AUSTIN PEAY STATE UNIVERSITY

CLARKSVILLE, TENNESSEE 37040

JUNIOR HIGH/MIDDLE SCHOOL MATHEMATICS COMPETITION

EIGHTH GRADE TEST
1992
SCORING FORMULA: 4R - W + 40

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DIRECTIONS:

This is a test of your competence in Junior High School Mathematics. For each problem there are 5 possible answers listed. You are to work the problems, determine the correct answer, and indicate your choice on the separate answer sheet provided you.

SAMPLE:

1. If $x + 1 = 2$, then x equals

   (a) 0

   (b) 2

   (c) -1

   (d) 1

   (e) none of the above

The correct answer is 1, which is answer (d), so you would answer this problem by darkening the space on the answer sheet corresponding with this choice.

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

When told to do so, open your test booklet to page 2 and begin. When you have finished one page, go on to the next. The working time for the entire test is 80 minutes.

EIGHTH GRADE
JUNIOR HIGH MATH CONTEST

1. How many lines are determined by 6 points, no three of which are collinear?

   a) 12 b) 15 c) 18 d) 21 e) 24

2. If $2x + 3 = 7$, then $4x + 9 =$

   a) 0 b) 29 c) 1 d) 17 e) -1

3. What is the double of 2^{30}?

   a) 2^{60} b) 2^{30} c) $2 + 2^{30}$ d) 2^{31} e) 4^{30}

4. Given that the area of an isosceles right triangle is 8 square inches, what is the length in inches of the altitude to the hypotenuse?

   a) $4\sqrt{2}$ b) $2\sqrt{2}$ c) $\sqrt{2}$ d) 4 e) $3\sqrt{2}$

5. If a cork and a bottle together cost \$1.05 and the bottle costs \$1.00 more than the cork, how much does the cork cost?

   a) \$.01 b) 5 cents c) 2.5 cents d) \$1.00 e) 10 cents

6. A quality control inspector found two defective electric blenders in a shipment of 100 blenders. At this rate how many blenders would be defective in a shipment of 5000?

   a) 100 b) 50 c) 200 d) 150 e) 250

7. Twenty kilometers is closest to:

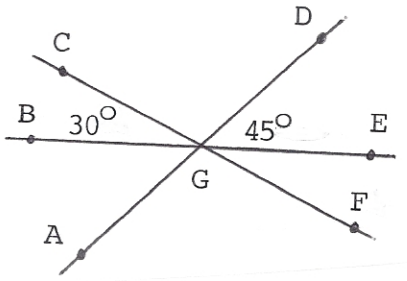
   a) 10 miles b) 25 miles c) 18 miles d) 15 miles e) 12 miles

8. The results of a survey of doctors, teachers, and lawyers regarding their opinions concerning a state income tax are presented below. Suppose a person is chosen at random from those surveyed. If the person chosen opposes the state income tax, what is the probability that he or she is a lawyer?

	Number that favor	Number that oppose	Number with no opinion	Total
Doctors	70	32	17	119
Teachers	83	24	10	117
Lawyers	23	15	8	46
Total	176	71	35	282

a) 15/46 b) 15/282 c) 0 d) 15/71 e) 46/71

9. Find the measure of ∠ AGF.



a) 75° b) 105° c) 95° d) 150° e) 100°

10. A mathematics student has scores of 74, 78, and 70 on three examinations. What score is needed on a fourth examination for the student to earn an average grade of 80?

a) 100 b) 98 c) 88 d) 99 e) 86

11. Australia has a population of approximately 14,000,000 and a land area of approximately 7,700,000 square kilometers. Find the average number of people per square kilometer, rounded to the nearest tenth.

a) .2 b) 1.8 c) 18.2 d) 181.8 e) .6

12. If p, q, and r are consecutive natural numbers where $p < q < r \leq 10$, what is the probability that $p \cdot q + r$ is odd?

a) 2/3 b) 3/10 c) 2/5 d) 1/2 e) 4/7

13. Define the operation $\oplus$ on the set of integers as follows: $x \oplus y = x \cdot y \cdot y$. Which of the following is a false statement?

a) $4 \oplus 9 = 81 \oplus 2$ b) $4 \oplus 9 = 36 \oplus 3$
c) $4 \oplus 9 = 1 \oplus 18$ d) $4 \oplus 9 = 324 \oplus 1$
e) $4 \oplus 9 = 9 \oplus 4$

14. Let A and B be sets such that A has 20 elements, B has 23 elements, and $A \cup B$ has 38 elements. How many elements are in $A \cap B$?

