

ANSWER MAZE



SINE, COSINE AND TANGENT RATIOS

Opposite or Adjacent? Sine, Cosine and Tangent

One page · 10–15 minutes · nothing to prepare

FREE

4

**The arc is at B.
What is $\sin B$?**

$\frac{4}{5} \rightarrow$ **go to box 3**
 $\frac{3}{5} \rightarrow$ **go to box 7**

Hint: Find the arc. Which leg stays away from that corner?

7

**The arc is at P.
What is $\tan P$?**

$\frac{33}{56} \rightarrow$ **go to box 6**
 $\frac{56}{33} \rightarrow$ **go to box 2**

Hint: Name the two legs for the angle with the arc. Which one touches it?

1. **Hand out page 3**, one per student. Nothing else is needed.
2. **Say this once:** *“Start at box 4. In every box, find the arc first. The opposite leg does not touch the arc. The adjacent leg touches it. 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. A strip at the top shows the three definitions, with the same triangle drawn twice.
Answers	page 4.

Every wrong answer comes from swapping the opposite and adjacent legs. That gives the ratio of the other acute angle. In a sine or cosine box, the wrong answer keeps the hypotenuse on the bottom and uses the other leg on top. It sends the student to box 3. In a tangent box, the wrong answer is the fraction upside down, and it sends the student to box 6. Boxes 3 and 6 ask the same kind of question again, and both of their answers lead back to the route.

Answers are fractions of two side lengths from the box, never reduced. On three of the six boxes on the route the arc is at the larger acute angle, so “the short leg is opposite” fails there. No triangle has a level side: a student who calls the more upright leg “opposite” is right on only three of the six boxes.

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 fraction, goes wrong within the first three 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 — opposite or adjacent?

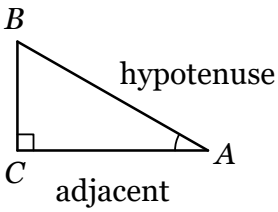
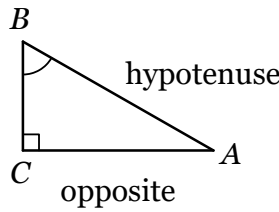
Start at box 4

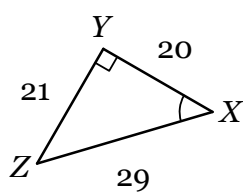
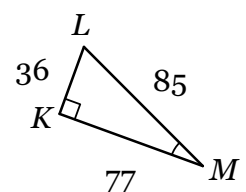
Name _____

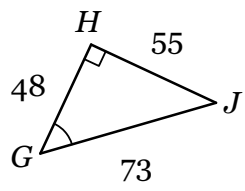
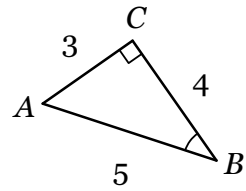
Period _____

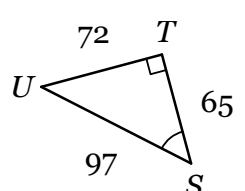
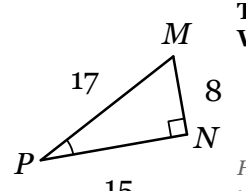
Date _____

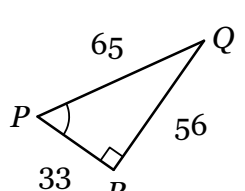
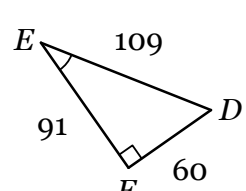
Start at box 4. Find the ratio the box asks for, as a fraction of two side lengths. Pick the answer you got and go to the box it names. Write each box number in the row at the bottom as you go.

 The arc marks angle A. The leg opposite an angle does not touch it. The leg adjacent to an angle touches it. The hypotenuse is never the adjacent leg.	 The arc marks angle B.	$\sin A = \frac{\text{leg opposite A}}{\text{hypotenuse}}$ $\cos A = \frac{\text{leg adjacent to A}}{\text{hypotenuse}}$ $\tan A = \frac{\text{leg opposite A}}{\text{leg adjacent to A}}$
--	---	--

1  The arc is at X. What is cos X? $\frac{20}{29} \rightarrow$ you are out $\frac{21}{29} \rightarrow$ go to box 3 <i>Hint: Look at the arc, then at the square. Which leg joins them?</i>	2  The arc is at M. What is cos M? $\frac{77}{85} \rightarrow$ go to box 5 $\frac{36}{85} \rightarrow$ go to box 3 <i>Hint: Which side is across from the square? Which leg touches the arc?</i>
---	--

