

Venn Diagrams

A **Venn diagram** uses shapes to describe relationships between two or more sets.

Example 1 Draw a Venn diagram of the positive integers less than 19, where set *A* consists of factors of 18 and set *B* consists of even numbers.

Positive integers less than 19:

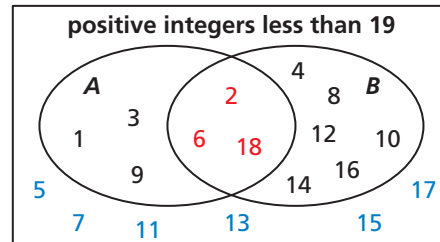
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18

Set *A* (factors of 18): 1, 2, 3, 6, 9, 18

Set *B* (even numbers): 2, 4, 6, 8, 10, 12, 14, 16, 18

Both set *A* and set *B*: 2, 6, 18

Neither set *A* nor set *B*: 5, 7, 11, 13, 15, 17



Example 2 Use the Venn diagram above to decide whether the statement is *true* or *false*. Explain your reasoning.

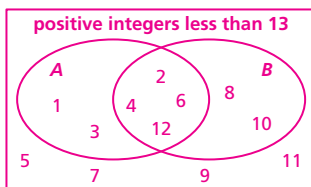
- If a positive integer less than 19 is not even, then it is not a factor of 18.
 - ▶ False. 1, 3, and 9 are not even, but they are factors of 18.
- All positive integers less than 19 that are even are factors of 18.
 - ▶ False. 4, 8, 10, 12, 14, and 16 are even, but they are not factors of 18.

Practice

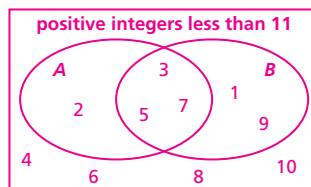
Check your answers at BigIdeasMath.com.

Draw a Venn diagram of the sets described.

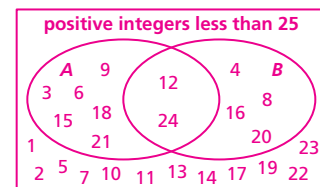
- Of the positive integers less than 13, set *A* consists of the factors of 12 and set *B* consists of even numbers.



- Of the positive integers less than 11, set *A* consists of prime numbers and set *B* consists of odd numbers.



- Of the positive integers less than 25, set *A* consists of the multiples of 3 and set *B* consists of the multiples of 4.



Use the Venn diagrams you drew in Exercises 1–3 to decide whether the statement is *true* or *false*. Explain your reasoning.

- The only positive factors of 12 less than 13 that are not even are 1 and 3.
true; The positive factors of 12 are 1, 2, 3, 4, 6, and 12.
- All positive odd numbers less than 11 are prime.
false; 1 and 9 are not prime.
- All prime numbers less than 11 are odd.
false; 2 is even and prime.
- There are 2 positive integers less than 25 that are both a multiple of 3 and a multiple of 4.
true; 12 and 24 are the only positive integers less than 25 that are multiples of 3 and 4.
- The number of positive integers less than 25 that are multiples of either 3 or 4 is equal to the number of positive integers less than 25 that are not multiples of either 3 or 4.
true; There are 12 of each.