

A **compound statement** has two or more parts joined by *or* or *and*.

- For an *and* compound statement to be true, each part must be true.
- For an *or* compound statement to be true, at least one part must be true.

EXAMPLE

State whether the compound statement is *true* or *false*.

a. $12 < 20$ and $-12 > -20$

True True

▶ True, because each part is true.

b. $2 < 4$ and $4 < 3$

True False

▶ False, because one part is false.

c. $10 > 0$ or $-10 > 0$

True False

▶ True, because at least one part is true.

d. $-8 > -7$ or $-7 > -6$ or $-6 > -5$

False False False

▶ False, because every part is false.

PRACTICE

State whether the conclusion is *valid* or *invalid*. If the conclusion is valid, name the type of logical argument used.

1. If Scott goes to the store, then he will buy sugar. If he buys sugar, then he will bake cookies. Scott goes to the store. Therefore, he will bake cookies.
2. If a triangle has at least two congruent sides, then it is isosceles. Triangle MNP has sides 5 in., 6 in., and 5 in. long. Therefore, triangle MNP is isosceles.
3. If a horse is an Arabian, then it is less than 16 hands tall. Andrea's horse is 13 hands tall. Therefore, Andrea's horse is an Arabian.
4. If a figure is a rhombus, then it has four sides. Figure $WXYZ$ has four sides. Therefore, $WXYZ$ is a rhombus.
5. Jeff cannot buy both a new coat and new boots. Jeff decides to buy new boots. Therefore, Jeff cannot buy a new coat.
6. If $x = 0$, then $y = 4$. If $y = 4$, then $z = 7$. Therefore, if $z = 7$, then $x = 0$.
7. Kate will order either tacos or burritos for lunch. Kate does not order tacos for lunch. Therefore, Kate orders burritos for lunch.
8. If a triangle is equilateral, then it is equiangular. Triangle ABC is not equiangular. Therefore, triangle ABC is not equilateral.
9. An animal cannot be both a fish and a bird. Courtney's pet is not a fish. Therefore, Courtney's pet must be a bird.

State whether the compound statement is *true* or *false*.

10. $-7 < -5$ and $-5 < -6$

11. $6 > 2$ or $8 < 4$

12. $0 \leq -1$ or $5 \geq 5$

13. $4 \leq 3$ or $12 \geq 13$

14. $3 < 5$ and $-3 < -5$

15. $1 = -1$ or $1 = 1$ or $1 = 0$

16. $7 < 8$ and $8 < 12$

17. $-2 < 2$ and $3 \geq 2$

18. $3(-4) = 12$ or $-3(4) = 12$

19. $-8 > 8$ or $-8 = 8$ or $-8 \geq 0$

20. $140 \neq 145$ or $140 > -145$ or $-140 < -145$

21. $-8(9) = -72$ and $8(-9) = -72$

22. $22 \leq 23$ and $-22 < -23$ and $23 > 22$