Chapter 9: Probability and Statistics

9.1: Probability in Society

In almost every class, job, and even in our personal lives, we continually are analyzing data in order to make predictions.

Ex. *"If I talk when Ms. Burt is talking 3 or 4 times, she's going to get mad and give us a lecture. If I continue, she may yell."*

Probability - the likelihood that an event will occur. It can be expressed as a percentage, ratio, fraction, or decimal.

Ex. 40% = 4 out of 10 = $\frac{4}{10}$ = 0.4.

We often hear probability mentioned when we watch weather forecasts. Meteorologists analyze past weather conditions in order to make predictions about future weather. For example, when the weather calls for a 20% chance of showers, it means that, under similar conditions, it rained 20% of the time.

Definitions related to Probability:

Theoretical probability - what should happen, in theory. If we flip a coin, we should get tails 50% of the time, or 1 out of 2 times.

Experimental probability - a result of trials that test predictions. We flip a coin 10 times to see how often it actually lands on tails. We must do a sufficient number of experiments.

Subjective Judgment - derived from an individual's personal judgment about whether a specific outcome is likely to occur. Subjective probabilities contain no formal calculations and only reflect the subject's opinions and past experience.

Assumptions

-When discussing probability, we often have to make assumptions.

For example, let's say it has been calculated that a certain basketball player is 80% from the free throw line. This means that, in the past, he scores 8 baskets out of every 10 at that line.

Therefore, we assume that this probability will remain true for the next ten baskets he shoots from the free throw line.

Often times, you will be asked what assumptions you made. Our assumptions are going to be that the pattern will continue.

If these assumptions change and are not true, the prediction we make will not match the outcome. For example, our basketball pro may have a sore elbow, thus decreasing the probability that he makes the next basket.

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3. Indicate whether each decision is based on theoretical probability, experimental probability, or subjective judgment. Explain how you know.

a) The last two times Andrei won a prize at a coffee shop, he ordered a medium hot chocolate. Andrei never won when he ordered a large hot chocolate, so today he orders a medium hot chocolate.

b) Instead of buying her own lottery ticket, Martha pools her money with the people at work to buy more tickets and increase her chances of winning.

c) Anita boards the last car of a train because, in the past, the last car always had available seats.

d) Doug will not travel by airplane even though experts say it is safer to fly than drive.

(a) Experimental Probability: Decision is based on Andrei's past experience.

(b) Theoretical Probability: The more tickets you buy, the greater the chances of winning.

(c) Experimental Probability: Decision is based on Anita's past experience.

(d) Subjective Judgment: Decision is based on Doug's feelings.

17. According to Transport Canada, in 2004, there were 34 fatalities due to air travel and 2730 fatalities due to road travel.

a) What impression does this information give? How might this information be misleading?

b) What additional information would you need to determine whether travelling by plane or by car is safer?

(a) This gives the impression that it is much more dangerous to travel by car than plane. This information could be misleading because there are more people that travel by road than by air.

(b) We need to know how many people travel by plane and by car in 2004.