Answer on Question #49351 – Math – Statistics and Probability

A survey was conducted among 960 people on their opinion about President Obama's health care proposal. The following information was collected:

a). There were 560 Democrats and 400 Republicans

b). Among the Democrats, 400 supported the President's health care proposal and the rest didn't.

c). Among the Republicans, 200 supported the President's health care proposal and the rest didn't.

Suppose a person is selected randomly from these 960 people

i). What is the probability that the person is a Democrat?

ii). What is the probability that the person is a Republican who doesn't support the President's proposal?

iii). What is the probability that the person is a Republican or the person supports the President's proposal?

iv). What is the probability that the person supports the President's proposal knowing that the person is a Democrat?

v). Are "being a Democrat" and "supporting the President's proposal" independent events?

vi). Are "being a Democrat" and "supporting the President's proposal" mutually exclusive events?

Solution

i). The probability that the person is a Democrat is

$$P(D) = \frac{560}{560 + 400} = 0.583.$$

ii). The probability that the person is a Republican who doesn't support the President's proposal is

$$P(RDS) = \frac{200}{560 + 400} = 0.208.$$

iii). The probability that the person is a Republican or the person supports the President's proposal is

$$P(R\ or\ S) = 1 - P(DDS) = 1 - \frac{560 - 400}{560 + 400} = 0.833.$$

iv). What is the probability that the person supports the President's proposal knowing that the person is a Democrat is

$$P(S|D) = \frac{P(S \cap D)}{P(D)} = \frac{\frac{400}{560 + 400}}{\frac{560}{560 + 400}} = \frac{400}{560} = 0.714.$$

v). Events "being a Democrat" and "supporting the President's proposal" are not independent:

$$P(D) \cdot P(S) = \frac{560}{560 + 400} \cdot \frac{200 + 400}{560 + 400} = 0.364 \neq P(D\ and\ S) = \frac{400}{560 + 400} = 0.417.$$

vi). Are "being a Democrat" and "supporting the President's proposal" mutually exclusive events?

Events “being a Democrat” and “supporting the President’s proposal” are not mutually exclusive:

$$P(D) + P(S) = \frac{560}{560+400} + \frac{200+400}{560+400} = 1.208 \neq P(D \text{ or } S) = 1 - P(RDS) = 1 - \frac{200}{560+400} = 0.792.$$