Aim: How do we find probability with two outcomes?
Bernoulli's Theorem:

HW: Study Test Thursday

Do Now:

1) John takes a multiple choice test on a topic for which he has learned nothing. Each question has 3 choices.
   a) What is the probability that John answers a question
      I) correctly?

      II) incorrectly?
   b) If there are 4 questions on the test what is the probability John answers:
      I) all questions correctly?

      II) only the first 3 questions correctly?

      III) only the last 2 questions correctly?

BUT..... c) Suppose we wanted to know the probability that John answered any 4 questions correctly how would we find this?

Suppose we wanted to know the probability that John answered any 3 of the 4 questions correctly how would we find this?

How many combinations would this be?

P(3 out of 4) $\quad {}_4C_3\,(1/3)^3\,(2/3)^1$

To find the probability of two outcomes we use Bernoulli's Theorem. $\boxed{{}_nC_r\,P^r\,Q^{n-r}}$

n = numberof trials
r = number of successes
P = probability of success
Q = Probablityof failure 1-p = q

$${}_nC_r\ P^r\ Q^{n-r}$$

2. If a fair coin is tossed 10 times what is the probability it comes up exactly 6 times.

n = P =

r = Q =

$${}_{10}C_6\,(1/2)^6\,(1/2)^4$$

3. The probability that the Wings will win a baseball game is 2/3. What is the probability that they will win:

a) exactly 2 out of 4 games?

b) exactly 3 out of 4 games?

4. For a certain product, the probability of getting one that is defective is 0.3. If an inspector was to select a product at random find the probability of

a) 3 defectives out of 5 selections:

b) 2 defectives out of 5 selections:

c) 4 good products out of 5 selections:

d) 2 defectives out of 6 selections.

A study shows that 62% of the people in a community watch TV while they eat dinner. Suppose you select 6 families at random from this community. What is the probability that 4 out of 6 families watch TV while they eat dinner?

Let's let T = families watching TV
N = families that do do watch TV

T T T T N N

T N T N T T

N N T T T T

And how many more combinations can we expect???

What is the probability of T 62%
N 38%

This is alot of work. However we have a formula to calculate this.

Bernoulli's Theorem: $_nC_r\ p^r\ q^{n-r}$

where n = # of trials, r = # of successes, p = prob. of success and q = prob. of failure.

$$_6C_4\ (.62)^4\ (.38)^2\ =$$

If 5 fair dice are tossed, what is the probability that they show exactly 3 fours?

1st ...How many different combinations of throws are there?

12345
12346
12344
11445 etc.

What is the probability of throwing a 4?

What is the probability of not throwing a 4?

So

1st ...How many different combinations of throws are there?

12345
12346
12344
11445

1/6 *1/6* 1/6* 5/6 * 5/6

p = P(4) = 1/6 q = P(not 4) = 5/6 $r = 3$ $n = 5$

$$_nC_r\, p^r q^{n-r} = 5C3\ (1/6)3(5/6)2 = \frac{5 \cdot 4 \cdot 3}{3 \cdot 2 \cdot 1}\ (1/216)(25/36) =$$

10 (25/7776) = 250/7776 = 125/3888