

ANSWER MAZE

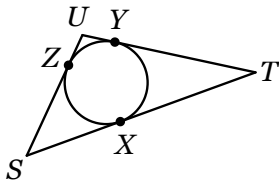
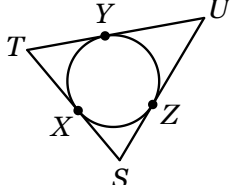


TANGENT SEGMENTS AND INSCRIBED AND CIRCUMSCRIBED CIRCLES

Tangent Segments Round an Inscribed Circle

Two pieces from each corner · one page · 10–15 minutes · nothing to prepare

FREE

	5 Find TX. $ST = 22$, $TU = 16$ and $US = 12$. 11 → go to box 3 13 → go to box 2 <i>Hint: Find the corner this piece starts from. Which side is across from that corner?</i>
	2 Find the perimeter. $SZ = 9$, $TX = 11$ and $UZ = 14$. 34 → go to box 6 68 → go to box 7 <i>Hint: Count the pieces round the outline of the triangle. How many start at each corner?</i>

1. **Hand out page 3**, one per student. No calculator is needed.
2. **Say this once:** *“Start at box 5. The two pieces from one corner of the triangle are equal. Label them first. 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 4 1 8**: six boxes, then out.

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

Every box shows a triangle STU with its inscribed circle. The circle touches ST at X, TU at Y and US at Z, and each side is tangent to it. Two tangent segments from one point are equal, so the two pieces from each corner are equal: $SX = SZ$, $TX = TY$ and $UY = UZ$. Some boxes give the three sides and ask for one piece. Some give one piece from each corner and ask for the perimeter, which is twice their sum. Some give two sides and one piece, and the student goes round the triangle from corner to corner. Every answer is a whole number.

Every wrong answer comes from one of two mistakes. In the first, the student pairs the two pieces of one side, which meet at its point of tangency (the dot X, Y or Z), as if that point were the middle of the side. These wrong answers send the student to box 3. In the second, the student adds the three given pieces once, when each corner has two pieces. 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 larger number, goes wrong within the first four boxes. This sheet calls a circle inscribed in a triangle when it is inside the triangle and each side is tangent to it. Some textbooks use other definitions, so tell the class which ones this sheet uses.



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 — two pieces from each corner

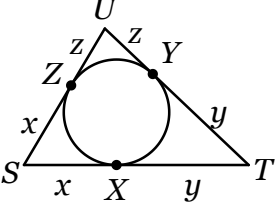
Start at box 5

Name _____

Period _____

Date _____

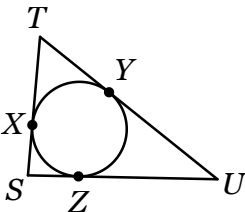
Start at box 5. Every answer is a whole number. Pick one answer and go to the box it names. Write each box number in the row at the bottom as you go.



The circle is inscribed in the triangle. It is inside the triangle and each side is tangent to it. The dots X, Y and Z are the points of tangency.

Two tangent segments from one point are equal. So the two pieces from S are both x , the two from T are both y , and the two from U are both z .

Each side is its two pieces added. So $ST = x + y$.



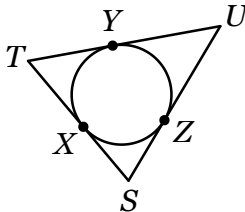
1 Find TY.

$ST = 11$, $TU = 18$ and $US = 15$.

7 → go to box 8

9 → go to box 3

Hint: Label the pieces by corner first. Write each side as a sum of two letters.



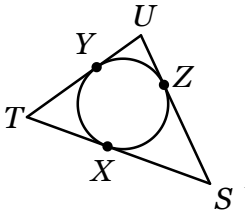
2 Find the perimeter.

$SZ = 9$, $TX = 11$ and $UZ = 14$.

34 → go to box 6

68 → go to box 7

Hint: Count the pieces round the outline of the triangle. How many start at each corner?



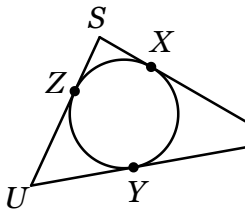
3 Find SX.

$TU = 18$, $US = 21$ and $TY = 11$.

10 → go to box 5

14 → go to box 2

Hint: Look at the two pieces at each dot. Which corner does each of them run from?



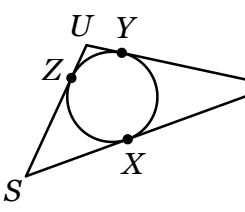
4 Find the perimeter.

$SX = 4$, $TX = 10$ and $UZ = 7$.

42 → go to box 1

21 → go to box 6

Hint: Label all six pieces with the letters of the strip. Then add the outline.



