

SCAVENGER HUNT



PROVING LINES PARALLEL

Proving Lines Parallel

Find the x that makes them parallel

FREE

ANSWER

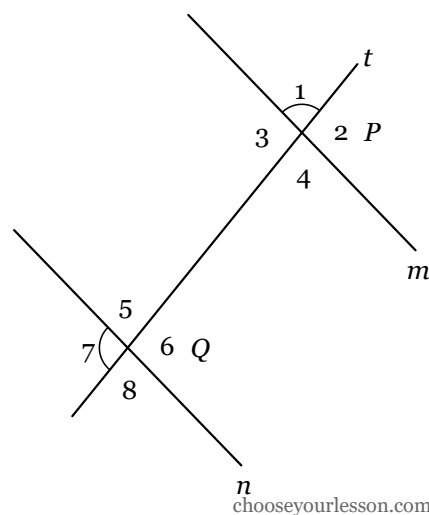
$$x = 35$$

Lines m and n are cut by t , and $m \angle 1 = (3x + 29)^\circ$, $m \angle 7 = (x + 79)^\circ$.

Find the value of x that makes $m \parallel n$.

One arc at a time: inside the two lines, or outside them?

A



Scavenger Hunt — how to run it

a full class period

1. **Tape the 16 cards around the room**, in any order. Send each group to a *different* card. Each card has a large letter in its bottom left corner. Start each group on one of the eight cards on this page: the list is *D M H A K R F P*.
2. **Say this once:** “Decide if the two angles are equal or add to 180° . That depends where they sit. Then write your equation. Write every card you visit on your sheet. You are done after eight lines.”
3. **Work out x . Find the card with your x at the top.** You are finished when you get back to the card you started at.

16 cards	pages 3–10, one copy. Two to a sheet — one cut through the stack.
Record sheet	page 11, one per student. It carries the five positions as pictures.
Answers	pages 12–13 — yours. They do not go in the room.

eight of the 16 cards make the ring, and the other eight are where a wrong answer goes. They do not look any different: a number at the top, two expressions, a figure and one line, like every other card. A group that sets a same-side pair equal, or makes a corresponding pair add to 180° , gets a different value of x — and **that value is at the top of one of those cards**. They walk to it, do the card standing there, and its answer sends them back to the one they got wrong.

The check is the length of their row, and it is the only one you need. A clean run is **eight lines**; every wrong answer costs exactly two more and none can cost fewer. *Count the rows.*

Where they will go wrong, and what to ask. On one of the four same-side cards, nearly always. Not the answer: ask “are your two angles on the same side of the slanted line?” If they are, the two have to add to 180° and the group has set them equal — which is what the line at the foot of the card they landed on says too.

Nothing in the room is marked parallel, and that is the lesson: the student is choosing the x that *makes* the lines parallel, so parallel cannot also be given. **For the group that finishes early**, the joke on the record sheet decodes from the numbers they wrote down. **Cards stay on the wall** — say so, because one student will take one down.



This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.
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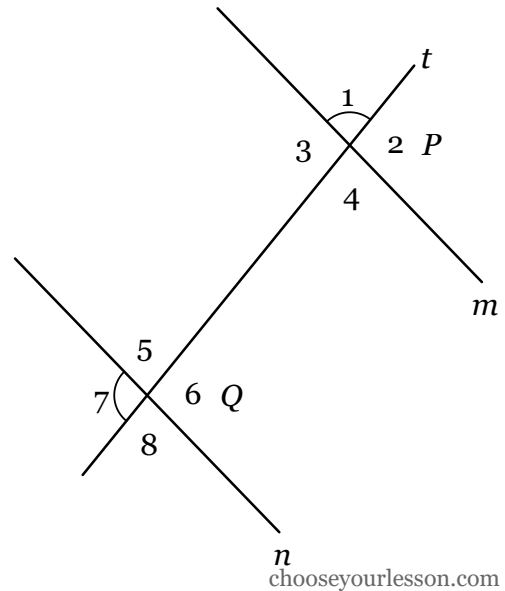
ANSWER

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One arc at a time: inside the two lines, or outside them?



