Using Assessment as Tool for Evaluating Corequisite MathP 146
Fall 2019

Common Final Questions for MathP 146 to Math& 146 (2 instructors each)
3 common final questions
Topics selected by consensus; question prompts customized by instructor
Common Grading Rubric

Question 1: Sample/Population
Example prompts

- In your own words, explain the difference between a sample and a population and give one example of a sample and population.

- In a sentence or two, describe the relationship between a sample and a population. Explain the difference and provide one example.

- *In your own words, explain the difference between a sample and population and give one example of a sample and population.*

Question 2: Z Scores
Example prompts

- Human body temperature is normally distributed with a mean of 98.2 °F and a standard deviation of 0.73 °F

  Compute the Z score for a human body temperature of 100 °F and interpret the meaning of the Z score in the context of the problem.

- The lifespan of lightbulbs is normally distributed with a mean of 300 days and standard deviation of 50 days.

  If a light bulb has a z-score of 2.5, how long did the lightbulb last?

  Using the terms 'mean' and 'standard deviation', explain what it means for the light bulb to have a z-score of 2.5.
  (Instructor note on interpretation: I did not require strong contextualization. I accepted the answers
  425 days "it lasts 2.5 standard deviations above the mean.")

- The patient recovery time for a particular surgical procedure is normally distributed with a mean of 6.4 days and a standard deviation of 2.5 days.

Compute the z-score for a patient who takes 9 days to recover, and interpret what it means in the context of the problem.

Question 3: Confidence Intervals

Example Prompts

- Using the data as a sample representing college students, compute the 95% confidence interval for the proportion of students with hypertension during finals week and interpret the interval in the context of the problem.

We randomly selected 16 Highline Statistics students and asked my class how many hours they spent studying for their final exam. The responses from the students are shown below.

Hours
12
8
5
4
12
5
10
1
5
10
3
6
7
2
9
5

a) Compute the following sample statistics for our data.

$n =$ $\bar{x} =$ $s =$

b) What population are we studying?

c) Find the 95% confidence interval AND the margin of error E for the population mean for the number of hours studied.

d) Interpret your answer by completing the sentence*:*

I am 95% confident that

Rubric: To be totally correct, they need to have a correct interval and margin of error, as well as communicating their answer. Part (d) should include reference to the MEAN being in the interval:

- Compute the 95% confidence interval for the population mean cost of a textbook at the Highline College book store. Interpret the confidence interval in the context of the problem.

(Note Data given in Statcrunch)

RESULTS

Focus 1: Sample Versus Population

*Question: In your own words, explain the difference between a sample and population and **give one example of a sample and population***

0 pts Unable to provide an interpretation or interpretation is incorrect/inappropriate	1 point Interpretation includes some appropriate statements that demonstrate some understanding, but the interpretation may be incomplete or not quite correct	2 pts Interpretation is appropriate and complete, but may not be well communicated.	3 pts Interpretation is appropriate, complete and well communicated (including examples)
MathP146 7 (13%) n = 52	2 (10%)	1 (2%)	39 (75%)
Math& 146 5 (3%) n = 148	13 (9%)	31 (21%)	99 (67%)

Example of Correct Response (1pt):

- Population is the total number of something. Example: Total Highline College Students. Sample is group of population that is part of the total population: Example: Number of male students out of the total population of Highline Students.
- A population is a complete set of elements (people/objects) that is being studied. While a sample is a subgroup of the population, only some of the individuals or objects are being studied. Population: All registered nurses in Washington. Sample: 100 registered nurses in Des Moines."
- Population is every individual within a parameter, like the entire state of Washington.
- The population is the entire number of objects for which we study include an example)
- The sample is a part of population selected for specific statistical study

Example of Incorrect Response (0 OR 1 pt):

- Sample: Random people that were selected
- Population : The area of each group that were selected.
- The difference between a sample and population is sample is just sampling thing, where the population is calculating out the all population. For example, if its population then we have the percentage and it tells us about the population

Comments: I am finding the rubric doesn't quite fit my prompt. Overall, 38 (67%) correctly communicated the difference between a sample and a population, **but 6 of these did not provide an example**. Out of the other students with 2pts (12), they had good examples but where missing something in the definition. Also at the beginning of the course I did tell them that I would not ask them to state exact definitions for anything.

It is unclear whether faculty held to this standard of expecting an example

Focus 2: Computing and Interpreting Z score

Count and percentage who correctly computed the Z score correctly:

MathP 146: 37/52 (71%)
Math& 146 70/92 (76%) Note: One instructor did not provide this data point.

Count and percentage of students who received full credit for the interpretation based on your grading style. Please provide one or two examples of what you considered a "full-credit" answer.

Interpretation of Z score

0 pts No interpretation provided	1 point Interpretation includes some appropriate statements but does not include any connection between Z scores and standard deviation units.	2 pts Interpretation is appropriate and complete and indicates that the student connects Z scores to standard deviations, but the answer was not well communicated in your judgment	3 pts Interpretation communicates that the student connects Z scores with standard deviation units. An example response from a student might be: *A lightbulb that lasts one year is 1.3 standard deviations above the mean.* Note: Depending on your style, you may also consider an acceptable answer to be *The lightbulb is 1.3 standard deviations above the mean.*
MathP 146 23 (44%) (n = 52)		8 (15%)	21 (40%)
Math& 146 31 (21%) (n = 148)	27 (18%)	8 (5%)	82 (55%)

*There was wide variation across instructors in both types of courses on success here.

Examples of correct responses:

- Z=1.3 is number of standard deviations of the lifespan of lightbulbs from the mean.
- The lightbulbs life span is 1.3 standard deviation away from the mean life span.
- A patient who takes 9 days to recover from a surgical procedure is 1.4 standard deviations above the mean, 6.4 days."
- The weight of 20.14 ounces is 2 standard deviations away from the mean weight of 20 ounces.

Examples of incorrect responses:

- A human body temperature of 100 °F has a z score of 2.5 above the mean

Comment: The expectations for correct interpretation may vary by instructors given some of the examples provided. Helen would expect that the interpretation include the Raw and Z score, such as in the third example above.

Focus 3: Computing and Interpreting Confidence Interval

Count and percentage of students who correctly computed the confidence interval (include students who may have made minor rounding errors).

MathP 146 (n = 52) 35 (67%)

Math& 146 (n = 148) 98 (66%)

Count and percentage of students who received full credit on the interpretation based on your grading style. It would also help if you provided one or two examples of what you considered a "full-credit" answer.

MathP 146* (n = 52) 35 (63%)

Math& 146* (n = 148) 80 (54%)

*Includes students who correctly interpreted an incorrectly computed confidence interval

Examples:

- We are 90% confident that the true mean range weight of adult wild mountain lions are between (65.728, 116.27).
- We are 90% confident that the interval (65.728, 116.27) includes the true mean.
- "I am 95% confident that the population proportion for all students with hypertension during finals week is between .09357 and .19185."
- "I am 95% confident that the true population proportion for all students with hypertension during finals week is between 9.4% and 19.2%."

Examples of incorrect responses:

- I am 95% confident that the true population proportion is between .09357 and .19185.
- I am 95% confident that the proportion mean for all students with hypertension during finals week is between .09357 and .19185."

Comment: There may have been inconsistency in what is a full-credit interpretation is, particularly whether the context needs to be stated as opposed to "the true population proportion."