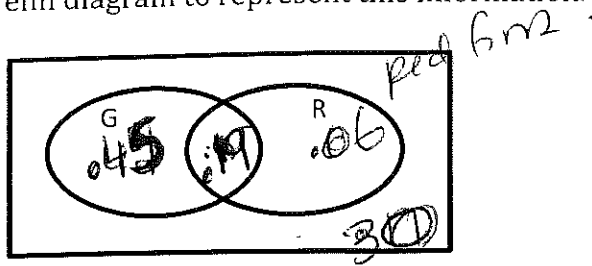1) When a fish is selected at random from a tank, the probability that it has a green tail is 0.64, the probability that it has red fins is 0.25, and the probability that it has both a green tail and red fins is 0.19. *Use probabilities given to fill in the Venn diagram, do not subtract overlap.*

   a. Draw a Venn diagram to represent this information.

   red   Grn

   G .45   (.19)   R .06

   .30

   b. Find the probability that the fish has

      i. red fins but does not have a green tail.   . 06

      ii. a green tail but not red fins.   . 45

      iii. neither a green tail nor red fins.   .30

   c. Complete the table below showing the probabilities of the events corresponding to the cells of the table.

	Green Tail	Not Green Tail	Total
Red Fins	19%	6%	25%
Not Red Fins	45%	30%	75%
Total	64%	36%	100%

2) On a flight, some of the passengers have frequent flier status and some do not. Also, some of the passengers have checked baggage and some do not. Let the set of passengers who have frequent flier status be F and the set of passengers who have checked baggage be C. On the Venn diagrams provided, **shade** the regions representing passengers who:
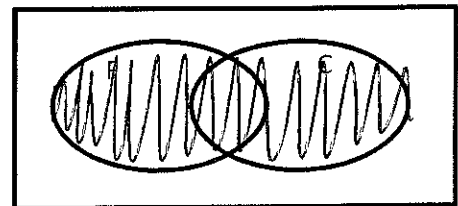
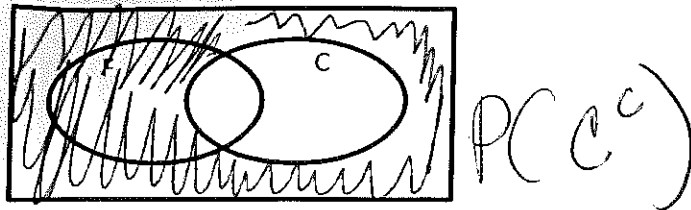a) have frequent flier status and have checked baggage $P(F \cap C)$
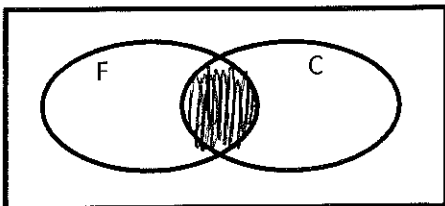
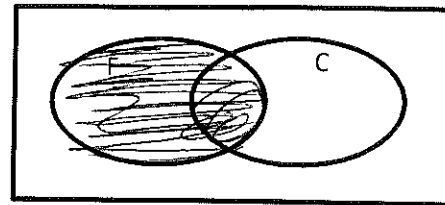b) have frequent flier status or have checked bagged $P(F \cup C$

1

c) do not have checked baggage

$P(C^c)$

d) have frequent flier status $P(F)$

3) Now think about the cars available at a dealership. Suppose a car is selected at random from the cars at this dealership. Let the event that the car has manual transmission be denoted by M, and let the event that the car is a sedan be denoted by S. The Venn diagram below shows the probabilities associated with four of the regions of the diagram.

a. What is the value of $P(M \cap S)$?

12%

b. Complete the sentence using and/or:

$P(M \cap S)$ is the probability that a randomly selected car has a manual transmission And **is a sedan.**
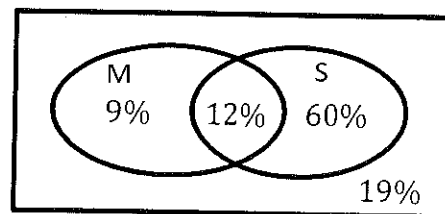
c. What is the value of $P(M \cup S)$? $9 + 12 + 60 = 81\%$

d. Complete the sentence using and/or:

$P(M \cup S)$ is the probability that a randomly selected car has a manual transmission Or **is a sedan.**

e. What is the value of $P(S^c)$? $9 + 19 = 28\%$

f. Explain the meaning of $P(S^c)$.   Don't own a sedan.

