Constructing triangles

October 21, 2013

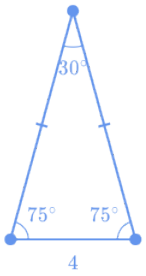
1 x0a2c8d4a7e3a85b9

How many triangles can be drawn where we know two angles and the side length between the two angles?

Ans None
Only one
More than one

Hint 1 Let's draw an example of a triangle where the side length is known between two angles. Let's look at when a side of length 4 is between a pair of 75° angles.

Hint 2 The other two sides can be drawn at 75° angles and are equal in length. The sides meet at a 30° angle to complete the triangle.



This triangle is unique, meaning no other triangle exists with the same shape and size.

Hint 3 When the side length is known between two known angles, only one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: 4a925246.. 2013-10-21

2 x18341f6f8d24d96e

How many triangles can be drawn with side lengths 9, 12 and 15?

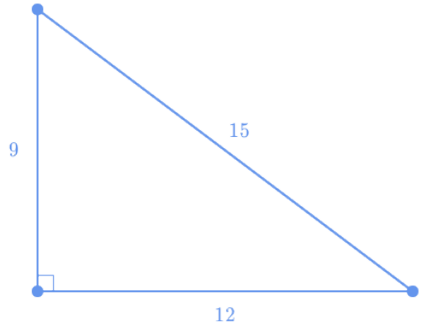
Ans None
Only one
More than one

Hint 1 A triangle is a plane figure with three straight sides and three angles. Can we satisfy the definition given the conditions? Let's try to draw a triangle given the conditions.

Hint 2 In general, any side of a triangle is always shorter than the sum of the other two sides:

$$15 < 9 + 12$$
$$12 < 9 + 15$$
$$9 < 12 + 15$$

We can create a triangle with a unique size and shape.



Hint 3 Given the conditions, only one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: 49159f6f.. 2013-10-21

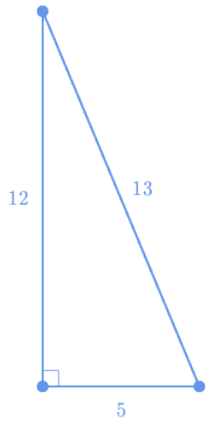
3 x1afa3df30210708e

Draw a right triangle with side lengths $5a$, $12a$ and $13a$, where a is any positive number.
Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

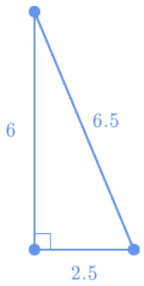
Ans Yes
No

Hint 1 Lets start by choosing a value for a where a is any positive number, then we can draw a right triangle with side lengths $5a$, $12a$ and $13a$.

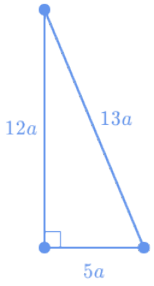
Hint 2 Choosing $a = 1$, we can draw a right triangle with side lengths 5, 12 and 13.



Hint 3 Choosing $a = 0.5$, we can draw a right triangle with side lengths 2.5, 6 and 6.5.



Hint 4 The triangle is not unique. We can let a be any positive number and draw many triangles with the same shape but different sizes.



Tags: Constructing triangles, CC.7.G.A.2
Version: f00b6980.. 2013-10-21

4 x1c875467bbf94500

Draw a triangle with side length 4 between two 70° angles.

Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

Ans Yes
No

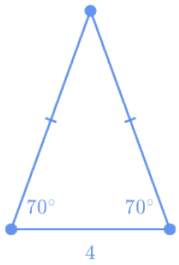
Hint 1 Lets start by drawing the side whose length is 4.

Hint 2 From the side 4, lets draw two 70° angles. Since we have two equal angles, we have an isosceles triangle. An isosceles triangle has at least two sides equal in length.

Since we have two 70° angles, the third angle must be 40°. The sum of three angles in a triangle will always be 180°.

Hint 3 We know the measure of two angles and the length of the side between the angles, so we can draw only one triangle.

