

ANSWER MAZE



PROPORTIONAL SEGMENTS AND THE ANGLE BISECTOR THEOREM

Which Way Round Does It Go?

One page · 10–15 minutes · nothing to prepare

FREE

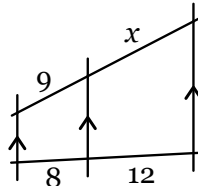
4

The three lines with arrowheads are parallel. Find x .

$x = 6 \rightarrow$ go to box 6

$x = 13.5 \rightarrow$ go to box 7

Hint: Trace each transversal from one end to the other. Keep its pieces in order.



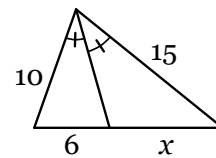
7

The marked segment cuts the top angle into two equal angles. Find x .

$x = 9 \rightarrow$ go to box 2

$x = 4 \rightarrow$ go to box 3

Hint: Which corner does x touch? Find the side that touches that corner too.



1. **Hand out page 3**, one per student. Nothing else is needed.
2. **Say this once:** *“Start at box 4. Write the proportion before you work anything out. Write every box number in the row at the bottom as you go.”*
3. **Check a sheet quickly.** A student with no mistakes writes **4 7 2 5 8 1**: six boxes, then out.

Student sheet	page 3, one per student. Each box has a drawing with three numbers and x.
Answers	page 4.

The boxes use two facts. Three parallel lines cut two transversals into proportional pieces: the first piece over the second piece is the same fraction on both transversals. On this sheet the parallel lines stand upright and the transversals run across, so the pieces are read from left to right. And the angle bisector of a triangle cuts the opposite side into two pieces in the ratio of the two sides at that corner: each piece goes with the side that meets it at a corner. On these sheets, an angle bisector of a triangle is the segment from a corner to the opposite side that cuts the angle at that corner into two equal angles. Some textbooks use other definitions, so tell the class which ones this sheet uses.

Every wrong answer comes from one of two mistakes. The first is writing the fraction of one transversal turned round, so the pieces are compared crosswise. These wrong answers send the student to box 6. The second is pairing a piece of the bottom side with the side across from it, because that is what looks opposite in the drawing. These wrong answers send the student to box 3. Boxes 6 and 3 ask the same kind of question again, and both of their answers lead back to the route.

The row at the bottom is the check. A clean run is six numbers. Each wrong answer adds at least one more. Guessing does not get a student out: every simple guessing rule, such as always taking the larger number, goes wrong within the first four boxes.



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 Maze — proportional pieces

Start at box 4

Name _____

Period _____

Date _____

Start at box 4. Find x . Pick one answer and go to the box it names. Write each box number in the row at the bottom as you go.

Parallel lines: the first piece over the second piece is the same fraction on both transversals. Angle bisector: each piece of the bottom side goes with the side that meets it at the same corner. You may know other facts about angle bisectors. This sheet uses only this one.

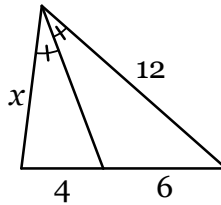
1

The marked segment cuts the top angle into two equal angles. Find x .

$x = 18 \rightarrow$ go to box 3

$x = 8 \rightarrow$ you are out

Hint: Find the corner where side x meets the bottom side. Which piece meets it there too?



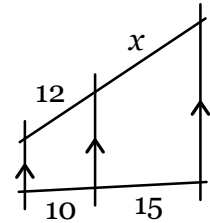
2

The three lines with arrowheads are parallel. Find x .

$x = 8 \rightarrow$ go to box 6

$x = 18 \rightarrow$ go to box 5

Hint: Which piece of the lower transversal sits between the two lines that hold x ?



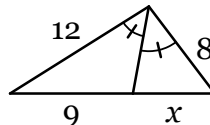
3

The marked segment cuts the top angle into two equal angles. Find x .

$x = 13.5 \rightarrow$ go to box 7

$x = 6 \rightarrow$ go to box 2

Hint: Which corner does each piece of the bottom side touch?



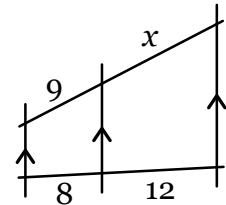
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The three lines with arrowheads are parallel. Find x .

$x = 6 \rightarrow$ go to box 6

$x = 13.5 \rightarrow$ go to box 7

Hint: Trace each transversal from one end to the other. Keep its pieces in order.



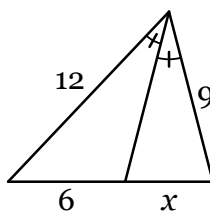
5

The marked segment cuts the top angle into two equal angles. Find x .

$x = 4.5 \rightarrow$ go to box 8

$x = 8 \rightarrow$ go to box 3

Hint: Point to each piece of the bottom side. Then point to the side at its corner.



