



**The Mathematical Association of America
AMERICAN MATHEMATICS COMPETITIONS**

20th Annual Contest

AMC 8

TEACHERS' MANUAL

Instructions and Reporting Forms for
School Contest Managers

TUESDAY, November 16, 2004

Please read this booklet completely upon receipt.

DATES OF THE 2005 CONTESTS

- AMC 10/AMC 12 - Tuesday, February 1, 2005 &/or
Wednesday, February 16, 2005
AIME - Tuesday, March 8 or March 22, 2005
USAMO - Tuesday, April 19, 2005 & Wednesday, April 20, 2005



The MATHEMATICAL ASSOCIATION OF AMERICA

American Mathematics Competitions

Steven Dunbar
Director

To All AMC 8 Managers:

Welcome to the twentieth annual American Mathematics Competitions' AMC 8. A review of the upcoming contest assures me that your students will find the 2004 AMC 8 to be an excellent learning experience.

I am pleased to announce that, again this year, the Committee on the American Mathematics Competitions (CAMC) has approved a "window" which will enable schools to participate officially in case of a school closing or an academic conflict with the official scheduled date. The alternate "window" dates are November 17, 18, 19, 22 and 23. Further rules governing the use of the "window" are found on page 3 and 4 of this manual.

Last year, the Edyth May Sliffe Award, which recognizes distinguished mathematics teaching, was given regionally to fifty-three Sponsoring Teachers from high scoring AMC 8 schools. I am pleased to inform you that this program will be continued in 2004. Further details for nominating a teacher from your school can be found on page 9. If you nominated someone at the time you registered, it will not be necessary to complete this form again.

If this is the first year you have administered the AMC 8, please take a moment to thoroughly read this manual for the rules and regulations. For all schools, several days before the contest date fill out the School Identification Form and have the students complete the non-answer sections of the Answer Form (See Sections V. and VI., pages 2 and 3.)

We will make every effort to process your results rapidly. Please make one final check of the materials you send to me. I anticipate that most schools will receive their results before the holiday break.

On behalf of the Committee on the American Mathematics Competitions, I send my appreciation to you for all of your help with this contest.

Very sincerely,

Steven Dunbar
Director

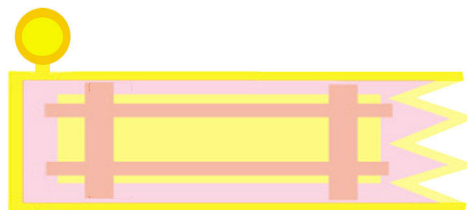
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I. Changes of Note

Rule Change for Block Scheduling or other Conflicts

The Committee on the American Mathematics Competitions has decided that the contest may now be administered on more than one day during the window period. Please keep all student answer forms secured, and send everything back to us after all administrations have taken place.



Let Parents/Guardians know about this activity!

The letter found on page 13 can be duplicated and sent home with students or handed out at parent/teacher conference time or open house.



Give your Student Scores a Boost!

A sampling of good practice questions can be found on Pages 14-20 in this manual! Also, our new Math Club Package provides more practice questions and resources to help teachers prepare students for the AMC 8. (Use the “Math Club Package” line on Additional Bundles Form on page 11 to order.).



Sample Press Release

A Sample Press Release about the AMC 8 for distribution to local newspapers and media is available on page 14.



II. Contents Of The Package

Your contest package contains

1. This Teachers' Manual,
2. The AMC 8 Report Envelope (marked with your school ID),
3. A School Identification Form,
4. The Contest bundles,
5. A set of 10 Answer Forms for each bundle of 10 exams ordered,
(Please check that the number of bundles corresponds to the number ordered. If it does not, call the AMC office as soon as possible.)
6. Solution Pamphlet Sets (if ordered) in sets of 10,
7. Contest Manager's Envelope (*contains a complimentary copy of the AMC 8 contest and solutions*),
8. Complimentary poster, study materials, publication catalog, and other information and,
9. Math Messenger.

III. Braille or Large Print Exams

1. Braille or Large Print exams (if ordered) will be sent under separate cover.
 - a. The time limit set by the Committee on the American Mathematics Competitions for visually impaired students is 70 MINUTES.
 - b. Please note that a certified teacher or a school administrator may read the questions to the student and mark the answers as directed by the student.

IV. Eligibility and Participation Schedule

1. Any student in grade 8 and age 14 or below may participate.
2. The contest may be given either to the entire group of students at one time or during a regular mathematics class period of the students.

Comment:

- a. A discussion of academic integrity should take place with your students if the contest is administered at several times or on more than one day,



and all copies of the contest should be retained by the teacher until after all administrations have taken place.

- b. See Section VII on page 3 for instructions relating to administering the contest on other dates.

