

2000 MCTM Elementary Mathematics Contest — Sample Test

Grades 4-6

sponsored by the
Missouri Council of Teachers of Mathematics



2000 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, 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.

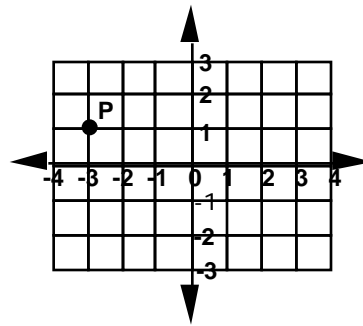
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2000 MCTM Elementary Mathematics Contest — Sample Test

4TH Grade Concepts

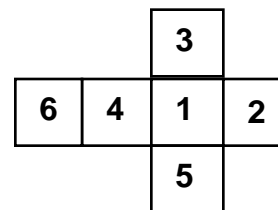
- The sides of a rectangle are measured as 8 cm and 10 cm, to the nearest cm in each case. What is the greatest possible value of the rectangle's area, to the nearest cm^2 ?
a. 80 b. 82 c. 84 d. 85 e. 89
- What is the smallest number which is divisible by 2, by 3, by 4, by 5, and by 6?
- Mitchell just bought a new car. Lester said it was a blue Dodge. Patricia said it was a black Chevrolet. Sandy said it was a black Ford. If each person correctly identified either the make of the car or its color but not both, what was the actual color and make of Mitchell's new car?
- If the time is now 2:17 P.M., what will be the time 11 hours and 59 minutes from now?

- What are the coordinates of point P?



- The Bell System first planned in the 1940's 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?
- What number is missing in this sequence? 20, , 8, 2, -4, ...
- In the following sequence there are 10 numbers. Each number has one more 2 than the preceding number: 2, 22, 222, 2222, ... , 2222222222. What is the hundreds digit of the sum of these 10 numbers?

- When the figure to the right is folded to make a cube, what is the largest sum of the numbers on a pair of parallel faces?

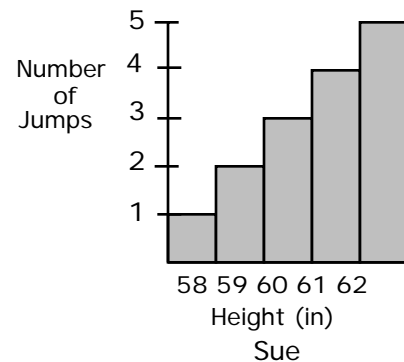


- What is the sum of the tenth odd number and the tenth even number?

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4TH Grade Problem Solving

1. In a set of number rods, there is one rod of length 10, two rods of length 9, three rods of length 8, and so on. If all the rods are laid end to end in one line, how long would the line be?
2. An elephant ride at the zoo costs \$3.00 for the first 10 minutes and 25¢ for each additional 5 minutes. Liam paid \$4.00 for his elephant ride. How long did he ride?
3. There is a boy in front of 2 girls and a boy behind two girls. There is a boy between two girls. What is the smallest number of children that could be in line?
4. During practice for the Olympic high jump, Sue completed 15 jumps. The chart to the right illustrates the heights in inches of Sue's jumps. Find the average height for Sue's 15 jumps, to the nearest whole number.



5. What is the largest number of pizza pieces you can get if you cut a round pizza with 4 straight lines? (The pieces don't need to be the same size.)
6. I started on a 460-mile trip with a full tank of gasoline. After driving 345 miles, I bought 15 gallons of gasoline to fill the tank. At this rate, how many gallons of gasoline will I use on the whole trip?
7. $0 \rightarrow 1$
 $1 \rightarrow 3$
 $5 \rightarrow 11$
 $3 \rightarrow 7$

If the same rule is applied to every number, then $6 \rightarrow \underline{\quad? \quad}$.
8. A farmer needs to fence a rectangular piece of land. She wants the length of the field to be 80 feet longer than the width. If she has 1080 feet of fencing, what should the dimensions of the field be?
9. Shannon surveyed 14 of her classmates. Eight play on a softball team and 7 play on a soccer team. Two play on no team at all. How many of her friends play on both soccer and softball teams?
10. If it takes a machine $\frac{2}{3}$ of a minute to produce one item, how many items will it produce in 2 hours?

