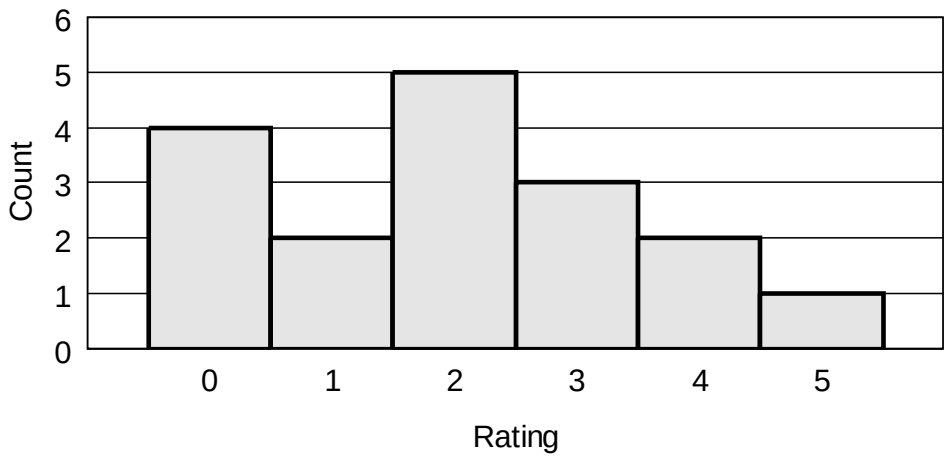
-- No calculators, phones, or other devices permitted. --

Name _____

[Directions for the actual exam, not this practice exam] Please write your name on this page. Using a No. 2 pencil, on the opscan, write and bubble in the letters for your last name and first initial, write in "POL" for "DEPT.", write in "138" for "COURSE", and then bubble in your responses. No need for University ID or other information.

POL 138-003 Quantitative Reasoning in Political Science
KEY Practice Exam 1 · Fall 2025

1. The histogram to the right indicates how a person rated 17 movies on a scale from 0 to 5. In this histogram, which is true?
   A. There are 2 ratings of 5.
   B. There are 5 ratings of 2.



2. Research focusing on numbers is ___.
   A. qualitative research
   B. quantitative research

3. Which of these is closest to what an inference is?
   A. a logical fallacy
   B. a conclusion
   C. the reason for a prediction

4. If the outlier number of 500 were added to the set of numbers {1, 2, 3, 6}, that would have ___.
   A. more influence on the mean of the set than on the median of the set
   B. more influence on the median of the set than on the mean of the set
   C. an equal influence on the mean of the set as on the median of the set

5. Standard deviation is a measure of ___ a set of numbers.
   A. the validity of
   B. the spread in
   C. the reliability of
   D. the correctness of
   E. the central tendency of

6. The standard deviation of the set of numbers {-10, -2} is ___.
   A. positive
   B. zero
   C. negative

7. The standard deviation of the set of numbers {2, 2, 2} is ___.
   A. 0
   B. 2
   C. 3
   D. 6
   E. None of the above

8. Suppose that we start with the set of numbers {1, 3, 10}. If we add 5 to each number in that set to get {6, 8, 15}, the standard deviation of the set will ___.
   A. increase
   B. decrease
   C. remain the same

9. Suppose that we start with the set of numbers {1, 3, 10}. If we double each number in that set to get {2, 6, 20}, the standard deviation of the set will ___.
   A. increase
   B. decrease
   C. remain the same

10. Suppose that a sample has 10 Democrats and 5 Republicans. What formula could be used to correctly calculate the proportion of the sample that is Democrat?
    A. $10 \div 5$
    B. $5 \div 10$
    C. $10 \div (10 + 5)$
    D. $(10 + 5) \div (10 + 5)$
    E. $(10 - 5) \div (10 + 5)$

11. Suppose that, in 2023, 40% of students at a college are women, but that, in 2024, 60% of students at the college are women. That change can be correctly expressed as an increase of ___.
    A. 20 percent
    B. 20 percentage points

12. Suppose that, in 2023, 40% of students at a college are women, but that, in 2024, 60% of students at the college are women. That change can be correctly expressed as an increase of ___.
    A. 50 percent
    B. 50 percentage points

13. Suppose that a score of 90 is at the 70th percentile for scores on a test. What does this mean?
    A. 90 percent of scores were 70.
    B. 70 percent of scores were 90.
    C. 70 percent of scores were below 90.
    D. 90 percent of scores were below 70.
    E. 70 percent of scores were above 90.
    F. 90 percent of scores were above 70.

