Eighth Grade Mathematics Competition
1995

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DIRECTIONS:

This is a test of your competence in middle school mathematics. For each problem there are five possible answers listed. You are to work the problems, determine the correct answer, and indicate your choice on the separate answer sheet provided.

SAMPLE:

1.   If $x + 1 = 2$, then x equals
  a.   0
  b.   2
  c.   -1
  d.   1
  e.   none of the above

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      A  B  C  D  E
   1  ①  ②  ③  ●  ⑤
      A  B  C  D  E
   2  ①  ②  ③  ④  ⑤
      A  B  C  D  E
   3  ①  ②  ③  ④  ⑤
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The correct answer is 1 which is **d**; so you should answer this problem by darkening the space on the answer sheet corresponding with this choice.

If you change your mind about your answer, be sure to erase completely. Avoid wild guessing, as wrong answers count against you. Do not mark more than one answer for any problem. Make no stray marks of any kind on your answer sheet.

When told to do so, open your test booklet and begin. When you have finished one page, go on to the next. The working time for the entire test is 60 minutes.

# JUNIOR HIGH SCHOOL MATHEMATICS COMPETITION
EIGHTH GRADE TEST
1995

1. Suppose that you owe your brother $38.05 for half the cost of a new video game. If sales tax is 8.25%, what was the price of the game before tax was added?

   a. $70.30   b. $76.05   c. $67.85   d. $82.40   e. $73.09

2. If the lengths of two sides of a triangle are 10 and 15, the length of the third side could be

   a. 4   b. 5   c. 20   d. 25   e. all of these

3. Suppose that a is any nonzero real number. Then the statement $0 < -a$ is:

   a. always true   b. never true   c. true for positive a only
        d. true for negative a only   e. true for rational a only

4. The area of a square is $z^2 - 30z + 225$. What is the perimeter?

   a. $|4z - 60|$ b. $|z - 15|$ c. $(z - 15)^2$ d. $2|z - 15|$ e. $|z + 15|$

5. If the reciprocal of x + 1 is x - 1, then x equals:

   a. 0   b. 11   c. -1   d. +1 or -1   e. none of these

6. A train goes from Town X to Town Y averaging 40 km/hr and returns averaging 60 km/hr. Assuming no time is lost turning around, what is the average speed for the round trip?

   a. 52 km/hr   b. 50 km/hr   c. 46 km/hr   d. 48 km/hr   e. 54 km/hr

7. Rewrite using inequality symbols: q is nonnegative and at most 12.

   a. $0 \le q \le 12$
   b. $0 < q \le 12$
   c. $12 \le q \le 0$
   d. $0 < q < 12$
   e. $12 \le q < 0$

8. There are seven slips of paper in a box. One slip has "1" written on it. One slip has "2" written on it. One slip has "3" written on it, and so on. The seven slips of paper are drawn from the box one at a time. What is the probability that all the odd numbers will be chosen first?

   a. $\dfrac{1}{35}$ b. $\dfrac{1}{24}$ c. $\dfrac{3}{8}$ d. $\dfrac{5}{36}$ e. $\dfrac{1}{18}$

9. If a circle has its radius increased by 10 percent of its initial value, by what percentage is the area of the inscribed square increased?

   a. 17
   b. 21
   c. 15
   d. 20
   e. 25

10. What is the ratio of a to b if $5a - 2b = 3a + 5b$?

   a. 5:2   b. 3:5   c. 8:7   d. 7:2   e. none of these

11. If there are exactly four Sundays in August, then August 31 could **not** fall on a

   a. Tuesday   b. Wednesday   c. Thursday   d. Friday   e. Saturday

12. On the first day of math class, 20 people are present in the room. To become acquainted with one another, each person shakes hands just once with everyone else. How many handshakes take place?

   a. 400   b. 380   c. 360   d. 190   e. not given

8.2

13.   Which one of the following is not possible?

    a. A right triangle that is also isosceles.
    b. A right triangle that is also equilateral.
    c. A right triangle that is also scalene.
    d. A right triangle that has 2 acute angles.
    e. All of the above are possible.

