Stat 330
Homework 2

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1)

(a) $P(B|A) + P(B|\bar{A}) = 1$ $\qquad$ $\dfrac{P(B)P(A)}{P(B)} + \dfrac{P(B)P(\bar{A})}{P(B)} = 1$

$\frac{P(B)P(A)+P(B)P(\bar{A})}{P(B)} = 1$ $\qquad$ $P(A) + P(\bar{A}) = 1$ ✓

(b) $P(\bar{A}|\bar{B}) = 1 - P(A \cup B)$ $\qquad$ $= 1 - P(A) - P(B) + P(A \cap B)$

$= 1 - P(A) - P(B) + P(A)P(B)$ $\qquad$ $= (1 - P(A))(1 - P(B))$

$P(\bar{A}|\bar{B}) = P(\bar{A})P(\bar{B})$ ✓

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2)

(a) P(A) = .4, P(B) = .7, P(A ∩ B) = .28
(b) P(A|B) = P(A ∩ B) / P(B) = .28 / .7 = .4
(c) P(B|A) = P(A ∩ B) / P(A) = .28 / .4 = .7
(d) A test for independance is if P(A|B) = P(A) and P(B|A) = P(B)
As the above tests hold, these two events are independent.

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3)

(a) When drawing from the first urn, the chances are:
Red: 2/6, White: 4/6.

If a red is transferred, when drawing from urn 2 the chances are:
Red: 4/5, **White: 1/5**.
If a white is transferred, when drawing from urn 2 the chances are:
Red: 3/5, **White: 2/5**.

Drawing from urn 1 affects drawing from the second, and must be considered.
Thus, the cumulative chance of selecting white from urn 2 is:
$\frac{2}{6} * \frac{1}{5} + \frac{4}{6} * \frac{2}{5} = 1/3$

(b) The two events are not independent, as drawing from the first urn affects the chances of drawing from the second.
Using the values calculated above,
P(W2|R1) $= \frac{2}{6} * \frac{1}{5} = 1/15$

P(W2|W1) $= \frac{4}{6} * \frac{2}{5} = 4/15$

If the events were independent, the two resulting values would be equivalent.

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4)

	$D(.15)$	$\overline{D}(.85)$	$Total$
Pos	.98	.10	?
Neg	?	?	?
$Total$	?	?	