Trig Honors **Name:**
Probability Day 3

1. You and your partner cut out the letters of the word "CENTRAL" and put them in a bag. You will be choosing a letter at random from the bag.

a) What is the sample space? C E N T R A L

b) What is the probability of choosing an "N"? 1/7

c) What is the probability of choosing a vowel? 2/7

d) Both you and your partner want to pick a letter. You pick the letter N and you do replace it (you put it back in the bag). What is the probability of your partner choosing an "A"?

1/7

e) Both you and your partner want to pick a letter. You pick he letter N and this time you do not replace it.

   i. Does the sample space change? Yes! C E T R A L

   ii. If your partner picks now, what will the probability of choosing an "A" be?

1/6

If we consider the two events A and B, the probability of A and B occurring is given by:

$$\boxed{Probability\ of\ A\ and\ B = P(A \cap B) = P(A) \cdot P(B)}$$

provided A & B are INDEPENDENT

2. Consider the question above regarding the letters of "PARTICLE."

a) Find the probability of choosing an "I," and then choosing an "A," with replacement.

$$\frac{1}{8} \cdot \frac{1}{8} = \frac{1}{64}$$

b) Find the probability of choosing an "I," and then choosing an "A," without replacement. Is it the same as in (a)? Why or why not?

$$\frac{1}{8} \cdot \frac{1}{7} = \frac{1}{56}$$

c) Find the P(consonant, then consonant) if two letters are chosen without replacement.

$$\frac{5}{8} \cdot \frac{4}{7} = \frac{5}{14}$$

Independent vs. Dependent Events

Independent –	If knowing A does NOT change the prob B.
Dependent –	If knowing A does change the prob B.

3. There are 24 numbered balls in a daily lottery drawing, each with equal weight and probability of being chosen at random.
   a) Will the number being drawn on Saturday be independent or dependent of the number drawn on Monday?

   INDEPENDENT - this is a daily lottery

   b) What is the probability of picking a 2 on Saturday and a 4 on Sunday?

   $\frac{1}{24} \cdot \frac{1}{24}$

   c) What is the probability of picking a 12 on Saturday and a 12 on Sunday?

   $\frac{1}{24} \cdot \frac{1}{24}$

   d) What is the probability of picking the same number on Saturday and Sunday?

   $1 \cdot \frac{1}{24}$

4. Consider the following events:

   C = all college students arrive to statistics class on time

   D = the roads leading to the college are icy and dangerous

   Are the events C and D independent or dependent? Why?

   Dependent! The icy conditions may prevent someone from being on time.

5. The "heart" of a pocket calculator is one or more "chips," each of which contains several thousand components. These chips are mass produced, and have a fairly high probability of being defective. Suppose that a particular kind of calculator uses two chips. Chip A has a probability of 70% (0.7) of being defective, and Chip B has a probability of 80% (0.8) of being defective. If one chip of each kind is selected at random, what is the probability that

   a. Both are defective?

   $0.7 \cdot 0.8 = 0.56$

   b. A is not defective?

   0.3

   b. B is not defective?

   0.2

   c. Both work?

   $0.3 \cdot 0.2 = 0.06$

Trig Honors
Probability Day 3 HW

1. You drive on a long vacation trip. The probability you will have a flat tire is 0.1, and the probability of engine trouble is 0.05. What is the probability you will have

   a. No flat tire? 0.9

   b. No engine trouble? 0.95

   c. No flat tire and no engine trouble? $0.9 \cdot 0.95 = 0.855$

   d. Both a flat tire and engine trouble? $0.1 \cdot 0.05 = 0.005$

2. Doc Worker is a regular customer at the Waterfront Coffee Shop. The manager has figured that Doc's probability of ordering ham is 0.8 and eggs is 0.65. What is the probability that

   a. He does not order ham? 0.2

   b. He does not order eggs? 0.35

   c. He orders neither ham nor eggs? $0.2 \cdot 0.35 = 0.07$

   d. He orders ham and eggs? $0.8 \cdot 0.65 = 0.52$

3. Two traffic lights on Broadway operate independently. Your probability of being stopped at the first one is 0.4 and your probability of being stopped at the second one is 0.7. What is your probability of being stopped at

   a. Both lights? $0.4 \cdot 0.7 = 0.28$

   b. Neither light? $0.6 \cdot 0.3 = 0.18$

   c. The first but not the second? $0.4 \cdot 0.3 = 0.12$

   d. The second but not the first? $0.6 \cdot 0.7 = 0.42$

4. The Dover children, Eileen and Ben, are away at college. They visit home on random weekends, Eileen with a probability of 0.2 and Ben with a probability of 0.25. On any given weekend, what is the probability that

   a. Both will visit? $0.2 \cdot 0.25 = 0.05$

   b. Neither will visit? $0.8 \cdot 0.75 = 0.6$

   c. Eileen will visit, but Ben will not? $0.2 \cdot 0.75 = 0.15$

   d. Ben will visit but Eileen will not? $0.25 \cdot 0.8 = 0.2$

5. Terry Torrey has the following probabilities of passing various courses: Humanities, 90%; Speech, 80%; and Latin, 95%. What is his probability of

   a. Passing all three?

      $0.9 \cdot 0.8 \cdot 0.95 = 0.684$

   b. Failing all three?

      $0.1 \cdot 0.2 \cdot 0.05 = 0.001$

6. Fly-By-Night Spaceship Company produces a booster rocket that has 1000 vital parts. If any one of these parts fails, the booster will crash, so they design each part with a reliability of 99.9%, meaning that the probability of an individual part working is 0.999.

   a. What is the probability that all 1000 parts work, and the booster does not crash? Is this surprising?

      $(0.999)^{1000} = 0.368$

      Ah!

   b. What is the minimum reliability needed for each part to insure that there is a 90% probability of all 1000 parts working?

      $x^{1000} = 0.90$

      $x = 0.90^{1/1000} = 0.9999$