Chapter 8 Review Exercises

1. Let R, S be **relations** on the set of real numbers
   - R = {(x, y) | x = y – 2017}
   - S = {(x, y) | x = y – 2017 or y + 2017 = x}

   Which relations are **symmetric**?

   A. S only
   B. R only
   C. Both
   D. None
2. Given the **matrix representing a relation** R on the set {a, b , c}

$$M_R = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 1 \\ 1 & 0 & 0 \end{pmatrix}$$

   Find the matrix of the relation $\bar{R} - R^{-1}$.

   (i) $\begin{pmatrix} 0 & 0 & 1 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$

   (ii) $\begin{pmatrix} 1 & 1 & 1 \\ 0 & 1 & 0 \\ 0 & 1 & 0 \end{pmatrix}$

   (iii) $\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

   A. (i)
   B. (ii)
   C. (iii)
   D. None of these
3. Given the matrix of a relation R on the set {1, 2, 3, 4}

$$\begin{pmatrix} 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

   Which of the following statements is true?

   A. R is symmetric
   B. R is antisymmetric
   C. R is reflexive
   D. R is irreflexive
4. How many binary relations are there from the set {a, b, c} to the set {1, 2}?

A. 2^6
B. 6
C. 8
D. 9
E. None of these

5. Consider the relations on the set {1, 2, 3, 4}
   - R = {(1, 1), (2, 2), (3, 3), (4, 4), (2, 3), (3, 2)}
   - S = {(1, 1), (2, 2), (3, 3), (4, 4), (1, 2)}

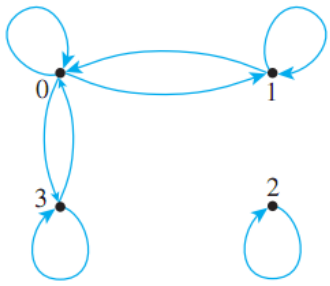
   Which relations are **equivalence relations**?

   A. R
   B. S
   C. Both
   D. None

6. Let R = {(1, 2), (1, 3), (3, 1), (1, 1)} and S = {(1, 2), (3, 2), (1, 1)} be relations on the set {1, 2, 3}.
   Which relations are **transitive**?
   A. R
   B. S
   C. Both
   D. None

7. Let R = {(a, b), (b, c), (c, c), (c, a)} and S = {(a, a), (b, a), (b, b), (c, b)} be relations on the set {a, b, c}.
   Find SoR.
   A. {(a,b), (a, c), (c, b), (b, c)}
   B. {(a, c), {b, a), (b, c), (c, b)}
   C. {(a, a), (b, b), (c, b), (c, a)}
   D. {(a, b), (b, b), (b, c), (c, c)}
   E. None of these

8. Given the relation on the set {1, 2, 3, 4}



   Which of the following statements is FALSE?
   A. The relation is symmetric

B. The relation is transitive
C. The relation is reflexive
D. The relation is antisymmetric

KEY: 1A 2C 3B 4A 5A 6B 7C 8D
7E 8 D&B