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5TH Grade Concepts

1. At which of these times is the angle between the two hands of a clock face exactly 170° ?

- a. 3:50 b. 5:00 c. 6:30 d. 8:10 e. 10:20

2. Put a single digit in each box to make the problem correct:

$$\begin{array}{r} \square \square \square \\ \times \square \\ \hline 1090 \end{array}$$

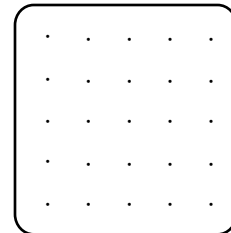
3. Which of these numbers is the smallest?

- a. $1/3$ b. $3/10$ c. $333/1000$ d. $7/20$ e. 0.33

4. If you are allowed to use positive whole numbers and addition, there are just four different ways of writing the number 3, namely: $1+1+1$, $2+1$, $1+2$, and 3 itself. How many different ways are there of writing the number 5?

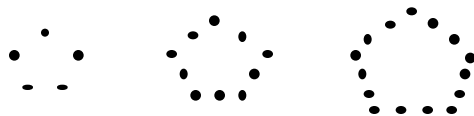
5. The perimeter of a triangle is 24 cm. Its sides have lengths (in cm) which are consecutive numbers. How long is the shortest side?

6. On the geoboard on your answer sheet, connect pegs to create an isosceles trapezoid with area = 4 square units.



7. What is the product of the first four positive prime numbers?

8. These represent models of pentinumbers. How many dots (in total) would it take to build the next two pentinumbers?



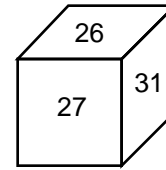
9. Paul bought a school notebook at a 30% discount. He paid \$1.19. What was the original price of the notebook before the discount?

10. If the radius of a circle is increased by 100%, by what factor is the area increased?

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5TH Grade Problem Solving

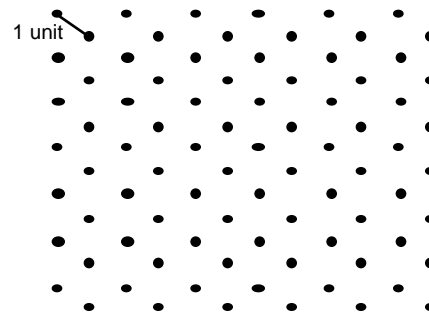
1. The faces of the cube shown are numbered in order. What is the sum of the numbers on all faces?



2. Alice sells an item at \$10 less than the list price and receives 10% of her selling price as her commission. Bob sell the same item at \$20 less than the selling price and receives 20 % of his selling price as his commission. If they both get the same commission, then what is the list price of the item?
3. A 3 cm by 3 cm by 3 cm cube is painted all over its outside and then is cut into 27 smaller cubes. How many of these smaller cubes have paint on more than one face?
4. Jesse was looking at the cars in the dealer’s lot and noticed that the cars were red, white or blue. Every white car had a black roof. Half of the blue cars had a black roof. Half of the cars with black roofs were white. There were 20 blue cars and 15 white ones. How many cars with black roofs were red?
5. Tanya and her older brother, Wilson, were discussing their ages. “Last year, said Wilson, “my age was a perfect square. Next year it will be a perfect cube.” What is Wilson’s age?
6. What number belongs in the START circle of this set of instructions?



7. Keisha has an equal number of quarters, dimes, nickels, and pennies. The total value of all of her coins is \$9.02. How many coins does she have in total?
8. On the triangular (isometric) dot paper on your answer sheet, draw a 3-dimensional "L"-shape made with 4 cubes up-and-down, and 2 extra cubes to the right to make the bottom of the "L".



9. Use the digits 1 through 5 exactly once each to find the smallest product in the following arrangement of missing numerals.

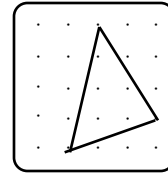
$$\begin{array}{r} \square \square \square \\ \times \square \square \\ \hline \end{array}$$

10. 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?

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6TH Grade Concepts

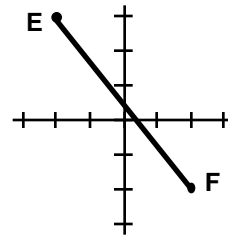
1. On the geoboard to the right, find the area of the shape outlined.



2. How many different four-figure numbers can be made using the digits 1,9,9,1?
3. The probability that it rains while Tom is walking home from school is $\frac{1}{3}$; the probability that Tom remembers to take his umbrella is $\frac{3}{5}$. If these events are independent, what is the probability Tom gets wet when walking home?

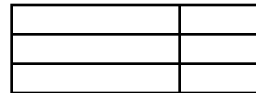
4. If the length of two sides of a right triangle are 3 and 4, what is the least possible length of the third side?