V. What Must Be Done Prior To November 16, 2004

1. Complete the following Pre-Examination processes associated with the AMC 8 Answer Forms:
 - a. Stamp or print the Name and Address of your School (including ZIP code, if applicable) in the box in the upper right-hand corner on each form. DO NOT put any type of paste-on or adhesive address label on the form. If no stamp is available, the block could be filled in by using a computer program to print the information. COPIES OF ANSWER FORMS AND PREVIOUS YEARS' ANSWER FORMS CANNOT BE ACCEPTED.

Please note that it is very important that each form is identified with your school name. We have no way to identify the answer form if the school name is omitted.

- b. Have the students complete the following parts of the form. (*The most common errors in the past have been filling in more than one circle in a column or not completely filling in the circles*).

- (1) Last Name
- (2) First Name
- (3) Middle Initial of their name
- (4) Section Letter

For each math class participating in the AMC 8, assign a different section letter of the alphabet (A-Z). These letters are assigned at the Contest Manager's discretion. At least 10 students should be assigned to each Section Letter. If you return results with Sections which have fewer than ten people, we will combine these Sections into a single Section. Certificates are given to the top 3 students in each section (see page 6).

- (5) Age, grade and gender
 - c. Collect the Answer Forms for redistribution on the contest date.
 - d. Please make a final check to see if the forms have been marked correctly.
2. Review the rules found on the package(s) of the AMC

- 8.
3. Discuss with your students the questions and solutions from previous AMC 8's so that they may see the type of questions to expect.
4. Review with your students the instructions on the cover of the 2004 AMC 8, also found on page 21 of this manual.
5. The day before the contest, remind students of the time and place of the AMC 8.
6. Make arrangements to mail the AMC 8 REPORT ENVELOPE(s) by FIRST CLASS MAIL.
7. Obtain a supply of: (a) #2 lead pencils with good erasers, (b) unmarked scratch paper for use by the students, and (c) calculators for your class if you wish to use them. Students may not share a calculator.

Please inform participating students that no aids are permitted other than scratch paper, graph paper, ruler, erasers and calculators that are accepted for use on the SAT. No problems on the contest will require the use of a calculator. (See www.collegeboard.com/counselors/hs/sat/registration/calc.html for details.)

VI. Instructions For Completing The School Identification Form

Several days before the contest date, please complete the following Items on the School Identification Form.

1. Stamp or write your **school name** and complete **school mailing address** in the box in the upper-right hand corner.
2. **School ID** -- Your School ID is found on your AMC 8 Report Envelope. Please CAREFULLY copy your School ID in the empty boxes under the words "School ID." All School ID's have six characters.

***NOTE:** Leave the School ID Section of this form blank if there is a question about marking the School ID correctly.*

Mark as follows:

Schools using U.S.A. ZIP Codes: Blacken the circles for 0-9 in each column for the five digits and blacken one circle of the letters A-J for the letter that has been assigned uniquely to your school.

Canadian Schools: All schools have a School ID that follows this pattern: letter, digit, letter, blank, blank, letter. Blacken the correct circles under these 6 characters. Be sure to darken the blank circles (not the circles containing zeroes) for the two blanks in your School ID.

Schools outside the U.S.A.: All schools have a School ID in which the six characters are letters (A-Z), unless the 4th and/or 5th characters are blanks. Blacken the correct circles under these six characters. If there are blanks in your School ID, be sure to blacken the blank circles (not the circles containing zeroes).

3. Using the "OTHER USE ONLY" grid, mark the total number of students attending your school.
4. Leave the section marked OFFICE USE blank. Items 5 and 6 should be completed following the administration of the contest.
5. Mark the number of completed Answer Forms Returned. Please do not count or return answer forms of students who were absent, blank forms or teacher "practice" forms.
6. Mark the proper circles for the date the contest was actually administered. Use a single digit for the year (4).

VII. Policy Statements

Statement 1

Official & Unofficial Administration of the AMC 8 Early Administration

Administration on an earlier date is NEVER permitted and will lead to a disqualification of the results. Such an administration would jeopardize the validity of all scores from other schools.

Official Administration Window Statement:

The AMC 8 should be given officially on the first day that the school is open between Tuesday, November 16 and Tuesday, November 23. If the contest is not given on Tuesday, November 16, the principal must include an explanation describing briefly the academic conflict. (See XII - 2004 Certification Form).

Please note: Because the contest may be given officially during the "window" days, as indicated above, you must collect the students' contest booklets and instruct them not to discuss the contest questions and solutions outside their contest administration until after November 23. We define the term **contest administration** as a group of students who are taking the contest at the same time in the same room.

If you are unable to give the contest on November 16 because

- a. your school is closed,
- b. your school has an academic conflict,
- c. the class periods have been shortened due to an



- assembly or other reason, or
- d. the majority of your best students will be on a field trip on contest day,
- then your school may use a window date (November 17-23).

