Constructing triangles

October 18, 2013

1   x0a2c8d4a7e3a85b9

How many triangles can be drawn where the side length is known between two known angles?
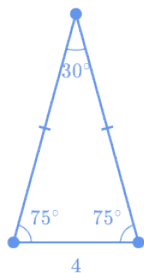
Ans   None

> Only one

More than one

Hint 1   A triangle is a plane figure with 3 straight sides and 3 angles. Can we satisfy the definition given the conditions? Let's try to draw a triangle where the side length is known between 2 angles.

Hint 2   The 3 angles in a triangle always sum to 180°. Because we know the measure of 2 angles, we can find the measure of the third angle.

Hint 3   Let's draw any triangle where we know the side length between 2 known angles. For example, let's look at when a side of length 5 is between 2 equal angles 75° and 75°. The other 2 sides must be equal and meet at a 30° angle.

This triangle is unique, meaning no other triangle exists with exact same shape or size.

Hint 4   If the side length is known between two known angles, only one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: d920ceb5.. 2013-10-18

2   x18341f6f8d24d96e

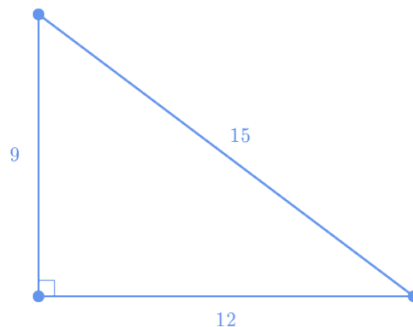**How many triangles can be drawn with side lengths 9, 12 and 15?**

Ans   None

> Only one

More than one

Hint 1   A triangle is a plane figure with 3 straight sides and 3 angles. Can we satisfy the definition given the conditions? Let's try to draw a triangle given the conditions.

Hint 2   In general, the longest side of a triangle must be shorter than the sum of the two other sides. Because $9 + 12 = 21$, the two sides 9 and 12 meet to form 2 angles with the side of length 15. We can create 3 angles with the 3 sides to satisfy the definition of a triangle.

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

Tags: Constructing triangles, CC.7.G.A.2
Version: 4c858421.. 2013-10-18

3   x1afa3df30210708e

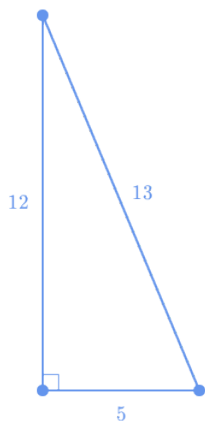**Draw a triangle with side lengths 5a, 12a and 13a where a > 0.**
   Given these criteria is the triangle unique? [[? interactive-graph 1]]
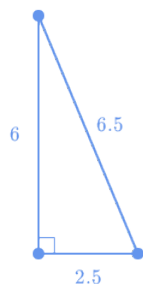
Ans   Yes

> No

Hint 1   Lets start by choosing a value for a where $a > 0$, then we can draw a triangle with side lengths $5a$, $12a$ and $13a$.

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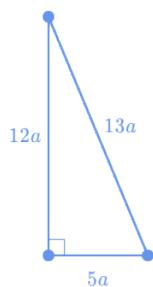

Hint 3 If $a = 0.5$, then we can draw a right triangle with side lengths 2.5, 6 and 6.5.

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

Hint 4 The triangle is not unique.

Tags: Constructing triangles, CC.7.G.A.2
Version: 5e8d2d2a.. 2013-10-18

4   x1c875467bbf94500

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

Given these criteria is the triangle unique? [[? interactive-graph 1]]

Ans | Yes |
No

Hint 1 Lets start by drawing the length of 1 side, which we know is 4.

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

Since we have 2 70° angles, the third angle must be 40°. The sum of 3 angles in a triangle will always be 180°.

Hint 3 We know the measure of 2 angles and the length of the side between the angles, so we can draw only 1 triangle.

Hint 4 The triangle is unique.
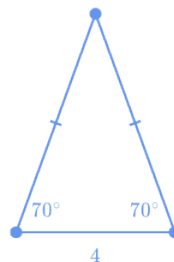
Tags: Constructing triangles, CC.7.G.A.2
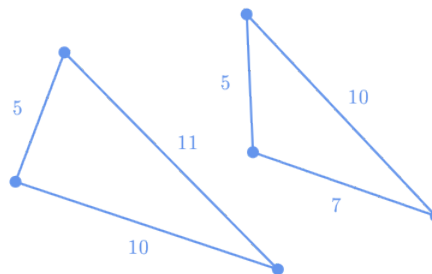**Version:** 7ec6851f.. 2013-10-17

5   x1da87b180aca0e3d

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

Ans None
Only one
| More than one |

Hint 1 Without knowing at least 1 angle measure, we cannot create a unique triangle with only one shape and size.

