

SCAVENGER HUNT



30-60-90 SPECIAL RIGHT TRIANGLES

30-60-90 Triangles: Find the Shorter Leg First

All six ways round the triangle · half an equilateral triangle · the cards check the answers

FREE

ANSWER

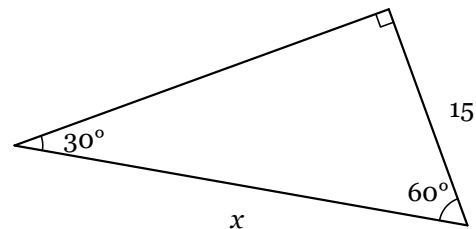
22

This is a 30-60-90 triangle.

Find x .

Find the shorter leg first.

Point to the 30° angle. The side across from it is the shorter leg.



F

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1. **Tape the 16 cards around the room**, in any order. Each card has a large letter in its bottom left corner. Start each group at a *different* one of these eight cards: *F N A J G P K Q*.
2. **Say this once:** *“Find the shorter leg first. It is across from the 30° angle. Write your answer exactly, like $9\sqrt{3}$. Then walk to the card with that answer at the top.”*
3. **Each group writes one line per card.** Eight right answers bring the group back to its first card.

16 cards	pages 3–10, one copy. There are two cards on each sheet. Cut the whole stack once.
Record sheet	page 11, one per student. It shows the rule as a labeled triangle.
Answers	pages 12–13, for you only. Do not put them up in the room.

Every card shows a 30-60-90 triangle drawn to scale, turned a different way, with its angles marked. On four of the cards it is half of an equilateral triangle, cut by the altitude. One side has its length, and the side marked x is the one to find. The shorter leg is across from the 30° angle, the longer leg is across from the 60° angle, and the hypotenuse is across from the right angle. The longer leg is the shorter leg times $\sqrt{3}$. The hypotenuse is the shorter leg times 2.

Eight of the sixteen cards make the ring. A group reaches the other eight only by a wrong answer, but all the cards look the same. There are two mistakes. In the first, the $\sqrt{3}$ and the 2 trade places: the hypotenuse is taken as the shorter leg times $\sqrt{3}$, or the longer leg as the shorter leg times 2. In the second, the student starts from the given side as if it were the shorter leg: the longer leg is doubled, or the whole side of the equilateral triangle is multiplied by $\sqrt{3}$. Each of these lands on a card off the ring. That card sends the group back to the card it got wrong.

The check is the length of the group’s list. A clean run is **eight lines**. Each wrong answer adds two. Every card has a line in italics under its question. It tells a group that arrived by a wrong answer what to check. A group that arrived by a right answer skips it. If a group keeps coming back to the same cards, do not give the answer. Ask: *“Point to the 30° angle. Which side is across from it? How long is that side?”*



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

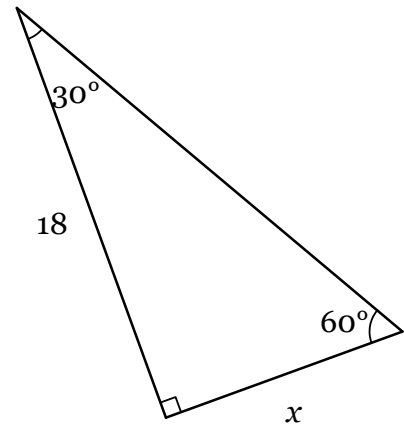
$$7\sqrt{3}$$

This is a 30-60-90 triangle.

Find x .

Find the shorter leg first.

Is the answer shorter than the side you start from? It should be.



A

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ANSWER

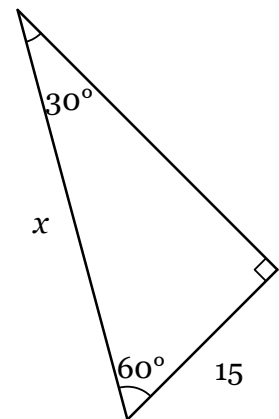
$$14\sqrt{3}$$

This is a 30-60-90 triangle.

Find x .

Find the shorter leg first.

The altitude cuts the side it meets in half. Which part is the shorter leg?