Unofficial Administration

Unofficial administration after the “window” period is permitted if it is impossible to take the contest during the “window.” Be sure to mark the exceptions box at the bottom of the certification form as indicated. **The last date to take the contest unofficially is Friday, December 17, 2004.**

Statement 2

Irregularities

If it is clear to the Contest Manager or another proctor that a student has cheated, then the Manager must disqualify the student's score and not submit that student's AMC 8 ANSWER FORM for grading.

If there is inconclusive evidence of cheating, or an accusation without clear evidence, the Contest Manager must report this irregularity in writing when submitting the ANSWER FORMS for the school. This written report and the questionable ANSWER FORM(s) should be clearly identified, banded together and submitted along with the other ANSWER FORMS.

Statement 3

Follow-up Inquiries

The results of this AMC 8 are used to identify students with high levels of mathematical ability. To assure that the purpose is served, the Committee on the American Mathematics Competitions reserves the right to make inquiries about scores, to re-examine students and to disqualify scores if necessary. If the required security procedures are not followed, all scores from a school may be disqualified.

Statement 4

Refund/Credit Policy

If your school is unable to take the AMC 8, please use the materials as practice sets for the next year. **WE CANNOT GIVE REFUNDS OR CREDITS AFTER THE CONTEST MATERIALS ARE SHIPPED.**

Statement 5

Learning Disabilities

If you have students with learning disabilities, please call the Lincoln Office for clarification on eligibility. In most cases, students are given a 70-minute time allowance to take the AMC 8. All such administrations must be documented on the reverse side of the Certification Form, by listing the student's name and circumstance.

Statement 6

English Language Learners

To benefit recent immigrants, English Language Learners may use a book or electronic type dual-language nontechnical dictionary between their native language and English. A student may use the dictionary only the first time that he/she takes the AMC 8. The dictionary must be given to the school contest manager to examine and retain for the 24-hour period preceding the test. The proctor must announce to other students that the student(s) has/have been given special permission to use the dictionary during the contest.

VIII. Instructions For The Day Of The Contest

Do not open the contest bundle(s) until just before you are ready to hand the exams out to the students.

1. When the students arrive, seat them so they are separated by an empty space, if possible.
2. Hand out the Answer Forms which have previously been partially completed by the students.
3. Provide a #2 lead pencil with a good eraser for each student.
4. Read the following instructions to the students:
 - a. This 40-minute contest has 25 questions. Unfold the contest booklet to see all problems. You will note that after the question number there are five possible answers labeled A, B, C, D, and E. Only one answer is correct. Mark your answers to these problems in the rows on the answer form.
 - b. **BE AS CERTAIN AS POSSIBLE OF YOUR ANSWERS BEFORE YOU MARK YOUR FORM.** Forms which contain imperfect erasures may not be read by the scanner that is used to grade the contest. Take special care to mark the answer in the row which corresponds to the problem number.
 - c. *Remark to Teacher:* Some students may wish to keep a personal record of their answers by cir-

IX. What To Do Following The Contest

- cling their answers on the contest booklet before they are marked on the form. This procedure is acceptable provided it does not consume too much time. **However, the official answers will be the ones blackened on the answer form.**
- Next, open the contest bundle(s), hand out the AMC 8 and inform the students that they are not to open the contest booklet until instructed to do so.
 - As you hand out the contest, tell the students to disregard the page which contains instructions for the contest manager. Instruct students to read the entire front cover of the AMC 8. Allow at most 3 minutes to do this. Inform students that the contest is a folded booklet and to be cautious about following the correct numeric sequence.
 - Ask if there are any questions about procedures. Inform the participants that they may not talk or ask any questions during the contest, and they must do their own work
 - Remind students that they have 40 minutes to complete the contest. Then tell them to BEGIN.
 - The contest should be proctored continuously as you would for any important contest. Students whose eyes wander should be warned. Students caught copying answers or collaborating must be disqualified. Try to provide as quiet an environment as possible.
 - Announce when there are 15 minutes left and when there are 5 minutes left.
 - When time is up, tell the students to STOP and have them sign their name in the space provided on the Student Answer Form. Collect the Answer Forms and exams as quickly as possible.
Inform the students that the contest and solutions may not be discussed with anyone outside of their contest administration either orally, via email, www, copier or media of any type until after November 23. Tell students that their contest will be returned to them after that date.
 - Please do not grade the answer forms.** They are to be sent to Lincoln for grading. Tell the students that their scores will be available by late December.







- Place the School ID Form on top of the Answer Forms and insert in the Report Envelope.

