

ANSWER MAZE



INDIRECT MEASUREMENT WITH SIMILAR TRIANGLES

Eyes or the Top of the Head?

One page · 10–15 minutes · nothing to prepare

FREE

4

The sun shines on level ground. Mia is 1.6 m tall. Her shadow is 2 m long. At the same moment, the shadow of a tree is 20 m long.

Draw the two triangles. How tall is the tree?

25 m → **go to box 3**

16 m → **go to box 7**

Hint: Which number is Mia's height, and which is her shadow?

7

A mirror lies flat on level ground. Leo sees the top of a tower in it. Leo is 1.6 m tall, and his eyes are 1.5 m above the ground. The mirror is 2 m from his feet and 20 m from the base of the tower.

Draw the two triangles. How tall is the tower?

15 m → **go to box 1**

16 m → **go to box 6**

Hint: Where does the line of sight start? Look at Leo's two heights.

1. **Hand out page 3**, one per student. Nothing else is needed.
2. **Say this once:** *“Start at box 4. In every box, draw the two triangles first. Heights go with heights. In a mirror, use the height of the eyes. 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 1 2 8 5**: six boxes, then out.

Student sheet	page 3, one per student, and scrap paper for the drawings. No box has a drawing.
Answers	page 4.

Every wrong answer comes from one of two mistakes. The first is in the sun boxes. A student puts the person’s shadow where the person’s height belongs, so a height is matched with a shadow. These wrong answers send the student to box 3.

The second mistake is in the mirror boxes. Each mirror box gives the person’s height and the height of the person’s eyes. The line of sight starts at the eyes, so the eye height is the side of the triangle. A student who uses the full height gets an answer a little too big, and it looks believable. 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 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 — how tall, how far?

Start at box 4

Name _____

Period _____

Date _____

Start at box 4. Draw the two triangles on scrap paper. Pick one answer and go to the box it names. Write each box number in the row at the bottom as you go.

1

The sun shines on level ground. Tom is 1.6 m tall. His shadow is 1.2 m long. A tree nearby is 12 m tall.
Draw the two triangles. How long is the tree's shadow?

9 m → go to box 2

16 m → go to box 3

Hint: Put the two heights in one ratio and the two shadows in the other.

2

A mirror lies flat on level ground. Ana sees the top of a tower in it. Ana is 1.6 m tall, and her eyes are 1.5 m above the ground. The mirror is 2 m from her feet. The tower is 24 m tall.

Draw the two triangles. How far is the mirror from the base of the tower?

30 m → go to box 6

32 m → go to box 8

Hint: Which point of Ana is a corner of her triangle?

3

The sun shines on level ground. A post is 2 m tall. Its shadow is 3 m long. At the same moment, the shadow of a building is 24 m long.

Draw the two triangles. How tall is the building?

16 m → go to box 7

36 m → go to box 4

Hint: Which length is the post's height, and which is its shadow?

4

The sun shines on level ground. Mia is 1.6 m tall. Her shadow is 2 m long. At the same moment, the shadow of a tree is 20 m long.

Draw the two triangles. How tall is the tree?

25 m → go to box 3

16 m → go to box 7

Hint: Which number is Mia's height, and which is her shadow?

5

A mirror lies flat on level ground. Nia sees the top of a chimney in it. Nia is 1.5 m tall, and her eyes are 1.4 m above the ground. The mirror is 1 m from her feet and 20 m from the base of the chimney.

Draw the two triangles. How tall is the chimney?

28 m → you are out

30 m → go to box 6

Hint: Which of Nia's heights starts the line to the mirror?

6

A mirror lies flat on level ground. Kai sees the top of a mast in it. Kai is 1.7 m tall, and his eyes are 1.6 m above the ground. The mirror is 2 m from his feet and 20 m from the base of the mast.

Draw the two triangles. How tall is the mast?

17 m → go to box 7

16 m → go to box 1

Hint: Look at Kai's two heights. Where does the line of sight start?

7

A mirror lies flat on level ground. Leo sees the top of a tower in it. Leo is 1.6 m tall, and his eyes are 1.5 m above the ground. The mirror is 2 m from his feet and 20 m from the base of the tower.

Draw the two triangles. How tall is the tower?

15 m → go to box 1

16 m → go to box 6

Hint: Where does the line of sight start? Look at Leo's two heights.

8

The sun shines on level ground. Sam is 1.8 m tall. His shadow is 0.9 m long. At the same moment, the shadow of a flagpole is 10 m long.

Draw the two triangles. How tall is the flagpole?

5 m → go to box 3

20 m → go to box 5

Hint: Which of Sam's lengths goes with the flagpole's height?

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.

