

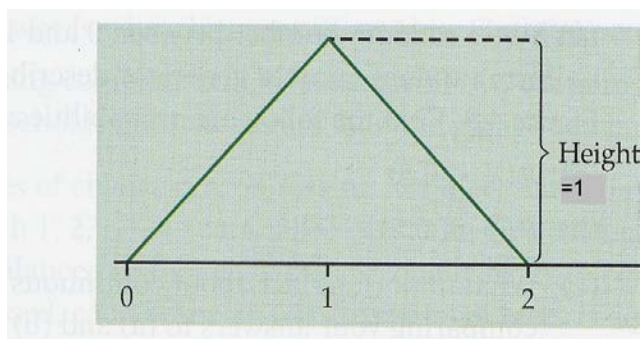
MATH 2560 3.0

Assignment 4

For Section E, the due date of this assignment is Tuesday, **November 19, 2002**.

Question 1

Generate two random numbers between 0 and 1 and take Y to be their sum. Then Y is a continuous random variable that can take any value between 0 and 2. The density curve of Y is the triangle shown below:



- Verify by geometry that the area under this curve is 1.
- What is the probability that Y is less than 1? (Sketch the density curve, shade the area that represents the probability, then find that area. Do this for (c) also.)
- What is the probability that Y is less than 0.5?

Question 2

In a process for manufacturing glassware, glass stems are sealed by heating them in a flame. The temperature of the flame varies a bit. Here is the distribution of the temperature X measured in degrees Celsius:

Temperature	540°	545°	550°	555°	560°
Probability	0.1	0.25	0.3	0.25	0.1

- Find the mean temperature μ_X and the standard deviation σ_X .
- The target temperature is 550° C. What are the mean and standard deviation of the number of degrees off target, $X - 550$?
- A manager asks for results in degrees Fahrenheit. The conversion of X into degrees Fahrenheit is given

$$Y = \frac{9}{5}X + 32$$

What are the mean μ_Y and standard deviation σ_Y of the temperature of the flame in the Fahrenheit scale?

Question 3

Here are the counts (in thousands) of earned degrees in the United States in the 2001-2002 academic year, classified by level and by the sex of the degree recipient:

	Bachelor's	Master's	Professional	Doctorate	Total
Female	645	227	32	18	922
Male	505	161	40	26	732
Total	1150	388	72	44	1654

- If you choose a degree recipient at random, what is the probability that the person you choose is a woman?
- What is the conditional probability that you choose a woman, given that the person chosen received a professional degree?
- Are the events "choose a woman" and "choose a professional degree recipient" independent? How do you know?

Question 4

Common sources of caffeine in the diet are coffee, tea, and cola drinks. Suppose that

- 55% of adults drink coffee
- 25% of adults drink tea
- 45% of adults drink cola

and also that

- 15% drink both coffee and tea
- 5% drink all three beverages
- 25% drink both coffee and cola
- 5% drink only tea

Draw a Venn diagram marked with this information. Use it along with the addition rules to answer the following questions.

- What percent of adults drink only cola?
- What percent drink none of these beverages?

Question 5

The votes in a large city are 40% white, 40% black, and 20% Hispanic. (Hispanics may be of any race in official statistics, but in this case we are speaking of political blocs.) A black mayoral candidate anticipates attracting 30% of the white vote, 90% of the black vote, and 50% of the Hispanic vote. Draw a tree diagram with probabilities for the race (white, black, or Hispanic) and vote (for or against the candidate) of a randomly chosen voter. What percent of the overall vote does the candidate expect to get? What percent of the candidate's votes come from black voters?