EE Meeting

Basic Probability!

January 18, 2015

In this handout we will continue to learn about probability.

1. We have a standard coin with one side that we call "heads" (H) and one side that we call "tails" (T).

   (a) Let's say that we flip this coin 100 times.

      i. How many times do you expect to get "heads" as an outcome?

      ~ 50

      ii. In an actual experiment, can one get a different number of "heads" when flipping a coin 100 times?

      yes

      iii. Do you think it is likely to get only 10 "heads"?

      no

ii. What does the "2" in the denominator mean?

total # outcomes

iii. What is the probability of "tails" if you flip a coin once?

$\frac{1}{2}$

2. Now let's flip two coins at the same time.

(a) What are all the possible outcomes? (Denote "heads" by H and "tails" by T when listing outcomes.)

H H T H

H T T T

(b) What is the probability of getting two "heads"?

$P(2\,H) = \frac{1}{4}$

(c) If you flip these 2 coins 400 times, how many times do you expect to get two "heads"?

$\frac{1}{4}(400) = 100$ times

(e) What is the probability of getting 0 "heads"?

$\frac{1}{8}$

(f) What is the probability of getting at least two "heads"? (*At least two* means two or more.)

$\frac{1}{2}$

(g) What is the probability of getting at most 1 "head"? (*At most one* means one or less.)

$\frac{1}{2}$

(h) What is the relationship between your answers in parts (f) and (g)?

same probability

& $\frac{1}{2} + \frac{1}{2} = 1$

4. We roll a single die.

(a) What are the possible outcomes of our roll?

1, 2, 3, 4, 5, 6

(g) What is the probability of rolling at least a 5?

$\frac{2}{6} = \frac{1}{3}$

(h) What is the relationship between your answers in parts (f) and (g)

$\frac{2}{3} + \frac{1}{3} = 1$

(i) Based on your answers in parts (e) and (h) above, what can you say about the sum of probabilities of all outcomes of an experiment?

sum is 1

5. We color the faces of a single die: 4 faces are red and 2 faces are blue.

(a) Olga says that since we colored the die with two colors, it follows that the probability of rolling a red face is 1/2 and the probability of rolling a blue face is 1/2. Is she correct?

no

(b) What are the correct probabilities for rolling a red

red $= \frac{4}{6} = \frac{2}{3}$

blue $= \frac{2}{6} = \frac{1}{3}$

(c) What is the probability of first rolling a 2 and then rolling a 1?

$\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$

(d) What is the probability that both rolls give the same number?

$\frac{1}{6}$

✳ (e) What is the probability that the number on the second roll is strictly larger than the number on the first roll?

count from #79).

$5 + 4 + 3 + 2 + 1 = 15$

$\frac{15}{36}$

(f) What is the probability that the first roll is an odd number?

$\frac{1}{2}$