

# USAMO Table of Contents

<b>I. The USAMO – General Information .....</b>	<b>2</b>
<b>II. Preliminary Information for the Proctor .....</b>	<b>2</b>
<b>III. Information for the 2 Days of the USAMO .....</b>	<b>3</b>
<b>IV. Cancellation .....</b>	<b>4</b>
<b>V. Math Olympiad Winners .....</b>	<b>4</b>
<b>VI Mathematical Olympiad Summer Program .....</b>	<b>4</b>
<b>VII. The International Mathematical Olympiad .....</b>	<b>4</b>
<b>VIII. USAMO Teacher &amp; Student Forms .....</b>	<b>5</b>
<b>T-II – 2005 USAMO Acknowledgement Response Form .....</b>	<b>5</b>
<b>T-III (19) – CERTIFICATION FORM for APRIL 19, 2005 .....</b>	<b>7</b>
<b>T-III (20) – CERTIFICATION FORM for APRIL 20, 2005 .....</b>	<b>9</b>
<b>S-I – Letter to USAMO Qualifier .....</b>	<b>11</b>
<b>S-II – Instructions to be Read by USAMO Participants .....</b>	<b>12</b>
<b>S-III – Student/Parent Response Form .....</b>	<b>13</b>
<b>S-IV – USAMO Publications Order Form .....</b>	<b>15</b>
<b>IX. USAMO Answer Sheets .....</b>	<b>17</b>
<b>Problem 1      17</b>	
<b>Problem 2      19</b>	
<b>Problem 3      21</b>	
<b>Problem 4      23</b>	
<b>Problem 5      25</b>	
<b>Problem 6      27</b>	



## USAMO 2005 Teacher Manual



### I. THE USAMO – GENERAL INFORMATION

The 2005 USA Mathematical Olympiad (USAMO) is to be given in your school, and is scheduled for Tuesday & Wednesday, **April 19 & 20, 2005**.

U. S. citizens and students legally residing in the United States and Canada (with qualifying scores) are eligible to take the USAMO.

The format for the USAMO is identical to the format used for the International Mathematical Olympiad. The Olympiad will consist of six essay-proof questions to be solved over two days in nine hours, three questions for 4.5 hours on Tuesday, and three questions for 4.5 hours on Wednesday.

The top 12 scoring students on the USAMO will be invited to an award ceremony held in Washington, D.C., June 26-27, 2005. The USA International Mathematical Olympiad (IMO) Team will be chosen at the Mathematical Olympiad Summer Program (MOSP, June 8-July 2, 2005) after further testing.



We recommend that students selected for the USAMO practice on prior year examinations. For your convenience a USAMO Publication Order Form S-IV (page 15) is found in the student section of this manual.

The selection of the USAMO participants will be made on or before Monday, March 28. All selected students and their School Manager will receive a letter of invitation, to be mailed out during the week of March 28<sup>th</sup>-April 1<sup>st</sup>, or before. Please do not inquire about the USAMO invitations with anyone except the AMC Director, and do not phone prior to Thursday, March 31<sup>st</sup>.

The USAMO must be taken on the official days under the supervision of a certified professional educator--absolutely no exceptions. It is possible, however, for a student to take

the test under the supervision of a teacher at a site other than the student's school for valid reasons. The student's teacher must call the AMC national office for permission.

Selection for the USAMO will be made according to the following rules:

1. The goal is to select about 250 of the top scorers from this year's AIME and AMC 12A, AMC 12B, AMC 10A and AMC 10B contests to participate in the USAMO.
2. Selection will be based on the USAMO index which is defined as 10 times the student's AIME score plus the student's score on the AMC 12 or the AMC 10.
3. The first selection will be the approximately 160 highest USAMO indices of students taking the AMC 12A or AMC 12B contest.
4. The lowest AIME score among those 160 first selected will determine a floor value. The second selection of approximately 80 USAMO participants will be among students in the 10<sup>th</sup> grade and below who received an AIME score at least as high as the floor value. If there are more than 80 young students with a score above the floor value, then approximately 80 students will be selected with the USAMO index.
5. The student with the highest USAMO index from each state, territory, or U.S. possession not already represented in the selection of the first and second groups will be invited to take the USAMO.
6. To adjust for variations in contest difficulty, the number of students selected from A & B contests will be proportional to the number of students who took the A & B Contests.
7. The selection process is designed to favor students who take the more mathematically comprehensive AMC 12A and AMC 12B contests.