Comments:

- Please arrange the forms by section with each form facing the same direction with the same side up.
REMOVE ALL PAPER CLIPS, RUBBER BANDS OR NOTE PAPER ATTACHED TO ANY ANSWER FORMS. PLEASE FAN THE FORMS SEPARATING ANY THAT MIGHT BE STUCK TOGETHER.
 - A maximum of 200 forms should be placed in one envelope.
 - Do not return blank forms or teacher "practice" forms.
- Complete the Certification Form, page 7. If you did not nominate a teacher for the Sliffe award when you registered, please do so now on the Sliffe Award Nomination Form on page 9.
 - Ask your Principal or person with comparable title to sign the Certification Form and place it in the AMC 8 Report Envelope, seal and send it First Class (please affix the proper postage before mailing) within 24 hours or as soon as possible after all administrations have taken place.

General Comments:

-  Indicate the number of packages you are returning in the space provided on the Report Envelope.
 -  Please be certain that the postage affixed to the AMC 8 Report Envelope is adequate for FIRST CLASS MAILING.
 -  The AMC 8 Student ANSWER FORMS sent to Lincoln for grading will not be returned.
 -  A \$5 charge will be assessed for rescoring.
- Please note:** After you have delivered all of the Answer Forms to the school office to be mailed, you may discuss the contest and solutions with your students. Remember that there will be schools taking the contest in other locations at different times, and some will be taking the contest on other "window" dates.
 - Inform the students that the contest and solutions may not be discussed with anyone outside

of their contest administration either orally, via email, www, copier or media of any type until after November 23.

- b. The contest booklets must be collected from the students. They may be returned after November 23.

X. Report Of Results

The AMC 8 will be centrally scored at the AMC office at the University of Nebraska-Lincoln.

Each school will receive the following reports:

1. A list of the top 20 students in your school.
2. A report for each section with a minimum of 10 students. This report lists the score of each student.
3. One combined report for all sections of size less than 10.
4. Tables of Item Difficulty associated with the participants in your school.
5. A 2005 AMC 8 Registration Form.
Comment: This registration form is included with your results at the request of many AMC 8 School Contest Managers who wish to register before the beginning of the next school year.
6. A 2005 AMC 10/AMC 12 Invitation Brochure will be included with your results if you have students with a high score. The date of the AMC 10/AMC 12 is **Tuesday**, February 1, 2005 and **Wednesday**, February 16, 2005. We recommend that prior year AMC 10/AMC 12 exams be studied by these students.
7. A National Summary of Results and Awards which will include the names of the top-scoring students and a listing of the national award winners. This Summary will be sent following the complete analysis of results (usually in February).










PLEASE NOTE:

IF YOU DO NOT RECEIVE YOUR 2004 AMC 8 REPORT OF RESULTS BY FEBRUARY 4, 2005, PLEASE CALL THE AMC OFFICE at 800-527-3690.

ALL student answer forms returned for grading will be *RECYCLED* 60 days after the AMC 8.



-  A Certificate of Distinction is given to all students who receive a perfect score.
-  An AMC 8 Winner Pin is given to the student(s) in each school with the highest score.
-  The top three students in each of your assigned sections will receive, respectively, a gold, silver, or bronze Certificate for Outstanding Achievement. In case of a tie, additional certificates will be included with your results.
-  An AMC 8 Honor Roll Certificate is given to all students who score in (approximately) the top 2%.
-  An AMC 8 Merit Roll Certificate is given to all students in 6th grade and below who score in (approximately) the top 2%.
-  A Certificate of Participation will be included in your school results and may be reproduced and given to the other students so that every student taking the AMC 8 will receive recognition. An Order Form will be included with your results in case you wish to purchase a set of these Certificates.
-  Achievement Award Pins, Certificates of Merit and T-Shirts are available for purchase if your school wishes to recognize other outstanding students. Ordering information for these awards will be sent along with your school's results.

XII. AMC 8 CERTIFICATION FORM 2004

The AMC 8 is open to any student who is in grade 8 or below and is age 14 or below. The AMC 8 must be administered by a certified teacher or an adult not associated with or related to any of the participants. The administration of the contest must take place in a public building (e.g. school, library, church). Please send all Answer Forms from your school or group at one time.

For a school/home school, the Contest Manager and the Principal, Vice Principal, Headmaster, Home School Coordinator, or person with comparable title must sign this form and return it with your student Answer Forms. The Contest Manager must wait until all aspects of the contest process at the school have been completed.

Certification by the principal, official or person with comparable title:

- a. I certify that the contest package(s), the Complimentary Solutions Envelope and/or the Solution Packets were retained in their sealed condition within an hour of the start of the administration of the contest.
- b. I accept for our school/home school the rules and procedures described on this page and pages 1-6, and accept that failure to follow these rules and procedures may result in DISQUALIFICATION from official standing of all scores from our school.

Signature _____ Time _____

Title _____ Date _____

If your school did not administer the AMC 8 contest on November 16, 2004, please enter the date(s) given _____.

Indicate the reason the school used a "window" date: _____

If the contest was taken unofficially after the "window," mark the exceptions box at the bottom and write the reason on the back of this form.

