

PJAS STATE JUDGING - THE SHORT COURSE

General Nature of PJAS Competition

Students wishing to present their researches for PJAS competition are grouped into units with other students of similar grade and category of research and evaluated by a small team of judges. Students give timed oral presentations about their projects after which judges may ask questions for a timed period. Judges score the student on their individual worksheets after each presentation. The student is rated numerically by his success in each of 5 independently-evaluated criteria. Later when all students in the unit are finished the judging team returns to Judging Headquarters to obtain the official tally sheet. On that paper they will compile their individual scores into a composite average score for each student.

General Procedures for Judges

1. Judges will show knowledge of the field he or she is judging as demonstrated by academic degrees or experience in the field.
2. New judges will submit a registration form to the Judging Committee.
3. New judges will attend an orientation session conducted by the Judging Committee.
4. *Judges should make sure that a timekeeper is available with an official log sheet and that the projection equipment is working properly. It is imperative that no one enters or leaves the room during the presentation. Judges must maintain proper decorum inside and outside the room so that no student can be interrupted during his presentation. We suggest that a member of the judging team explain these operating procedures to those in the room at the beginning of the session.*
5. Each student will give his presentation in the order listed in the program book. Judges may make an exception for unusual circumstances, such as special interviews, multiple-projects, or a wide disparity in grade levels.
6. Judges may NOT add a student to their unit without official written notice from the registration committee or its representative.
7. Students are not in competition with each other for some single top award; rather they are evaluated on how well they succeed in fulfilling the 5 PJAS State Criteria. Therefore, there is no limit to the number of each award that may be awarded in a given Presentation Room.
8. Only judges are permitted to question the presenters. The questioning period will not exceed five minutes.
9. Each judge's evaluation of the presentation shall be made independently from other members of the judging team. However, after all the presentations have been heard, judges are encouraged to consult with one another in determination of the final awards.
10. It is important that all judges in the team return to the judging headquarters when the individual worksheets are completed to record their scores on the official tally sheets. All worksheets and the tally sheet must be personally signed when they are submitted. Furthermore, judges are often called upon to fill out individual comment sheets on the students or make recommendations about special awards for which they may be eligible.
11. Awards will be solely based on the mathematical averages of the scores. But judges should be aware that data entry into the computer scoring program is by using the individual judge's scores in each of the 5 criteria.
12. Room Technicians. The judging team will be assisted in the presentation rooms by one or more technicians. Their duties are to:

- a) Act as a timekeeper, using flash cards to aid the participant and judges, recording the times on the official log sheet.
- b) Set up the audio-visual equipment, aiding in its use during presentations, and returning equipment at the end of the session.
- c) Control the door and hallway so that the participant is not distracted during his presentation.

In rare cases where no technician is available, judges may NOT serve as timekeepers themselves. They should make arrangements with student presenters to serve as timers. Students at the front or back end of the "batting order" are usually more amenable to this request.

12. Remember these PJAS participants are **CHILDREN** who are just beginning to work and think as scientists; **they are not Ph.D. candidates**
13. **Questionable Research Topics:** Judges should know that PJAS adheres very closely to the rules and procedures of the *International Science and Engineering Fair* regarding living vertebrate and human subjects, recombinant DNA, tissue acquisition, the use of lasers, and the use of controlled substances.

Before any such experimentation can be registered for regional competition the student and his sponsor must submit detailed research plans and obtain a series of certifications and clearances to ensure proper adult supervision during the planning and execution of the project.

For a project in the above list to appear at a Regional or State PJAS competition, the judge must assume the project has met the necessary qualifications at the regional level. The judge is welcome to ask the Judging Committee to check the validity of the certification that resides in the hands of the Regional Director.

More precise details about the certification process can be obtained from the booklet *PJAS Rules and Regulations for Conducting and Judging of Student Research* or *The PJAS Sponsor Handbook*.