In advising students who desire to be selected for the USAMO whether to take the AMC 12 level contests or the AMC 10 level contests, past statistics show that it is to their advantage to take the AMC 12 level contests.

### II. PRELIMINARY INFORMATION FOR THE PROCTOR

The USAMO Committee has a very tight schedule. We grade the papers on April 22<sup>nd</sup>, 23<sup>rd</sup> & 24<sup>th</sup>, posting results on April 29, 2005. Your help is vital.

The USAMO is to be given on Tuesday, April 19 and Wednesday, April 20, 2005, in two 4.5-hour sessions. The first session (Problems 1, 2, 3) is scheduled for Tuesday, April 19<sup>th</sup> and will begin at 12:30 p.m. EDT and end at 5:00 p.m. EDT or equivalent in your time zone. The second session (Prob-

## USAMO 2005 Teacher Manual



lems 4, 5, 6) is scheduled for Wednesday, April 20<sup>th</sup> and will begin at 12:30 p.m. EDT and end at 5:00 p.m. EDT or equivalent in your time zone. The 9-hour time limit is to be strictly enforced. Students should come prepared with a sack lunch and/or snacks due to no lunch break during the exam (Exceptions will be made for restroom breaks). Be sure that in the room you reserve for the exam, the student(s) will have ample working space and freedom from interruptions. *The student(s) must be under supervision during the entire course of the exam and only one student at a time may leave for restroom breaks.* If you have more than one student who qualified, be certain there is adequate space between them.

You will find the following materials included in your AIME/USAMO Teachers Manual or on our website at [www.unl.edu/amc](http://www.unl.edu/amc) :

1. T-II – 2005 USAMO ACKNOWLEDGEMENT RESPONSE FORM (page 5)

**Comment:** This Form and the S-III – Student/Parent Response Form (page 13) must be returned to the AMC Office so that it is received by April 13. We suggest Faxing 303/374-6339 if at all possible (Emergency Fax # 402/472-6087). All information requested on these forms must be provided by you, the student and his/her parents. Missing or incorrect information could cause disqualification of your student(s).

2. Copy (for your information) of the “S-I – Letter to USAMO Qualifier” (page 11), “S-II – Instructions to be Read by USAMO Participants” (page 12) and “S-III Student/Parent Response Form” (page 13).

3. Follow these instructions to download the 2005 USAMO from the internet:

- Use a computer to visit the Web. We have a trial page in place, so you can check your ability to download the exam.
- Log on to our web page <<http://www.unl.edu/amc>>
- On our home page under the heading **What's New** <<http://www.unl.edu/amc/>> there will be a link to the USAMO Questions page. There will also be a link from the USAMO page

4. T-III – USAMO Certification Forms (pages 7 & 9) . There are two forms, one to be used each day of the Contest.

5. S-IV – Publications Order Form (page 15)

6. USAMO Answer Sheets Forms (to be copied, 1 set for each student) (in section IX, starting on page 17, but unnumbered).

### III. INFORMATION FOR THE 2 DAYS OF THE USAMO

Please note this year's USAMO 2 day format:

April 19 & 20, 2005

and the 4.5 hour length both days, given at the following times:

- 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

The USAMO will be posted on the web 15 minutes prior to the start time. Please tell students to stay within the borders when writing their solutions and to write **darkly** so the faxed copy can be clearly read. If requested, you may let the participant have unmarked scratch paper. If, for any reason, the student submits scratch paper instead of, or in addition to, an answer form, the Problem Number and the Student Number, but NOT the student's name or school, must be on each page submitted. All papers must be anonymous at the time of the grading. You are not permitted to answer any questions about the test and should ensure that no participant has the opportunity to talk to any other student while the exam is in progress. No notes, books, headphones, slide rules, mathematical tables, computers, calculators or calculator watches are allowed during the exam. The only instruments permitted are writing and drawing instruments (ruler, compass, protractor, graph paper, carbon paper). Students learning English as a second language, who are taking the USAMO for the first time, are permitted to use a non-technical translation dictionary during the exam. However, you must examine and keep the dictionary in your possession for the 24 hours preceding the USAMO, and you must announce to any other participants that the student has been given special permission to use the dictionary. Please list the name(s) of any student planning to use a non-technical translation dictionary on page T-II.

