8th ANNUAL
AMERICAN JUNIOR HIGH SCHOOL MATHEMATICS EXAMINATION
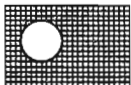## (AJHSME)

THURSDAY, NOVEMBER 19, 1992

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. The answers to the problems are to marked on the AJHSME ANSWER FORM with a #2 pencil. Check the blackened circles for accuracy and erase errors completely. Only answers actually encoded on the answer sheet will be considered.

4. There is no penalty for guessing. Your score on this test is the number of correct answers.

5. Calculators, scratch paper, graph paper, rulers and erasers are permitted. No problems on the test will require the use of a calculator, but you may have one available to use if you wish.

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.

1. $\dfrac{10 - 9 + 8 - 7 + 6 - 5 + 4 - 3 + 2 - 1}{1 - 2 + 3 - 4 + 5 - 6 + 7 - 8 + 9} =$

   (A) −1   (B) 1   (C) 5   (D) 9   (E) 10

2. Which of the following is not equal to $\dfrac{5}{4}$?

   (A) $\dfrac{10}{8}$ (B) $1\dfrac{1}{4}$ (C) $1\dfrac{3}{12}$ (D) $1\dfrac{1}{5}$ (E) $1\dfrac{10}{40}$

3. What is the largest difference that can be formed by subtracting two numbers chosen from the set $\{-16, -4, 0, 2, 4, 12\}$?

   (A) 10   (B) 12   (C) 16   (D) 28   (E) 48

4. During the softball season, Judy had 35 hits. Among her hits were 1 home run, 1 triple and 5 doubles. The rest of her hits were singles. What percent of her hits were singles?

   (A) 28%   (B) 35%   (C) 70%   (D) 75%   (E) 80%

5. A circle of diameter 1 is removed from a 2×3 rectangle, as shown. Which whole number is closest to the area of the shaded region?

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

6. Suppose that $\triangle$ (with a on top, b, c on bottom) means $a + b - c$. For example, $\triangle$ (with 5 on top, 4, 6 on bottom) is $5 + 4 - 6 = 3$.

   Then the sum $\triangle$ (with 1 on top, 3, 4 on bottom) + $\triangle$ (with 2 on top, 5, 6 on bottom) is

   (A) −2   (B) −1   (C) 0   (D) 1   (E) 2

7. The digit-sum of 998 is $9 + 9 + 8 = 26$. How many 3-digit whole numbers, whose digit-sum is 26, are even?

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

8. A store owner bought 1500 pencils at $0.10 each. If he sells them for $0.25 each, how many of them must he sell to make a profit of exactly $100.00?

   (A) 400   (B) 667   (C) 1000   (D) 1500   (E) 1900

9. The population of a small town is 480. The graph indicates the number of females and males in the town, but the vertical scale-values are omitted. How many males live in the town?

POPULATION

F   M

(A) 120   (B) 160   (C) 200
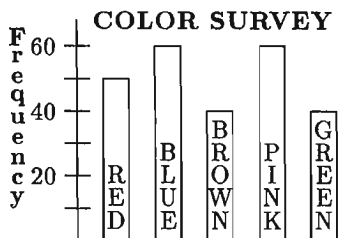
(D) 240   (E) 360
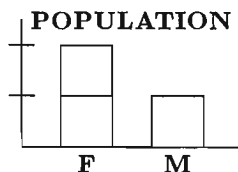
10. An isosceles right triangle with legs of length 8 is partitioned into 16 congruent triangles as shown. The shaded area is

(A) 10   (B) 20   (C) 32   (D) 40   (E) 64
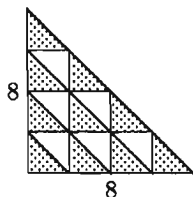
11. The bar graph shows the results of a survey on color preferences. What percent preferred blue?

