

THE MATHEMATICAL ASSOCIATION OF AMERICA
American Mathematics Competitions



19th Annual

AMC 8

(American Mathematics Contest 8)
Tuesday, NOVEMBER 18, 2003

INSTRUCTIONS

1. DO NOT OPEN THIS BOOKLET UNTIL YOUR PROCTOR TELLS YOU.
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 be marked on the AMC 8 Answer Form with a #2 pencil. Check the blackened circles for accuracy and erase errors and stray marks completely. Only answers properly marked on the answer form will be graded.
4. There is no penalty for guessing. Your score on this test is the number of correct answers.
5. No aids are permitted other than scratch paper, graph paper, rulers, erasers, and calculators that are accepted for use on the SAT. No problems on the test will require the use of a calculator.
6. 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 on the problems. You will have 40 minutes to complete the test.
9. When you finish the exam, *sign your name* in the space provided on the Answer Form.

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.

The publication, reproduction, or communication of the problems or solutions of the AMC 8 during the period when students are eligible to participate seriously jeopardizes the integrity of the results. Duplication at any time via copier, telephone, e-mail, World Wide Web or media of any type is a violation of the copyright law.

Copyright © 2003, Committee on the American Mathematics Competitions,

1. Jamie counted the number of edges of a cube, Jimmy counted the number of corners, and Judy counted the number of faces. They then added the three numbers. What was the resulting sum?



(A) 12 (B) 16 (C) 20 (D) 22 (E) 26

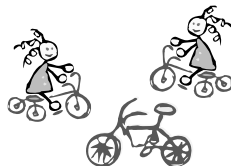
2. Which of the following numbers has the smallest prime factor?

(A) 55 (B) 57 (C) 58 (D) 59 (E) 61

3. A burger at Ricky C's weighs 120 grams, of which 30 grams are filler. What percent of the burger is not filler?

(A) 60% (B) 65% (C) 70% (D) 75% (E) 90%

4. A group of children riding on bicycles and tricycles rode past Billy Bob's house. Billy Bob counted 7 children and 19 wheels. How many tricycles were there?



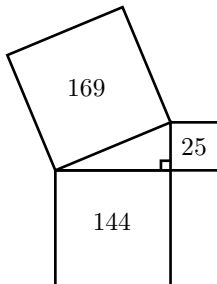
(A) 2 (B) 4 (C) 5 (D) 6 (E) 7

5. If 20% of a number is 12, what is 30% of the same number?

(A) 15 (B) 18 (C) 20 (D) 24 (E) 30

6. Given the areas of the three squares in the figure, what is the area of the interior triangle?

(A) 13 (B) 30 (C) 60 (D) 300 (E) 1800



7. Blake and Jenny each took four 100-point tests. Blake averaged 78 on the four tests. Jenny scored 10 points higher than Blake on the first test, 10 points lower than him on the second test, and 20 points higher on both the third and fourth tests. What is the difference between Jenny's average and Blake's average on these four tests?

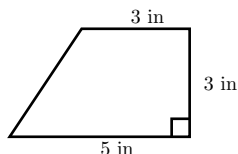
(A) 10 (B) 15 (C) 20 (D) 25 (E) 40

Problems 8, 9 and 10 use the data found in the accompanying paragraph and figures.

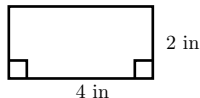
Bake Sale

Four friends, Art, Roger, Paul and Trisha, bake cookies, and all cookies have the same thickness. The shapes of the cookies differ, as shown.

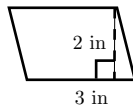
- Art's cookies are trapezoids:



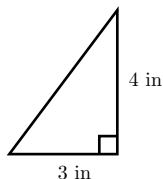
- Roger's cookies are rectangles:



- Paul's cookies are parallelograms:



- Trisha's cookies are triangles:



Each friend uses the same amount of dough, and Art makes exactly 12 cookies.

8. Who gets the fewest cookies from one batch of cookie dough?
 (A) Art (B) Paul (C) Roger (D) Trisha (E) There is a tie for fewest.
9. Art's cookies sell for 60¢ each. To earn the same amount from a single batch, how much should one of Roger's cookies cost?
 (A) 18¢ (B) 25¢ (C) 40¢ (D) 75¢ (E) 90¢
10. How many cookies will be in one batch of Trisha's cookies?
 (A) 10 (B) 12 (C) 16 (D) 18 (E) 24

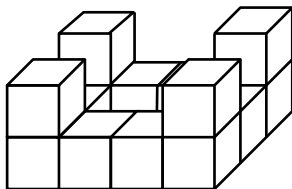
11. Business is a little slow at Lou's Fine Shoes, so Lou decides to have a sale. On Friday, Lou increases all of Thursday's prices by 10%. Over the weekend, Lou advertises the sale: "Ten percent off the listed price. Sale starts Monday." How much does a pair of shoes cost on Monday that cost \$40 on Thursday?