Neither the problems nor the student's solutions should be machine copied. **The USAMO is copyrighted.**



## USAMO 2005 Teacher Manual

Instruct the participant to cease writing at the end of each exam session. Session 1 ends at 5:00 p.m. EDT (or equivalent in your time zone) on April 19, 2005 and session 2 ends at 5:00 p.m. EDT (or equivalent in your time zone) on April 20, 2005. At the end of each session instruct your students to double-check that the student number on their answer forms matches the number assigned in the official invitation letter. Next, immediately Fax (303/374-6339) the papers to the AMC Office. Send one complete fax transmission per student, with appropriate accompanying T-III form. Please fax at least one official USAMO answer sheet with student number for each problem, even if the answer sheet is blank because the student did not attempt a solution. This assures that we have received all problems from all students.

If you have any questions concerning this exam, you may call or Fax:

AMC Office  
1-800-527-3690  
FAX 303/374-6339  
(Emergency FAX # 402/472-6087)

### IV. CANCELLATION

If for some reason the student or school cancels participation, call us immediately (1-800-527-3690).

### V. MATH OLYMPIAD WINNERS

The top 12 scoring students on the USAMO will be invited to attend an award ceremony held in Washington, D.C. June 26-27, 2005. Activities include a reception at the Mathematical Association of America Headquarters, a tour of the National Science Foundation, meetings with members of Congress, a reception at the National Academy of Sciences, and a celebration dinner with the mathematical sciences community at the U.S. Department of State Building.

### VI MATHEMATICAL OLYMPIAD SUMMER PROGRAM

The top 12 scoring students on the USAMO will be invited to attend the Mathematical Olympiad Summer Program regardless of grade. In addition to the top 12 USAMO winners, 12-

18 high-scoring USAMO participants, who are current juniors and below, will also be invited to participate in the Mathematical Olympiad Summer Program (MOSP).

Thanks to a grant from the Akamai Foundation, we will invite an additional (approximately) 30 ninth-grade USAMO participants for a MOSP program aimed at preparing them for Olympiad style competitions.

The Mathematical Olympiad Summer Program will be held on the campus of the University of Nebraska - Lincoln June 8-July 2, 2005. Students will be treated to classes on advanced mathematical topics, special guest speakers, mathematical contest training, and related social and mathematical activities.

During the first week of MOSP a final "IMO" type exam will be given to the top 12 USAMO students with the goal of identifying the USA IMO team. This exam will replicate an actual IMO and will consist of 6 problems to be solved over two 4 1/2 hour sessions. The 12 equally weighted problems (6 on USAMO and 6 on this exam) will determine the tentative USA Team.

In order to assure that the strongest possible team has been formed, the MOSP Director/IMO Team Leader reserves the right to appoint up to one IMO team member. This appointment would happen only in a circumstance where a student's performance during the first two weeks of MOSP clearly surpasses that of an existing team member.

### VII. THE INTERNATIONAL MATHEMATICAL OLYMPIAD

Each year (Mexico in 2005, Slovenia in 2006) the USA sends a team of six students to the International Mathematical Olympiad (IMO). Six of the top students on the 2005 USAMO will constitute the U.S.A.'s team, and the next two will be the alternates.



# VIII. USAMO TEACHER & STUDENT FORMS

## T-II – 2005 USAMO ACKNOWLEDGEMENT RESPONSE FORM

To be completed by the USAMO Exam Manager

This form must be completed by the USAMO exam manager and returned to the AMC Office either by FAX 303/374-6339 (Emergency FAX 402/472-6087) or mail. Confirmation (either by fax or postal mail) must be received **on or before April 13, 2005**.

\*\*\*\*\*

This is to inform you that I have received official notification of the qualified student(s) and will strictly follow the implementation instructions.

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Name (print): \_\_\_\_\_

Email: \_\_\_\_\_

Name of School: \_\_\_\_\_

CEEB: \_\_\_\_\_

School Address: \_\_\_\_\_

\_\_\_\_\_ Zip \_\_\_\_\_

School Phone: (\_\_\_\_) \_\_\_\_\_

School Fax: (if available) (\_\_\_\_) \_\_\_\_\_

Please print the name(s) and USAMO number(s) of your student(s) participating in the 2005 USAMO below:

_____	_____
<small>Name /</small>	<small>USAMO number</small>
_____	_____
_____	_____

The following student(s) will be using a non-technical translation dictionary during the examination:

**This Page  
Intentionally Left Blank**

**USAMO 2005 Teacher Manual**  
**MAA American Mathematics Competitions U.S.A. Mathematical Olympiad**

**T-III (19) – CERTIFICATION FORM FOR APRIL 19, 2005**

Please fill out one form for each student you have participating in the USAMO.