Certification by the Contest Manager:

I certify that the following statements are true or that, if there are any exceptions, I have checked the box below and have listed them above or on the back of this page. I understand that the absence of either signature from this form and a consideration of the exceptions may result in DISQUALIFICATION of all scores from our school. I understand that administering the AMC 8 before November 16, 2004 will lead to disqualification of our school's results.

1. Only students in grade 8 and age 14 or below participated in the Contest.
2. The package of Contests was not opened until just before the administration of the Contest was given on Tuesday, November 16, 2004 or the first day the school was open during the "window" (see Section VII, Pages 3 & 4).
3. The participants were continuously monitored during the Contest, and they were separated by an empty space, if possible.
4. Participants had exactly 40 minutes working time.
5. No student was permitted to proctor the Contest.
6. I collected all of the students' Contest booklets following the administration of the Contest.
7. After the Contest, the AMC 8 ANSWER FORMS were placed in the AMC 8 Report Envelope and kept secure. No changes were made in the answers. If the AMC 8 was given at more than one time, the Contest papers were kept secure until administrations were over.
8. The instructions relating to the opening of the "Complimentary Solutions Envelope" and/or Solution Packets were followed.
9. I have followed all the rules as stated in this Teachers' Manual.

DAY & DATE

SIGNATURE _____

TEST WAS GIVEN _____

School Name _____

Telephone _____

City _____

State _____ Zip _____

E-mail (please print clearly): _____

School Grade Level: _____ through _____

PLEASE INDICATE THE EXACT NUMBER OF
AMC 8 ANSWER FORMS RETURNED FOR GRADING: _____

EXCEPTIONS

Questionnaire to Help Us Serve You Better

1. Do you read the NCTM journal *Mathematics Teaching in the Middle School*? YES NO

If so, do you recall seeing the AMC ads in September, October or November? YES NO

If you do not read the NCTM journals, could you please give us the names of other math publications you do read? _____

2. Would you like to get an electronic reminder before the registration deadlines? Email address: _____

3. Did you use the option of giving the Contest on multiple days? YES NO

4. Did you order the AMC 8 Math Club Package? YES NO

If so, did you use 1. Practice Problems? YES NO

2. Web Pages Suggestions? YES NO

3. Club Activities Ideas? YES NO

5. Did you send a version of the Press release on page 14 to your local newspaper/media? YES NO

6. What would encourage your school to continue registering for the AMC Contests? What can we do to insure your school will register again next year?

Please feel free to provide the name of a school or teacher in your area that you believe would be interested in our contests.

Comments on the Contest and/or its Administration:

(please disregard this form if your school nominated a teacher when you registered)

2004 AMC 8

**XIII. SLIFFE NOMINATION FORM
for the**

EDYTH MAY SLIFFE AWARD

f o r

D I S T I N G U I S H E D M A T H E M A T I C S T E A C H I N G

(please print all information clearly)

Name of School Nominated Mathematics Teacher: _____

Only one name may be submitted from your 2004 AMC 8 registered school, and it should be the mathematics teacher who has been identified with the success of the students on the AMC 8. If you nominated a teacher during the registration process, you do not need to fill this out now. The teacher must be currently employed by the participating school from which the student answer forms have been submitted. **Please do not hesitate to list your own name. Past recipients are ineligible.**

School ID #: _____

School Name: _____

City, State, & Zip: _____

School Telephone: _____

Date: _____

Email: _____

NOTE: Teachers are eligible for the Sliffe Award, provided their school has participated in the AMC 8 for three consecutive years. Approximately fifty awards (five from each of ten USA regions) are given. The award includes \$100, a Sliffe pin, a certificate and a 1-year membership in the National Council of Teachers of Mathematics. Selection is based on averaging the scores of the top three students in each participating school over a three year period.

Please return this form in your AMC 8 REPORT ENVELOPE.

XIV. Additional Bundles Form

Please fill in the information below and FAX your order. The administrator or authorized person of the school agrees to pay the American Mathematics Competitions for the following materials:

School Name _____

Address _____

City _____ State _____ Zip _____

Teacher placing the order _____



Contest Bundles of ten..... # _____ @ \$10/bundle =\$ _____

Solutions Sets of ten (optional) # _____ @ \$ 6/set =\$ _____

AMC 8 Math Club Package - (Study Guide, Web Material) - @ \$15 per Study Guide \$ _____

Postage/handling Fee (see chart below) \$ _____

Total \$ _____

P.O. Number _____

VISA/MC#: _____

Address: _____

Name (Please Print): _____

Exp. Date: _____

Telephone # _____

AMC ORDERING -- TERMS

1. VISA & MasterCard accepted.

2. Make checks payable to:
AMERICAN MATHEMATICS COMPETITIONS

FAX 402-472-6087 or Call 1-800-527-3690

3. PAYMENT IN U.S. FUNDS ONLY.

Please Send Your Order To:

| | | |
|------------|--------------------|-------------------------|
| 4. U.S.A.: | <u>Order TOTAL</u> | <u>Shipping Charge*</u> |
| | \$10.00 -- \$40.00 | \$7.00 |
| | \$40.01 -- \$50.00 | \$9.00 |
| | \$50.01 -- \$75.00 | \$12.00 |
| | \$75.01 -- UP | \$15.00 |

American Mathematics Competitions
ATTN: AMC 8 Additional Bundles
P.O. Box 81606

5. CANADIAN: Same as above. Order will be sent by DHL.

* Orders after November 1st will be charged a higher fee for 2 or 1 day UPS.

