



The MATHEMATICAL ASSOCIATION OF AMERICA
American Mathematics Competitions

23RD ANNUAL

AIME

American Invitational Mathematics Examination

TEACHERS' MANUAL

Instructions and Reporting Forms for
School Contest Managers

Please read this booklet thoroughly

DO NOT OPEN the sealed package of exams until Tuesday, March 8, 2005, the date of the exam.
Your Principal or Vice Principal must be present at that time.

DATES TO REMEMBER

AIME - Tuesday, March 8, 2005

Alternate AIME - Tuesday, March 22, 2005

**PLEASE NOTE:
USAMO TEACHERS MANUAL ON FLIP SIDE**



The MATHEMATICAL ASSOCIATION OF AMERICA

American Mathematics Competitions

Prof. Steven R. Dunbar
Director

To All AIME Managers:

Please read this manual thoroughly so that there will be no misunderstanding regarding the AIME rules and regulations.

Please note our established policy for the official administration of the AIME. The AIME I can only be given officially on March 8th, and the AIME II can only be given officially on March 22, 2005. The exam should be scheduled from 9AM to 12 noon if possible.

All students who are in the top 5% of all American Mathematics Contest 12 (AMC 12) participants or score at least 100 points on the AMC 12 and those with a score in the top 1% of the American Mathematics Contest 10 (AMC 10) participants or score at least 120 points, are invited to take the AIME. The AIME is the second in the sequence of mathematics contests which leads to participation in the USA Mathematical Olympiad and the designation of Winners of the USAMO. The AIME is a 15-question, 3-hour examination. All answers are integers ranging from 000 to 999, inclusive. The score is the number of correct answers. There is neither partial credit nor a penalty for wrong answers.

I call your attention to several items found in this manual which answer inquiries I frequently receive from AIME Managers:

1. All administrations of the AIME **must** take place on the scheduled dates.
There will be a processing fee for the second AIME as follows: 1-10 students = \$25, 11+ students = \$50. We will need your payment before the answer forms can be graded. A special envelope and payment form will be included with your AIME material, if you have AIME qualifiers. All AIME answer forms must be returned by "express mail" so that they arrive in the AMC office by March 25, 2005.
2. Email requests for the second AIME may be sent to: **AIMEQUAL@AMC.UNL.EDU**
Or, you can call the AMC office at 1-800/527-3690. Please have your school identification number (CEEB) and charge card information available before calling. E-Mail requests should include the school's CEEB#, and complete mailing address.
3. Under no circumstances can a student take both AIME's.
4. In section VI you will find a discussion of how and when you will receive results.
5. On the reverse side of this Manual you will find a section relating to the USAMO. In this section you will find all the information and forms relevant to the taking of the USAMO. If you have had students qualify for the USAMO in the past, or you are anticipating this to be so this year, please look over this new material. REGARDLESS, do not throw this Manual away until you have received the results of this year's AIME. You may need the USAMO forms.
6. The second AIME on March 22, 2005 is a new set of 15 questions, completely different from, but comparable in difficulty, to the AIME on March 8, 2005.
7. Selection of USAMO participants will depend on the AMC 10/12 score, AIME score, and the grade level of the student.

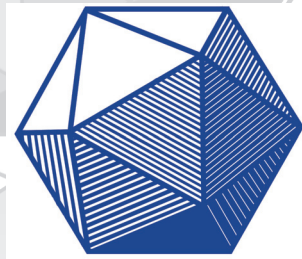
We feel that the 2005 AIME will be interesting and challenging to your student(s). On behalf of the Committee on the American Mathematics Competitions, I send my appreciation to you for assisting with the implementation of this examination.

Very sincerely,

Steven Dunbar, *Director*

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I. CONTENT OF PACKAGE

You will find enclosed, in addition to this Teachers' Manual, the following material:

- ✓ A list of your qualified AIME students.
- ✓ A sealed envelope containing one AIME for each of your qualified students and an extra copy for you. The AIME rules are printed on the envelope and in this manual. The envelope must NOT be opened until just before the examination is given on the authorized date, preferably during the morning hours. The penalty for opening the sealed envelope earlier is disqualification. In extreme cases where you cannot administer the AIME from 9 A.M.–12 noon, call or email the AMC office to request an academic integrity pledge form.
- ✓ AIME Answer Forms. *One for each participating student.*
- ✓ One AIME School Identification Form.
- ✓ One AIME Report Envelope.
- ✓ One Alternate AIME Payment Form (page 9 in this Manual) and Return Envelope

We will mail the Solutions for the AIME with your AIME school report.

