AMERICAN MATHEMATICS COMPETITIONS

1st ANNUAL
AMERICAN JUNIOR HIGH SCHOOL MATHEMATICS EXAMINATION
(AJHSME)

TUESDAY, DECEMBER 10, 1985

Sponsors:
MATHEMATICAL ASSOCIATION OF AMERICA
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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. Several problems have only one reasonable answer—all others can be eliminated by estimating. Therefore, if a question seems to require a good deal of calculation, try estimating instead.
4. For each question, indicate your answer by marking the appropriate space on the answer card provided by your proctor.
5. There is no penalty for guessing. Your score on this test is the number of correct answers.
6. 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.*
7. Unless specified otherwise, figures are not necessarily drawn to scale.
8. Before beginning the test, your proctor will ask you to record certain information on the answer card.
9. When you proctor gives the signal, begin to work the problems. You have **40 MINUTES** working time.

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.

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1. $\frac{3 \times 5}{9 \times 11} \times \frac{7 \times 9 \times 11}{3 \times 5 \times 7} =$

A) 1 B) 0 C) 49 D) $\frac{1}{49}$ E) 50

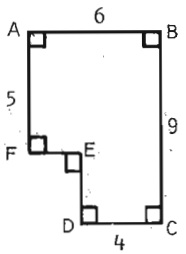
2. $90 + 91 + 92 + 93 + 94 + 95 + 96 + 97 + 98 + 99 =$

A) 845 B) 945 C) 1005 D) 1025 E) 1045

3. $\frac{10^7}{5 \times 10^4} =$

A) .002 B) .2 C) 20 D) 200 E) 2000

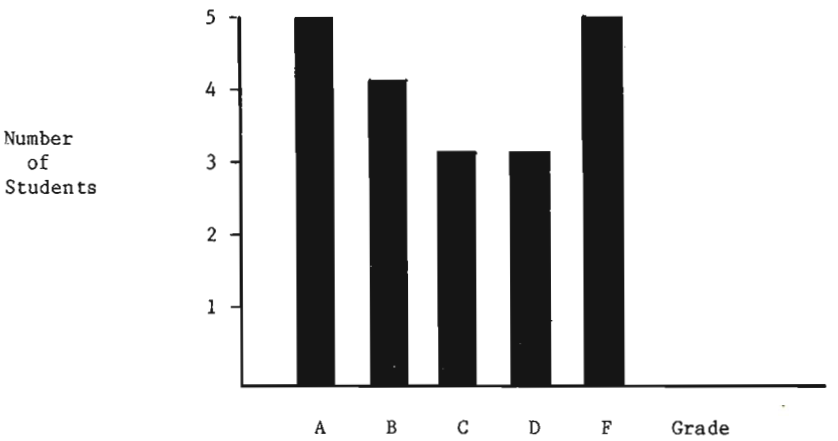
4. The area of polygon ABCDEF, in square units, is



A) 24 B) 30 C) 46

D) 66 E) 74

5.



The bar graph shows the grades in a mathematics class for the last grading period. If A, B, C and D are satisfactory grades, what fraction of the grades shown in the graph are satisfactory?

A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) $\frac{3}{4}$ D) $\frac{4}{5}$ E) $\frac{9}{10}$

6. A ream of paper containing 500 sheets is 5 cm thick. Approximately how many sheets of this type of paper would there be in a stack 7.5 cm high?

A) 250 B) 550 C) 667 D) 750 E) 1250

7. A "stair-step" figure is made up of alternating black and white squares in each row. Rows 1 through 4 are shown. All rows begin and end with a white square. The number of black squares in the 37th row is

A) 34 B) 35 C) 36 D) 37 E)38

8. If $a = -2$, the largest number in the set $\left\{-3a, 4a, \frac{24}{a}, a^2, 1\right\}$ is

A) $-3a$ B) $4a$ C) $\frac{24}{a}$ D) a^2 E) 1

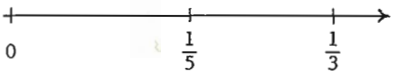
9. The product of the 9 factors $(1 - \frac{1}{2})(1 - \frac{1}{3})(1 - \frac{1}{4}) \ldots (1 - \frac{1}{10}) =$

A) $\frac{1}{10}$ B) $\frac{1}{9}$ C) $\frac{1}{2}$ D) $\frac{10}{11}$ E) $\frac{11}{2}$

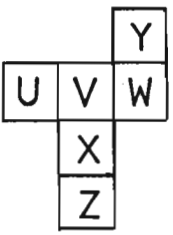
10. The fraction halfway between $\frac{1}{5}$ and $\frac{1}{3}$ (on the number line) is

A) $\frac{1}{4}$ B) $\frac{2}{15}$ C) $\frac{4}{15}$

D) $\frac{53}{200}$ E) $\frac{8}{15}$



11. A piece of paper containing six joined squares labeled as shown in the diagram is folded along the edges of the squares to form a cube. The label of the face opposite the face labeled X is



A) Z B) U C) V D) W E) Y

12. A square and a triangle have equal perimeters. The lengths of the three sides of the triangle are 6.2 cm, 8.3 cm and 9.5 cm. The area of the square is

A) 24 cm^2 B) 36 cm^2 C) 48 cm^2 D) 64 cm^2 E) 144 cm^2

13. If you walk for 45 minutes at a rate of 4 mph and then run for 30 minutes at a rate of 10 mph, how many miles have you gone at the end of one hour and 15 minutes?

