



Problem of the Week

Problem B and Solution

Honesty - the Best Policy?

Problem

A reporter is doing interviews at a convention attended by 500 people.

- 40% of these people always tell the truth.
- 20 of them will always lie.
- The remaining people each sometimes tell the truth and sometimes lie.



- a) Suppose that she interviews a person at random.
- (i) As a fraction, what is the probability that the person always lies?
 - (ii) As a fraction, what is the probability that the person always tells the truth?
- b) Suppose she interviews Joe Public, a person at the convention. The last time she interviewed him, he only told her the truth, so she knows he must be a person who always tells the truth or a person who sometimes tells the truth and sometimes lies. What is the probability that Joe Public always tells the truth?

Solution

- a) (i) Since there are 20 people who always lie out of 500 people, the probability she will at random interview someone who always lies is $\frac{20}{500}$ which can be reduced to $\frac{1}{25}$.
- (ii) Since $40\% = \frac{40}{100}$ of the 500 people always tell the truth, the probability that the person always tells the truth is $\frac{40}{100}$. This can be reduced to $\frac{2}{5}$.
- b) Since Joe has told the truth so far, we know that he does not always lie. There are 20 people that always lie. Therefore, Joe is one of the remaining $500 - 20 = 480$ people. Since 40% of the 500 people always tell the truth, that means 40 out of 100 people always tell the truth. We know $100 \times 5 = 500$. That means there are $40 \times 5 = 200$ people at the convention that always tell the truth. Therefore, the probability that Joe always tells the truth is $\frac{200}{480}$. This can be reduced to $\frac{5}{12}$.