II. POLICY ON AIME ADMINISTRATION

You must give the AIME on the official date (March 8th) to all students in the same place and at the same time; invited students who cannot be there miss this opportunity. **Be advised that if students miss the exam, Tuesday, March 8, 2005, they may take the alternate sitting of the exam, March 22, 2005. The second AIME on March 22, 2005 is a new set of 15 questions completely different from, but comparable to the AIME on March 8, 2005.**

If you need to have a student or students sit for the exam on March 22, read below for the applicable details and then contact the AMC office if you have questions. There is a minimal charge for the second exam due to compressed shipping considerations. These two dates will be the only dates acceptable for qualifying for the USAMO.

There is a processing fee for the second AIME as follows: 1–10 students = \$25, 11+ students = \$50. We need your payment before we grade the answer forms. A special envelope and payment form has been included with your AIME material. All Alternate AIME (AIME II) answer forms must be returned by “express mail” so that they arrive in the AMC office by March 25, 2005.

Email requests for the second AIME may be sent to:

AIMEQUAL@AMC.UNL.EDU

Or, you can call the AMC office at 800/527-3690. Please have your school identification number (CEEB) available before calling. E-mail requests should in-

clude the school's CEEB number and complete mailing address, teacher name, number of students taking the AIME II, and method of payment. The AMC office will send a confirmation of registration for the AIME II. Please note that you will be billed for all AIME II shipped, unless you cancel your order before March 8, 2005.

Under no circumstances can a student take both AIME's.

If one of your AIME qualified students is visually impaired and/or learning disabled please call the AMC office and we will discuss the options available to you. We do not have copies available in braille. The time allowance for students with learning disabilities is 4.5 hours.

III. INSTRUCTIONS PRIOR TO THE DAY OF THE CONTEST

1. Please study the contents of this Teachers' Manual.
2. Reserve a room for 3 1/2 hours from 8:45 AM – 12:15 PM to administer the AIME on Tuesday, March 8, 2005 from 9AM – 12 noon. This allows 15 minutes for pre- and post-examination activities and 3 hours for the examination itself.
3. Inform the students well in advance of the time and place. Urge them to prepare for the AIME by studying past AIME exams and solutions and other challenging problems. Refer to Order Form C–AIME ORDER FORM FOR PRIOR YEAR EXAMS on Page 7 in this manual for ordering information relating to prior year AIME exams.
4. Review the Examination Rules printed on the sealed envelope which contains the examination.
5. Obtain a supply of:
 - a. Number 2 lead pencils with good erasers
 - b. Unmarked scratch paper
 - c. Rulers, compasses, protractors, and graph paper.
6. **Calculators and Computers are NOT permitted.**
7. Complete the AIME School Identification Form using the instructions found on the Form.
8. Please study the AIME STUDENT ANSWER FORM. Have each student complete Side 1 of the Form using the instructions found on the Form. **Please carefully follow the marking instructions printed on both the identification and student answer forms, and double check to see that all the items are filled out correctly. Only the information which has been properly blackened will be read by the Opscan reader. Be sure to mark the AMC 10 or AMC 12 score in the appropriate area, including decimals if needed.**
9. The AIME Answer Form is now ready for distribution to your qualified students on Tuesday, March 8th.

10. Make arrangements to mail your AIME Report Envelope by First Class Mail (or Express Mail if taking the alternate date). *Please note that this is an oversized envelope and thus requires special postage even if it weighs one ounce or less.*