14. Which score below indicates a higher degree of political knowledge for a political knowledge test?
    A. scoring at the 10th percentile on the test
    B. scoring at the 90th percentile on the test

15. Students in higher grades tend to know more about math, on average, compared to students in lower grades. Suppose that each student in an elementary school takes the same math test. Bob's score on the math test is at the 50th percentile among the students in fifth grade. Bob's score on the math test is likely ___ among the students in second grade.
    A. less than the 50th percentile
    B. at the 50th percentile
    C. greater than the 50th percentile

16. Suppose that a course has two exams: Exam 1 is worth 20% of the overall grade for the course, and Exam 2 is worth 80% of the overall grade for the course. If a student scored a 90% on Exam 1 and a 70% on Exam 2, which of the following could be used to correctly calculate that student's overall percentage for the course?
    A. $(20 + 80) \div 2$
    B. $(90 + 70) \div 2$
    C. $(0.20 \times 80) + (0.90 \times 70)$
    D. $(0.20 \times 90) + (0.80 \times 70)$

17. The probability of X happening is 10%, and the probability of Y happening is 20%. X and Y are independent events. What is the probability that X and Y both occur?
    A. 0.10 + 0.20
    B. 0.10 × 0.20
    C. 0.10 ÷ 0.20
    D. (0.10 + 0.20) ÷ 2
    E. Cannot be determined from the information provided

18. The probability of X happening is 10%, and the probability of Y happening is 20%. X and Y are NOT independent events. What is the probability that X and Y both occur?
    A. 0.10 + 0.20
    B. 0.10 × 0.20
    C. 0.10 ÷ 0.20
    D. (0.10 + 0.20) ÷ 2
    E. Cannot be determined from the information provided

19. Suppose that, in a class of 100 students, 40 students are male, and 60 students are female. Two different students are randomly selected to come to the front of the class at the same time. Which indicates the probability that both students are female?
    A. (60 ÷ 100) × (40 ÷ 100)
    B. (60 ÷ 100) × (60 ÷ 100)
    C. (60 ÷ 100) × (59 ÷ 99)
    D. (60 ÷ 100) × (59 ÷ 100)
    E. Cannot be determined from the information provided

20. Suppose that in a class of 100 students, 40 students are male and 20 students are freshman. Which indicates the probability that a randomly selected student is a male freshman?
    A. (40 ÷ 100) × (20 ÷ 100)
    B. (40 ÷ 100) × (19 ÷ 100)
    C. (40 ÷ 100) × (19 ÷ 99)
    D. Cannot be determined from the information provided

21. The sample for a research study is better described as which of the following?
    A. the things that are studied
    B. the things that the research study is interested in

22. The population for a research study is better described as which of the following?
    C. the things that are studied
    D. the things that the research study is interested in

23. Which of the following would provide a more credible estimate of the mean political ideology of a population of 3 million persons?
    A. a random sample of 500 members of the population
    B. a non-random sample of 1,000 members of the population

24. Political scientists weight survey data for which of the following reasons?
    A. Because the sample is too small
    B. Because the population is much larger than the sample
    C. Because the sample characteristics do not match the population characteristics

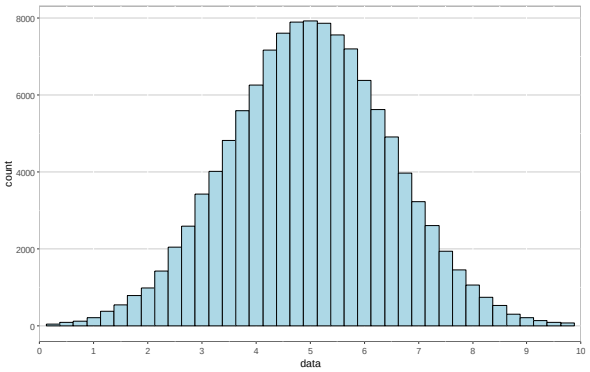
25. Suppose that we want to test the null hypothesis that the percentage of Illinois Democrats who support lowering the voting age to 12 equals the percentage of Illinois Republicans who support lowering the voting age to 12. Which set of samples below would be better for testing this null hypothesis?
    A. a random sample of 500 Illinois Democrats and a random sample of 500 Illinois Republicans
    B. a random sample of 800 Illinois Democrats and a random sample of 600 Illinois Republicans

26. Suppose that a researcher randomly samples a different 10 ISU students each day and measures their height. After 1 day, the researcher has a sample of 10 and calculates the mean height of these 10 students. After 2 days, the researcher has a sample of 20 and calculates the mean height of these 20 students. After 50 days, the researcher has a sample of 500 and calculates the mean height of these 500 students. Which of following is the most likely thing to have happened to the mean height that the researcher has calculated over these 50 days?
    A. The mean height has increased between Day 1 and Day 50.
    B. The mean height has decreased between Day 1 and Day 50.
    C. The mean height has gotten closer to the population mean between Day 1 and Day 50.
    D. The mean height has gotten farther from the population mean between Day 1 and Day 50.