B

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ANSWER

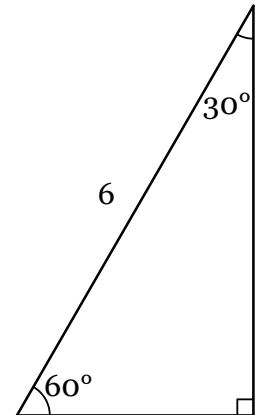
$22\sqrt{3}$

This is a 30-60-90 triangle.

Find x .

Find the shorter leg first.

An altitude is a leg. Which leg is it, and what is the shorter leg?



x

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C

ANSWER

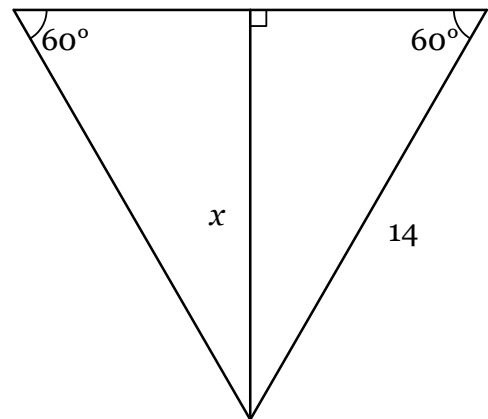
9

The big triangle is equilateral. The altitude cuts it in half.

Find x .

Find the shorter leg first.

The longest side is exactly twice the shortest side. Check your numbers.



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D

ANSWER

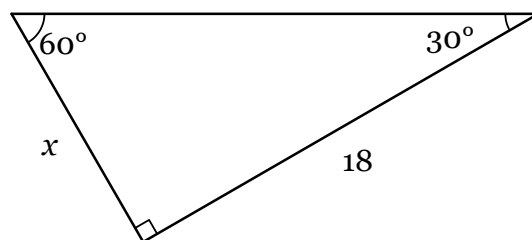
$$8\sqrt{3}$$

This is a 30-60-90 triangle.

Find x .

Find the shorter leg first.

Find the shorter leg first. Every other side is one step from it.



E

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ANSWER

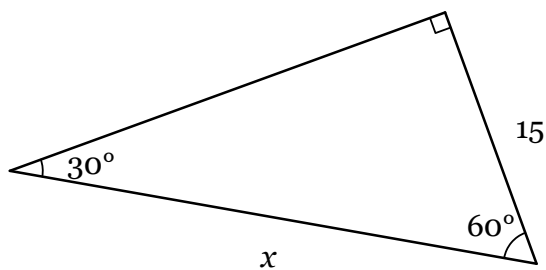
$$22$$

This is a 30-60-90 triangle.

Find x .

Find the shorter leg first.

Point to the 30° angle. The side across from it is the shorter leg.



F

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ANSWER

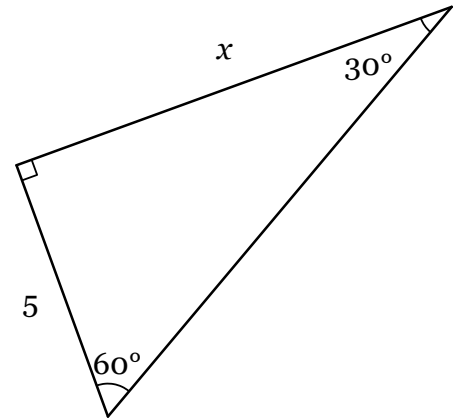
$$4\sqrt{3}$$

This is a 30-60-90 triangle.

Find x .

Find the shorter leg first.

The $\sqrt{3}$ belongs to the longer leg. The 2 belongs to the hypotenuse.



G

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ANSWER

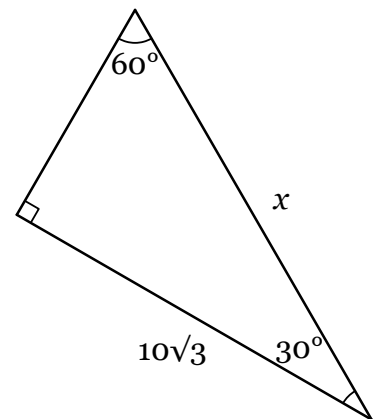
$$2\sqrt{3}$$

This is a 30-60-90 triangle.

