AUSTIN PEAY STATE UNIVERSITY

CLARKSVILLE, TENNESSEE 37040

JUNIOR HIGH/MIDDLE SCHOOL MATHEMATICS COMPETITION

EIGHTH GRADE TEST
1989
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

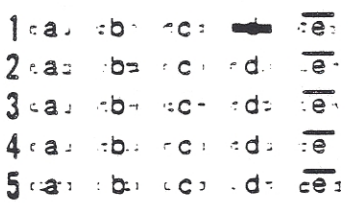
   (a) 0

   (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.

1. $8 + 3 \times 2 + 40/2 \times 5$ equals:

a) 114 b) 122 c) 26 d) 18 e) 81

2. A board 27.33 meters long is to have six 4 meter pieces cut from it. Each cut made is two millimeters wide. How long is the remaining piece of the board?

a) 3.33 meters

b) 3.318 meters

c) 3.324 meters

d) 3.322 meters

e) 3.21 meters

3. $1 + (-3) + 5 + (-7) + 9 + (-11) + \cdots + 97 + (-99)$ equals:

a) -100 b) -99 c) 99 d) -101 e) -50

4. The product $a \times \frac{b}{\sqrt{10}} \times \frac{1}{\sqrt{10}}$ equals:

a) $\frac{b+1}{\sqrt{10}}$ b) $\frac{a^2b}{\sqrt{20}}$ c) $\frac{ab}{\sqrt{20}}$ d) $\frac{ab}{10}$ e) $\frac{ab+a}{\sqrt{10}}$

5. What percent of 15 is 3?

a) 30% b) 500% c) 10% d) 15% e) 20%

6. How many integers will satisfy: $4 \leq x^2 \leq 100$?

a) 18 b) 0 c) 5 d) 20 e) 2

7. Suppose I lend you \$10.00 with the understanding that you will repay me \$10.50 in one week. What annual rate of simple interest am I charging?

a) 2.6% b) 260% c) .26% d) 26% e) 5%

8. A 60" board is to be cut into n equal pieces, each of whose length is an integer number of inches. Also, an 84" board is to be cut into n equal pieces, each of whose length is an integer number of inches. What is the largest possible value of n?

a) 15 b) 12 c) 4 d) 3 e) none of these

9. If $x \neq 0$ and $y \neq 0$, which of the following expressions is equal to 1?

a) $2x^0y^3$ b) $2(xy^3)^0$ c) $(2x)^0y^3$ d) $(2xy^3)^0$ e) $2^0x^0y^3$

10. Which of the following is false?

a) Every triangle is either equilateral, isosceles, or scalene.

b) An isosceles triangle can have 3 equal sides.

c) Every triangle is either an acute, obtuse, or right triangle.

d) The sum of two of the angles of an acute triangle must be greater than 90°.

e) An obtuse triangle may not also be an isosceles triangle.

11. In order to preserve its forest, a lumber company plants 12 new trees for each 10 trees it cuts. If 3,250 trees were cut in one week, how many trees were planted?

a) 4,000 b) 3,270 c) 3,900 d) 3,850 e) 2,708

12. If $x = a + ax$, then x equals:

a) $a - ax$ b) $\frac{1 + a}{a}$ c) $\frac{1 - a}{a}$ d) $\frac{a}{1 + a}$ e) $\frac{a}{1 - a}$

13. How much tax is owed on a purchase of \$952.18 if tax is 7.75% for the first \$500 and 3% for any amount over \$500?

a) \$50.04 b) \$52.32 c) \$102.35 d) \$22.13 e) \$40.25

14. Express in simplest form:

$$3 \times (8)^{2/3} \times (27/8)^{-1/3}$$

a) 2/3 b) 8 c) 12 d) 16 e) 3/2

15. Which of the following is correct?

a) Two triangles with the same area are congruent.
b) Two triangles with the same perimeter are congruent.
c) Two triangles with the same shape are congruent.
d) Right triangles are congruent.
e) None of the above.

