CCSS Adv. Algebra 4 AA8_9: Comparing Groups with Normal Distribution Name_____

1. The table below shows the mean and standard deviation of Annual Income by various groups in the U.S.

Gender/Race/ Ethnicity	Mean	Standard Deviation
Female	$40,127.49	21,337.19
Male	$48,373.77	28,556.47
White	$42,674.17	24,053.28
Black	$38,025.04	20,634.02
Hispanic	$32,245.84	14,016.93
Asian	$35,962.00	19,069.32
Native American	$41,072.38	23,529.71

   a. Calculate the z-score for an income of $100,000 for each group below:
      i. Female
      $Z = \frac{100000 - 40127.19}{21337.19} = 2.8$
      ii. Male
      $Z = \frac{100000 - 48373.77}{28356.47} = 1.8$
   b. What do the differences in z-scores tell you about the income of each group? Be specific.
      It is more likely for males to earn 100000 than females
   c. Assuming that incomes follow a normal distribution, calculate the probability of a randomly chosen person having income of greater than $100,000 for each group below:
      i. Black
      $Z = \frac{100000 - 38025.04}{20634.02}$ Normalcdf(100000, 999999, 38025, 20634) = .001 = .1%
      ii. White
      $Z = \frac{100000 - 42674.17}{24053.28}$ Normalcdf(100000, 999999, 42674, 24053) = .008 = .8%
   d. What do the differences in the probabilities tell you about the income of each group? Be specific. Whites are 8 times more likely to earn over $100K but neither group is likely.
   e. Assuming that incomes follow a normal distribution, calculate the probability of a randomly chosen person having income of less that $25,000 for each group below:
      i. Black
      Normalcdf(0, 25000, 38025.04, 20634.02) .23 = 23%
      ii. Hispanic
      Normalcdf(0, 25000, 32245.84, 14016.93) = .29 = 29%
   f. What do the differences in the probabilities tell you about the income of each group? Be specific.
      Hispanics are slightly more likely than Blacks to earn less than $25K

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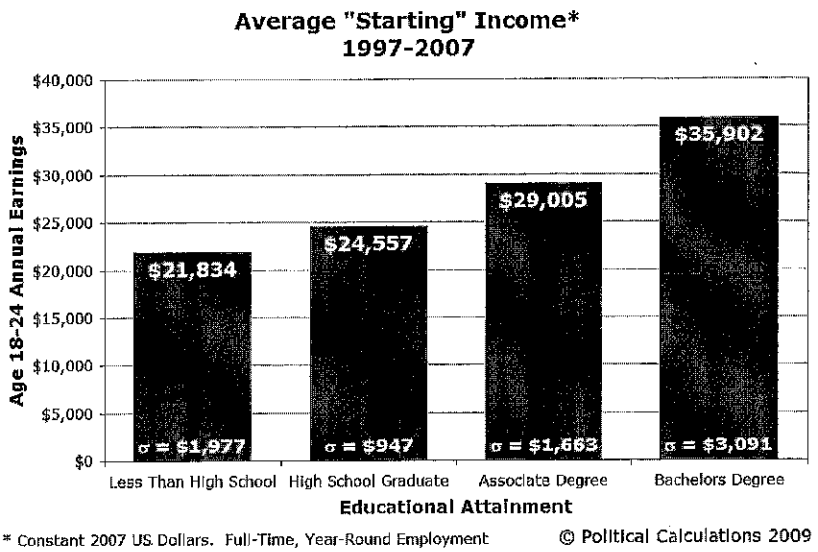
1. The chart below shows average annual earning for individuals aged 18-24 by educational attainment.
Note σ = Standard Deviation.



   a. Calculate the z-score for an income of \$30,000 for each group below:
      i. High school graduate

$Z = \frac{30000 - 21557}{947} = 5.75$

      ii. Bachelor degree

$Z = \frac{30000 - 35902}{3091} = -1.91$

   b. What do the differences in z-scores tell you about the income of each group? Be specific. It is much less likely for a H.S. grad to earn \$30K than a Bachelor's degree.

   c. Assuming that incomes follow a normal distribution, calculate the probability of a randomly chosen person having income of greater than \$30,000 for each group below:
      i. Less than high school

normalcdf(30000, 9999999, 21834, 1977) = .0018%

      ii. Associate degree

normalcdf(30000, 9999999, 29005, 1663) = 27%

   d. What do the differences in the probabilities tell you about the income of each group? Be specific. It is much more likely for an Associate's Degree to earn ≥ \$30K

   e. Assuming that incomes follow a normal distribution, calculate the probability of a randomly chosen person having income of less that \$15,000 for each group below:
      i. Less than high school

normalcdf(0, 15000, 21834, 1977) = .027%

      ii. Bachelor degree

normalcdf(0, 15000, 35902, 3091) = .00000000863%

   f. What do the differences in the probabilities tell you about the income of each group? Be specific. Almost no Bachelor degrees earn less than 15K