27. If Asians are 6 percent of a sample and 5 percent of a population, what weight should be applied to each Asian person in the sample, if weighting on only race?
    A. $5 + 6$
    B. 5×6
    C. $5 \div 6$
    D. $6 \div 5$
    E. None of the above

28. If the mean survey weight for a group is 0.4, then that means that the group was ___.
    A. undersampled, relative to the group's percentage of the population
    B. oversampled, relative to the group's percentage of the population
    C. neither undersampled nor oversampled, relative to the group's percentage of the population

29. The image below is an example of a ___.



    A. uniform distribution
    B. normal distribution

30. Suppose that a test has a mean of 100 and a standard deviation of 10. Scores on the test follow a normal distribution. About 95% of scores should fall within which two scores?
    A. 10 and 100
    B. 60 and 140
    C. 70 and 130
    D. 80 and 120
    E. 90 and 110

31. The 600 scores in Group A follow a normal distribution and have a mean of 100 and a standard deviation of 5. The 600 scores in Group B follow a normal distribution and have a mean of 100 and a standard deviation of 20. Based on these statements, which one of the following statements is true?
    A. It is more likely that Group A has the highest score, and not Group B.
    B. It is more likely that Group B has the highest score, and not Group A.
    C. The probability that Group A has the highest score is the same as the probability that Group B has the highest score.

32. Suppose that scores on a national test follow a normal distribution and have a mean of 100 and a standard deviation of 10. If Student A raises her score from 90 to 100, and Student B raises her score from 120 to 130, which of the following statements is true?
    A. Student A had the higher percentile increase on the test.
    B. Student B had the higher percentile increase on the test.
    C. Student A had the same percentile increase on the test as Student B had.

33. Suppose that scores on a national test follow a normal distribution and have a mean of 100 and a standard deviation of 10. If Student A raises her score from 90 to 100, and Student B raises her score from 100 to 110, which of the following statements is true?
    A. Student A had the higher percentile increase on the test.
    B. Student B had the higher percentile increase on the test.
    C. Student A had the same percentile increase on the test as Student B had.

34. Which of the following is expected to be thinner?
    A. the 83% confidence interval for the mean weight of a random sample of 400 U.S. residents
    B. the 95% confidence interval for the mean weight of a random sample of 400 U.S. residents

35. Which of the following is expected to be thinner?
    A. the 95% confidence interval for the mean weight of a random sample of 100 U.S. residents
    B. the 95% confidence interval for the mean weight of a random sample of 400 U.S. residents

36. Which best indicates what the null hypothesis is?
    A. The hypothesis that is true
    B. The hypothesis being tested
    C. The hypothesis that the effect is not zero
    D. The hypothesis that is most supported by the evidence

37. Suppose that the null hypothesis is that a treatment will have a positive effect. Which of the following would be the alternate hypothesis?
    A. The treatment will have no effect.
    B. The treatment will not have a positive effect.
    C. The treatment will have a negative effect.

38. Of the following, which best describes what a p-value measures?
    A. the precision of an estimate
    B. the strength of evidence against the null hypothesis
    C. the size of an association controlling for other model factors

39. Of the p-values below, which p-value indicates the strongest evidence that an observed difference between the percentage of heads and the percentage of tails from a set of coin flips would have been unlikely to have occurred due to random chance, if the coin is fair?
    A. p = 0.01
    B. p = 0.50
    C. p = 0.97

40. If we flipped a coin and got 30 heads and 20 tails, what would be the p-value for a statistical test of the null hypothesis that the coin is fair?
    A. 0
    B. 1
    C. something between 0 and 1

41. If we flipped a coin and got 30 heads and 30 tails, what would be the p-value for a statistical test of the null hypothesis that the coin is fair?
    A. 0
    B. 1
    C. something between 0 and 1