Find x .

Find the shorter leg first.

Is $\sqrt{3}$ bigger than 2? No, it is about 1.73.



H

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ANSWER

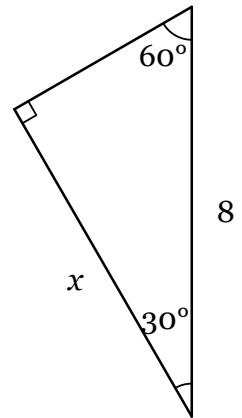
$$6\sqrt{3}$$

This is a 30-60-90 triangle.

Find x .

Find the shorter leg first.

From the hypotenuse, take half first. Then multiply by $\sqrt{3}$.



J

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ANSWER

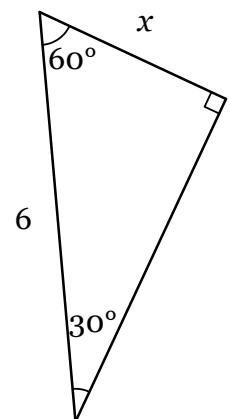
$$20$$

This is a 30-60-90 triangle.

Find x .

Find the shorter leg first.

Check the order of your three sides: short, then longer, then the hypotenuse.



K

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ANSWER

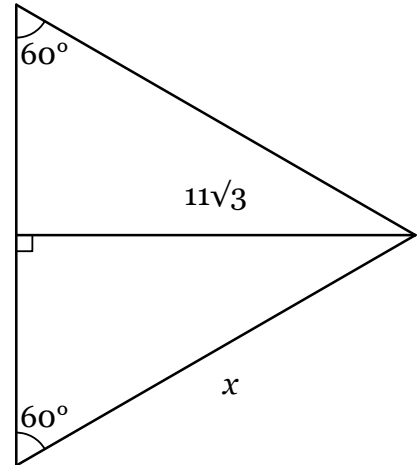
$$15\sqrt{3}$$

The big triangle is equilateral. The altitude cuts it in half.

Find x .

Find the shorter leg first.

Does the $\sqrt{3}$ go on the hypotenuse? Check which side gets the 2.



L

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ANSWER

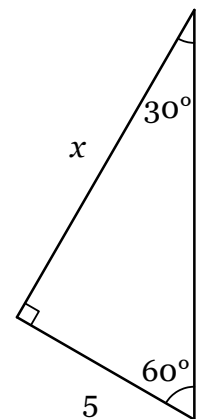
$$20\sqrt{3}$$

This is a 30-60-90 triangle.

Find x .

Find the shorter leg first.

Only the shorter leg doubles to make the hypotenuse. The longer leg never doubles.



M

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ANSWER

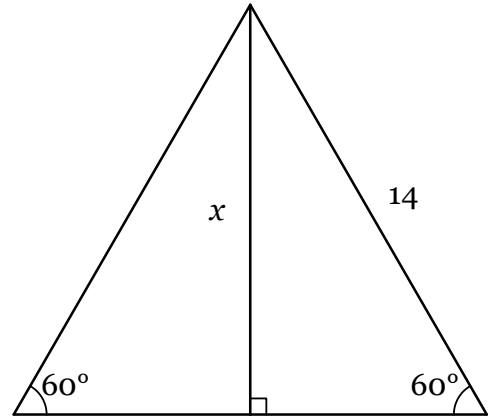
30

The big triangle is equilateral. The altitude cuts it in half.

Find x .

Find the shorter leg first.

Half of the side of an equilateral triangle is the shorter leg.



N

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ANSWER

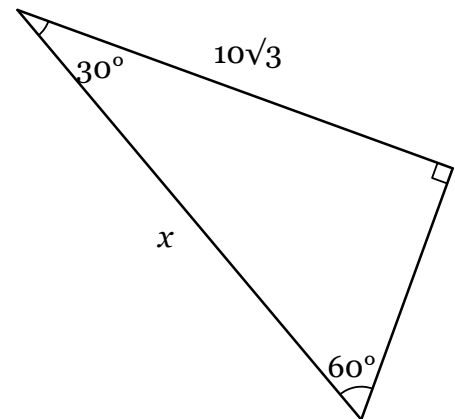
$5\sqrt{3}$

This is a 30-60-90 triangle.

