Homework 6 Key

3.3 (74, 74)
3.4 (5a-d, 6, 21-26)

Section 3.3

74) Let A be the event that Alex passes algebra.

Let H be the event that Alex passes history.

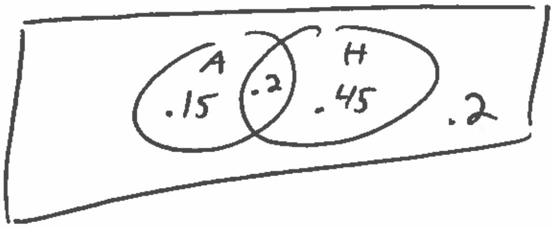
We know:
$$p(A) = .35$$
$$p(H') = .35$$
$$p(A \cup H) = .80$$

Since $p(H') + p(H) = 1$, we know

$$p(H) = 1 - .35 = .65$$

Then
$$p(A \cup H) = p(A) + p(H) - p(A \cap H)$$
$$.80 = .35 + .65 - p(A \cap H)$$
$$.80 = 1 - p(A \cap H)$$
$$p(A \cap H) = .2$$

So we have this Venn Diagram:



a) $p(H) = .65$

b) $p(A \cap H) = .2$

c) $p(A' \cap H') = .2$

d) $p((A \cup H) \cap (A \cap H)') = .15 + .45 = .6$

Section 3.4

6) Number of ways of picking 6 numbers: ${}_{53}C_6$

Number of ways to pick 5 of 6 winning numbers: $\underbrace{{}_6C_5}_{\text{winning}} \; \underbrace{{}_{47}C_1}_{\text{not}}$

Probability of picking 5 of 6 winning numbers: $\dfrac{{}_6C_5 \cdot {}_{47}C_1}{{}_{53}C_6} \approx .000012$

22a) Number of ways of being dealt aces/kings:

$\underbrace{{}_4C_3}_{\text{aces}} \; \underbrace{{}_4C_2}_{\text{kings}} = 24$

22a continued:

Number of ways of being dealt a 5-card hand: ${}_{52}C_5$

Probability of being dealt an aces over kings full house: $\frac{24}{{}_{52}C_5} \approx .000009$

b) There are 13 different denominations (2s, 3s, 4s, etc) So when looking to count the different types of full houses, there are 13 choices for the denomination in which you have 3 cards, leaving 12 choices for the denomination in which you have 2 cards.

The Fundamental Principle of Counting informs you that there are $13 \cdot 12 = 156$ different types of full houses

c) As in part a, there are 24 different full houses for each type of full house.

Since there are 156 types of full house, there are $156 \cdot 24 = 3744$ different full houses.

Hence, the probability of getting a full house is $\frac{3744}{{}_{52}C_5} \approx .0014$

24) Number of ways of picking 3 burritos:

$${}_{12}C_3 = 220$$

Number of ways of picking 3 burritos without hot peppers: ${}_{7}C_3 = 35$

Probability of picking 3 burritos without hot peppers: $\frac{35}{220} \approx .16$

26) Number of ways of picking exactly two with hot peppers: $\underbrace{{}_{5}C_2}_{\text{with}} \; \underbrace{{}_{7}C_1}_{\text{without}} = 70$

Probability of picking exactly two with hot peppers: $\frac{70}{220} \approx .32$