4) A credit card company states that 42% of its customers are classified as long-term cardholders, 35% pay their bills in full each month, and 23% are long-term cardholders who also pay their bills in full each month. Let the event that a randomly selected customer is a long-term cardholder be L, and the event that a randomly selected customer pays his or her bill in full each month be F. **Use the probabilities given, do not need to subtract the overlap.**
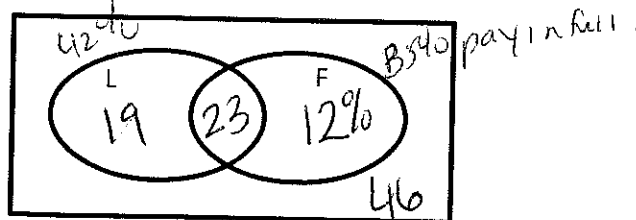
a. What are the values of (L), (F), and $(L$ and $F)$?

$P(L) = 19 + 23 = 42\%$ $P(F) = 23 + 12 = 35\%$ $(L \cap F) = 23\%$

b. Draw a Venn diagram, and label it with the probabilities from part (a).

c. What is the probability that a randomly selected customer is a long-term cardholder given that the customer pays his or her bill in full each month? (Round your answer to the nearest thousandth.)

$$P(L|F) = \frac{L \cap F}{F} \quad \frac{23\%}{35\%} \quad 66\% \quad \checkmark$$

d. What is the probability that a randomly selected customer pays his/her bill in full each month, given that he/she has been a long term cardholder? (Round your answer to the nearest thousandth.)

$$P(F|L) = \frac{23\%}{42\%} \quad 54.76\% \quad \checkmark$$

e. Which is greater, P(F|L) or the P(F)? Explain why this is relevant.

$$54.76\% \qquad 35\%$$

Shows not indep.   ✓

f. Remember that two events A and B are said to be independent if (A given B)=P(A). Are the events F and L independent? Explain.   No

✓

5) According to *www.census.gov*, based on the US population in 2010, the probability that a randomly selected male is 65 or older is 0.114, and the probability that a randomly selected female is 65 or older is 0.146. **(In the questions that follow, round your answers to the nearest thousandth.)**

a. If a male is selected at random and a female is selected at random, what is the probability that both people selected are 65 or older?

$$(.114)(.146) = .016664 \quad \checkmark$$

b. If two males are selected at random, what is the probability that both of them are 65 or older?

$$(.114)(.114) = .012996 \quad \checkmark$$

c. If two females are selected at random, what is the probability that neither of them is 65 or older?

$$(.146)(.146) \sim .021316$$

$$1 - .146 = .854 \quad \checkmark$$

$$(.854)(.854) = .729$$

$$P\binom{male}{65\ or\ older} = .114$$

$$P\binom{female}{65\ or\ old} = .146$$

6) Oostburg College has a rather large marching band. Engineering majors were heard bragging that students majoring in engineering are more likely to be involved in the marching band than students from other majors. If the above claim is accurate, does that mean that most of the band is engineering students? Explain your answer.

