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Discrete Mathematics with Applications, 4th Edition by Susanna S. Epp

Test Bank Questions

Chapter 1

- 1. Fill in the blanks to rewrite the following statement with variables: Is there an integer with a remainder of 1 when it is divided by 4 and a remainder of 3 when it is divided by 7?
 - (a) Is there an integer n such that n has ____?
 - (b) Does there exist _____ such that if n is divided by 4 the remainder is 1 and if _____?
- 2. Fill in the blanks to rewrite the following statement with variables: Given any positive real number, there is a positive real number that is smaller.
 - (a) Given any positive real number r, there is _____ s such that s is _____.
 - (b) For any $_$, $_$ such that s < r.
- 3. Rewrite the following statement less formally, without using variables:

There is an integer n such that 1/n is also an integer.

4. Fill in the blanks to rewrite the following statement:

For all objects T, if T is a triangle then T has three sides.

- (a) All triangles _____.
- (b) Every triangle _____.
- (c) If an object is a triangle, then it _____.
- (d) If T _____, then T _____.
- (e) For all triangles T, _____
- 5. Fill in the blanks to rewrite the following statement:

Every real number has an additive inverse.

- (a) All real numbers _____.
- (b) For any real number x, there is _____ for x.
- (c) For all real numbers x, there is real number y such that _____.
- 6. Fill in the blanks to rewrite the following statement:

There is a positive integer that is less than or equal to every positive integer.

- (a) There is a positive integer m such that m is _____
- (b) There is a _____ such that _____ every positive integer.
- (c) There is a positive integer m which satisfies the property that given any positive integer n, m is _____.
- 7. (a) Write in words how to read the following out loud $\{n \in \mathbb{Z} \mid n \text{ is a factor of } 9\}$.
 - (b) Use the set-roster notation to indicate the elements in the set.

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- 8. (a) Is {5} ∈ {1,3,5}?
 (b) Is {5} ⊆ {1,3,5}?
 (c) Is {5} ∈ {{1}, {3}, {5}}?
 (d) Is {5} ⊆ {{1}, {3}, {5}}?
- 9. Let $A = \{a, b, c\}$ and $B = \{u, v\}$. Write a. $A \times B$ and b. $B \times A$.
- 10. Let $A = \{3, 5, 7\}$ and $B = \{15, 16, 17, 18\}$, and define a relation R from A to B as follows: For all $(x, y) \in A \times B$,

$$(x,y) \in R \quad \Leftrightarrow \quad \frac{y}{x} \text{ is an integer}$$

- (a) Is 3 R 15? Is 3 R 16? Is $(7,17) \in R$? Is $(3,18) \in R$?
- (b) Write R as a set of ordered pairs.
- (c) Write the domain and co-domain of R.
- (d) Draw an arrow diagram for R.
- (e) Is R a function from A to B? Explain.
- 11. Define a relation R from **R** to **R** as follows: For all $(x, y) \in \mathbf{R} \times \mathbf{R}, (x, y) \in R$ if, and only if, $x = y^2 + 1$.
 - (a) Is $(2,5) \in R$? Is $(5,2) \in R$? Is (-3) R 10? Is 10 R (-3)?]
 - (b) Draw the graph of R in the Cartesian plane.
 - (c) Is R a function from A to B? Explain.
- 12. Let $A = \{1, 2, 3, 4\}$ and $B = \{a, b, c\}$. Define a function $G: A \to B$ as follows:

$$G = \{(1, b), (2, c), (3, b), (4, c)\}.$$

- (a) Find G(2).
- (b) Draw an arrow diagram for G.
- 13. Define functions F and G from \mathbf{R} to \mathbf{R} by the following formulas:

$$F(x) = (x+1)(x-3)$$
 and $G(x) = (x-2)^2 - 7$.

Does F = G? Explain.