A

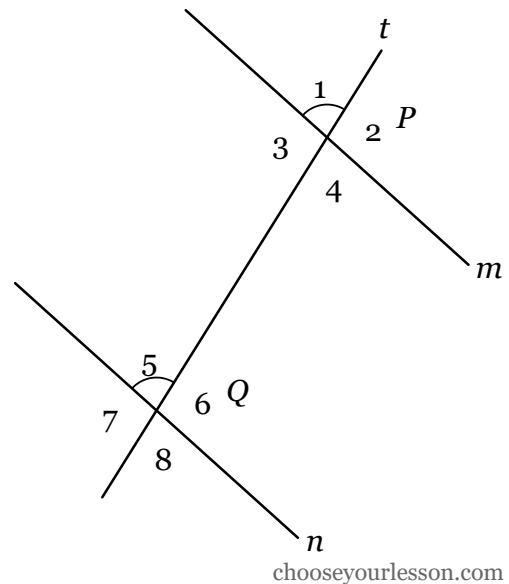
ANSWER

$$x = 25$$

Lines m and n are cut by t , and $m \angle 1 = (3x - 25)^\circ$, $m \angle 5 = (x + 45)^\circ$.

Find the value of x that makes $m \parallel n$.

One arc above its crossing and one above the other means equal. Nothing is subtracted from 180.



B

ANSWER

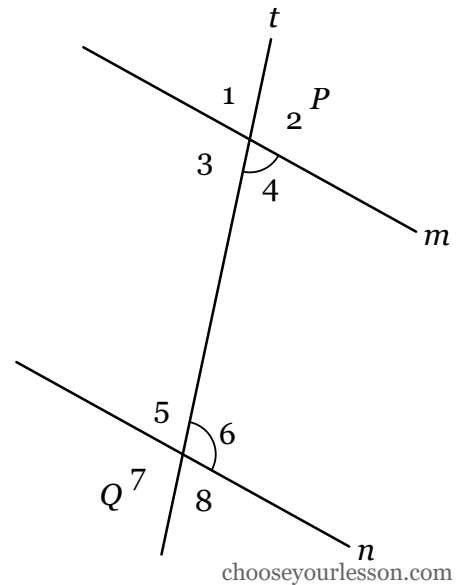
$$x = 8$$

Lines m and n are cut by t , and $m \angle 4 = (3x + 25)^\circ$, $m \angle 6 = (x + 91)^\circ$.

Find the value of x that makes $m \parallel n$.

Same side of the slanted line, and both between the lines? Then they add to 180, not equal.

C



ANSWER

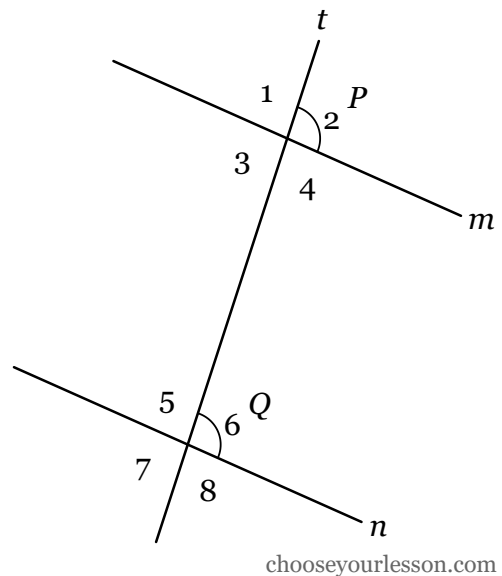
$$x = 16$$

Lines m and n are cut by t , and $m \angle 2 = (2x + 72)^\circ$, $m \angle 6 = (x + 84)^\circ$.

Find the value of x that makes $m \parallel n$.

Which side of the slanted line is each arc on? Ask that before you write anything.