42. If we flipped a coin and got 10 heads and 0 tails, what would be the p-value for a statistical test of the null hypothesis that the coin is fair?
    A. 0
    B. 1
    C. something between 0 and 1

43. What is the conventional p-value threshold in political science?
    A. 0
    B. 0.01
    C. 0.05
    D. 0.50
    E. 0.95
    F. 0.99
    G. 1

44. Suppose that we conduct 900 well-designed independent tests of a null hypothesis. In reality, the null hypothesis is true. What is the expected percentage of these tests that are expected to have a p-value of $p<0.05$?
    A. 0%
    B. 5%
    C. 50%
    D. 95%
    E. 100%
    F. Cannot be determined without more information

45. Suppose that data from a random sample of 200 persons provides some evidence against the null hypothesis, with a p-value of p=0.30. Suppose that all else were equal in the calculation of the p-value, but the standard deviation of measurements were larger. This would be expected to result in a p-value that is ___.
    A. less than p=0.30
    B. equal to p=0.30
    C. higher than p=0.30

46. If the p-value for a test of a null hypothesis is p=0.01, then we should do which of the following?
    A. accept the null hypothesis and accept the alternative hypothesis
    B. reject the null hypothesis and reject the alternative hypothesis
    C. accept the null hypothesis and reject the alternative hypothesis
    D. reject the null hypothesis and accept the alternative hypothesis
    E. none of the above

47. If the p-value for a test of a null hypothesis is p=0.99, then we should do which of the following?
    A. accept the null hypothesis and accept the alternative hypothesis
    B. reject the null hypothesis and reject the alternative hypothesis
    C. accept the null hypothesis and reject the alternative hypothesis
    D. reject the null hypothesis and accept the alternative hypothesis
    E. none of the above

48. A researcher tested the null hypothesis that an association is zero. The p-value for this test is p=0.01. Based on this p-value, which of the following should the researcher do, using the conventional level in political science?
    A. conclude that the association is zero
    B. conclude that the association is not zero
    C. neither of the above

49. Suppose that we are testing a null hypothesis. If we want to be extra certain before rejecting the null hypothesis, which p-value threshold below would be more appropriate?
    A. p=0.01
    B. p=0.10

50. For a test of the null hypothesis that there is no association, "statistically significant evidence" for the association refers to sufficient evidence that the association ___.
    A. exists
    B. is large

51. If the p-value is p=0.00001 for a single statistical test of a null hypothesis that there is no association, do we have enough evidence to claim that there is statistically significant evidence for the detected association?
    A. Yes
    B. No

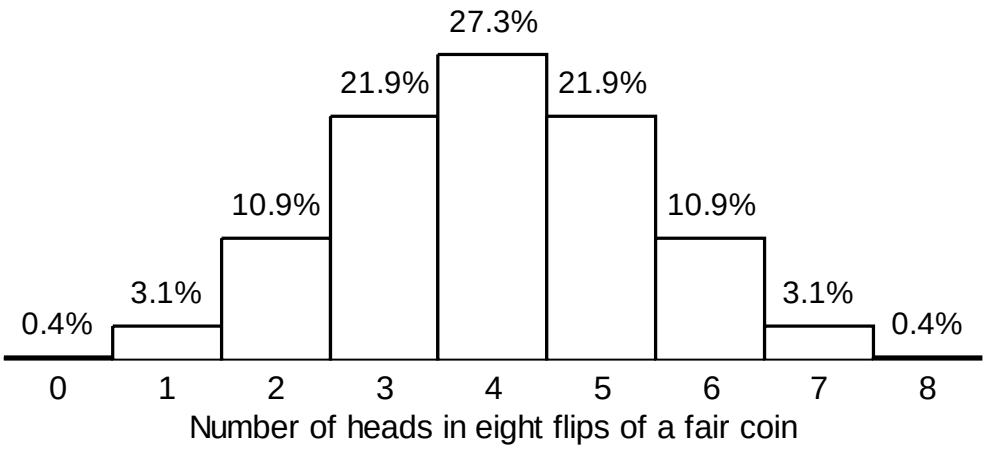
52. If the p-value is p=0.00001 for a single statistical test of a null hypothesis that there is no association, do we have enough evidence to claim that the association is large?
    A. Yes
    B. No

53. Suppose that students at Faber College identify into racial/ethnic groups as follows:

    6,000 White students
    4,000 Hispanic students
    3,000 Black students
    1,000 Students who identify as Other
    500 Asian students

    Faber College randomly selects 5% of students to receive a scholarship. But, due to random error, not every racial/ethnic group has the same percentage of scholarship winners. Which race/ethnic group below is most likely to have had the highest percentage of its group win a scholarship?
    ☐ Whites
    ☐ Blacks
    ☐ Asians

54. The histogram indicates the percentage of times that a fair coin is expected to land on the indicated number of heads in eight flips. Note that 3.1% is written as 0.031 as a decimal.



