Objective—Determine whether there is a linear relationship between a person's hand span and how much a person can hold in his hand.

Due Dates—Collect Data: October 10th, by the end of your class period.
You will receive 50% for any data turned in late. This will count as a quiz grade.
Report: October 17th, by the end of your class period. You will have 30 minutes of class time to print.
The report will count as a homework grade.

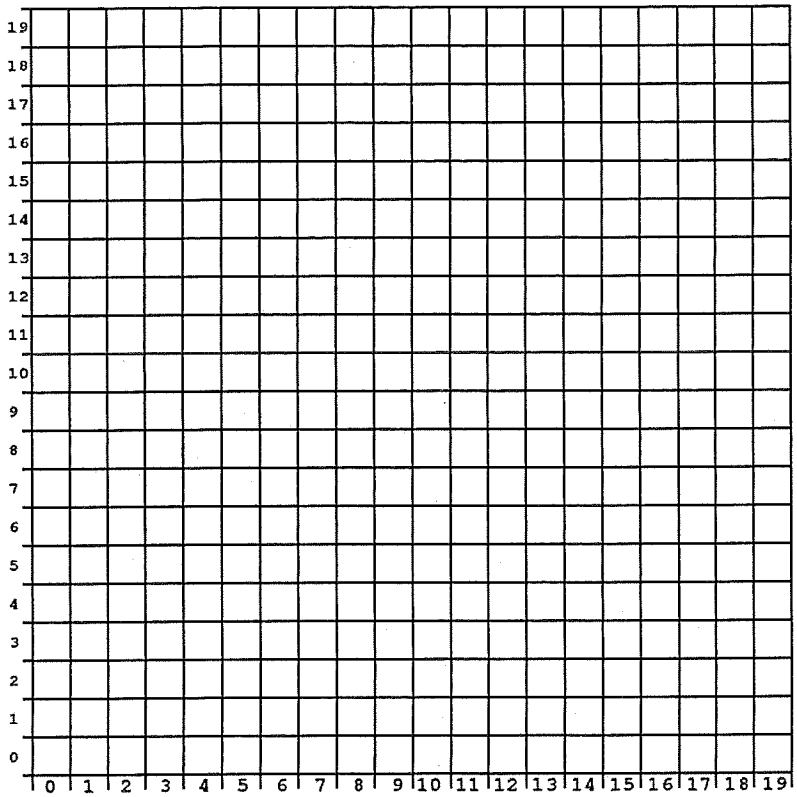
Criterion—The write up for this assignment will be graded against criterion C (communication) and criterion D (reflection). They are attached for your review.

Assignment—Your group will be gathering data points and then using the calculator steps to determine a relationship between a person's hand span and how much a person can hold in their hand.

Step 1—In your group determine how you will measure hand span. How you decide to measure hand-span is up to you! Your method merely needs to be consistent. Consider where you will measure on a person's hand and what units you will use. Record your decisions for your report. Then determine what objects you will use to gather your data. The items you use are up to you. I will have "O's", "puffs", dice, colored pencils, and/or beans for you to choose from.
Step 2—Measure the hand-span of at least 10 people (not in your group). Remember to make sure you are clear on how you plan to measure so that you can measure consistently. *You will also need to determine how you plan to handle left-handed vs. right-handed individuals in your experiment.* After you have measured each individual's hand-span, have them pick up whatever item you have chosen to measure. *You may need to provide directions to them on how they pick the items up!* Consistency is important for more accurate results. Record their hand-span and the number of items they were able to pick up.

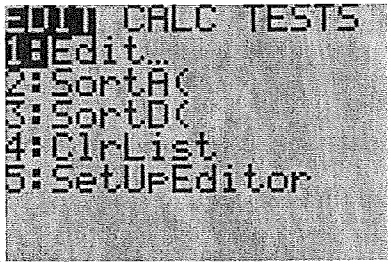
Name or Code for each person	Any observations you make	Hand Span	Number Picked Up

Step 3—Using the data you have gathered make a scatter plot.

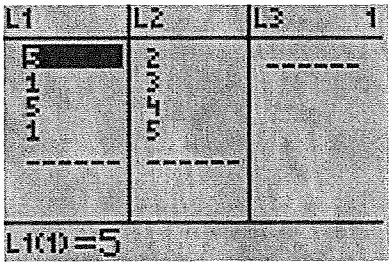


Step 4—Then find a line of best fit for your data. You will need to enter the data into your calculator following the instructions for your brand of calculator.

