1. Let \( A = \{x, y, z\} \) and \( B = \{x, y\} \).
   (a) Is \( A \) a subset of \( B \)?
   (b) Is \( B \) a subset of \( A \)?
   (c) What is \( A \cup B \)?
   (d) What is \( A \cap B \)?
   (e) What is \( A \times B \)?
   (f) What is the power set of \( B \)?

2. If \( A \) has \( a \) elements and \( B \) has \( b \) elements, how many elements are in \( A \times B \)? Explain your answer.

3. If \( C \) is a set of \( c \) elements, how many elements are in the power set of \( C \)? Explain your answer.

4. For each part, give a relation that satisfies the condition:
   (a) Reflexive and symmetric but not transitive.
   (b) Reflexive and transitive but not symmetric.
   (c) Symmetric and transitive but not reflexive.

5. Find the error in the following proof that \( 2 = 1 \). Let \( a = b = 1 \), then,

   \[
   \begin{align*}
   a &= b \\
   \Rightarrow a^2 &= ab \\
   \Rightarrow a^2 - b^2 &= ab - b^2 \\
   \Rightarrow (a + b)(a - b) &= b(a - b) \\
   \Rightarrow a + b &= b \\
   \Rightarrow 2 &= 1
   \end{align*}
   \]

6. Find the error in the following proof that all horses are the same color.
   **Claim:** In any set of \( h \) horses, all horses are the same color.
**Proof**: By induction on $h$.

**Basis**: For $h = 1$. In any set containing just one horse, all horses clearly are the same color.

**Induction step**: For $k \geq 1$ assume that the claim is true for $h = k$ and prove that it is true for $h = k + 1$. Take any set $H$ of $k + 1$ horses. We show that all the horses in this set are the same color. Remove one horse from this set to obtain the set $H_1$ with just $k$ horses. By the induction hypothesis, all the horses in $H_1$ are the same color. Now replace the removed horse and remove a different one to obtain the set $H_2$. By the same argument, all the horses in $H_2$ are the same color. Therefore all the horses in $H$ must be the same color, and the proof is complete. □

7. Show that every graph with 2 or more nodes contains two nodes that have equal degrees.