4 → 7 → 1 → 2 → 8 → 5 → out

	The box's question	Right answer, and why	Wrong answer, and why a student picks it
1	Box 4 The sun shines on level ground. Mia is 1.6 m tall. Her shadow is 2 m long. At the same moment, the shadow of a tree is 20 m long. How tall is the tree?	16 m. Height goes with height and shadow with shadow: the height $\div 1.6 = 20 \div 2$. So the tree is $1.6 \times 20 \div 2 = 16$ m tall.	"25 m" goes to box 3. A student who puts Mia's shadow where the height belongs gets $2 \times 20 \div 1.6 = 25$.
2	Box 7 A mirror lies flat on level ground. Leo sees the top of a tower in it. Leo is 1.6 m tall, and his eyes are 1.5 m above the ground. The mirror is 2 m from his feet and 20 m from the base of the tower. How tall is the tower?	15 m. The line of sight starts at the eyes, so the eye height goes with the tower's height, and mirror to feet goes with mirror to base. So the tower is $1.5 \times 20 \div 2 = 15$ m tall.	"16 m" goes to box 6. A student who uses Leo's full height (1.6 m) gets $1.6 \times 20 \div 2 = 16$.
3	Box 1 The sun shines on level ground. Tom is 1.6 m tall. His shadow is 1.2 m long. A tree nearby is 12 m tall. How long is the tree's shadow?	9 m. Shadow goes with shadow and height with height: the shadow $\div 1.2 = 12 \div 1.6$. So the shadow is $1.2 \times 12 \div 1.6 = 9$ m long.	"16 m" goes to box 3. A student who swaps Tom's height and shadow gets $1.6 \times 12 \div 1.2 = 16$.
4	Box 2 A mirror lies flat on level ground. Ana sees the top of a tower in it. Ana is 1.6 m tall, and her eyes are 1.5 m above the ground. The mirror is 2 m from her feet. The tower is 24 m tall. How far is the mirror from the base of the tower?	32 m. The line of sight starts at the eyes, so the eye height goes with the tower's height, and mirror to feet goes with mirror to base. So the distance is $2 \times 24 \div 1.5 = 32$ m.	"30 m" goes to box 6. A student who uses Ana's full height (1.6 m) gets $2 \times 24 \div 1.6 = 30$.
5	Box 8 The sun shines on level ground. Sam is 1.8 m tall. His shadow is 0.9 m long. At the same moment, the shadow of a flagpole is 10 m long. How tall is the flagpole?	20 m. Height goes with height and shadow with shadow: the height $\div 1.8 = 10 \div 0.9$. So the flagpole is $1.8 \times 10 \div 0.9 = 20$ m tall.	"5 m" goes to box 3. A student who puts Sam's shadow where the height belongs gets $0.9 \times 10 \div 1.8 = 5$.
6	Box 5 A mirror lies flat on level ground. Nia sees the top of a chimney in it. Nia is 1.5 m tall, and her eyes are 1.4 m above the ground. The mirror is 1 m from her feet and 20 m from the base of the chimney. How tall is the chimney?	28 m. The line of sight starts at the eyes, so the eye height goes with the chimney's height, and mirror to feet goes with mirror to base. So the chimney is $1.4 \times 20 \div 1 = 28$ m tall.	"30 m" goes to box 6. A student who uses Nia's full height (1.5 m) gets $1.5 \times 20 \div 1 = 30$.
	Box 3 The sun shines on level ground. A post is 2 m tall. Its shadow is 3 m long. At the same moment, the shadow of a building is 24 m long. How tall is the building?	16 m. Height goes with height and shadow with shadow: the height $\div 2 = 24 \div 3$. So the building is $2 \times 24 \div 3 = 16$ m tall.	"36 m" goes to box 4. A student who puts the post's shadow where the height belongs gets $3 \times 24 \div 2 = 36$.
	Box 6 A mirror lies flat on level ground. Kai sees the top of a mast in it. Kai is 1.7 m tall, and his eyes are 1.6 m above the ground. The mirror is 2 m from his feet and 20 m from the base of the mast. How tall is the mast?	16 m. The line of sight starts at the eyes, so the eye height goes with the mast's height, and mirror to feet goes with mirror to base. So the mast is $1.6 \times 20 \div 2 = 16$ m tall.	"17 m" goes to box 7. A student who uses Kai's full height (1.7 m) gets $1.7 \times 20 \div 2 = 17$.

How to check any box. Draw the two triangles apart, turned the same way. In the sun, each triangle is an object's height and its shadow. With a mirror, the person's triangle is the eye height and the distance from the mirror to the feet. Divide a length of the big triangle by the matching length of the small one, and use that number.

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.