a) 15 b) 3 c) 5 d) 18 e) 10

15. Twelve posts stand equidistant along a racetrack. The posts are numbered from 1 to 12. A runner who is running at a constant speed, is clocked as running from the post marked 1 to the post marked 8 in 8 seconds. How many seconds will it take her to run from post 8 to post 12, assuming that she continues to run at a constant speed?

a) 88/7 b) 12 c) 64/7 d) 32/7 e) 40/7

16. Regulations require that grade A hamburger not contain more than 20% fat. What is the maximum amount of fat that a grocer can mix with 200 lb. of lean hamburger to meet the 20% regulation for grade A hamburger?

a) 100 lb. b) 20 lb. c) 40 lb. d) 50 lb. e) 60 lb.

17. Find the next term in this sequence: 5,6,14,29,51...

a) 92 b) 80 c) 75 d) 83 e) 79

18. Suppose a sequence is defined as follows: $a_1 = 2$, $a_2 = 5$, and $a_n = a_{n-1} + a_{n-2}$ for $n = 3,4,5...$ What is the value of a_6?

a) 31 b) -19 c) -3 d) 10 e) 17

19. In a drawer containing only black and blue socks, there are 10 blue socks and 12 black socks. Suppose that it is dark and you choose 3 socks at random. What is the probability that you will choose two socks of the same color?

a) 66/144 b) 1/100 c) 1/144 d) 11/30 e) 1

20. Suppose that you are standing on the middle rung of a ladder. If you move up 3 rungs, then move down 5 rungs, and then climb up 10 rungs to reach the top rung, how many rungs are on the ladder?

a) 12 b) 14 c) 21 d) 17 e) 13

21. $(-8)^{4/3} \cdot 27^{-2/3} + 16^{3/4} =$

a) 88/9 b) -136 c) 56/9 d) 56 e) 1168/9

22. How many different three-digit numbers can be written with three different digits?

a) 1000 b) 720 c) 590 d) 438 e) 648

23. Twenty individuals work for a company. The lowest paid person earns \$110 per week and the highest paid person earns \$260 per week. Which of the following values could be a reasonable estimate of the total weekly payroll for the company?

a) \$3600 b) \$1800 c) \$1050 d) \$7400 e) \$6000

24. A car travels down a straight flat road. It starts from rest and teaches 55 miles per hour in 10 seconds. The acceleration of the car is constant during the first 10 seconds. What is the speedometer reading of the car exactly 4 seconds after starting?

a) 18 miles per hour
b) 20 miles per hour
c) 22 miles per hour
d) 24 miles per hour
e) 26 miles per hour

25. In a mathematics class, half the students scored 22 on an achievement test. Most of the remaining students scored 23 except for a few students who scored 72. Which of the following statements is true about the distribution of the scores?

a) The mean and the mode are the same.
b) The median is less than the mode.
c) The mean is less than the mode.
d) The mean is greater than the median.
e) The median and the mode are the same.

26. Choose the false statement.

a) All squares are rectangles.
b) All parallelograms are quadrilaterals.
c) Some rectangles are squares.
d) Every rhombus is a parallelogram.
e) Every rhombus is a rectangle.

27. If the least common multiple of 18 and x is 180, what is the smallest possible value of x?

a) 40 b) 10 c) 180 d) 20 e) 90

28. On a balance scale, three green balls balance six blue balls, two yellow balls balance five blue balls, and six blue balls balance four white balls. How many blue balls are needed to balance four green, two yellow, and two white balls?

a) 8 b) 16 c) 12 d) 10 e) 18

29. A square is inscribed in a circle. The area of the square is 36 sq. cm. What is the area of the circle in sq. cm?

a) 18π b) 36π c) 72π d) 324π e) 72

30. Suppose you are drawing cards at random from a standard 52-card deck. How many cards would you have to draw to be absolutely sure that you have four hearts?

a) 38 b) 39 c) 23 d) 47 e) 43

31. Let x and y be rational numbers such that $x < y < 0$. Which of the following is always true?

a) $x < 1/x$ b) $x \cdot y < 0$ c) $x/y < y$ d) $-y < -x$ e) $x^2 < y^2$

32. The sales tax in Fleechburg is 10%. If Sally paid the cashier $1.32 for the cost of her soda and tax, how much did the soda cost excluding the tax?

a) $1.22 b) $1.20 c) $1.24 d) $1.40 e) $1.42

33. Joe has a weighted die so that a 6 is rolled 3 times out of 5. The other 5 sides have equal probability of being rolled. What is the probability of rolling a 2?