D



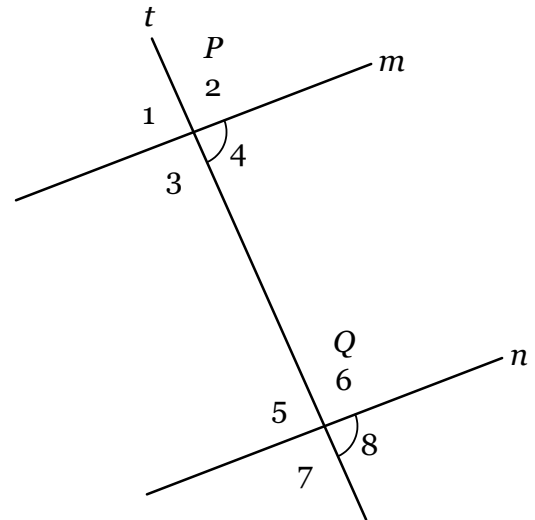
ANSWER

$$x = 42$$

Lines m and n are cut by t , and $m \angle 4 = (2x + 25)^\circ$, $m \angle 8 = (x + 56)^\circ$.

Find the value of x that makes $m \parallel n$.

One arc under its crossing and one under the other: equal.



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E

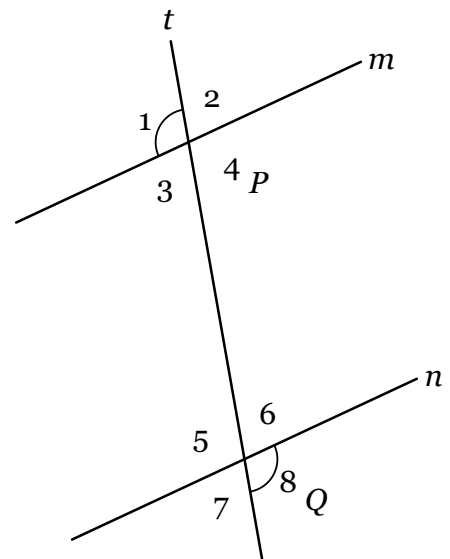
ANSWER

$$x = 23$$

Lines m and n are cut by t , and $m \angle 1 = (2x + 43)^\circ$, $m \angle 8 = (x + 74)^\circ$.

Find the value of x that makes $m \parallel n$.

Read where the two arcs sit before you read the two expressions.



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F

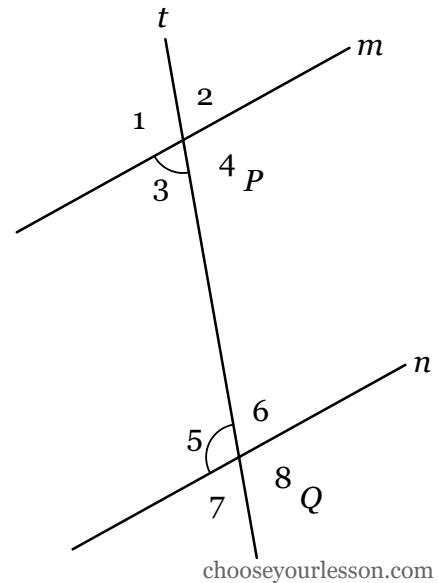
ANSWER

$$\mathbf{x = 40}$$

Lines m and n are cut by t , and $\mathbf{m \angle 3 = (3x + 17)^\circ}$, $\mathbf{m \angle 5 = (x + 91)^\circ}$.

Find the value of $\mathbf{x}$ that makes $m \parallel n$.

Between the two lines and on one side of the slanted line: that pair adds to 180.



G

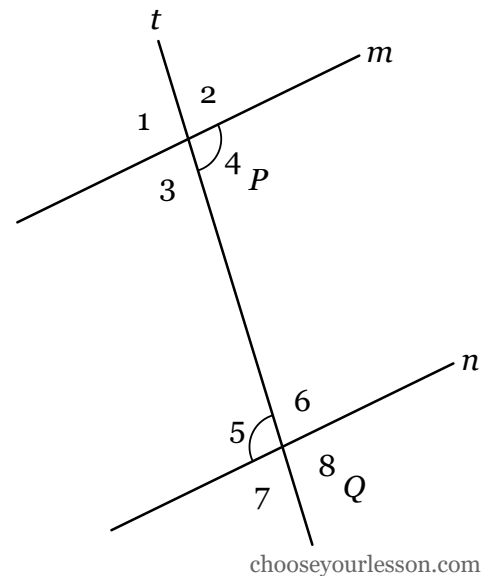
ANSWER

$$\mathbf{x = 27}$$

Lines m and n are cut by t , and $\mathbf{m \angle 4 = (2x + 29)^\circ}$, $\mathbf{m \angle 5 = (x + 64)^\circ}$.

