Probability cont.

Flipping a coin 4 times

What is the probability that the number of heads is two?

$$P(H_2) = \frac{n(H_2)}{n(SS)} = \frac{6}{16} = \frac{3}{8} = \frac{3}{8} = .375$$

What is the probability that there are at least two tails in a row?

$$P(R_{\geq 2}) = \frac{n(R_{\geq 2})}{n(SS)} = \frac{8}{16} = \frac{1}{2} = .5$$

What is the probability that the number of heads is two and there are at least two tails in a row?

$$P(H_2 \cap R_{\geq 2}) = \frac{H_2 \cap R_{\geq 2}}{n(SS)} = \frac{3}{16} = .1875$$

Same as above, but with OR instead of AND

$$P(H_2 \cup R_{\geq 2}) = \frac{6}{16} + \frac{8}{16} - \frac{3}{16} = \frac{11}{16} = .6875$$

What is the probability that the number of heads is not two?

$$P(H_2') = 1 - \frac{3}{8} = \frac{8}{8} - \frac{3}{8} = \frac{5}{8} = .625$$

Rolling a die

$SS = \{1, 2, 3, 4, 5, 6\}$
$T = \{2, 3\}$
$P(T) = \frac{2}{6} \approx .333\overline{3}$

Other

If all of the possible results are equally likely, then:

$$P(A) = \frac{n(A)}{n(SS)}$$

For some experiment, $SS = \{a, b, c, d\}$

$$P(a) = .11, P(b) = .23, P(c) = .45$$

$$P(\{a, b\}) = P(\{a\} \cup \{b\}) = P(\{a\}) + P(\{b\}) = .11 + .23 = .34$$

Now imagine d is in S

$$P(\{d\}) = P(\{a, b, c\}') = 1 - P(\{a, b, c\}) = 1 - (.11 + .23 + .45) = .21$$