Reagan Landis
HW 5

Probability

1) $$\frac{\binom{15}{1}\binom{14}{1}\binom{13}{1}\binom{12}{1}\binom{11}{1}\binom{10}{1}\binom{9}{1}\binom{8}{1}}{15^8}$$

or $\frac{128\,128}{1265625}$ or 10.12% chance

2) $$\frac{\underset{13579}{\underline{5}} \cdot \underline{4} \cdot \underset{10-3}{\underline{7}} \cdot \underset{10-4}{\underline{6}} \cdot \underset{02468}{\underline{5}}}{100{,}000} = 0.042$$

$$\binom{8}{5}(0.42)^5(1-0.042)^3$$

3) Yes, A and B are independent.

$P(A) = \left(\frac{1}{2}\right)^2\left(\frac{1}{2}\right)\left(\frac{3}{2}\right) + \left(\frac{1}{2}\right)^3 = \frac{1}{2}$

$P(B) = \frac{1}{6^2} = \frac{1}{36}$

$P(A \cap B) = \frac{3}{6} \cdot \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{72}$

$P(A) \cdot P(B) = \frac{1}{72}$

$P(A)P(B) = P(A \cap B)$

4) n = # of Bernoulli Trials
p = probablility of all 1 suit
E = expected # of successes

$$P = 1 \cdot \frac{12}{51} \cdot \frac{11}{50} \cdot \frac{10}{49} \cdot \frac{9}{48} = 0.0019807923\,1$$

Set $E = 1$

$$1 = n \cdot p \qquad n = \frac{51 \cdot 50 \cdot 49 \cdot 48}{12 \cdot 11 \cdot 10 \cdot 9} =$$

$$n = \frac{1}{P}$$

504.84 Hands $\approx$ 505 hands

5) Superstar Plays (0.75)
$P(\text{win 4 games} \mid \text{plays}) = (0.7)^4 (0.3) \binom{5}{4}$

Superstar does not Play (0.25)
$P(\text{win 4 games} \mid \text{not play}) = (0.5)^4 (0.5) \binom{5}{4}$

$$(0.75)(0.7)^4(0.3)\binom{5}{4} + (0.25)(0.5)^5\binom{5}{4}$$

$= 0.4737$

$\boxed{\text{87.37\% chance the superstar played}}$