TUGAS 1

- Pelajari subbab 6,1 buku Discrete Mathematics karangan Richard Johnsonbaugh tentang Prinsip Dasar Menghitung, lalu kerjakan soal-soal berikut:

1. Terjemahkan tulisan berikut:

Multiplication Principle

If an activity can be constructed in t successive steps and step 1 can be done in n_1 ways, step 2 can then be done in n_2 ways, ..., and step t can then be done in n_t ways, then the number of different possible activities is $n_1 \cdot n_2 \cdots n_t$.

2. Terjemahkan tulisan berikut:

Addition Principle

Suppose that $X_1, \ldots, X_t$ are sets and that the ith set X_i has n_i elements. If $\{X_1, \ldots, X_t\}$ is a pairwise disjoint family (i.e., if $i \neq j$, $X_i \cap X_j = \emptyset$), the number of possible elements that can be selected from X_1 or X_2 or ... or X_t is

$$n_1 + n_2 + \cdots + n_t.$$

(Equivalently, the union $X_1 \cup X_2 \cup \cdots \cup X_t$ contains $n_1 + n_2 + \cdots + n_t$ elements.)

3. Terjemahkan tulisan berikut:

Inclusion-Exclusion Principle for Two Sets

If X and Y are finite sets, then

$$|X \cup Y| = |X| + |Y| - |X \cap Y|.$$

4. Terjemahkan tulisan berikut:

Problem-Solving Tips

The key to solving problems in this section is determining when to use the Multiplication Principle and when to use the Addition Principle. Use the Multiplication Principle when using a step-by-step process to *construct an activity*. For example, to construct a dinner from Kay's Quick Lunch menu (Figure 6.1.1) consisting of one appetizer, one main course, and one beverage, we use a three-step process:

1. Choose one appetizer.
2. Choose one main course.
3. Choose one beverage.

The number of different possible activities is the product of the number of ways each step can be done. Here we can select one appetizer in 2 ways, one main course in 3 ways, and one beverage in 4 ways. Thus, the number of dinners is $2 \cdot 3 \cdot 4 = 24$.

Use the Addition Principle when you want to count the number of elements in a set and you can divide the set into nonoverlapping subsets. Suppose, for example, that we want to count the total number of items available at Kay's Quick Lunch. Since there are 2 appetizers, 3 main course items, and 4 beverages, and no item belongs to two categories, the total number of items available is

$$2 + 3 + 4 = 9.$$

Notice the difference between the two examples. To construct a dinner consisting of one appetizer, one main course, and one beverage at Kay's Quick Lunch, we use a step-by-step process. The size of the set of dinners is *not* counted by dividing the set

of dinners into nonoverlapping subsets. To count the number of dinners, we use the Multiplication Principle. To count the number of items available at Kay's Quick Lunch, we just sum the number of items each category since dividing the items by category naturally splits them into nonoverlapping subsets. We are *not* counting the individual items available by constructing them using a step-by-step process. To count the total number of items available, we use the Addition Principle.

The Inclusion-Exclusion Principle (Theorem 6.1.12) is a variant of the Addition Principle that can be used when the sets involved are *not* pairwise disjoint.

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