a) 1/6 b) 1/5 c) 2/5 d) 1/25 e) 2/25

34. If a circle of radius 10 cm has its radius decreased by 3 cm, by what percentage is its area decreased?

a) 68 b) 32 c) 28 d) 40 e) 51

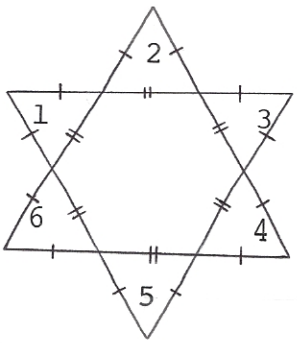
35. Three married couples are posing for a group picture. They are to be seated in a row of six chairs, with each husband and wife next to each other. In how many ways can this be done?

a) 24 b) 48 c) 720 d) 12 e) 30

36. In a rectangular field that is 40 yards by 60 yards, a strip 10 yards wide is mowed around the field along the outside edge. What is the area of the mowed portion of the field?

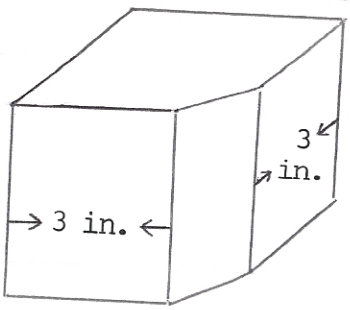
a) 1500 sq. yd. b) 1800 sq. yd.
c) 2000 sq. yd. d) 1600 sq. yd.
e) 800 sq. yd.

37. In the figure below, sides which are congruent are marked similarly. What is the sum of the measures of the labeled angles?



a) 180° b) 270° c) 360° d) 540° e) 720°

38. The cube below has dimensions 4 in. by 4 in. by 4 in. before it is cut. A vertical slice is taken from the cube as shown. What is the volume of the remaining solid in cubic inches with the vertical slice missing?



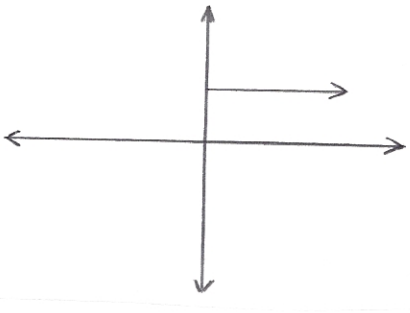
a) 62 b) 64 c) 36 d) 48 e) 54

39. A travel agent has just booked flights for three of her clients, Bill Holland, Pat Canada, and Debbie England. One of them is going to Holland, one is going to Canada, and one is going to England. Bill is not going to Holland, Pat is not going to Canada, and Debbie is not going to England. If Pat is not going to England either, which of the following is a true statement?

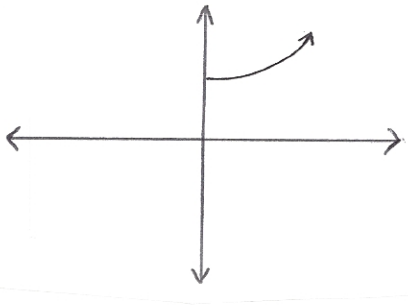
a) Bill Holland is going to Canada.
b) Bill Holland is going to England or Pat Canada is going to England.
c) Debbie England is going to Holland.
d) Debbie England is going to Canada and Bill Holland is going to Canada.
e) There is not enough information given to determine where the clients are going.

40. Suppose the population of Anywhere, Tennessee increases at a rate of 5% each year. Which of the following graphs is the most appropriate model? The horizontal axis represents time, and the vertical axis represents population.

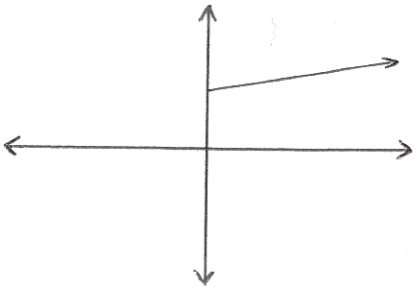
a)



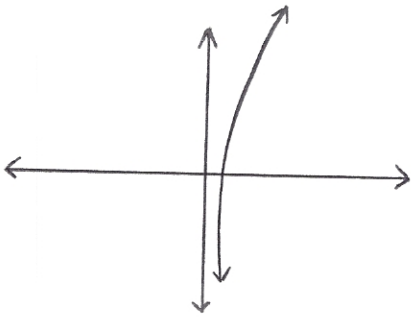
b)



c)



d)



e)