AUSTIN PEAY STATE UNIVERSITY
CLARKSVILLE, TENNESSEE 37044

JUNIOR HIGH/MIDDLE SCHOOL MATHEMATICS COMPETITION

EIGHTH GRADE TEST
1991
SCORING FORMULA: 4R - W + 40

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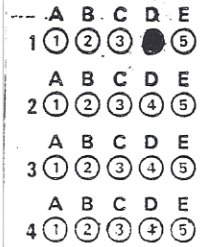
DIRECTIONS:

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.

SAMPLE:

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

   (a) 0
   (b) 2
   (c) -1
   (d) 1
   (e) none of the above

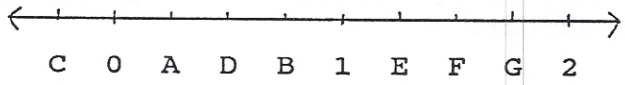


The correct answer is 1, which is answer (d), so you would answer this problem by darkening the space on the answer sheet corresponding with this choice.

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 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 80 minutes.

1. If the number represented by A is subtracted from the number represented by B, which letter best represents the difference?



a) C
b) D
c) E
d) F
e) G

2. On the Carter family's telephone bill for May, the cost of the long-distance calls was $43.66 more than the cost for local service. The total bill amounted to $64.82. What is the cost of long-distance calls?

a) $10.58
b) $33.08
c) $43.66
d) $50.44
e) $54.24

3. If $3^4 + 3^4 + 3^4 = 3^x$ then $x =$

a) 4
b) 5
c) 7
d) 12
e) 16

4. The cost of 4 apples is x cents. How many apples can be purchased with y dollars?

a) $\frac{y}{4x}$
b) $\frac{x}{y}$
c) $\frac{4x}{y}$
d) $\frac{x-y}{4}$
e) $\frac{400y}{x}$

5. If $\sqrt{x-1} = 2$ then $(x-1)^4 =$

a) 2^2
b) 2^4
c) 2^6
d) 2^8
e) 2^{12}

6. Four balls numbered 1, 2, 3, and 4 are placed in a bag and two are drawn at random without replacement. What is the probability that their sum is an odd number?

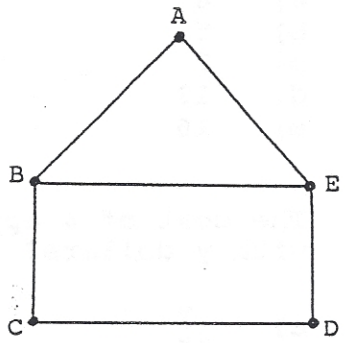
a) $\frac{1}{3}$
b) $\frac{1}{2}$
c) $\frac{2}{3}$
d) $\frac{7}{10}$
e) $\frac{4}{5}$

7. Fill in the blank so that 123__567891 will not be divisible by 3.

a) 0
b) 3
c) 4
d) 6
e) 9

8. Suppose we wish to travel each edge of the given figure exactly once, without lifting the pencil from the paper. Which of the following statements is true?

a) We must start at A
b) We must start at C or D
c) We must start at B or E
d) The task can be done regardless of starting point.
e) It is impossible to travel each edge exactly once.



9. Let a and b be integers chosen at random such that $1 \leq a \leq 4$ and $2 \leq b \leq 5$. What is the probability that $a > b$?

a) 0
b) $\frac{3}{16}$
c) $\frac{5}{16}$
d) $\frac{1}{3}$
e) $\frac{1}{2}$

10. A developer plans to build 100 houses in a subdivision. Each house will have a 15 ft. by 15 ft. multipurpose room which is to be carpeted with a special carpet costing $10 per square yard. How much will it cost to carpet all of the multipurpose rooms?

a) $2,500
b) $7,500
c) $25,000
d) $75,000
e) $250,000

11. $273 \cdot 146 \cdot 919 =$

a) 26,612,483
b) 36,519,516
c) 36,526,491
d) 36,629,502
e) 36,715,408

12. The measure of $\angle A$ is 1/5 of the measure of $\angle B$. Also $\angle A$ and $\angle B$ are complementary. What is the measure of $\angle A$?