Find the value of $\mathbf{x}$ that makes $m \parallel n$.

Name the position first. The equation comes after it, never before.



H

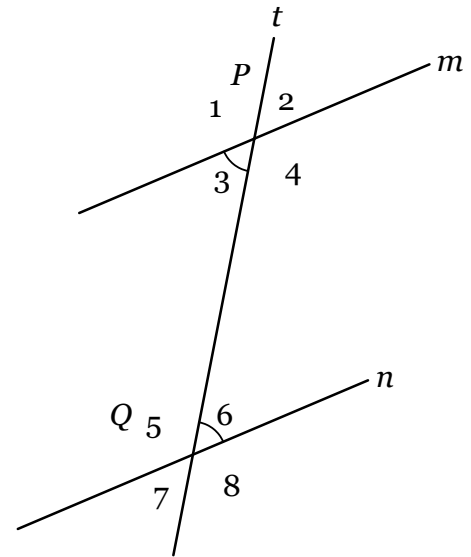
ANSWER

$$x = 33$$

Lines m and n are cut by t , and $m \angle 3 = (3x + 20)^\circ$, $m \angle 6 = (x + 44)^\circ$.

Find the value of x that makes $m \parallel n$.

Opposite sides of the slanted line means the two are equal, not adding to 180.



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J

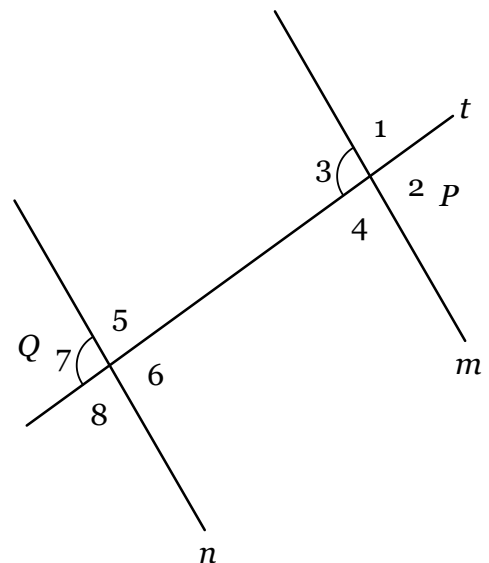
ANSWER

$$x = 18$$

Lines m and n are cut by t , and $m \angle 3 = (2x + 8)^\circ$, $m \angle 7 = (x + 52)^\circ$.

Find the value of x that makes $m \parallel n$.

The slanted line is the one that crosses both the others.



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K

ANSWER

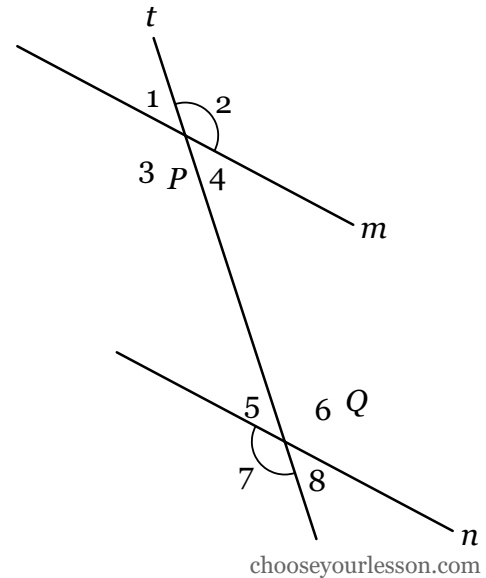
$$x = 37$$

Lines m and n are cut by t , and $m \angle 2 = (3x + 4)^\circ$, $m \angle 7 = (x + 92)^\circ$.

