

# ANSWER MAZE



## THE TRIANGLE MIDSEGMENT THEOREM

Did You Find the Length, or Just  $x$ ?

One page · 10–15 minutes · nothing to prepare

FREE

3

$XY = 13$ . How long is  $SU$ ?

**$SU = 6.5 \rightarrow$  go to 2**

**$SU = 26 \rightarrow$  go to 6**

*Find the side that  $XY$  does not touch. Which of the two is the long one?*

6

$YZ = x + 4$  and  $ST = 3x - 2$ . How long is  $YZ$ ?

**$YZ = 14 \rightarrow$  go to 1**

**$YZ = 10 \rightarrow$  go to 5**

*Solve for  $x$  first. Then put  $x$  back into the length the question names.*

1. **Hand out page 3**, one per student. Nothing else is needed.
2. **Say this once:** *“Start at box 3. Before any arithmetic, say which length is the long one and which is the short one. Every question asks for a length, not for  $x$ . Write every box number in the row at the bottom as you go.”*
3. **Check a sheet quickly.** A student with no mistakes writes **3 6 1 8 4 7**: six boxes, then out.

|                      |                                                                                                     |
|----------------------|-----------------------------------------------------------------------------------------------------|
| <b>Student sheet</b> | page 3, one per student. One triangle at the top, with its three midsegments, is used by every box. |
| <b>Answers</b>       | page 4.                                                                                             |

**Every wrong answer comes from one of two mistakes.** The first is going the wrong way. A midsegment is half as long as the side it does not touch. So from the midsegment to the side, the student doubles, and from the side to the midsegment, the student halves. Many students halve every time. These wrong answers send the student to box 2.

The second mistake is stopping at  $x$ . In the algebra boxes, the midsegment and the side are given as expressions. The student must double the midsegment's expression and set it equal to the side's:  $2(\text{midsegment}) = \text{side}$ . Setting the two expressions equal to each other is a common mistake too. After solving, the student puts  $x$  back in to get the length. The value of  $x$  is always the wrong answer offered. These wrong answers send the student to box 5. Boxes 2 and 5 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 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.  
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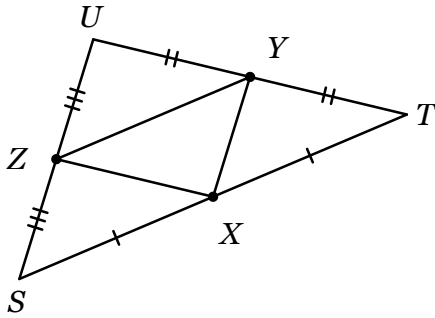
# Answer Maze

Start at box 3 · the midsegment theorem

Name \_\_\_\_\_

Period \_\_\_\_\_

Date \_\_\_\_\_



X, Y and Z are the midpoints of the three sides. XY, YZ and ZX are **midsegments**.

A midsegment is **half** as long as the side it does not touch. XY does not touch SU.

Every box uses this triangle. Every question asks for a **length**. Choose an answer, and go to the box it names.

1

TU = 31. How long is ZX?

**ZX = 15.5 → go to 8**

**ZX = 62 → go to 2**

*ZX runs beside TU and does not touch it. Which one is the short one?*

2

YZ = 6.5. How long is ST?

**ST = 3.25 → go to 3**

**ST = 13 → go to 6**

*Put a finger on YZ. Which side of the triangle does it not touch?*

3

XY = 13. How long is SU?

**SU = 6.5 → go to 2**

**SU = 26 → go to 6**

*Find the side that XY does not touch. Which of the two is the long one?*

4

ST = 17. How long is YZ?

**YZ = 34 → go to 2**

**YZ = 8.5 → go to 7**

*Say which of ST and YZ is the long one before any arithmetic.*

5

XY =  $x + 1$  and SU =  $4x - 10$ . How long is SU?

**SU = 14 → go to 1**

**SU = 6 → go to 6**

*Solve for  $x$ . Then find the length the question asks for, not  $x$ .*

6

YZ =  $x + 4$  and ST =  $3x - 2$ . How long is YZ?