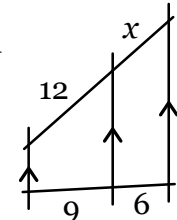
6

The three lines with arrowheads are parallel. Find x .

$x = 8 \rightarrow$ go to box 7

$x = 18 \rightarrow$ go to box 4

Hint: Read the order of the pieces along each transversal.



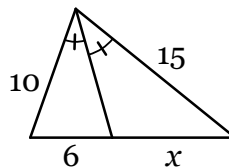
7

The marked segment cuts the top angle into two equal angles. Find x .

$x = 9 \rightarrow$ go to box 2

$x = 4 \rightarrow$ go to box 3

Hint: Which corner does x touch? Find the side that touches that corner too.



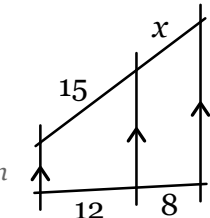
8

The three lines with arrowheads are parallel. Find x .

$x = 10 \rightarrow$ go to box 1

$x = 22.5 \rightarrow$ go to box 6

Hint: Read both transversals in one direction. Which piece of each comes first?



Write every box number here, in order.

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The route, in order. Boxes 6 and 3 are not on it. A student reaches them only by a wrong answer. They are the last two rows of the table.

4 → 7 → 2 → 5 → 8 → 1 → out

	The box's question	Right answer, and why	Wrong answer, and why a student picks it
1	Box 4 The three lines with arrowheads are parallel. Find x . Three parallel lines. Lower transversal: 8 then 12. Upper transversal: 9 then x .	$x = 13.5$. Left piece over right piece on both transversals: $8/12 = 9/x$, so $x = 12 \times 9 \div 8 = 13.5$.	" $x = 6$ " goes to box 6. A student who writes one transversal's fraction turned round picks this.
2	Box 7 The marked segment cuts the top angle into two equal angles. Find x . Angle bisector from the top corner. Sides 10 (left) and 15 (right). Pieces 6 (left) and x (right).	$x = 9$. The left piece and the left side meet at the left corner, so $6/x = 10/15$ and $x = 6 \times 15 \div 10 = 9$.	" $x = 4$ " goes to box 3. A student who pairs each piece with the side across from it picks this.
3	Box 2 The three lines with arrowheads are parallel. Find x . Three parallel lines. Lower transversal: 10 then 15. Upper transversal: 12 then x .	$x = 18$. Left piece over right piece on both transversals: $10/15 = 12/x$, so $x = 15 \times 12 \div 10 = 18$.	" $x = 8$ " goes to box 6. A student who writes one transversal's fraction turned round picks this.
4	Box 5 The marked segment cuts the top angle into two equal angles. Find x . Angle bisector from the top corner. Sides 12 (left) and 9 (right). Pieces 6 (left) and x (right).	$x = 4.5$. The left piece and the left side meet at the left corner, so $6/x = 12/9$ and $x = 6 \times 9 \div 12 = 4.5$.	" $x = 8$ " goes to box 3. A student who pairs each piece with the side across from it picks this.
5	Box 8 The three lines with arrowheads are parallel. Find x . Three parallel lines. Lower transversal: 12 then 8. Upper transversal: 15 then x .	$x = 10$. Left piece over right piece on both transversals: $12/8 = 15/x$, so $x = 8 \times 15 \div 12 = 10$.	" $x = 22.5$ " goes to box 6. A student who writes one transversal's fraction turned round picks this.
6	Box 1 The marked segment cuts the top angle into two equal angles. Find x . Angle bisector from the top corner. Pieces 6 (right) and 4 (left). Sides 12 (right) and x (left).	$x = 8$. The right piece and the right side meet at the right corner, so $6/4 = 12/x$ and $x = 12 \times 4 \div 6 = 8$.	" $x = 18$ " goes to box 3. A student who pairs each piece with the side across from it picks this.
	Box 6 The three lines with arrowheads are parallel. Find x . Three parallel lines. Lower transversal: 9 then 6. Upper transversal: 12 then x .	$x = 8$. Left piece over right piece on both transversals: $9/6 = 12/x$, so $x = 6 \times 12 \div 9 = 8$.	" $x = 18$ " goes to box 4. A student who writes one transversal's fraction turned round picks this.
	Box 3 The marked segment cuts the top angle into two equal angles. Find x . Angle bisector from the top corner. Sides 12 (left) and 8 (right). Pieces 9 (left) and x (right).	$x = 6$. The left piece and the left side meet at the left corner, so $9/x = 12/8$ and $x = 9 \times 8 \div 12 = 6$.	" $x = 13.5$ " goes to box 7. A student who pairs each piece with the side across from it picks this.

How to check any box. On three parallel lines, trace one transversal with a finger: its two pieces, in order, make one fraction, and the other transversal makes the other. On a triangle, point to a piece of the bottom side and to the side that meets it at a corner: those two go together. The bigger piece is always next to the longer side.

A student can find the last four boxes of the route by following the arrows backward from "you are out." So ask a student with a clean row to explain one box.