

Parallel Lines & Transversals

KEY IDEAS

A **transversal** crosses two lines and makes 8 angles. When the lines are **parallel** (marked with arrows >):

Equal: corresponding (F shape) · alternate interior (Z shape) · alternate exterior · vertically opposite

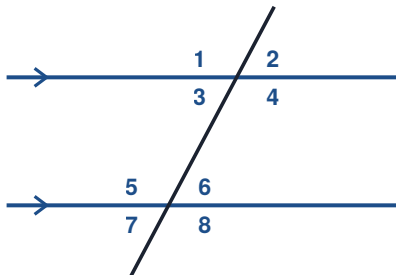
Add to 180° (supplementary): co-interior (C shape, same side, between the lines) · a linear pair on a straight line

These rules only work for parallel lines. Diagrams are drawn accurately, but always use the rules, not a protractor.

A Name the angle pairs

6 marks (1 each)

Word bank: **corresponding** · **alternate interior** · **alternate exterior** · **co-interior** · **vertically opposite** · **linear pair**

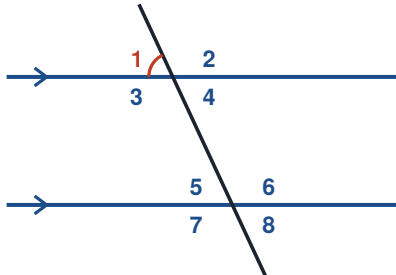


	Angles	Type of angle pair	Equal or supplementary?
1.	$\angle 1$ and $\angle 5$		
2.	$\angle 3$ and $\angle 6$		
3.	$\angle 2$ and $\angle 7$		
4.	$\angle 4$ and $\angle 6$		
5.	$\angle 5$ and $\angle 8$		
6.	$\angle 1$ and $\angle 2$		

B Find each angle and give a reason

4 marks

The lines are parallel and $\angle 1 = 65^\circ$.

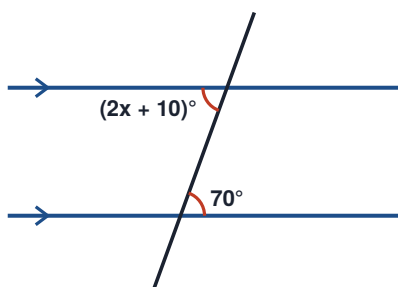


	Angle	Measure	Reason
7.	$\angle 2$		
8.	$\angle 4$		
9.	$\angle 6$		
10.	$\angle 8$		

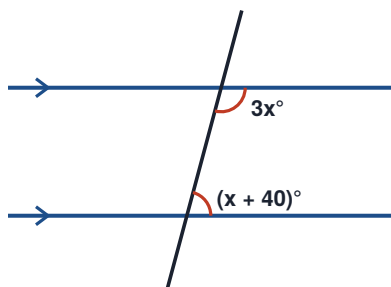
C Solve for x

6 marks (2 each)

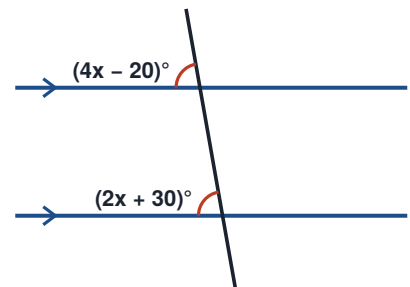
11. Find x.



12. Find x.



13. Find x.

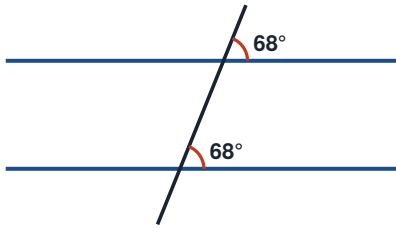


D Are the lines parallel?

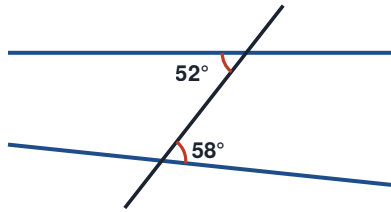
3 marks

No arrows this time: use the angles to decide, and give a reason.

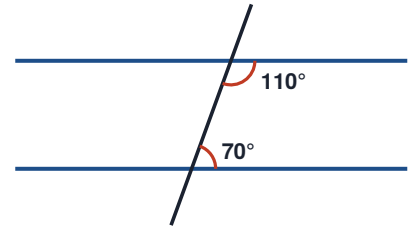
14. Are the blue lines parallel?