Hint 4 The triangle is unique.



Tags: Constructing triangles, CC.7.G.A.2
Version: 7647d185.. 2013-10-21

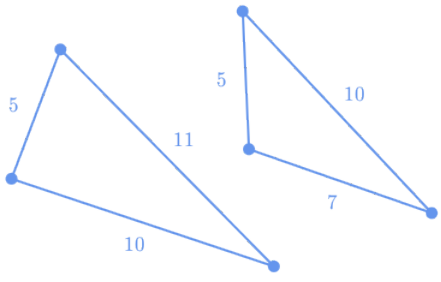
5 x1da87b180aca0e3d

How many triangles can be drawn which have side lengths of 5 and 10?

Ans None
Only one
More than one

Hint 1 We do not know the length of the third side so we are free to choose any length. Thus, we cannot create a unique triangle with only two side lengths.

Hint 2 We can draw many triangles with side lengths 5 and 10.



Hint 3 If we only know two side lengths, more than one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: d74ae956.. 2013-10-21

6 x25470998d7b41ee4

How many triangles can be drawn which have two 45° angles and two sides of length 2?

Ans None

[Only one]

More than one

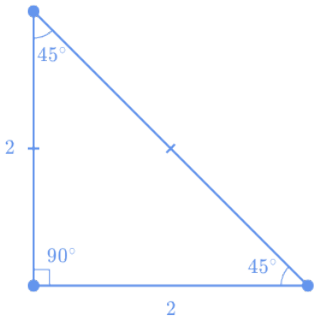
Hint 1 A triangle is a plane figure with three straight sides and three angles. The three angles always add up to 180°.

Since we have two 45° angles, the third angle is 90°:

$$= 180° - 2 \cdot 45°$$
$$= 90°$$

Let's draw a right triangle.

Hint 2 We can draw a right triangle and make two of its sides of length 2. The sides with length 2 must be between the 45° and 90° angles.



This triangle is unique, meaning no other triangle exists with exactly the same shape and size.

Hint 3 Given the conditions, only one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: 2c26d431.. 2013-10-21

7 x2bce84b97313fd2b

Draw a triangle with two angles 31° and 90° where side length 3 is *not* between the two angles 31° and 90°.

Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

Ans [Yes]

No

Hint 1 Lets start by drawing a right angle which is 90°.

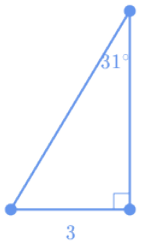
Then, let's draw the side of length 3 next to the right angle, so our base is length 3.

Hint 2 The length of 3 is not between two angles 31° and 90°.

Since we drew the side of length 3 next to the right angle, the 31° angle must be *opposite* the side of length 3 .

Hint 3 We know the measure of two angles and the length of one side not between the angles, so we can draw only one triangle.

Hint 4 The triangle is unique.



Tags: Constructing triangles, CC.7.G.A.2
Version: 4c8a5b03.. 2013-10-21

8 x31c216ff88dad8e7

How many triangles can we draw with side lengths 4, 4 and 7?

Ans None

[Only one]

More than one

Hint 1 A triangle is a plane figure with three straight sides and three angles. Can we satisfy the definition given the conditions? Let's try to draw a triangle given the conditions.

Hint 2 In general, any side of a triangle is always shorter than the sum of the other two sides:

$$7 < 4 + 4$$
$$4 < 7 + 4$$

We can create a triangle with a unique size and shape.

Hint 3 Given the conditions, only one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: 7bc13eed.. 2013-10-21

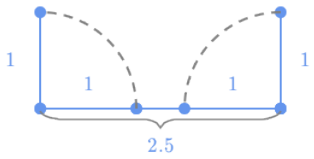
9 x38cc51ab93842600

How many triangles can be drawn with side lengths 1, 1 and 2.5?

Ans [None]
Only one
More than one

Hint 1 A triangle is a plane figure with three straight sides and three angles. Can we satisfy the definition given the conditions? Let's try to draw a triangle given the conditions.

