inches high. One is 20 inches by 20 inches, and the other is 14 inches by 14 inches. You plan to cut these cakes into 2 inch by 2 inch by 2 inch pieces. How many more children can you feed with the larger cake rather than the smaller cake?
- The temperatures in Cincinnati for the past 14 years are shown in the following stem and leaf plot. What was the average temperature for that period?



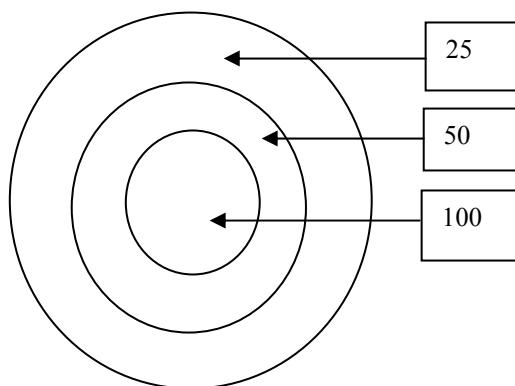
- In Booth's Bike Shop, Fred counted some bicycles and tricycles. He counted 23 bicycles and tricycles. When he counted the wheels, he got a total of 59. How many bicycles and tricycles were there?

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5. A line of ducks was walking along in single file and there were three ducks in front of a duck and three ducks behind a duck. What is the fewest number of ducks that could be in this line?
6. Study the following pentagon chain. How many sides would there be in one that was 46 pentagons long?

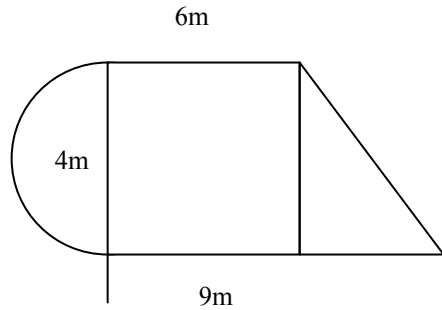


7. In the target below, the circles have radii of 1, 3, and 5 units, respectively. If you throw one dart and it hits the target, what is the probability that you score at least 50 points? Write your answer as a common fraction in lowest terms.



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8. The Sharon's had a cover made for their pool (shown below). If it cost \$5 per square meter, how much did they spend? (Use 3.14 for π)



9. A new motor oil saves 5% of the gasoline used by a car. If Ignatz drives 24,000 miles per year and he gets 32 miles per gallon, how many gallons of gas could he save?

10. The racers in the following table are going to have a race-off. The one with the fastest **average** practice laps will race the one with the slowest average practice laps. The racer with the second fastest average will race the third fastest. The winners of the heats will then race for the championship. Who races whom in the first two heats?

Driver	Practice Lap 1 (seconds)	Practice Lap 2 (seconds)
Coulthard	43.16	42.32
Montoya	42.35	41.35
Raikkonen	41.97	41.19
Barricello	44.66	42.33

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KEY

Name: 5th Grade Problem Solving

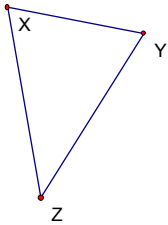
- | | | | |
|----|----------------------------------|-----|--|
| 1. | <u>11/30</u> | 6. | <u>185.</u> |
| 2. | <u>51</u> | 7. | <u>9/25</u> |
| 3. | <u>63</u> | 8. | <u>\$181.40</u> |
| 4. | <u>10 bicycles, 13 tricycles</u> | 9. | <u>37.5</u> |
| 5. | <u>4</u> | 10. | <u>Raikkonen vs. Barricello
Montoya vs Coulthard</u> |

6th Grade Concepts

1. What is the median test score in the following set of scores: 82, 74, 78, 72, 75, 74, 85, 96, 100, 79?
2. Very high ceilings waste energy. The average ceiling should be 8 feet high, but the ceilings in my house are 12 feet high. If I have a house that is 60 feet by 120 feet, how many cubic feet of space is wasting energy?
3. The number of students on a field trip is greater than 30 but less than 50. When seated 3 on a seat on the bus, no student has to sit alone. When placed in groups of 5 for a tour, all of the groups are the same size. How many students are on the trip?
4. Write the next two numbers in this sequence: 6, 9, 14, 21, 30, _____, _____ .
5. Two different circles and one straight line are drawn. What is the largest possible number of intersection points for this drawing?

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6. Of a parallelogram, a rectangle, and a square, which one has the most lines of symmetry?
7. In 1990 the price of a soccer ball was \$8.00. An analyst predicted that the price would rise \$0.25 per year for the next ten years. In what year will the price be \$9.75?
8. Which is largest: 63_{eight} , 110100_{two} , or 56_{ten} ?
9. Triangle XYZ is an isosceles triangle. If the measurement of angle Z is 42° , how many degrees are in the measure of angle Y ?



10. In January of 1990, Ginger deposited \$5,000 in a savings account. At the end of each year, the interest earned was added to the account. The following table shows the account balance, after interest was added, during the five years from 1990 to 1994. What is the growth rate in the account per year?

Year	Account Balance
1990	\$5000.00
1991	\$5250.00
1992	\$5512.50
1993	\$5788.13
1994	\$6077.53

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KEY

Name 6th Grade Concepts

- 1. 78.5
- 2. 28,800
- 3. 35 or 45
- 4. 41, 54
- 5. 6

- 6. square
- 7. 1997
- 8. 56_{ten}
- 9. 69
- 10. 5% or .05

6th Grade Problem Solving

- 1. 1. A merchant paid \$30 for an article. He wishes to place a price tag on it so that he can offer a 15 percent discount on the price marked on the tag and still make a 20 percent profit on the cost of the item. What price should he mark on the tag?
- 2. What is the smallest three-digit number whose digit product is 6 and whose digit sum is 8?
- 3. In a new version of the dating game, two of the three bachelors always lie while the other tells the truth. A woman asks questions of the men from behind a partition. She asks each man, "Which of you is the tallest?" Bachelor 1 replies, "Not me." Bachelor 2 replies, "I am." Bachelor 3 replies, "Not Bachelor 2." Who is the tallest?
- 4. The sum of the ages of 4 children (the Lopez twin brothers and the Wisler twin sisters) is 62 years. The Wislers are 7 years older than the Lopezes. What is the age of the brothers and what is the age of the sisters?
- 5. Solve for X: $11/12 - 5X = 5/24$. Write your answer as an improper fraction in lowest terms.
- 6. A swimming pool whose surface forms a rectangle measures 25 m long by 15 m wide. The pool is 2m deep at the shallow end, and the depth increases at a constant rate to 4 m deep at the other end. How many liters of water will the pool hold?
- 7. Five test scores were lost, but a summary of the five lost scores indicates that the mode was 90, the median was 85, and the mean was 83. If the grades were integers and could range from 0 to 100, what is the lowest possible grade from the missing set of scores?
- 8. On George's block the ratio of cars to houses is 8:5. There are 24 cars. How many houses are there?

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