Find x .

Find the shorter leg first.

Which leg touches the 30° angle? That one is the longer leg.



P

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ANSWER

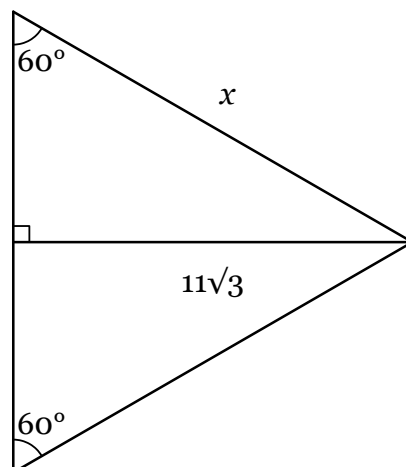
3

The big triangle is equilateral. The altitude cuts it in half.

Find x .

Find the shorter leg first.

Is the altitude shorter than the side of the triangle? It always is.



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Q

ANSWER

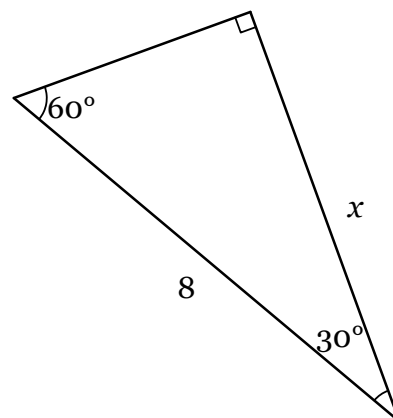
10

This is a 30-60-90 triangle.

Find x .

Find the shorter leg first.

Which side is across from the 60° angle? It gets the $\sqrt{3}$.



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R

Scavenger Hunt — where I went

30-60-90 triangles

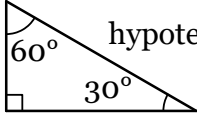
Name _____

Period _____

Date _____

Write the shorter leg first, then your answer. **Write the answer exactly, like $9\sqrt{3}$.** Then find the card with your answer at the top. A clean run is eight lines. Each card has a line in italics under its question.

If you are on a card because you went wrong, its line says what to check. If you were right, skip it.



Find the shorter leg first. It is across from the 30° angle.

longer leg = shorter leg $\times \sqrt{3}$ hypotenuse = shorter leg $\times 2$

$\sqrt{3} \approx 1.73$, so the longer leg is shorter than the hypotenuse.

Card letter	The shorter leg	My answer for x
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

What does a 30-60-90 triangle like to drink?

Every number stands for a letter. Write the letter for each answer in the box above its number. Read the boxes you filled, left to right. **If they do not spell the answer, one of your answers is wrong.**

3 = R $2\sqrt{3}$ = E $4\sqrt{3}$ = O $5\sqrt{3}$ = O 9 = O 10 = T $6\sqrt{3}$ = T $7\sqrt{3}$ = B $8\sqrt{3}$ = R 20 = E 22 = E $14\sqrt{3}$ = B $15\sqrt{3}$ = E
 30 = R $20\sqrt{3}$ = R $22\sqrt{3}$ = O

3	$2\sqrt{3}$	$4\sqrt{3}$	$5\sqrt{3}$	9	10	$6\sqrt{3}$	$7\sqrt{3}$	$8\sqrt{3}$	20	22	$14\sqrt{3}$	$15\sqrt{3}$	30	$20\sqrt{3}$	$22\sqrt{3}$	



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Scavenger Hunt — answers

For the teacher

The ring in order, with the answer found on each card. A group may begin anywhere on it. Wherever it begins, eight right answers bring it back to that card.

