Probability & Statistics

Postclass Problems due 1/26/10
Sec 1.1 # 3, 9, 11
Sec 1.2 # 3, 9, 11

1.1 3) a) $P(A) = P(\text{card is royal})$
$= \frac{12}{52} = \frac{3}{13}$

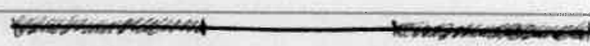
b) $P(A \cap B) = P(\text{card is royal AND is 9, 10, or J and red})$
$= P(\text{red jack})$
$= \frac{2}{52} = \frac{1}{26}$

c) $P(A \cup B) = P(\text{Card is royal OR is red 9/10/J})$
$= P(\text{royal or red 9s, 10s})$
$= \frac{16}{52} = \frac{4}{13}$

d) $P(C \cup D) = P(\text{card is club OR is heart, spade, or diamond})$
$= 1$

e) $P(C \cup D) = P(\text{Card is club AND is heart, spade, or diamond})$
$= 0$

1.1 9) - Pick random point on line
- intuition to assign probability that larger half is ≥ 2 times bigger



If you divide the line into thirds, the shaded sections would contain points where the larger section is ≥ 2 times bigger than the smaller.

$P(\text{shaded}) = 2/3$

1.1 11) a) Let $P(A_1) = n$, $P(A_2) = n, \ldots P(A_m) = n$
Because events are mutually exclusive, probabilities add up to 1
$P(A_1) + P(A_2) + P(A_3) + \ldots + P(A_m) = 1$
$\sum_{i=1}^{m} P(A_i) = 1$
$\sum_{i=1}^{m} n = 1$
$mn = 1$
$n = \frac{1}{m}$ $\therefore P(A_i) = \frac{1}{m}$

1.1 11) Continued

b) $P(A) = \sum_{i=1}^{h} P(A_i)$

$$P(A) = \sum_{i=1}^{h} \frac{1}{n}$$
$$= h/n$$

1.2 3) a) Two Letters, Four digit Integer

$26 \cdot 26 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 6,760,000$

b) Three Letters, Three digit Integer

$26 \cdot 26 \cdot 26 \cdot 10 \cdot 10 \cdot 10 = 17,576,000$

1.2 9) a) Line up nine candidates:

$${}_9P_9 = \frac{9!}{(9-9)!} =$$
$$= 9! = 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 362880$$

Note: there are 9 possibilities for the first seat, eight for the second and so on (use multiplication principle or permutation)

b) Label the 3D and 6R

${}_9C_3 = {}_9C_6 = 84$

Note: the 9 choose 3 is choosing possible positions (1st, 2nd, 3rd ...) for the democrats; the 9 choose 6 is looking at possible ~~ple~~ combination of where democrats aren't.

c) Approve or Disapprove

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = 2^9 = 512$

Note: canditate either gets G or P (two possibilities), use multiplication principl

1.2 11) a) $P(\text{4 of a kind}) = \frac{13 \cdot 48}{\binom{52}{5}} = 0.00024$

13 different "4 of a kind" events, multiplied by the 48 other ca

b) $P(\text{full house}) = \dfrac{\underbrace{13}_{\text{possible values for first set}} \cdot \underbrace{12}_{\text{possible values for second set}} \cdot \underbrace{\binom{4}{3}}_{\text{combos of pairs}} \cdot \underbrace{\binom{4}{2}}_{\text{combos of doubles}}}{\binom{52}{5}} = 0.00144$

1.2 11) continued

c) $$P(3 \text{ of a kind}) = \frac{\overset{\text{13 poss.}}{13} \cdot \overset{\text{3 of kind}}{\binom{4}{3}} \cdot \overset{\text{2 other vals}}{\binom{12}{2}} \overbrace{\binom{4}{1}\binom{4}{1}}^{\text{other suits}}}{\binom{52}{5}} = 0.02113$$

d) $$P(2 \text{ pairs}) = \frac{\overset{\text{2 values}}{\binom{13}{2}} \overbrace{\binom{4}{2}\binom{4}{2}}^{\text{two from each in hand}} \cdot \overset{\text{cards remaining}}{44}}{\binom{52}{5}} = 0.04754$$

e) $$P(1 \text{ pair}) = \frac{\underset{\text{poss \# for double}}{13} \underset{\text{which 2}}{\binom{4}{2}} \underset{\text{which 3 other \#s}}{\binom{12}{3}} \underbrace{\binom{4}{1}\binom{4}{1}\binom{4}{1}}_{\text{which suit for each}}}{\binom{52}{5}} = 0.42257$$