14.   Which of the following nets can be folded into a cube?

    a.   b.

    c.   d.

    e.
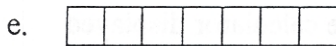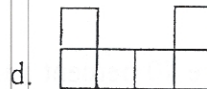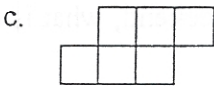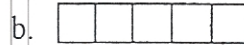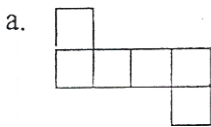
15.   If twelve perfectly round marbles, each 1 cm in diameter, were arranged in a straight line, touching each other, what would be the distance between the centers of the first and last marble?

   a. 12 cm   b. 11 cm   c. 10 cm   d. 14 cm   e. 9 cm

16. $$\frac{462 + 463 + 464 + 465 + 466 + 467 + 468 + 469 + 470 + 471}{5} =$$

    a. 929   b. 931   c. 933   d. 935   e. 937

8.3

17. How many odd numbers between 10 and 1000 can be formed from the digits 0-9 if each digit is used only once in each number?

   a. 450   b. 451   c. 355   d. 360   e. 348

18. The home plate used in baseball can be produced by filling in two of the corners of a 1 by 1 square as shown. What is the area of home plate?

   a. 1 square unit
   b. .75 square units
   c. 2.25 square units
   d. 1.5 square units
   e. not enough information given
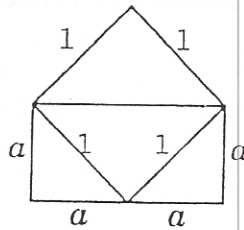
19. If the chances of rain are 40 percent and 20 percent for the two days of a weekend, what is the chance that it will rain on at least one of the two days?

   a. .80   b. .52   c. .48   d. .24   e. .64

20. A student entered $12.48357 \div 4.559845 =$ into a calculator. The calculator displayed the digits 27377181 in the answer but left out the decimal point. What is the correct quotient?

   a. 2.7377181   b. 27.377181   c. 273.77181   d. 2737.7181   e. 2737718.1

21. The number $2^{16} - 1$ is divisible by four prime numbers. The smallest and the largest of these four are:

   a. 5 and 17   b. 17 and 41   c. 3 and 257   d. 3 and 697   e. 5 and 41

22. At the beginning of a trip the odometer read 43,500 miles and the tank was full. When the odometer read 43,875 miles the driver filled the tank with 14 gallons of gas. At the end of the trip, the driver again filled the tank, this time with 16 gallons. The odometer read 44,310 miles. On average, how many miles could the car go on one gallon of gas?

   a. 25 miles   b. 27 miles   c. 28 miles   d. 29 miles   e. 31 miles

8.4

23. Which of the following is the smallest?

   a. $\dfrac{331}{452}$
   b. $\dfrac{330}{451}$
   c. $\dfrac{332}{453}$
   d. $\dfrac{329}{450}$
   e. $\dfrac{328}{454}$

24. A family has two children. One is a boy. What is the probability that the other child is a girl?

   a. $^2/_3$
   b. 1
   c. ½
   d. ¾
   e. ¼

25. If $1 * 3 = 5$, $6 * 9 = 21$, and $8 * 2 = 18$, find the value of $11 * 20$.

   a. 24
   b. 48
   c. 42
   d. 36
   e. 38

26. A drawer contains 12 identical white socks and 12 identical black socks. What is the fewest number of socks that must be drawn to <u>guarantee</u> two matching pairs?

   a. 4
   b. 5
   c. 6
   d. 7
   e. 8

27. A square piece of paper is folded in half vertically. If the resulting figure has a perimeter of 12 cm, what was the area of the original square?

   a. 9 cm^2
   b. 25 cm^2
   c. 18 cm^2
   d. 16 cm^2
   e. 36 cm^2

28. $(-64)^{\frac{2}{3}} \bullet (81)^{\frac{3}{4}} + (-243)^{\frac{3}{5}} =$

   a. 405
   b. 395
   c. 415
   d. 385
   e. 390

29. Find the number of digits in $4^{12} \cdot 5^{20}$ when written in usual base-ten form.

   a. 20
   b. 12
   c. 22
   d. 14
   e. 28

30. Supply the missing member of this sequence.

$14_{12}, 15_{11}, 16_{10}, 17_9, 20_8, 22_7, 24_6,$ _____, $100_4, 121_3, 10000_2$

    a. 48_5 b. 65_5 c. 26_5 d. 31_5 e. 79_5

31. What is the length of the side of a square which circumscribes a circle of area π?
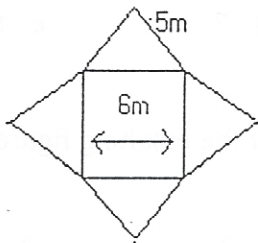
    a. 1   b. 2   c. 3   d. 4   e. 1.5