a) 10°
b) 15°
c) 17°
d) 20°
e) 25°

13. $\dfrac{5^{1001} + 5^{1000}}{5^{1001} - 5^{1000}} =$

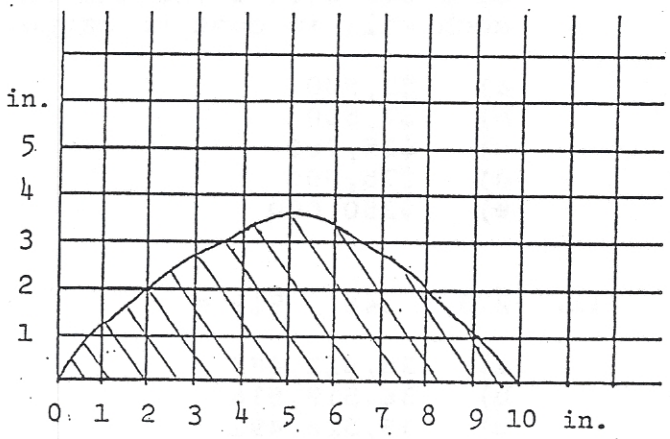
a) 5^{2000}
b) $\frac{12}{11}$
c) $\frac{6}{5}$
d) $\frac{4}{3}$
e) $\frac{3}{2}$

14. If $\frac{a}{b} + \frac{b}{a} = \frac{5}{2}$ then $\dfrac{\frac{1}{a}}{\frac{b}{a}} + \dfrac{\frac{1}{b}}{\frac{a}{b}} =$

a) 0
b) $\frac{2}{5}$
c) 1
d) $\frac{3}{2}$
e) $\frac{5}{2}$

15. Let A be the area of the shaded region. Which of the following is true?

a) 17 sq. in. < A < 24 sq. in.
b) A = 20.5 sq. in.
c) A < 17 sq. in.
d) A > 24 sq. in.
e) A = 30 sq. in.



16. If 1 + 1/2 + 1/4 + 1/8 + 1/16 + ... + 1/128 = 255/128, then 2 + 1 + 1/2 + 1/4 + 1/8 + ... + 1/64 =

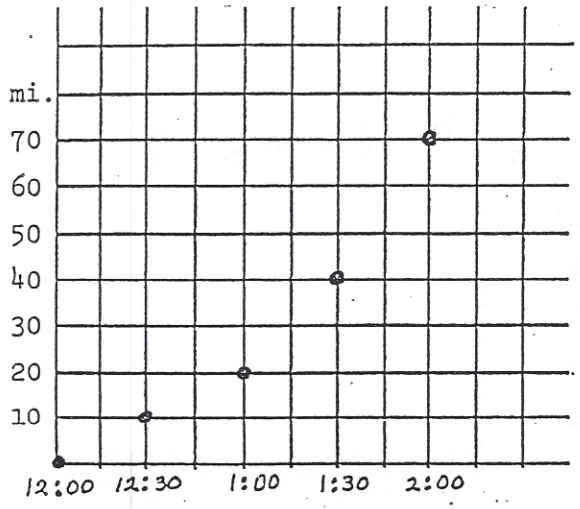
a) 1023/256
b) 255/64
c) 1535/256
d) 263/128
e) 255/32

17. A car averages 50 mi./hr. for the first 2 hours of a 10 hour trip. What is the average speed for the remaining time if the average speed for the total time is 58 mi./ hr.?

a) 54 mi./hr.
b) 60 mi./hr.
c) 62 mi./hr.
d) 64 mi./hr.
e) 66 mi./hr.

18. Ellen began an automobile trip in Topeka at 12:00. She traveled a straight highway across flat terrain for two hours. The chart below shows the distance of her car from Topeka at 30 minute intervals. For example, at 1:30, Ellen was 40 miles from Topeka. What was Ellen's average speed during the time interval from 12:30 to 2:00?

a) 20 mph
b) 23.3 mph
c) 35 mph
d) 40 mph
e) 45 mph



19. One liter of baby formula is in the proportion one part powder to one part water. How much water should be added to obtain a mixture which is one part powder to three parts water?

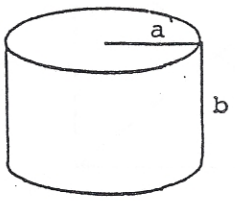
a) 1 liter
b) 1.5 liters
c) 2 liters
d) 2.5 liters
e) 3 liters

20. A computer can perform 10 instructions in one nanosecond. How long will it take the computer to perform 8 million instructions?