Hint 2 In general, any side of a triangle is always shorter than the sum of the other two sides. Because $2.5 > 1 + 1$, the two sides 1 and 1 cannot meet to form a third angle over the third side 2.5.



We cannot create three angles to satisfy the definition of a triangle.

Hint 3 Given the conditions, no triangles can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: 05f2acc5.. 2013-10-21

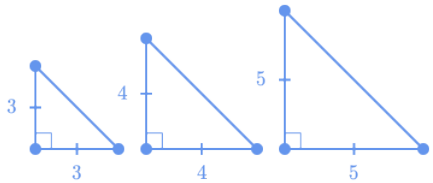
10 x4c335bfbee0cba92

Draw a right triangle with at least two sides of equal length.
Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

Ans Yes
[No]

Hint 1 Lets start by drawing. A right triangle has one $90°$ angle.
A triangle with at least two equal side lengths is called an isosceles triangle. We do not know the side lengths.

Hint 2 We can draw many right triangles with two sides of equal length.



Hint 3 The triangle is not unique.

Tags: Constructing triangles, CC.7.G.A.2
Version: 381a8a90.. 2013-10-21

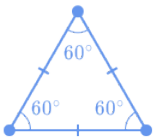
11 x531e157ba7c498eb

How many triangles can be drawn where the measures of all three angles are the same?

Ans None
Only one
[More than one]

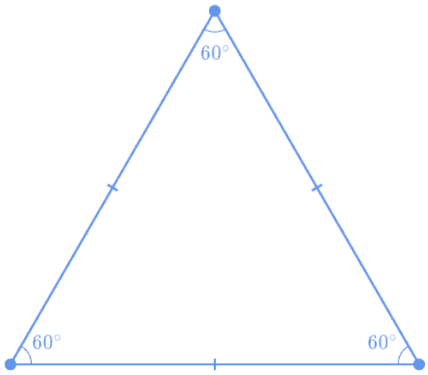
Hint 1 A triangle is a plane figure with three straight sides and three angles. What triangle or triangles would satisfy the conditions?
Let's try to draw a triangle where the measures of all three angles is the same.

Hint 2 The three angle measures in a triangle must sum to $180°$. Because we know the measure of all three angles must be the same, we know all three angles have measure $\frac{180°}{3} = 60°$.



This is an equilateral triangle.

Hint 3 Is this triangle unique or do other equilateral triangles exist with a different size?
We can draw many equilateral triangles with the same shape but different sizes.



Hint 4 More than one triangle can be drawn with all three angles measures equal.

Tags: Constructing triangles, CC.7.G.A.2
Version: 1ab79063.. 2013-10-21

12 x572fecbc70b353aa

Draw a right triangle that is also an isosceles triangle and has two sides of length 3.

Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

Ans Yes

No

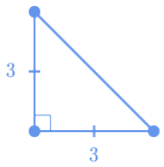
Hint 1 Lets start by drawing. A right triangle has one 90° angle.

An isosceles triangle has at least two side lengths equal. We are given two side lengths both equal to 3.

Hint 2 Let's draw one side length 3 as the height vertically (up and down) from the 90° angle. Let's draw the other side length 3 as the base horizontally (left and right) from the 90° angle.

Hint 3 Since we are given the measures of two sides and the angle between them, we can draw only one triangle.

Hint 4 The triangle is unique.



Tags: Constructing triangles, CC.7.G.A.2
Version: 42221dd1.. 2013-10-21

13 x651844ecfaac48e9

Draw a right triangle with two 45° angles.

Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

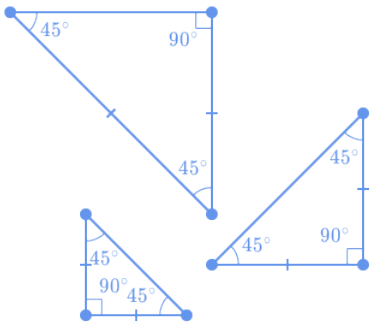
Ans Yes

No

Hint 1 Lets start by drawing. A right triangle has one 90° angle.