32. How many cubic centimeters (cm^3) of water must be added to 500 cm^3 of a solution that is 25% potassium chloride in order to reduce it to a 5% solution?

    a. 520 cm^3 b. 105 cm^3 c. 2000 cm^3 d. 5000 cm^3 e. none of these

33. Find the total surface area of the unfolded square pyramid.

    a. 36 m^2
    b. 6 m^2
    c. 84 m^2
    d. 12 m^2
    e. 52 m^2

34. A rectangular box measures 6 X 6 X 3 meters. What is the length of the longest stick that can be placed inside the box?

    a. 3m   b. 9m   c. 5m   d. 6m   e. 10m

35. A school has 1200 students. Each student takes 5 classes a day. Each teacher teaches 4 classes. Each class has 30 students and 1 teacher. How many teachers does the school have?

    a. 50   b. 60   c. 40   d. 45   e. 65

36. Candy for a party was purchased in bags containing 12 pieces. Each of the 9 boys and 6 girls attending the party were given the same number of candies and in so doing all the candy was eaten. What is the fewest possible number of bags of candy purchased?

    a. 4   b. 5   c. 10   d. 8   e. 11

37. A grain bin in the shape of a cylinder has a radius of 7 feet and a height of 18 feet. If there are about 1.25 ft.^{3} per bushel, approximately how many bushels of grain will the bin hold?

   a. 2200 bushels   b. 3450 bushels   c. 640 bushels   d. 1000 bushels   e. 1550 bushels

38. Which statement is correct if $\overline{AB}||\overline{DC}$?
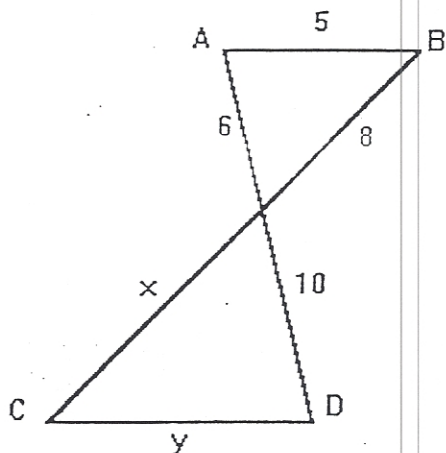
   a. $\dfrac{6}{10} = \dfrac{8}{x}$

   b. $\dfrac{6}{8} = \dfrac{x}{10}$

   c. $\dfrac{5}{y} = \dfrac{8}{10}$

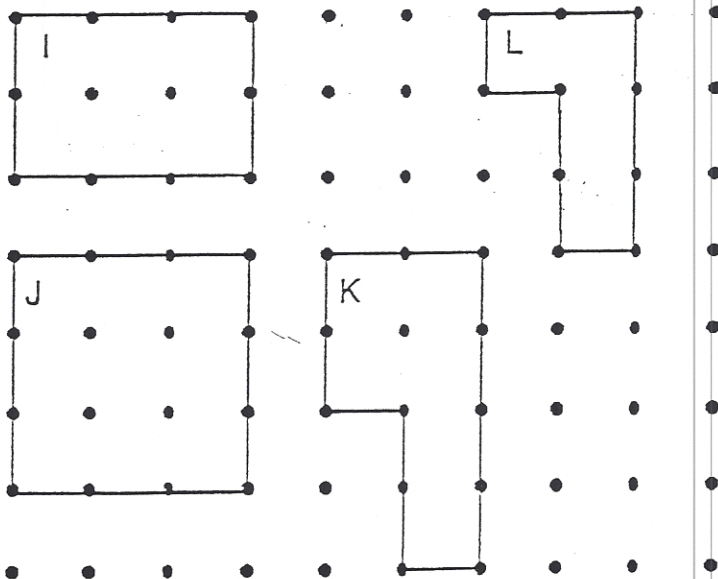   d. $\dfrac{6}{x} = \dfrac{8}{10}$

   e. all of these

39. On a true-false test, Fred answered 15 of the first 20 problems correctly, but only one-third of the remaining problems correctly. His final score was 50% correct. How many problems were on the test?

   a. 30   b. 40   c. 50   d. 60   e. none of these.

40. Which two figures have the same area but different perimeters?

   a. L and K
   b. J and K
   c. I and L
   d. I and K
   e. I and J

8.7