

2002 MCTM Elementary Mathematics Contest – Sample Test

Grades 4-6

Sponsored by the
Missouri Council of Teachers of Mathematics



2002 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.

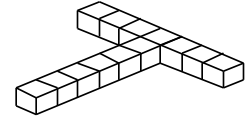
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2002 MCTM Elementary Mathematics Contest – Sample Test

4th Grade Concepts

1. A number is doubled and -9 is added to it. The result is -1. What was the number?

2. Thirteen one-inch cubes are put together to form the T-figure at the right. The complete outside of the T-figure (including the bottom) is painted red and then separated into its individual cubes. How many of the cubes have exactly 4 red faces?



3. The following diagram represents what division fact?

*** **
*** **
*** **

4. The following is called a “magic square.” What is its magic number?

8	1	6
3	5	7
4	9	2

5. According to expert scientific investigation, a small drip of water has a volume of about 1/4 of a milliliter(0.25 ml). How many drips are there in a liter of water?

6. The number of marbles that Bill (B) has is 7 less than twice the number that Ava (A). Write a number sentence for this information using the indicated letters.

7. What time will appear on a digital clock 465 minutes after it shows 2:00 p.m.?

8. According to experts, the first 4 moves in a chess game can be played in 197,299 different ways. If it takes 30 seconds to make one move, how many seconds would it take one player to try every possible set of 4 moves?

9. The probability of rain is 20% on Friday, 10% on Saturday, and 60% on Sunday. What is the probability that there is no rain on any of these three days(to the nearest tenth of a percent)?

10. If you multiply a one-digit number by 3, add 8, divide by 2, and subtract 6, you will get the number you started with back. What is the number?

KEY (4th Grade Concepts)

1. 4

2. 9

3. $\frac{27}{3}$

4. 15

5. 4,000

6. $B = 2A - 7$

7. 9:45 p.m.

8. 23,675,880 seconds

9. 288 or 28.8%

10. 4

KEY (4th Grade Problem Solving)

1. **50**

2. **55**

3. **45**

4. **34,146**

5. **$5/(2\pi)$ in.**

6. **800**

7. **.0625 or 6.25%**

8. **14**

9. **95**

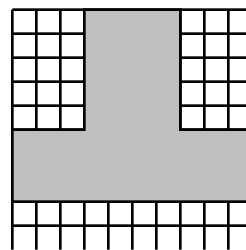
10. **2794**

2002 MCTM Elementary Mathematics Contest – Sample Test

5th Grade Concepts

1. The nearest rain forest is 2,796 miles away. How many days, to the nearest day, would it take to travel there if I traveled 134 miles per day?
2. Sue made the following high jumps: 63 in., 48 in., 60 in., 60 in., and 59 in. Find the average height of her jumps.
3. If you sleep 8 _ hours per night, how many seconds is that?
4. Put the following problems in order (listing the letter for each) according to the size of their answers, smallest first:
 - A. 49.95×70
 - B. 2.49×99.9
 - C. 9.99×499
 - D. 99.9×9.80099
5. What is the area of a circle with a 7 ft. diameter? Give your answer to the nearest thousandth of a foot(Use **3.14159** for pi).
6. A farming cooperative donates $\frac{1}{10}$ of its harvest to a food pantry. If they harvest $12 \frac{3}{5}$ tons of vegetables, how much goes to the pantry? Write your answer as fraction in simplest form.

7. What is the probability that a randomly thrown dart would hit the shaded portion of the dartboard shown at the right?



8. When the circumference of a toy balloon is increased from 20 inches to 25 inches, the radius is increased by?
9. A model car has a scale in which $\frac{1}{4}$ inch represents 28 inches. If the completed model is $2 \frac{3}{4}$ inches long, how long is the actual car?
10. In her first year as a dog breeder, her dogs produced 2 puppies. In her second year her dogs produced three times as many puppies as the previous year. In her third year her dogs produced five times as many puppies as the first year. How many puppies have been produced in the three years?

KEY (5th Grade Concepts)

1. **21**

2. **58 inches**

3. **30,600**

4. **b, d, a, c**

5. **38.485 sq.ft.**

6. **1 13/50**

7. **50/100 or $\frac{1}{2}$ or 50% or .5**

8. **5/(2 pi) inches**

9. **308 inches or 25 2/3 feet**

10. **18**

2002 MCTM Elementary Mathematics Contest – Sample Test

5th Grade Problem Solving

- 0 → 11
1 → 8
5 → -4
3 → 2 If the same rule is applied to every number, then 6 → ? .
- What number should be added to the following set of data so that the mean, median, and mode will become the same number?
91, 93, 93, 95, 95, 98, 100
- A large box is 150 cm long, 57 cm wide, and 54 cm high. Small boxes are 50 cm long, 19 cm wide, and 18 cm high. How many small boxes will fit inside the large box?
- Michael’s aunt is having a birthday. She is $\frac{1}{3}$ the age of Michael’s grandfather. Michael is 77 years younger than his grandmother. His grandmother is 2 years older than his grandfather. Michael just celebrated his 9th birthday. How old is his aunt?
- Sue made 15 high jumps of 58, 59, 59, 60, 60, 60, 61, 61, 61, 61, 62, 62, 62, 62, and 62 inches each. Joe made 15 high jumps of 58, 58, 58, 58, 59, 59, 59, 60, 61, 61, 61, 61, 62, 62, 62, and 62 inches each. Is Sue’s median jump **less than**, **equal to**, or **greater than** Joe’s median jump?
- If a fathom is 6 feet, how many fathoms are there in a mile?
- Find the distance between the points (3, 5) and (6, 4) to the nearest hundredth.
- Karen is shopping at the bakery for her mom. She was told to buy 10 onion rolls, 16 hamburger buns, and 8 loaves of rye bread for the picnic. How much did she spend before sales tax?