IV. INSTRUCTIONS FOR THE DAY OF THE AIME, TUESDAY, MARCH 8, 2005

1. Arrange for the Principal or Vice Principal to be present when you open the sealed envelope which contains the AIME(s).
2. Seat participants in alternate seats.
3. Ensure that each participant has the supplies listed on Item 5 under Section III.
4. Inform the students that they are not to open the exam booklet until instructed to do so.
5. Pass out the examination and have the students read the instructions on the front cover.
6. Next, distribute the AIME Answer Forms (which you or your students previously marked) to the students. Inform them that their answers should be marked **with a pencil** on SIDE 2 of the Form and that each problem has only one correct answer, an integer between 000 and 999 inclusive.
7. Read aloud the following instructions for recording answers to the problems:
 - a. For each question you answer, USING A #2 PENCIL, for your reference write your answer at the top of the problem answer columns using 3 digits, then in each of these columns blacken the one circle which is labeled with the digit you have written at the top. PLEASE NOTE: A single digit answer, such as 7, should be written and blackened as 007 and a two digit answer, such as 43, should be written and blackened as 043.
 - b. DO NOT BLACKEN ANSWERS UNTIL YOU ARE CERTAIN OF YOUR FINAL CHOICE. AVOID, IF POSSIBLE, ERASURES IN THE CIRCLES.
 - c. The results **will** be graded by computer. **Only the blackened circles will be graded.**
8. Ask the students if they have any questions about using the AIME Answer Form or about the instructions for the examination.
9. Start the Examination.
10. Check to see if each student is marking his/her Answer Form properly.
11. Allow exactly 3 hours working time.
12. If there is an urgent need to use a bathroom, inform the students that only one student may leave at one time and the AIME answer form and exam should be retained by you during the departure period. If there is a health or medical emergency

a backup exam manager should be available for such a contingency .

13. At the end of 3 hours, instruct the students to:
 - a. STOP.
 - b. Put aside the booklet and scratch paper and look again to be sure the AIME Answer Form has been filled out correctly.
 - c. **Be sure the written answers on the top of the AIME Answer Form are in agreement with the blackened circles' coded answers.**
 - d. Sign their name on Side 2 of the answer form.
 - e. Hand in the AIME Answer Form.
 - f. Keep the examination booklet for their reference in conjunction with your review of the Solutions. Inform the students that they may now leave the examination room.
14. Complete the Certification Form A and USAMO Information Form B found on pages 5 and 6.
15. Mail the material requested (See Section V) in the AIME REPORT ENVELOPE to the AMC Office, postmarked NO LATER THAN 24 HOURS AFTER THE EXAMINATION.
16. **Please note that if you have requested the "Alternate" AIME you will need to send your payment separately and in advance of the March 22nd test date.**

V. REPORTS AND EXAMINATION MATERIALS TO BE RETURNED

The following material should be sealed in the AIME Report Envelope and postmarked NO LATER THAN 24 hours after the examination is given:

1. Signed AIME Certification Form A and USAMO Information Form B.
2. AIME School Identification Form.
3. One AIME Answer Form for each participating student. ***Please do not paper clip or staple the forms together. Do not fold the forms.***

APO/FPO AND USA EMBASSY SCHOOLS must return materials by AIR EXPRESS MAIL (DHL, Federal Express, etc.).

VI. REPORT OF THE AIME RESULTS

The AIME score of your student(s), Certificates of Participation, an AIME Solutions Pamphlet and the list of USAMO selectees will be sent to you. **No AIME results will be given out by telephone until after March 28th.**

Please retain this report for future reference, either in your files or with the student counselor's office. Many students cite these scores on college applications.

VII. LIST OF THE SPONSORS OF THE AMERICAN MATHEMATICS COMPETITIONS

The

American Mathematics Competitions

are Sponsored by

The Mathematical Association of America — MAA www.maa.org/
University of Nebraska – Lincoln — UN-L www.unl.edu/

Contributors

The Akamai Foundation www.akamai.com
American Mathematical Association of Two Year Colleges – AMATYC www.amatyc.org/
American Mathematical Society — AMS www.ams.org/
American Society of Pension Actuaries — ASPA www.aspa.org/
American Statistical Association — ASA www.amstat.org/
Art of Problem Solving www.artofproblemsolving.com/
Canada/USA Mathpath — C/USA MP www.mathpath.org/
Canada/USA Mathcamp — C/USA MC www.mathcamp.org
Casualty Actuarial Society — CAS www.casact.org/
Clay Mathematics Institute — CMI www.claymath.org
Institute for Operations Research and the Management Sciences — INFORMS www.informs.org/
L. G. Balfour Co. www.balfour.com/
Mu Alpha Theta — MAT www.mualphatheta.org/
National Council of Teachers of Mathematics — NCTM www.nctm.org/
Pedagoguery Software Inc. www.peda.com/
Pi Mu Epsilon — PME www.pme-math.org/
Society of Actuaries — SOA www.soa.org/
U. S. A. Math Talent Search — USAMTS www.USAMTS.org/
W. H. Freeman and Company www.whfreeman.com/

FORM A – EXAMINATION CERTIFICATION 2005 AIME

The Examination Manager and the Principal, Vice Principal, or Headmaster must sign this form. Return it with your student Answer Forms.

