

Parallel Lines and Transversals

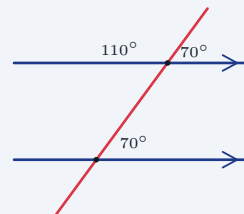
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Quick Review and Helpful Hints

When a transversal crosses two parallel lines, special angle pairs form: *corresponding* angles are equal, *alternate interior* angles are equal, and *alternate exterior* angles are equal. *Co-interior* (same-side interior) angles are supplementary (add to 180°), and any *linear pair* on a line is also supplementary. Vertical angles are equal.

▷ **Example:** Two parallel lines are cut by a transversal, making a 70° angle. Find its corresponding angle and its co-interior angle.

Work: Corresponding angles are equal, so one is 70° . Co-interior angles are supplementary, so the other is $180 - 70$. ★ **Answer:** 70° and 110°



Corresponding angles equal;
co-interior add to 180° .

Practice Problems

Find the measure of the requested angle.

- | | | | |
|---|-------|---|-------|
| 1. Corresponding angle of 65° | _____ | 8. Linear-pair angle of 130° | _____ |
| 2. Alternate interior angle of 80° | _____ | 9. Corresponding angle of 90° | _____ |
| 3. Co-interior angle of 110° | _____ | 10. Alternate interior angle of 35° | _____ |
| 4. Vertical angle of 45° | _____ | 11. Co-interior angle of 60° | _____ |
| 5. Corresponding angle of 120° | _____ | 12. Vertical angle of 100° | _____ |
| 6. Co-interior angle of 75° | _____ | 13. Linear-pair angle of 95° | _____ |
| 7. Alternate exterior angle of 50° | _____ | 14. Alternate exterior angle of 145° | _____ |

Word Problems

15. Two parallel lines are cut by a transversal. What is the angle corresponding to a 72° angle? _____
16. Same-side interior angles are formed by parallel lines. One is 115° . Find the other. _____
17. Alternate interior angles are formed by parallel lines. One is 48° . Find the other. _____
18. A transversal makes a 130° angle with a line. What is the angle next to it (its linear pair)? _____



◆ Illustrated Practice

Use each picture. Match the angle relationship first, then find the missing value.

19. Corresponding angles.
Find x . _____

25. Corresponding angles.
Find x . _____

20. Same-side interior angles.
Find x . _____

26. Same-side interior angles.
Find x . _____

21. Alternate interior angles.
Find x . _____

27. Alternate interior angles.
Find x . _____

22. Linear pair on l_1 . Find x . _____

28. Corresponding angles.
Find x . _____

23. Vertical angles. Find x . _____

29. Same-side interior equation. Find x . _____

24. Alternate exterior angles.
Find x . _____

30. What angle relationship is shown? _____



Answer Keys

- | | | |
|----------------|-----------------|------------------------|
| 1. 65° | 11. 120° | 21. 47° |
| 2. 80° | 12. 100° | 22. 42° |
| 3. 70° | 13. 85° | 23. 76° |
| 4. 45° | 14. 145° | 24. 121° |
| 5. 120° | 15. 72° | 25. $x = 16$ |
| 6. 105° | 16. 65° | 26. $x = 22$ |
| 7. 50° | 17. 48° | 27. $x = 11$ |
| 8. 50° | 18. 50° | 28. 58° |
| 9. 90° | 19. 64° | 29. $x = 25$ |
| 10. 35° | 20. 68° | 30. Alternate exterior |