Please print the name and USAMO Number of your student participating in the 2005 USAMO below:

Name

USAMO number

\_\_\_\_\_

\_\_\_\_\_

This form must be completed and returned by fax (303/374-6339) to the AMC Office immediately following the administration of the USAMO. Both the USAMO School Exam Manager and the school Principal or Vice Principal must sign this form. The Principal or Vice Principal must sign at the time he or she observes the downloading of the exam. The Exam Manager must wait until all aspects of the exam process of the school have been completed.

For the Principal or Vice Principal:

I Certify that

- a) I witnessed the downloading of the test at the start of the examination;
- b) I further attest that I observed that the exam was given only to qualified students;
- c) I accept that failure to follow these rules and procedures could result in DISQUALIFICATION from official standing of all scores from our school

Signature \_\_\_\_\_

Time \_\_\_\_\_

Title \_\_\_\_\_

Date \_\_\_\_\_

(must be comparable to Principal or Vice Principal)

**For the USAMO School Exam Manager:**

I certify that I administered the USAMO on Tuesday, April 19, 2005 from 12:30 p.m.-5:00 p.m. EDT or equivalent in my time zone. The 4.5-hour time limit was strictly enforced. The student(s) was/were continually supervised. All other rules for administering the USAMO, as detailed in the Information for Proctor, were followed.

I understand and accept for our school that any exception to these procedures as outlined on the *USAMO Exam Manager Letter* and the *Information for Proctors* section, unless explicitly authorized in advance, may be cause for disqualification, possibly extending beyond the current year.

Signature of USAMO Exam Manager \_\_\_\_\_

Day and Date of Signature \_\_\_\_\_

Your telephone # at School (\_\_\_\_\_) \_\_\_\_\_

Email \_\_\_\_\_

Name of School \_\_\_\_\_

School Address \_\_\_\_\_

\_\_\_\_\_ Zip \_\_\_\_\_

Day and Date USAMO was administered \_\_\_\_\_

Start Time \_\_\_\_\_ End Time \_\_\_\_\_

**This Page  
Intentionally Left Blank**



**USAMO 2005 Teacher Manual**  
**MAA American Mathematics Competitions U.S.A. Mathematical Olympiad**  
**T-III (20) – CERTIFICATION FORM FOR APRIL 20, 2005**

Please fill out one form for each student you have participating in the USAMO.

Please print the name and USAMO Number of your student participating in the 2005 USAMO below:  
Name \_\_\_\_\_ USAMO number \_\_\_\_\_

This form must be completed and returned by fax (303/374-6339) to the AMC Office immediately following the administration of the USAMO. Both the USAMO School Exam Manager and the school Principal or Vice Principal must sign this form. The Principal or Vice Principal must sign at the time he or she observes the downloading of the exam. The Exam Manager must wait until all aspects of the exam process of the school have been completed.

For the Principal or Vice Principal:

I Certify that

- a) I witnessed the downloading of the test at the start of the examination;
- b) I further attest that I observed that the exam was given only to qualified students;
- c) I accept that failure to follow these rules and procedures could result in DISQUALIFICATION from official standing of all scores from our school

Signature \_\_\_\_\_ Time \_\_\_\_\_

Title \_\_\_\_\_ Date \_\_\_\_\_  
(must be comparable to Principal or Vice Principal)

**For the USAMO School Exam Manager:**

I certify that I administered the USAMO on Wednesday, April 20, 2005 from 12:30 p.m.-5:00 p.m. EDT or equivalent in my time zone. The 4.5-hour time limit was strictly enforced. The student(s) was/were continually supervised. All other rules for administering the USAMO, as detailed in the Information for Proctor, were followed.

I understand and accept for our school that any exception to these procedures as outlined on the *USAMO Exam Manager Letter* and the *Information for Proctors* section, unless explicitly authorized in advance, may be cause for disqualification, possibly extending beyond the current year.