The triangle we want is an isosceles right triangle. An isosceles right triangle has two 45° angles.

Hint 2 We know the measure of all three angles but not the length of any side. Therefore, we can draw many triangles of various sizes all with a pair of 45° angles.



Hint 3 The triangle is not unique.

Tags: Constructing triangles, CC.7.G.A.2
Version: fb842816.. 2013-10-21

14 x6763ceb1ec0ceb41

How many triangles can be drawn where the lengths of all three sides are equal to 1?

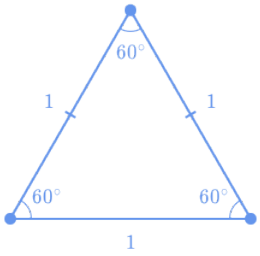
Ans None

Only one

More than one

Hint 1 A triangle is a plane figure with three straight sides and three angles. Is there a triangle or triangles that satisfy the conditions? Let's try to draw a triangle with all side lengths equal to 1.

Hint 2 The result is an equilateral triangle with equal side lengths and equal angles measures:



This triangle is unique, meaning no other triangle exists that has all sides equal to 1.

Hint 3 In general, if the lengths of all three sides are known, only one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: e412934c.. 2013-10-21

15 x67ee6010588311f2

How many triangles can be drawn with side lengths 4, 6 and 11?

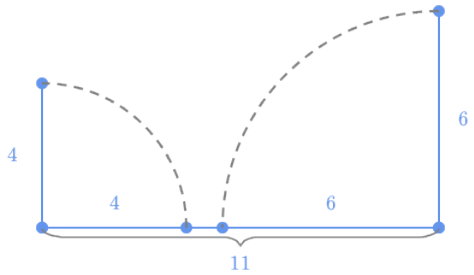
Ans [None]

Only one

More than one

Hint 1 A triangle is a plane figure with three straight sides and three angles. Can we satisfy the definition given the conditions? Let's try to draw a triangle given the conditions.

Hint 2 In general, any side of a triangle is always shorter than the sum of the other two sides. Because $11 > 6 + 4$, the two sides 6 and 4 cannot meet to form a third angle over the third side 11.



We cannot create three angles to satisfy the definition of a triangle.

Hint 3 Given the conditions, no triangles can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: edcac7f5.. 2013-10-21

16 x67fd10caf4f54df2

Draw a right triangle with side lengths $3a$, $4a$ and $5a$, where a is any positive number.

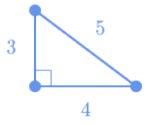
Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

Ans Yes

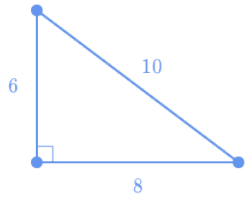
[No]

Hint 1 Lets start by choosing a value for a where a is any positive number, then we can draw a right triangle with side lengths $3a$, $4a$ and $5a$.

Hint 2 If $a = 1$, then we can draw a right triangle with side lengths 3, 4 and 5.

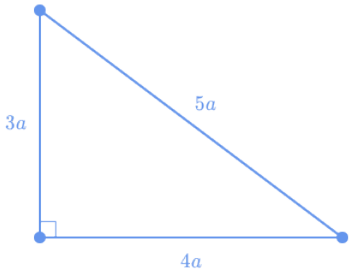


Hint 3 If $a = 2$, then we can draw a right triangle with side lengths 6, 8 and 10.



We can let a be any positive number and draw many triangles of same shape but different sizes.

Hint 4 The triangle is not unique. Multiple triangles satisfy the conditions.



Tags: Constructing triangles, CC.7.G.A.2
Version: 0b713fdb.. 2013-10-21

17 x6d7be6276bcb5815

Draw a right triangle with a height 4 and base 5.

Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

Ans [Yes]

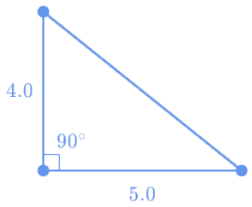
No

Hint 1 Lets start by drawing. A right triangle has a 90° angle.

