Project Connection

Permutations and Combinations

Sanjev was wondering what he could do with his presentation. He was struggling a little bit until he came across the following news headline:

40% of adults feel that winning the lottery is the best way to save for retirement.

This caught his attention. He decided that his presentation would involve calculating the likelihood of being able to use the lottery to save enough money for retirement. He had just finished developing skills with counting techniques, particularly permutations and combinations, and he wondered how he might be able to apply his techniques to help him with his presentation.

First, though, he had to research how to win prizes. He found the information that follows.

Lottery Draws and Prizes

(i) There are six numbers, drawn at random, between 1 and 49. Once a number has been chosen, it no longer can be used again.
(ii) Each ticket has six numbers.
(iii) A ticket wins the grand prize if all its numbers match the six numbers drawn.
(iv) Second prize is won if five numbers on the ticket match any five of the six numbers drawn.
(v) Third prize is won if four numbers on the ticket match any four of the six numbers drawn.
(vi) Fourth prize is won if three numbers on the ticket match any three of the six numbers drawn.

Sanjev decided to use his counting techniques to determine how many ways there are for winning each of the prizes. Help Sanjev complete his calculations by answering the questions that follow.

- How many ways are there for selecting the numbers on a ticket that can win the grand prize?
- How many ways are there for selecting the numbers on a ticket that can win second prize?
- How many ways are there for selecting the numbers on a ticket that can win third prize?
- How many ways are there for selecting the numbers on a ticket that can win fourth prize?

Sanjev was astonished when he saw the number after his calculations. Why do you think that Sanjev was so surprised? What do these numbers indicate to you about the likelihood of being able to win the lottery and save enough money for retirement?

By now, you have probably gathered a lot of data and have done a fair amount of research on your topic. You may be looking for ways to analyze your data. Look at your data.

- Is there any way that your counting techniques can be used on your data to help you interpret it or get more meaning from it?
- What information is gained because of the application of your counting techniques?
- What conclusions can you make because of the application of your counting techniques?
- How does the information that you have gained, and the conclusions you have drawn, fit into your project and presentation?
- Have any new questions been raised that you would like to answer now? Do you feel you should answer these questions?