Probability Questions:

1. Total ways to ask: 15^8

   Num of ways to get 8/15: $P(15,8) = \frac{15!}{(15-8)!} = 259459200$

   probability no student will have to answer more than one?: $\frac{259459200}{15^8} = 0.101237$

2. 0 - 100 : 0

   100 - 1000 : $5 \times 4 \times 5 = 100$

   1000 - 10000 : $5 \times 4 \times 7 \times 5 = 700$

   10000 - 99999 : $5 \times 4 \times 7 \times 6 \times 5 = 4200$

   Total : $100 + 700 + 4200 = 5000$

   Total from 0 - 99999: 10^5

   probability : $\frac{5000}{10^5} = 0.05$

For 8 num : $P(5) = 8(0.05)^5 (1-0.05)^3$

$= 1.5004 \times 10^{-5}$

3. prob of $4\leq$: $\frac{3}{6}$

P(A): P(2 or more dice show 4 or more) =

$P(2) + P(3) = C(3,2)\left(\frac{3}{6}\right)^2\left(\frac{3}{6}\right) + C(3,3)\left(\frac{3}{6}\right)^2\left(\frac{3}{6}\right)$

$= \frac{1}{2}$

P(B): P(all same) = $\frac{6}{6^3} = \frac{1}{36}$

P(all same & $4\leq$) = P(all 4) + P(all 5) + P(all 6)

$= \frac{1}{6}^3 + \frac{1}{6}^3 + \frac{1}{6}^3 = \frac{1}{72}$

$P(A) \times P(B) = \frac{1}{2} \cdot \frac{1}{36} = \frac{1}{72}$ and P(both) = $\frac{1}{72}$

$\frac{1}{72} = \frac{1}{72}$ so events A & B are independent.

4. single draw of 5-card hand = p = 0.001980792

$$\frac{1}{0.0019807 92} = 504.85$$

5. star plays : 0.7 win

star doesnt play : 0.5 win

P(star plays) = 0.75 for next 5 games

P(star plays & 4/5) = C(5,4) $(0.7^4)(0.3)$ = 0.36015

P(no star & 4/5) = C(5,4) (0.5^5) = 0.15625

P(win 4/5) = 0.15625 (.25) + 0.36015 (.75) = 0.309175

$$P(\text{star plays} \mid \text{win } 4/5) = \frac{0.36015(.75)}{0.309175} = 0.9737$$