MAKE SURE THAT YOUR COPY OF THIS TEST CONSISTS OF 7 PAGES AND 11 QUESTIONS

<table>
<thead>
<tr>
<th>Name</th>
<th>I.D.#</th>
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<tr>
<th>Section</th>
<th>Day</th>
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<th>Room</th>
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<td>1</td>
<td>UTH</td>
<td>15:00 – 15:50</td>
<td>S41 – 031</td>
<td>Dr. Reeman Abu-Shanab</td>
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<td>Dr. Reeman Abu-Shanab</td>
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<td>5</td>
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<td>S40 – 2008</td>
<td>Mrs. Monita Baruah</td>
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<td>6 &amp; 7</td>
<td>MW</td>
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<td>Dr. Khalid Amin</td>
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TOTAL (40 PTS)
ANSWER THE FOLLOWING QUESTIONS AND SHOW YOUR WORK.

1. [03 points] The measurements (in centimeters) of 30 items are shown by the given stem-and-leaf display. Find the inter-quartile range IQR.

Q1 = 12

Q3 = 51

IQR = 51 – 12 = 39

2. [04 points] The given frequency polygon shows the distribution of the studying hours that 34 students spent as a preparation for the final examination.

- Find the class interval of this distribution.
  10 – 3 = 7

- What are the class limits of the first class?
  The class boundaries are 6.5 & 13.5
  The class limits are 7 & 13

- How many students spent more than 27.5 studying hours?
  4 students
3. **04 points** A game involves you to select a card among a collection of cards numbered from 1 through 9. Your payoff (in Bahraini Dinars) is specified according to the selected card as shown in the given table. If your **expected payoff** is 10, find the payoff $X$.

<table>
<thead>
<tr>
<th>Card</th>
<th>Even Number</th>
<th>Odd Number</th>
</tr>
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<tbody>
<tr>
<td>Payoff</td>
<td>$X$</td>
<td>$-30$</td>
</tr>
</tbody>
</table>

\[
10 = X \left(\frac{1}{6}\right) - 30 \left(\frac{1}{6}\right)
\]
\[
90 = 4X - 150
\]
\[
240 = 4X
\]
\[
X = 60
\]

4. **02 points** In how many ways can we **rank the top 3** graduation projects among 11 projects submitted to the Department of Mathematics?

\[11 \text{ P } 3 = 990\]

5. **03 points** A box contains **4 red** marbles, **5 yellow** marbles, and **6 green** marbles. If four marbles are drawn randomly from the box, find the probability that all the selected marbles are of **yellow** color.

\[
\frac{\binom{5}{4}}{\binom{15}{4}} = \frac{5}{1365} = 0.003663004
\]
6. **03 points** If \( P(A) = 0.2 \), \( P(B) = 0.6 \) and \( P(B|A) = 0.3 \), then find \( P(A \cup B) \).

\[
P(B) = 1 - 0.6 = 0.4
\]

\[
P(A \cap B) = P(B|A) \times P(A) = 0.3 \times 0.2 = 0.06
\]

\[
P(A \cup B) = P(A) + P(B) - P(A \cap B) = 0.2 + 0.4 - 0.06 = 0.54
\]

7. **02 points** At a local university 66% of the incoming first-year students have computers. If 3 students are selected at random, find the probability that none have computers.

\[
P(\text{not having a computer}) = 1 - 66\% = 34\%
\]

\[
P(\text{none have computers}) = (34\%)^3 = 0.039304
\]

8. **03 points** Use the given Venn diagram.

- Find \( P(\overline{A} \cup B) \).

\[
0.20 + 0.10 = 0.30
\]

- Find \( P(A \cup B \cup C) \).

\[
1 - 0.10 = 0.90
\]
9. **05 points** Two boxes labeled I and II of which each contains a collection of red and blue balls. A box is selected and a ball is drawn so that the probabilities of the possible outcomes are shown by the tree diagram.

- If box I was selected, find the probability of drawing a blue ball.

\[
P(\text{blue ball} \mid \text{box I}) = \frac{P(\text{blue ball} \cap \text{box I})}{P(\text{box I})} = \frac{1/6}{1/2} = \frac{1}{3}
\]

- If a red ball was drawn, find the probability of selecting box II.

\[
P(\text{box II} \mid \text{red ball}) = \frac{P(\text{box II} \cap \text{red ball})}{P(\text{red ball})} = \frac{1/8}{11/24} = \frac{3}{11}
\]
10. [04 points] A company has two factories A and B that produce respectively 60% and 40% of a specific model of car. It is known that 35% of the cars produced in factory A and 15% of those produced in factory B are white. If a car produced by the company is selected at random, find the probability that it will be white.

\[
P(\text{white} \cap A) = P(\text{white} | A) \cdot P(A) = 35\% \times 60\% = 21\% \quad \text{1 pt}
\]

\[
P(\text{white} \cap B) = P(\text{white} | B) \cdot P(B) = 15\% \times 40\% = 6\% \quad \text{1 pt}
\]

\[
P(\text{white}) = P(\text{white} \cap A) + P(\text{white} \cap B) = 21\% + 6\% = 27\% \quad \text{1 pt}
\]

**ALTERNATIVELY, USE TREE DIAGRAM**

\[
P(\text{white} | A) = 35\% \quad P(\text{white} \cap A) = 60\% \times 35\% = 21\%
\]

\[
P(A) = 60\%
\]

\[
P(\text{white} | B) = 15\% \quad P(\text{white} \cap B) = 40\% \times 15\% = 6\%
\]

\[
P(A) = 60\%
\]

\[
P(B) = 40\%
\]

\[
P(\text{white}) = 21\% + 6\% = 27\%
\]
The following histogram represents the number of miles that 50 employees of a company traveled to work each day.

\[
\sum x \cdot f = (1.95)(20) + (3.95)(10) + (5.95)(15) + (7.95)(5) = 207.5
\]

\[
\sum x^2 \cdot f = (1.95)^2(20) + (3.95)^2(10) + (5.95)^2(15) + (7.95)^2(5) = 1079.125
\]

- Calculate the mean \( \bar{x} \) of this distribution.

\[
\bar{x} = \frac{\sum x \cdot f}{n} = \frac{207.5}{50} = 4.15
\]

- Calculate the variance \( s^2 \) of this distribution.

\[
s^2 = \frac{n \sum x^2 \cdot f - (\sum x \cdot f)^2}{n(n-1)} = \frac{50(1079.125) - (207.5)^2}{(50)(49)} = 4.44898
\]