A) 3.5 miles B) 8 miles C) 9 miles D) $25\frac{1}{3}$ miles E) 480 miles

14. The difference between a 6.5% sales tax and a 6% sales tax on an item priced at $20 before tax is

A) $.01 B) $.10 C) $.50 D) $1 E) $10

15. How many whole numbers between 100 and 400 contain the digit 2 ?

A) 100 B) 120 C) 138 D) 140 E) 148

16. The ratio of boys to girls in Mr. Brown's math class is 2:3. If there are 30 students in the class, how many more girls than boys are in the class?

A) 1 B) 3 C) 5 D) 6 E) 10

17. If your average score on your first six mathematics tests was 84 and your average score on your first seven mathematics tests was 85, then your score on the seventh test was

A) 86 B) 88 C) 90 D) 91 E) 92

18. Nine copies of a certain pamphlet cost less than $10.00 while ten copies of the same pamphlet (at the same price) cost more than $11.00. How much does one copy of this pamphlet cost?

A) $1.07 B) $1.08 C) $1.09 D) $1.10 E) $1.11

19. If the length and width of a rectangle are each increased by 10%, then the perimeter of the rectangle is increased by

A) 1% B) 10% C) 20% D) 21% E) 40%

20. In a certain year, January had exactly four Tuesdays and four Saturdays. On what day did January 1 fall that year?

A) Monday B) Tuesday C) Wednesday D) Friday E) Saturday

21. Mr. Green receives a 10% raise every year. His salary after four such raises has gone up by what percent?

A) less than 40% B) 40% C) 44% D) 45% E) More than 45%

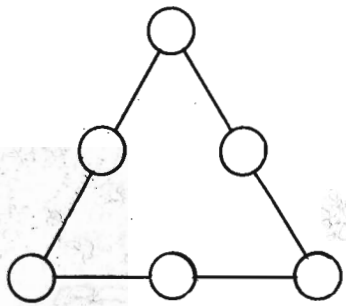
22. Assume every 7-digit whole number is a possible telephone number except those which begin with 0 or 1. What fraction of telephone numbers begin with 9 and end with 0?

A) $\frac{1}{63}$ B) $\frac{1}{80}$ C) $\frac{1}{81}$ D) $\frac{1}{90}$ E) $\frac{1}{100}$

23. King Middle School has 1200 students. Each student takes 5 classes a day. Each teacher teaches 4 classes. Each class has 30 students and 1 teacher. How many teachers are there at King Middle School?

A) 30 B) 32 C) 40 D) 45 E) 50

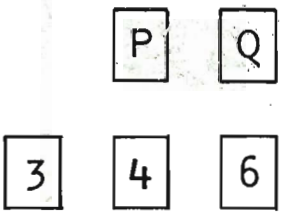
24. In a magic triangle, each of the six whole numbers 10 - 15 is placed in one of the circles so that the sum, S, of the three numbers on each side of the triangle is the same. The largest possible value for S is



A) 36 B) 37 C) 38

D) 39 E) 40

25. Five cards are lying on a table as shown. Each card has a letter on one side and a whole number on the other side. Jane said, "If a vowel is on one side of any card, then an even number is on the other side." Mary showed Jane was wrong by turning over one card. Which card did Mary turn over?



A) 3 B) 4 C) 6

D) P E) Q

SOLUTIONS

A Solutions Pamphlet will be mailed to your school AJHSME Examination Manager along with your score.

WRITE TO US

Questions and comments about the problems and solutions for this AJHSME should be addressed to:

Professor Thomas Butts, AJHSME Subcommittee Chairman
Science Education Department
University of Texas at Dallas
PO Box 688 FN32
Richardson, Texas 75080

Remarks about administrative arrangements, and **orders for any of the publications listed below** should be addressed to:

Professor Walter E. Mientka, CAMC Executive Director
Department of Mathematics & Statistics
University of Nebraska-Lincoln
Lincoln, Nebraska, 68588-0322

1985 AHSME

The 37th American High School Mathematics Examination (AHSME) will be held on February 25, 1986. The Committee on the American Mathematics Competitions (CAMC) would like to encourage high scoring students on the AJHSME to participate in the AHSME, which is administered each year to over 380,000 students in the USA, Canada and abroad. Your teacher may obtain information about the AHSME by writing to the Executive Director of the CAMC whose address is indicated above.

PUBLICATIONS

In order to review prior year American High School Mathematics Examinations, the following publications are available in either pamphlet or book format.

Examinations. Each price is for one copy of an exam and its solutions for one year. Specify the years you want and how many copies of each. All prices effective to October 1, 1986

AHSME 1972-85, 40c per copy per year.

Books.

Contest Problem Book I ($6.50), AHSME exams & solution, 1950-60.
Contest Problem Book II ($6.50), AHSMEs 1961-65.
Contest Problem Book III ($7.50), AHSMEs 1966-72.
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