1. (2.3) Which of the following events are equal?

   (a) $A = \{1, 3\}$

   (b) $B = \{x : x \text{ is a number on a die}\} = \{1, 2, 3, 4, 5, 6\}$

   (c) $C = \{x : x^2 - 4x + 3 = 0\} = \{x : (x - 1)(x - 3) = 0\} = \{1, 3\}$

   (d) $D = \{x : x \text{ numbers of heads when six coins are tossed }\} = \{0, 1, 2, 3, 4, 5, 6\}$

$$\boxed{A = C}$$

2. (2.6) Two jurors are selected from 4 alternates to serve at a murder trial. Using the notation $A_1 A_3$, for example, to denote the simple event that alternates 1 and 3 are selected, list the 6 elements of the sample space Ω.

$$\boxed{\Omega = \{A_1 A_2, A_1 A_3, A_1 A_4, A_2 A_3, A_2 A_4, A_3 A_4\}}$$

3. (2.10) An engineering firm is hired to determine if certain waterways in Virginia are safe for fishing. Samples are taken from three rivers.

   (a) List the elements of a sample space S, using the letters F for safe to fish and N for not safe to fish.

$$\boxed{S = \{FFF, FFN, FNF, NFF, FNN, NFN, NNF, NNN\}}$$

   (b) List the elements of S corresponding to event E that at least two of the rivers are safe for fishing.

$$\boxed{E = \{FFF, FFN, FNF, NFF\}}$$

   (c) Define an event that has as its elements the points

$$\{FFF, NFF, FFN, NFN\} \to E = \text{ River 2 is safe}$$

4. (2.14) If

$$S = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$$
$$A = \{0, 2, 4, 6, 8\}, B = \{1, 3, 5, 7, 9\}$$
$$C = \{2, 3, 4, 5\}, D = \{1, 6, 7\},$$

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

   (a) $A \cup C = \boxed{\{0, 2, 3, 4, 5, 6, 8\}}$

   (b) $A \cap B = \boxed{\varnothing}$

   (c) $C' = \boxed{\{0, 1, 6, 7, 8, 9\}}$

5. (2.18) 2.18 Which of the following pairs of events are mutually exclusive?

   (c) A mother giving birth to a baby girl and a set of twin daughters on the same day.

   - **Not mutually exclusive**.

   (d) A chess player losing the last game and winning the match.

   - Ambiguous. Depends on how winning a match is defined. Assuming winning a match is *first one* to say, 3 wins, then yes, it's **mutually exclusive**.

6. (2.22) In a medical study, patients are classified in 8 ways according to whether they have blood type AB+, AB-, A+, A-, B+, B-, O+, or O-, and also according to whether their blood pressure is low, normal, or high. Find the number of ways in which a patient can be classified.

$$(8)(3) = \boxed{24} \quad \text{using Rule 2.1}$$

7. (2.27) developer of a new subdivision offers a prospective home buyer a choice of 4 designs, 3 different heating systems, a garage or carport, and a patio or screened porch. How many different plans are available to this buyer?

$$(4)(3)(2)(2) = \boxed{48} \quad \text{using Rule 2.2}$$