Question 1 (5 points)

In each of the following cases, (i) explain if the reported correlation coefficient *r* is a reasonable value, and (ii) if the value of *r* is not reasonable, explain why.

(a) A study found a correlation of $r = 0.7$ between gender and height.

(b) A study found a correlation of $r = -0.7$ between amount of alcohol consumed and the reaction time it takes to brake.

(c) A study found a correlation of $r = 0$ between IQ scores and shoe size.

(d) A study found a correlation of $r = 0.25$ between distance from the equator for North American cities and average January temperature.

(e) A study found a correlation of $r = 1.00$ between temperature and ice cream sales.

Question 2 (4 points)

We would like to determine how the horsepower of a car can help predict the car's gas mileage (in miles per gallon). The horsepowers and the gas mileages (in miles per gallon) for a sample of 10 cars are shown below:

Car	1	2	3	4	5	6	7	8	9	10
Horsepower	110	215	52	65	150	175	91	62	175	180
Gas Mileage	21	10.4	30.4	33.9	15.5	19.2	26	24.4	19.7	17.3

The least-squares regression line is calculated to be $\hat{y}=35.42-0.11x$

and it is reported that 79.43% of the variation in gas mileage is explained by its regression on horsepower.

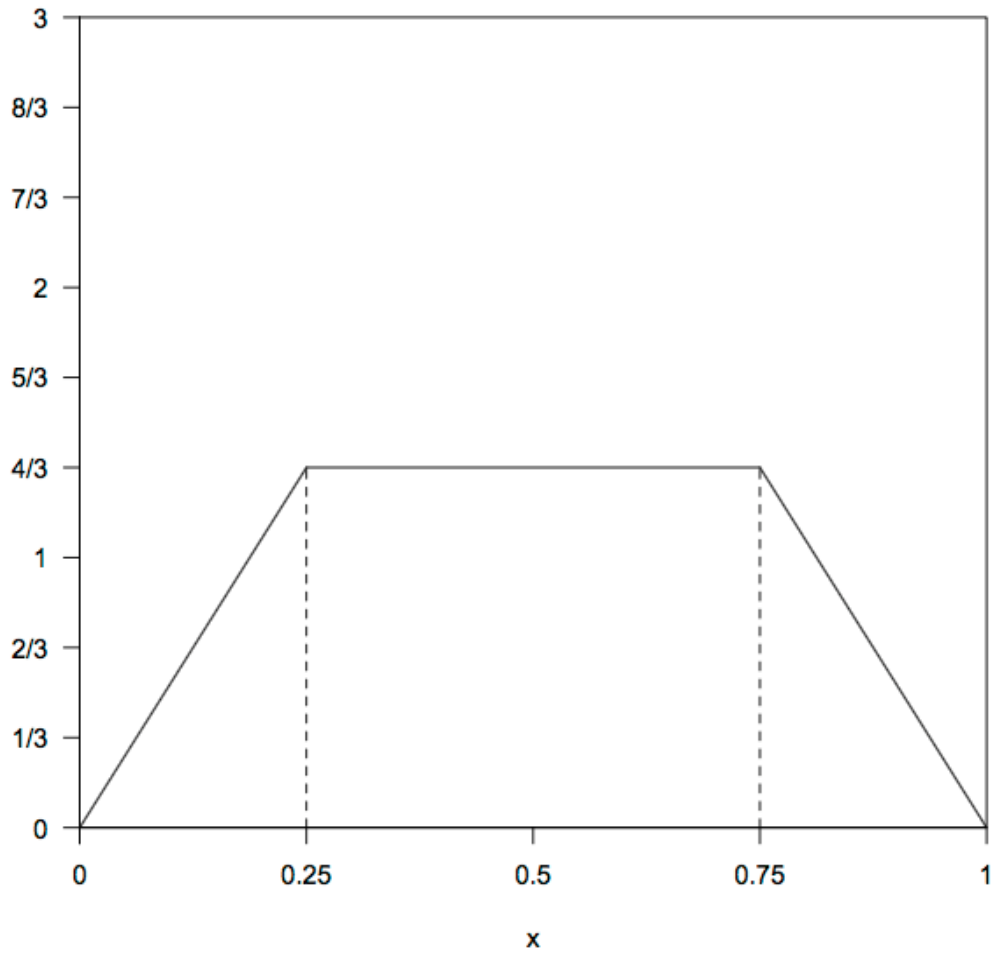
(a) What is the correlation between horsepower and gas mileage? Show your work.

(b) What is the residual for Car #5? Show your work. What does the sign of the residual (positive or negative) tell us?

(c) Interpret the slope of the least-squares regression equation **in the context of this problem.**

Question 3 (5 points)

Answer the below questions in regards to the density curve pictured below. Show your work for all question parts. (Hint: the dashed lines are drawn to help you see that the region under the density curve can be split up into triangles and a rectangle.)



(a) Use the two properties of density curves to verify that the above figure is a valid density curve.

(b) What proportion of values of X are between 0.25 and 0.75?

(c) What proportion of values of X are less than 0.6?

(d) Use your answer to part (c) to determine the proportion of values of X that are at least 0.6.

(e) What is the value of *x* such that $P(0.25 < X < x) = 0.5$?

Question 4 (4 points)

Weights of hockey players in a certain league follow a normal distribution with mean 194 pounds. It is known that 30.85% of players weigh more than 200 pounds.

Show your work.

(a) What is the standard deviation of the weights of hockey players in the league?

(b) What proportion of players weigh between 190 and 205 pounds?

Question 5 (6 points)

Speeds of vehicles going through an intersection follow a normal distribution with standard deviation 8 km/h. It is known that only 0.62% of vehicles are going faster than 85 km/h.

Show your work.

(a) What is the mean speed of vehicles going through the intersection?

(b) What proportion of vehicles are going faster than 73 km/h?

(c) Only 5% of cars go faster than what speed?

Question 6 (6 points)

An experiment is to be conducted to determine the effect of a new medication in reducing fever. The researcher believes the effect of the drug depends on the frequency of taking the drug (once per day or twice per day) and the dosage (325 mg, 500 mg, or 650 mg). There are 120 people available for the experiment and the decrease in fever symptoms will be measured by comparing the change in body temperature for all the subjects.

(a) What type of experimental design should be used?

(b) Identify the experimental units in this experiment.

(c) Identify the factors and factor levels in this experiment.

(d) Identify the treatments in this experiment and determine the number of experimental units to be allocated to each treatment.

(e) What is the response variable in this experiment?

(f) Is there a blocking variable in this experiment? If so, what is it?

Question 7 (6 points)

An experiment is to be conducted to determine the effect of type of engine analyzer on the time needed to complete a minor engine tune-up. A computerized engine analyzer or an electronic analyzer will be used. The experiment will be conducted separately for three sizes of cars (compact, intermediate, and full-sized), as the effect of type of engine analyzer used is expected to differ for the three car sizes. There are 10 compact cars,
10 intermediate cars, and 10 full-sized cars available for the experiment.

(a) What type of experimental design should be used?

(b) Identify the experimental units in this experiment.

(c) Identify the factors and factor levels in this experiment.

(d) Identify the treatments in this experiment.

(e) What is the response variable in this experiment?

(f) Is there a blocking variable in this experiment? If so, what is it?