Based on the above, which calculation indicates the p-value that would occur for a test of the null hypothesis that a coin is fair, if the coin landed on 6 heads in 8 flips?

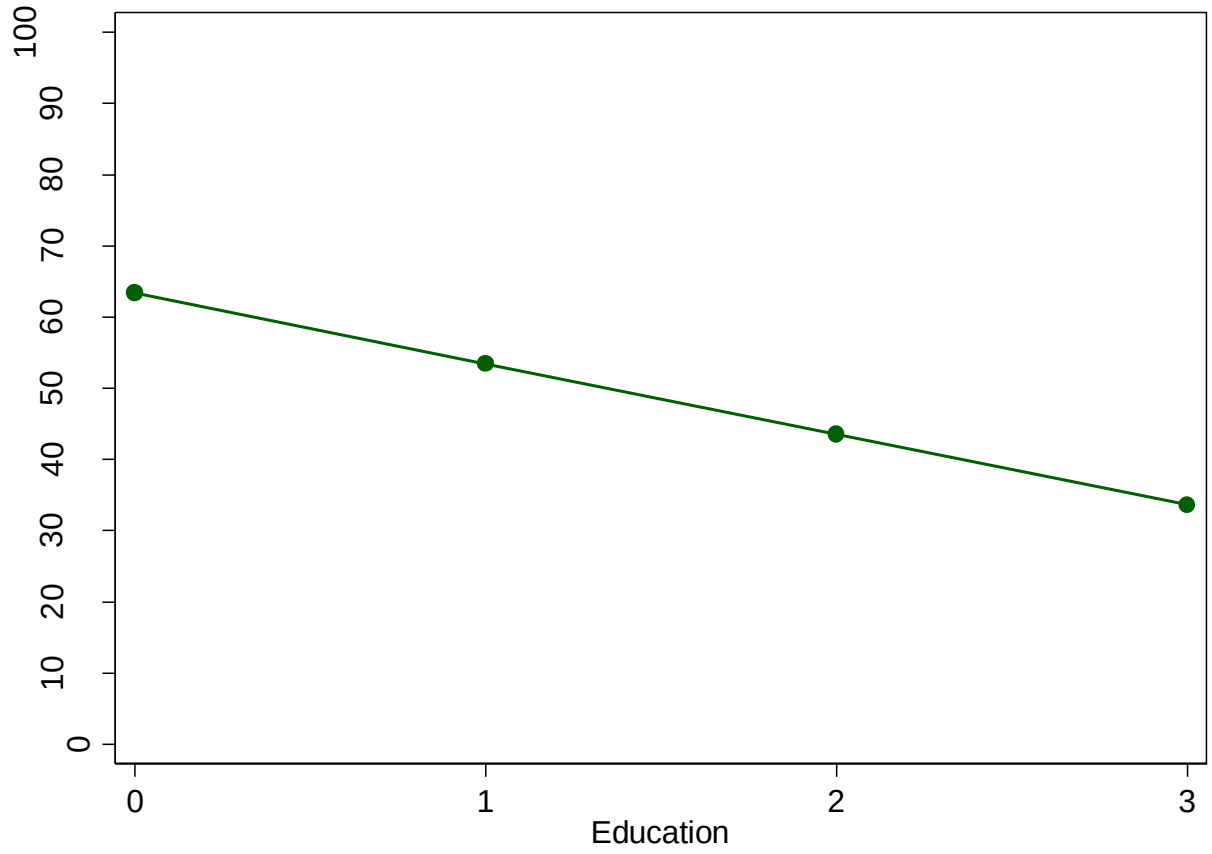
A. 0.109
B. 0.109 + 0.109
C. 0.109 + 0.219 + 0.273 + 0.219 + 0.109
D. 0.004 + 0.031 + 0.109 + 0.109 + 0.031 + 0.004

55. Suppose that data from an in-person POL 138 course indicated that students who attended a higher percentage of class meetings had a higher final exam percentage correct, compared to students who attended a lower percentage of class meetings. The p-value is p=0.01 for a test of the null hypothesis that the final exam percentage does not differ by percentage of class meetings attended. Does this analysis contain sufficient evidence to conclude at the conventional level in political science that, at least among students in this analysis and at least on average, attending a higher percentage of class meetings caused students to have a higher final exam percentage correct?

