

Tutorial Sheets 11 (Answers)

1. We just apply the definition each time. We find that R^2 contains all the pairs in $\{1, 2, 3, 4, 5\} \times \{1, 2, 3, 4, 5\}$ except $(2, 3)$ and $(4, 5)$; and R^3 , R^4 , and R^5 contain all the pairs.

2. a)
$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{pmatrix}$$

b)
$$\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$$

3. a) The matrix for the union is formed by taking the join:
$$\begin{pmatrix} 0 & 1 & 0 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$$

- b) The matrix for the intersection is formed by taking the meet:
$$\begin{pmatrix} 0 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 0 \end{pmatrix}$$

- b) The matrix is the entry wise XOR:
$$\begin{pmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 1 \end{pmatrix}$$

4. a) $R_1 \cap R_2 = \{(b, HKT), (b, IBM), (c, IBM), (c, Orange), (d, HKT), (d, IBM)\}$

Students attend the interviews and are offered the companies.

- b)
 $R_1 \setminus R_2 = \{(a, AT \& T), (a, 3Com), (a, IBM), (b, AT \& T), (b, 3Com), (b, Orange), (d, AT \& T)\}$

Students attend the interviews but are rejected.

- c) $R_2 \setminus R_1 = \{(c, 3Com), (d, Orange)\}$

Students are offered by the companies but without needing to attend the interviews.