

AMERICAN MATHEMATICS COMPETITIONS

3rd ANNUAL  
AMERICAN JUNIOR HIGH SCHOOL  
MATHEMATICS EXAMINATION  
(AJHSME)

TUESDAY, DECEMBER 8, 1987

Sponsors:

MATHEMATICAL ASSOCIATION OF AMERICA  
SOCIETY OF ACTUARIES      MU ALPHA THETA  
NATIONAL COUNCIL OF TEACHERS OF MATHEMATICS  
CASUALTY ACTUARIAL SOCIETY

AMERICAN STATISTICAL ASSOCIATION  
AMERICAN MATHEMATICAL ASSOCIATION OF TWO-YEAR COLLEGES



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INSTRUCTIONS AND INFORMATION

1. DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO BY YOUR PROCTOR.
2. This test contains twenty-five multiple choice questions. Each question is followed by five possible answers labeled A, B, C, D, and E. Only one answer is correct.
3. For each question, indicate your answer by marking the appropriate space on the answer card provided by your proctor.
4. There is no penalty for guessing. Your score on this test is the number of correct answers.
5. Use a #2 pencil since your answer card will be read by a marked-sense machine. Scratch paper, graph paper, rulers and erasers are permitted. *Calculators are not permitted.*
6. Unless specified otherwise, figures are not necessarily drawn to scale.
7. Before beginning the test, your proctor will ask you to record certain information on the answer card.
8. When your proctor gives the signal, begin to work the problems. You have **40 MINUTES** working time.

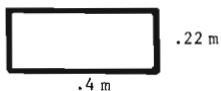
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The MAA Committee on the American Mathematics Competitions reserves the right to reexamine students before deciding whether to grant official status to their scores. The Committee also reserves the right to disqualify all scores from a school if it is determined that the required security procedures were not followed.

1.  $.4 + .02 + .006 =$   
 A) .012    B) .066    C) .12    D) .24    E) .426
2.  $\frac{2}{25} =$   
 A) .008    B) .08    C) .8    D) 1.25    E) 12.5
3.  $2(81 + 83 + 85 + 87 + 89 + 91 + 93 + 95 + 97 + 99) =$   
 A) 1600    B) 1650    C) 1700    D) 1750    E) 1800
4. Martians measure angles in clerts. There are 500 clerts in a full circle. How many clerts are there in a right angle?  
 A) 90    B) 100    C) 125    D) 180    E) 250

5. The area of the rectangular region is

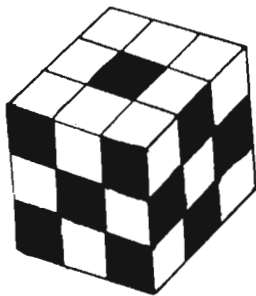
- A)  $.088 \text{ m}^2$     B)  $.62 \text{ m}^2$     C)  $.88 \text{ m}^2$   
 D)  $1.24 \text{ m}^2$     E)  $4.22 \text{ m}^2$



6. The smallest product one could obtain by multiplying two numbers in the set  $\{-7, -5, -1, 1, 3\}$  is  
 A) -35    B) -21    C) -15    D) -1    E) 3

7. The large cube shown is made up of 27 identical sized smaller cubes. For each face of the large cube, the opposite face is shaded the same way. The total number of smaller cubes that must have at least one face shaded is

- A) 10    B) 16    C) 20    D) 22    E) 24



8. 
$$\begin{array}{r} 9876 \\ A32 \\ \hline B1 \end{array}$$
 If A and B are nonzero digits, then the number of digits (not necessarily different) in the sum of the three whole numbers is

- A) 4    B) 5    C) 6    D) 9    E) depends on the values of A and B

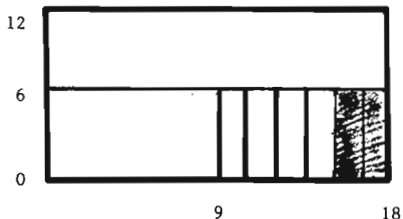
9. When finding the sum  $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} + \frac{1}{6} + \frac{1}{7}$ , the least common denominator used is
- A) 120    B) 210    C) 420    D) 840    E) 5040

10.  $4(299) + 3(299) + 2(299) + 298 =$
- A) 2889    B) 2989    C) 2991    D) 2999    E) 3009

11. The sum  $2\frac{1}{7} + 3\frac{1}{2} + 5\frac{1}{19}$  is between
- A) 10 and  $10\frac{1}{2}$     B)  $10\frac{1}{2}$  and 11    C) 11 and  $11\frac{1}{2}$
- D)  $11\frac{1}{2}$  and 12    E) 12 and  $12\frac{1}{2}$