The height of length 4 is drawn vertically (up and down) from the 90° angle. The base of length 5 is drawn horizontally (left and right) from the 90° angle.

Hint 2 Since we are given the measures of two sides and the angle between them, we can draw only one triangle.

Hint 3 The triangle is unique.



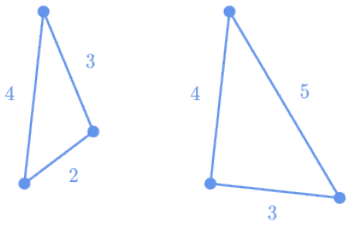
Tags: Constructing triangles, CC.7.G.A.2
Version: 77539544.. 2013-10-21

18 x72d893d1e3229dfd

How many triangles can we draw with side lengths 3 and 4?

Ans None
Only one
More than one

Hint 1 We can draw many triangles with side lengths 3 and 4.



Hint 2 Without knowing at least one angle measure, we cannot create a unique triangle with side lengths 3 and 4.

Hint 3 If we only know two side lengths, more than one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: 7f5a7177.. 2013-10-21

19 x892857b71e427c39

How many triangles can be drawn with angles 60°, 60° and 70°?

Ans None
Only one
More than one

Hint 1 A triangle is a plane figure with three straight sides and three angles. In a triangle, the sum of the three angle measures is 180°.

Hint 2 Let's add together the angles measures 60°, 60° and 70°:

$$\begin{aligned}\text{sum of angle measures} &= 60° + 60° + 70° \\ &= 120° + 70° \\ &= 190°\end{aligned}$$

The sum of the three angle measures is greater than 180°.

Hint 3 No triangle can be drawn that satisfies the given conditions.

Tags: Constructing triangles, CC.7.G.A.2
Version: b659944d.. 2013-10-21

20 xb880da8414b8f195

Draw an obtuse triangle with angles 45°, 35° and 100°.
Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

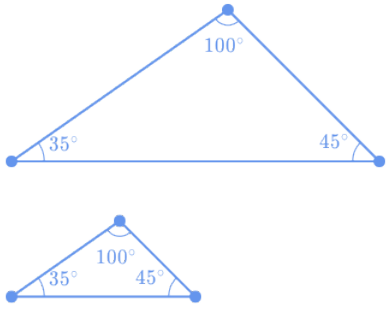
Ans Yes
No

Hint 1 Lets start by drawing. While keeping one angle constant, we can change the side lengths to create one of the other two angles.

For example, while keeping a 45° angle, we can change the side lengths to create the 35° angle. The third angle will have measure 100°.

Hint 2 We know the measure of three angles but not the length of any side. We can draw many triangles of same shape but different sizes.

Hint 3 The triangle is not unique.



Tags: Constructing triangles, CC.7.G.A.2
Version: 6879cae0.. 2013-10-21

21 xb9aa47b3de982d55

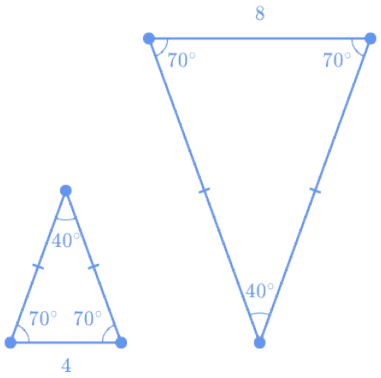
Draw an isosceles triangle with two 70° angles.
Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

Ans Yes
No

Hint 1 Lets start by drawing an isosceles triangle with two 70° angles. An isosceles triangle has at least two side lengths equal and two angles equal.

Hint 2 We do not know the side lengths, so we can draw many triangles.

Hint 3 The triangle is not unique.



Tags: Constructing triangles, CC.7.G.A.2
Version: c30a9e63.. 2013-10-21

22 xbd061a8700fced6c

How many right triangles can be drawn with angles 40° and 60°?

Ans None
Only one
More than one

Hint 1 A triangle is a plane figure with three straight sides and three angles. In a triangle, the sum of the three angle measures is 180°.
A right triangle has a 90° angle.