(A) \$36 (B) \$39.60 (C) \$40 (D) \$40.40 (E) \$44

12. When a fair six-sided die is tossed on a table top, the bottom face cannot be seen. What is the probability that the product of the numbers on the five faces that can be seen is divisible by 6?

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

13. Fourteen white cubes are put together to form the figure on the right. The complete surface of the figure, including the bottom, is painted red. The figure is then separated into individual cubes. How many of the individual cubes have exactly four red faces?



(A) 4 (B) 6 (C) 8 (D) 10 (E) 12

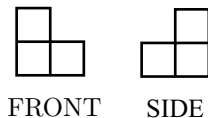
14. In this addition problem, each letter stands for a different digit.

$$\begin{array}{r} T \quad W \quad O \\ + \quad T \quad W \quad O \\ \hline F \quad O \quad U \quad R \end{array}$$

If $T = 7$ and the letter O represents an even number, what is the only possible value for W ?

(A) 0 (B) 1 (C) 2 (D) 3 (E) 4

15. A figure is constructed from unit cubes. Each cube shares at least one face with another cube. What is the minimum number of cubes needed to build a figure with the front and side views shown?

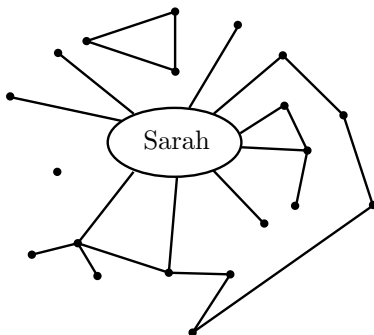


(A) 3 (B) 4 (C) 5 (D) 6 (E) 7

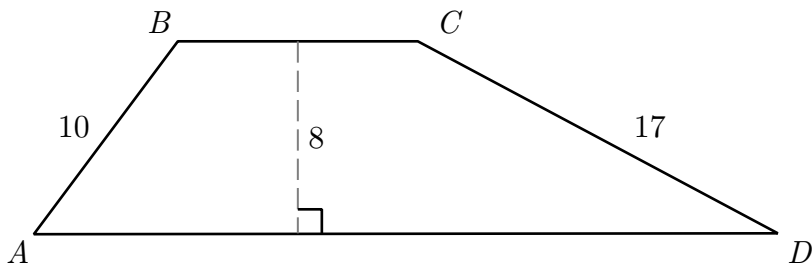
16. Ali, Bonnie, Carlo and Dianna are going to drive together to a nearby theme park. The car they are using has four seats: one driver's seat, one front passenger seat and two back seats. Bonnie and Carlo are the only two who can drive the car. How many possible seating arrangements are there?
- (A) 2 (B) 4 (C) 6 (D) 12 (E) 24
17. The six children listed below are from two families of three siblings each. Each child has blue or brown eyes and black or blond hair. Children from the same family have at least one of these characteristics in common. Which two children are Jim's siblings?

Child	Eye Color	Hair Color
Benjamin	Blue	Black
Jim	Brown	Blond
Nadeen	Brown	Black
Austin	Blue	Blond
Tevyn	Blue	Black
Sue	Blue	Blond

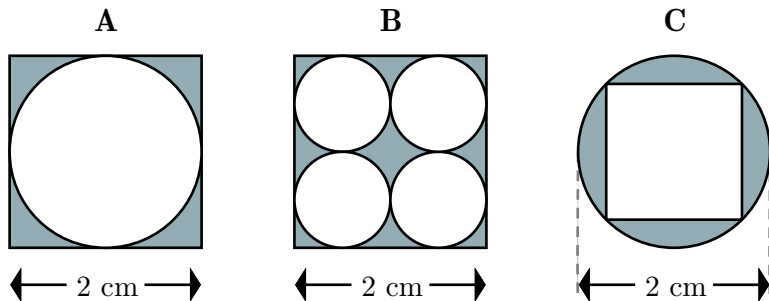
- (A) Nadeen and Austin (B) Benjamin and Sue
 (C) Benjamin and Austin (D) Nadeen and Tevyn
 (E) Austin and Sue
18. Each of the twenty dots on the graph below represents one of Sarah's classmates. Classmates who are friends are connected with a line segment. For her birthday party, Sarah is inviting only the following: all of her friends and all of those classmates who are friends with at least one of her friends. How many classmates will not be invited to Sarah's party?
- (A) 1 (B) 4 (C) 5 (D) 6 (E) 7



19. How many integers between 1000 and 2000 have all three of the numbers 15, 20 and 25 as factors?
 (A) 1 (B) 2 (C) 3 (D) 4 (E) 5
20. What is the measure of the acute angle formed by the hands of a clock at 4:20 a.m.?
 (A) 0° (B) 5° (C) 8° (D) 10° (E) 12°
21. The area of trapezoid $ABCD$ is 164 cm^2 . The altitude is 8 cm, AB is 10 cm, and CD is 17 cm. What is BC , in centimeters?

