
Section 2.4: Functions and Relations

Relation: is used to represent a relationship between 2 numbers or objects.

Examples: 5 is less than 7
I am shorter than my husband.
I am older than my brother.

Ways to represent a relation:

- **Arrow diagram:** Use arrows to indicate the relation.

Example 1: Given $\{2, 4, 6, 8\}$, represent the relation “is a divisor of” using an arrow diagram.

- **Ordered pairs:** Uses ordered pairs to indicate the relation.

Example 2: Given $\{2, 4, 6, 8\}$, represent the relation “is a divisor of” using ordered pairs.

THREE RELATION PROPERTIES:

1. **Reflexive Property:** A relation R on a set A is reflexive if $(a, a) \in R$ for all $a \in A$. (In other words, every element of A is related to itself).

2. **Symmetric Property:** A relation R on a set A is symmetric if whenever $(a, b) \in R$ then $(b, a) \in R$. (In other words, if a is related to b , then b is related to a .)

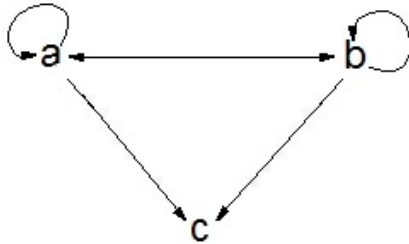
3. **Transitive Property:** A relation R on a set A is transitive if whenever $(a, b) \in R$ and $(b, c) \in R$ then $(a, c) \in R$. (In other words, if a is related to b and b is related to c , then a is related to c .)

Equivalence relation: is a relation R on a set A which is reflexive, symmetric, and transitive.

Example 3: Determine if the following relations are reflexive, symmetric, and/or transitive.

(a) $\{(a, a), (b, a), (b, b), (c, a), (c, b), (c, c)\}$

(b)



(c) “is a multiple of”

Functions: are relations that match one element of the first set (called **domain**) to one element of the second set (called **codomain**) in such a way that no element in the first set is assigned to two different elements in the second set.

NOTE: A function can assign more than one element from the domain to the same element in the codomain.

Function notation: A function f that assigns an element of set A to an element in set B is denoted $f : A \rightarrow B$. If $a \in A$, then the function notation for the element in B that is assigned to a is $f(a)$ (read f of a).

range: is the set of all elements in the codomain that the function pairs with an element of the domain. Hence, the range is a subset of the codomain.

Ways to represent a function:

1. Arrow Diagram
2. Tables
3. Ordered pairs
4. Function machines
5. Formulas
6. Graphs

Sequence: is a list of numbers, called terms, arranged in a particular order.

Special Sequences:

- **Arithmetic sequence:** is a sequence in which successive terms differ by the SAME number, called the **common difference**.

- **Geometric sequence:** is a sequence in which successive terms are found by multiplying the previous term by the SAME number, called the **common ratio**.

Example 4: Determine if each of the following sequences are arithmetic, geometric, or neither. For arithmetic and geometric, find the 200th term.

(a) 7, 20, 33, 46, 59, ...

(b) 2, 5, 10, 50, 500, 250000, ...

(c) 3, 12, 48, 192, ...

Example 5: How many terms are in the following sequence:

$$3, 8, 13, 18, 23, \dots, 343?$$