AMERICAN MATHEMATICS COMPETITIONS

5th ANNUAL
AMERICAN JUNIOR HIGH SCHOOL MATHEMATICS EXAMINATION
(AJHSME)

THURSDAY, NOVEMBER 30, 1989

Sponsored by

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
American Mathematical Society

INSTRUCTIONS

1. DO NOT OPEN THIS BOOKLET UNTIL TOLD TO DO SO BY YOUR PROCTOR.
2. This is a twenty-five question multiple choice test. Each question is followed by answers marked A, B, C, D and E. Only one of these is correct.
3. For each question, indicate your answer by marking the appropriate space on the answer form 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 form 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 form.
8. When your proctor gives the signal, begin working the problems. You will have **40 MINUTES** working time for the test.

The Committee on the American Mathematics Competitions reserves the right to re-examine 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. $(1 + 11 + 21 + 31 + 41) + (9 + 19 + 29 + 39 + 49) =$

   A) 150 B) 199 C) 200 D) 249 E) 250

2. $\frac{2}{10} + \frac{4}{100} + \frac{6}{1000} =$

   A) .012 B) .0246 C) .12 D) .246 E) 246

3. Which of the following numbers is the largest?

   A) .99 B) .9099 C) .9 D) .909 E) .9009

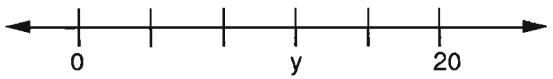
4. Estimate to determine which of the following numbers is closest to $\frac{401}{.205}$.

   A) .2 B) 2 C) 20 D) 200 E) 2000

5. $-15 + 9 \times (6 \div 3) =$

   A) –48 B) –12 C) –3 D) 3 E) 12

6. If the markings on the number line are equally spaced, what is the number y?



   A) 3 B) 10 C) 12 D) 15 E) 16

7. If the value of 20 quarters and 10 dimes equals the value of 10 quarters and n dimes, then n =

   A) 10 B) 20 C) 30 D) 35 E) 45

8. $(2 \times 3 \times 4)(\frac{1}{2} + \frac{1}{3} + \frac{1}{4}) =$

   A) 1 B) 3 C) 9 D) 24 E) 26

9. There are 2 boys for every 3 girls in Ms. Johnson's math class. If there are 30 students in her class, what percent of them are boys?

   A) 12% B) 20% C) 40% D) 60% E) $66\frac{2}{3}\%$

10. What is the number of degrees in the smaller angle between the hour hand and the minute hand on a clock that reads seven o'clock?

    A) 50° B) 120° C) 135° D) 150° E) 165°

11. Which of the five "T-like shapes" would be symmetric to the one shown with respect to the dashed line?

A)  B)  C)  D)  E) 

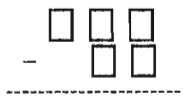
12. $\dfrac{1-\frac{1}{3}}{1-\frac{1}{2}} =$

A) $\frac{1}{3}$ B) $\frac{2}{3}$ C) $\frac{3}{4}$ D) $\frac{3}{2}$ E) $\frac{4}{3}$

13. $\dfrac{9}{7 \times 53} =$

A) $\dfrac{.9}{.7 \times 53}$ B) $\dfrac{.9}{.7 \times .53}$ C) $\dfrac{.9}{.7 \times 5.3}$ D) $\dfrac{.9}{7 \times .53}$ E) $\dfrac{.09}{.07 \times .53}$

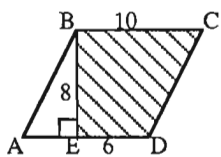
14. When placing each of the digits 2,4,5,6,9 in exactly one of the boxes of this subtraction problem, what is the smallest difference that is possible?



A) 58 B) 123 C) 149 D) 171 E) 176

15. The area of the shaded region BEDC in parallelogram ABCD is

A) 24 B) 48 C) 60 D) 64 E) 80



16. In how many ways can 47 be written as the sum of two primes?

A) 0 B) 1 C) 2 D) 3 E) more than 3

17. The number N is between 9 and 17. The average of 6, 10, and N could be

A) 8 B) 10 C) 12 D) 14 E) 16

18. Many calculators have a reciprocal key $\boxed{\frac{1}{x}}$ that replaces the current number displayed with its reciprocal. For example, if the display is $\boxed{4}$ and the $\boxed{\frac{1}{x}}$ key is depressed, then the display becomes $\boxed{.25}$. If $\boxed{32}$ is currently displayed, what is the fewest number of times you must depress the $\boxed{\frac{1}{x}}$ key so the display again reads $\boxed{32}$?

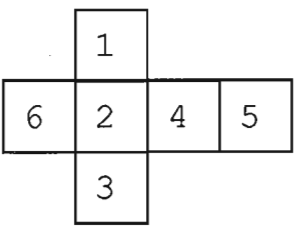
A) 1 B) 2 C) 3 D) 4 E) 5

19. The graph below shows the total accumulated dollars (in millions) spent by the Surf City government during 1988. For example, about .5 million had been spent by the beginning of February and approximately 2 million by the end of April. Approximately how many millions of dollars were spent during the summer months of June, July, and August?

