

AUSTIN PEAY STATE UNIVERSITY  
CLARKSVILLE, TENNESSEE 37040

# Junior High School Mathematics Competition

Prepared by:

EIGHTH GRADE TEST  
1980

SCORING FORMULA:  $4R - W + 40$

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

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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

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.

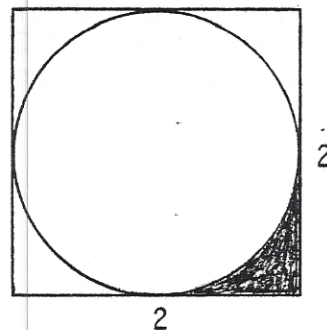
When told to do so, open your test booklet to page 2 and begin. When you have finished one page, go on to the next. The working time for the entire test is 80 minutes.

1.  $-6 \div -\frac{2}{3} =$
- (a) 9 (d) -4  
(b) -9 (e) none of the above  
(c) 4
2. A car travels one mile in 90 seconds. To find its speed in miles per hour, which of the following equations can be used?
- (a)  $\frac{60}{90} = \frac{60}{n}$  (d)  $\frac{1}{90} = \frac{n}{3600}$   
(b)  $\frac{n}{60} = \frac{90}{60}$  (e)  $\frac{1}{90} = \frac{n}{60}$   
(c)  $\frac{n}{90} = \frac{3}{2}$
3. If three positive whole numbers,  $x$ ,  $y$  and  $z$  are such that  $x < y - z$ , then
- (a)  $x < y$  (d)  $x + y + z = 0$   
(b)  $y < z$  (e)  $x < \frac{(y + z)}{2}$   
(c)  $x + z > y$
4. The sum of the prime divisors of 9800 is
- (a) 27 (d) 52  
(b) 29 (e) none of the above  
(c) 49
5. A four digit whole number is a perfect square. Its ones digit can not be
- (a) 9 (d) 5  
(b) 7 (e) 1  
(c) 6
6. A small circle has 16% of the area of a larger circle. The radius of the big circle is 20 cm. What is the radius of the small circle?
- (a) 4 cm (d) 5 cm  
(b) 8 cm (e) none of the above  
(c) 3.2 cm

7. 15 students are enrolled in both math and English. They make up 30% of the total math enrollment and 20% of the total English enrollment. The total enrolled for math or English or both is
- (a) 110 (d) 140  
(b) 125 (e) none of the above  
(c) 95
8. Nine players line up single file to shoot free throws. Four are seniors. How many alignments are possible if the first two and the last two in line are to be seniors?
- (a) 120 (d) 1440  
(b) 144 (e) none of the above  
(c) 2880
9. The diameter of a truck tire is 4 ft. How many times does the wheel rotate in one second if the truck is moving at 50 mph?
- (a) 350 (d) 5.84  
(b) 21,000 (e) 1.95  
(c) 18.33
10. The common fraction equivalent to  $0.\overline{36}$  is
- (a)  $\frac{9}{25}$  (d)  $\frac{5}{13}$   
(b)  $\frac{7}{18}$  (e) No common fraction is equivalent to  $0.\overline{36}$ .  
(c)  $\frac{4}{11}$
11. If a 5 by 5 by 5 cube composed of 1 in. wooden blocks is painted red on the outside so that  $x$  blocks get paint on two faces and  $y$  blocks get paint on three faces, then  $x - y =$
- (a) 32 (d) 16  
(b) 28 (e) none of the above  
(c) 20

12. The area of the shaded region in the diagram to the right is

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



13. If  $L$  is the least common multiple of 285 and 360 and  $G$  is the greatest common divisor, then the product,  $L \cdot G$ , is

- (a) 102,600 (d) 25,650  
 (b) 17,100 (e) none of the above  
 (c) 20,520

14. The number of proper subsets of  $\{a, b, c, d, e, f, g\}$  is

- (a) 127 (d) 63  
 (b) 255 (e) none of the above  
 (c) 128

15. The cost of a house including a 3% lawyer's fee is \$41,100. What was the price without the lawyer's fee?

- (a) \$39,867 (d) \$39,902.91  
 (b) \$42,333 (e) \$41,097  
 (c) \$41,099.97

16. What is the median for the set of scores

80, 81, 87, 85, 87, 70, 42, 100, 95?

