#18 Given $P[A_1] = 0.5 \quad P[A_2] = 0.7$
Find $P[A_1 \cap A_2]$ when $A_1$ and $A_2$ are independent

From Definition 2.3.1 in the text:

Events $A_1$ and $A_2$ are independent if:

$$P[A_1 \cap A_2] = P[A_1] \cdot P[A_2]$$

$$= (0.5)(0.7) = 0.35$$

#34

$A_1$: He has type A blood
$A_2$: He has type B blood
$A_3$: He has type AB blood
$A_4$: He has type O blood
B: He is typed as type A.

Find $P[A_2 | B]$

Use Baye's Theorem 2.4.1:

$$P[A_2 | B] = \frac{P[B | A_2] \cdot P[A_2]}{\sum_{i=1}^{n} P[B | A_i] \cdot P[A_i]}$$

Given:

$P[A_1] = 0.41 \quad P[B | A_1] = 0.88$

$P[A_2] = 0.09 \quad P[B | A_2] = 0.04$

$P[A_3] = 0.04 \quad P[B | A_3] = 0.10$

$P[A_4] = 0.46 \quad P[B | A_4] = 0.04$

$$P[A_2 \cap B] = \frac{(0.04)(0.09)}{(0.88)(0.41) + (0.04)(0.09) + (0.10)(0.04) + (0.04)(0.46)}$$

$$= \frac{0.0036}{0.3868} = 0.0093$$