XV. Proof of Intent to Pay

This document is intended to be used in lieu of pre-payment when calling or faxing an order. **Please indicate if you wish to be billed or will be sending a "check in the mail"** (to be received **within 2 weeks** of order or you will be billed). Mail orders not wishing to be billed should include a check when returning this form. **The person who signs this form must be authorized to pay the order that is placed by the teacher.**

Billed

Name of Person Authorized to Pay (please print): _____

Signature: _____

Title: _____

Date: _____

Email: _____

XVI. Letter to Parents



The MATHEMATICAL ASSOCIATION OF AMERICA American Mathematics Competitions

Steven Dunbar
Director

Fall, 2004

Dear Parent or Guardian:

On November 16, 2004 your son or daughter can participate in the 20th annual American Mathematics Competitions 8 (AMC 8) contest being offered in your school. Last year the AMC 8 contest involved over 150,000 students worldwide.

With these contests, there are awards in each school for the student with the highest score, certificates for high-scoring students in each school, and state-wide awards. The AMC 8 contest can lead to other more selective math contests, even all the way to the United States of America team sent to the International Mathematical Olympiad, the premier international high school level mathematical problem solving contest. But the real rewards come from challenging each student with mathematics that is new, different, and “outside of the box.” The problems on the contest are hard, but designed to be within the reach of students. Even so, if your son or daughter managed to solve only one or two problems, you can consider that satisfactory, because these problems are meant to be more challenging than students routinely encounter in their mathematics courses.

Mathematics is increasingly important in our technological and scientific age. Taking enough mathematics in school is the gateway to jobs and careers of all kinds, even those that are not explicitly mathematical, scientific or technological. We hope that by offering these contests, we can challenge and inspire students to want to learn more mathematics. We hope that your son or daughter enjoys the contests and will continue to take mathematics courses in middle school, high school and beyond.

Sincerely,

Dr. Steven R. Dunbar
Director, American Mathematics Competitions

XVII. Publicity

If possible the sample Contest Announcement and Results Announcement news releases should be prepared and distributed to the newspapers, radio and television stations in your region. See the AMC website, or the 2003 Summary of Results for statistics and figures from the the 2003 contest. Statistics and figures for the 2004 Contest will be available on our website in early 2005.

(School or School District)

FOR IMMEDIATE RELEASE

(School) STUDENTS INVITED TO WORLD-WIDE COMPETITION

(#) students at (School) participated in the 20th annual American Mathematics Competitions 8, held on Tuesday, November 16, 2004. They competed for local and national student and school awards. The contest, which covers Middle School mathematics, is given at participating schools. Its purpose is to spur interest in mathematics and develop talent through the excitement of friendly competition at problem solving in a timed format. In 2003 over 150,000 students from 2,500 schools participated in the AMC 8 contest including (#) students from (#) schools in (State).

Prof. Steven Dunbar of The University of Nebraska - Lincoln serves as the Director of the American Mathematics Competitions. According to Prof. Dunbar the AMC 8, first offered in 1985, is an annual project sponsored by The Mathematical Association of America, and is located at the University of Nebraska - Lincoln. The AMC receives support from the Akamai Foundation, American Mathematical Association of Two Year Colleges, American Mathematical Society, American Society of Pension Actuaries, American Statistical Association, Art of Problem Solving, Canada/USA Mathpath & Mathcamp, Casualty Actuarial Society, Clay Mathematics Institute, Institute for Operations Research and the Management Sciences, Mu Alpha Theta, National Association of Mathematicians, National Council of Teachers of Mathematics, Pedagogy, Inc., Pi Mu Epsilon, & the Society of Actuaries. The Contest is given across the U.S.A, Canada, and in many schools abroad.

Details concerning the 2005 AMC 10/12 contests for High School are available on the AMC web site: www.unl.edu/amc .Entries for the 2005 contest close on January 25, 2005 for the February 1st exam, and February 7, 2005 for the February 16th contest.

For further information contact the AMC -- telephone: 402/472-2257, email: amcinfo@unl.edu.