COLOR SURVEY

(A) 20%   (B) 24%   (C) 30%

(D) 36%   (E) 42%

12. The five tires of a car (four road tires and a full-sized spare) were rotated so that each tire was used the same number of miles during the first 30,000 miles the car traveled. For how many miles was each tire used?

(A) 6000   (B) 7500   (C) 24,000   (D) 30,000   (E) 37,500

13. Five test scores have a mean (average score) of 90, a median (middle score) of 91 and a mode (most frequent score) of 94. The sum of the two lowest test scores is

(A) 170   (B) 171   (C) 176   (D) 177

(E) not determined by the information given

14. When four gallons are added to a tank that is one-third full, the tank is then one-half full. The capacity of the tank in gallons is
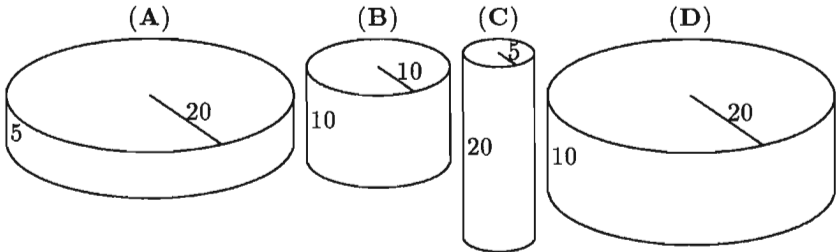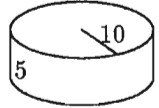
(A) 8   (B) 12   (C) 20   (D) 24   (E) 48

15. What is the 1992nd letter in this sequence?

    ABCDEDCBAABCDEDCBAABCDEDCBAABCDEDC···
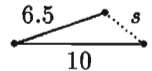
    (A) A   (B) B   (C) C   (D) D   (E) E

16. Which cylinder has twice the volume of the cylinder shown to the right?

    (A)   (B)   (C)   (D)

    (E) None of the above

17. The sides of a triangle have lengths $6.5, 10$, and s, where s is a whole number. What is the smallest possible value of s?

    (A) 3   (B) 4   (C) 5   (D) 6   (E) 7

18. On a trip, a car traveled 80 miles in an hour and a half, then was stopped in traffic for 30 minutes, then traveled 100 miles during the next 2 hours. What was the car's average speed in miles per hour for the 4-hour trip?

    (A) 45   (B) 50   (C) 60   (D) 75   (E) 90

19. The distance between the 5th and 26th exits on an interstate highway is 118 miles. If any two exits are at least 5 miles apart, then what is the largest number of miles there can be between two consecutive exits that are between the 5th and 26th exits?

    (A) 8   (B) 13   (C) 18   (D) 47   (E) 98

20. Which pattern of identical squares could NOT be folded along the lines shown to form a cube?
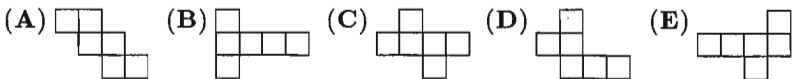
21. Northside's Drum and Bugle Corps raised money for a trip. The drummers and bugle players kept separate sales records. According to the double bar graph, in what month did one group's sales exceed the other's by the greatest percent?

    MONTHLY SALES
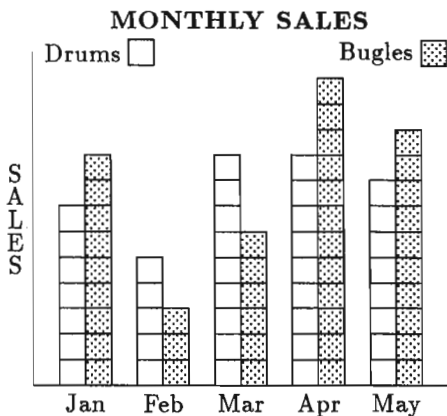
    (A) Jan   (B) Feb

    (C) Mar   (D) Apr

    (E) May

22. Eight 1×1 square tiles are arranged as shown so their outside edges form a polygon with a perimeter of 14 units. Two additional tiles of the same size are added to the figure so that at least one side of each tile is shared with a side of one of the squares in the original figure. Which of the following could be the perimeter of the new figure?
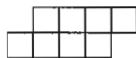
    (A) 15   (B) 17   (C) 18   (D) 19   (E) 20