15. Are the blue lines parallel?

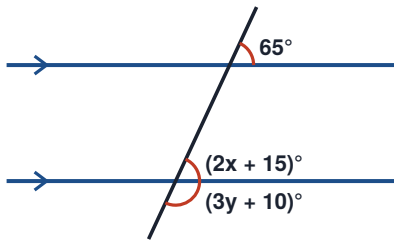


16. Are the blue lines parallel?



E Find x and y

3 marks



17. The lines are parallel. Find x and y.

x = _____

y = _____

Reasons: _____

F Real-world problems

6 marks (2 each)

18. A straight road crosses two parallel railway tracks. It makes a 48° angle with the first track. What acute and obtuse angles does it make with the second track? Explain.

19. A carpenter nails a brace across two boards. The alternate interior angles measure 88° and 92° . Are the boards parallel? Explain.

20. Two parallel shelves are joined by a slanted support bar. Between the shelves, the bar makes a 35° angle with the bottom shelf. What angle does it make with the top shelf on the same side of the bar, also between the shelves?

G Spot the mistake

2 marks

21. Parallel lines are cut by a transversal and $\angle 3 = 70^\circ$. A student says $\angle 5 = 70^\circ$ because $\angle 3$ and $\angle 5$ are co-interior. Explain the error.

22. Two lines that are **not** parallel are cut by a transversal. A student says the alternate interior angles must be equal. Explain the error.

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ANSWER KEY

KEY IDEAS

A **transversal** crosses two lines and makes 8 angles. When the lines are **parallel** (marked with arrows >):

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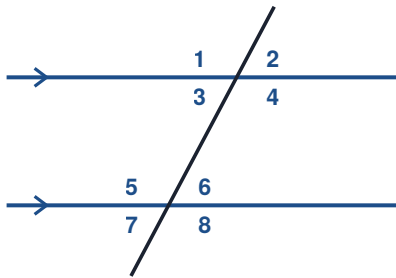
Add to 180° (supplementary): co-interior (C shape, same side, between the lines) · a linear pair on a straight line

These rules only work for parallel lines. Diagrams are drawn accurately, but always use the rules, not a protractor.

A Name the angle pairs

6 marks (1 each)

Word bank: **corresponding** · **alternate interior** · **alternate exterior** · **co-interior** · **vertically opposite** · **linear pair**

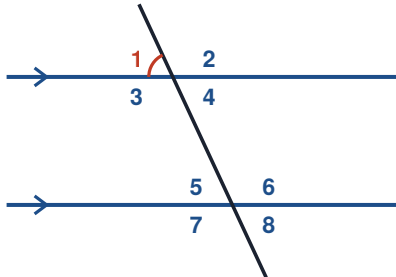


	Angles	Type of angle pair	Equal or supplementary?
1.	$\angle 1$ and $\angle 5$	corresponding	Equal
2.	$\angle 3$ and $\angle 6$	alternate interior	Equal
3.	$\angle 2$ and $\angle 7$	alternate exterior	Equal
4.	$\angle 4$ and $\angle 6$	co-interior	Supplementary
5.	$\angle 5$ and $\angle 8$	vertically opposite	Equal
6.	$\angle 1$ and $\angle 2$	linear pair	Supplementary

B Find each angle and give a reason

4 marks

The lines are parallel and $\angle 1 = 65^\circ$.

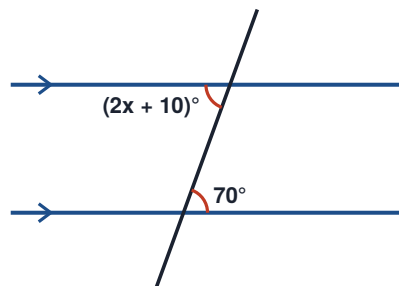


	Angle	Measure	Reason
7.	$\angle 2$	115°	linear pair with $\angle 1$: $180^\circ - 65^\circ$
8.	$\angle 4$	65°	vertically opposite $\angle 1$
9.	$\angle 6$	115°	corresponding to $\angle 2$
10.	$\angle 8$	65°	alternate exterior with $\angle 1$

C Solve for x

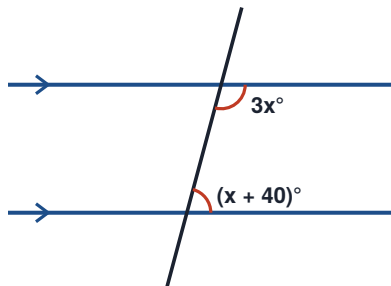
6 marks (2 each)