Find the value of x that makes $m \parallel n$.

Opposite sides and both outside the lines:
equal.

L



ANSWER

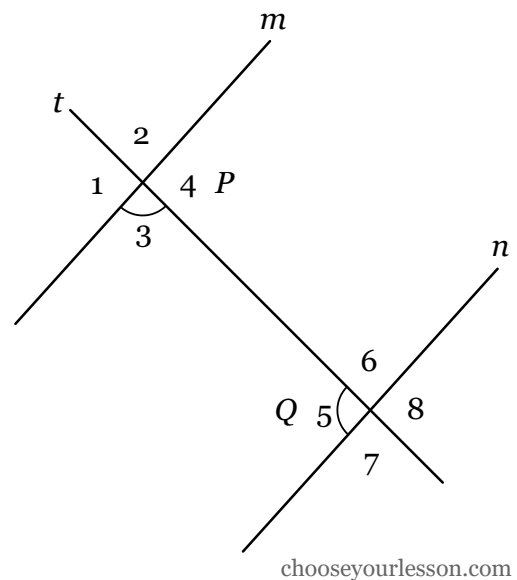
$$x = 12$$

Lines m and n are cut by t , and $m \angle 3 = (2x + 33)^\circ$, $m \angle 5 = (x + 66)^\circ$.

Find the value of x that makes $m \parallel n$.

Then ask whether each arc is between the
two lines or outside them.

M



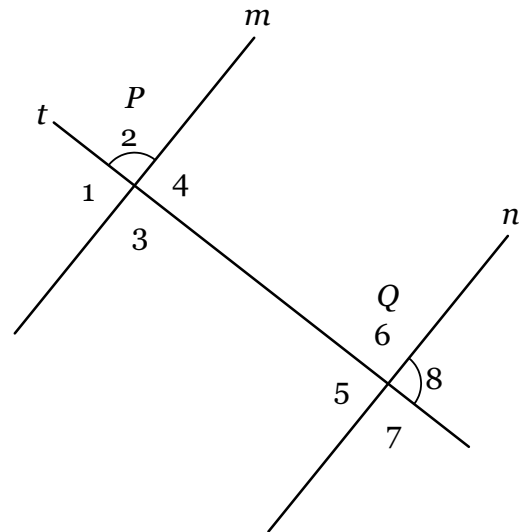
ANSWER

$$x = 29$$

Lines m and n are cut by t , and $m \angle 2 = (2x + 37)^\circ$, $m \angle 8 = (x + 62)^\circ$.

Find the value of x that makes $m \parallel n$.

Same side and both outside the lines still adds to 180.



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N

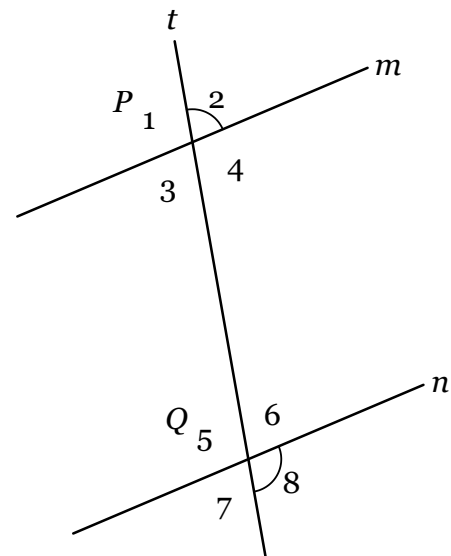
ANSWER

$$x = 31$$

Lines m and n are cut by t , and $m \angle 2 = (2x + 45)^\circ$, $m \angle 8 = (x + 87)^\circ$.

Find the value of x that makes $m \parallel n$.

Opposite sides, or the same side? Ask it of the slanted line.