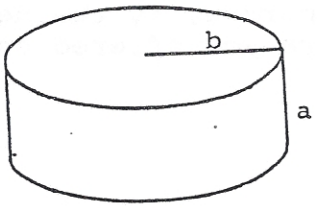
a) .00008 sec.
b) .0008 sec.
c) .008 sec.
d) .08 sec.
e) .8 sec.

21. Given that $b > a > 0$, which container holds more water?

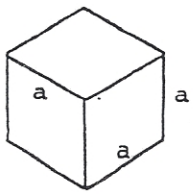
a)



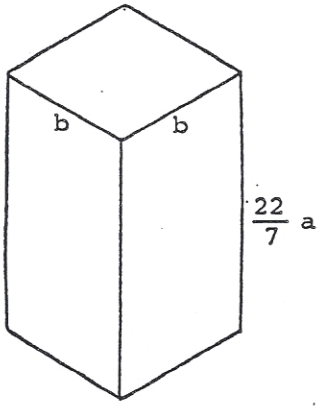
b)



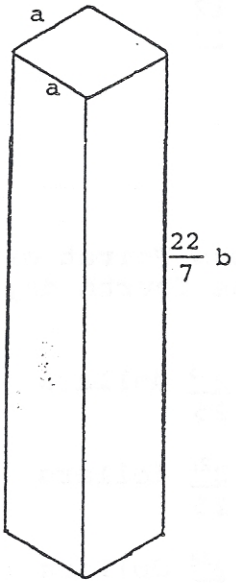
c)



d)



e)



22. How many integers larger than 1,000,000 and smaller than 4,000,000 are perfect squares?

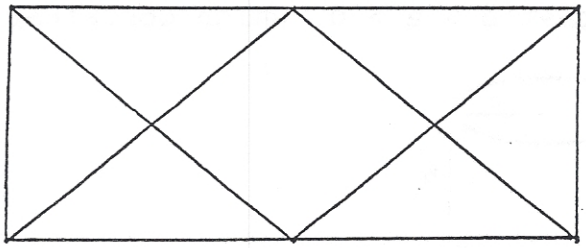
a) 899
b) 900
c) 999
d) 1,000
e) 1,001

23. If $3^x = 2$ then $3^{2x+3} =$

a) 7
b) 10
c) 48
d) 108
e) 128

24. How many triangles are in the following figure?

a) 8
b) 10
c) 11
d) 12
e) 13



25. If Ross Poirot offers you 1¢ today, 2¢ tomorrow, 4¢ the next day, 8¢ the fourth day, etc., how much money are you offered on the 30th day?

a) $\frac{2^{26}}{25}$ dollars

b) $\frac{2^{27}}{25}$ dollars

c) $\frac{2^{28}}{25}$ dollars

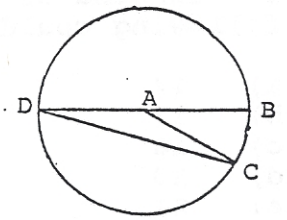
d) $\frac{2^{29}}{25}$ dollars

e) $\frac{2^{30}}{25}$ dollars

26. $\sqrt{\frac{321 \cdot 123 + 877 \cdot 321}{3210}}$

a) 10
b) 100
c) $\frac{1000}{\sqrt{32100}}$
d)
e) 321010

27. In the given diagram, A is the center of the circle and the measure of $\angle BAC = 30°$. What is the measure of $\angle ACD$?



a) $10°$
b) $15°$
c) $18°$
d) $20°$
e) $30°$

28. A cannonball is dropped from a tower. The distance d of the ball from the ground after t seconds is given by the formula $d = -16t^2+64$. After how many seconds will the ball hit the ground?

