

ANSWER MAZE



SLOPES OF PARALLEL AND PERPENDICULAR LINES

Perpendicular Slopes: Opposite Reciprocals

Change the sign, turn the fraction over · one page · 10–15 minutes · nothing to prepare

FREE

4 Line n : $y = -2x + 3$

slope 2 → go to box 6

slope $\frac{1}{2}$ → go to box 7

Hint: Look at the top and the bottom of each answer. Two steps make a perpendicular slope.

7 Line n has slope $\frac{3}{4}$.

slope $\frac{4}{3}$ → go to box 3

slope $-\frac{4}{3}$ → go to box 2

Hint: In a perpendicular pair, one line goes up and the other goes down. Check each sign.

1. **Hand out page 3**, one per student. No calculator is needed.
2. **Say this once:** *“Start at box 4. Find the slope of a line perpendicular to line n. Change the sign, then turn the fraction over. 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 8 5 1**: six boxes, then out.

Student sheet page 3, one per student, and scrap paper for working.
Answers page 4.

Every box gives a line n, by its slope or by an equation $y = mx + b$ that is already solved for y. Two lines are perpendicular when their slopes are opposite reciprocals. So the student changes the sign of the slope of n and turns the fraction over: $\frac{3}{4}$ becomes $-\frac{4}{3}$. A whole number is a fraction over 1, so -4 becomes $\frac{1}{4}$.

Every wrong answer comes from doing only one of the two steps. Some students change the sign and forget to turn the fraction over. These wrong answers send the student to box 6. Other students turn the fraction over and keep the sign. 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, and the extra box number tells you which step the student leaves out. Guessing does not get a student out: every simple guessing rule, such as always taking the answer printed first, 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.
chooseyourlesson.com — 135 free geometry lessons.

Answer Maze — perpendicular slopes

Start at box 4

Name _____

Period _____

Date _____

Start at box 4. **Each box gives a line n . Find the slope of a line perpendicular to line n .** Pick one answer and go to the box it names. Write each box number in the row at the bottom as you go.

Perpendicular slope, in two steps: change the sign, then turn the fraction over. $-\frac{2}{3} \rightarrow \frac{2}{3} \rightarrow \frac{3}{2}$.

Write a slope as a whole number or a fraction in lowest terms, with its sign: $-\frac{3}{4}$, 5, $-\frac{1}{2}$. A whole number is a fraction over 1: $5 = \frac{5}{1}$.

1 Line n : $y = \frac{8}{5}x + 2$

slope $\frac{5}{8} \rightarrow$ **go to box 3**

slope $-\frac{5}{8} \rightarrow$ **you are out**

Hint: Uphill and downhill lines meet at right angles. Which way does line n go?

2 Line n : $y = \frac{5}{6}x - 1$

slope $-\frac{6}{5} \rightarrow$ **go to box 8**

slope $-\frac{5}{6} \rightarrow$ **go to box 6**

Hint: Write the slope of line n as a fraction. Then change its sign and turn it over.

3 Line n : $y = -\frac{5}{9}x + 4$

slope $-\frac{9}{5} \rightarrow$ **go to box 7**

slope $\frac{9}{5} \rightarrow$ **go to box 2**

Hint: Look at the minus signs. A perpendicular slope has the other sign.

4 Line n : $y = -2x + 3$

slope 2 $\rightarrow$ **go to box 6**

slope $\frac{1}{2} \rightarrow$ **go to box 7**

Hint: Look at the top and the bottom of each answer. Two steps make a perpendicular slope.

5 Line n has slope $-\frac{2}{3}$.

slope $\frac{2}{3} \rightarrow$ **go to box 6**

slope $\frac{3}{2} \rightarrow$ **go to box 1**

Hint: A flat line meets a steep line at a right angle. How steep is line n ?

6 Line n has slope 7.

slope $-\frac{1}{7} \rightarrow$ **go to box 7**

slope $-7 \rightarrow$ **go to box 4**

Hint: Say the two steps out loud. Check that the answer shows both of them.

7 Line n has slope $\frac{3}{4}$.

slope $\frac{4}{3} \rightarrow$ **go to box 3**

slope $-\frac{4}{3} \rightarrow$ **go to box 2**

Hint: In a perpendicular pair, one line goes up and the other goes down. Check each sign.

