

AUSTIN PEAY STATE UNIVERSITY
CLARKSVILLE, TENNESSEE 37040

Junior High School Mathematics Competition

Prepared by:

EIGHTH GRADE TEST

1981

SCORING FORMULA: $4R - W + 40$

The Mathematics Departments of
Austin Peay State University
and
Middle Tennessee State University

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

1 :a: :b: :c: ~~d:~~ :e:
2 :a: :b: :c: :d: :e:
3 :a: :b: :c: :d: :e:
4 :a: :b: :c: :d: :e:
5 :a: :b: :c: :d: :e:

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 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. What is 40% of 900?

- a) 360
- b) 36,000
- c) 36
- d) 3600
- e) 400

2. $2511.01 \div .857 =$

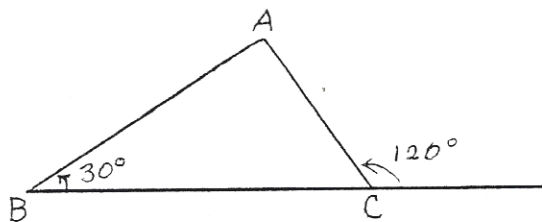
- a) 293
- b) 2930
- c) 29,300
- d) 293,000
- e) 2,930,000

3. $\frac{5}{12} \div \frac{15}{8} =$

- a) $\frac{25}{32}$
- b) $\frac{13}{27}$
- c) $4\frac{1}{2}$
- d) $\frac{2}{9}$
- e) $1\frac{7}{25}$

4. In the figure below $m(\angle A) =$

- a) 30°
- b) 60°
- c) 90°
- d) 120°
- e) 150°



5. $6 + 2 \times 7 + 30 \div 2 \times 3 =$

- a) 129
- b) 25
- c) 101
- d) 65
- e) 213

6. $\sqrt{1 + \sqrt{2 + \sqrt{3 + 46}}}$

- a) 1
- b) 2
- c) 3
- d) 6
- e) 7

7. The combined population of city X and city Y is 16,000 persons. If the ratio of the populations of city X to city Y is 5 to 3, then what is the population of each city?

- a) 5000 in city X and 3000 in city Y
- b) 4000 in city X and 12000 in city Y
- c) 12000 in city X and 4000 in city Y
- d) 6000 in city X and 10000 in city Y
- e) 10000 in city X and 6000 in city Y

8. Which of the following numbers is half the sum of all of its factors?

- a) 6
- b) 8
- c) 10
- d) 12
- e) 16

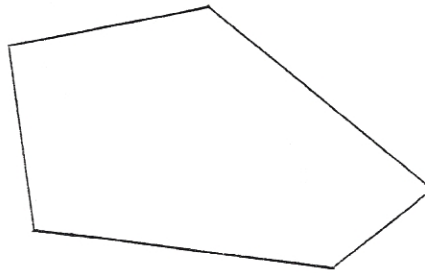
9. $3 \cdot (5 + 6) = (5 + 6) \cdot 3$ is an example of the
- distributive property of multiplication over addition.
 - commutative property of multiplication.
 - commutative property of addition.
 - associative property of addition.
 - associative property of multiplication.
10. If $3N + 3 = 9$, then $N =$
- 4
 - 1
 - 4
 - 3
 - 2
11. $\frac{9.03 \times 10^{16}}{4.30 \times 10^2} =$
- 2.01×10^8
 - 2.10×10^8
 - 2.10×10^{14}
 - 4.73×10^{14}
 - 4.73×10^8
12. A tank is $\frac{3}{4}$ full of fuel oil. After 250 liters are used, the tank is $\frac{1}{2}$ full. How many liters does the tank hold?
- 500 liters
 - 1250 liters
 - 5000 liters
 - 1000 liters
 - 750 liters

13. Which of the following is a true statement?

- a) $.793 < \overline{.78} < \overline{.79}$
- b) $\overline{.78} < .793 < \overline{.79}$
- c) $\overline{.78} < \overline{.79} < .793$
- d) $\overline{.78} < .78 < \overline{.78}$
- e) $\overline{.78} < \overline{.79} < \overline{.793}$

14. Find the sum of the interior angles of the pentagon pictured below. (Hint: It may be helpful to divide the pentagon into triangles.)