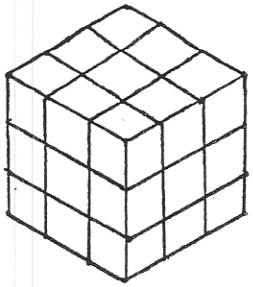
a) 2 sec
b) 4 sec
c) 8 sec
d) 16 sec
e) 64 sec

29. John has 2 quarters, 1 nickel and 2 dimes in his pocket. He makes a purchase requiring exactly 35¢. If he reaches into his pocket and pulls out two coins at random, what is the probability that his hand contains at least enough money to make the purchase?

a) $\frac{3}{10}$
b) $\frac{1}{3}$
c) $\frac{1}{2}$
d) $\frac{2}{3}$
e) $\frac{7}{10}$

30. Twenty-seven one-inch cubes are assembled into a single large cube. This large cube is spray painted on all surfaces with red paint. If the large cube is then disassembled into the 27 smaller cubes, and one of these cubes is selected at random, what is the probability that the cube has exactly two red faces?

a) $\frac{2}{9}$
b) $\frac{8}{27}$
c) $\frac{4}{9}$
d) $\frac{3}{27}$
e) $\frac{1}{3}$



31. The lengths of two sides of a triangle are 4 and 7. Which of the following could <u>not</u> be the perimeter of the triangle?

a) 14
b) 17
c) 18
d) 20
e) 21

32. Which of the following is more likely?

a) A 70% free throw shooter hitting 3 free throws in 3 tries.
b) Rolling a prime number when a die is rolled.
c) Getting an ace when one card is drawn from a 52 card deck.
d) Drawing a red marble from an urn containing 2 red and 6 blue.
e) Winning a lottery in which you are required to correctly pick a 4-digit number.

33. If $x - y = 15$ and $x^2 + y^2 = 273$, then $xy =$

a) -48
b) -24
c) 0
d) 24
e) 48

34. A group of teachers and students are assembled at a Christmas party. $100 is to be divided among these individuals. It is decided that each student will receive $4 and each teacher will receive $5. A possible value for the number of students is

a) 16
b) 18
c) 19
d) 20
e) 30

35. In a survey of 64 hamburger lovers, 32 liked tomato, 24 liked lettuce, 16 liked mustard, 6 liked lettuce and mustard, 10 liked lettuce and tomato, 7 liked tomato and mustard, and 3 liked all three. How many people preferred hamburgers without any of the three condiments?

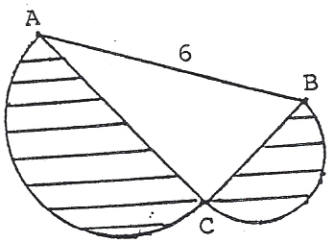
a) 0
b) 8
c) 10
d) 12
e) 14

36. An integer larger than 11 and smaller than 55 is chosen at random. What is the probability that the integer is divisible by 3?

a) $\frac{14}{43}$
b) $\frac{15}{43}$
c) $\frac{15}{44}$
d) $\frac{16}{43}$
e) $\frac{4}{11}$

37. In the figure below, angle C is a right angle, the two arcs are semicircles and AB = 6. What is the area of the shaded region?

a) $\frac{9\pi}{2}$ square units
b) 9π square units
c) $\frac{25\pi}{2}$ square units
d) 18 square units
e) 18π square units

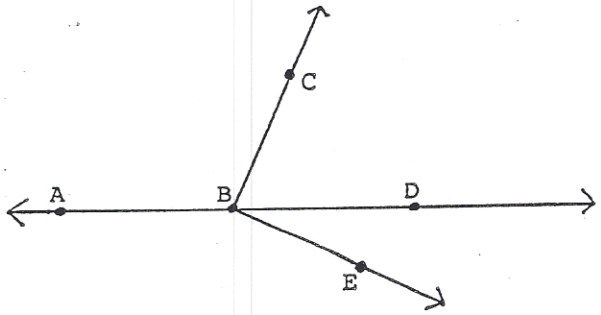


38. Which of the following is largest?

a) 1^{1000}
b) 2^{70}
c) 3^{40}
d) 4^{30}
e) 10^{20}

39. In the figure below $\angle CBE$ is a right angle and $m(\angle ABC) = 137°$. Then $m(\angle DBE)$ =

a) 27°
b) 43°
c) 45°
d) 47°
e) 53°



40. If $(A \cup B) \cap C = A \cap B$, which of the following must be true?

a) $A = C$
b) $A \subseteq B$
c) $A \cap B = \emptyset$
d) $A \cap B \subseteq C$
e) $A \cap C = A$