AP Statistics 5.2B Worksheet
Venn Diagrams, and two way tables

Name KEY
Per ____ Date ____

1. Canada has two official languages, English and French. Choose a Canadian at random and ask, “What is your mother tongue?” Here is the distribution of responses, combining many separate languages from the broad Asia/Pacific region:

Language:	English	French	Asian/Pacific	Other
Probability:	0.63	0.22	0.06	? 0.09

(a) What probability should replace “?” in the distribution? Why?

$1 - 0.63 - 0.22 - 0.06 = \boxed{0.09}$

All probabilities should add to 1

(b) What is the probability that a Canadian’s mother tongue is not English?

$1 - 0.63 = \boxed{0.37}$

(c) What is the probability that a Canadian’s mother tongue is a language other than English or French?

$0.06 + 0.09 = \boxed{0.15}$

2. Students in an urban school were curious about how many children regularly eat breakfast. They conducted a survey, asking, “Do you eat breakfast on a regular basis?” All 595 students in the school responded to the survey. The resulting data are shown in the two-way table below.[7]

	Male	Female	Total
Eats breakfast regularly	190	110	300
Doesn't eat breakfast regularly	130	165	295
Total	320	275	595

If we select a student from the school at random, what is the probability that we choose

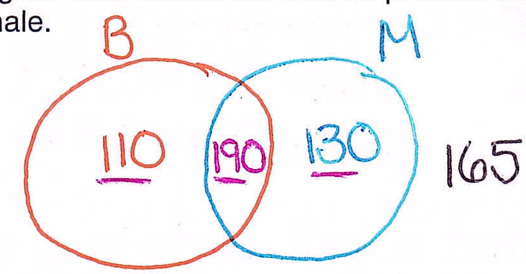
(a) a female? $\frac{275}{595} = 0.462$ 46.2%

(b) someone who eats breakfast regularly? $\frac{300}{595} = 0.504$ 50.4%

(c) a female who eats breakfast regularly? $\frac{110}{595} = 0.185$ 18.5%

(d) a female or someone who eats breakfast regularly? $\frac{110+165+190}{595} = \frac{465}{595} = 0.782$ 78.2%

(e) Construct a Venn diagram that models the chance process using events *B*:eats breakfast regularly, and *M*: is male.



(f) Find $P(B \cup M)$. Interpret this value in context.

or

The probability of randomly choosing a person that eats breakfast or is male is $\left(\frac{110+190+130}{595}\right)$ $\frac{430}{595} = 0.723$ 72.3%

(g) Find $P(B^C \cap M^C)$. Interpret this value in context.

The probability of randomly choosing a person that doesn't eat breakfast and is not male is

$\frac{165}{595} = 0.277$ 27.7%

3. A company that offers courses to prepare students for the Graduate Management Admission Test (GMAT) has the following information about its customers: 20% are currently undergraduate students in business; 15% are undergraduate students in other fields of study; 60% are college graduates who are currently employed; and 5% are college graduates who are not employed. Choose a customer at random.

(a) Create a table to display the data:

Undergraduate		Graduates	
business	other	employed	unemployed
0.20	0.15	0.60	0.05

(b) What's the probability that the customer is currently an undergraduate? Which rule of probability did you use to find the answer? $0.2+0.15 = \boxed{0.35}$

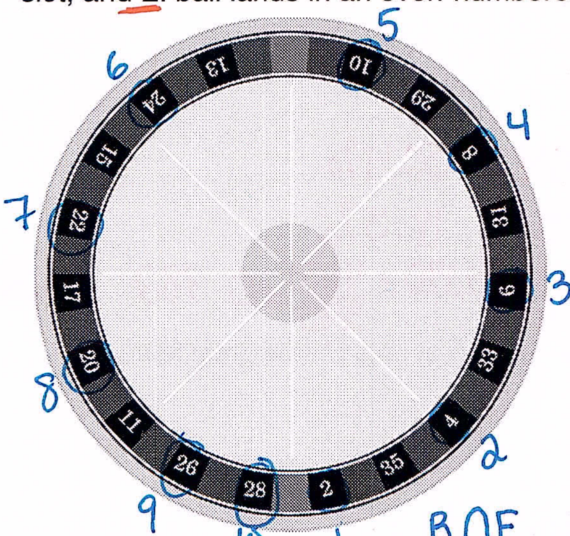
addition rule of mutually exclusive events

(c) What's the probability that the customer is not an undergraduate business student? Which rule of probability did you use to find the answer?

