

# Proof Structure

Statements, reasons, diagram discipline, and core geometric justification.

Name \_\_\_\_\_ Date \_\_\_\_\_

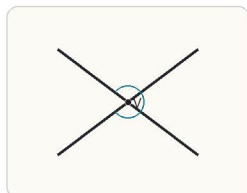
32 main 2-up grid 3 pages

### Completion Reward



Shown here as a small pack artifact, not a preview destination.

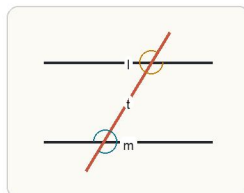
1. If two angles are vertical angles, what can you conclude?



When two lines intersect, the opposite angles form a vertical pair and are congruent.

- A. They are supplementary.
- B. They are always right angles.
- C. They have equal side lengths.
- D. They are congruent.

2. If lines  $l$  and  $m$  are parallel, what can you conclude about angles  $a$  and  $b$  in the figure?



Corresponding and alternate interior angle relationships come from the parallel-line structure, not from appearance alone.

- A. They sum to 360 degrees.
- B. They must both be right angles.
- C. They are congruent.
- D. They have equal side lengths.

3. What does it mean for two lines to be perpendicular?

- A. They are the same length.
- B. They never intersect.
- C. They are both horizontal.
- D. They intersect to form right angles.

4. What is true about a linear pair of angles?

- A. They are vertical.
- B. They are always congruent.
- C. They are supplementary.
- D. They are always acute.

5. In a two-column proof, where do the reasons go?

- A. Left column
- B. Top row only
- C. Under the diagram
- D. Right column

6. What is the converse of 'If two lines are parallel, then alternate interior angles are congruent'?

- A. If the lines are not parallel, then the angles are not congruent.
- B. If the angles are congruent, then the lines intersect.
- C. If lines are parallel, then corresponding sides are equal.
- D. If alternate interior angles are congruent, then the lines are parallel.

7. What does a counterexample do?

- A. It shows a conjecture is false.
- B. It proves a theorem true.
- C. It labels the diagram.
- D. It changes a definition.

8. In the statement 'If two lines are perpendicular, then they form right angles,' what is the hypothesis?

- A. They form right angles.
- B. Two lines are perpendicular.
- C. The lines intersect.
- D. The angles are supplementary.

9. In a two-column proof, which of these is usually a reason?

- A. Vertical angles are congruent.
- B. Angle ABC
- C. Segment AB
- D. Triangle DEF

10. In a proof, what is a given?

- A. A fact that only appears in the picture
- B. The final statement to prove
- C. A fact provided at the start of the problem
- D. A random guess about the diagram

11. Which is a definition rather than a theorem?

- A. Vertical angles are congruent.
- B. The triangle sum is 180 degrees.
- C. Parallel lines cut by a transversal create corresponding angles.
- D. A midpoint divides a segment into two congruent segments.

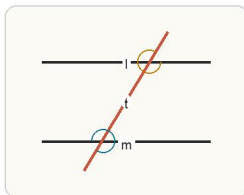
12. Which reason matches the statement 'Angle 1 is congruent to angle 2' when the angles are alternate interior angles formed by parallel lines?

- A. Reflexive property
- B. Segment addition postulate
- C. Alternate interior angles theorem
- D. Corresponding parts of congruent triangles are congruent

13. If a pair of alternate interior angles are congruent, what can you conclude?

- A. The lines are perpendicular.
- B. The angles must be supplementary.
- C. The segments are equal in length.
- D. The lines are parallel.

14. Where does the fact angle  $a = \text{angle } b$  come from in the figure?



If the marked angles come from a transversal crossing parallel lines, the justification comes from that angle relationship theorem.

- A. A midpoint definition
- B. Vertical angles theorem
- C. Parallel lines cut by a transversal
- D. Triangle angle-sum theorem

15. If two angles are vertical angles, what statement can you write next?

- A. The angles are supplementary.
- B. The angles are congruent.
- C. The angles are complementary.
- D. The lines are parallel.

