Assignment 2

AI1110: Probability and Random Variables
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12.13.1.7Question: Two coins are tossed once,where
(a)E : tail appears on one coin. F : one coin shows head
(b)E : no tail appears. F : no head appears
Answer:
(a) 1
(b) 0
Solution: Here two coins are tossed once. So the possible outcomes are {HH,HT,TH,TT}
(a) For event E : Tail appears on one coin.

X_1:	the number of tails appeared on the coin
X_2:	the number of heads appeared on the coin

Possibilities for E: One coin shows a tail and the other shows a head Using random variables, we can express event E as: E: (X_1= 1 and X_2 = 1)
For event F: One coin shows a head.
Possibilities for F: One coin shows a head and the other shows a tail
Using random variables, we can express event F as: F: (X_1= 1 and X_2 = 1)
To calculate Pr($E|F$), we need to find Pr($E \cap F$)

	X_1	X_2
E:	1	1
F:	1	1

and Pr(F). Pr($E \cap F$) is the probability that both E and F occur, which corresponds to the case where one coin shows a tail and the other shows a head:

$$\Pr(E \cap F) = \Pr(X_1 = 1 and X_2 = 1) \tag{1}$$
$$= \frac{2}{4} \tag{2}$$
$$= \frac{1}{2} \tag{3}$$
$$\Pr(F) = \Pr(X_2 = 1 and X_1 = 1) \tag{4}$$
$$= \frac{2}{4} \tag{5}$$
$$= \frac{1}{2} \tag{6}$$
$$\Pr(E|F) = \frac{\Pr(E \cap F)}{\Pr(F)} \tag{7}$$
$$= \frac{\frac{1}{2}}{\frac{1}{2}} \tag{8}$$
$$\Pr(E|F) = 1 \tag{9}$$

(a) For event E : No tail appears.
Possibilities for E: Both coins shows head
Using random variables, we can express event E as: E: (X_2 = 2)
For event F: No head appears..
Possibilities for F:Both coins shows tail
Using random variables, we can express event F as: F: (X_1= 2)
To calculate Pr($E|F$), we need to find Pr($E \cap F$)

	X_1	X_2
E:	0	2
F:	2	0

and Pr(F). Pr($E \cap F$) is the probability that both E and F occur, which here doesn't corresponds to any case as both the coins either shows head or tail:

$$\Pr(E \cap F) = 0 \tag{10}$$

$$\Pr(F) = \Pr(X_1 = 2) \tag{11}$$

$$= \frac{1}{4} \tag{12}$$

$$\Pr(E|F) = \frac{\Pr(E \cap F)}{\Pr(F)} \tag{13}$$

$$\Pr(E|F) = 0 \tag{14}$$