F (30) → N ($7\sqrt{3}$) → A ($6\sqrt{3}$) → J ($4\sqrt{3}$) → G ($5\sqrt{3}$) → P (20) → K (3) → Q (22) → F

What does a 30-60-90 triangle like to drink? The answer is *ROOT BEER!* It is read along the boxes of the record sheet, which run from the smallest number to the largest. ($\sqrt{3}$ is about 1.73, so $7\sqrt{3}$ is about 12.1.)

Card	The question on the card	Answer, and why	The common wrong answer on this card, and why	Letter of its top
1 F	A 30-60-90 triangle. The shorter leg is 15. Find x, the hypotenuse.	30. The 15 is across from the 30° angle, so it is the shorter leg. x is the hypotenuse: $2 \times 15 = 30$.	$15\sqrt{3}$. The $\sqrt{3}$ is put on the hypotenuse: $15 \times \sqrt{3} = 15\sqrt{3}$.	E
2 N	An equilateral triangle with its altitude. The side is 14. Find x, the altitude.	$7\sqrt{3}$. The altitude cuts the equilateral triangle into two 30-60-90 triangles. The side 14 is a hypotenuse, so the shorter leg is half of it, 7. The altitude is the longer leg: $7 \times \sqrt{3} = 7\sqrt{3}$.	$14\sqrt{3}$. The whole side is used as the shorter leg: $14 \times \sqrt{3} = 14\sqrt{3}$.	R
3 A	A 30-60-90 triangle. The longer leg is 18. Find x, the shorter leg.	$6\sqrt{3}$. The 18 is across from the 60° angle, so it is the longer leg. The shorter leg is $18 \div \sqrt{3} = 18\sqrt{3} \div 3 = 6\sqrt{3}$. So $x = 6\sqrt{3}$.	9. The longer leg is taken as twice the shorter leg: $18 \div 2 = 9$.	B
4 J	A 30-60-90 triangle. The hypotenuse is 8. Find x, the longer leg.	$4\sqrt{3}$. The 8 is across from the right angle, so it is the hypotenuse. The shorter leg is half of it, 4. x is across from the 60° angle: $4 \times \sqrt{3} = 4\sqrt{3}$.	$8\sqrt{3}$. The hypotenuse is multiplied by $\sqrt{3}$ with no halving first: $8 \times \sqrt{3} = 8\sqrt{3}$.	T
5 G	A 30-60-90 triangle. The shorter leg is 5. Find x, the longer leg.	$5\sqrt{3}$. The 5 is across from the 30° angle, so it is the shorter leg. x is across from the 60° angle: $5 \times \sqrt{3} = 5\sqrt{3}$.	10. The 2 is put on the longer leg: $2 \times 5 = 10$.	O
6 P	A 30-60-90 triangle. The longer leg is $10\sqrt{3}$. Find x, the hypotenuse.	20. The $10\sqrt{3}$ is across from the 60° angle, so it is the longer leg. The shorter leg is $10\sqrt{3} \div \sqrt{3} = 10$. x is the hypotenuse: $2 \times 10 = 20$.	$20\sqrt{3}$. The longer leg is doubled: $2 \times 10\sqrt{3} = 20\sqrt{3}$. Only the shorter leg doubles.	O
7 K	A 30-60-90 triangle. The hypotenuse is 6. Find x, the shorter leg.	3. The 6 is across from the right angle, so it is the hypotenuse. The shorter leg is half of it, 3. So $x = 3$.	$2\sqrt{3}$. The hypotenuse is taken as the shorter leg times $\sqrt{3}$: $6 \div \sqrt{3} = 6\sqrt{3} \div 3 = 2\sqrt{3}$.	E
8 Q	An equilateral triangle with its altitude. The altitude is $11\sqrt{3}$. Find x, the side.	22. The altitude cuts the equilateral triangle into two 30-60-90 triangles. The altitude $11\sqrt{3}$ is the longer leg, so the shorter leg is $11\sqrt{3} \div \sqrt{3} = 11$. The side is the hypotenuse: $2 \times 11 = 22$.	$22\sqrt{3}$. The altitude is doubled as if it were the shorter leg: $2 \times 11\sqrt{3} = 22\sqrt{3}$.	R

Scavenger Hunt — the cards off the ring

For the teacher

A group reaches these eight cards only by a wrong answer. The number at the top of each one is the wrong answer from one ring card. Its right answer is the number at the top of that ring card, so the group goes to the card it got wrong and tries it again. If the group makes the same mistake here, it goes to another card off the ring. So a second wrong answer never moves a group forward.

