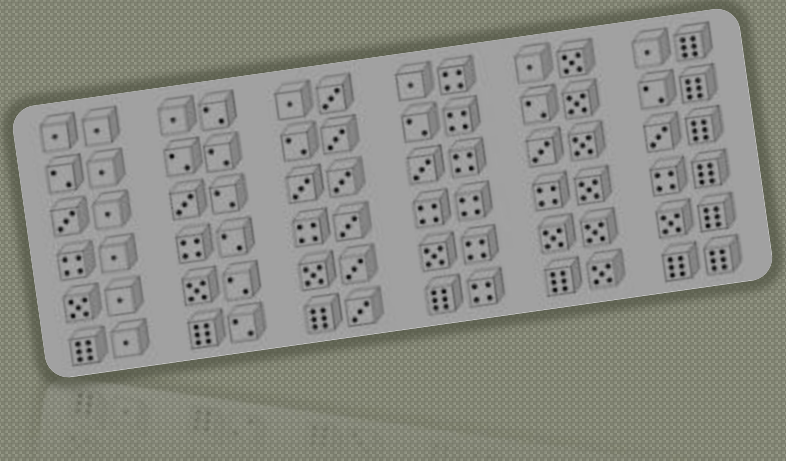
1. COMBINATIONS



Q1. A man wants to paint his house in 3 colors. If he can choose 3 colors out of 6 colors, how many different color settings can he make?

(A) 216 (B) 20 = 6 C 3 (C) 18
(D) 120 (E) 110

Q2. The number of ways in which we can select two students among a group of 5 students is

(A) 120 (B) 10 = 5 C 2 (C) 60
(D) 20 (E) 110

Q3. The number of ways in which we can select a president and a secretary among a group of 5 students is

(A) 120 (B) 10 (C) 60
(D) 20 = 5 P 2 (E) 110

2.4. An experiment involves tossing a pair of dice, one green and one red, and recording the number that come up. If x equal the outcome on the green die and y the outcome on the red die, describe the sample space S.

(a) By listing the elements (x, y).

S = {(x, y) : x = # of green die and y = # of red die }

$$=\{(1,1),(1,2),(1,3),(1,4),(1,5),(1,6),$$
$$(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),$$
$$(3,1),(3,2),(3,3),(3,4),(3,5),(3,6),$$
$$(4,1),(4,2),(4,3),(4,4),(4,5),(4,6),$$
$$(5,1),(5,2),(5,3),(5,4),(5,5),(5,6),$$
$$(6,1),(6,2),(6,3),(6,4),(6,5),(6,6)\}$$

2.8. For the sample space of Exercise 2.4.

(a) List the elements corresponding to the event A that the sum is greater than 8.

$A = \{(3,6),(4,5),(4,6),(5,4),(5,5),(5,6),(6,3),(6,4),(6,5),(6,6)\}$.

(b) List the elements corresponding to the event B that a 2 occurs on either die.

$B = \{(2,1),(2,2),(2,3),(2,4),(2,5),(2,6),(1,2),(3,2),(4,2),(5,2),(6,2)\}$.

(c) List the elements corresponding to the event C that a number greater than 4 comes up on the green die.

$C = \{(5,1), (5,2), (5,3), (5,4), (5,5), (5,6), (6,1), (6,2), (6,3), (6,4), (6,5), (6,6)\}$.

(d) List the elements corresponding to the event $A \cap C$.

$A \cap C = \{(5,4), (5,5), (5,6), (6,3), (6,4), (6,5), (6,6)\}$.

(e) List the elements corresponding to the event $A \cap B$.

$A \cap B = \Phi$

(f) List the elements corresponding to the event $B \cap C$.

$B \cap C = \{(5,2), (6,2)\}$.

2.15. Consider the sample space
S= {copper, sodium, nitrogen, potassium, uranium, oxygen, zinc}.
And the events

A= {copper, sodium, zinc},
B= {sodium, nitrogen, potassium},
C= {oxygen}.

List the elements of the sets corresponding to the following events:

(a) $A' = \{\text{nitrogen, potassium, uranium, oxygen}\}$.

(b) $A \cup C = \{\text{copper, sodium, zinc, oxygen}\}$.

