Quiz C

Instructions: Open book and notes. On a Scantron sheet indicate the one best or closest answer to each question. Keep this page. Put your name, SSN4, and either "AM" or "PM" on your Scantron sheet.

Fifty students took the final exam in a psychology class. Out of 100 points possible on the exam: 5 students scored in the 90s, 10 in the 80s, 12 in the 70s, 9 in the 60s, 7 in the 50s, and 4 in the 40s, and rest scored in the 30s. [Hint: It may be helpful to sketch a histogram on scratch paper.]

1. What percentage of the students scored in the 30s on this exam?
   (a) 3%   (b) 5%   (c) 6%   (d) 10%   (e) None of these
   
   Number in 30s is 50 – (5 + 10 + 12 + 9 + 7 + 4) = 3. Percent in 30s is 3/50 = 6%

2. In what interval does the median score lie?  (a) 90s   (b) 80s   (c) 70s   (d) 60s   (e) 50s
   
   5 + 10 = 15 < 25, but 5 + 10 + 12 = 27 > 25, so median must be in 70s
   INCORRECT APPROACH: The 60s is the "middle" interval out of 30s, 40s, 50s, 60s, 70s, 80s, 90s. Count individuals (students), not intervals.

3. The shape of this distribution of test scores can best be summarized as:
   (a) skewed to the left   (b) skewed to the right   (c) roughly symmetrical   (d) bimodal   (e) having many outliers
   
   Look at a histogram. Skewness is in the direction of the tail.

Of the students at State University 10% of them are at least 40 years old and 20% are younger than 21.

4. One student is chosen at random from the students at this university. What is the probability that he or she is younger than 40?  [Complement rule]   (a) .05   (b) .30   (c) .70   (d) .80   (e) .90
   
   1 – .10 = .90

5. What is the probability that a student chosen at random from this student body is between 21 and 40 years old? (a) .02   (b) .30   (c) .70   (d) .80   (e) .85
   
   1 – P(either in younger group or older group) = 1 – (.10 + .20) = .70

6. If two students are chosen at random, what is the probability that they are both younger than 21?  [Multiplication rule]   (a) .01   (b) .04   (c) .20   (d) .30   (e) .40
   
   P(both in younger group) = P(first in younger group) * P(second in younger group) = (.2)(.2) = .04
Scores on the XYZ college admissions test are normally distributed. For all students who took this test during 2002, the mean was 150 and the standard deviation was 15.

7. What is the probability that a randomly chosen student who took this test during 2002 scored between 135 and 165?  
   (a) .16  (b) .32  (c) .68  (d) .95  (e) .997

   \[ P(135 < X < 135) = P\left(\frac{135 - 150}{15} < \frac{X - \mu}{\sigma} < \frac{165 - 150}{15}\right) = P(-1 < Z < 1) \approx .68 \]

8. What is the probability that such a student did not score between 135 and 165?  
   (a) .0256  (b) .003  (c) .05  (d) .32  (e) .68

   \[ 1 - .68 = .32 \]

9. If a SRS of four such students is chosen, what is the probability that the average of the four scores is between 135 and 165? [Sampling distribution of \( \bar{X} \)]  
   (a) .16  (b) .64  (c) .68  (d) .95  (e) .997

   \[ SD(\bar{X}) = \frac{15}{\sqrt{4}} = 15/2 = 7.5 \]

   \[ P(135 < \bar{X} < 135) = P\left(\frac{135 - 150}{7.5} < \frac{\bar{X} - \mu}{SD(\bar{X})} < \frac{165 - 150}{7.5}\right) = P(-2 < Z < 2) \approx .95 \]

10. If a SRS of two such students is chosen at random, what is the probability that both of them scored below 135?  
    (a) .025  (b) .10  (c) .16  (d) .32  (d) .64

    \[ P(X < 135) = P\left(\frac{X - \mu}{\sigma} < \frac{135 - 150}{15}\right) = P(Z < -1) = 0.1587 \]

    \[ P(\text{both below 135}) = P(\text{first below 135}) \cdot P(\text{second below 135}) = (.1587)(.1587) = .025 \]