BAKERY SHOPPE

White Bread	2 for \$1.39
Rye Bread	2 for \$1.59
Onion Rolls	5 for \$2.95
Hamburger Buns	8 for \$1.79
Hot Dog Buns	8 for \$1.69

- Bob guesses on a true-false test TTFFFT. All questions are equally weighted. His teacher lets him take it again and he guesses FFTTF. If his teacher gives him the best of the two scores, what is the lowest score he can make?
- The prices of four items are in the ratio 3 : 7 : 8 : 13. If the most expensive item is \$165.88, what is the total price of the four items?

KEY (5th Grade Problem Solving)

1. -7

95

2. _____

27

3. _____

28

4. _____

greater than

5. _____

6. **880**

3.16

7. _____

\$15.84

8. _____

3/5 or 60%

9. _____

\$395.56

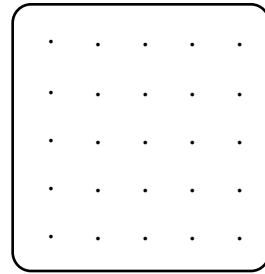
10. _____

2002 MCTM Elementary Mathematics Contest – Sample Test

6th Grade Concepts

1. A couple would like to have three children. How many different possible orders of boys and/or girls could be born to this couple?
2. Complete the sequence 60, __, __, 42, 36.
3. Hawaii became our 50th state in 1959. The English alphabet contains 2 more than twice as many letters as the Hawaiian alphabet. How many letters are in the Hawaiian alphabet?

4. On the geoboard on your answer sheet, draw a figure whose corners touch the pegs, has an area of 7, and has a perimeter of 12.



5. A motorist drives through three sets of traffic lights every day. The probability that the motorist has to stop at the first set of lights is 0.4, at the second 0.6, and at the third, 0.63. Each set of lights is independent of the others. Calculate the probability that the motorist does **not** have to stop at any of the lights.
6. What temperature in Fahrenheit is equivalent to 35° C
7. Cheryl is mowing a ball field. It is 125 yards long and 75 feet wide. What is the area of the ball field in square feet?
8. The Bell System first planned in the 1940s 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?
9. The measures of the four interior angles of a quadrilateral are in the ratio of 1:2:3:4. How many degrees are in the measure of the largest interior angle of the figure?
10. In 1990, the population of Hong Kong was 5,840,000. It is predicted that the population will increase to 134% of the 1990 population by the year 2025. What will the estimated population be by then?

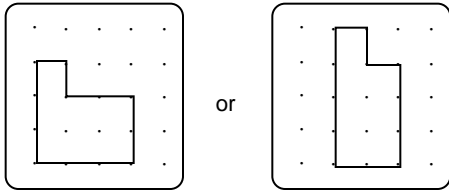
KEY (6th Grade Concepts)

1. **8**

54, 48

2. **12**

3. _____



4. **8.88% or .0888**

5. _____

95

6. **28,125**

7. _____

144

8. _____

144

9. _____

7, 825,600

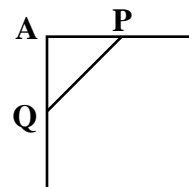
10. _____

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6th Grade Problem Solving

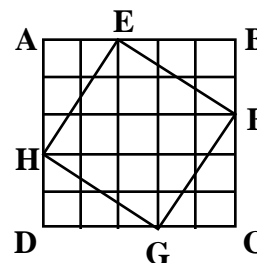
- When Dave walks to school, he averages 90 steps per minute, each of his steps are 75 cm long. It takes him 16 minutes to get to school. His brother, Jack, going to school by the same route, averages 100 steps per minute, but his steps are only 60 cm long. How long does it take Jack to get to school?
- I start with a square, increase one side by 3 cm and decrease an adjacent side by 2 cm to form a rectangle of area 24cm^2 . Find the perimeter of the rectangle (in cm).

- P and Q are the midpoints of the sides of this square. What is the ratio of the area of triangle APQ to the area of the complete square?



- Led by Kobe Bryant and Shaquille O’Neal, the Los Angeles Lakers beat the Indiana Pacers in the 2000 NBA Finals. Kobe missed Game 3, but he made 31 field goals(2 points each), 2 three-pointers, and 10 free throws(1 point each). In the five games that he did play, how many points did he average per game?
- A drawer contains 10 red socks and 10 blue socks. What is the smallest number of socks you must remove before you are assured of getting a matching pair?
- There are fewer than 6 dozen rocks in a collection. Grouping the rocks by 2s leaves 1 extra. Grouping them by 3s leaves 2 extra. Grouping by 4s leaves 3 extra. Grouping by 5s leaves 4 extra. How many rocks are in the collection?

- Find the area of quadrilateral EFGH.



- Suppose some towns wish to string fiber-optic cables so that each town is connected with every other town by exactly one cable. Then two towns require 1 connecting cable; three towns require 3 connecting cables; and four towns require 6 connecting cables. How many connecting cables are required for 8 towns?
- David has \$500 in a savings account. If his money earns 6% interest at the end of each year, how much money will he have in total after collecting his interest for the 6th year?
- If the length of a rectangle is increased by 10% and the area is unchanged, then by what percentage must the width be decreased?

KEY (6th Grade Problem Solving)

1. **18 minutes**

2. **22**

3. **1/8 or 1:8**

4. **15.6**

5. **3**

6. **59**

7. **13 Sq. Units**

8. **28**

9. **\$709.26**

10. **9.09 or 9 1/11**
