Parallel line angle rules — Solutions

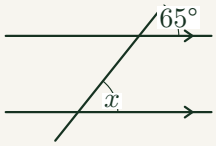
Identify angle relationships and solve for unknowns using parallel line properties.

Name _____ **Date** _____

How to answer

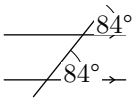
Read each diagram carefully. Identify which angle rule applies (corresponding, alternate, or co-interior). Show working for calculations. Explain your reasoning when asked.

Worked example Two parallel lines are cut by a transversal. One angle is $65°$. Find the corresponding angle.



Corresponding angles are equal when lines are parallel. The marked $65°$ angle and x sit in the same position at each crossing, so they are corresponding angles. Therefore $x = 65°$.

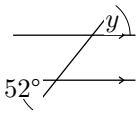
1. Name the angle relationship between the marked angles.



Solution

Same corner at each crossing. Corresponding angles (equal).

2. Name the angle relationship and find y.

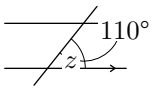


Solution

Alternate angles are equal.

$y = 52°$

3. These angles are co-interior. Find z.

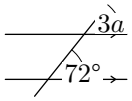


Solution

Co-interior angles sum to $180°$.

$z = 180° - 110° = 70°$

4. Find a. (Corresponding angles)

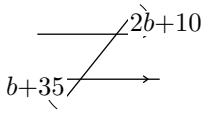


Solution

Corresponding angles are equal.

$3a = 72° \Rightarrow a = 24$

5. Find b. (Alternate angles)

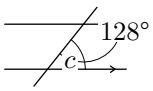


Solution

$2b + 10 = b + 35 \Rightarrow b = 25$

(each angle $= 60°$)

6. Find c. (Co-interior angles)

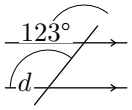


Solution

Co-interior angles sum to $180°$.

$c = 180° - 128° = 52°$

7. Name the rule. Then find d.

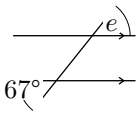


Solution

Corresponding angles.

$d = 123°$

8. Find e. Explain which rule you used.



Solution

Alternate angles are equal.

$e = 67°$

9. Two alternate angles are $(2f + 5)°$ and $(3f - 30)°$. Find f and both angles.

Solution

$2f + 5 = 3f - 30 \Rightarrow f = 35$

Both angles $= 75°$

10. Complete: when lines are parallel, corresponding angles are _____.

Solution

equal

11. Complete: when lines are parallel, alternate angles are _____.

Solution

equal

12. Complete: when lines are parallel, co-interior angles _____ to $180°$.

Solution

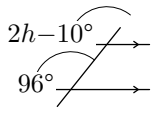
add (sum)

13. Two co-interior angles are $(4g + 8)°$ and $(2g + 22)°$. Find g and both angles.

Solution

$(4g+8)+(2g+22) = 180 \Rightarrow g = 25$
Angles $= 108°$ and $72°$

14. Find h. Then name the angle relationship.



Solution

Corresponding angles are equal.
$2h - 10 = 96 \Rightarrow h = 53$

15. The acute angle is $41°$. List all eight angle sizes at the two intersections.

Solution

Obtuse $= 180° - 41° = 139°$.
Four angles $= 41°$, four $= 139°$

16. One angle is $(5x - 20)°$ and its corresponding angle is $(3x + 10)°$. Find x.

Solution

$5x - 20 = 3x + 10 \Rightarrow x = 15$

17. Two alternate angles are $(6y + 5)°$ and $(8y - 25)°$. Find y and both angles.

Solution

$6y + 5 = 8y - 25 \Rightarrow y = 15$
Both angles $= 95°$

18. Angles $(3z)°$ and $(z + 60)°$ are co-interior. Find z and explain why they must sum to 180°.

Solution

$3z + (z+60) = 180 \Rightarrow z = 30$
$(90°, 90°)$
Co-interior angles are supplementary.

19. Given one angle is $38°$, write three different facts about the other angles formed.

Solution

Vert. opp. $= 38°$; corresponding $= 38°$;
co-interior $= 180° - 38° = 142°$

20. A pair of corresponding angles is $124°$ and $124°$. What does this tell you about the lines? Explain.

Solution

Equal corresponding angles mean
the lines must be parallel.

21. A pair of co-interior angles is $97°$ and $83°$. Are the lines parallel? Explain your reasoning.

Solution

$97° + 83° = 180°$, so yes –
the lines are parallel.

22. A student says co-interior angles are equal. Correct this statement in one sentence.

Solution

Co-interior angles are not equal –
they sum to $180°$
(supplementary).

23. Find m and both angles if they are alternate angles: $(7m - 13)°$ and $(4m + 20)°$.

Solution

$7m - 13 = 4m + 20 \Rightarrow m = 11$
Both angles $= 64°$

24. Two angles on the same side of the transversal add to $180°$. What is their relationship called?

Solution

Co-interior (allied) angles.

25. Explain the difference between corresponding angles and alternate angles using the words *position* and *equal*.

Solution

Same position = corresponding.
Opposite sides = alternate. Both equal.

26. One angle is $72°$. Find all four acute angles and all four obtuse angles formed at the two intersections.

Solution

Supplement $= 180° - 72° = 108°$.
Four angles $= 72°$, four $= 108°$

27. Write your own parallel line problem with one unknown and solve it.

Solution

Sample: co-interior
$(2p+15)°, (3p+25)°$.
$5p + 40 = 180 \Rightarrow p = 28$; $71°, 109°$