This worksheet will be a continuation of the statistics learned on the last worksheet. We will now be learning about the probability on compound events.

Compound Events

Compound events are just two or more simple events occurring at the same time.

The probability that a coin will show head when you toss only one coin is a simple event.

However, if you toss two coins, the probability of getting 2 heads is a compound event because once again it combines two simple events

Suppose you say to a friend, " I will give you 10 dollars if both coins land on head."

Let's see what happens when your friend toss two coins:

If heads = H and tails = T, the different outcomes are HH, HT, TH, or TT.

As you can see, out of 4 possibilities, only 1 will give you HH.

Therefore, the probability of getting 2 heads is $\frac{1}{4}$.

We could always find the probability of compound events this way but the more events and the complexity of those events can make it impossible. So instead, when we are finding the probability of one simple event AND another simple event, we can just multiply the two separate probabilities.

For example:

Coin #1 - Probability of getting head $= \frac{1}{2}$

Coin #2 - Probability of getting head $= \frac{1}{2}$

Probability of getting a head on coin 1 AND coin 2: $\frac{1}{2} \bullet \frac{1}{2} \Rightarrow \frac{1}{4}$

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Mutually Exclusive Events

Lastly, sometimes, as opposed to having two events happening at the same time, you may need to choose between two events.

When two events cannot both occur, they are called mutually exclusive events.

To find the probability of compound events when the events are mutually exclusive, you need to add the probabilities of the two separate events.

For example:
Suppose you and your brother both throw a die. Whoever gets a 4 wins!

These are mutually exclusive events because you cannot both win this game.

You - Probability of rolling a four = $\frac{1}{6}$

Brother - Probability of rolling a four = $\frac{1}{6}$

Probability of you OR your brother rolling a four: $\frac{1}{6}+\frac{1}{6} \Rightarrow \frac{2}{6} \Rightarrow \frac{1}{3}$

Summary

And = multiply

Or = add

Sometimes you have to do both in one problem.

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Practice problems

1) A six-die is rolled. Find the probability of the following events:

   a. Rolling a 2 or 5

      i. Add $\frac{1}{6}+\frac{1}{6}\Rightarrow\frac{2}{6}\Rightarrow\frac{1}{3}$

   b. Rolling a 1 or an even number

      i. Add $\frac{1}{6}+\frac{3}{6}\Rightarrow\frac{4}{6}\Rightarrow\frac{2}{3}$

   c. Rolling a 4 or a multiple of 3

      i. Add $\frac{1}{6}+\frac{2}{6}\Rightarrow\frac{3}{6}\Rightarrow\frac{1}{2}$

   d. Rolling a 3 or a number less than 4

      i. Add $\frac{1}{6}+\frac{3}{6}\Rightarrow\frac{4}{6}\Rightarrow\frac{2}{3}$

2) If you roll both a fair, six-sided and an eight-sided die, what is the probability of rolling a sum of 5 or sum of 6?

   i. Find the probability of rolling a sum of 5 and then a sum of 6 and add.

   $\frac{4}{48}+\frac{5}{48}\Rightarrow\frac{9}{48}\Rightarrow\frac{3}{16}$

   *The bottom is found by multiply the number of sides on each die.

   Note: This problem can also be done using the same method from worksheet 8. Either way is acceptable.

3) If you roll both a fair eight-sided and ten-sided die, what is the probability that you will roll either a 2, 3, or 4 on the eight-sided die and roll either a 2, 4, 6, or 8 on the ten-sided die?

   i. This problem requires students to add and the multiply probabilities. First, find the probability of rolling a 2 and than a 3 on the eight-sided die and add the probabilities.

   $\frac{1}{8}+\frac{1}{8}+\frac{1}{8}\Rightarrow\frac{3}{8}$

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Then do the same from the ten-sided die.

$$\frac{1}{10}+\frac{1}{10}+\frac{1}{10}+\frac{1}{10}\Rightarrow\frac{4}{10}\Rightarrow\frac{2}{5}$$

Then multiply those two probabilities.

$$\frac{3}{8}\bullet\frac{2}{5}\Rightarrow\frac{3}{20}$$

4) A eight-sided die is rolled and a six-sectioned spinner, containing the letters L, M, N, O, P, and Q, is spun. Find the probability of the following events:

a. Rolling a 1 and landing on M

i. Multiply $\frac{1}{8}\bullet\frac{1}{6}\Rightarrow\frac{1}{48}$

b. Rolling a 3 and landing on a vowel

i. Multiply $\frac{1}{8}\bullet\frac{1}{6}\Rightarrow\frac{1}{48}$

c. Rolling a 6 or 7 and landing on a consonant

i. Add and then Multiply

$$\frac{1}{8}+\frac{1}{8}\Rightarrow\frac{2}{8}\Rightarrow\frac{1}{4}$$

$$\frac{1}{4}\bullet\frac{5}{6}\Rightarrow\frac{5}{24}$$

d. Rolling a factor of 8 and landing on L, N, or Q

i. Add and then Multiply

$$\frac{1}{6}+\frac{1}{6}+\frac{1}{6}\Rightarrow\frac{3}{6}\Rightarrow\frac{1}{2}$$

$$\frac{3}{8}\bullet\frac{1}{2}\Rightarrow\frac{3}{16}$$

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