- a) 90°
- b) 180°
- c) 360°
- d) 540°
- e) 720°

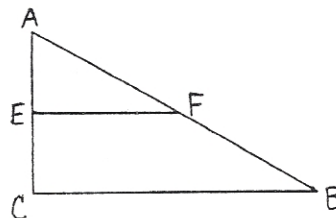


15. How many diagonals does a hexagon (6 sided polygon) have?

- a) 6
- b) 7
- c) 8
- d) 9
- e) 10

16. In the figure below $\triangle ABC$ is a right triangle with the right angle at C. $AE = EC$, $AF = FB$, $AB = 10$, and $CB = 8$. Then $AE =$

- a) 3
- b) 2
- c) $2\frac{1}{2}$
- d) 4
- e) $3\frac{1}{2}$



17. If A is a set with 6 elements, B is a set with 5 elements, and $A \cap B$ has 3 elements, then how many elements does $A \cup B$ have?
- a) 14
 - b) 6
 - c) 5
 - d) 8
 - e) 11
18. Which of the following represents a capacity different from all the others?
- a) 100 milliliters
 - b) 100 cubic centimeters
 - c) 1 deciliter
 - d) $\frac{1}{10}$ cubic decimeter
 - e) All have the same capacity.
19. If a whole number is selected at random from the set $\{1, 2, 3, 4, \dots, 24\}$, what is the probability that it is a factor of 24?
- a) $\frac{1}{2}$
 - b) $\frac{1}{3}$
 - c) $\frac{3}{8}$
 - d) $\frac{2}{3}$
 - e) $\frac{7}{24}$
20. Which of the following is a false statement?
- a) If a negative number is raised to an even power, then the result is always positive.
 - b) If an even number is raised to an odd power, then the result is always even.
 - c) If an odd number is raised to an odd power, then the result is always odd.
 - d) If an odd number is raised to an even power, then the result is always even.
 - e) If a negative number is raised to an odd power, then the result is always negative.

21. A box is 4 inches long, 4 inches wide, and one-half foot tall. A second box is similarly shaped, but each of its dimensions is twice the corresponding dimension of the first box. How does the volume of the second box compare with the volume of the first box?
- a) twice as large
 - b) three times as large
 - c) four times as large
 - d) eight times as large
 - e) nine times as large
22. If each indicated sum of squares is simplified, then which sum is different from all the others?
- a) $4^2 + 5^2 + 20^2$
 - b) $4^2 + 13^2 + 16^2$
 - c) $4^2 + 8^2 + 19^2$
 - d) $8^2 + 11^2 + 16^2$
 - e) All are equal.
23. Which of the following is false?
- a) $\sqrt{2}$ is irrational.
 - b) $\sqrt{2}$ is a real number.
 - c) $\sqrt{2}$ can be written as a repeating decimal.
 - d) $\sqrt{2}$ is greater than 1.
 - e) $\sqrt{2}$ is less than 2.
24. How many subsets of $\{a, b, c, d\}$ contain the element d ?
- a) 3
 - b) 7
 - c) 8
 - d) 9
 - e) 16

25. $\frac{31}{89} \cdot \frac{41}{100} + \frac{31}{89} \cdot \frac{59}{100} =$

- a) $\frac{31}{89}$
- b) $\frac{31}{100}$
- c) $\frac{131}{8900}$
- d) $\frac{1271}{8900}$
- e) $\frac{30}{89}$

26. A student has an average of 87% on his first 5 tests. What should he average on the next three tests to have an accumulative average of exactly 90%?