The following graph was prepared to investigate the above claim.
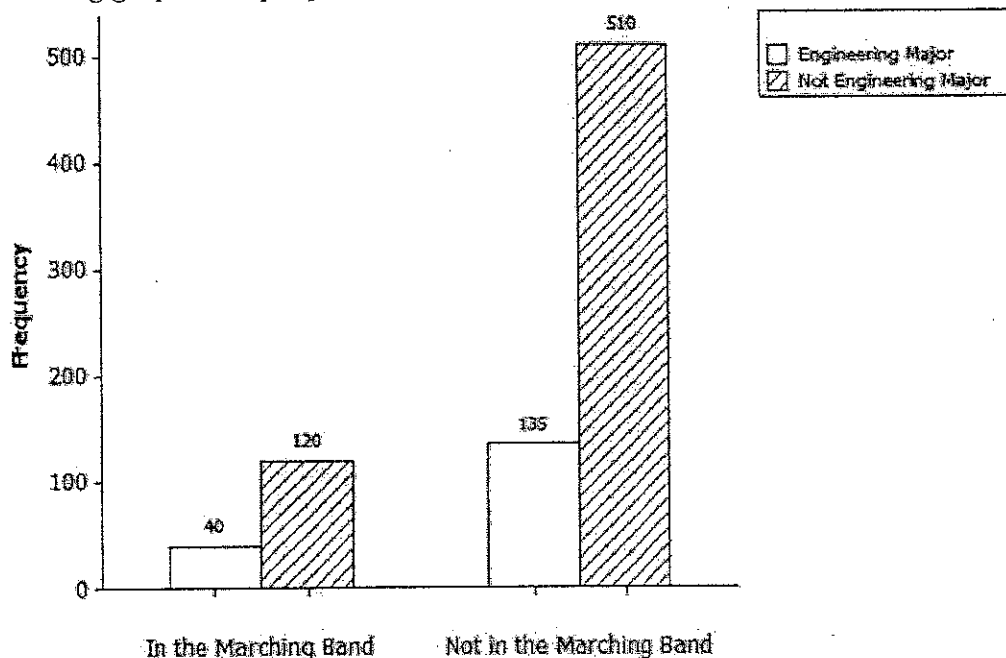
a) Based on the graph, complete the following two-way frequency table:

	Marching Band	Not in Marching Band	Total
Engineering Major	40	135	175
Not an Engineering Major	120	510	630
Total	160	645	805

b) Based on the completed two-way frequency table, determine the following and explain how you got your answer. Show fraction and decimal (round to three decimal places)

i. The probability that a randomly selected student is in the marching band.

$$P(MB) = \frac{160}{805} = \boxed{.199}$$

ii. The probability that a randomly selected student is an engineering major.

$$P(EM) = \frac{175}{805} = \boxed{.217}$$

iii. The probability that a randomly selected student is in the marching band and an engineering major.

$$P(MB \cap EM) = \frac{40}{805} = \boxed{.05}$$

iv. The probability that a randomly selected student is in the marching band and not an engineering major.

$$P(MB \cap E^C) = \frac{120}{805} = \boxed{.149}$$

4

v. A randomly selected student is majoring in engineering. What is the probability that this student is in the marching band?

$40/175$

$(\text{Match}|\text{Engineering}) = 4.9185\%$

vi. A randomly selected student is not majoring in engineering. What is the probability that this student is in the marching band?

$120/630$ $(\text{Band}|\text{Not eng}) = 14.91\%$

vii. The claim that started this investigation was that students majoring in engineering are more likely to be in the marching band than students from other majors. Describe the conditional probabilities that would be used to determine if this claim is accurate.

Given that a randomly sel student is an eng major, what is prob student in B

7) A survey of registered voters in a city in Connecticut was carried out to assess support for a new school tax. 51% of the respondents supported the school tax. Of those with school-age children, 56% supported the school tax, while only 45% of those who did not have school-age children supported the school tax.

a. If a person who responded to this survey is selected at random, what is the probability that

i. the person selected supports the school tax?

tax=51%

Shortage

51%

ii. the person supports the school tax given that he or she does not have school-age children?

$P(\text{tax}|\text{school no}) = 45\%$

b. Are the two events *has school-age children* and *supports the school tax* independent? Explain how you know this.

NO

c. Suppose that 35% of those responding to the survey were over the age of 65 and that 10% of those responding to the survey were both over age 65 and supported the school tax. What is the probability that a randomly selected person who responded to this survey supported the school tax given that he or she was over age 65?

$P(\text{tax}|\text{65}) = \dfrac{10\%}{35\%} = .286$

8) 3 coins are tossed. Find the probability that exactly 2 coins show tails, given the 3rd coin shows tails.
Reminder: pencil example!

H $\begin{smallmatrix}H\\T\end{smallmatrix}$

T $\begin{smallmatrix}H\\T\end{smallmatrix}$

HHH
HHT
HTH
HTT ✓

THH
THT ✗
TTT ✗
TTH ✓

$\dfrac{2/8}{4/8} = 1/2$ 5