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P

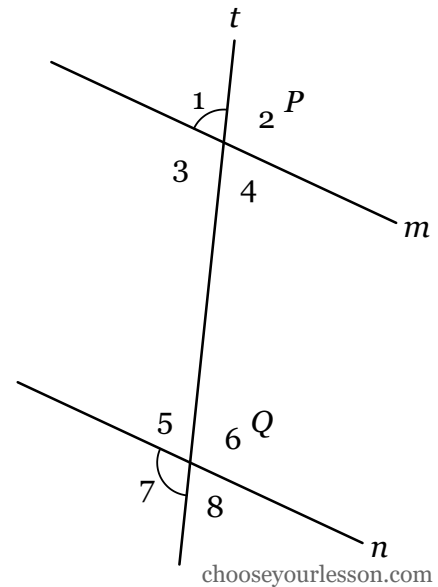
ANSWER

$$\mathbf{x = 21}$$

Lines m and n are cut by t , and $m \angle 1 = (3x + 2)^\circ$, $m \angle 7 = (x + 86)^\circ$.

Find the value of x that makes $m \parallel n$.

Both outside the lines and on one side of the slanted line: they add to 180.



Q

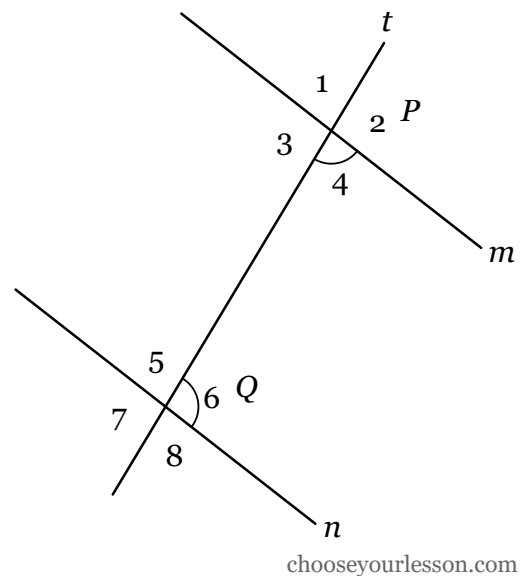
ANSWER

$$\mathbf{x = 44}$$

Lines m and n are cut by t , and $m \angle 4 = (2x + 37)^\circ$, $m \angle 6 = (x + 74)^\circ$.

Find the value of x that makes $m \parallel n$.

Two questions and no more, and the picture answers both of them.



R

Scavenger Hunt — where I went

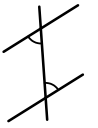
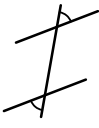
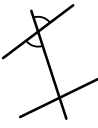
Proving lines parallel

Name _____

Period _____

Date _____

Work out the card you are at. Fill in one line. Then find the card with your x at the top. **Decide if the two marked angles are equal or add to 180° . Then write your equation.** A clean run is eight lines. A longer row means one answer was wrong.

				
Corresponding <i>equal $\rightarrow$ parallel</i>	Alternate interior <i>equal $\rightarrow$ parallel</i>	Alternate exterior <i>equal $\rightarrow$ parallel</i>	Same-side interior <i>add to $180^\circ \rightarrow$ parallel</i>	Both at one crossing <i>proves nothing</i>

Card letter	My x	Which of the positions above
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

A theorem's given and conclusion trade places. What is the new statement called?

Every value of x stands for a letter. Write the letter for each answer in the box under that number. Leave the other boxes empty. Then read the boxes you filled across. **If it does not spell a word, one answer was wrong.**

8 = T 12 = C 16 = O 18 = N 21 = H 23 = V 25 = D 27 = E 29 = S 31 = R 33 = M 35 = S 37 = N 40 = G 42 = U
44 = E

8	12	16	18	21	23	25	27	29	31	33	35	37	40	42	44



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Scavenger Hunt — answers

For the teacher

The ring in order. A group may begin anywhere on it; wherever it begins, eight right answers bring it back to that card.

D → M → H → A → K → R → F → P → D

A theorem's given and conclusion trade places. What is the new statement called?

CONVERSE. The boxes on the record sheet are in order of the answers, smallest first.

The answers on the ring, smallest first: 12 = C, 16 = O, 18 = N, 23 = V, 27 = E, 31 = R, 35 = S, 44 = E, which spells CONVERSE.

