Name: ________________________________

1. Please write your name in the above space.

2. **You need to do all 4 questions.** All questions are of equal value (but not necessarily of equal difficulty).

3. Do not turn the page until so instructed. (You will have 90 minutes to work after the examination has been discussed with you.)

4. You may use your crib sheet and your calculator. Otherwise this is a closed book examination.

5. If you do not have enough room for your work in the place provided, use the back of a nearby page. (However, be sure to mark clearly which problem the material on the back of any page refers to.) If you pull the pages apart, sign all pages.

6. Answers should unambiguously state, in words, the approach taken. You should show your work so that partial credit can be given. Poorly described solutions will be penalized. unsupported answers

7. Good luck!

<table>
<thead>
<tr>
<th>Question</th>
<th>Subject</th>
<th>Points Available</th>
<th>Points Earned</th>
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<tr>
<td>Total</td>
<td></td>
<td>100</td>
<td></td>
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Question 1) Debate on Blood Pressure Medication (25 points)

Read the article that appeared in the Seattle Times on a “New study stirs debate over blood-pressure medication” and answer the questions posed below.

The article is at:

Note that your answers may be brief and address the article’s reporting of the attached study, not the details of the study itself. If there is not information on a question, leave it blank.

Here are the questions:

a) (12 points)

Briefly address the following basic questions about the article and the underlying study. You only need to address the questions you think are most important to the study.

1. What are the claims made in the article?

2. Are the claims supported in the article? If so, how?

3. Is there data in the article used to support the claims?

4. Is there data in the references for the claims?

5. Can you think of alternative explanations for the data in the article? Is there data in the article to support these alternatives?
6. Does the data presented support the claims?

b) (13 points)

Briefly describe each of the following components of the study. You only need to address the questions you think are most important to comment on.

Component 1: The individuals or objects studied and how they were selected

Component 2: The exact nature of the measurements made and the questions asked

Component 3: The setting or context in which the measurement were made

Component 4: The extraneous differences between groups being compared
Component 5: The magnitude of any claimed effects of differences

Component 6: The source of the research and the funding

Component 7: The researchers who had contact with the participants
Expanded educational emphasis is thought to benefit national economic development through improved labor force capacities and the creation of new knowledge and capacities. To test this hypothesis researchers considered the percentage growth of real gross domestic product (GDP) from 1995-2000 for counties around the world. The countries were split into those who placed a high emphasis on education and those who placed a low emphasis. This was measured by the number of years of school per person in the country adjusted for the different ages of the populations. The growth for thirteen randomly selected high education counties and thirteen randomly selected low education counties are recorded below:

<table>
<thead>
<tr>
<th>High education</th>
<th>Low education</th>
</tr>
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<tbody>
<tr>
<td>15.7</td>
<td>18.9</td>
</tr>
<tr>
<td>22.0</td>
<td>13.0</td>
</tr>
<tr>
<td>20.1</td>
<td>18.2</td>
</tr>
<tr>
<td>23.7</td>
<td>15.0</td>
</tr>
<tr>
<td>21.9</td>
<td>13.9</td>
</tr>
<tr>
<td>21.7</td>
<td>12.2</td>
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<tr>
<td>20.4</td>
<td>15.7</td>
</tr>
<tr>
<td>17.3</td>
<td>13.2</td>
</tr>
<tr>
<td>15.3</td>
<td>19.6</td>
</tr>
<tr>
<td>16.8</td>
<td>13.1</td>
</tr>
<tr>
<td>21.8</td>
<td>18.8</td>
</tr>
<tr>
<td>16.0</td>
<td>19.0</td>
</tr>
<tr>
<td>16.4</td>
<td>14.6</td>
</tr>
</tbody>
</table>

| mean, ($\bar{x}$) | 19.16 | 15.78 |
| standard deviation, ($s$) | 2.97  | 2.73  |

a) (10 points)

Based on the axis supplied, construct back-to-back stem-and-leaf plots for the two samples. Be sure to include a legend to indicate the units.

Briefly describe the distributions for the two samples.

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b) **(7 points)**

Calculate the median, lower quartile, upper quartile, and interquartile range for each sample.

c) **(5 points)**

Below are two parallel box-and-whisker plots, one for each type of country:

![Box-and-Whisker Plot](image)

Indicate on the plots the location of the median, lower quartile and upper quartile. Briefly describe the features of the High and Low education countries.

d) **(3 points)**

A fellow student compares high to low education countries by comparing the means of the samples alone. Is this an adequate comparison? Justify your answer with reference to the above analysis.
Question 3) Race and Legalized Abortion (25 points)

A researcher in Alabama is interested in studying the relationship, if any, between a person’s race and their opinion about legalized abortion. They consider two racial groups (“black” and “white”) and two opinions (“favor” and “oppose”). Based on survey data they find that 30% of whites favor legalized abortion, 60% of the respondents are white, and 32% of the respondents are black and favor legalized abortion.

(a) (5 points)

Construct a probability tree for this situation, with the first branch being the event “respondent is white.”

(b) (5 points)

Draw a simple Venn diagram for this situation.

(c) (5 points)

Based on the probability tree and Venn diagram, find the probability that the respondent is white or favors abortion (or both)
d) (4 points)

Find the probability that the respondent is white and opposes abortion.

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e) (4 points)

What is the probability that a black person favors legalized abortion? In symbols, what does this conditional probability represent?

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f) (2 points)

Are the events “the respondent is white” and “the respondent favors legalized abortion” independent? Briefly explain your answer.
Question 4) Interest Rates and Building Permits (25 points)

The interest rate determines the cost of funds necessary to build a home. The number of building permits issued by local governments in King County is a strong indicator of the number of new homes that will be available in the next six months.

The King County Homebuilders’ Association argued that during periods of high interest rates the number of building permits issued decreases drastically. They then argue that the number of new homes will be correspondingly reduced, leading to a potential housing shortage.

As a result, the homebuilders’ association is lobbying for various home subsidy programs to be applied during periods of high interest rates.

Is there a relationship between interest rates and the number of housing permits? To address this question, we collected data on the interest rates and the number of housing permits for the spring season for twelve successive years.

The scatter plot below relates the interest rates to the number of housing permits issued for the 12 years.

![Scatter plot]

a) (3 points)

Estimate the regression line by eye and draw it on the above scatter plot.
b) (6 points)

Based on the line you have drawn on the plot, estimate the coefficients of the regression line?

c) (4 points)

Estimate the correlation coefficient between the number of building permits and the interest rate. Does it appear that the relationship between the two variables is approximately linear?

d) (2 points)

Does the correlation coefficient indicate a positive or negative association between the two variables? Does it indicate a strong, or weak linear relationship between the two variables?

e) (3 points)

What is the interpretation of the intercept of the regression line?

f) (3 points)

How large a change in the number of building permits is associated with an increase of 2% in interest rates?

g) (4 points)

Predict the number of building permits for a year when the interest rate is 16%. Based on the model, do you think we can this prediction is valid (approximately)?