Instructions. To get full credit, you must show your work. Good luck!

1. (18 pts.) True or false:
   
   (a) Under the normal curve, the 95th percentile in standard units is about 1.96.
   
   (b) The correlation between percentages of men and percentages of women in all math classes at UNT must be −1.
   
   (c) It is possible to find the missing number in the following data set so that the correlation is 1.
   
   \[
   \begin{array}{cc}
   x & y \\
   1 & 3 \\
   1 & 3 \\
   2 & 5 \\
   4 & - \\
   \end{array}
   \]
   
   (d) When studying one variable, you can use a graph called a histogram. When studying the relationship between two variables, you can use a graph called a scatter diagram.
   
   (e) If \( y \) is usually bigger than \( x \), the correlation coefficient between \( x \) and \( y \) will be positive.
   
   (f) If a coin is tossed five times, the chance of getting HHHHH is lower than the chance of getting HTTHT.

2. (15 pts.) A computer program prints out \( r \) for the two data sets shown below. Someone tells you that one of the \( r \)'s is wrong. Which one? Give a detailed explanation. (No calculation is necessary)

   (i) \[
   \begin{array}{cc}
   x & y \\
   1 & 5 \\
   1 & 5 \\
   2 & 3 \\
   3 & 1 \\
   4 & -1 \\
   \end{array}
   \]
   \[ r = -1 \]

   (ii) \[
   \begin{array}{cc}
   x & y \\
   1 & 7 \\
   1 & 7 \\
   2 & 3 \\
   3 & 3 \\
   4 & 1 \\
   \end{array}
   \]
   \[ r = -0.986 \]

3. (6 pts.) Ten measurements (in inches) of the thickness of a table top, using a vernier gauge reading to 0.0001 of an inch, are:

   1.4317 1.4316 1.4316 1.4318 1.4329 1.4332 1.4342 1.4337 1.4333 1.4315

   The likely size of the chance error in a single measurement is—

   0.01 0.001 0.03

   (Circle the correct answer.)
4. (16 pts.) Pearson and Lee obtained the following results in a study of about 1,000 families:

- Average height of husband ≈ 68 inches, SD ≈ 3.0 inches
- Average height of wife ≈ 63 inches, SD ≈ 2.5 inches, \( r ≈ 0.25 \)

(a) Predict the height of a wife when the height of her husband is 65 inches.
(b) Predict the height of a husband when the height of his wife is 65 inches.

5. (18 pts.) In a statistics class with 100 students, there are 60 men, 25 freshmen and 75 sophomores.

(a) Complete the following tables so that Table 1 has the smallest percentage of female freshmen possible and Table 2 has the largest percentage of female freshmen possible.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Sophomores</td>
<td>60</td>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Sophomores</td>
<td>60</td>
<td>40</td>
</tr>
</tbody>
</table>

(b) True or false: if a student is picked at random from the class in Table 1, the chance of picking a female freshman is \( 40\% \times 25\% \).
(c) True or false: if a student is picked at random from the class in Table 2, the chance of picking a female freshman is \( 40\% \times 25\% \).
(d) Complete the following table so that if a student is picked at random from this class, the chance of picking a female freshman is \( 40\% \times 25\% \).

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshmen</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Sophomores</td>
<td>60</td>
<td>40</td>
</tr>
</tbody>
</table>

(e) Which table(s) shows that gender and classification are independent?

6. (12 pts.) A poker hand is dealt. Find the chance that the first four cards are aces and the fifth is a king. (A deck of cards has 4 suits \{clubs, diamonds, hearts, spades\} with 13 cards in each suit – 2, 3, …, 10, jack, queen, king, ace.)

7. Among students in a statistics class, scores on the Math SAT followed the normal curve, as do scores on the final. The average of Math SAT was 500, with an SD of 100. The correlation between Math SAT scores and final scores is about 0.85. The scatter diagram is football-shaped. Fill in the blanks; show work.

(a) (15 pts.) One student in this class made a 650 on his Math SAT, which is _____ points above average. In standard units, his Math SAT score is _____. The regression prediction for his final score is _____ \times _____ ≈ _____ in standard units.

So the percentile rank on the final score for him is _____%.

(b) (Bonus: 15 pts.) Another student was in the 40th percentile rank on the Math SAT. In standard units, his Math SAT score is _______. The regression prediction for his final score is _____ \times _____ ≈ _____ in standard units.

So the percentile rank on the final score for him is ______%. 

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