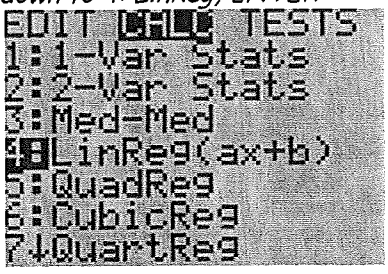
For the TI-84, turn on the calculator and press the STAT Key. Click Enter

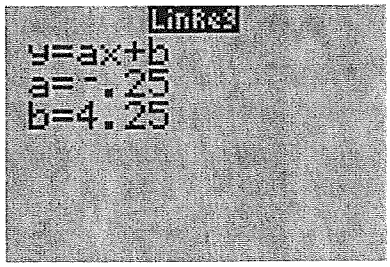


and enter handspan in L1 enter the number picked up in L2



Press the STAT Key and right arrow over to CALC. Arrow down to 4: LinReg, ENTER





In the example, the line of best fit is: y=-.25x+4.25

When you use the equation, the input is handspan and the output should be number picked up.

For the Casio family, turn on the calculator and use the arrows to highlight STAT. Press enter.

You will see the second picture above. Enter handspan in L1 and number in L2.
Press CALC <F2>, Press REG <F3>, Press X <F1>

You will see something like the last box.

Step 5—Go back to your scatter plot in step 3 and sketch the line on your scatter plot. In your group's report, you will earn more points if this is done on a computer using excel or cutting the screenshot from your calculator's graph. For today's data collection grade, it should be sketched on the scatter plot in step 3.

Step 6—Measure the hand span of each of your group members. Test your equation by plugging in each member of your groups' hand span into your line of best fit equation. Compare the prediction from your equation to how much of each you can actually pick up.

Name or Code for each person	Hand Span	Number Picked Up	Predicted Number using your equation	Observation

Step 7—One person in each group needs to give me their pages 1-3 so I can copy them and give your group a data collection grade.

The Write-up—Your small group will be turning in a two to three page double spaced essay discussing in an organized manner (this means paragraphs with cohesive sentences) what you discovered through your process. *Your write-up should contain a table of all data collected and a graph of the line of best fit. (this is not counted in the two to three pages). Work together, one paper per group because this is a practice assessment.

General Outline:

Introduction with thesis:

- This is provided for you below. Fill in the blanks with which ever object you chose. And hypothesize about what you think will happen or what you think the relationship will be.

Discussion/Justification of the process

- Tell about what you actually did for steps 1 to 2.
- As you tell about each step, explain why you chose to do things the way you did (if there was not any reasoning for a particular process however, just move onto the next one)
- Questions to consider:

- How did you measure a person's hand span?
- Why did you decide to do it this way?
- What units did you use to measure? To what accuracy?
- What object did you decide to use? Why?
- How did you handle left versus right handed individuals?
- Where individuals given instructions on how to 'grab' your object? What where they?

- Give the actual data provided
- Include the equation you found from your calculator
- Include the graph of the data and the equation. I can help with this during tutoring time if you would like to insert an Excel graph or a calculator screen shot.

Discussion of the accuracy of results

- Tell how your results either do or do not validate the original hypothesis
- Justify what you have said by using your equations to predict how much you will pick up (Step 4)
- Explain why your results are not perfect (because they aren't, there is *always* room for improvement)
- Discuss limitations your equation has
- Questions to consider:
  - What type of correlation did your data have (positive/negative)?
  - What was the correlation coefficient?
  - What does the correlation coefficient suggest about the strength of the relationship between hand span and number of items picked up?
  - Did your equation accurately predict the number of items a person would pick up?
  - Overall is your equation good enough to predict general data points?
  - Do you think your equation would work for a person with a drastically small (infant/toddler) or drastically large hand? Why or why not?
  - What limitations does your equation have? Should the domain/range be restricted?

Conclusion and Discussion of possible improvements

- Discuss whether you stand by your original hypothesis
- Suggest possible improvements
- Summarize results of your experiment
- Questions to consider:
  - Would a different way have provided more accurate results?
  - Is there anything you did not take into consideration with measuring you would do differently now?
  - What units did you use to measure? To what accuracy? Did this affect results?
  - Did any properties (size/shape) of your object affect the results?
  - Would you choose a different object if you had to redo the process? Why or why not?
  - Would you give more or less instructions given the opportunity to redo the process?

Title

Common sense would tell us that the larger a person's hand is the more they can hold in their hand. In order to test this, my group conducted an experiment to determine if the hand span of a person is related to how many _____ a person can hold. According to our theory, [tell what you think the relationship should be between hand span and number of objects held]

Firstly, [discuss process with any justification for decisions made about how to measure, what object to use, what instructions you gave to participants, etc. This is not necessarily just one paragraph]

We recorded the data which can be seen in the table below.