3  The arc is at G. What is sin G? $\frac{48}{73} \rightarrow$ go to box 4 $\frac{55}{73} \rightarrow$ go to box 7 <i>Hint: Find the arc again. Which leg is across from that corner?</i>	4  The arc is at B. What is sin B? $\frac{4}{5} \rightarrow$ go to box 3 $\frac{3}{5} \rightarrow$ go to box 7 <i>Hint: Find the arc. Which leg stays away from that corner?</i>
---	---

5  The arc is at S. What is sin S? $\frac{72}{97} \rightarrow$ go to box 8 $\frac{65}{97} \rightarrow$ go to box 3 <i>Hint: Put a finger on the arc. Which leg is across from it?</i>	6  The arc is at P. What is tan P? $\frac{8}{15} \rightarrow$ go to box 2 $\frac{15}{8} \rightarrow$ go to box 7 <i>Hint: Which leg touches the angle with the arc, and which leg is across from it?</i>
--	--

7  The arc is at P. What is tan P? $\frac{33}{56} \rightarrow$ go to box 6 $\frac{56}{33} \rightarrow$ go to box 2 <i>Hint: Name the two legs for the angle with the arc. Which one touches it?</i>	8  The arc is at E. What is tan E? $\frac{91}{60} \rightarrow$ go to box 6 $\frac{60}{91} \rightarrow$ go to box 1 <i>Hint: The tangent uses the two legs. Which leg touches the arc?</i>
--	---

Write every box number here, in order.

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



chooseyourlesson.com
135 free geometry lessons

The route, in order. Boxes 3 and 6 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 Right angle at C. CA = 3, CB = 4, AB = 5. The arc marks angle B. What is sin B?	3/5. AC = 3 is the leg opposite B, and AB = 5 is the hypotenuse. So sin B = 3/5.	"4/5" goes to box 3. This swaps the opposite and adjacent legs: BC = 4 is the leg adjacent to B, so the fraction is cos B.
2	Box 7 Right angle at R. RP = 33, RQ = 56, PQ = 65. The arc marks angle P. What is tan P?	56/33. QR = 56 is the leg opposite P, and PR = 33 is the leg adjacent to P. So tan P = 56/33.	"33/56" goes to box 6. This swaps the opposite and adjacent legs, so the fraction is upside down: the adjacent leg over the opposite leg.
3	Box 2 Right angle at K. KL = 36, KM = 77, LM = 85. The arc marks angle M. What is cos M?	77/85. KM = 77 is the leg adjacent to M, and LM = 85 is the hypotenuse. So cos M = 77/85.	"36/85" goes to box 3. This swaps the opposite and adjacent legs: KL = 36 is the leg opposite M, so the fraction is sin M.
4	Box 5 Right angle at T. TS = 65, TU = 72, SU = 97. The arc marks angle S. What is sin S?	72/97. TU = 72 is the leg opposite S, and SU = 97 is the hypotenuse. So sin S = 72/97.	"65/97" goes to box 3. This swaps the opposite and adjacent legs: ST = 65 is the leg adjacent to S, so the fraction is cos S.
5	Box 8 Right angle at F. FD = 60, FE = 91, DE = 109. The arc marks angle E. What is tan E?	60/91. DF = 60 is the leg opposite E, and EF = 91 is the leg adjacent to E. So tan E = 60/91.	"91/60" goes to box 6. This swaps the opposite and adjacent legs, so the fraction is upside down: the adjacent leg over the opposite leg.
6	Box 1 Right angle at Y. YX = 20, YZ = 21, XZ = 29. The arc marks angle X. What is cos X?	20/29. XY = 20 is the leg adjacent to X, and XZ = 29 is the hypotenuse. So cos X = 20/29.	"21/29" goes to box 3. This swaps the opposite and adjacent legs: YZ = 21 is the leg opposite X, so the fraction is sin X.
	Box 3 Right angle at H. HG = 48, HJ = 55, GJ = 73. The arc marks angle G. What is sin G?	55/73. HJ = 55 is the leg opposite G, and GJ = 73 is the hypotenuse. So sin G = 55/73.	"48/73" goes to box 4. This swaps the opposite and adjacent legs: GH = 48 is the leg adjacent to G, so the fraction is cos G.
	Box 6 Right angle at N. NM = 8, NP = 15, MP = 17. The arc marks angle P. What is tan P?	8/15. MN = 8 is the leg opposite P, and NP = 15 is the leg adjacent to P. So tan P = 8/15.	"15/8" goes to box 7. This swaps the opposite and adjacent legs, so the fraction is upside down: the adjacent leg over the opposite leg.

How to check any box. Find the arc. The hypotenuse is across from the right angle. The leg that does not touch the arc is the opposite leg. The leg that touches it is the adjacent leg. This sheet uses these definitions: sin = opposite leg ÷ hypotenuse, cos = adjacent leg ÷ hypotenuse, tan = opposite leg ÷ adjacent leg. Some textbooks use other definitions, so tell the class which ones this sheet uses.

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.