5. If point E has coordinates $(-6,9)$ and point F has coordinates $(6,-6)$, then what is the exact length of segment EF?



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. How many rectangles are in this figure?



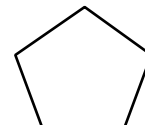
8. My yearly salary is \$30,000, and it is increased by \$3,000 a year. Your yearly salary is \$20,000, and it will be increased by \$5,000 a year. In how many years will we both have the same yearly salary?

9. The figure below consists of 9 small squares and is called a “magic square” because the total of the numbers added horizontally, vertically, or diagonally are all equal. If the total of the two diagonal rows are subtracted from the total of the three horizontal rows, the result obtained will equal which of the following:

- A. two-thirds a diagonal row
- B. three-halves a diagonal row
- C. any vertical row
- D. double a horizontal row
- E. one-half a horizontal row

8	1	6
3	5	7
4	9	2

10. In the regular pentagon shown to the right, what is the measure of each interior angle?

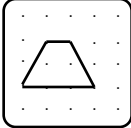
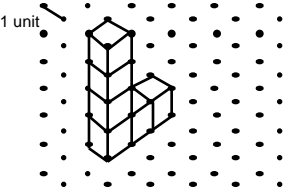


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6TH Grade Problem Solving

1. 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).
2. A quiz has 25 questions with four points awarded for each correct answer and one point deducted for each incorrect answer, with zero for each question omitted. John scores 77 points. How many questions did he omit?
3. Jan and Marisa both swim at the local pool for exercise. They met each other while swimming on July 2. Marisa swims every fourth day and will swim again on July 6th. Jan swims every third day and will swim again on the 5th of July. On what other dates in July will the two girls both swim if they stick to their schedules?
4. What is the 150th letter in the pattern ABBCCDDDD...?
5. What is the fraction? It is equivalent to $\frac{2}{3}$. The product of its numerator and denominator is 216.
6. 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?
7. A person made a purchase for D dollars and C cents and gave the cashier a \$20 bill. The cashier incorrectly charged the person C dollars and D cents, and returned \$4.88 in change. If the cashier had charged the correct price, what would the correct change have been?
8. John is covering his flower bed with mulch. The flower bed is in the shape of a circle with a diameter of 12 feet. He wants to put the mulch 2 inches deep all over the flower bed. How many bags of mulch does he need if one bag is 1 cubic foot of mulch?
9. In a triangle ABC, angle A has a measure of 30 degrees. Angle B is four times as large as angle C. What is the measure of angle B?
10. A light flashes every two minutes, a second light flashes every 2.5 minutes, and a third light flashes every 3 minutes. Suppose all three lights flash together at 9:00 a.m. What is the next time of the day they will all flash together?

2000 MCTM Elementary Mathematics Contest — Sample Test Solutions

Grade 4	Grade 5	Grade 6
<p><u>Concepts</u></p> <ol style="list-style-type: none"> e. 89 60 black Dodge 2:16 a.m. (-3, 1) 144 14 8 8 39 	<p><u>Concepts</u></p> <ol style="list-style-type: none"> e. 10:20 $\begin{array}{r} \boxed{2} \boxed{1} \boxed{8} \\ \times \boxed{5} \\ \hline 1090 \end{array} \quad \text{or} \quad \begin{array}{r} \boxed{5} \boxed{4} \boxed{5} \\ \times \boxed{2} \\ \hline 1090 \end{array}$ <ol style="list-style-type: none"> b. $\frac{3}{10}$ 16 7  <ol style="list-style-type: none"> 210 45 \$1.70 4 	<p><u>Concepts</u></p> <ol style="list-style-type: none"> $5 \frac{1}{2}$ (or 5.5) 6 $\frac{2}{15}$ $\sqrt{7}$ $\sqrt{369}$ 8:3 18 5 C. any vertical row 108 degrees
<p><u>Problem Solving</u></p> <ol style="list-style-type: none"> 220 30 minutes 5 61 11 20 13 310 ft. x 230 ft. 3 180 	<p><u>Problem Solving</u></p> <ol style="list-style-type: none"> 171 \$30 20 5 26 1,191 88  <ol style="list-style-type: none"> 3,185 27 	<p><u>Problem Solving</u></p> <ol style="list-style-type: none"> 22 2 14, 26 Q $\frac{12}{18}$ 59 \$7.85 19 120 degrees 9:30 a.m.

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