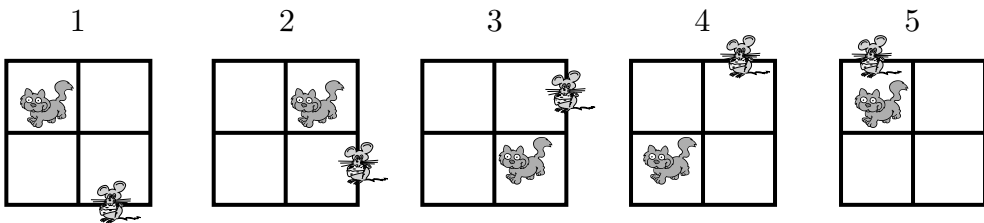


- (A) 9 (B) 10 (C) 12 (D) 15 (E) 20
22. The following figures are composed of squares and circles. Which figure has a shaded region with largest area?

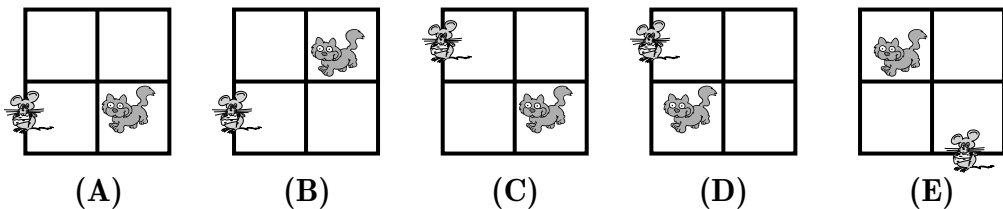


- (A) A only (B) B only (C) C only (D) both A and B (E) all are equal

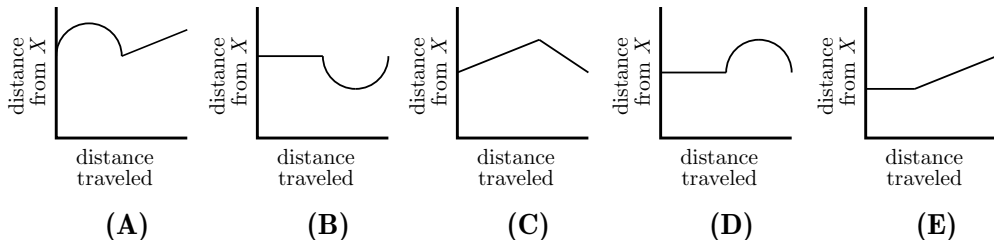
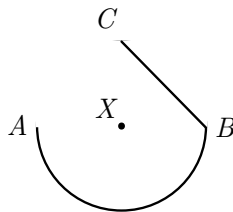
23. In the pattern below, the cat moves clockwise through the four squares and the mouse moves counterclockwise through the eight exterior segments of the four squares.



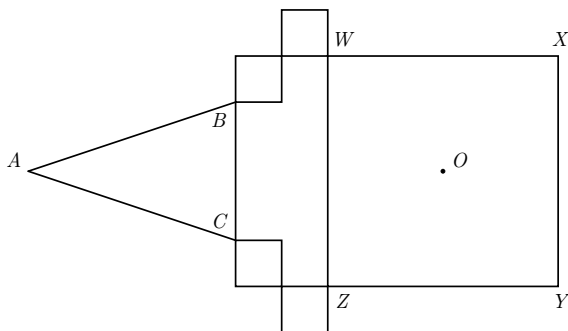
If the pattern is continued, where would the cat and mouse be after the 247th move?



24. A ship travels from point A to point B along a semicircular path, centered at Island X . Then it travels along a straight path from B to C . Which of these graphs best shows the ship's distance from Island X as it moves along its course?



25. In the figure, the area of square $WXYZ$ is 25 cm^2 . The four smaller squares have sides 1 cm long, either parallel to or coinciding with the sides of the large square. In $\triangle ABC$, $AB = AC$, and when $\triangle ABC$ is folded over side \overline{BC} , point A coincides with O , the center of square $WXYZ$. What is the area of $\triangle ABC$, in square centimeters?



(A) $\frac{15}{4}$

(B) $\frac{21}{4}$

(C) $\frac{27}{4}$

(D) $\frac{21}{2}$

(E) $\frac{27}{2}$

SOLUTIONS

Your School Manager will be sent at least one copy of the 2003 AMC 8 Solutions Pamphlet. It is meant to be loaned to students (but not duplicated).