**YZ = 14 → go to 1**

**YZ = 10 → go to 5**

*Solve for  $x$  first. Then put  $x$  back into the length the question names.*

7

XY =  $x - 4$  and SU =  $x + 7$ . How long is XY?

**XY = 11 → you are out**

**XY = 15 → go to 5**

*The value of  $x$  is a step on the way. Put it into the expression for XY.*

8

ZX =  $2x - 3$  and TU =  $3x + 2$ . How long is TU?

**TU = 8 → go to 5**

**TU = 26 → go to 4**

*Read the question again. Which segment does it ask for?*

Write each box number as you reach it:

|  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|--|



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The route, in order. Boxes 2 and 5 are not on it. A student reaches them only by a wrong answer. They are the last two rows of the table.

**3 → 6 → 1 → 8 → 4 → 7 → out**

|   | Box                                                               | Right answer, and why                                                                                                       | Wrong answer, and why a student picks it                                                          |
|---|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 1 | <b>Box 3</b><br>XY = 13. How long is SU?                          | <b>SU = 26.</b> XY is the midsegment and SU is the side it does not touch, so SU is twice XY: $2 \times 13 = 26$ .          | "SU = 6.5" goes to box 2. A student who halves the midsegment instead of doubling it picks this.  |
| 2 | <b>Box 6</b><br>YZ = $x + 4$ and ST = $3x - 2$ . How long is YZ?  | <b>YZ = 14.</b> ST is twice YZ, so $2(x + 4) = 3x - 2$ , which gives $x = 10$ . Then $YZ = x + 4 = 14$ .                    | "YZ = 10" goes to box 5. A student who solves for x and stops there picks this. 10 is x, not YZ.  |
| 3 | <b>Box 1</b><br>TU = 31. How long is ZX?                          | <b>ZX = 15.5.</b> TU is the side and ZX is the midsegment that does not touch it, so ZX is half of TU: $31 \div 2 = 15.5$ . | "ZX = 62" goes to box 2. A student who doubles the side instead of halving it picks this.         |
| 4 | <b>Box 8</b><br>ZX = $2x - 3$ and TU = $3x + 2$ . How long is TU? | <b>TU = 26.</b> TU is twice ZX, so $2(2x - 3) = 3x + 2$ , which gives $x = 8$ . Then $TU = 3x + 2 = 26$ .                   | "TU = 8" goes to box 5. A student who solves for x and stops there picks this. 8 is x, not TU.    |
| 5 | <b>Box 4</b><br>ST = 17. How long is YZ?                          | <b>YZ = 8.5.</b> ST is the side and YZ is the midsegment that does not touch it, so YZ is half of ST: $17 \div 2 = 8.5$ .   | "YZ = 34" goes to box 2. A student who doubles the side instead of halving it picks this.         |
| 6 | <b>Box 7</b><br>XY = $x - 4$ and SU = $x + 7$ . How long is XY?   | <b>XY = 11.</b> SU is twice XY, so $2(x - 4) = x + 7$ , which gives $x = 15$ . Then $XY = x - 4 = 11$ .                     | "XY = 15" goes to box 5. A student who solves for x and stops there picks this. 15 is x, not XY.  |
|   | <b>Box 2</b><br>YZ = 6.5. How long is ST?                         | <b>ST = 13.</b> YZ is the midsegment and ST is the side it does not touch, so ST is twice YZ: $2 \times 6.5 = 13$ .         | "ST = 3.25" goes to box 3. A student who halves the midsegment instead of doubling it picks this. |
|   | <b>Box 5</b><br>XY = $x + 1$ and SU = $4x - 10$ . How long is SU? | <b>SU = 14.</b> SU is twice XY, so $2(x + 1) = 4x - 10$ , which gives $x = 6$ . Then $SU = 4x - 10 = 14$ .                  | "SU = 6" goes to box 6. A student who solves for x and stops there picks this. 6 is x, not SU.    |

**How to check any box.** Find the midsegment in the question and the side it does not touch: XY with SU, YZ with ST, ZX with TU. The side is twice as long as the midsegment. In an algebra box, write  $2(\text{midsegment}) = \text{side}$ , solve for x, and then put x into the expression for the length the question asks for.

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.