Counting & Probability:
Form V

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Contents

CHAPTER 1

Sets

CHAPTER 2

Combinatorics

The section on counting and probability usually follows the unit on sequences and series.

1. Counting: Multiplication Principle A

(1)

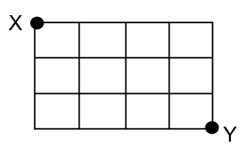
2. Counting: Multiplication Principle B

3. Counting: Multiplication Principle C

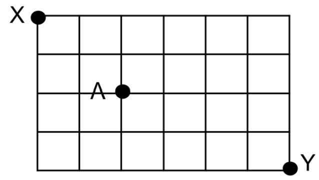
4. Counting: Multiplication Principle D

5. Combinations A

* **Exercise 1 Paths on a Grid** The grid below represents the streets of a city. You are traveling from point X to point Y by moving either to the right or down. How may different routes are there from X to Y? **??**



** **Exercise 2 Paths on a Grid II** Again the grid below represents the streets of a city. You are still traveling from X to Y, but this time you must avoid passing through point A. How many routes are there from X to Y that do not pass through A? **??**


X
A
Y

CHAPTER 3

Probability

CHAPTER 4

Answers

Exercise ??

There are 35 paths. You can arrive at this answer by recognizing each path 7 parts, 4 of which are to the right and 3 of which are down. You can count this either as $\binom{7}{4}$, choosing which 4 parts will be to the right, $\binom{7}{3}$, choosing which 3 parts will be down or $\frac{7!}{4!\cdot 3!}$ where you count the rearrangements of all 7 parts dividing out by repetitions.

Exercise ??

There are 120 paths. In this problem we want to avoid the point A. So we can first tally all the routes from X to Y as $\binom{10}{6}$, and then we take away all the paths that pass through A. There are two pieces to this journey. The trip from X to A can be done $\binom{4}{2} = 6$ ways, and the trip from A to Y can be done in $\binom{6}{2} = 15$ ways. Using the multiplication counting principle this means there are $6 \cdot 15 = 90$ ways to go from X to Y, passing through A. If we want to avoid point A that means we will only have $210 - 90 = 120$ paths.