Signature of USAMO Exam Manager \_\_\_\_\_

Day and Date of Signature \_\_\_\_\_

Your telephone # at School (\_\_\_\_\_) \_\_\_\_\_

Email \_\_\_\_\_

Name of School \_\_\_\_\_

School Address \_\_\_\_\_

\_\_\_\_\_ Zip \_\_\_\_\_

Day and Date USAMO was administered \_\_\_\_\_

Start Time \_\_\_\_\_ End Time \_\_\_\_\_

**This Page  
Intentionally Left Blank**



Prof. Steven R. Dunbar  
Director

**USAMO 2005 Teacher Manual**  
The MATHEMATICAL ASSOCIATION OF AMERICANS  
**American Mathematics Competitions**

**SAMPLE**

**S-I – LETTER TO USAMO QUALIFIER**

April 2005

Dear USAMO Qualifier,

Congratulations! Because of your excellent performance on the 2005 AMC 10/12 and AIME, you have qualified to take the 34<sup>th</sup> U.S.A. Mathematical Olympiad (USAMO). Your teacher will be notified shortly of your AIME score and the final cutoff levels for a USAMO invitation. Since both you and your school indicated at the time of the AIME that you would accept a USAMO invitation, the exam will be posted on the Internet to be downloaded each day of the exam. A trial question will be posted one week before the USAMO for teachers & students to practice obtaining & downloading. Please notify your USAMO Exam Manager (math teacher or mathematics department chair) that you have received this letter and immediately complete the Form S-III (along with your parent or guardian) from the AIME/USAMO Teachers Manual or downloaded from our website at [www.unl.edu/amc](http://www.unl.edu/amc). **The completed S-III Form must be FAXED to 303/374-6339 (Emergency FAX # to be used only if the first number fails is 402/472-6087) or mailed so that it is received by us on or before April 15.**

**The USAMO will be given on Tuesday, April 19 and Wednesday April 20, 2005, in two 4.5-hour sessions each day, which are to be scheduled from 12:30 p.m.-5:00 p.m. EDT or equivalent in your time zone.** Enclosed is an instruction sheet (Form S-II), which you should look over now and shortly before taking the exam. The USAMO is a prestigious event. Only about 250 students from about 12,000 American Invitational Mathematics Examination participants are invited to take the USAMO. The top 12 participants will be declared Winners and honored at ceremonies on June 26 and June 27, 2005 at the National Academy of Sciences, the National Science Foundation and the Mathematical Association of America (MAA) Headquarters in Washington, DC.

A Mathematical Olympiad Summer Program (MOSP) will be held from June 8-July 2, 2005 at the University of Nebraska-Lincoln. Approximately 30 of the highest scoring USAMO participants will be invited, along with an additional (approximately) 30 ninth grade USAMO participants, all expenses paid, to the 2005 program. Selection will be based on the exams administered by the committee on the American Mathematics Competitions (CAMC), primarily the USAMO. This year, the International Mathematical Olympiad (IMO), will be held July 8-19, 2005 in Merida, Mexico. The United States will participate with a team of 6 students, all expenses paid. The six member IMO Team will be selected from the top 12 USAMO qualifiers after further testing at MOSP.

USAMO Winners, and all those invited to the MOSP will be notified by telephone shortly after the USAMO grading on April 22, 23, and 24, 2005. Information regarding the MOSP will be sent to those selected beginning on Monday, April 25<sup>th</sup>. A copy of the USAMO with solutions and results (including your score) will be mailed to your USAMO Exam Manager on Wednesday, April 27<sup>th</sup>. Also included will be a USAMO Certificate of Participation to be presented to you. Students and teachers should **not** inquire about results before Friday, April 29, 2005.

Keep in mind that it is an achievement of the highest order merely to have qualified for the USAMO. You should **not** be discouraged if you find problems on the USAMO to be extremely challenging. A good way to prepare for the USAMO and set appropriate goals for yourself is to work on previous USAMO and IMO problems and to study the content of the Arbelos Journals. Please use the Publication Order Form (from our website [www.unl.edu/amc](http://www.unl.edu/amc) or the AIME/USAMO Teachers Manual) if you wish to order practice materials.

I look forward to your participation in the USAMO.

Sincerely,

Steven R. Dunbar  
AMC Director

University of Nebraska – Lincoln ■ P. O. Box 880658 ■ 1740 Vine Street ■ Lincoln, NE 68588-0658

Phone: 402/472-2257 ■ Fax: 402/472-6087 ■ email: [amcinfo@unl.edu](mailto:amcinfo@unl.edu) ■ <http://www.unl.edu/amc>