	Card	Given	What it needs	Answer	Wrong rule gives	Sends them to
1	D	$\angle 2 = (2x + 72)^\circ \cdot \angle 6 = (x + 84)^\circ$	Corresponding — <i>equal</i>	x = 12	8	M
2	M	$\angle 3 = (2x + 33)^\circ \cdot \angle 5 = (x + 66)^\circ$	Same-side interior — <i>add to 180°</i>	x = 27	33	H
3	H	$\angle 4 = (2x + 29)^\circ \cdot \angle 5 = (x + 64)^\circ$	Alternate interior — <i>equal</i>	x = 35	29	A
4	A	$\angle 1 = (3x + 29)^\circ \cdot \angle 7 = (x + 79)^\circ$	Same-side exterior — <i>add to 180°</i>	x = 18	25	K
5	K	$\angle 3 = (2x + 8)^\circ \cdot \angle 7 = (x + 52)^\circ$	Corresponding — <i>equal</i>	x = 44	40	R
6	R	$\angle 4 = (2x + 37)^\circ \cdot \angle 6 = (x + 74)^\circ$	Same-side interior — <i>add to 180°</i>	x = 23	37	F
7	F	$\angle 1 = (2x + 43)^\circ \cdot \angle 8 = (x + 74)^\circ$	Alternate exterior — <i>equal</i>	x = 31	21	P
8	P	$\angle 2 = (2x + 45)^\circ \cdot \angle 8 = (x + 87)^\circ$	Same-side exterior — <i>add to 180°</i>	x = 16	42	D

Each number in the column “Wrong rule gives” is at the top of a card that is not on the ring. It is the x a student gets by setting a same-side pair equal, or by making a corresponding or alternate pair add to 180°. That card has a real task, and its answer sends the group back to the card they got wrong. So a group cannot solve both equations and simply pick the number it finds in the room.

And not one card says the lines are parallel. That is what the x is for. A student who writes an equation without first deciding what the position *requires* has done the arithmetic of this lesson and none of its geometry.

Scavenger Hunt — the cards that are not on the ring

For the teacher

These eight cards are where a wrong answer goes. Each carries the x a group gets by using the wrong requirement at one card of the ring. Its own answer is the x at the top of that card. So a group that lands here and solves it goes back to the card they got wrong, and their row comes out two lines longer than a clean run. **A group cannot arrive at one of these cards by being right**, so a sheet whose row holds one of these letters is a sheet that went wrong at a card you can name.

Card	Given	What it needs	Answer	Wrong rule gives	Sends them to
B	$\angle 1 = (3x - 25)^\circ \cdot \angle 5 = (x + 45)^\circ$	Corresponding — <i>equal</i>	$x = 35$	40	A
C	$\angle 4 = (3x + 25)^\circ \cdot \angle 6 = (x + 91)^\circ$	Same-side interior — <i>add to 180°</i>	$x = 16$	33	D
E	$\angle 4 = (2x + 25)^\circ \cdot \angle 8 = (x + 56)^\circ$	Corresponding — <i>equal</i>	$x = 31$	33	P
G	$\angle 3 = (3x + 17)^\circ \cdot \angle 5 = (x + 91)^\circ$	Same-side interior — <i>add to 180°</i>	$x = 18$	37	K
J	$\angle 3 = (3x + 20)^\circ \cdot \angle 6 = (x + 44)^\circ$	Alternate interior — <i>equal</i>	$x = 12$	29	M
L	$\angle 2 = (3x + 4)^\circ \cdot \angle 7 = (x + 92)^\circ$	Alternate exterior — <i>equal</i>	$x = 44$	21	R
N	$\angle 2 = (2x + 37)^\circ \cdot \angle 8 = (x + 62)^\circ$	Same-side exterior — <i>add to 180°</i>	$x = 27$	25	H
Q	$\angle 1 = (3x + 2)^\circ \cdot \angle 7 = (x + 86)^\circ$	Same-side exterior — <i>add to 180°</i>	$x = 23$	42	F

The line at the foot of each of these cards names the mistake — *same side of the slanted line, so they add to 180, not equal*, and the seven others like it. Every card in the room carries a line in the same place, so nothing on a student's page says which cards these are.