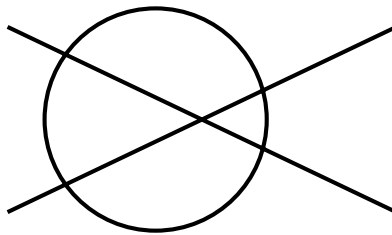
XVIII. AMC 8 Practice Questions

- A circle and two distinct lines are drawn on a sheet of paper. What is the largest possible number of points of intersection of these figures?

(A) 2 (B) 3 (C) 4 (D) 5 (E) 6

2002 AMC 8, Problem #1—“Draw some figures”

- **Solution (D)** Two distinct lines can intersect in one point whereas a line can intersect a circle in two points. The maximum number 5 can be achieved if the lines and circle are arranged as shown. Note that the lines could also meet outside the circle for the same result. (Other arrangements of the lines and circle can produce 0, 1, 2, 3, or 4 points of intersection.)



Difficulty: Easy

NCTM Standard: 6-8: Geometry: Use visualization, spatial reasoning, and geometric modeling to solve problems, draw geometric objects with specified properties, such as side lengths or angle measures.

Mathworld.com Classification:

Geometry > Line Geometry > Lines > Circle-Line Intersection;

Geometry > Plane Geometry > Circles > Circle-Line Intersection

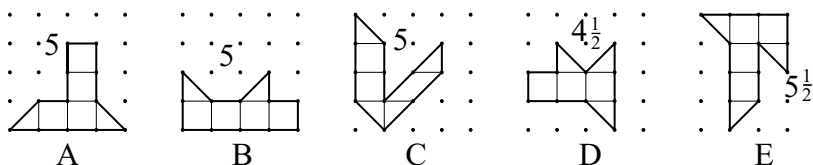
AMC 8 Practice Questions Continued

- Which of the following polygons has the largest area?



2002 AMC 8, Problem #15— “Divide in triangles and squares”

- **Solution (E)** Areas may be found by dividing each polygon into triangles and squares as shown.



Note: Pick’s Theorem may be used to find areas of geoboard polygons. If I is the number of dots inside the figure, B is the number of dots on the boundary and A is the area, then $A = I + \frac{B}{2} - 1$. Geoboard figures in this problem have no interior points, so the formula simplifies to $A = \frac{B}{2} - 1$. For example, in polygon D the number of boundary points is 11 and $\frac{11}{2} - 1 = 4\frac{1}{2}$.

Difficulty: Easy

NCTM Standard: Grades 6-8 Geometry: Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships. Middle-grades students should explore a variety of geometric shapes and examine their characteristics. Students can conduct these explorations using materials such as geoboards, dot paper, . . .

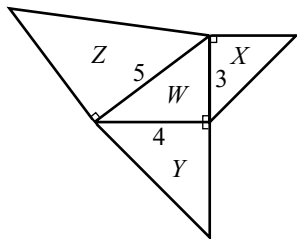
Mathworld.com Classification:

Discrete Mathematics > Combinatorics > Lattice Paths and Polygons > Lattice Polygons > Pick’s Theorem;

Geometry > Computational Geometry > Triangulation > Triangulation

AMC 8 Practice Questions Continued

- Right isosceles triangles are constructed on the sides of a 3-4-5 right triangle, as shown. A capital letter represents the area of each triangle. Which one of the following is true?



- (A) $X + Z = W + Y$ (B) $W + X = Z$ (C) $3X + 4Y = 5Z$
(D) $X + W = \frac{1}{2}(Y + Z)$ (E) $X + Y = Z$

2002 AMC 8, Number #16—

“A variant of the Pythagorean Theorem”

- **Solution (E)** The areas are $W = \frac{1}{2}(3)(4) = 6$, $X = \frac{1}{2}(3)(3) = 4\frac{1}{2}$, $Y = \frac{1}{2}(4)(4) = 8$ and $Z = \frac{1}{2}(5)(5) = 12\frac{1}{2}$. Therefore, (E) is correct. $X + Y = 4\frac{1}{2} + 8 = 12\frac{1}{2} = Z$. The other choices are incorrect.

OR

By the Pythagorean Theorem, if squares are constructed on each side of any right triangle, the sum of the areas of the squares on the legs equal the area of the square on the hypotenuse. So $2X + 2Y = 2Z$, and $X + Y = Z$.

Difficulty: Hard

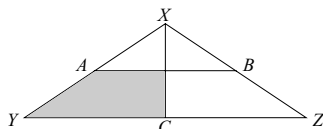
NCTM Standard: Grades 6-8 Geometry: Use visualization, spatial reasoning, and geometric modeling to solve problems. . . . Eighth graders should be familiar with one of the many visual demonstrations of the Pythagorean relationship, the diagram showing three squares attached to the sides of a right triangle.