## USAMO 2005 Teacher Manual

MAA American Mathematics Competitions U.S.A. Mathematical Olympiad

### S-II – INSTRUCTIONS TO BE READ BY USAMO PARTICIPANTS

1. The space in the upper right-hand corner of your answer sheets is for your **Student Number**. You and your USAMO proctor will be informed by mail of your assigned student number. The number at the top center is the **Problem Number**. Do NOT write your name or school anywhere on the answer sheets; all your papers must be anonymous at the time of the grading. Write only your Student Number and Problem Number (in a similar location) on any additional papers you hand in.
2. There are six equally weighted problems, for which you will be allowed a total of **nine hours**. **You will be allowed 4.5 hours on Tuesday April 19, 2005 (12:30 p.m. -5:00 p.m. EDT or equivalent in your time zone) for Problems 1, 2 and 3, and 4.5 hours on Wednesday April 20, 2005 (12:30 p.m. -5:00 p.m. EDT or equivalent in your time zone) for Problems 4, 5 and 6.** Each problem should be started on the corresponding numbered answer sheet. You may write on only the front of the sheet. During each session, carefully look over all the problems. Then work on those which you can work well or start well. Concurrently, be aware of the total time you allocate to each problem.
3. You will be scored on your method of attack, clarity of reasoning, evidence of ingenuity, inventiveness, and general insight. In order to obtain full credit, all the claims in your solution must be PROVED. When in doubt, you should include details rather than leave them out. Examination of special cases or generalizations may lead to fruitful ideas on how to begin a problem, and partial credit may be given for constructive progress toward a solution. An unusually elegant proof or a carefully stated non-trivial extension with proof may play a role in breaking an eventual tie.
4. Your papers should be CLEAR, CONCISE and COMPLETE, since GOOD PRESENTATION counts. This includes MATHEMATICAL CLARITY, GOOD ENGLISH and LEGIBILITY. Points will be deducted for inadequate or poorly written explanations, as well as for incorrect mathematics. Therefore, use scratch paper freely before writing the solutions you submit, and submit ONLY the final work you wish to have graded. Solutions written in languages other than English will not be graded. Please leave a 1" margin on all sides of the Answer Sheet and on any additional pages and write darkly so your faxed copy can be easily read.
5. **NO** notes, headphones, cell phones, books, slide rules, mathematical tables, calculators or calculator watches are allowed during the exam. The only instruments permitted are writing and drawing instruments (ruler, compass, protractor, graph paper, carbon paper). Recent eligible immigrants who are taking the USAMO for the first time are permitted to use a non-technical translation dictionary during the exam. However, the proctor must examine and keep the dictionary in his or her possession for the 24 hours preceding the USAMO. Your solutions must be faxed to 303/374-6339 immediately at 5:00 p.m. EDT or equivalent in your time zone each day.
6. The USAMO will be administered in two sessions. Students should come prepared with a sack lunch and/or snacks because there is no lunch break during the exam (Exceptions will be made for restroom breaks). Your proctor is required to be present during the entire course of the exam for your papers to be valid, but is not permitted to answer any questions about the test. You are not allowed to talk to any other student while the exam is in progress. If you feel that a problem is not stated clearly, note this on your answer sheet and try to make a non-trivial restatement of the problem. Then try to solve the restated problem.
7. You will start the exam when your proctor gives the signal. When the proctor announces **after each session** that 4.5 hours are up, **immediately cease writing**. Double-check that your Student Number on your answer sheets matches with the one assigned by mail. Next, **immediately hand all Answer Sheets to the USAMO Proctor (even if some sheets are blank) to be faxed to the AMC office.**
8. You may keep the USAMO problem sheets. An additional copy of the USAMO, a set of solutions, and the USAMO results (including your score interval) will be mailed to your USAMO Exam Manager on Wednesday, April 27, 2005.
9. The USAMO is graded more strictly than most school examinations, so it is typical for students to overestimate the scores they will receive. The decisions of the graders are final and may not be appealed.

**USAMO 2005 Teacher Manual**

**S-III – STUDENT/PARENT RESPONSE FORM**

This Form must be completed by each USAMO student and his or her parent/guardian and returned by FAX 303/374-6339 (Emergency FAX 402/472-6087) or mailed to the AMC Office so that it is received on or before April 13.

Complete all items carefully.

\*\*\*\*\*

**Section A- USAMO Participant High School Certification**

I certify that my last month as a regular high school student, either due to graduation or to early enrollment in a college degree program, will be no sooner than \_\_\_\_\_.  
(Month and year)

Students who are not citizens of the USA are eligible to participate in the USAMO if they are legal residents in the U.S.A. or Canada.

