Writing & Math
IB Internal Assessment

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1. Elements of a successful IB Internal Assessment.

Basic elements of a good Math Studies Project or Math SL/HL Portfolio piece:
- Correct answers throughout.
- All questions answered in a logical order.
- Audience is the teacher.
- Identify and address the principal goal of the assignment.
- Written explanations of difficult or less-obvious steps in work.
- Word-processed including use of technology for graphs and equations.

Elements of superior work:
- Attention to detail.
  - Consistent significant figures or decimal place rounding.
  - Use of proper notation such as "$\approx$" for approximations.
  - Avoid calculator notation such as 4*5, x^2, or 2.3E4.
  - Graphs are clear with logical scales and labeled axes.
- Work stands alone.
  - Audience is another student of the same level.
  - Reader doesn't have to refer to the assignment sheet.
  - Reads smoothly and effortlessly.
  - Answers are not numbered unless required.
- Single word-processed document
  - Integrate an equation writing program, spreadsheets, graphing program, etc.
  - Comment on everything included.
  - Explain steps each time a new mathematical process is used.
  - Avoid repetition of processes already explained.
  - Graphs, charts, etc. appear on the same page where they are explained.
- Student goes beyond the assignment with insight and sophistication.
  - Identify and address the hidden goals of the assignment.
  - Try to get into the mind of the writer of the assignment.
  - Most good assignments leave some space for the top students to explore.
- Student uses a variety of mathematical approaches.
  - A good assignment will require the use of many kinds of math.
  - A good question will often have several possible approaches for the solution.
- All math used is relevant to the task.
  - No fluff or space-fillers.

2. Tips to the students.

- Work through all problems with pencil and calculator before writing it up.
  - ➤ Gives an overall feel for the project so that that student can start to address the main goal, and even insights, right from the start.
- Write a brief introduction rather than jumping right in to the first question.
  - ➤ Sets a tone of readability.
- Math SL/HL students can pretend that they are writing a chapter in a textbook.
  - ➤ Encourages students to fully explain each step, remembering that their audience is another student from their course of average ability.
  - ➤ Students can have fun with creative formatting.
  - ➤ Take pride in the look and feel of their work.
- Math Studies students can approach the IA Project as they would a science lab.
  - ➤ Write a hypothesis.
  - ➤ Collect data.
  - ➤ Analyze data.
  - ➤ Draw conclusions.
  - ➤ Discuss possible errors or improvements.

3. Common problems.

- Solutions to individual problems are cut in half by the page break.
  - ➤ It is ok to leave space on the bottom of a page.
  - ➤ Use the "Insert Page-Break" feature of most word-processing programs when a new problem is started. (If there is not enough space on the current page.)
- Proof for comments like "see the graph below" when the graph was accidentally bumped to the next page during editing.
- Pages of graphs or charts with comments and explanations at end.
  - ➤ Full-page graphs should be avoided if possible.
  - ➤ Include small (but clear) graphs with an explanation on the same page.
  - ➤ Use features like "text-wrapping" to make graphs or charts an integrated part of the work.
  - ➤ If a graph must take up a full page, include a full discussion of it on the next page.
- Pages of raw data in the main body of text.
  - ➤ Raw data should be organized as concisely as possible and included in the appendix.
  - ➤ The main body should only include the compiled data used in the relevant calculation.
- Frequent reference to appendix.
  - ➤ Cuts the flow of the work.
  - ➤ If what is in the appendix is very important, move it to the body.
- Use of Microsoft Excel for graphing.
  - ➤ Excel graphs are generally not of good mathematical quality.
  - ➤ Makes good pie charts and bar graphs, but these are not sophisticated analysis tools.
  - ➤ Scatter plots are ok, but look very amateurish.
  - ➤ Histograms are very difficult and require a plug-in.
  - ➤ Search for better graphs programs online if the school doesn't provide them.
- Over-researching.
  - ➤ IB Math Internal Assessments are not research projects.
  - ➤ IB is looking for student work, and it is obvious when it is not.

4. Grading.

- Read paper from start to finish before assigning grades.
  - ➤ Detail is important.
  - ➤ Overall feel is important.
- Make comments or corrections in the text.
  - ➤ Comments help the IB moderator to understand how you have assigned marks.
- Rubric.
  - ➤ Write a rubric that fits the nature of the assignment.
  - ➤ IB has two rubrics which could be used for students at many levels.
  - ➤ Math Studies. (Open-ended project.)
  - ➤ Math SL/HL. (Answering an assigned problem.)
  - ➤ ECA Mathematics Rubric integrates both on a 7-point grading scale.

5. Student work.

Math Studies Project:
Student Sample #1 (PDF)

Highlights:
- Clear introductions.
- Concise, easy to understand data.
- Tables logically presented with explanations on the same page.
- Thorough conclusion.

Lowlights:
- No visuals.
- Only one mathematical operation (Chi-squared tests).

Math Studies Project:
Student Sample #2 (PDF)

Highlights:
- Attempts chi-squared tests.
- Clear calculations.

Lowlights:
- Data table not explained.
- Pie chart calculations, but no pie charts.
- Explanations of graphs precede the graphs.
- Poorly hand-written graphs.
- All graphs put at end.
- Separate sections "Sources of Error", "Conclusion", etc. don't give smooth flow.

Math SL Portfolio Piece:
Optimizing a Can of Drink (Word, PDF)
Student Sample #1 (Word)

Highlights:
- Labeled photos.
- Step by step equations.
- Clear explanations.
- Small, but clear graphs.
- Structured in sections like a textbook.
- Explanation boxes.
- Screen shots.

Lowlights:
- Scans some images rather than using MS Equation Editor.
- Strange axes on graphs.
- Graphs of different sizes and scales.
- Each new section should start on new page.

Student Sample #2 (PDF)

Highlights:
- Uses own 3-D models.

Lowlights:
- Labels (a), (b), (c), etc. so that the question isn't apparent to reader.
- Includes text in MS Equation Editor ("error =").
- Types out data from Advanced Grapher in computer notation.
- Stretched out graphs with strange labeling.

Math SL Portfolio Piece:
Normal Distribution Function (Word, PDF)
Student Sample #1 (PDF)

Highlights:
- Good use of MS Word with headers, background, text-wrapping, etc.
- Looks and reads like a chapter in a textbook.
- Clear graphs with multiple transformations on one set of axes.
- Consistent windows on graphs.
- Integrates MS Equation Editor into text.

Lowlights:
- Refers to "graphs above" when then are on the previous page.

Student Sample #2 (PDF)

Highlights:
- Comments on each graph.
- Consistent windows on graphs.

Lowlights:
- Math simplifications within a paragraph.
- Improper limit notation.
- Copy/Paste overused.
- Wasted space in negative region of graphs.
- Uses arrows where equal signs should be.

Non-IB project:
Investigating the Graphs of Sine Functions
Student Sample (PDF)

Highlights:
- Mastery of MS Word with headers, footnotes, background, text-wrapping, tables, etc.
- Looks and reads like a chapter in a textbook.
- Highlights important points. (Italics, bold, colors, side notes.)
- Clear graphs with multiple transformations on one set of axes.
- Creative labeling of graphs with arrows and brackets.
- Integrates MS Equation Editor into text.

Lowlights:
- Few, if any.