8 Line n has slope -4 .

slope $\frac{1}{4} \rightarrow$ **go to box 5**

slope $-\frac{1}{4} \rightarrow$ **go to box 3**

Hint: Read the sign of the slope of line n . Then read the sign of each answer.

Write every box number here, in order.

--	--	--	--	--	--	--	--	--	--



chooseyourlesson.com
135 free geometry lessons

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. This sheet writes every slope as a whole number or a fraction in lowest terms, with its sign in front. Some textbooks use other definitions, so tell the class which ones this sheet uses.

4 → 7 → 2 → 8 → 5 → 1 → out

	The box's question	Right answer, and why	Wrong answer, and why a student picks it
1	Box 4 Line n: $y = -2x + 3$. Find the slope of a line perpendicular to n.	1/2. The equation is solved for y, so the slope of n is the number in front of x, -2. Change the sign: 2. Turn it over: 1/2. Check: $-2 \times 1/2 = -1$.	"2" goes to box 6. The sign is changed and the fraction is not turned over: -2 becomes 2. The product -2×2 is not -1.
2	Box 7 Line n: slope 3/4. Find the slope of a line perpendicular to n.	-4/3. Change the sign: -3/4. Turn it over: -4/3. Check: $3/4 \times -4/3 = -1$.	"4/3" goes to box 3. The fraction is turned over and the sign is kept: 3/4 becomes 4/3. Both slopes have the same sign, and their product is 1, not -1.
3	Box 2 Line n: $y = (5/6)x - 1$. Find the slope of a line perpendicular to n.	-6/5. The equation is solved for y, so the slope of n is the number in front of x, 5/6. Change the sign: -5/6. Turn it over: -6/5. Check: $5/6 \times -6/5 = -1$.	"-5/6" goes to box 6. The sign is changed and the fraction is not turned over: 5/6 becomes -5/6. The product $5/6 \times -5/6$ is not -1.
4	Box 8 Line n: slope -4. Find the slope of a line perpendicular to n.	1/4. Change the sign: 4. Turn it over: 1/4. Check: $-4 \times 1/4 = -1$.	"-1/4" goes to box 3. The fraction is turned over and the sign is kept: -4 becomes -1/4. Both slopes have the same sign, and their product is 1, not -1.
5	Box 5 Line n: slope -2/3. Find the slope of a line perpendicular to n.	3/2. Change the sign: 2/3. Turn it over: 3/2. Check: $-2/3 \times 3/2 = -1$.	"2/3" goes to box 6. The sign is changed and the fraction is not turned over: -2/3 becomes 2/3. The product $-2/3 \times 2/3$ is not -1.
6	Box 1 Line n: $y = (8/5)x + 2$. Find the slope of a line perpendicular to n.	-5/8. The equation is solved for y, so the slope of n is the number in front of x, 8/5. Change the sign: -8/5. Turn it over: -5/8. Check: $8/5 \times -5/8 = -1$.	"5/8" goes to box 3. The fraction is turned over and the sign is kept: 8/5 becomes 5/8. Both slopes have the same sign, and their product is 1, not -1.
	Box 6 Line n: slope 7. Find the slope of a line perpendicular to n.	-1/7. Change the sign: -7. Turn it over: -1/7. Check: $7 \times -1/7 = -1$.	"-7" goes to box 4. The sign is changed and the fraction is not turned over: 7 becomes -7. The product 7×-7 is not -1.
	Box 3 Line n: $y = -(5/9)x + 4$. Find the slope of a line perpendicular to n.	9/5. The equation is solved for y, so the slope of n is the number in front of x, -5/9. Change the sign: 5/9. Turn it over: 9/5. Check: $-5/9 \times 9/5 = -1$.	"-9/5" goes to box 7. The fraction is turned over and the sign is kept: -5/9 becomes -9/5. Both slopes have the same sign, and their product is 1, not -1.

How to check any box. Find the slope of line n. Change its sign, then turn the fraction over. Multiply the slope of n by the answer: a perpendicular pair always gives -1.

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.