[Insert Table of data. Be sure to label columns, i.e. Hand Span in Inches or Number of Marbles Picked-Up]

Next, we used the data to determine the equation for the line of best fit. The equation is

[Insert equation. Be sure to indicate what the variables represent]

[Insert graph of line with date points plotted. Be sure to label each axis.]

In order to determine the accuracy of our equation...[continue discussing process of testing equation by using additional test subjects.]

[Insert table of new data along with predicted values, again label columns.]

[Discuss how results compared to predicted values. Discuss how the correlation coefficient explains this. Discuss limitations of the equations...i.e. how does the domain and range need to be limited within the context of the problem? Consider the intercepts.]

Many factors could have affected the results of our experiment. [Give possible reasons results are not perfect. Discuss areas that could be improved. Summarize the results and whether or not your stand by your original hypothesis.]

Criterion C: communication in mathematics

Maximum 6

Students are expected to use mathematical language appropriately when communicating mathematical ideas, reasoning and findings—both orally and in writing.

This criterion examines to what extent the student is able to:

- use appropriate mathematical language in both oral and written explanations
- use different forms of mathematical representation
- communicate a complete and coherent mathematical line of reasoning using different forms of representation when investigating problems.

Students are encouraged to choose and use ICT tools as appropriate and, where available, to enhance communication of their mathematical ideas. Some of the possible ICT tools used in mathematics include spreadsheets, graph plotter software, dynamic geometry software, computer algebra systems, mathematics content-specific software, graphic display calculators (GDC), word processing, desktop publishing, graphic organizers and screenshots. **Assessment tasks** for this criterion are likely to be real-life problems, tests, examinations and investigations. Tests and examinations that are to be assessed against criterion C must be designed to allow students to show complete lines of reasoning using mathematical language.

Achievement level	Descriptor	Task Specific (Hand Span)
0	The student does not reach a standard described by any of the descriptors below	The student does not reach a standard described by any of the descriptors given below
1 – 2	The student shows **basic use** of mathematical language and/or forms of mathematical representation. The lines of reasoning are **difficult to follow**.	The student explains process, but in an unorganized manner which is hard to follow. The student does not use graphs, tables, or equations successfully.
3 – 4	The student shows **sufficient use** of mathematical language and forms of mathematical representation. The lines of reasoning are **clear though not always logical or complete**. The student moves between different forms of representation with **some success**.	The student explains process in an organized manner which is mostly easy to read and understand. The student uses graphs, tables, and equations, but not always successfully.
5 – 6	The student shows **good use** of mathematical language and forms of mathematical representation. The lines of reasoning are **concise, logical and complete**. The student moves **effectively** between different forms of representation.	The student explains process in an organized manner that is easy to read and understand. The student used graphs, tables, and equations properly within the text of their paper.

Notes:

Mathematical language: the use of notation, symbols, terminology and verbal explanations.

- **Forms of mathematical representation**: refers to formulae, diagrams, tables, charts, graphs and models used to represent mathematical information.

Criterion D: reflection in mathematics

Maximum: 6

MYP mathematics encourages students to reflect upon their findings and problem-solving processes. This criterion examines to what extent the student is able to:

- explain whether his or her results make sense in the context of the problem
- explain the importance of his or her findings in connection to real life where appropriate
- justify the degree of accuracy of his or her results where appropriate
- suggest improvements to the method when necessary.

Assessment tasks are most likely to be mathematical investigations or real-life problems. Generally these types of tasks will provide students with opportunities to use mathematical concepts and skills to solve problems in real-life contexts.

Achievement level	Descriptor	Task Specific (Hand Span)
0	The student does not reach a standard described by any of the descriptors given below	The student does not reach a standard described by any of the descriptors given below
1 – 2	The student **attempts to explain** whether his or her results make sense in the context of the problem. The student **attempts to describe** the importance of his or her findings in connection to real life where appropriate.	The student attempts to discuss and justify methods used. The student attempts to discuss accuracy of equation.
3 – 4	The student **correctly but briefly explains** whether his or her results make sense in the context of the problem. The student **describes the importance** of his or her findings in connection to real life where appropriate. The student **attempts to justify** the degree of accuracy of his or her results where appropriate.	The student only briefly discusses and justifies the methods used and makes minimal suggestions for improvements. The student attempts to discuss accuracy of equation.
5 – 6	The student **critically explains** whether his or her results make sense in the context of the problem. The student provides a **detailed explanation** of the importance of his or her findings in connection to real life where appropriate. The student **justifies** the degree of accuracy of his or her results where appropriate. The student suggests improvements to his or her method where appropriate.	The student justifies methods used and explains where methods may have been flawed and suggests improvements. The student also justifies the accuracy and any limitations in the context of real life for the equation created.

Notes

- **Explain**: give a detailed account including reasons or causes.
- **Describe**: give a detailed account.