AP Statistics
Unit 04 – Probability
Homework #2

Name Key
Period

1. Computer games in which the payers take the roles of characters are very popular. They go back to earlier tabletop games such as Dungeons & Dragons. These games use many different types of dice. A four-sided die has faces with 1, 2, 3, and 4 spots.
   a. List the sample space for rolling the die twice (spots showing on the first and second rolls).

   $$S = \begin{Bmatrix} (1,1) & (2,1) & (3,1) & (4,1) \\ (1,2) & (2,2) & (3,2) & (4,2) \\ (1,3) & (2,3) & (3,3) & (4,3) \\ (1,4) & (2,4) & (3,4) & (4,4) \end{Bmatrix}$$

   b. What is the assignment of probabilities to outcomes in this sample space? Assume the die is perfectly balanced.

   each outcome has a probability of 1/16.

2. All human blood can be typed as one of O, A, B, or AB, but the distribution of the types varies a bit with race. Here is the distribution of the blood type of a randomly chosen black American.

Blood Type:	O	A	B	AB
Probability:	0.49	0.27	0.20	? 0.04

   a. What is the probability of type AB blood? Why?

   $P(AB) = 1-(0.49+0.27+0.20) = 0.04$

   There is a 4% chance that a randomly selected black American has type AB blood.

   Because all probabilities must sum to 1 or 100%.

   b. What is the probability that the person chosen does not have type AB blood?

   $P(AB^c) = 1 - P(AB) = 1 - 0.04 = 0.96$

   There is a 96% chance that a randomly selected black American does not have type AB blood.

   c. Maria has type B blood. She can safely receive blood transfusions from people with blood types O and B. What is the probability that a randomly chosen black American can donate blood to Maria?

   $P(B \text{ or } O) = P(B) + P(O) = 0.20 + 0.49 = 0.69$

   There is a 69% chance that a randomly selected black American can donate blood to Maria.

3. A company that offers courses to prepare students for the GMAT has the following information about its customers: 20% are currently undergraduate students in business, 15% are currently 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.

SKIP ~~a.~~ Create a two-way table to organize the information.

b. What's the probability that the customer is currently an undergraduate? Which rule of probability did you use to find the answer?

P(undergrad) = 0.15 + 0.20 = $\boxed{0.35}$

There is a 35% chance that a randomly selected customer is currently an undergrad.

disjoint addition rule! :)

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?

P(not undergrad business) =

1 - P(undergrad business) = 1 - 0.20 = 0.80

There is an 80% chance that a randomly selected customer is not an undergrad business student.

complement rule! :)

4. 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.

	Male	Female	**Total**
Eats breakfast reg	190	110	**300**
No reg breakfast	130	165	**295**
Total	**320**	**275**	**595**

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

a. A female?

P(female) = 275/595 = There is a 46.2% chance that a randomly selected student is a female.

b. Someone who eats breakfast regularly?

P(reg.) = 300/595 = There is a 50.4% chance that a randomly selected student regularly eats breakfast.

c. A female and eats breakfast regularly

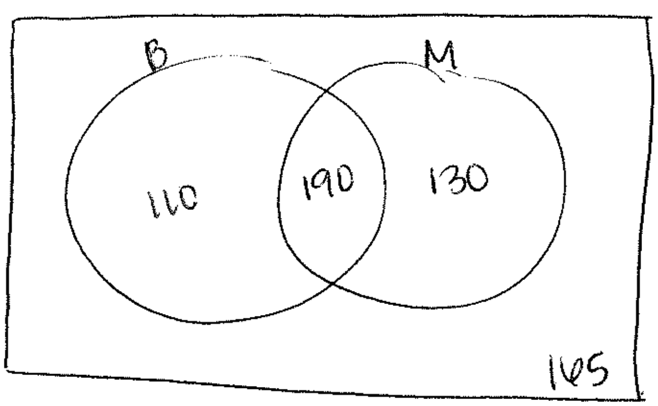
P(female and reg.) = 110/595 = There is a 18.5% chance that a randomly selected student is female & regularly eats breakfast.

d. A female or eats breakfast regularly?

P(female or reg.) = P(female) + P(reg.) − P(both)

$= \frac{275}{595} + \frac{300}{595} - \frac{110}{595} = \frac{465}{595} =$ There is a 78.2% chance that a randomly selected student is a female or eats breakfast regularly

e. Construct a Venn Diagram that models the chance process using events B: eats breakfast regularly and M: is male.



f. Find P(B∪M). Interpret this value in context.

$P(B \cup M) = P(B) + P(M) - P(B \cap M) = \frac{300}{595} + \frac{320}{595} - \frac{190}{595} = \frac{430}{595} = 72.3\%$

There is a 72.3% chance that a randomly selected student is male or eats breakfast regularly.

g. Find $P(B^C \cap M^C)$. Interpret this value in context. There is a 27.7% chance that a randomly selected student is female and does not eat breakfast regularly.

$P(B^C \cap M^C) = 165/595 = 27.7\%$