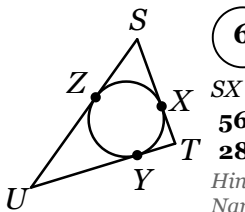
5 Find TX.

$ST = 22$, $TU = 16$ and $US = 12$.

11 → go to box 3

13 → go to box 2

Hint: Find the corner this piece starts from. Which side is across from that corner?



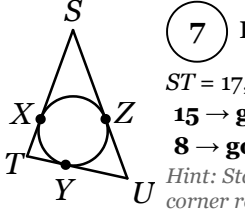
6 Find the perimeter.

$SX = 9$, $TY = 5$ and $UZ = 14$.

56 → go to box 7

28 → go to box 2

Hint: Trace the whole outline with a pencil. Name every piece on the way round.



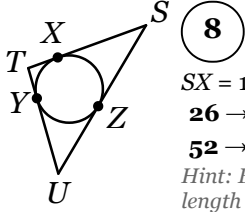
7 Find UY.

$ST = 17$, $US = 20$ and $TX = 5$.

15 → go to box 3

8 → go to box 4

Hint: Start at the given piece. Go from corner to corner round the triangle.



8 Find the perimeter.

$SX = 12$, $TX = 4$ and $UZ = 10$.

26 → go to box 6

52 → you are out

Hint: Each corner has two pieces. Write the length of every piece on the drawing.

Write every box number here, in order.

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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 → 4 → 1 → 8 → out

	The box's question	Right answer, and why	Wrong answer, and why a student picks it
1	Box 5 $ST = 22$, $TU = 16$ and $US = 12$. Find TX .	13. Half the perimeter is $(22 + 16 + 12) \div 2 = 25$. TX is a tangent segment from T, and the side across from T is $US = 12$. So $TX = 25 - 12 = 13$.	"11" goes to box 3. 11 is half of $ST = 22$. The student took the dot as the middle of ST . The two pieces of one side belong to two different corners.
2	Box 2 $SZ = 9$, $TX = 11$ and $UZ = 14$. Find the perimeter.	68. Each corner has two equal pieces, so each of 9, 11, 14 is used twice: $2 \times (9 + 11 + 14) = 68$.	"34" goes to box 6. 34 adds each length once. The triangle has six pieces, two from each corner.
3	Box 7 $ST = 17$, $US = 20$ and $TX = 5$. Find UY .	8. The other piece of ST is $17 - 5 = 12$. It is from S, so $SZ = 12$ too. The rest of US is $20 - 12 = 8$, and it is from U, so $UY = 8$.	"15" goes to box 3. $15 = 20 - 5$. The student paired TX with the piece next to it at the dot on ST . Those two pieces belong to two different corners.
4	Box 4 $SX = 4$, $TX = 10$ and $UZ = 7$. Find the perimeter.	42. Each corner has two equal pieces, so each of 4, 10, 7 is used twice: $2 \times (4 + 10 + 7) = 42$.	"21" goes to box 6. 21 adds each length once. The triangle has six pieces, two from each corner.
5	Box 1 $ST = 11$, $TU = 18$ and $US = 15$. Find TY .	7. Half the perimeter is $(11 + 18 + 15) \div 2 = 22$. TY is a tangent segment from T, and the side across from T is $US = 15$. So $TY = 22 - 15 = 7$.	"9" goes to box 3. 9 is half of $TU = 18$. The student took the dot as the middle of TU . The two pieces of one side belong to two different corners.
6	Box 8 $SX = 12$, $TX = 4$ and $UZ = 10$. Find the perimeter.	52. Each corner has two equal pieces, so each of 12, 4, 10 is used twice: $2 \times (12 + 4 + 10) = 52$.	"26" goes to box 6. 26 adds each length once. The triangle has six pieces, two from each corner.
	Box 3 $TU = 18$, $US = 21$ and $TY = 11$. Find SX .	14. The other piece of TU is $18 - 11 = 7$. It is from U, so $UZ = 7$ too. The rest of US is $21 - 7 = 14$, and it is from S, so $SX = 14$.	"10" goes to box 5. $10 = 21 - 11$. The student paired TY with the piece next to it at the dot on TU . Those two pieces belong to two different corners.
	Box 6 $SX = 9$, $TY = 5$ and $UZ = 14$. Find the perimeter.	56. Each corner has two equal pieces, so each of 9, 5, 14 is used twice: $2 \times (9 + 5 + 14) = 56$.	"28" goes to box 2. 28 adds each length once. The triangle has six pieces, two from each corner.

How to check any box. Label the two pieces from S with one letter, the two from T with a second and the two from U with a third. Each side is the sum of its two letters. The answer must rebuild every number the box gives.

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.