$1-0.20 = \boxed{0.80}$ OR $0.15+0.60+0.05 = \boxed{0.80}$

Complement rule — addition rule of mutually exclusive events

4. An American roulette wheel has 38 slots with numbers 1 through 36,0, and 00, as shown in the figure. Of the numbered slots, 18 are red, 18 are black, and 2—the 0 and 00—are green. When the wheel is spun, a metal ball is dropped onto the middle of the wheel. If the wheel is balanced, the ball is equally likely to settle in any of the numbered slots. Imagine spinning a fair wheel once. Define events *B:* ball lands in a black slot, and *E:* ball lands in an even-numbered slot. (Treat 0 and 00 as even numbers.)



$B \cap E$

(a) Make a two-way table that displays the sample space in terms of events *B* and *E*.

	Even	E^c not even	
Black	10	8	18
B^c not black	10	10	20
	20	18	38

(b) Find *P*(*B*) and *P*(*E*).

$P(B) = 18/38 = 0.474$ 47.4%

$P(E) = 20/38 = 0.526$ 52.6%

(c) Describe the event "*B* and *E*" in words. Then find *P*(*B* and *E*). Show your work.

The probability that a ball lands in a slot that is black and even is $10/38 = 0.263 = 26.3\%$

$B \cup E$

(d) Explain why *P*(*B* or *E*) ≠ *P*(*B*) + *P*(*E*). Then use the general addition rule to compute *P*(*B* or *E*).

They are not equal because they are not mutually exclusive events.

$P(B \cup E) = P(B) + P(E) - P(B \text{ and } E) = \frac{18}{38} + \frac{20}{38} - \frac{10}{38} = \frac{28}{38} =$

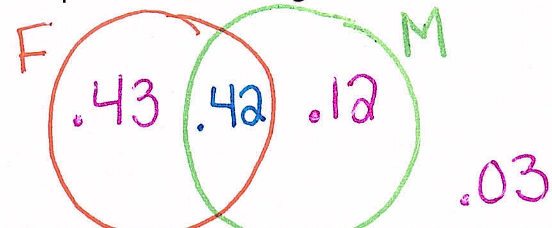
$0.737 = 73.7\%$

5. A 2008 survey suggests that 85% of college students have posted a profile on Facebook, 54% use MySpace regularly, and 42% do both. Suppose we select a college student at random.

(a) Make a two-way table for this chance process.

	MS	MS^c	
FB	0.42	0.43	0.85
FB^c	0.12	0.03	0.15
	0.54	0.46	

(b) Construct a Venn diagram to represent this setting.



(c) Consider the event that the randomly selected college student has posted a profile on at least one of these two sites. Write this event in symbolic form using the two events of interest that you chose in (b).

$P(F \cup M) = 0.43 + 0.42 + 0.12 = \boxed{0.97}$

OR

$= 1 - 0.03 = \boxed{0.97}$

OR

$= 0.54 + 0.85 - 0.42 = \boxed{0.97}$

$P(F \cup M) = P(F) + P(M) - P(F \cap M)$

(d) Find the probability of the event described in (c). Explain your method.

There are multiple methods to calculate this probability.

- add up the individual probabilities pieces for facebook and myspace.
- Subtract the probability that a person has neither from 1
- add the total probability for facebook and the total probability for myspace then subtract the probability of them having both (we counted these people twice).