PJAS Presentation and Scoring Rules

The participant's research and presentation must conform to the following rules:

1. Each research will be judged on its own merit in meeting the Criteria for Judging rather than in competition with other research.
2. Eligibility. The student doing the presentation must be the one who conducted the research. (ABSOLUTELY NO SUBSTITUTES).
3. No student may present a research topic from a previous year without conducting significant additional research on the topic during the current year.
4. Presentation specifics:
 - A student shall not be interrupted during his presentation.
 - No three-dimensional objects may be used in the presentations.
 - Any two-dimensional representation (charts, pictures, graphs, posters, slides, projections etc.) may be used to enhance and supplement the talk, but not to replace the speaker.
 - The actual experiment may not be used in the presentation. No materials may be passed to the judges during the presentation. Only in rare, unique situations might the judges request materials during the questioning period.
 - Only a PJAS technician may assist with the use of the audiovisual equipment.
 - Specialized presentation media such as video recording, tape cassettes, computer screens, etc. should be used only when absolutely necessary to establish a point that

cannot be made with standard media and should constitute at most 10% of the total speech.

- In cases of doubt as to the appropriateness of a presentation, the State Judging Chairmen will make the final ruling.
5. Measurements must be in metric except where highly specialized equipment is calibrated in other units. Presentations in which the measurements were not done in metric will not receive a first place award, regardless of score.
 6. The presentation will not exceed a maximum time limit of 10 minutes and will be given proper notice by a timekeeper. No reduction in score will be given for a presentation of less than 10 minutes. Presentations **exceeding 10 minutes will not receive a first place award**, regardless of score. There will be a grace period of approximately 10 seconds before this penalty is applied.
 7. Upon completion of the presentation the researcher may be questioned **BY THE JUDGES** for a time period of **NOT MORE THAN 5 MINUTES**. Judges may ask questions to seek clarification of a student's methods, conclusions, and/or understanding. It is inappropriate for judges to criticize or comment on a student's project.
 8. The researchers may use notes in their presentations but reading the report to the judges is considered bad form.
 9. Scoring specifics. Each category of the Judging Criteria shall be scored on a 5 point **integer** system:

(Excellent) 5 - 4 - 3 - 2 - 1 (Unacceptable)

10. The student shall receive award based on the average score per judge, calculated by the following formula:

$$\text{Average Score} = \frac{\text{Total Score of All Judges}}{5 \times (\text{Total Number of Judges})}$$

11. The standards for awards at the State Meeting are:
 - 1st award - average score 4.0 or higher
 - 2nd Award - average score 3.0 or higher
 - 3rd Award - average score below 3.0
12. Judges may not disqualify a student. It is the responsibility of the Judging Committee to decide disqualifications.
13. Questions concerning infractions of the State Rules for Judging are subject to the investigation and ruling of the Chairmen of the State Judging Committee and the Regional Directors if appropriate.
14. Non-PJAS Awards. Judges should be aware that outside agencies often are interested in rewarding some of our participants, identified either by judges' high scores or a set of criteria of their own.

PJAS Judging Criteria

General comments on the criteria:

Note that of the 5 criteria to be used to evaluate the student, two (Presentation and Judges Opinion) are the same in all three of the research fields chosen (science presentations, math presentations, and computer science presentations). The other three criteria are referring to content of the project and will vary according to the nature of the specific discipline. The official criteria will appear here in bold face print with discussion or suggestions as to interpretation found in regular print.

Science Presentations

SCIENTIFIC THOUGHT - *Selection and statement of the problem, experimental validity and value, scope of design.*

The ultimate aim of science research is to promote new knowledge and understanding of the world in which we live. From reading and observation one comes up with a basic concept. This idea permits formulation of a meaningful question or hypothesis to which an answer may be found through a suitably designed experiment.

Thus judging the "scientific thought" criterion involves consideration of such questions as:

- a) Does the student exhibit sufficient background understanding of the principles and concepts involved in the topic?
- b) Is there a significant basic thought in the project? Is it clearly stated?
- c) Does it admit formulation of an age-appropriate meaningful question?
- d) Is the scope of the problem sufficiently limited to permit a meaningful experiment?
- e) Is there a single, formal hypothesis?

