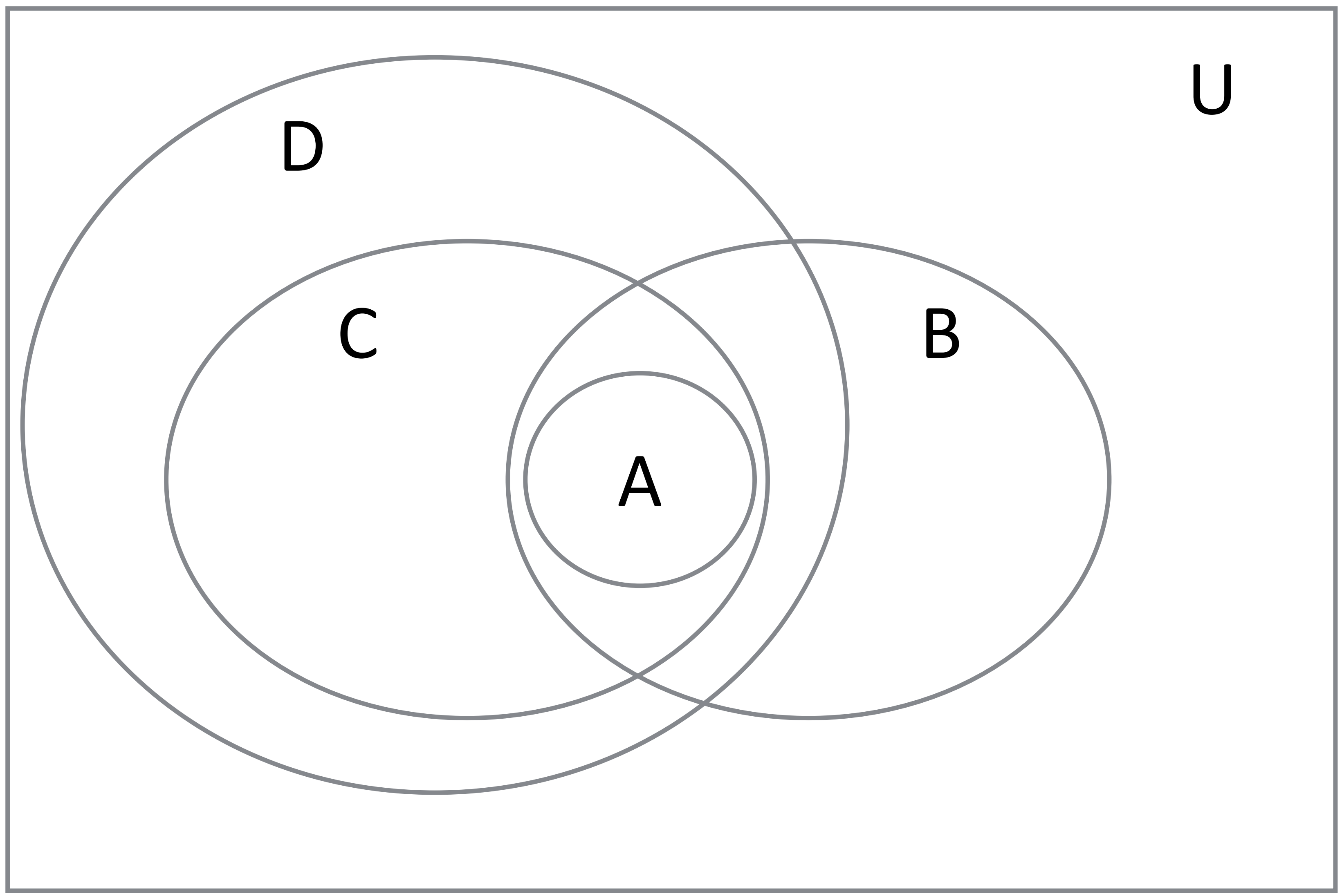
2.1 Examples

Use set builder notation to give a description of each of these sets.

- **1)** {0, 3, 6, 9, 12}
  - { 3n | n = 0, 1, 2, 3, 4 }
  - { x | x is a multiple of 3 and $0 \leq x \leq 12$}.
- **2)** {−3,−2,−1, 0, 1, 2, 3}
  - { x | $-3 \leq x \leq 3$ }
- **3)** {*m*, *n*, *o*,*n*}
  - {x | x is a letter of the word moon}

Use a Venn diagram to illustrate the relationships $A \subset B$, $A \subset C$, and $C \subset D$.



What is the power set of the set S = {0, 1, 2}?

$|S|=3$

$|P(S)| = 2^{|S|} = 2^3 = 8$

$P(\{0, 1, 2\}) = \{\emptyset, \{0\}, \{1\}, \{2\}, \{0, 1\}, \{0, 2\}, \{1, 2\}, \{0, 1, 2\}\}$

What is the power set of the set S = Ø?

$|S|=0$

$|P(S)| = 2^{|S|} = 2^0 = 1$

$P(\emptyset) = \{\emptyset\}$

What is the power set of the set S = {Ø}?

|S|=1

$|P(S)| = 2^{|S|} = 2^1 = 2$

P({Ø}) = {Ø, {Ø}}

What is the cartesian product of A×B, where A = {0,1} and B = {0,1}?

A × B = { (0,0), (0,1), (1,0), (1,1) }

How many pairs in A x B?
Answer:?

What is the cartesian product of A×B, where A = {A,K,Q,J,10,9,8,7,6,5,4,3,2} and B = {♠, ♥, ♦, ♣}?

{(A, ♠), (A, ♥), (A, ♦), (A, ♣),
(K, ♠), (K, ♥), (K, ♦), (K, ♣),
………
………
(3, ♠), (3, ♥), (3, ♦), (3, ♣),
(2, ♠), (2, ♥), (2, ♦), (2, ♣)}

All 52 cards in a deck by (rank, suit)!

What is the cartesian product of $A \times B \times C$, where $A=\{a\}$, $B=\{5,7\}$, $C=\{0, 1\}$?

$A \times B \times C = \{(a,5,0), (a,5,1), (a,7,0), (a,7,1)\}$

How many pairs in A x B x C.

Translate into English

- $\forall x \in \mathrm{R}\ (x^2 \neq -1)$
  - The square of a real number is never -1. (True)
- $\exists x \in \mathrm{Z}\ (x^2 = 2)$
  - There exists an integer whose square is 2. (False)
- $\forall x \in \mathrm{Z}\ (x^2 > 0)$
  - The square of every integer is positive. (False, for inst. 0)
- $\exists x \in \mathrm{R}\ (x^2 = x)$
  - There is a real number equal to its square. (True, for inst. 1)