

ANSWER MAZE



PERPENDICULAR BISECTORS AND THE CIRCUMCENTER

Where Is the Circumcenter, and How Far Away?

One page · 10–15 minutes · nothing to prepare

FREE

5

P is the circumcenter of triangle ABC.
PA = 11. P is 4 units from side AB. How far
is P from B?

4 → go to 3

11 → go to 2

*Find where each given length ends: at a corner, or
on a side.*

2

Triangle DEF has angles of 30° , 45° and
 105° . Where is its circumcenter?

Outside the triangle. → go to 7

Inside the triangle. → go to 6

*Find the largest angle. Compare it with a right
angle.*

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

Student sheet	page 3, one per student. It shows a perpendicular bisector and the circumcenter of three kinds of triangle as small drawings.
Answers	page 4.

Every wrong answer comes from one of two mistakes. The first mistake is about distances. The circumcenter is the same distance from the three *corners*. Some boxes also give its distance to a side, and students often take that number instead. Other boxes write the distances with x , and students stop at x instead of finding the distance. These wrong answers send the student to box 3.

The second mistake is about where the circumcenter is. Many students think a “center” must be inside. It is inside an acute triangle, at the middle of the longest side of a right triangle, and outside an obtuse triangle. In a right triangle it is half the longest side away from each corner, not the whole side. These wrong answers send 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.

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 first answer, goes wrong within the first four boxes.



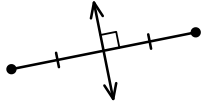
This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.
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Name _____

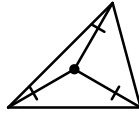
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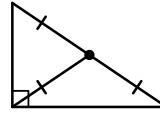
The **circumcenter** (the dot) is the one point that is the same distance from all three **corners**. The ticks show the three equal distances.



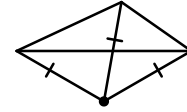
Perpendicular bisector of a side: a right-angle square **and** equal ticks.



Acute triangle: the circumcenter is **inside**.



Right triangle: it is the **middle of the longest side**.



Obtuse triangle: it is **outside**.

Answer the question in the box. Choose an answer, and go to the box it names. Write each box number in the row at the bottom as you reach it.

1

Triangle RST has a right angle at T. $RS = 18$. How far is its circumcenter from T?

18 → go to 6

9 → go to 8

Where does the circumcenter of a right triangle sit? How far is that spot from R and from S?

2

Triangle DEF has angles of 30° , 45° and 105° . Where is its circumcenter?

Outside the triangle. → go to 7

Inside the triangle. → go to 6

Find the largest angle. Compare it with a right angle.

3

P is the circumcenter of triangle XYZ. $PX = 9$. P is 5 units from side YZ. How far is P from Z?

9 → go to 2

5 → go to 5

Which of the two given lengths ends at a corner of the triangle?

4

Triangle UVW has angles of 35° , 55° and 90° . Where is its circumcenter?

At the middle of the longest side. → you are out

Inside the triangle. → go to 6

Look for a right angle among the three angles.

5

P is the circumcenter of triangle ABC. $PA = 11$. P is 4 units from side AB. How far is P from B?

4 → go to 3

11 → go to 2

Find where each given length ends: at a corner, or on a side.

6

Triangle GHK has angles of 20° , 35° and 125° . Where is its circumcenter?

Inside the triangle. → go to 2

Outside the triangle. → go to 7

Which is the largest angle? Compare it with a right angle.

7

P is the circumcenter of triangle JKL. $PJ = x - 8$ and $PK = 40 - 3x$. How far is P from L?

4 → go to 1

12 → go to 3

Solve for x first. Then put x into one of the two lengths.

8

The circle through A, B and C has its center at P. P is 6 units from side BC, and $PC = 15$. What is the radius of the circle?

6 → go to 3

15 → go to 4

A radius runs from the center to the circle. Which given length does that?

Write each box number as you reach it:

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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.

5 → 2 → 7 → 1 → 8 → 4 → out

	Box	Right answer, and why	Wrong answer, and why a student picks it
1	Box 5	11 P is the same distance from all three corners, so $PB = PA = 11$. The 4 is the distance to a side.	“4” goes to box 3. A student who mixes up the distance to a side with the distance to a corner picks this.
2	Box 2	Outside the triangle. The 105° angle is obtuse, so the triangle is obtuse. The circumcenter of an obtuse triangle is outside it.	“Inside the triangle.” goes to box 6. A student who thinks a “center” must be in the middle picks this.
3	Box 7	4 $PJ = PK$, so $x - 8 = 40 - 3x$, and $x = 12$. Then $PJ = 12 - 8 = 4$, and PL is the same, 4.	“12” goes to box 3. A student who stops at $x = 12$ picks this. The question asks for a distance, not for x .
4	Box 1	9 The circumcenter of a right triangle is the middle of the longest side, RS . It is the same distance from all three corners, so it is $18 \div 2 = 9$ from T .	“18” goes to box 6. A student who uses the whole side RS instead of the distance from its middle picks this.
5	Box 8	15 The radius goes from the center to a point on the circle, such as C . So it is $PC = 15$. The 6 is the distance to a side.	“6” goes to box 3. A student who takes the distance to a side as the radius picks this.
6	Box 4	At the middle of the longest side. The triangle has a right angle. The circumcenter of a right triangle is the middle of its longest side.	“Inside the triangle.” goes to box 6. A student who thinks a “center” must be in the middle picks this. Students often think the point on the side is a mistake.
	Box 3	9 P is the same distance from all three corners, so $PZ = PX = 9$. The 5 is the distance to a side.	“5” goes to box 5. A student who still measures to the side picks this.
	Box 6	Outside the triangle. The 125° angle is obtuse. The circumcenter of an obtuse triangle is outside it.	“Inside the triangle.” goes to box 2. A student who still thinks a “center” must be in the middle picks this.

How to check any box. For a distance: the circumcenter is the same distance from all three corners, so find a given length that ends at a corner. For a place: find the largest angle. Less than 90° means inside, exactly 90° means the middle of the longest side, and more than 90° means outside.

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.