A. Yes
B. No

-- No calculators, phones, or other devices permitted. --

[Items 56 through 61] The image and output are from a linear regression on data from the ANES 2020 Time Series Study that used a participant's education (in a variable called EDUC) to predict the participant's rating about the National Rifle Association (NRA) on a 0-to-100 scale. The EDUC predictor is coded so that 0 is a high school degree only, 1 is some college, 2 is a BA/BS 4-year college degree only, and 3 is a graduate degree.




```
Coefficients:
             Estimate   p-value
(Intercept)        63    <0.0001
       EDUC       -10    <0.0001
```

56. What does the 63 intercept coefficient indicate?
    A. The predicted rating about the National Rifle Association among all respondents.
    B. The predicted rating about the National Rifle Association among respondents with the average level of education.
    C. The predicted rating about the National Rifle Association among respondents with only a high school degree.

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[From the prior page:]

```
Coefficients:
             Estimate   p-value
(Intercept)       63     <0.0001
       EDUC      -10     <0.0001
```

57. What does the -10 coefficient for EDUC indicate?
    A. The predicted rating about the National Rifle Association is 10 units lower among participants with a graduate degree than among participants with only a high school degree.
    B. For each one-unit increase in the EDUC predictor, the predicted rating about the National Rifle Association drops by 10 units.

58. Which of the following is a correct linear regression equation for the output in the image, using X and Y?
    A. Y = -10X + 63X
    B. Y = 63X + -10
    C. Y = 63 + -10
    D. Y = 63 + -10X

59. Which formula can be used to estimate the predicted rating about the National Rifle Association among participants who have a graduate degree?
    A. (-10 × 3) + (63 × 3)
    B. (63 × 3) + -10
    C. (63 × 3) + -10
    D. 63 + (-10 × 3)

60. Did the analysis provide sufficient evidence to conclude, at the conventional level in political science, that more education correlated with a person to have a lower rating about the National Rifle Association, at least on average among participants in the sample?
    A. Yes
    B. No

61. Did the analysis provide sufficient evidence to conclude, at the conventional level in political science, that more education caused a person to have a lower rating about the National Rifle Association, at least on average among participants in the sample?
    A. Yes
    B. No

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[Items 62 and 63] Below is output from a linear regression using data from the ANES 2020 Time Series Study, predicting respondent ratings about Donald Trump (FTTRUMP), using a predictor for the political party of the respondent, with categories of Democrat, Republican, and Independent, with Democrat as the omitted category.

FTTRUMP	Coef.	p-value	[95% Conf.	Interval]
PARTY				
Republican	69.55	0.000	67.97	71.14
Independent	26.00	0.000	24.41	27.59
intercept	7.56	0.000	6.47	8.64

62. What does the 7.56 coefficient estimate for the intercept indicate?
    A. The mean rating about Donald Trump is predicted to be 7.56 among the average respondent.
    B. The mean rating about Donald Trump is predicted to be 7.56 among Democrat respondents.
    C. The mean rating about Donald Trump is predicted to be 7.56 units higher for Democrat respondents than for other respondents.
    D. The mean rating about Donald Trump is predicted to increase by 7.56 for a one-unit increase in participant political party.

63. What does the 69.55 coefficient estimate for the Republican category indicate?
    A. The mean rating about Donald Trump is predicted to be 69.55 among Republican respondents.
    B. The mean rating about Donald Trump is predicted to be 69.55 higher among Republican respondents than among all other respondents.
    C. The mean rating about Donald Trump is predicted to be 69.55 higher among Republican respondents than among Democrat respondents.

Sample bonus-type item

64. Suppose that, in a course, a student has scored 92% on everything but has not taken the final exam. In that course, the final exam is worth 25% of the final grade. Which of the following can be used to calculate the percentage that the student needs on the final exam to get at least a 90% in the course?
    A. $(92 \times 0.25) \div 90$
    B. $(90 \times 0.25) \div 92$
    C. $(90 \times 0.25) \div (100 - 92)$
    D. $(92 \times 0.25) \div (100 - 90)$
    E. $(90 - (0.25 \times 92)) \div 0.75$
    F. $(90 - (0.75 \times 92)) \div 0.25$