EXPERIMENTAL METHODS- *Choosing/developing techniques for valid analysis. Use of original materials or using old materials in an original way. Proper controls and sample size.*

This criterion refers to the details of a **well-designed experimental procedure** intended to answer the question posed. The project may require designing, building and using material hardware. **The presenter must design and carry out his/her own experiment.**

- a) Is the project well designed for the problem at hand?
- b) Is the experiment basically sound, with sufficient sample size and control of variables? Did the experiment have both a control group and experimental group(s)?
- c) Does the procedure follow a logical sequence?
- d) Have any original or ingenious materials or methods been used?
- e) Were results measurable/quantifiable and done in **metric**?

ANALYTICAL APPROACH - *Ability to draw valid conclusions. Full use of data and findings. Interpretations of weakness of design. Suggestions for further research.*

Book reports and research theories unsupported by practical data cannot achieve success in PJAS competitions because of this criterion. The student must have personally accumulated some actual data to analyze, even if the trend is negative or neutral to his hypothesis. The critical thing for a student to exhibit to judges is that he knows what the data MEANS.

- a) Is the body of data sufficient to draw valid conclusions?
- b) Do the conclusions refer back to the original question or hypothesis?
- c) Is the student grouping the data properly to enable comparisons between groups? Is the data fully used to draw conclusions?
- d) Is he evaluating the significance of his own data properly?
- e) Has the student thought about how his experiment could be improved if it were to be repeated? Is he aware of sources of error?
- f) Is the student able to make suggestions for further researches related to his topic or perhaps see a practical application of his findings to the real world?

PRESENTATION - *Ability to convey the information gained to others. To demonstrate new and improved ways of expressing and communicating scientific ideas.*

The presentation should, preferably, be in the form of a free talk employing good oral communication skills. The time restrictions in the rules necessitate planning and rehearsal. The critical question is "When the student is finished do you understand exactly what he did and why?"

- a) Does the talk cover all the essentials of the project - the basic premises, the hypothesis or problem, the experimental methods, the data, and the conclusions?
- b) Is the talk well-organized and flowing in a logical pattern?
- c) Do the audiovisual aids enhance the audience's understanding?
- d) Does the student demonstrate through the presentation and his responses during the questioning period a firm understanding of the basic scientific principles involved?

JUDGE'S OPINION - *Consider the age level and project correlation when necessary. Also, consider your overall feeling of the problem and the quality of the student's work.*

This criterion covers simply the judge's overall reaction to the nature of the project and its handling by the student.

Mathematics Presentations

Mathematics presentations are expository in nature, not experimental.

Appropriate projects should either be of a level beyond what the student is currently studying or on an enrichment topic.

FULFILLMENT OF PURPOSE -

- a) Did the presentation have focus?
- b) Considering the topic and time allowed, was the scope of the presentation suitable?
- c) Did the student use appropriate mathematical vocabulary?
- d) Did the student show depth of understanding of mathematical concepts and principles?

CONTENT

- a) Did the presentation have specific and illustrative content?
- b) Was the presentation free from mathematical errors?
- c) Is there a practical application or any correlation or interaction with other disciplines?
- d) Did the student use correct mathematical notation?

DEVELOPMENT

- a) Was there unity, coherence and inherent logic in the sequence of ideas?
- b) Does the student show insight?
- c) Does the student show sufficient examples or counter-examples?
- d) Can the student make suggestions as to related topics needing further investigation?

PRESENTATION

The presentation should, preferably, be in the form of a free talk employing good oral communication skills. The time restrictions in the rules necessitate planning and rehearsal.

- a) Is the talk well organized and flowing in a logical pattern?
- b) Do the audiovisual aids enhance the audience's understanding?

- c) Is the quality of exposition of a high degree?
- d) Is the student's competency with the principles such that he can answer questions with clarity, and elaborate where necessary to make a point?

