

STAT 200 7-21-10 Sam.

7/20/2010

1. 10 R 6 G 4 Y TOTAL OF 20 BALLS EQ PROB ON REMAINING  
NO REPLACEMENT

a.  $P(R1) = \text{INTUIT} \frac{\# \text{FAVORABLE}}{\# \text{TOTAL}} = \frac{10}{20}$

b.  $P(R2) = \text{SAME AS FIRST DRAW } \frac{10}{20}$   $P(G2) = \frac{6}{20}$  SAME AS FOR  $P(G1)$

c.  $P(G2 | \text{IF } G1) = \frac{5}{19}$  DRAW 2 IS FROM 10 R 5 G 4 Y IF  $G1$ .

d.  $P(G2 | \text{IF } G1^c) = \frac{6}{19}$  DRAW 2 IS FROM 6 G 13 R

e.  $P(G1 \text{ and } G2) = \text{MULT. RULE } P(G1) P(G2 | \text{IF } G1) = \frac{6}{20} \frac{5}{19}$

f. LOOK AT HOW YOU MAY GET  $G2$ .

$\frac{6}{20} \frac{5}{19}$  or  $\frac{14}{20} \frac{6}{19}$  TWO WAYS TO GET TO  $G2$

$$\Sigma P(G2) = P(G1 \ G2) + P(G1^c \ G2) - P(\text{OVERLAP})$$

$$= \frac{6}{20} \frac{5}{19} + \frac{14}{20} \frac{6}{19} = \frac{30+84}{20 \cdot 19} = \frac{114}{20 \cdot 19} = \frac{6}{20}$$

DO NOT OVERLAP

YES!

Q. (NOT (e)). IF REPLACE FIRST DRAW

$$P(G2 \mid_{\text{IF}} G1^c) = \frac{6}{20} \quad \text{REPLACED FIRST DRAW!}$$

BACK TO ORIGINAL BOX. INDEPENDENCE

$$P(G2 \mid_{\text{IF}} G1) = \frac{6}{20}$$

$$P(G2) = P(G1 \ G2) \text{ or } P(G1^c \ G2)$$

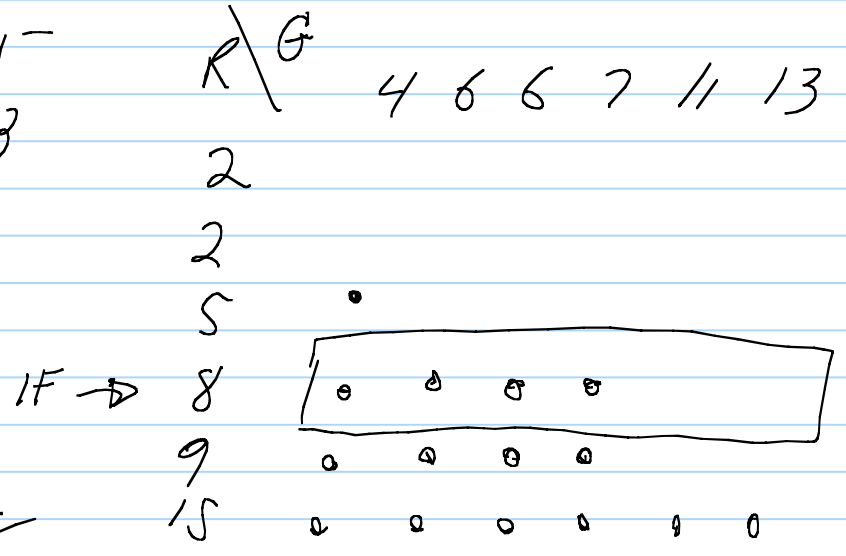
$$\begin{aligned}
 &= P(G1)P(G2|_{IF} G1) + P(G1^c)P(G2|_{IF} G1^c) \\
 \text{REPLACING} \\
 &= \frac{6}{20} \frac{6}{20} + \frac{14}{20} \frac{6}{20} = \left( \frac{6}{20} + \frac{14}{20} \right) \frac{6}{20} = \frac{6}{20} \quad \checkmark \\
 &\quad \underbrace{\hspace{10em}}_1 \\
 &\text{AGAIN, WITH REPL } P(G2) = \frac{6}{20}
 \end{aligned}$$

2. RED CUBE: 2 2 5 8 9 15  
 GREEN " 4 6 6 7 11 13

a.  $P(R > G) = \frac{15}{36}$

b.  $P(R > G |_{IF} R=8) = \frac{4}{6}$

$$\text{RULE} = \frac{P(R=8 \text{ AND } R > G)}{P(R=8)} = \frac{4/36}{6/36}$$



MULT SAID  $P(A \text{ and } B) = P(A) P(B|A)$

$$\text{SAYS } P(B|A) = \frac{P(A \text{ and } B)}{P(A)}$$

C.  $P(R+G=7) \checkmark$  NO  $\checkmark$  Empty = 0.

3.  $p=0.62$   $n=12$  INDEP TOSSES,

a. HOW MANY WAYS TO PLACE 4 H, 3 T. IN LINE? HHHHTT

= # WAYS TO SELECT 4 FROM 7.

