# 3.1

## a

$1/52 * 1/51 = 1/2652 = 0.00038$

## b

$4/52 * 3/51 = 1/221 = 0.004$

## c

$48/52 * 47/51 = 188/221 = 0.85$

## d

The probability of picking the ace of hearts on the first draw is 1/52 and 1/51 on the second.
The other option includes picking one of the other aces, and another card that is hearts, which gives 3/52 and 12/51 respectively.
Which gives the final probability of:
$(1/52 * 1/51) + (3/52 * 12/51) = 0.014$

# 3.2

$P(C|R) = 0.9$, $P(C) = 0.4$ ,$P(R) = 0.25$
We apply Bayes theorem that says:
$P(R|C) = P(R) * P(C|R)/P(C)$
$P(R|C) = 0.25 * 0.9/0.4 = 0.5625$

# 3.3

$P(B) = 0.01$, $P(H|B) = 0.75$.
The probability of two heads given biased coin is $P(2H|B) = \binom{10}{2} * 0.75^2 * (0.25)^8 = 405/1048576$
The probability of two heads given fair coin is $P(2H|\neg B) = \binom{10}{2} * 0.5^{10} = 45/1024$
$P(B|2H) = \frac{P(B)*P(2H|B)}{P(B)*P(2H|B)+(1-P(B))*P(2H|\neg B)} = \frac{0.01*405/1048576}{(0.01*405/1048576)+(0.99*45/1024)} = 1/11265 = 0.00008877$