11. Find x.



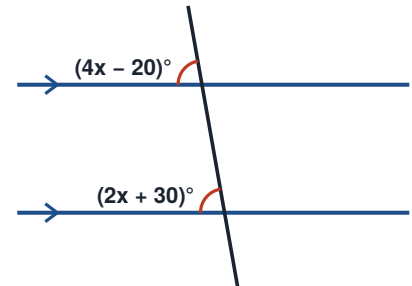
Alternate interior angles are equal:
 $2x + 10 = 70 \rightarrow 2x = 60 \rightarrow x = 30$

12. Find x.



Co-interior angles add to 180°: $3x + x + 40 = 180 \rightarrow 4x = 140 \rightarrow x = 35$

13. Find x.



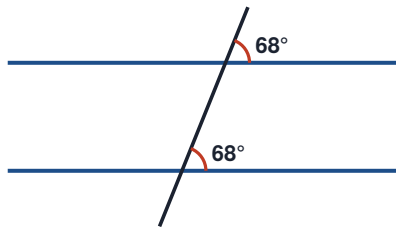
Corresponding angles are equal: $4x - 20 = 2x + 30 \rightarrow 2x = 50 \rightarrow x = 25$

D Are the lines parallel?

3 marks

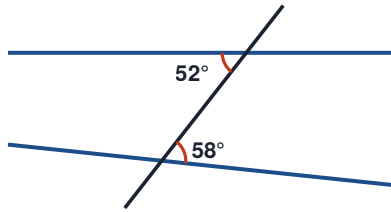
No arrows this time: use the angles to decide, and give a reason.

14. Are the blue lines parallel?



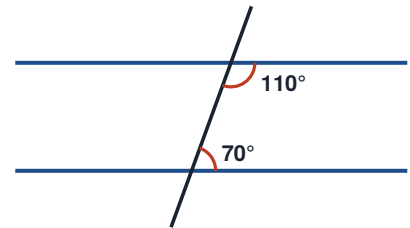
Yes. Corresponding angles are equal ($68^\circ = 68^\circ$).

15. Are the blue lines parallel?



No. Alternate interior angles would be equal, but $52^\circ \neq 58^\circ$.

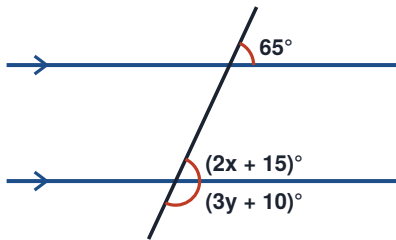
16. Are the blue lines parallel?



Yes. Co-interior angles add to 180° ($110^\circ + 70^\circ$).

E Find x and y

3 marks



17. The lines are parallel. Find x and y.

x = Corresponding to 65° : $2x + 15 = 65 \rightarrow x = 25$

y = Linear pair with the 65° angle above it: $3y + 10 = 115 \rightarrow y = 35$

F Real-world problems

6 marks (2 each)

18. A straight road crosses two parallel railway tracks. It makes a 48° angle with the first track. What acute and obtuse angles does it make with the second track? Explain.

48° and 132° . Corresponding angles are equal (48°), and the angle beside it on the straight line is $180^\circ - 48^\circ = 132^\circ$.

19. A carpenter nails a brace across two boards. The alternate interior angles measure 88° and 92° . Are the boards parallel? Explain.

No. If the boards were parallel, alternate interior angles would be equal. $88^\circ \neq 92^\circ$.

20. Two parallel shelves are joined by a slanted support bar. Between the shelves, the bar makes a 35° angle with the bottom shelf. What angle does it make with the top shelf on the same side of the bar, also between the shelves?

These are co-interior angles, so they add to 180° : $180^\circ - 35^\circ = 145^\circ$.

G Spot the mistake

2 marks

21. Parallel lines are cut by a transversal and $\angle 3 = 70^\circ$. A student says $\angle 5 = 70^\circ$ because $\angle 3$ and $\angle 5$ are co-interior. Explain the error.

Co-interior angles are **supplementary**, not equal: $\angle 5 = 180^\circ - 70^\circ = 110^\circ$.

22. Two lines that are **not** parallel are cut by a transversal. A student says the alternate interior angles must be equal. Explain the error.

The angle rules only work when the lines are **parallel**. With non-parallel lines the alternate angles are not equal (see question 15).