16. If M is the midpoint of AB, what can you conclude?

- A. Angle A equals angle B
- B.  $AM = MB$
- C. AB is perpendicular to M
- D.  $AM + MB = 1$

17. You have already proven two sides and the included angle congruent in two triangles. What should you do next?

- A. Conclude the triangles are congruent by SAS.
- B. Conclude the triangles are similar by AA.
- C. Use HL because two sides are known.
- D. Look for another angle before any theorem can apply.

18. A student says two segments are equal because they look equal in the picture. What is the problem?

- A. A sketch can suggest, but it does not prove, equal lengths without a given fact or theorem.
- B. Pictures always prove side lengths exactly.
- C. Side lengths matter only in algebra, not geometry.
- D. You should never use a diagram in geometry.

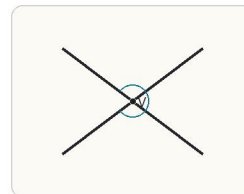
19. A student writes 'These segments look equal, so they are congruent.' What is the flaw?

- A. Equal-looking segments are always congruent.
- B. Only angles can be proven from a diagram.
- C. Congruence never appears in proofs.
- D. A diagram can suggest ideas but is not proof by itself.

20. A student claims two angles are congruent just because the lines in the picture look parallel. What is missing?

- A. A measurement showing the diagram is drawn neatly.
- B. A given fact or proven statement that the lines are parallel.
- C. A statement that the angles are vertical.
- D. A translation of the whole figure.

21. Vertical angles are labeled  $x + 15$  and  $3x - 25$ . What is  $x$ ? Answer with a number.



Vertical angles are congruent, so their algebraic expressions can be set equal to solve for  $x$ .

22. Two angles form a linear pair. One angle is 118 degrees. What is the other angle? Answer with a number.

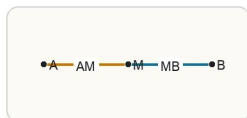
23. Student A says  $AC = AC$  because of the reflexive property. Student B says  $AC = AC$  because of the transitive property. Who is correct?

- A. Student B
- B. Student A
- C. Both students
- D. Neither student

24. Student A says if  $AB = CD$  and  $CD = EF$ , then  $AB = EF$  by the transitive property. Student B says the reason is the reflexive property. Who is correct?

- A. Student B
- B. Both students
- C. Student A
- D. Neither student

25. If M is the midpoint of AB, what is the best next statement?



If M is the midpoint of AB, then  $AM = MB$ .

- A. AM is perpendicular to MB
- B. Angle AMB is 90 degrees
- C.  $AM = MB$
- D. AB is parallel to MB

26. Two triangles share side AC. Which theorem or property lets you say  $AC = AC$ ?

- A. Transitive property
- B. Reflexive property
- C. Substitution property
- D. Segment addition postulate

27. A student says: 'If lines are parallel, corresponding angles are congruent. These angles are congruent, so the lines must be parallel.' What is the issue?

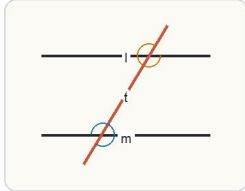
- A. Congruent angles can never appear in geometry.
- B. The original statement means the lines are perpendicular.
- C. The problem is that the angles should be supplementary instead.
- D. They used the converse without proving its conditions.

28. Angles in a linear pair measure  $2x + 10$  and  $x + 20$ . What is  $x$ ? Answer with a number.

29. Two supplementary angles measure  $x + 20$  and  $3x$ . What is  $x$ ? Answer with a number.

30. A linear pair has angle measures  $2x + 10$  and  $x + 20$ . What is  $x$ ? Answer with a number.

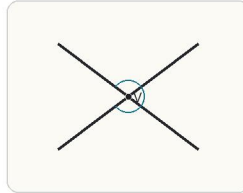
31. Which proof line is justified correctly?



Corresponding and alternate interior angles come from the parallel structure, not from the picture looking equal.

- A. If lines are parallel, alternate interior angles are congruent.
- B. If two angles look equal, they must be congruent.
- C. If one segment is longer, it is the hypotenuse.
- D. If two points are labeled, they determine a midpoint.

32. You know two lines intersect. Which next step is the most useful if you need congruent angles?



Vertical angles are opposite angles formed by two intersecting lines.

- A. Assume the lines are the same length.
- B. Identify a pair of vertical angles.
- C. Guess that the angles are complementary.
- D. Redraw the figure larger.