# Empty and Universal Relations

In a boys' school, who is whose sister? Nobody, and Maths has a name for that. What a relation is, and its two extreme cases.

Name: Date: Score: ____ / 19

## A. Fill in the blanks

**1.** A relation in A is a subset of A × ____.

**2.** A relation with no pairs is an ____ relation.

**3.** If R = A × A, the relation is ____.

**4.** Empty and universal relations are called ____ relations.

**5.** If A has 3 elements, A × A has ____ pairs.

## B. True or False

**6.** The empty set is a relation in A. True / False

**7.** A universal relation contains every ordered pair. True / False

**8.** Every relation is empty or universal. True / False

**9.** In a boys' school, "a is the sister of b" is universal. True / False

## C. Assertion and reason

**10. Assertion (A):** The relation "a is a sister of b" on a boys' school is empty.
**Reason (R):** No student is anyone's sister.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

**11. Assertion (A):** Any relation in A contains at most $n^2$ pairs.
**Reason (R):** A × A has $n^2$ ordered pairs.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

## D. Choose the correct option

**12.** If A = {1, 2}, the relation a + b = 10 is:

(a) universal
(b) empty
(c) both
(d) neither

Answer: _____

**13.** If A = {1, 2}, the relation "difference of a and b is less than 5" is:

(a) empty
(b) universal
(c) has one pair
(d) has two pairs

Answer: _____

**14.** The number of pairs in a universal relation on 4 elements is:

(a) 4
(b) 8
(c) 12
(d) 16

Answer: _____

**15.** In NCERT's example, height difference < 3 m is:

(a) empty
(b) universal
(c) a function
(d) a graph

Answer: _____

## E. Numerical problems

**16.** A has 5 elements. How many pairs does A × A have?

**17.** A has 3 elements. How many relations in A exist?

## F. Short answer questions

**18.** Define the empty and universal relations.

## G. Match the columns

**19. Match each item in Column A with the correct item in Column B.**

| Column A | Column B | Your answer |
|---|---|---|
| 1. R = empty set | (a) trivial relations | 1 → ____ |
| 2. R = A × A | (b) empty relation | 2 → ____ |
| 3. Both extremes | (c) ordered pair | 3 → ____ |
| 4. (a, b) | (d) universal relation | 4 → ____ |

## Detailed solutions

**1.** A

**2.** empty

**3.** universal

**4.** trivial

**5.** 9

**6.** True. It is a subset of A × A.

**7.** True. R = A × A.

**8.** False. Most lie between the two.

**9.** False. It is empty.

**10.** (a) R explains A.

**11.** (a) R explains A.

**12.** (b) empty. No pair adds to 10.

**13.** (b) universal. All four pairs pass.

**14.** (d) 16. 4 × 4.

**15.** (b) universal. Every pair passes.

**16.** 5 × 5. **Answer: 25**

**17.** Subsets of a set of 9 pairs: $2^9$. **Answer: 512**

**18.** Empty: no element is related to any element, R is the empty set. Universal: each element is related to every element, R = A × A.

**19.** 1 → (b), 2 → (d), 3 → (a), 4 → (c). Each statement matches its name.