## **Multiplication Rule**

### 1. Jane is given the following probability problem and her work is displayed. She has done something wrong. What did she do wrong and why is it wrong?

Problem: A bag of marbles has 3 green, 2 blue and 5 red marble. What is the probability of getting a red and then a green marble without replacement?

$$P(R \text{ and } G) = \left(\frac{5}{10}\right) \left(\frac{3}{10}\right) = \frac{15}{100}$$

### 2. Given a jar of cookies with 5 chocolate chip, 3 oatmeal, and 2 peanut butter cookies in it, determine the following probabilities.

a) Getting an oatmeal cookie and	b) Getting two chocolate chip	c) Getting a peanut butter cookie
then a chocolate chip cookie	cookies without replacement.	and then an oatmeal cookie
without replacement.		without replacement.

P(O and CC) =	P(CC and CC) =	P(PB and O) =
		r (r b and 0) =

3. Given two bags of marbles, bag #1 with 2 green, 3 red and 7 orange, and bag #2 with 5 green, 1 red and 4 orange. Determine the following probabilities.

a) Getting an orange from bag #1 and then getting a green from bag #2.	b) Getting a red from bag #1 and then getting a red from bag #1 <b>without</b> replacement.	c) Getting a green from bag #1 and then getting a green from bag #2.

P(O1 and G2) =

P(R1 and R1) = \_\_\_\_\_

P(G1 and G2) =

d) Getting a red from bag #1 and then getting an orange from bag #1 with replacement.

e) Getting a red from bag #2 and

f) Getting a green from bag #1 and then getting an orange from bag then getting an red from bag #2.

P	(R1	and	01	) =		
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#2 with replacement.

P(R2 and O2) = \_\_\_\_\_ P(G1 and R2) = \_\_\_\_\_

4. Using the marble bags in question #3, what would P(Green and Green) be if the person picked from bag #1 and then placed that marble into bag #2 and then picked from bag #2?

#### 5. Given a standard deck of cards. Determine the probabilities.

a) Getting a red card and then a red card <b>without</b> replacement.	b) Getting a face card and then a 5 <b>without</b> replacement.	c) Getting a numerical card less than 5 and then a king <b>with</b> replacement.	
P(Red and Red) =	P(Face and 5) =	P(#<5 and King) =	
d) Getting a 2 and then a 2 <b>without</b> replacement.	e) Getting two black face cards without replacement.	f) Getting any pair <b>without</b> replacement.	
P(2 and 2) =	P(B Face and B Face) =	P(Pair) =	

# 6. Complete the tree diagram by writing in the probabilities for each branch and then calculating the probabilities for each possible outcome.

a) Bag #1 has 2 white and 3 red marbles and bag #2 has 4 purple, 2 green and 1 orange. Pick from bag #1 keep it and then pick from bag #2.



b) A bag of marbles has 15 red and 5 green. Two picks are made from the same bag without replacement.



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# 7. A Jar of cookies have 12 chocolate chip cookies, 13 peanut butter cookies, and 5 walnut cookies. Beside the jar is a cookie sheet of 20 chocolate chip cookies.

#### Some unique replacement rules exist as you pick from the jar:

- -- if you pick a chocolate chip cookie from the jar you eat it and then replace it with 2 chocolate chip cookies from the cookie sheet.
- -- if you pick a peanut butter cookie you eat it
- -- if you pick a walnut cookie, you put it back.

a) P(CC | P) = \_\_\_\_\_ b) P(P|W) = \_\_\_\_\_

c) P(W|CC) = \_\_\_\_\_

d) P(CC and then W) = \_\_\_\_\_

- e) P(CC and CC) = \_\_\_\_\_ f) P(W and then W) = \_\_\_\_\_
- g) P(PB and then CC) = \_\_\_\_\_

h) Which has a greater chance of happening? P(PB and then a W) or P(W and then a CC)?

8. Box #1 has 7 white marbles and 3 black marbles and Box #2 has 6 black marbles and 4 white marbles. You pick a marble from box #1 (not looking at it) and then place it into box #2.



a) on the second pick from Box #2, P(W|B) = \_\_\_\_\_

b) on the second pick form Box #2, P(B|B) = \_\_\_\_\_

- c) P(W and W) = \_\_\_\_\_
- d) P(B and then W) = \_\_\_\_\_

e) P(B and then B) = \_\_\_\_\_