Name: _____

SM2 10.4: Conditional Probability

	Bus	Private Car	Walk	Total
Male	146	166	82	394
Female	154	185	64	403
Total	300	351	146	797

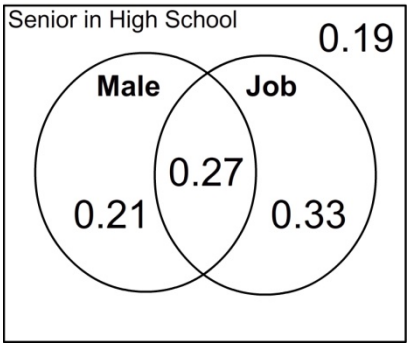
Use the table above that shows the counts of each gender and how they come to school each day to answer the following questions.

1) $P(Walk \mid Female)$
$\frac{64}{403} \approx .159$
2) $P(Bus \mid Male)$
$\frac{146}{394} = \frac{73}{197} \approx .371$
3) $P(Male \mid Private\ Car)$
$\frac{166}{351} \approx .473$
4) $P(Female \mid Doesn't\ Walk)$
$\frac{339}{651} = \frac{113}{217} \approx .521$

5) What is the probability that Melissa rides the bus?
$P(Bus|Female) = \frac{154}{403} \approx .382$

6) Jordan walks to school. What is the probability that Jordan is male?
$P(Male|Walks) = \frac{82}{146} \approx .562$

7) What is the probability that Susan doesn't walk to school?
$P(not\ Walks|Female) = \frac{339}{403} \approx .841$



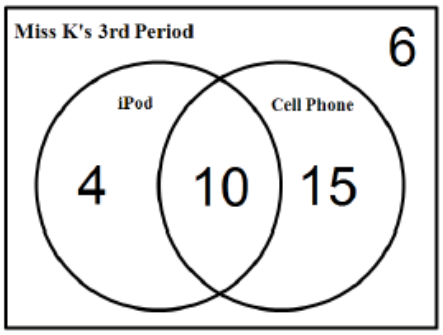
Use the Venn Diagram above, showing the probabilities of gender and have a job afterschool for the seniors at the high school to answer the following questions.

8) $P(Job \mid Male)$
$\frac{.27}{.21 + .27} = \frac{.27}{.48} = .5625$
9) $P(No\ Job \mid Male)$
$\frac{.21}{.21 + .27} = \frac{.21}{.48} = .4375$
10) $P(Female \mid No\ Job)$
$\frac{.19}{.21 + .19} = \frac{.19}{.40} = .475$
11) $P(Male \mid Job)$
$\frac{.27}{.27 + .33} = \frac{.27}{.60} = .45$

12) Is the probability of having a job, given you're a male the same as the probability of being a male, given you have a job? Use your answers from #8 and #11 to help.
No:
$P(Job|Male) = .5625\ and\ P(Male|Job) = .45$

13) A senior works at McWendy King, what it the probability the student is female?
$P(Female\ |Job) = \frac{.33}{.27 + .33} = \frac{.33}{.60} = .55$

Independence:



Use the Venn Diagram above that shows the counts of students in Miss K's 3rd period that have an iPod or a Cell Phone to answer the following questions.

14) What is the probability of having both an iPod and a Cell Phone?

$\frac{10}{35} = \frac{2}{7} \approx .286$

15) What is the probability of having an iPod?

$\frac{14}{35} = \frac{2}{5} = .4$

16) What is the probability of having a Cell Phone, given the student has an iPod? Show your work.

$\frac{10}{14} = \frac{5}{7} \approx .714$

17) Are the events, "having an iPod" and "having a Cell Phone" independent? Show your work.

$P(I|C) = \frac{10/35}{25/35} = \frac{2}{5}$, and $P(I) = \frac{14}{35} = \frac{2}{5}$, So YES they are independent.

Use the table below showing the counts of student's genders and goals for school to answer the following questions.

	Goals			
	Grades	Popular	Sports	Total
Boy	117	50	60	227
Girl	130	91	30	251
Total	247	141	90	478

18) Is the probability of having good grades as a goal independent of gender?

$$P(Good\ Grades) = \frac{247}{478} = .5167$$

$$P(Good\ Grades\ |Female) = \frac{P(Good\ Grades\ and\ Female)}{P(Female)} = .5179$$

$$P(Good\ Grades\ |Male) = \frac{P(Good\ Grades\ and\ Male)}{P(Male)} = \frac{117}{227} = .5154$$

$$.5167 \neq .5179 \neq .5154 \ldots . close\ but\ not\ equal\ so\ NOT\ independent$$

19) Is gender independent of having popularity as a goal?

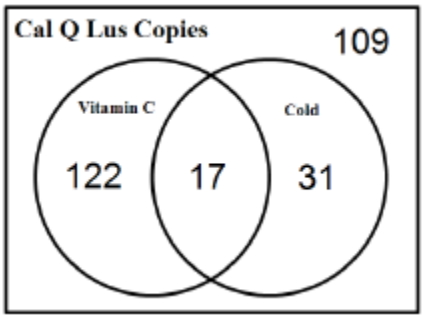
$$P(Popular) = \frac{141}{478} = .2950$$

$$P(Popular\ |Female) = \frac{P(Popular\ and\ Female)}{P(Female)} = .3625$$

$$P(Popular\ |Male) = \frac{P(Popular\ and\ Male)}{P(Male)} = \frac{50}{227} = .2203$$

$$.2950 \neq .3625 \neq .2203 \ldots not\ equal\ so\ NOT\ independent$$

Use the Venn diagram below showing the counts of workers at Cal Q Lus Copies that take vitamin C and those that caught a cold to answer the following question.



20) What is the probability of catching a cold?

$$\frac{48}{279} = .1720$$

21) What is the probability of catching a cold given the worker is taking Vitamin C?

$$\frac{17}{122+17} = \frac{17}{139} = .1230$$

22) Are you less likely to catch a cold if you are taking Vitamin C? Use your answers to #20 and #21 to help you.

Yes, you have a 17.2% chance of catching a cold with or without vitamin C and a 12.3% chance of catching a cold with Vitamin C.