Mathworld.com Classification:

Geometry > Plane Geometry > Triangles > Special Triangles > Other Triangles > Right Triangles

AMC 8 Practice Questions Continued

- The area of triangle XYZ is 8 square inches. Points A and B are mid points of congruent segments \overline{XY} and \overline{XZ} . Altitude \overline{XC} bisects \overline{YZ} . The area (in square inches) of the shaded region is

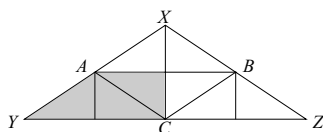


- (A) $1\frac{1}{2}$ (B) 2 (C) $2\frac{1}{2}$ (D) 3 (E) $3\frac{1}{2}$

2002 AMC 8, Problem #20—

“Divide into congruent triangles”

- **Solution (D)** Segments \overline{AD} and \overline{BE} are drawn perpendicular to \overline{YZ} . Segments \overline{AB} , \overline{AC} and \overline{BC} divide $\triangle XYZ$ into four congruent triangles. Vertical line segments \overline{AD} , \overline{XC} and \overline{BE} divide each of these in half. Three of the eight small triangles are shaded, or $\frac{3}{8}$ of $\triangle XYZ$. The shaded area is $\frac{3}{8}(8) = 3$.



OR

Segments \overline{AB} , \overline{AC} and \overline{BC} divide $\triangle XYZ$ into four congruent triangles, so the area of $\triangle XAB$ is one-fourth the area of $\triangle XYZ$. That makes the area of trapezoid $ABZY$ three-fourths the area of $\triangle XYZ$. The shaded area is one-half the area of trapezoid $ABZY$, or three-eighths the area of $\triangle XYZ$, and $\frac{3}{8}(8) = 3$.

Difficulty: Medium-hard

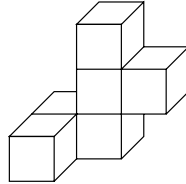
NCTM Standard: Grades 6-8 Geometry : Use visualization, spatial reasoning, and geometric modeling to solve problems. Apply transformations and use symmetry to analyze mathematical situations describe sizes, positions, and orientations of shapes under informal transformations such as flips, turns, slides, and scaling; examine the congruence, similarity, and line or rotational symmetry of objects using transformations.

Mathworld.com Classification:

Geometry > Plane Geometry > Geometric Similarity > Congruent

AMC 8 Practice Questions Continued

- Six cubes, each an inch on an edge, are fastened together, as shown. Find the total surface area in square inches. Include the top, bottom and sides.



- (A) 18 (B) 24 (C) 26 (D) 30 (E) 36

2002 AMC 8, Problem #22—

“Subtract hidden faces from all faces”

- **Solution (C)** Before the cubes were glued together, there were $6 \times 6 = 36$ faces exposed. Five pairs of faces were glued together, so $5 \times 2 = 10$ faces were no longer exposed. This leaves $36 - 10 = 26$ exposed faces.

Difficulty: Hard

NCTM Standard: Use visualization, spatial reasoning, and geometric modeling to solve problems; use two-dimensional representations of three-dimensional objects to visualize and solve problems such as those involving surface area and volume.

Mathworld.com Classification:

Geometry > Solid Geometry > Polyhedra > Cubes > Polycubes

AMC 8 Practice Questions Continued

- Loki, Moe, Nick and Ott are good friends. Ott had no money, but the others did. Moe gave Ott one-fifth of his money, Loki gave Ott one-fourth of his money and Nick gave Ott one-third of his money. Each gave Ott the same amount of money. What fractional part of the group's money does Ott now have?

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

2002 AMC 8, Problem #25— “Make the numbers easy”

- **Solution (B)** Only the fraction of each friend's money is important, so we can assume any convenient amount is given to Ott. Suppose that each friend gave Ott \$1. If this is so, then Moe had \$5 originally and now has \$4, Loki had \$4 and now has \$3, and Nick had \$3, and now has \$2. The four friends now have $\$4 + \$3 + \$2 + \$3 = \$12$, so Ott has $\frac{3}{12} = \frac{1}{4}$ of the group's money. This same reasoning applies to any amount of money.

Difficulty: Hard

NCTM Standard: Grades 6-8 Problem Solving: Instructional programs from prekindergarten through grade 12 should enable all students to solve problems that arise in mathematics and in other contexts; apply and adapt a variety of appropriate strategies to solve problems;

Mathworld.com Classification:

Number Theory > Arithmetic > Fractions > Fraction

XIX. Facsimile of the AMC 8 front cover

THE MATHEMATICAL ASSOCIATION OF AMERICA
American Mathematics Competitions



20th Annual

AMC 8

(American Mathematics Contest 8)

Tuesday, NOVEMBER 16, 2004

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.

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XX. Certificate of Participation

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(Page 25)

The Mathematical Association of America
American Mathematics Competitions

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CERTIFICATE

Awarded to

for participating in the

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(AMC 8)

2005

Steven R. Dunbar

Director

American Mathematics Competitions



Bonnie Lettice

Chair

AMC 8 Subcommittee

The Mathematical Association of America
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