Hint 2 Let's add together the angle measures 40°, 60° and 90°:

$$\begin{aligned}\text{sum of angle measures} &= 40° + 60° + 90° \\ &= 190°\end{aligned}$$

The sum of the three angles is greater than 180°.

Hint 3 No triangle can be drawn that satisfies the given conditions.

Tags: Constructing triangles, CC.7.G.A.2
Version: 24dc4864.. 2013-10-21

23 xc001c788d01d9e5f

Draw a triangle with two angles 58° and 90° where side length 4 is *not* between the two angles 58° and 90°.
Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

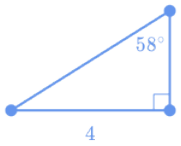
Ans Yes
No

Hint 1 Lets start by drawing a right angle which is 90°.
Then, let's draw the side of length 4 next to the right angle, so our base has a length of 4.

Hint 2 The side of length 4 is not between two angles 58° and 90°.
Since we drew the side of length 4 next to the right angle, the 58° angle must be *opposite* the side of length 4 .

Hint 3 We know the measure of two angles and the length of one side not between the angles, so we can draw only one triangle.

Hint 4 The triangle is unique.



Tags: Constructing triangles, CC.7.G.A.2
Version: c15babbe.. 2013-10-21

24 xc256611ab7d92e83

Draw a triangle with side length 5 between two 58° angles.
Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

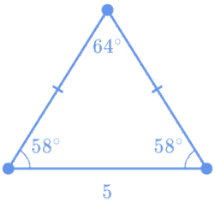
Ans Yes
No

Hint 1 Lets start by drawing the length of one side, which we know is 5.

Hint 2 From the side 5, lets draw two 58° angles. Since we have two equal angles, we have an isosceles triangle. An isosceles triangle has at least two sides equal in length.
Since we have two 58° angles, the third angle must be 64°. The sum of three angles in a triangle will always be 180°.

Hint 3 We know the measure of two angles and the length of the side between the angles, so we can draw only one triangle.

Hint 4 The triangle is unique.



Tags: Constructing triangles, CC.7.G.A.2
Version: 7d6f4977.. 2013-10-21

25 xc40b1278855716df

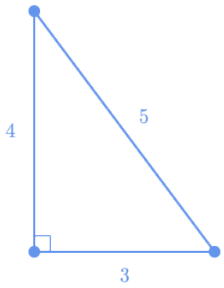
Draw a right triangle with side lengths 3, 4 and 5.
Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

Ans Yes
No

Hint 1 Lets start by drawing. We know the lengths of all three sides. How many triangles can we draw?

Hint 2 The triangle with side lengths 3, 4 and 5 is a right triangle. Since we are given the measures of three sides, we can draw only one triangle.

Hint 3 The triangle is unique.



Tags: Constructing triangles, CC.7.G.A.2
Version: 3adc68e6.. 2013-10-21

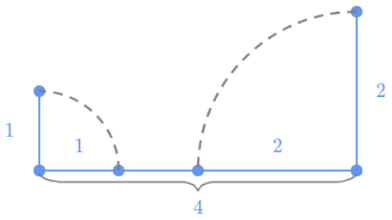
26 xdba9a2b900c8bbcd

How many triangles can be drawn with side lengths 1, 2 and 4?

Ans None
Only one
More than one

Hint 1 A triangle is a plane figure with three straight sides and three angles. Can we satisfy the definition given the conditions? Let's try to draw a triangle given the conditions.

Hint 2 In general, any side of a triangle is always shorter than the sum of the other two sides. Because $4 > 2 + 1$, the two sides 2 and 1 cannot meet to form a third angle over the third side 4.



We cannot create three angles to satisfy the definition of a triangle.

Hint 3 Given the conditions, no triangles can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: 950a8286.. 2013-10-21

27 xe06107bc78ca0b3c

How many triangles can we draw with angles 30°, 50° and 100°?