Certification by the Principal, Official or person with comparable title:

- a) I certify that the exam package(s) were retained in their sealed condition within a half hour of the start of the examination;
- b) I accept for our school the rules and procedures described on this page and page 2, 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 _____

Certification by the Examination Manager:

I certify that the 2005 American Invitational Mathematics Examination was given today, Tuesday, March 8, 2005; that all students who took it did so at the same time and place; that only invited students took it; that the 3-hour time limit was strictly enforced; that the test envelope was sealed until the time of the test; that no student had access to the test questions in advance; that the students were continually supervised by a certified teacher while they were taking the test; that I am returning those materials as required in Section V; and that all other rules for administering the test were followed.

YES NO If no, describe the exceptions on a separate sheet of paper.

I also certify that I understand and accept the following for our school. The Committee on the American Mathematics Competitions reserves the right to:

1. Disqualify all scores from our school if it is determined that the required security procedures were not followed.
2. Re-examine students if, after an inquiry, there is a reasonable basis to believe that the scores do not validly represent the ability of the students. (The procedures for disqualification, follow-up inquiries and re-examination are similar to those for the AMC 10 and AMC 12, as outlined in the AMC 10/12 Teachers' Manual.)

Signature of AIME School Manager _____

Date _____ School Telephone # _____

Name of School _____

State _____

School Identification Number (CEEB) _____

The AIME was administered on **March 8, 2005** **YES** please circle **NO**

Starting Time _____ Ending Time _____

Please also complete the **OLYMPIAD INFORMATION Form B**, found on Page 6.

FORM B – USAMO INFORMATION FORM

When a student qualifies for the United States of America Mathematical Olympiad (USAMO), both the student and the USAMO School Manager are notified at least one week before the USAMO date. Don't worry about an invitation getting lost in the mail. When a USAMO invitation is extended, both the student and the USAMO School Manager must complete and return a USAMO Response Form. If the Form is not returned, we do a follow-up.

Please provide the information requested below if you agree to administer the USAMO. There is no fee for participating in the USAMO.

AGREEMENT STATEMENT:

In the event that I have a qualifying student(s), I or my designee (indicated below) agree to:

1. Serve as the USAMO School Manager.
2. Administer the USAMO on **Tuesday, April 19th** , and **Wednesday, April 20th, 2005**, to the student(s) in my school who qualify and not to any other students.
3. Arrange for the exclusive use of a room for four and a half hours (from 12:30 p.m. to 5:00 p.m., eastern daylight time or your time zone equivalent, see below) on the designated days which will be used to administer the USAMO.
4. Be present in the room to supervise the student(s) during the entire nine hours duration of the examination.
5. Have the ability to fax the students answer sheets to the central location immediately, to be graded with the rest of the papers at the central location.

I understand that results of my participating USAMO students could be voided if the rules and procedures associated with the administration of the USAMO are not followed.

Signature _____

Telephone Number _____ Date _____

Name of USAMO School Manager _____

eMail _____

School _____ CEEB#: _____

City _____ State _____ Zip _____

PLEASE NOTE THIS YEARS 4.5 HOURS PER DAY TIME LENGTH AND 2 DAYS LENGTH FOR THE 2005 USAMO:

TUESDAY, April 19, 2005

- 12:30–5:00 p.m., Eastern Daylight Time
- 11:30–4:00 p.m., Central Daylight Time
- 10:30–3:00 p.m., Mountain Daylight Time
- 9:30–2:00 p.m., Pacific Daylight Time

&

WEDNESDAY, April 20, 2005

- 12:30–5:00 p.m., Eastern Daylight Time
- 11:30–4:00 p.m., Central Daylight Time
- 10:30–3:00 p.m., Mountain Daylight Time
- 9:30–2:00 p.m., Pacific Daylight Time

FORM C – AIME ORDER FORM FOR PRIOR YEARS EXAMS

If you wish to order any of these publications complete the order form below and mail to:
 American Mathematics Competitions, ATTN: Publications, PO Box 81606, Lincoln ,NE 68501-1606.
 To expedite delivery you may fax your order (402-472-6087). **VISA & MASTERCARD accepted.** (Call 1-800-527-3690).