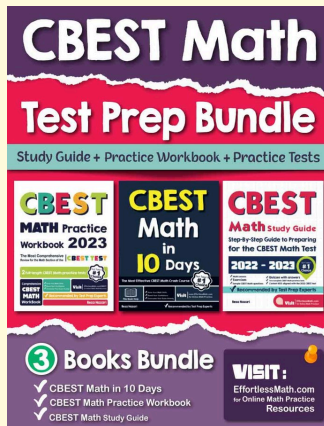
Step-by-Step Explanations

1. Corresponding angles are in the same relative position at the two crossings. Because the lines are parallel, those angles are equal, so the requested angle is 65° .
2. Alternate interior angles are inside the parallel lines and on opposite sides of the transversal. For parallel lines they are equal, so the angle measure stays 80° .
3. Co-interior angles are on the same side of the transversal between the parallel lines, so they add to 180° . Subtract the given angle: $180 - 110 = 70$, so the missing angle is 70° .
4. Vertical angles are the opposite angles made by two intersecting lines. Opposite angles match exactly, so the vertical angle is also 45° .
5. Use the corresponding-angle rule again: same position at each crossing means same measure when the lines are parallel. The corresponding angle is 120° .
6. Co-interior angles are supplementary, which means their sum is 180° . Compute $180 - 75 = 105$, so the missing angle is 105° .
7. Alternate exterior angles are outside the parallel lines and on opposite sides of the transversal. They are congruent, so the angle is 50° .
8. A linear pair forms a straight line, and a straight angle is 180° . Subtract the known angle: $180 - 130 = 50$, so the angle next to it is 50° .
9. Corresponding angles keep the same corner position at the two intersections. Since corresponding angles are equal, the answer is 90° .
10. Alternate interior angles match when the two lines are parallel. The given angle is 35° , so the alternate interior angle is also 35° .
11. Same-side interior angles are supplementary, so start from 180° and subtract the given angle. $180 - 60 = 120$, so the missing angle is 120° .
12. Vertical angles are opposite each other at one crossing, and opposite angles are equal. That makes the requested angle 100° .
13. Angles in a linear pair sit side by side on a straight line, so they total 180° . $180 - 95 = 85$, so the missing angle is 85° .
14. Alternate exterior angles are equal for parallel lines cut by a transversal. Since one exterior angle is 145° , the alternate exterior angle is 145° .
15. The problem asks for a corresponding angle, so look for the same position at the other crossing. Corresponding angles are equal, so the answer is 72° .
16. Same-side interior angles add to 180° . Subtract the known angle from 180 : $180 - 115 = 65$, so the other angle is 65° .
17. Alternate interior angles are equal when the lines are parallel. The matching angle is therefore 48° .
18. The angle next to a 130° angle forms a linear pair with it. Linear pairs add to 180° , so $180 - 130 = 50^\circ$.
19. The diagram marks corresponding angles, which means the two angles sit in matching positions at the two intersections. Matching positions have equal measures, so $x = 64^\circ$.
20. Same-side interior angles are the pair inside the parallel lines on the same side of the transversal. They must add to 180° , so $x = 180 - 112 = 68^\circ$.
21. These are alternate interior angles: inside the two lines, but on opposite sides of the transversal. Alternate interior angles are equal, so $x = 47^\circ$.
22. The two marked angles share a straight line, so they form a linear pair. A straight line is 180° , so $x = 180 - 138 = 42^\circ$.
23. The marked angles are vertical angles at the same intersection. Vertical angles are congruent, so $x = 76^\circ$.
24. The angles are outside the parallel lines and on opposite sides of the transversal, so they are alternate exterior angles. Alternate exterior angles are equal, giving $x = 121^\circ$.
25. Corresponding angles are equal, so set the expressions equal: $3x + 12 = 5x - 20$. Add 20 to both sides and subtract $3x$ from both sides to get $32 = 2x$, so $x = 16$.
26. Same-side interior angles are supplementary, so their expressions must add to 180° . Write $(4x + 8) + (2x + 40) = 180$, combine to get $6x + 48 = 180$, then solve $6x = 132$ and $x = 22$.
27. Alternate interior angles are equal, so set the two expressions equal: $6x - 5 = 4x + 17$. Subtract $4x$ and add 5 to get $2x = 22$, so $x = 11$.
28. The two marked angles are in corresponding positions. Corresponding angles are equal when the lines are parallel, so $x = 58^\circ$.
29. Same-side interior angles add to 180° , so write $(x + 35) + (2x + 70) = 180$. Combine like terms to get $3x + 105 = 180$, then $3x = 75$, so $x = 25$.
30. Angles A and B are both outside the parallel lines and on opposite sides of the transversal. That location makes them alternate exterior angles.



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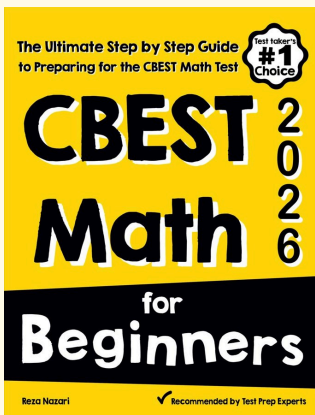
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