

Write the first statement for an indirect proof of the situation.

1. $x = 4$
Assume $x \neq 4$.
2. An angle is obtuse if it is greater than 90° .
Assume an angle is less than 90° .
3. A square has exactly 4 sides.
Assume a square does not have exactly 4 sides.
4. Two angles that are supplementary add up to 180° .
Assume that two angles that are supplementary do not add up to 180° .
5. Two lines intersect at exactly 1 point.
Assume that two lines do not intersect at exactly 1 point.
6. If $m\angle 1 = m\angle 2$, then $\overline{XY} \parallel \overline{CD}$.
Assume $\overline{XY} \nparallel \overline{CD}$.
7. If $\overline{XY} \parallel \overline{CD}$, then $m\angle 1 = m\angle 2$.
Assume $m\angle 1 \neq m\angle 2$.
8. If $\overline{AB} \nparallel \overline{CD}$, then $ABCD$ is not a parallelogram.
Assume $ABCD$ is a parallelogram.
9. If M is the midpoint of \overline{AB} , then $AM = MB$.
Assume $AM \neq MB$.
10. If $x^2 > 6x$, then $x \neq 4$.
Assume $x = 4$.

Identify the two statements that contradict each other.

11. **Doug is dating a girl with two first names.**
Doug is dating Anna Maria.
Doug is dating Anna.
12. **Troy Homecoming was Saturday.**
Troy Homecoming was 9/28/18.
Troy Homecoming was on a weekday.
13. **Anna has art class from 9:00 AM to 10:00 AM on Mondays.**
Anna has math class from 10:30 AM to 11:30 AM on Mondays.
Anna has Spanish class from 9:00 AM to 10:00 AM on Mondays.

Write an indirect proof.

14. Given: $2x + 3 \neq 17$
Prove: $x \neq 7$

Assume $x = 7$. Then $2x \neq 14$, where $x \neq 7$. This contradicts the given of $2x + 3 \neq 17$. Therefore, $x \neq 7$.

15. Given: $x^2 + 8 \leq 12$
Prove: $x \leq 2$

Assume $x \geq 2$. Then $x^2 = 4$, where $x = \pm 2$. This contradicts the given of $x^2 + 8 \leq 12$. Therefore, $x \leq 2$.

16. Given: $x^2 + 5x + 6 = 0$
Prove: $x < 0$

Assume $x > 0$. Then $x^2 + 5x + 6 = 0$, where $x = -2$ and $x = -3$. This contradicts the given $x^2 + 5x + 6 = 0$. Therefore, $x < 0$.

17. Given: $\overline{AB} \perp \overline{CD}$
Prove: $\angle ABC$ is not a straight angle

Assume $\angle ABC$ is a straight angle. Then $m\angle ABC = 180^\circ$. This contradicts the given that $\overline{AB} \perp \overline{CD}$ making $m\angle ABC = 90^\circ$. Therefore, $\angle ABC$ is not a straight angle.

18. Given: $m\angle X \neq m\angle Y$
Prove: $\angle X$ and $\angle Y$ are both not right angles.

Assume $\angle X$ and $\angle Y$ are both right angles. Then $m\angle X = 90^\circ$ and $m\angle Y = 90^\circ$. This contradicts the given $m\angle X \neq m\angle Y$. Therefore, $\angle X$ and $\angle Y$ are both not right angles.

19. Anna scored 13 points for her high school lacrosse team during the last six games. Prove that her average points per game was less than 3 points.

Assume that Anna's average per game was greater than 3 points. By taking the average of $\frac{13}{6} = 2.2$, the conclusion is false, contradicting the assumption. Therefore, Anna average points per game was less than 3 points.

20. A computer game involves a knight on a quest for treasure. At the end of the journey, the Knight approaches the two doors shown below. A servant tells the knight that one of the signs is true and the other is false. Use indirect reasoning to determine which door the knight should choose.



The knight should choose the door on the left. If the sign on the door on the right were true, then both signs would be true. But one sign is false, so the sign on the door on the right must be false.