For each publication below write the quantity of each you wish to order in the blank beside the year or volume

AMERICAN INVITATIONAL MATHEMATICS EXAMINATION

1989_____1990_____1991_____1992_____1993_____

1994_ NA _1995_____1996_____1997_____1998_____1999_____

From 2000 on there were 2 versions of the AIME given:

| | | | | | |
|--------|-------|-------|-------|-------|-------|
| | 2000 | 2001 | 2002 | 2003 | 2004 |
| AIME 1 | _____ | _____ | _____ | _____ | _____ |
| AIME 2 | _____ | _____ | _____ | _____ | _____ |

Total quantity of AIMEs_____ @ \$ 2.00 = \$ _____

Minimum Order \$10.00 (Before Postage)

Subtotal \$ _____

| | <u>ORDER TOTAL</u> | <u>SHIPPING CHARGE</u> | |
|---------------------------------------|--------------------|------------------------|--|
| U.S.A. & CANADIAN POSTAGE: | \$10.00--\$40.00 | \$7.00 | |
| | \$40.01--\$50.00 | \$9.00 | |
| | \$50.01--\$75.00 | \$12.00 | |
| | \$75.01--UP | \$15.00 | |

| | | | |
|-------------------------------|----------------|---------|----------|
| INTERNATIONAL POSTAGE: | Under 2 pounds | \$30.00 | |
| | Over 2 pounds | \$50.00 | \$ _____ |

PAYABLE ONLY IN U.S. FUNDS **\$\$\$ GRAND TOTAL** \$ _____

ORDER RECORD (Please Print)

CEEB # _____

Name _____

School _____

City _____

State _____

Zip _____

VISA or MASTERCARD Number: _____

Exp. Date _____

Cardholder Signature _____

Email _____

**Your comments
welcome!**

FORM D – ALTERNATE AIME PAYMENT FORM

2005 *Alternate* AIME

Tuesday, March 22, 2005

The Alternate AIME on March 22, 2005 is a new set of 15 questions, completely different from, but comparable to the AIME on March 8, 2005. Please send payment before March 22, 2005.

PLEASE PRINT

School CEEB #

Contest Manager: _____

School Name: _____

School Address: _____

City: _____ State: _____ Zip: _____

School Phone #: _____

E-mail: _____

There will be a processing fee for the second AIME as follows: 1-10 students = \$25, 11+ students = \$50. We will need your payment before the answer forms can be graded. A special envelope and payment form has been included with your AIME material. All AIME answer forms must be returned by "express mail" so that they arrive in the AMC office by March 25, 2005.

Number of AIME qualifiers who will be taking the *Alternate* AIME on Tuesday, March 22, 2005:

Number of Alternate Exams Requested: # _____

1-10 student qualifiers @ \$25.00 = \$ _____

OR

11+ student qualifiers @ \$50.00 = \$ _____

Method of Payment:

Check enclosed (US funds only) made payable and mailed with this form in the BUSINESS REPLY/postpaid envelope provided:

AMERICAN MATHEMATICS COMPETITIONS

University of Nebraska-Lincoln

PO Box 880658

Lincoln, NE 68588-0658

Charge to Visa/Mastercard #: _____

Name on card (print): _____

Signed: _____

Expiration Date: _____ Telephone: _____

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VIII. FASCIMILE OF THE MARCH 8, 2005 AIME FRONT COVER

MATHEMATICAL ASSOCIATION OF AMERICA
AMERICAN MATHEMATICS COMPETITIONS



23rd Annual

AMERICAN INVITATIONAL
MATHEMATICS EXAMINATION
(AIME)

Tuesday, March 8, 2005

1. DO NOT OPEN THIS BOOKLET UNTIL YOUR PROCTOR GIVES THE SIGNAL TO BEGIN.
2. This is a 15-question, 3-hour examination. All answers are integers ranging from 000 to 999, inclusive. Your score will be the number of correct answers; i.e., there is neither partial credit nor a penalty for wrong answers.
3. No aids other than scratch paper, graph paper, ruler, compass, and protractor are permitted. In particular, calculators and computers are not permitted.
4. A combination of the AIME and the American Mathematics Contest 10 or the American Mathematics Contest 12 scores are used to determine eligibility for participation in the U.S.A. Mathematical Olympiad (USAMO). The USAMO will be given on TUESDAY and WEDNESDAY, April 19 & 20, 2005.
5. Record all of your answers, and certain other information, on the AIME answer form. Only the answer form will be collected from you.

The publication, reproduction or communication of the problems or solutions of the AIME during the period when students are eligible to participate seriously jeopardizes the integrity of the results. Duplication at any time via copier, telephone, email, world wide web, or media of any type is a violation of the competition rules.

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