

M118 SECTION 7.3 – BASIC COUNTING PRINCIPLES

- 1) In a class of students, 20 were math majors
16 were physics majors
7 were both math and physics majors.

How many students are in the class?

Does the number in the class equal $M \cup P = 20 + 16 = 36$? NO
Because we counted the double majors twice.

$$\begin{aligned} M \cup P &= \text{number in } M + \text{number in } P - \text{number common to both} \\ &= 20 + 16 - 7 = 29 \end{aligned}$$

So there are 29 students in all.

Example: A survey found that 345 firms offer their employees group life insurance, 285 offer long-term disability, and 115 offer group life insurance and long-term disability. How many firms offer their employees group life insurance or long-term insurance?

Example: #50 A class of 30 music students includes 13 who play the piano, 16 who play the guitar, and 5 who play both piano and guitar. How many students in the class play neither instrument?

Example: #52

A high school football team with 40 players includes 16 who played offense last year, 17 who played defense last year, and 12 who were not on last year's team. How many players from last year played both offense and defense?

Example: #58

A survey of 800 small businesses indicates that 250 own photocopiers, 420 own fax machines, and 180 own photocopiers and fax machines.

- a) How many businesses own either a copier or fax machine?
- b) How many own neither a copier or fax machine?
- c) How many own a fax machine but not a copier?

Example: #66

If 12,457 people voted for a politician in his first election, 15,322 voted for him in his second election, and 9,345 voted for him in both elections, how many voted for this politician in his first or second election?

MULTIPLICATION PRINCIPLE:

#36

A delicatessen serves meat sandwiches with the following options: 3 kinds of bread, 5 kinds of meat, and lettuce or sprouts. How many different sandwiches are possible, assuming that one item is used out of each category?

MULTIPLICATION PRINCIPLE (for Counting)

If n operations $O_1, O_2, O_3, \dots, O_n$ are performed in order, with possible outcomes $N_1, N_2, N_3, \dots, N_n$ respectively then there are $N_1 \cdot N_2 \cdot N_3 \cdot \dots \cdot N_n$ possible outcomes.

Ex: #38

How many 5 letter code words are possible from the first 7 letters of the alphabet if no letter is repeated? _____

If letters are repeated? _____

If adjacent letters must be different? _____

Ex: #42

How many 5-digit ZIP code numbers are possible?

How many of these numbers contain no repeated digits?

Ex: #64

A couple is planning to have 3 children. How many boy-girl combinations are possible?

a) Solve by using a tree diagram.

b) Solve by using the multiplication principle.