$$C(7, 4) = \frac{7!}{(4! 3!)} = \frac{7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{4 \cdot 3 \cdot 2 \cdot 1 \cdot 3 \cdot 2 \cdot 1} = 35$$

TTTTHHH

$$b. P(HHHHTTT) = P(H_1) P(H_2|H_1) P(H_3|H_1, H_2) \dots$$

$$.62 \cdot .62 \cdot .62 \cdot .62 \cdot .38 \cdot .38 \cdot .38 = (.62)^4 (.38)^3$$

$$c. \text{So } P(HHHHTTT) = .62^4 (.38)^3$$

d.  $P(\text{get 4 H 3 T}) = \text{AGGREGATE } .62^4 \cdot .38^3 \text{ OVER ALL 35 ARRANGEMENTS.}$

$$= 35 \cdot .62^4 \cdot .38^3$$

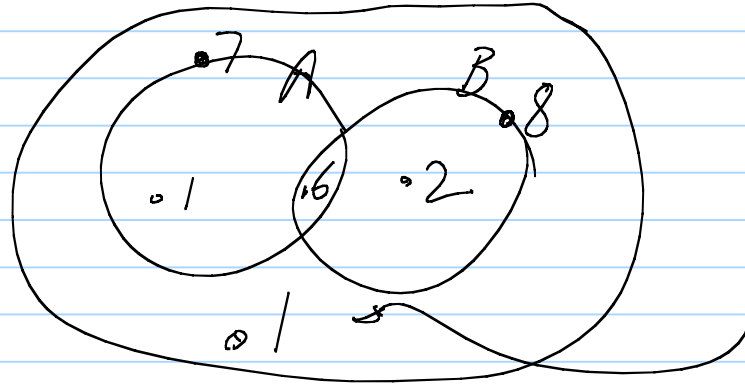
BIN FORMULA  $P(x) = C(n, x) p^x (1-p)^{n-x}$

(e)  $35 \cdot .62^4 \cdot .38^3$

ABOVE  
( $n=7$ )  
( $p=.62$ )

4.  $P(A) = 0.7$   $P(B) = 0.8$   $P(A \text{ and } B) = 0.6$

Venn



$$0.2 = P(A^c \text{ and } B)$$

$$0.1 = P(A^c \text{ and } B^c)$$

5. DIE 2, 2, 5, 8, 9, 15.

$$a. ER = \frac{2+2+5+8+9+15}{6} = 6.83$$

$$b. Var R = \left( (2-6.83)^2 + \dots + (15-6.83)^2 \right) / 6 = 20.42$$

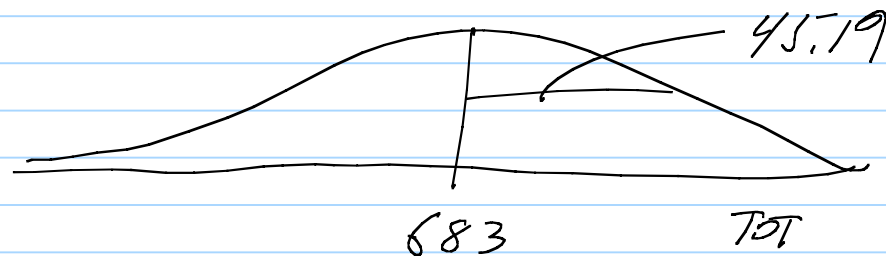
$$\sigma = \sqrt{20.42}$$

100 TOSSES !!  $E(\text{TOT}) = 100 ER = 683$

$$\text{Var}(\text{TOT}) = 100 \underset{\text{INDEP}}{(20.42)} = 2042$$

$$\sigma_{\text{TOT}} = \sqrt{2042} = 45.19$$

DISTRIBUTION  $\approx$   
 $\approx$



6.  $x$  14 23 11  
 $P(x)$  .13 .29 .58

$$\begin{aligned} a. EX &= \sum_i x p(x) \\ &= 14(.13) + 23(.29) + 11(.58) \\ &= 14.87 \end{aligned}$$

$$b. \text{Var } X = E X^2 - (E X)^2$$

$$= \text{[blacked out]} - (14.8)^2 = \underline{\underline{27.95}}$$

$$E X^2 = 14^2 (.13) + 23^2 (.29) + 11^2 (.58)$$

$$c. E(5X-9) = 74.35 - 9 = 65.35 \quad \begin{array}{l} \text{TRULY} \\ \hline \sum EX - 9 \\ \sum (14.8) - 9 \end{array}$$

PASSES  
TAROVEN

(e)  $X_1, X_2$  INDEP PLAYS.



$$\begin{aligned}\text{Var}(2X - 6Y + \cancel{X}) &= \text{Var}(2X - 6Y) \\ &\stackrel{\text{INDEP}}{=} \text{Var}(2X) \oplus \text{Var}(-6Y) \\ &= 2^2 \text{Var} X \oplus (-6)^2 \text{Var} Y\end{aligned}$$