CITIZENSHIP Status: USA Citizen\_\_\_\_\_ Legal Resident of U.S.A.\_\_\_\_\_or Canada\_\_\_\_\_

Date of Birth\_\_\_\_\_Place of Birth\_\_\_\_\_

Signed\_\_\_\_\_Date:\_\_\_\_\_  
USAMO Participant

Verified by:\_\_\_\_\_Date:\_\_\_\_\_  
Parent/Guardian

\*\*\*\*\*

**Section B  
USAMO/IMO PARTICIPATING STUDENT (American Citizen or Legal Resident)**

I have read the "Instructions to Participate-Form S-II" and my teacher has made arrangements for me to take the USAMO on Tuesday, April 19, 2005 and Wednesday April 20, 2005.

- #1 Circle one: If invited, I (am or am not) willing to attend the 2005 Mathematical Olympiad Summer Program (June 8-July 2).
- #2 Circle one: I (am or am not) able to present proof of United States citizenship or Permanent Residency.
- #3 Circle one: If invited, I (am or am not) willing to serve as a USA Team Member at the IMO, July 8-19, 2005 in Merida, Mexico.

Signature:\_\_\_\_\_Date:\_\_\_\_\_

Home phone(\_\_\_\_)\_\_\_\_\_Email:\_\_\_\_\_

Full Name (please print, including initial):  
\_\_\_\_\_

May/June Mailing Address \_\_\_\_\_

\_\_\_\_\_Zip\_\_\_\_\_

**This Page  
Intentionally Left Blank**



# USAMO 2005 Teacher Manual

## S-IV – USAMO PUBLICATIONS ORDER FORM

To: All USAMO Exam Managers and Participants

From: Steven Dunbar

Congratulations on being selected to participate in the USAMO! For learning and practice, many fine books are available from the MAA at [www.maa.org](http://www.maa.org), click "Bookstore," or from your favorite on-line book retailer. You may also purchase selected Olympiads and/or Arbelos Journals, I urge you to order a set for practice and review. If you wish to order copies of these materials, please complete the form given below. All orders will be sent UPS or DHL "overnight". **RUSH** ordering may be accomplished by using Visa/MasterCard. Call 402/472-2257 or FAX your order to 402/472-6087.

### Order Record

Name \_\_\_\_\_ City, State, Zip \_\_\_\_\_

Item	#	Total Cost
USAMO- IMO Pamphlets @ \$5 each per year. (Years available 1989, 1992, 1993, 1994 Includes problems and solutions.)	List years & No. Ordered	\$
THE ARBELOS JOURNAL-Volumes 1-5 @ \$8 each (problems and articles on Olympiad topics)	List Volumes Ordered	\$
Mathematical Olympiads (Around the World) 1999-2000 @ \$25		\$
Mathematical Olympiads 2001-USAMO Selection Test & IMO @ \$17		\$
<b>Subtotal</b>		\$
Postage/Handling		\$
<b>Grand Total in US Funds</b>		\$

Make checks payable (US funds only) to the American Mathematics Competitions and mail to:

MAA American Mathematics Competitions  
ATTN: USAMO Publications Order  
PO Box 81606  
Lincoln, NE 68588-0658 U.S.A

#### U.S.A. Postage Chart

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

#### All Canadian & International Orders:

Please include e-mail or fax number. AMC will send you a total order confirmation with the shipping charge added to your order. When paying by Visa or MasterCard we need your charge card number, expiration date, and name of card holder.

Payment by check (in U.S. Funds only) will also be accepted.

**Mailing Label (print clearly)**

Name: \_\_\_\_\_

Visa/MasterCard \_\_\_\_\_

School: \_\_\_\_\_

Expiration Date: \_\_\_\_\_

Address: \_\_\_\_\_

Cardholder Name: \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Cardholder Telephone # (\_\_\_\_) \_\_\_\_\_