16. If $c^2 = a^2 + b^2$ and $a > 0$, $b > 0$, $c > 0$, then which of the following is false?

a) $c = a + b$
b) c is larger than a
c) $b = \sqrt{(c - a)(c + a)}$
d) $-b^2 = a^2 - c^2$
e) $c^2 + 2ab = (a + b)^2$

17. Two numbers have a sum of 2 and a product of 3. Find the sum of their reciprocals.

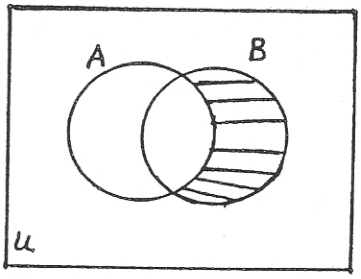
a) 1/2 b) 1/16 c) 1/3 d) 5/6 e) 2/3

18. A pair of dice is tossed. Which of the following has the least probability?

a) sum is 7
b) at least one "3" is showing
c) doubles are tossed
d) sum is 5
e) face on 1st die is less than that on 2nd

19. The given diagram is a representation of:

a) B
b) $A \cup B$
c) $A' \cap B$
d) $A \cap B$
e) $A - B$



20. One number is seven more than another number. What are the two numbers if three times the larger exceeds four times the smaller by five?

a) 1, 8 b) 9, 16 c) 16, 23 d) 19, 26 e) 8, 15

21. What is the solution to $(1/3)y + 5 = (2/3)y$?

a) 5 b) 15 c) 5/3 d) 14/3 e) 0

22. A race track encloses a rectangular region with a semi–circular region at each end. The length of each "straight part" of the track is m, and the semi– circles have radius r. The area of the region enclosed by the track is:

a) $2rm + .5\,\pi\, r^2$

b) $2m + 2\pi\, r$

c) $2m + \pi\, r$

d) $2rm + \pi\, r^2$

e) $2rm + 2\pi\, r$

23. Captain Kirby and his children sailed into town on his new sailboat. When asked, he replied that his age, the number of his children and the length of his boat in feet had a product of 35,754. We do know that his boat is a rather large one, the Captain is less than 100 years old, and he has both sons and daughters. Captain Kirby's age is:

a) 59 b) 37 c) 51 d) 43 e) 91

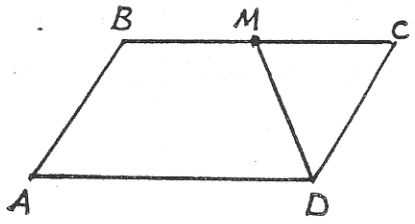
24. Betty has just typed 5 letters and 5 envelopes. Before she can insert the letters into the envelopes, she drops them on the floor and they get all mixed up. When she picks them up, she inserts the letters into the envelopes without looking at them. In how many ways can this be done?

a) 120 b) 3125 c) 60 d) 25 e) 100

25. Five test scores were lost, but a summary of the five lost scores indicates that the mode was 90, the median was 85, and the mean was 83. If the grades were integers and could range from 0 to 100, what is the lowest possible grade from the missing set of scores?

a) 35 b) 65 c) 60 d) 50 e) 66

26. If the area of the parallelogram ABCD is 60 sq. cm and M is the midpoint of line segment BC, then the area of $\triangle$ MCD is:



a) 10 sq. cm

b) 15 sq. cm

c) 30 sq. cm

d) 24 sq. cm

e) 20 sq. cm

27. Which of the following positive real numbers is equal to one–half of its reciprocal?

a) 1/3 b) $\sqrt{2}$ c) $\sqrt{3}$ d) $\frac{\sqrt{3}}{3}$ e) $\frac{\sqrt{2}}{2}$

28. A yardstick casts a shadow 9/2 ft. long. At the same time a tree casts a shadow 39 ft. long. How tall is the tree?

a) 20 ft.

b) 30 ft.

c) 26 ft.

d) 40 ft.

e) Not enough information given

29. A twin engine airplane flew from Houston to Memphis, a distance of 550 miles, and averaged 130 mph. A single engine airplane flew from Memphis to Houston and averaged 90 mph. If both airplanes left at the same time and flew the same route, after how many hours did they meet?

a) 4 hrs.

b) 3 1/2 hrs.

c) 4 3/4 hrs.

d) 2 1/2 hrs.

e) 1 2/3 hrs.

