

Answer on Question #50185 – Math – Statistics and Probability

An archer shoots an arrow at a target.
The probability that he will hit the target is $\frac{3}{4}$

After the first shot, the target is moved further away from the archer.
The archer shoots a second arrow at the target and the probability that he will hit the target is now $\frac{3}{5}$.

- (a) Draw a tree diagram for the situation.
- (b) Calculate the probability that the archer will hit the target with his first shot but miss the target with his second shot
- (c) Calculate the probability that the archer will hit the target at least once if he takes both shots.

Solution

$P_1 = \frac{3}{4}$, $P_2 = \frac{3}{5}$. The events of the first and the second shots are assumed to be independent.

- (a) Draw a tree diagram for the situation.



- (b) Using the rule of multiplication, the probability that the archer will hit the target with his first shot but miss the target with his second shot is
 $P = P(1=\text{''Hit'' and } 2=\text{''Miss''}) = P(1=\text{''Hit''}) * P(2=\text{''Miss''}) = \frac{3}{4} * \frac{2}{5} = \frac{3}{10} = 0.3$
- (c)

Using rule of multiplication, the probability that the archer will hit the target at least once if he takes both shots is

$$P = P(1=\text{''Hit'' and } 2=\text{''Miss''}) + P(1=\text{''Miss'' and } 2=\text{''Hit''}) + P(1=\text{''Hit'' and } 2=\text{''Hit''}) = P(1=\text{''Hit''})P(2=\text{''Miss''}) + P(1=\text{''Miss''})P(2=\text{''Hit''}) + P(1=\text{''Hit''})P(2=\text{''Hit''}) =$$

$$= \frac{3}{4} * \frac{2}{5} + \frac{1}{4} * \frac{3}{5} + \frac{3}{4} * \frac{3}{5} = \frac{6+3+9}{20} = \frac{18}{20} = \frac{9}{10} = 0.9$$