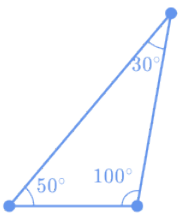
Ans None
Only one
More than one

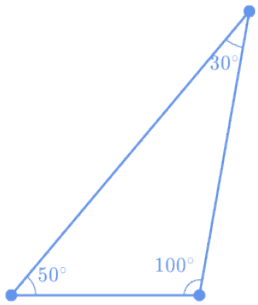
Hint 1 A triangle is a plane figure with three straight sides and three angles. The three angles measures must add up to 180°. Let's add together the angles 30°, 50° and 100°:

$$\begin{aligned}\text{total angle measure} &= 30^\circ + 50^\circ + 180^\circ \\ &= 180^\circ\end{aligned}$$

So, at least one triangle exists. Let's draw.

Hint 2 We know the measure of three angles but not the length of any side. We can draw many triangles with the same shape but different sizes.





Hint 3 When only the measures of all three angles are known, more than one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: 7c205db7.. 2013-10-21

28 xe937d430ba8d75d8

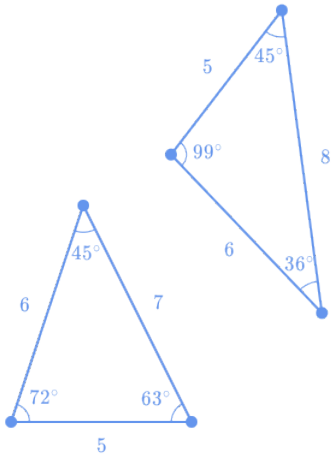
How many triangles can we draw that have one angle measure equal to 45° and one side of length 5?

Ans None
Only one
More than one

Hint 1 A triangle is a plane figure with three straight sides and three angles.

The three angles measures always add up to 180°. We only know one angle is 45°. We can't find the measures of the other two angles.

Hint 2 We know the length of only one side is 5. Depending if we place the side of length 5 next to or across from the 45° angle, we can draw many triangles with different shapes and different sizes.



Hint 3 If we only know one angle and one side length, more than one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: e1956610.. 2013-10-21

29 xf51994a651ca1d7f

Draw a triangle with angles 30°, 50° and 100°.

Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

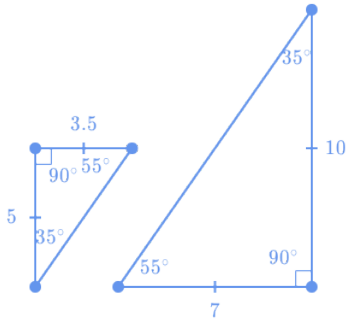
Ans Yes
No

Hint 1 Lets start by drawing. While keeping one angle, we can change the side lengths to create one of the other two angles.

While keeping a 100° angle, we can change the side lengths to create the 50° angle. The final angle will be 30°.

Hint 2 We know the measure of three angles but not the length of any side. We can draw many triangles of same shape but different sizes.

Hint 3 The triangle is not unique.



Tags: Constructing triangles, CC.7.G.A.2
Version: d7e4aa43.. 2013-10-21

30 xf9872931929ac56c

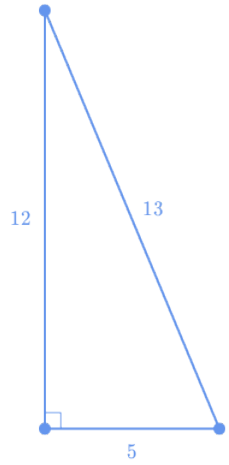
Draw a right triangle with side lengths 5, 12 and 13.

Is there a unique triangle that satisfies the given conditions? [[? interactive-graph 1]]

Ans Yes
No

Hint 1 Lets start by drawing. We know the lengths of all three sides. How many right triangles can we draw?

Hint 2 Since we are given the lengths of all three sides, we can draw only one right triangle with side lengths 5, 12 and 13.



Hint 3 The triangle is unique.

Tags: Constructing triangles, CC.7.G.A.2
Version: ba30b682.. 2013-10-21