

BE - PRECALC Monday 2-15-10

① Find the following combinations of "N" items taken "r" at a time for

$N=5$ and $r=5, 4, 3, 2, 1, 0$.

$${}_N C_r = \frac{N!}{(N-r)!r!}$$

① ${}_5 C_5$	② ${}_5 C_4$	③ ${}_5 C_3$	④ ${}_5 C_2$	⑤ ${}_5 C_1$	⑥ ${}_5 C_0$
1	5	10	10	5	1

Recognize the 6th row (1st row = 0) of Pascal's Triangle? COOL.

The Binomial Theorem has close ties to the arrangement of items and to probability!

Events THAT have only 2 outcomes can be modeled with the B.T.!!

Let's try one. (Binomial Theorem)

⑥ A mahogany tree has a survival rate of 90% = 0.9 when planted & cared for properly. If 10 trees are planted, find the probability 7 will survive.

$$S = \text{survive} \quad D = \text{die} \quad (S+D) = 1$$
$$= 0.9 \quad = 0.1$$

$$(S+D)^{10} = ? = \sum_{r=0}^{10} \frac{10!}{r!(10-r)!} S^{10-r} D^r$$

$$\text{for } S=7, D=3 \quad \therefore D^3 \text{ term} \Rightarrow r=3$$

$$= \frac{10!}{3!(7)!} S^7 D^3$$

$$= \frac{10 \cdot 9 \cdot 8}{3 \cdot 2 \cdot 1} S^7 D^3$$

$$= 120 (.9)^7 (.1)^3 \approx 0.0574$$

$$\approx \boxed{5.7\%} \text{ exactly 7 trees will survive}$$

Note: to find $P(\geq 7)$ will survive, add the $r=3, r=2, r=1, r=0$ terms !!!

This is ex 3 pg 877

Ex) Of seven children, find the probability at least 3 are boys.

$$B = G = \frac{1}{2} \quad (B+G)^7 = ?$$

$$(B+G)^7 = \sum_{r=0}^7 \frac{7!}{r!(7-r)!} B^{7-r} G^r$$

$$\geq 3 \Rightarrow B^7 + B^6 + B^5 + B^4 + B^3$$

$r=0 \quad r=1 \quad r=2 \quad r=3 \quad r=4$

$$\underbrace{\frac{7!}{0!7!} B^7 G^0}_{r=0} + \underbrace{\frac{7!}{1!6!} B^6 G^1}_{r=1} + \underbrace{\frac{7!}{2!5!} B^5 G^2}_{r=2}$$

$$\underbrace{\frac{7!}{3!4!} B^4 G^3}_{r=3} + \underbrace{\frac{7!}{4!3!} B^3 G^4}_{r=4}$$

$$\begin{aligned} & 1\left(\frac{1}{2}\right)^7 + 7\left(\frac{1}{2}\right)^6\left(\frac{1}{2}\right)^1 + 21\left(\frac{1}{2}\right)^5\left(\frac{1}{2}\right)^2 + 35\left(\frac{1}{2}\right)^4\left(\frac{1}{2}\right)^3 + 35\left(\frac{1}{2}\right)^3\left(\frac{1}{2}\right)^4 \\ &= \frac{1}{128} + \frac{7}{128} + \frac{21}{128} + \frac{35}{128} + \frac{35}{128} \\ &= .0078 + .0547 + .1641 + .2734 + .2734 \\ &= .7734 = \boxed{77.3\%} \text{ or } \frac{99}{128} = \boxed{77.3\%} = \text{Probability of 3 or more boys.} \end{aligned}$$

EX2 Pg 802 | WHAT WOULD CHANGE IF P(B) = .53 ??

Homework: Pg 878 # 11 & 12

Pg 879 # 17-20