JUDGE'S OPINION

This criterion is an overall subjective evaluation of the student's work considering age level, depth, complexity of the subject matter, as well as the student's success in achieving his purpose or objective.

Computer Science Presentations

PROPER PLACEMENT DECISIONS: As in the mathematics projects this category is expository in nature of its presentations and seldom involves the controlled experiments required of science projects. Judges, sponsors and students must realize that projects that do have data accumulated in a controlled experiment where the computer's role is merely to serve as a tool to analyze the data, draw pretty graphs, and do statistical conclusions **DO NOT BELONG IN THE COMPUTER SCIENCE category**. Such projects more properly fit the judging criteria for the specific science field such as biology or physics in which the project was done and should be transferred there before being judged.

The PJAS State Judging Committee feels that a small modification of a pre-existing (canned) program is not a suitable project to present in our competition. Pre-existing programs may be used, however, if they are a small part of the student's own work. A wide disparity exists between schools in their offerings of formal computer science courses. It is the task of the judges to identify students who have gone beyond the standard opportunities provided by their schools.

STATEMENT OF THE PROBLEM

- a) Is the objective of the project clearly stated?
- b) Does the problem chosen have relevance or practical application in today's world?
- c) Did the student use appropriate computer vocabulary?
- d) Did the student show depth of understanding of relevant programming concepts and principles?
- e) Does the project entail creative thinking in approach techniques?

METHODS

- a) Was there unity, coherence and inherent logic in the sequence of the presentation?
- b) Does the student follow accepted procedures, using either structured programming or object-oriented programming? Is the underlying logic sound?
- c) Did the student explain the project design using a high level diagram?
- d) Did the student include an explanation of difficult, unique and/or significant section(s) of the program?

FULFILLMENT OF PURPOSE

- a) Did the student show the results of his work? Was the objective obtained?
- b) Does the student have a quality product?
- c) Did the project include exceptional features and/or coding?
- d) Does the presenter know of areas for further expansion or improvement of the project?

PRESENTATION

The presentation should, preferably, be in the form of a free talk employing good oral communication skills. The time restrictions in the rules necessitate planning and rehearsal.

- a) Is the talk well organized and flowing in a logical pattern?
- b) Do the audiovisual aids enhance the audience's understanding?
- c) Is the student's competency with the principles such that he can answer questions with clarity, and elaborate where necessary to make a point?
- d) If the student is employing special medium, such as a VCR or computer screen, is its value to the speech significant? Was its use limited to less than 10% of the total speech?
- e) It is acceptable for a student to show key parts of code line by line. However, the presentation should not consist of a student explaining his/her program line by line. A high-level method should be used instead.

JUDGE'S OPINION

Evaluate the complexity and quality of the project with respect to the age and grade level of the student and the amount of previous experience with computers. Remember schools vary considerably in what computer offerings they can make available to students.

General Notes on the Use of Audiovisuals

- a) No 3-D objects are permitted. Nothing may be passed to the judges.
- b) Most students prepare either overhead transparencies or posters. Both are acceptable.
- c) Judges are reminded in their briefing that schools vary considerably in the types of equipment that they have available to make transparencies. Content is more important than flashy color transparencies. Making the transparencies by hand is acceptable. The poster or transparency should not be too "busy".
- d) Students may use slides. The student is responsible for bringing the slide projector and setting it up. Students may use audio (tapes or CDs) when necessary. The student is responsible for bringing the tape/CD player and setting it up.
- e) PJAS presentations are an educational activity. For this reason, presentation visuals (transparencies, posters, slides, etc.) must be clearly visible to all in the presentation room. Any audio must be audible to all in the presentation room.
- f) Before using any specialized media, please review the pertinent section of the Short Course: PJAS Presentation and Scoring Rules, #4 – Presentation Specifics.

This Short Course (revised 04/04) is an excerpt from Pennsylvania Junior Academy of Science Rules and Regulations for Conducting and Judging of Student Research.

Scoring rubrics for science, mathematics, and computer science projects are included in Appendix 25, 26, and 27, respectively.

