Tests for independence examples

Example: Use the multiplication rule to determine whether A and B are independent.

$P(A) = \frac{3}{5}$ $P(B) = \frac{2}{5}$

$P(A \text{ or } B) = \frac{41}{50}$

For multiplication rule test, we need $P(A \text{ and } B)$. We can use the addition rule:

$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

$\frac{41}{50} = \frac{3}{5} + \frac{2}{5} - P(A \text{ and } B)$

$+P(A \text{ and } B)$ $+P(A \text{ and } B)$

$\frac{41}{50} + P(A \text{ and } B) = \frac{3}{5} + \frac{2}{5}$

$\frac{41}{50} + P(A \text{ and } B) =$ ☐

$-\frac{41}{50}$ $-\frac{41}{50}$

$P(A \text{ and } B) =$ ☐

$=$ ☐

Now for the multiplication rule:

if $P(A \text{ and } B) = P(A) \cdot P(B)$, then A and B are independent.

Example: Use the definition of independence to determine whether A and B are independent.

$P(A) = \frac{1}{2}$ $P(B) = \frac{11}{20}$

$P(A \text{ and } B) = \frac{11}{40}$

Definition of independence: A and B are independent iff $P(A|B) = P(A)$.

We need to know $P(A|B)$.

We can calculate $P(A|B)$ using the definition of conditional probability

$P(A|B) = \frac{P(A \text{ and } B)}{P(B)}$

So: $P(A|B) = \frac{11/40}{}$ ☐

$=$ ☐

Now use the definition of independence. Is $P(A|B) = P(A)$?

Fill in the blanks to finish working out the examples!