12. What fraction of the large 12 by 18 rectangular region is shaded?

- A)  $\frac{1}{108}$     B)  $\frac{1}{18}$     C)  $\frac{1}{12}$
- D)  $\frac{2}{9}$     E)  $\frac{1}{3}$



13. Which of the following fractions has the largest value?
- A)  $\frac{3}{7}$     B)  $\frac{4}{9}$     C)  $\frac{17}{35}$     D)  $\frac{100}{201}$     E)  $\frac{151}{301}$

14. A computer can do 10,000 additions per second. How many additions can it do in one hour?
- A) 6 million    B) 36 million    C) 60 million
- D) 216 million    E) 360 million

15. The sale ad read: "Buy three tires at the regular price and get the fourth tire for \$3." Sam paid \$240 for a set of four tires at the sale. What was the regular price of one tire?
- A) \$59.25    B) \$60    C) \$70    D) \$79    E) \$80

16. Joyce made 12 of her first 30 shots in the first three games of this basketball season, so her seasonal shooting average was 40%. In her next game, she took 10 shots and raised her seasonal shooting average to 50%. How many of these 10 shots did she make?
- A) 2    B) 3    C) 5    D) 6    E) 8

17. Abby, Bret, Carl, and Dana are seated in a row on four seats numbered #1 to #4. Joe looks at them and says:

"Bret is next to Carl."

"Abby is between Bret and Carl."

However each one of Joe's statements is false. Bret is actually sitting in seat #3. Who is sitting in seat #2?

- A) Abby    B) Bret    C) Carl    D) Dana  
E) There is not enough information to be sure.
18. Half the people in a room left. One third of those remaining started to dance. There were then 12 people who were not dancing. The original number of people in the room was

A) 24    B) 30    C) 36    D) 42    E) 72

19. A calculator has a squaring key  $\boxed{x^2}$  which replaces the current number displayed with its square. For example, if the display is  $\boxed{3}$  and the  $\boxed{x^2}$  key is depressed, then the display becomes  $\boxed{9}$ . If the display reads  $\boxed{2}$ , how many times must you depress the  $\boxed{x^2}$  key to produce a displayed number greater than 500?

A) 4    B) 5    C) 8    D) 9    E) 250

20. "If a whole number  $n$  is not prime, then the whole number  $n - 2$  is not prime." A value of  $n$  which shows this statement to be false is

A) 9    B) 12    C) 13    D) 16    E) 23

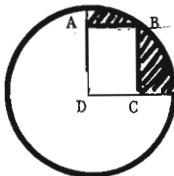
21. Suppose  $n^*$  means  $\frac{1}{n}$ , the reciprocal of  $n$ . For example,  $5^* = \frac{1}{5}$ .

How many of the following statements are true?

- i)  $3^* + 6^* = 9^*$                       iii)  $2^* \cdot 6^* = 12^*$   
ii)  $6^* - 4^* = 2^*$                       iv)  $10^* \div 2^* = 5^*$

A) 0    B) 1    C) 2    D) 3    E) 4

22. ABCD is a rectangle, D is the center of the circle, and B is on the circle. If  $AD = 4$  and  $CD = 3$ , then the area of the shaded region is between



- A) 4 and 5    B) 5 and 6    C) 6 and 7  
D) 7 and 8    E) 8 and 9

23. Assume the adjoining chart shows the 1980 U.S. population, in millions, for each region by ethnic group. To the nearest percent, what percent of the U.S. Black population lived in the South?

	NE	MW	South	West
White	42	52	57	35
Black	5	5	15	2
Asian	1	1	1	3
Other	1	1	2	4

- A) 20%    B) 25%    C) 40%    D) 56%    E) 80%
24. A multiple choice examination consists of 20 questions. The scoring is +5 for each correct answer, -2 for each incorrect answer, and 0 for each unanswered question. John's score on the examination is 48. What is the maximum number of questions he could have answered correctly?
- A) 9    B) 10    C) 11    D) 12    E) 16
25. Ten balls numbered 1 to 10 are in a jar. Jack reaches into the jar and randomly removes one of the balls. Then Jill reaches into the jar and randomly removes a different ball. The probability that the sum of the two numbers on the balls removed is even is
- A)  $\frac{4}{9}$     B)  $\frac{9}{19}$     C)  $\frac{1}{2}$     D)  $\frac{10}{19}$     E)  $\frac{5}{9}$

## SOLUTIONS

A 1987 Solutions Pamphlet will be mailed to your school Examination Manager along with your results.

## WRITE TO US!

Address questions and comments about the problems and solutions for this AJHSME to:

Professor Thomas Butts, AJHSME Chairman  
Science Education Department  
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Comments about administrative arrangements and orders for any of the publications listed below should be addressed to:

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## 1988 AHSME

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