30. What will be the output of the following BASIC program?

```
10 Let E=2
20 Let F=3
30 Let G=4
40 Print "E + F*G = "; E + F*G
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a) E+F*G = E+F*G

b) E+F*G = 14

c) E+F*G = 20

d) 14 = 14

e) 20 = 20

31. A cubic inch of iron weighs 40/9 ounces. Find the weight in pounds of an iron bar 1 inch square at the end and 1 yard long.

a.) 10 pounds

b.) 160 pounds

c.) 9 pounds

d.) 144 ounces

e.) 4.4 pounds

32. If the circumference of a circle of radius r is doubled, then the area of the circle will be multiplied by:

a) 4 b.) 1/2 c) $\frac{r}{4}$ d) $\frac{r}{2}$ e) 2

33. Find the area of:

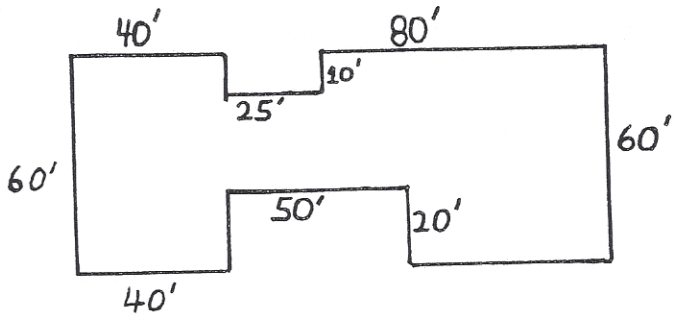
a) 7200 sq. ft.

b) 6600 sq. ft.

c) 7450 sq. ft.

d) 6650 sq. ft.

e) 7000 sq. ft.



34. A man bends his elbow through 60° with his index finger extended. The distance from his elbow to the tip of his index finger is 18 inches. The distance the tip of the index finger moves is:

a) 6π inches
b) 6 inches
c) 36π inches
d) 24 inches
e) 18 inches

35. How many diagonals are there in a convex polygon of 10 sides?

a) 35
b) 70
c) 100
d) 45
e) 25

36. A goat is tied to a 100 ft. long chain attached to the barn at point B. The total area outside the barn that is accessible to the goat is:

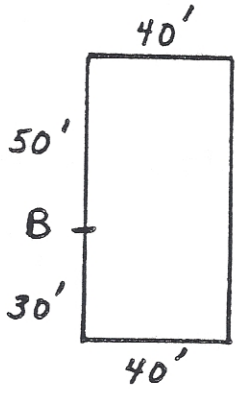
a) 5000π square ft.

b) 6850π square ft.

c) 7100π square ft.

d) 8700π square ft.

e) none of these



37. What is the sum of the odd composite numbers less than 20?

a) 25 b) 38 c) 17 d) 20 e) 24

38. If the area of a circle is 9 sq. ft., the circumference is:

a) $\frac{3}{\sqrt{\pi}}$ ft.

b) $\frac{6}{\sqrt{\pi}}$ ft.

c) $3\sqrt{\pi}$ ft.

d) $\frac{81}{4\pi}$ ft.

e) $6\sqrt{\pi}$ ft.

39. Which is the largest element in the set $\left\{a, a^2, \frac{1}{a}, \sqrt{a}\right\}$, where $0<a<1$?

a) a

b) a^2

c) $\frac{1}{a}$

d) $\sqrt{a}$

e) Impossible to determine without knowing the specific value of a.

40. In the given figure, AB = BC = CD = DE = EF = FG = 1 and the angles at B, C, D, E and F are right angles as marked. How long is segment AG?

a) 6

b) $\sqrt{6}$

c) $\sqrt{5}$

d) 5

e) cannot be determined