WRITE TO US

Comments about the problems and solutions for this AMC 8 should be addressed to:

Ms. Bonnie Leitch, AMC 8 Chair / bleitch@earthlink.net
548 Hill Avenue, New Braunfels, TX 78130

Comments about administrative arrangements should be addressed to:

MAA American Mathematics Competitions / amcinfo@unl.edu
American Mathematics Competitions, University of Nebraska-Lincoln
P.O. Box 81606, Lincoln, NE 68501-1606

AMC 10 & AMC 12

The AMC 10 and AMC 12 are 25-question, 75-minute contests with 5 choices of answers for each problem (A through E). Schools with high scoring students on the AMC 8 will receive an Invitation Brochure for the 2004 AMC 10. The best way to prepare for these upper level contests is to study exams from previous years. Orders for all publications listed below should be addressed to:

American Mathematics Competitions
ATTN: Publications
P.O. Box 81606
Lincoln, NE 68501-1606

PUBLICATIONS

MINIMUM ORDER: \$10 (Before handling fee), *PAYMENTS IN US FUNDS ONLY*. U.S.A. and Canadian orders must be prepaid and will be shipped UPS/DHL or AIRMAIL.

Shipping & Handling charges for Publication Orders:

Order TOTAL	Shipping Charge
\$10.00 -- \$40.00	\$7.00
\$40.01 -- \$50.00	\$9.00
\$50.01 -- \$75.00	\$12.00
\$75.01 -- UP	\$15.00

Make checks payable to the American Mathematics Competitions; or give your Visa or MasterCard number, expiration date and cardholder's home address.

International Orders: Do NOT prepay; an invoice will be sent to you.

Each price is for an exam and its solutions for one year. Specify the years you want and how many copies of each exam. All prices effective to September 1, 2004.

AMC 8 (Junior High/Middle School exam), 1990-2002, \$1.00 per copy per year.

AMC 10 & AMC 12 (High School Exam), 1990-2003, \$1.00 per copy per year.

Books (Exams and Solutions)

Problem Book I, AHSMEs 1950-1960,	\$10.00
Problem Book II, AHSMEs 1961-1965,	\$10.00
Problem Book III, AHSMEs 1966-1972,	\$13.00
Problem Book IV, AHSMEs 1973-1982,	\$13.00
Problem Book V, AHSMEs & AIMEs 1983-1988,	\$30.00
Problem Book VI, AHSMEs 1989-1994	\$18.00

2003 AMC 8

DO NOT OPEN UNTIL TUESDAY, NOVEMBER 18, 2003

****Administration On An Earlier Date Will Disqualify Your School's Results****

1. All information (Rules and Instructions) needed to administer this exam is contained in the TEACHERS' MANUAL, which is outside of this package. PLEASE READ THE MANUAL BEFORE NOVEMBER 18, 2003. Nothing is needed from inside this package until November 18.
2. Your PRINCIPAL or VICE-PRINCIPAL must verify on the AMC 8 CERTIFICATION Form that all rules associated with the conduct of the exam were followed.
3. The Answer Forms must be mailed First Class to the AMC office no later than 24 hours following the exam.
4. THE AMC 8 IS TO BE ADMINISTERED DURING A CONVENIENT 40 MINUTE PERIOD. THE EXAM MAY BE GIVEN DURING A REGULAR MATH CLASS.
5. *The publication, reproduction or communication of the problems or solutions of this test during the period when students are eligible to participate seriously jeopardizes the integrity of the results. Duplication at any time via copier, telephone, e-mail, World Wide Web or media of any type is a violation of the copyright law.*

Major Sponsors

The Mathematical Association of America — MAA
University of Nebraska – Lincoln — UN-L

www.maa.org/
www.unl.edu/

Contributors

American Mathematical Association of Two Year Colleges — AMATYC
American Mathematical Society — AMS
American Society of Pension Actuaries — ASPA
American Statistical Association — ASA
Canada/USA Mathcamp & Mathpath..
Casualty Actuarial Society — CAS
Clay Mathematics Institute — CMI
Institute for Operations Research and the Management Sciences — INFORMS
Mu Alpha Theta — MAT
National Council of Teachers of Mathematics — NCTM
Pedagoguery Software, Inc.
Pi Mu Epsilon — PME
Society of Actuaries — SOA

www.amatyc.org/
www.ams.org/
www.aspa.org/
www.amstat.org/
www.mathcamp.org/ & www.mathpath.org/
www.casact.org/
www.claymath.org
www.informs.org/
www.mualphatheta.org/
www.nctm.org/
www.peda.com
www.pme-math.org/
www.soa.org/