

## Probability and Statistics

Homework 1.2

Name \_\_\_\_\_

In Exercises 1-4 write  $\subseteq$  or  $\not\subseteq$  in each blank so that the resulting statement is true.

1.  $\{2, 3, 7\}$  \_\_\_\_\_  $\{1, 2, 3, 4, 5, 6, 7\}$
2.  $\{\text{Monday, Friday}\}$  \_\_\_\_\_  $\{\text{Saturday, Sunday, Monday, Tuesday, Wednesday}\}$
3.  $\{x \mid x \text{ is a dog}\}$  \_\_\_\_\_  $\{x \mid x \text{ is a pure-bred dog}\}$
4.  $\{\frac{1}{2}, \frac{1}{3}\}$  \_\_\_\_\_  $\{2, 3, 5\}$

In Exercises 5-7 determine whether  $\subseteq$ ,  $\subset$ , both, or neither can be placed in each blank to form a true statement.

5.  $\{F, I, N\}$  \_\_\_\_\_  $\{F, I, N, K\}$
6.  $\{x \mid x \text{ is a person living in London}\}$  \_\_\_\_\_  $\{y \mid y \text{ is a person living in the capital of England}\}$
7.  $\{x \mid x \text{ is a person living in Massachusetts}\}$  \_\_\_\_\_  $\{y \mid y \text{ is a person living in Boston}\}$

In Exercises 8-14, determine whether each statement is true or false. If false, explain why.

8.  $\text{Canada} \in \{\text{Mexico, United States, Canada}\}$
9.  $\text{Canada} \subseteq \{\text{Mexico, United States, Canada}\}$
10.  $\{\text{Canada}\} \subseteq \{\text{Mexico, United States, Canada}\}$
11.  $\emptyset \subseteq \{\text{Charlie Chaplin, Groucho Marx, Woody Allen}\}$
12.  $\{1\} \in \{\{1\}, \{3\}\}$
13.  $\{1, 4\} \subsetneq \{4, 1\}$
14.  $0 \not\subseteq \emptyset$

In Exercises 15-17, list all the subsets of the given set.

15.  $\{\text{Romeo, Juliet}\}$
16.  $\{\text{I, II, III}\}$
17.  $\emptyset$

In Exercises 18-19, calculate the number of subsets and the number of proper subsets for each set.

18.  $\{\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}\}$
19.  $\{a, b, c, d, e, f\}$

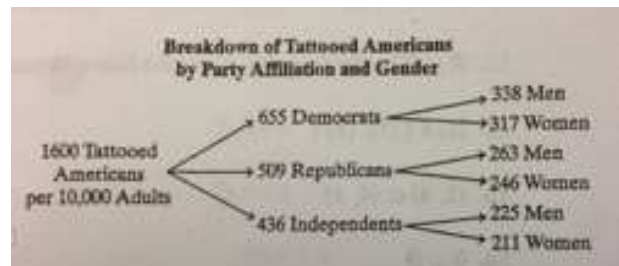
In Exercises 20-26, determine whether each statement is true or false. If the statement is false, make the necessary change(s) to produce a true statement.

20. The set  $\{1, 2, 3, \dots, 10,000\}$  has  $2^{10,000}$  proper subsets.
21.  $\{x \mid x \in \mathbf{N} \text{ and } 20 \leq x \leq 60\} \not\subseteq \{x \mid x \in \mathbf{N} \text{ and } 20 < x < 60\}$
22.  $\{\emptyset\} \not\subseteq \{\emptyset, \{\emptyset\}\}$
23.  $\{\emptyset\} \in \{\emptyset, \{\emptyset\}\}$
24. If  $A \subseteq B$  and  $B \subseteq C$ , then  $A \subseteq C$ .
25. If Set A is equivalent to the set of even natural numbers, then  $n(A) = \aleph_0$ .
26. The set of subsets of  $\{a, b, c, d, e, f\}$  contains 128 elements.

Application Exercises - Sets and subsets allow us to order and structure data. In the data shown below, the set of tattooed Americans is divided into subsets categorized by party affiliation. These subsets are further broken down into subsets categorized by gender. All numbers in the branching tree diagram are based on the number of people per 10,000 American adults.

Let

- T = the set of tattooed Americans
- R = the set of tattooed Republicans
- D = the set of tattooed Democrats
- M = the set of tattooed Democrat men
- W = the set of tattooed Democrat women



In Exercises 27-30, determine whether each statement is true or false. If the statement is false, make the necessary change(s) to produce a true statement.

27.  $R \in T$
28.  $W \subset T$
29. If  $x \in D$ , then  $x \in M$ .
30. If  $x \in D$ , then  $x \notin R$ .