$P(7) = \frac{1}{6}$

	1	2	3	4	5	6
1						1,6
2					2,5	
3				3,4		
4			4,3			
5		5,2				
6	6,1					

$1 - P(\text{no } 7\text{s})$

For n rolls:

$$1 - \left(\frac{5}{6}\right)^n \geq 0.95$$

$$-\left(\frac{5}{6}\right)^n \geq -0.05$$

$$\left(\frac{5}{6}\right)^n \leq 0.05$$

$$n \cdot \ln\left(\frac{5}{6}\right)^{\cancel{n}} \leq \ln 0{,}05$$

$$n \geq \frac{\ln 0{,}05}{\ln(5/6)} = 16.4$$

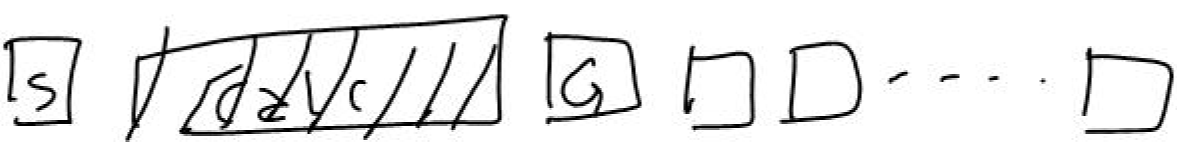
$\boxed{17 \text{ rolls}}$

#9 total # of outcomes $\frac{20!}{6!\,7!\,4!\,3!}$

prob (stats, ___) $= \dfrac{\cancel{\dfrac{14!}{7!\,4!\,3!}}}{\dfrac{\cancel{20!}}{6!\,\cancel{7!\,4!\,3!}}}$

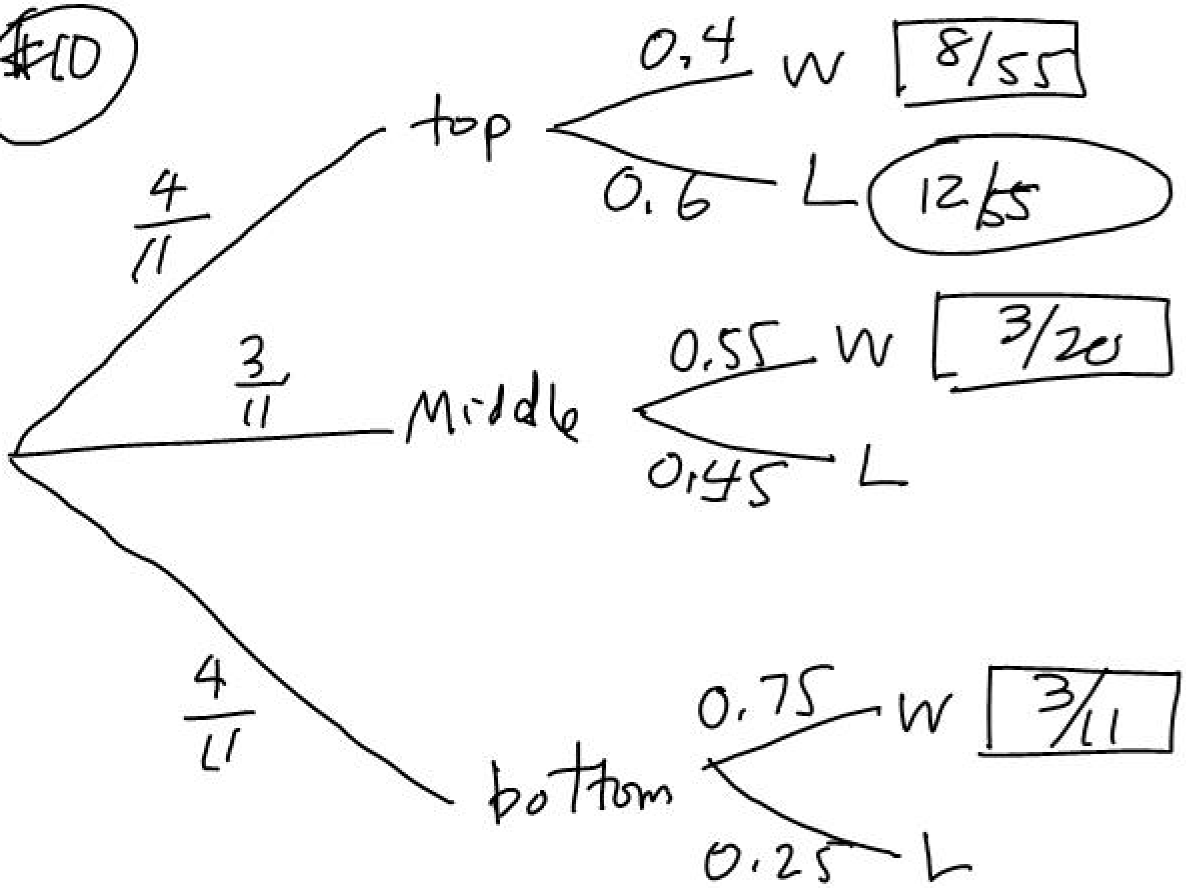
$20\cdot19\cdot18\cdot17\cdot16\cdot15$

$\dfrac{\cancel{6!}\ \cancel{6}\cdot\cancel{5}\cdot\cancel{4}\cdot\cancel{3}\cdot\cancel{2}}{15\cdot16\cdot17\cdot\cancel{18}\cdot19\cdot\cancel{20}} = \dfrac{1}{15\cdot16\cdot17\cdot19} = \dfrac{1}{38760}$



$$\dfrac{\dfrac{13!}{6!\,4!\,3!}\cdot 14}{\dfrac{20!}{6!\,7!\,4!\,3!}}$$

#10



$$P(\text{Win}) = \frac{25}{44}$$

$$P(\text{top} \mid W') = \frac{P(\text{top} \cap W')}{P(W')} = \frac{12/55}{1 - \frac{25}{44}}$$

$$= \frac{48}{95}$$

Random Variables

A variable whose values are the outcome of an experiment.

Ex. X = the number of H when 3 coins are tossed

discrete random variable
(countable number of values)

Ex. Y = the height an IB student at IHS ISA

Continuous Random Variable
(Its values come from the $\mathbb{R}$ number line)

Probability Distribution Table for a Discrete R.V.

X = number of H from a 3 coin toss

X	0	1	2	3
P(x)	$\frac{1}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{1}{8}$

$= 1$

$\left(\frac{1}{2}\right)^3$

$\binom{3}{1}\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)^2$

H T T

$\binom{3}{2}\left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right)$

H H T

$\left(\frac{1}{2}\right)^3$

The <u>mean</u> of the distribution:

$$\mu = 0\left(\frac{1}{8}\right) + 1\left(\frac{3}{8}\right) + 2\left(\frac{3}{8}\right) + 3\left(\frac{1}{8}\right) = \frac{3}{2}$$

The <u>variance</u> of the distribution

$$Var = E(X^2) - [E(X)]^2$$

expected value = mean

$$E(X^2) = 0^2\left(\frac{1}{8}\right) + 1^2\left(\frac{3}{8}\right) + 2^2\left(\frac{3}{8}\right) + 3^2\left(\frac{1}{8}\right) = 3$$

$$\mathrm{Var}(X) = E(X^2) - (E(X))^2$$

$$= 3 - \left(\frac{3}{2}\right)^2 = \frac{3}{4}$$

Standard Deviation $= \frac{\sqrt{3}}{2} \approx 0.866$