Card	The question on the card	Answer, and why	The common wrong answer on this card, and why	Letter of its top
L	An equilateral triangle with its altitude. The altitude is $11\sqrt{3}$. Find x, the side.	22. The altitude cuts the equilateral triangle into two 30-60-90 triangles. The altitude $11\sqrt{3}$ is the longer leg, so the shorter leg is $11\sqrt{3} \div \sqrt{3} = 11$. The side is the hypotenuse: $2 \times 11 = 22$.	$22\sqrt{3}$. The altitude is doubled as if it were the shorter leg: $2 \times 11\sqrt{3} = 22\sqrt{3}$.	E
B	A 30-60-90 triangle. The shorter leg is 15. Find x, the hypotenuse.	30. The 15 is across from the 30° angle, so it is the shorter leg. x is the hypotenuse: $2 \times 15 = 30$.	$15\sqrt{3}$. The $\sqrt{3}$ is put on the hypotenuse: $15 \times \sqrt{3} = 15\sqrt{3}$.	B
D	An equilateral triangle with its altitude. The side is 14. Find x, the altitude.	$7\sqrt{3}$. The altitude cuts the equilateral triangle into two 30-60-90 triangles. The side 14 is a hypotenuse, so the shorter leg is half of it, 7. The altitude is the longer leg: $7 \times \sqrt{3} = 7\sqrt{3}$.	$14\sqrt{3}$. The whole side is used as the shorter leg: $14 \times \sqrt{3} = 14\sqrt{3}$.	O
E	A 30-60-90 triangle. The longer leg is 18. Find x, the shorter leg.	$6\sqrt{3}$. The 18 is across from the 60° angle, so it is the longer leg. The shorter leg is $18 \div \sqrt{3} = 18\sqrt{3} \div 3 = 6\sqrt{3}$. So $x = 6\sqrt{3}$.	9. The longer leg is taken as twice the shorter leg: $18 \div 2 = 9$.	R
R	A 30-60-90 triangle. The hypotenuse is 8. Find x, the longer leg.	$4\sqrt{3}$. The 8 is across from the right angle, so it is the hypotenuse. The shorter leg is half of it, 4. x is across from the 60° angle: $4 \times \sqrt{3} = 4\sqrt{3}$.	$8\sqrt{3}$. The hypotenuse is multiplied by $\sqrt{3}$ with no halving first: $8 \times \sqrt{3} = 8\sqrt{3}$.	T
M	A 30-60-90 triangle. The shorter leg is 5. Find x, the longer leg.	$5\sqrt{3}$. The 5 is across from the 30° angle, so it is the shorter leg. x is across from the 60° angle: $5 \times \sqrt{3} = 5\sqrt{3}$.	10. The 2 is put on the longer leg: $2 \times 5 = 10$.	R
H	A 30-60-90 triangle. The longer leg is $10\sqrt{3}$. Find x, the hypotenuse.	20. The $10\sqrt{3}$ is across from the 60° angle, so it is the longer leg. The shorter leg is $10\sqrt{3} \div \sqrt{3} = 10$. x is the hypotenuse: $2 \times 10 = 20$.	$20\sqrt{3}$. The longer leg is doubled: $2 \times 10\sqrt{3} = 20\sqrt{3}$. Only the shorter leg doubles.	E
C	A 30-60-90 triangle. The hypotenuse is 6. Find x, the shorter leg.	3. The 6 is across from the right angle, so it is the hypotenuse. The shorter leg is half of it, 3. So $x = 3$.	$2\sqrt{3}$. The hypotenuse is taken as the shorter leg times $\sqrt{3}$: $6 \div \sqrt{3} = 6\sqrt{3} \div 3 = 2\sqrt{3}$.	O

Other mistakes lead to no card. A group might multiply where it should divide, use $\times \sqrt{3} \div 2$ in place of $\div \sqrt{3}$, or copy the given number. Its answer is then not the number at the top of any card.