23. If two dice are tossed, the probability that the product of the numbers showing on the tops of the dice is greater than 10 is

    (A) $\dfrac{3}{7}$ (B) $\dfrac{17}{36}$ (C) $\dfrac{1}{2}$ (D) $\dfrac{5}{8}$ (E) $\dfrac{11}{12}$

24. Four circles of radius 3 are arranged as shown. Their centers are the vertices of a square. The area of the shaded region is closest to
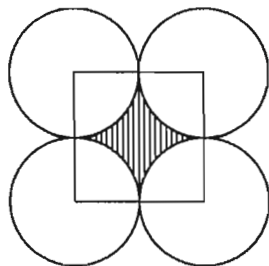
    (A) 7.7   (B) 12.1   (C) 17.2

    (D) 18   (E) 27

25. One half of the water is poured out of a full container. Then one third of the remainder is poured out. Continue the process: one fourth of the remainder for the third pouring, one fifth of the remainder for the fourth pouring, etc. After how many pourings does exactly one tenth of the original water remain?

    (A) 6   (B) 7   (C) 8   (D) 9   (E) 10

SOLUTIONS

Your School Examination Manager has at least one copy of the 1992 AJHSME Solutions Pamphlet. It is meant to be lent 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:

Mr Bruce Brombacher, AJHSME Chairman
Jones Middle School
Upper Arlington, OH 43221

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 68588-0658

1993 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 1993 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.

PUBLICATIONS

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 or 20% of total order, whichever is larger, with a maximum of $15. Make checks payable to the American Mathematics Competitions.
 FOREIGN ORDERS: do **NOT** prepay; an invoice will be sent.
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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, 1993.

- **AJHSME** (Junior High Exam), 1985-1992, $1 per copy per year.
- **AHSME** 1972-92, $1 per copy per year.
- **AIME** 1983-92, $2 per copy per year.
- **AJHSME Summary** of Results and Awards, 1985-91, $4 per copy per year.
- **AHSME Summary** of Results and Awards, 1980-92, $4 per copy per year.

Books (Exams and solutions):
- Problem Book I, AHSMEs 1950-60, $8.50.
- Problem Book II, AHSMEs 1961-65, $8.50.
- Problem Book III, AHSMEs 1966-72, $10.
- Problem Book IV, AHSMEs 1973-82, $11.
- USA Mathematical Olympiad Book 1972-86, $13.
- International Mathematical Olympiad Book I, 1959-77, $10.
- International Mathematical Olympiad Book II, 1978-85, $11.

1. All information (Rules and Instructions) needed to administer the AJHSME is contained in the AJHSME TEACHERS' MANUAL, which is outside of this package. **PLEASE READ THE MANUAL BEFORE NOVEMBER 19.** Nothing is needed from inside this package until November 19.

2. Your PRINCIPAL or VICE-PRINCIPAL must verify on the AJHSME CERTIFICATION Form that all rules associated with the conduct of the examination were followed.

3. Results must be mailed by First Class Mail to Dr. Mientka no later than 48 hours following the Examination.

4. THE AJHSME IS TO BE ADMINISTERED DURING A CONVENIENT 40 MINUTE PERIOD. THE EXAMINATION MAY BE GIVEN DURING THE REGULAR MATHEMATICS CLASS PERIOD OF THE STUDENTS IF IT IS NOT POSSIBLE TO ADMINISTER THE EXAMINATION TO ALL STUDENTS DURING ONE 40 MINUTE PERIOD.