- (a)  $80\frac{7}{9}$  (d) 85  
 (b) 42 (e) 71  
 (c) 58

17. If  $f(x) = x^{-2}$ , then  $f(-\frac{1}{2}) =$

- (a)  $-\frac{1}{4}$  (c) -4 (e) none of the above  
 (b)  $\frac{1}{4}$  (d) 4



18. If the only scoring in a football game were by touchdowns which count 7 points and field goals which count 3 points, what is the greatest number of points that cannot be scored by one team
- (a) 4 (d) 23  
(b) 8 (e) 87  
(c) 11
19. Sales of a company last year were 1000 more than 50 times the number of years the company has been in business. Sales last year were 2300. How long has the company been in business?
- (a) 66 years (d) 33 years  
(b) 130 years (e) 26 years  
(c) 260 years
20. The sum of three numbers is 24. One number is 2 more than twice the smallest number. The third number is 2 more than the sum of the other two. What are the three numbers?
- (a)  $2\frac{2}{3}$ ,  $8\frac{5}{6}$ ,  $13\frac{1}{2}$  (d) 3, 8, 13  
(b) 5, 6, 13 (e)  $3\frac{1}{4}$ ,  $7\frac{1}{2}$ ,  $13\frac{1}{4}$   
(c)  $3\frac{1}{4}$ ,  $8\frac{1}{2}$ ,  $13\frac{3}{4}$
21. A train  $\frac{1}{2}$  mile long is just entering a tunnel that is 1 mile long. The train is traveling at the rate of 60 mph. How long will it take the train to go completely through the tunnel?
- (a) 40 sec. (d) 3 min.  
(b) 1.5 min. (e) 1 min.  
(c) 120 sec.
22. Change  $101,110_{\text{two}}$  to octal numeration.
- (a)  $56_{\text{eight}}$  (d)  $214_{\text{eight}}$   
(b)  $46_{\text{eight}}$  (e) none of the above  
(c)  $232_{\text{eight}}$

23. A bag contains 1 white, 2 red, and 3 blue marbles. What is the probability of drawing a red then a blue marble (no replacement)?
- (a) .1 (d) .2  
(b) .125 (e) .833  
(c) .166
24. Which package of beans is the best buy, assuming equal quality?
- (a) 12 oz. bag for 36¢ (d) 22 oz. bag for 50¢  
(b) 16 oz. bag for 40¢ (e) 24 oz. bag for 62¢  
(c) 18 oz. bag for 45¢
25. A 6 inch square is inscribed in a circle. What is the area between one side of the square and the arc of the circle?
- (a)  $9(\pi - 1)$  (d)  $\frac{9\pi}{2}$   
(b)  $\frac{9(\pi - 1)}{2}$  (e)  $\frac{9(\pi - 2)}{2}$   
(c)  $9(\pi - 2)$
26. If a cube holds 2 liters, what is the length of one edge?
- (a) 12.6 cm (d) 20 cm  
(b) 44.72 cm (e) 14.14 cm  
(c) 15.5 cm
27. A car travels 1 mile at 30 mph and a second mile at 60 mph. If  $S$  is the average speed for the 2 miles, then
- (a)  $30 < S < 40$  (d)  $45 < S \leq 50$   
(b)  $40 \leq S < 45$  (e)  $50 < S < 60$   
(c)  $S = 45$
28. Jill bought \$1.20 worth of 10¢ and 15¢ stamps. How many 10¢ stamps did she buy if the total number of stamps is a prime?
- (a) 2 (d) 9  
(b) 3 (e) cannot be determined from given data  
(c) 6

29.  $1 + 2 + 4 + 8 + 16 + \dots + 256 =$
- (a) 511 (d) 531  
(b) 471 (e) 357  
(c) 685
30. The area  $A$  and circumference  $C$  of a circle are related by which of the following formulas?
- (a)  $C = 2A$  (d)  $A^2 = 4\pi C$   
(b)  $C^2 = 2\pi A$  (e)  $C^2 = 4\pi A$   
(c)  $A^2 = 2\pi C$
31. The lengths of the three sides of several triangles are given below. Which triangle has only acute angles?
- (a) 2, 3, 4 (d) 5, 12, 13  
(b) 4, 5, 6 (e) 5, 6, 8  
(c) 4, 6, 9
32. A die is rolled and a coin tossed. What is the probability of 5 on the die or tails on the coin, but not both?
- (a)  $\frac{1}{3}$  (d)  $\frac{2}{3}$   
(b)  $\frac{1}{2}$  (e) none of the above  
(c)  $\frac{7}{12}$
33.  $\sqrt{5} + \sqrt{80} =$
- (a)  $8\sqrt{5}$  (d)  $\sqrt{85}$   
(b)  $17\sqrt{5}$  (e) none of the above  
(c)  $5\sqrt{5}$
34. How many rectangles with dimensions given by positive integers have area and perimeter numerically equal?
- (a) none (d) 4  
(b) 1 (e) more than 4  
(c) 2

35. What is the greatest possible error in a correct measurement of 2.03 cm?
- (a) .05 cm (d) .5 cm  
 (b) .005 mm (e) .5 mm  
 (c) .05 mm
36. In 7 hour clock arithmetic (modulo 7),  $3 - 5 =$
- (a) 5 (d) 2  
 (b) 4 (e) none of the above  
 (c) 3
37. A fair coin is tossed three times. What is the probability of getting two heads and one tails?
- (a)  $\frac{2}{3}$  (d)  $\frac{1}{3}$   
 (b)  $\frac{1}{8}$  (e)  $\frac{3}{4}$   
 (c)  $\frac{3}{8}$
38. Bob takes a diagonal short cut across a lot that is 80 yards by 150 yards. How many yards does he save using the short cut?
- (a) 50 (d) 40  
 (b) 30 (e) 60  
 (c) 70
39.  $27^{-\frac{2}{3}} =$
- (a) 9 (d) -18  
 (b) 18 (e)  $\frac{1}{9}$   
 (c) -9
40. If  $x$  and  $y$  are real numbers, which of these formulas is false?
- (a)  $(x+y)x + (x+y)y = (x+y)^2$  (d)  $x^2 + y^2 = (x+y)^2$   
 (b)  $(x+y)(x-y) + y^2 = x^2$  (e)  $(2x+y)^2 + y^2 = 2(x+y)^2 + 2x^2$   
 (c)  $4(x+y)x + y^2 = (2x+y)^2$