(c) $(A \cap B') \cup C'$

$B' = \{\text{copper, uranium, oxygen, zinc}\}$
$C' = \{\text{copper, sodium, nitrogen, potassium, uranium, zinc}\}$
$A \cap B' = \{\text{copper, zinc}\}$
$(A \cap B') \cup C' = \{\text{copper, sodium ,nitrogen, potassium, uranium, zinc}\}$

(d) $B' \cap C' = \{\text{copper , uranium, zinc}\}$

(e) $A \cap B \cap C = \Phi$

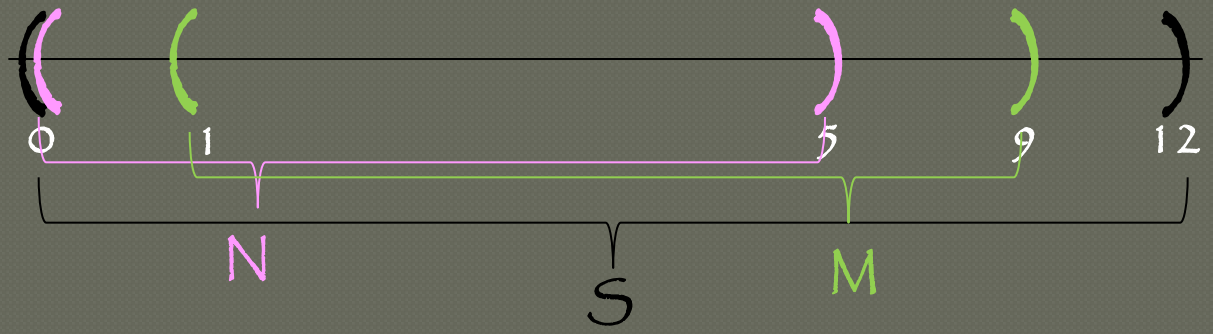
(f) $(A' \cup B') \cap (A' \cap C)$

$A' \cup B' =$ {copper, nitrogen, potassium, uranium, oxygen, zinc}

$A' \cap C =$ {oxygen}

$(A' \cup B') \cap (A' \cap C) =$ {oxygen}

2.16. If $S = \{x \mid 0 < x < 12\}$, $M = \{x \mid 1 < x < 9\}$, and $N = \{x \mid 0 < x < 5\}$, find:



(a) $M \cup N = (0, 9) = \{x \mid 0 < x < 9\}$.

(b) $M \cap N = (1, 5) = \{x \mid 1 < x < 5\}$.

(c) $M' \cap N'$.

$M' = (0, 1] \cup [9, 12)$

$N' = [5, 12)$

$M' \cap N' = [9, 12) = \{x \mid 9 <= x < 12\}$.

2.23. If an experiment consists of throwing a die and then drawing a letter at random from the English alphabet, how many points are there in the sample space?

English alphabet consisting of 26 letters. And the dice has six faces, each of its six faces showing a different number of dots (pips) from 1 to 6.
So, (6)(26)=156.

2.33 If a multiple-choice test consists of 5 questions, each with 4 possible answers of which only 1 is correct,

(a) in how many different ways can a student check off one answer to each question?

(b) in how many ways can a student check off one answer to each question and get all the answers wrong?

a) n1 = 4; n2 = 4; n3 = 4; n4 = 4; n5 = 4
So, (n1)(n2)(n3)(n4)(n5) = (4)(4)(4)(4)(4) = 1024 possible ways.

b) n1 = 3; n2 = 3; n3 = 3; n4 = 3; n5 = 3
So, (n1)(n2)(n3)(n4)(n5) = (3)(3)(3)(3)(3) = 243 possible ways.

2.36

(a) How many three-digit numbers can be formed from the digits 0, 1, 2, 3, 4, 5, and 6 if each digit can be used only once?

(b) How many of these are odd numbers?

Assuming that the three-digit number does NOT begin with zero.

(a)

Any of the 6 nonzero digits can be chosen for the hundreds position (1 through 6), leaving 6 digits possible for the tens position (any of the other 6 digits, including the 0), and 5 digits for the units position. So, there are (6)(6)(5) = 180 three digit numbers.

(b)

First, the units position can be filled using any of the 3 odd digits (there are 3 odd digits {1,3,5}). Any of the remaining 5 (non-zero digits) nonzero digits can be chosen for the hundreds position, leaving a choice of 5 digits for the tens position. Thus, there are (3)(5)(5) = 75 three digit odd numbers.

2.45 : How many distinct permutations can be made from the letters of the word INFINITY ?

We have here 8 letters total.
And there are 3 ″i″s, 2 ″n″s, 1 ″f″, 1 ″t″ and 1 ″y″.
Answer will therefore be: 8! / (3! x 2! x 1! x 1!)= 8!/(3!2!) = 3360 unique permutations.