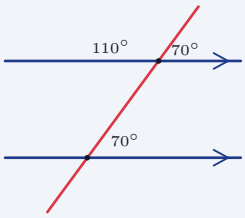
Parallel Lines and Transversals

Name: _____	Date: _____	Score: _____ / 30

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.

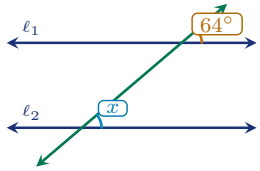
1. Corresponding angle of $65°$ _____
2. Alternate interior angle of $80°$ _____
3. Co-interior angle of $110°$ _____
4. Vertical angle of $45°$ _____
5. Corresponding angle of $120°$ _____
6. Co-interior angle of $75°$ _____
7. Alternate exterior angle of $50°$ _____
8. Linear-pair angle of $130°$ _____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

Word Problems

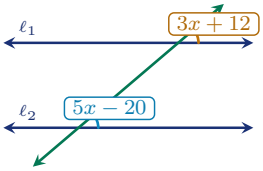
15. Two parallel lines are cut by a transversal. What is the angle corresponding to a $72°$ angle? _____
16. Same-side interior angles are formed by parallel lines. One is $115°$. Find the other. _____
17. Alternate interior angles are formed by parallel lines. One is $48°$. Find the other. _____
18.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

Illustrated Practice

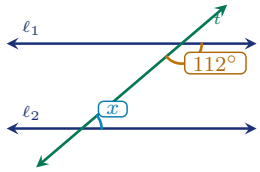
Use each picture. Match the angle relationship first, then find the missing value.



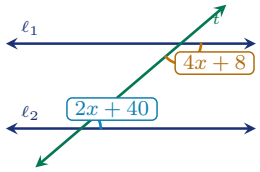
19. Corresponding angles. Find x. _____



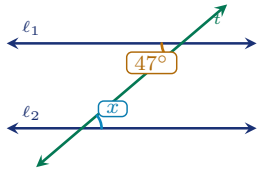
25. Corresponding angles. Find x. _____



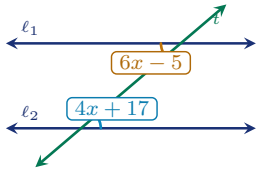
20. Same-side interior angles. Find x. _____



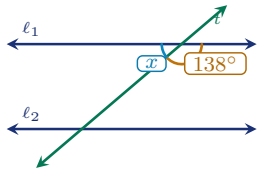
26. Same-side interior angles. Find x. _____



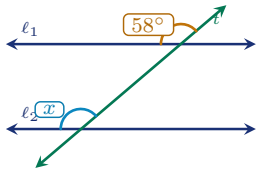
21. Alternate interior angles. Find x. _____



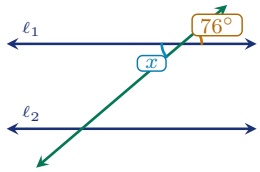
27. Alternate interior angles. Find x. _____



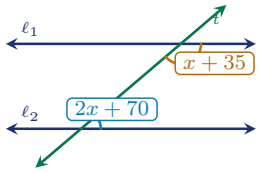
22. Linear pair on ℓ_1. Find x. _____



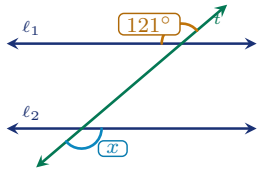
28. Corresponding angles. Find x. _____



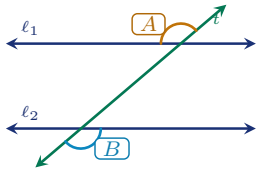
23. Vertical angles. Find x. _____



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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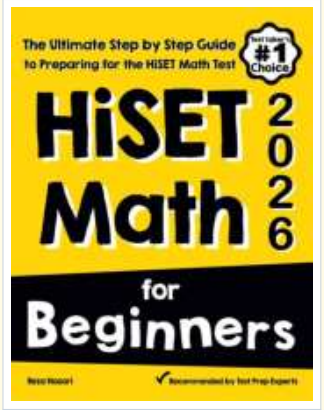

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