Module 5: Making Informed Decisions

TOPIC 2: COMPUTING PROBABILITIES

In this topic, students apply and extend the probability concepts they learned in the previous topic to explore expected value and conditional probability. They also use combinatorial techniques, such as combinations and permutations, to construct and reason with large sample spaces. Students consider simple and complex event interactions in this topic and organize them in order to derive information from them about probabilities.

Where have we been?

In the previous topic, students revisited simple probability and deepened their understanding of compound probability in preparation for this topic. The Counting Principle was introduced in the previous topic as a precursor to combinations and permutations introduced in this topic.

Where are we going?

Combinations and permutations used to construct large sample spaces are widely used concepts in a variety of mathematical subfields, including number theory and computer science. Conditional probability and expected value are important concepts in fields such as economics and statistics.

Using a Two-Way Table to Determine a Sample Space

A two-way table can be used to determine a sample space for compound events. For example, the table shown can organize the outcomes when two number cubes are rolled and summed.

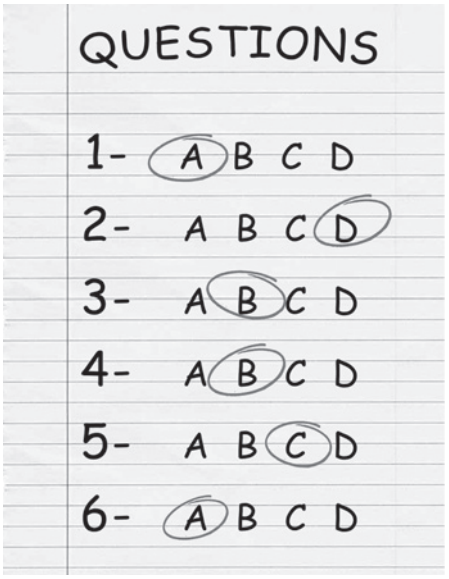
1st Number Cube \ 2nd Number Cube	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

None of the Above

One good thing about a multiple choice question is that you can always make an educated guess. This can be a good strategy, especially if you're not 100% sure about the solution.

On the flip side, relying too much on guessing means you may not have been prepared for the questions. Remember, a little extra preparation can go a long way!

Have you thought about the chances of guessing the correct answer to a multiple choice question? What about the chances of guessing the correct answers to a bunch of multiple-choice questions?



Talking Points

It can be helpful to understand combinations and permutations for college admissions tests.

Here is an example of a sample question:

A committee of 10 people will elect three representatives. How many different groups of three representatives can they choose?

It is possible to choose two groups of the same three people, which only differ by the order they were chosen. Those groups would be permutations of each other. But what we want are combinations—where no two groups have the same people.

There is a formula for choosing r combinations from a set of n elements: $\frac{n!}{(n-r)!r!}$. So, the number of different groups of three representatives that can be chosen is:

$$\frac{10!}{(10-3)! \cdot 3!} = \frac{3{,}628{,}800}{30{,}240} = 120$$

Key Terms

contingency table

A two-way frequency table, also called a contingency table, shows the number of data points and their frequencies for two variables.

relative frequency

A relative frequency is the ratio of occurrences within a category to the total number of occurrences.

conditional probability

A conditional probability is the probability of Event B, given that Event A has already occurred.

factorial

The factorial of n, which is written with an exclamation mark as $n!$, is the product of all non-negative integers less than or equal to n.