**This Page  
Intentionally Left Blank**

PROBLEM 1

2005 USAMO

Student #

---

---

1. Stay within the borders when writing your solution.
2. Write **darkly** so your faxed copy can be clearly read.

**This Page  
Intentionally Left Blank**

# 2005 USAMO

## PROBLEM 2

Student #

1. Stay within the borders when writing your solution.
2. Write **darkly** so your faxed copy can be clearly read.

**This Page  
Intentionally Left Blank**



# 2005 USAMO

## PROBLEM 3

Student #

1. Stay within the borders when writing your solution.
2. Write **darkly** so your faxed copy can be clearly read.

**This Page  
Intentionally Left Blank**

# 2005 USAMO

## PROBLEM 4

Student #

1. Stay within the borders when writing your solution.
2. Write **darkly** so your faxed copy can be clearly read.

**This Page  
Intentionally Left Blank**

# 2005 USAMO

## PROBLEM 5

Student #

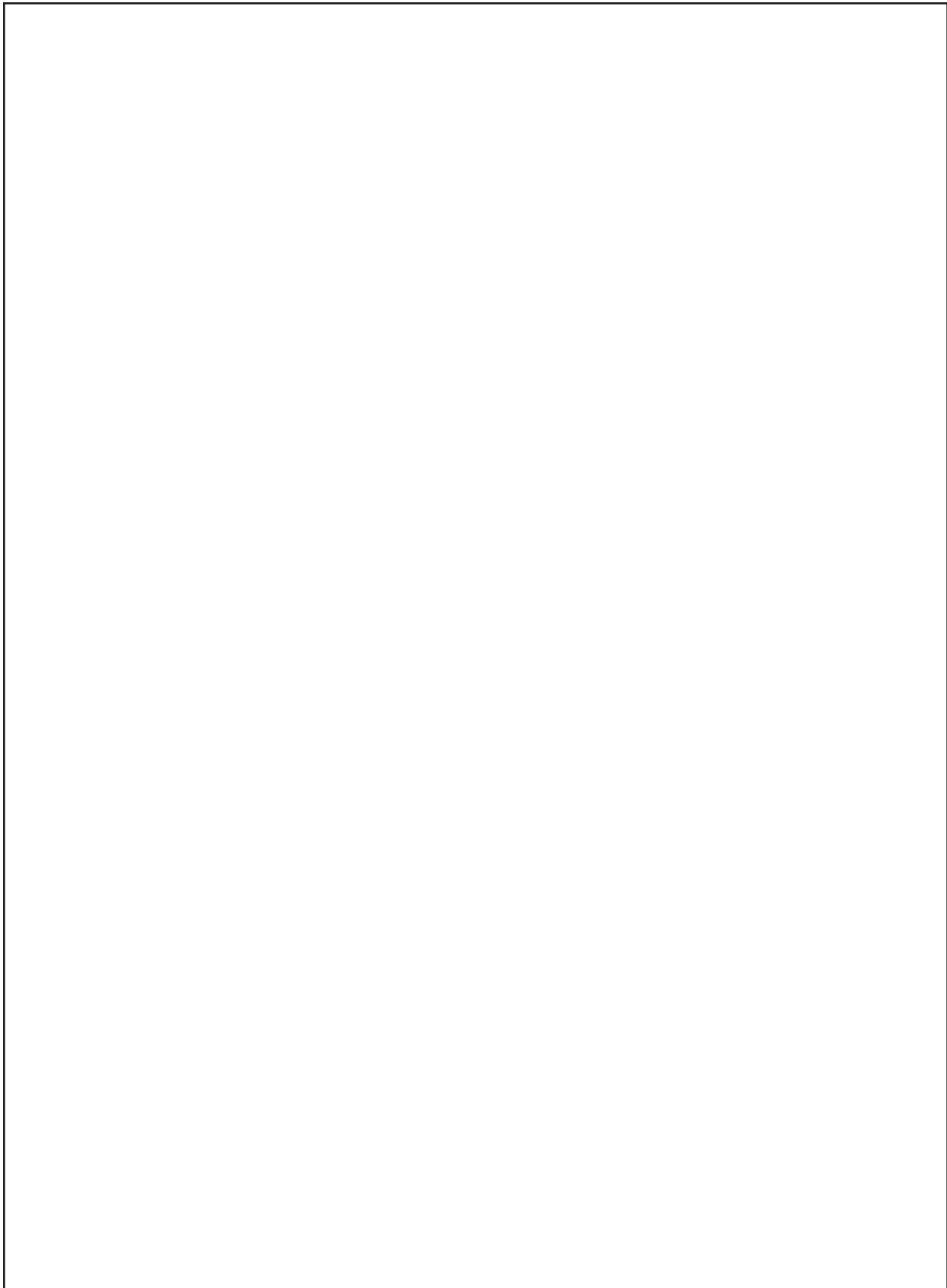
1. Stay within the borders when writing your solution.
2. Write **darkly** so your faxed copy can be clearly read.

**This Page  
Intentionally Left Blank**



---

---



1. Stay within the borders when writing your solution.
2. Write **darkly** so your faxed copy can be clearly read.

**This Page  
Intentionally Left Blank**