

# Parallel Lines and Transversals

Name: \_\_\_\_\_ Date: \_\_\_\_\_ Score: \_\_\_\_\_ / 24

## Q Quick Review

When a **transversal** (a line) crosses two **parallel lines**, it creates eight angles with neat relationships. **Corresponding angles** (same position at each crossing) are *equal*. **Alternate interior angles** (between the lines, opposite sides of the transversal) are *equal*. **Alternate exterior angles** (outside the lines, opposite sides) are *equal*. **Co-interior angles** (between the lines, same side) are *supplementary* — they add to  $180^\circ$ . Once you know one angle, you can find all the others.

◇ **Example:** Two parallel lines are cut by a transversal. One angle measures  $70^\circ$ . Find its co-interior (same-side interior) angle.  
 ⇒ Co-interior angles sit between the two parallel lines, on the *same side* of the transversal. The rule is that they are *supplementary* — they add up to  $180^\circ$ . So if one is  $70^\circ$ , the other must be  $180^\circ - 70^\circ = 110^\circ$ . Check:  $70 + 110 = 180$ . That's the straight line they form together.

**Answer:**  $110^\circ$

## PRACTICE

Find the requested angle. Lines are parallel, cut by a transversal.

- |  |       |  |       |
|--|-------|--|-------|
| 1. Corresponding angle to $50^\circ$       | _____ | 11. Linear pair with $115^\circ$                             | _____ |
| 2. Corresponding angle to $125^\circ$      | _____ | 12. Corresponding angle: $3x$ equals $75^\circ$ . Find $x$ . | _____ |
| 3. Alternate interior angle to $65^\circ$  | _____ | 13. Alternate interior: $2x$ equals $100^\circ$ . Find $x$ . | _____ |
| 4. Alternate interior angle to $140^\circ$ | _____ | 14. Co-interior: $x$ and $4x$ . Find $x$ .                   | _____ |
| 5. Alternate exterior angle to $38^\circ$  | _____ | 15. Co-interior: $x$ and $x + 60$ . Find $x$ .               | _____ |
| 6. Alternate exterior angle to $152^\circ$ | _____ | 16. Corresponding: $x + 10$ equals $85^\circ$ . Find $x$ .   | _____ |
| 7. Co-interior angle to $80^\circ$         | _____ | 17. Alternate exterior: $5x$ equals $145^\circ$ . Find $x$ . | _____ |
| 8. Co-interior angle to $110^\circ$        | _____ | 18. Two angles, one $130^\circ$ , on a line. Other?          | _____ |
| 9. Co-interior angle to $90^\circ$         | _____ | 19. Co-interior: $2x$ and $3x$ . Find $x$ .                  | _____ |
| 10. Vertical angle to $47^\circ$           | _____ | 20. Corresponding angles equal? (parallel lines)             | _____ |

## ◆ Word Problems

21. A straight crosswalk cuts across two parallel street curbs. It makes a  $68^\circ$  angle with the first curb. What is the corresponding angle it makes with the second curb? \_\_\_\_\_
22. Two parallel shelves are joined by a diagonal brace. The brace makes a  $115^\circ$  co-interior angle on the top shelf. What is the co-interior angle it makes on the bottom shelf? \_\_\_\_\_
23. A transversal crosses two parallel lines. One alternate interior angle is labeled  $4x$  and the other is  $96^\circ$ . Solve for  $x$ . \_\_\_\_\_
24. A road sign post crosses two parallel guide wires. The co-interior angles it forms are  $2x$  and  $7x$ . Find  $x$  and both angle measures. \_\_\_\_\_



## Answer Keys

- |                                      |   |
|--------------------------------------|---|
| 1. <input type="text" value="50°"/>  | 13. <input type="text" value="50°"/>                              |
| 2. <input type="text" value="125°"/> | 14. <input type="text" value="36°"/>                              |
| 3. <input type="text" value="65°"/>  | 15. <input type="text" value="60°"/>                              |
| 4. <input type="text" value="140°"/> | 16. <input type="text" value="75°"/>                              |
| 5. <input type="text" value="38°"/>  | 17. <input type="text" value="29°"/>                              |
| 6. <input type="text" value="152°"/> | 18. <input type="text" value="50°"/>                              |
| 7. <input type="text" value="100°"/> | 19. <input type="text" value="36°"/>                              |
| 8. <input type="text" value="70°"/>  | 20. <input type="text" value="yes"/>                              |
| 9. <input type="text" value="90°"/>  | 21. <input type="text" value="68°"/>                              |
| 10. <input type="text" value="47°"/> | 22. <input type="text" value="65°"/>                              |
| 11. <input type="text" value="65°"/> | 23. <input type="text" value="x = 24°"/>                          |
| 12. <input type="text" value="25°"/> | 24. <input type="text" value="x = 20°; angles are 40° and 140°"/> |

### Step-by-Step Explanations

- |   |  |
|---|--|
| 1. Corresponding angles are equal.                                | 14. $x + 4x = 5x = 180$ , so $x = 36^\circ$ .  |
| 2. Corresponding angles are equal.                                | 15. $x + x + 60 = 180$ , so $2x = 120$ and $x = 60^\circ$ .  |
| 3. Alternate interior angles are equal.                           | 16. $x + 10 = 85$ , so $x = 75^\circ$ .  |
| 4. Alternate interior angles are equal.                           | 17. $5x = 145$ , so $x = 29^\circ$ .   |
| 5. Alternate exterior angles are equal.                           | 18. Angles on a line are supplementary: $180 - 130 = 50^\circ$ .   |
| 6. Alternate exterior angles are equal.                           | 19. $2x + 3x = 5x = 180$ , so $x = 36^\circ$ .   |
| 7. Co-interior angles are supplementary: $180 - 80 = 100^\circ$ . | 20. Yes — corresponding angles are always equal between parallel lines.  |
| 8. $180 - 110 = 70^\circ$ .                                       | 21. Corresponding angles between parallel lines are equal, so the angle is also $68^\circ$ .   |
| 9. $180 - 90 = 90^\circ$ .  | 22. Co-interior angles are supplementary, so the angle is $180 - 115 = 65^\circ$ .   |
| 10. Vertical angles are equal.                                    | 23. Alternate interior angles are equal, so $4x = 96$ , giving $x = 24^\circ$ .  |
| 11. A linear pair is supplementary: $180 - 115 = 65^\circ$ .      | 24. Co-interior angles add to $180^\circ$ : $2x + 7x = 9x = 180$ , so $x = 20^\circ$ . The angles are $2(20) = 40^\circ$ and $7(20) = 140^\circ$ . |
| 12. $3x = 75$ , so $x = 25^\circ$ .                               |  |
| 13. $2x = 100$ , so $x = 50^\circ$ .                              |  |



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