1. **10 points** This is essentially problem 35 from the book. It is your birthday! Time to do some math. Mom or Dad have hidden a present for you, either upstairs or downstairs. With probability .6, the present was hidden by Mom. If Nom has hidden the present, it is upstairs with probability .7. Dad is equally likely to have hidden it upstairs or downstairs.

   (a) **5 points** What is the probability that the present is upstairs?

   (b) **5 points** If it is upstairs, what is the probability that it was hidden by Dad?
Answers

1. \( M = \{ \text{Mom hid the present} \} \) and \( U = \{ \text{present is upstairs} \} \).

We know that
\[
P(M) = .6, \quad P(U|M) = .7, \quad \text{and} \quad P(U|D) = .5.
\]

We then compute that
\[
P(U \cap M) = P(U|M)P(M) = .7 \times .6 = .42
\]
\[
P(U \cap D) = P(U|D)P(D) = .5 \times .4 = .20
\]

(a) \( P(U) = P(U \cap M) + P(U \cap D) = .42 + .2 = .62. \)

(b) \( P(D|U) = P(U \cap D)/P(U) = .2/.62. \)