A) 1.5 B) 2.5 C) 3.5 D) 4.5 E) 5.5

20. The figure may be folded along the lines shown to form a number cube. Three number faces come together at each corner of the cube. What is the largest sum of three numbers whose faces come together at a corner?

A) 11 B) 12 C) 13 D) 14 E) 15



21. Jack had a bag of 128 apples. He sold 25% of them to Jill. Next he sold 25% of those remaining to June. Of those apples still in his bag, he gave the shiniest one to his teacher. How many apples did Jack have then?

A) 7 B) 63 C) 65 D) 71 E) 111

22. The letters A,J,H,S,M,E and the digits 1,9,8,9 are "cycled" separately as follows and put in a numbered list:

AJHSME 1989

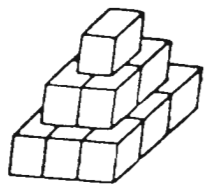
1. JHSMEA 9891
2. HSMEAJ 8919
3. SMEAJH 9198

.....

What is the number of the line on which AJHSME 1989 will **appear for the first time?**

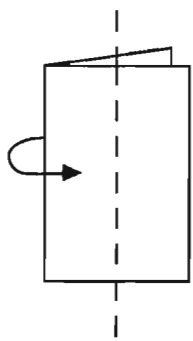
A) 6 B) 10 C) 12 D) 18 E) 24

23. An artist has 14 cubes, each with an edge of 1 meter. She stands them on the ground to from a sculpture as shown. She then paints the exposed surface of the sculpture. How many square meters does she paint?



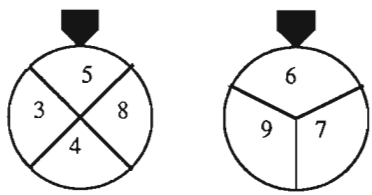
A) 21 B) 24 C) 33 D) 37 E) 42

24. **Suppose a square piece of paper is folded in half vertically. The folded paper is then cut in half along the dashed line. Three rectangles are formed–a large one and two small ones. What is the ratio of the perimeter of one of the small rectangles to the perimeter of the large rectangle?**



A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) $\frac{3}{4}$ D) $\frac{4}{5}$ E) $\frac{5}{6}$

25. Every time these two wheels are spun, two numbers are selected by the pointers. What is the probability that the sum of the two selected numbers is even?



A) $\frac{1}{6}$ B) $\frac{3}{7}$ C) $\frac{1}{2}$ D) $\frac{2}{3}$ E) $\frac{5}{7}$

SOLUTIONS

Your School Examination Manager has at least one copy of the 1989 AJHSME Solutions Pamphlet. It is meant to be lent or given to students (but not duplicated).

WRITE TO US!

Questions and comments about the problems and solutions for this AJHSME (but **not** requests for the Solutions Pamphlet) should be addressed to:

Prof Thomas Butts, AJHSME Chairman
Science Education Department
The University of Texas at Dallas
P O Box 830688 FN32, Richardson, TX 75083-0688

Comments about administrative arrangements and orders for any publications listed below should be addressed to:

Prof Walter E Mientka, AMC Executive Director
Department of Mathematics and Statistics
University of Nebraska, Lincoln, NE 68588-0322

1990 AHSME

The American High School Mathematics Examination [AHSME] is a 30-question, 90-minute, multiple choice examination. Schools with high-scoring students on the AJHSME will receive a 1990 AHSME Invitation Brochure containing information about the AHSME and registration procedure. The best way to prepare for the AHSME is to study the exams from previous years. The procedure used to purchase these publications is indicated below.

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MINIMUM ORDER: $5 (before handling fee), US FUNDS ONLY. Canada and US orders must be prepaid. Orders are mailed 4th class, unless you specify 1st class, in which case add $3.00 or 20% of total order, whichever is larger, with a maximum of $10.00. Make checks payable to the American Mathematics Competitions.

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Examinations: Each price is for an examination **and** its solutions for one year. Specify the years you want and how many copies of each. All prices effective to July 1, 1990.

- **AJHSME** (Junior High Exam), 1985-1989, 50 cents per copy per year.
- **AJHSME Combination Set** containing 10 copies each of 1985, 1986, 1987, and 1988 AJHSME at $16 per set.
- **AHSME** 1972-89, 50 cents per copy per year.
- **AIME** 1983-89, $2 per copy per year.
- **AJHSME Summary** of Results and Awards, 1985-88, $3 per copy per year.
- **AHSME Summary** of Results and Awards, 1980-89, $4 per copy per year.

Books (Exams and solutions):

- Contest Problem Book I, AHSMEs 1950-60, $8.50.
- Contest Problem Book II, AHSMEs 1961-65, $8.50.
- Contest Problem Book III, AHSMEs 1966-72, $10.00.
- Contest Problem Book IV, AHSMEs 1973-82, $11.00.