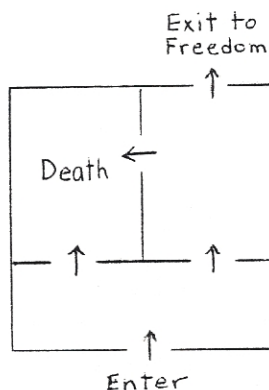
- a) 90%
- b) 93%
- c) 95%
- d) 98%
- e) 100%

27. If $m = 2$, $n = -4$, and $p = -3$, then $m(n^2 - p^2) =$

- a) -28
- b) 14
- c) 28
- d) 50
- e) 98

28. In the world's first "FAIR CHANCE MOUSETRAP" a mouse goes through one-way doors (it cannot backtrack). All doors are equally attractive to the mouse. What is the probability that a mouse entering the trap will exit to freedom?

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



29. If $13_b + 35_b = 51_b$ in base b , then $b =$

- a) 6
- b) 7
- c) 8
- d) 9
- e) 12

30. Articles purchased by a merchant for \$40 each were marked up 10% to obtain their retail price. During a sale they were marked down 10% of the retail price. Find the price of each article during the sale?

- a) \$40.00
- b) \$44.00
- c) \$36.00
- d) \$35.60
- e) \$39.60

31. The area of a circle with a circumference of 12π cm. is

- a) 36π sq. cm.
- b) 144π sq. cm.
- c) 6π sq. cm.
- d) 36 sq. cm.
- e) 72π sq. cm.

32. What is the units digit of $(7)^{40}$?

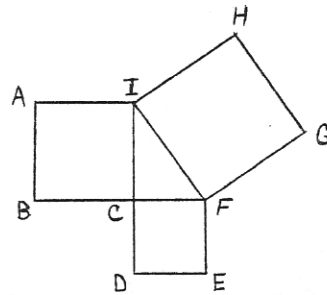
- a) 1
- b) 2
- c) 3
- d) 7
- e) 9

33. $\frac{1}{2} + \frac{1}{3} + \frac{1}{7} + \frac{1}{43} + \frac{1}{1806} =$ (Hint: $1806 = (2)(3)(7)(43)$)

- a) 1
- b) $\frac{5}{1861}$
- c) $\frac{1}{2}$
- d) $\frac{5}{6}$
- e) $\frac{1806}{1861}$

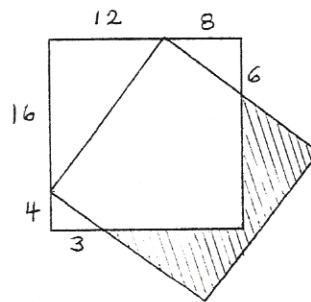
34. In the figure below are three squares and a right triangle. If the area of square ABCI is 64 and the area of square FGHI is 100, then the area of $\triangle CFI$ is

- a) 12
- b) 14
- c) 24
- d) 36
- e) 48



35. Two congruent squares overlap as shown in the figure below. Find the area of the shaded region.

- a) 400
- b) 252
- c) 126
- d) 52
- e) 274



36. The intersection of 3 planes, no two of which are parallel, is

- a) always a point.
- b) always a straight line.
- c) always a plane.
- d) an empty set.
- e) either a point or a straight line.

37. If a , b , and c are integers with $a < b$, then which of the following is not always true?
- a) $b > a$
 - b) $ca < cb$
 - c) $b - a > 0$
 - d) $a - b < 0$
 - e) $a + c < b + c$

38. If the array below were expanded to 10 rows, what would be the sum of the numbers in the tenth row?

			1	
		3		5
		7	9	11
	13	15	17	19
			⋮	
			⋮	
			⋮	

- a) 768
 - b) 796
 - c) 873
 - d) 985
 - e) 1000
39. A block of cheese 4 cm. by 5 cm. by 6 cm. is covered with wax on all 6 sides. If the cheese is cut into cubes 1 cm. by 1 cm. by 1 cm., then how many cubes will not have any wax on them?
- a) 120
 - b) 60
 - c) 24
 - d) 6
 - e) 0

40. The figure below is formed by joining four congruent semicircles. If each semicircle has a diameter of 2 meters, then the shaded area is

- a) 2 square meters
- b) 4 square meters
- c) $4 - \pi$ square meters
- d) $1 + \pi$ square meters
- e) $\frac{3}{2}\pi$ square meters

