

JQE Study Guide (corrected)  
Finite Mathematics

- Be able to use problem solving strategies such as using a systematic approach, using a guess and check method, and choosing good names for unknowns.
- Be able to solve problems involving sets and basic set operations.
  - A collection of objects is called a set, and the individual objects in this collection are called the elements of the set.
  - The set  $U$  of all elements under consideration in a given discussion is called the universal set.
  - A set that has no elements is called the empty set and is denoted by  $\emptyset$ .
  - Two sets  $A$  and  $B$  are equal if they have exactly the same members.
  - Set  $A$  is a subset of set  $B$ , denoted by  $A \subseteq B$ , if every element of  $A$  is also an element of  $B$ .
  - A set with  $k$  elements has  $2^k$  subsets.
  - Set  $A$  is a proper subset of  $B$ , denoted by  $A \subset B$ , if  $A \subseteq B$  and  $A \neq B$ .
  - The union of sets  $A$  and  $B$ , written  $A \cup B$ , is the set of elements that are elements of either  $A$  or  $B$  (or both).
  - The intersection of sets  $A$  and  $B$ , written  $A \cap B$ , is the set of elements that are common to both  $A$  and  $B$ .
  - The complement of  $A$ , written  $A'$ , is the set of elements of the universal set that are not elements of  $A$ .
- Be able to represent set operations using Venn diagrams.
- Be able to determine the truth value of compound statements.
  - Negation, represented symbolically by  $\sim$ , expresses the idea of the opposite truth value.
  - Conjunction, represented symbolically by  $\wedge$ , expresses the idea *and*.
  - Disjunction, represented symbolically by  $\vee$ , expresses the idea *or*.
  - The conditional, represented by  $\rightarrow$ , expresses the idea *if . . . then*.
  - Truth tables:

| Negation (not) |          |
|----------------|----------|
| $p$            | $\sim p$ |
| T              | F        |
| F              | T        |

| Conjunction (and) |     |              |
|-------------------|-----|--------------|
| $p$               | $q$ | $p \wedge q$ |
| T                 | T   | T            |
| T                 | F   | F            |
| F                 | T   | F            |
| F                 | F   | F            |

| Conditional (if . . . then) |     |                   |
|-----------------------------|-----|-------------------|
| $p$                         | $q$ | $p \rightarrow q$ |
| T                           | T   | T                 |
| T                           | F   | F                 |
| F                           | T   | T                 |
| F                           | F   | T                 |

| Disjunction (or) |     |            |
|------------------|-----|------------|
| $p$              | $q$ | $p \vee q$ |
| T                | T   | T          |
| T                | F   | T          |
| F                | T   | T          |
| F                | F   | F          |

- Be able to negate quantified statements—statements that involve words with meanings like *all*, *some*, or *none*.
- Be able to determine if a syllogism is valid or invalid.
  - A syllogism consists of a set of statements called premises followed by a statement called a conclusion. The premises and conclusion of a syllogism may contain quantifiers such as *all*, *some*, or *none*.
  - A syllogism is valid if whenever its premises are all true, then the conclusion is also true. If the conclusion of a syllogism can be false even though all the premises are true, the syllogism is invalid.
- Be able to convert between decimals, fractions, and percents.
- Be able to solve problems involving percentages.
- Be able to solve problems about simple and compound interest.
  - We compute simple interest,  $I$ , using the formula  $I = Prt$ , where  $P$  is the principal,  $r$  is the interest rate, and  $t$  is the time.
  - The equation  $A = P(1 + rt)$  computes the future value of an account using simple interest.  $A$  is the future value,  $P$  is the principal,  $r$  is the interest rate, and  $t$  is the time.
  - The equation  $A = P\left(1 + \frac{r}{n}\right)^{nt}$  computes the future value of an account using compound interest.  $A$  is the future value,  $P$  is the principal,  $r$  is the annual interest rate,  $n$  is the number of compounding periods per year, and  $t$  is the time (in years).
- Be able to compute the probability of a simple event.
  - Probability values are numbers between 0 and 1, inclusive, and are computed using the formula

$$P(E) = \frac{\text{number of ways } E \text{ can occur}}{\text{number of items in sample space } S},$$

provided that each item in the sample space  $S$  is equally likely to occur.

- The probability that an event  $E$  does not occur is called the probability of the complement of event  $E$ , and is found by

$$P(E') = 1 - P(E).$$