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

2

Hint 3 If we only know 1 angle and 1 side length, more than one triangle can be drawn.

6   x25470998d7b41ee4

How many triangles can be drawn where side length 2 is not between two 45° angles?

Ans   None
   | Only one |
   More than one

Hint 1 A triangle is a plane figure with 3 straight sides and 3 angles. The 3 angles always add up to 180°.
   We have 2 45° angles. Since $180° - 2 \cdot 45° = 90°$, the missing angle is 90°. We have a right triangle.

Hint 2 We know a length and 2 angles. We can draw a triangle given the side length 2 is not between the 2 45° angles. The side length 2 is between the 45° and 90° angles:
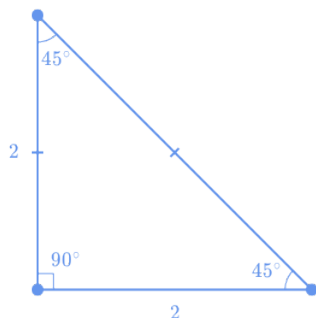
   This triangle is unique, meaning no other triangle exists with exact same shape or size.

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

7   x2bce84b97313fd2b

Draw a triangle where the side length 3 is not between two angles 31° and 90°.
   Given these criteria is the triangle unique? [[? 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 2 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 2 angles and the length of 1 side not between the angles, so we can draw only 1 triangle.

Hint 4 The triangle is unique.
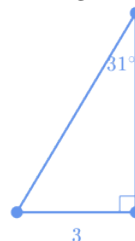
8   x31c216ff88dad8e7

How many triangles can be drawn with side lengths 4, 4 and 7?

Ans   None
   | Only one |
   More than one

Hint 1 A triangle is a plane figure with 3 straight sides and 3 angles. Can we satisfy the definition given the conditions? Let's try to draw a triangle given the conditions.

Hint 2 In general, the longest side of a triangle must be shorter than the sum of the two other sides. Because $4 + 4 = 8$, the two sides 4 and 4 meet to form 2 angles with the side of length 7. We can create 3 angles with the 3 sides to satisfy the definition of a triangle.

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

9   x38cc51ab93842600

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

Ans | None |

Only one

More than one

Hint 1 A triangle is a plane figure with 3 straight sides and 3 angles. Can we satisfy the definition given the conditions? Let's try to draw a triangle given the conditions.

Hint 2 In general, the longest side of a triangle must be shorter than the sum of the two other sides. Because $1 + 1 = 2$, the two side lengths 1 and 1 cannot meet to form a third angle. We cannot create 3 angles to satisfy the definition of a triangle.
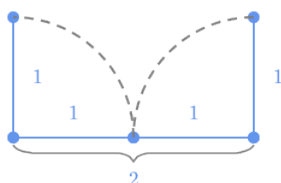
Hint 3 Given the conditions, no triangles can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: aeb719e4.. 2013-10-18

10   x4c335bfbee0cba92

Draw a right triangle with at least 2 side lengths equal.
 **Given these criteria is the triangle unique?** [[? interactive-graph 1]]

Ans Yes
| No |

Hint 1 Lets start by drawing. A right triangle has one $90°$ angle.
  A triangle with at least 2 side lengths equal is isosceles. We do not know the side lengths.

Hint 2 Since we are given the measures of 3 angles and do not know any side lengths, we can draw many triangles with at least 2 side lengths equal.

Hint 3 The triangle is not unique.
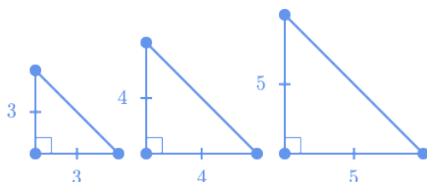
Tags: Constructing triangles, CC.7.G.A.2
**Version:** 0abcb8e1.. 2013-10-18

11   x531e157ba7c498eb

How many triangles can be drawn where the measures of all 3 angles are known?

Ans None

Only one

| More than one |

Hint 1 A triangle is a plane figure with 3 straight sides and 3 angles. Can we satisfy the definition given the conditions? Let's try to draw a triangle where we known the lengths of all 3 angles.

Hint 2 For example, let's look at when all 3 angles are $60°$:
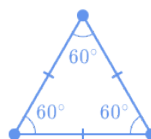
Is this triangle unique, meaning do no other triangles exist with exact same shape or size?

Hint 3 We can draw many equilateral triangles with same shape but different sizes:
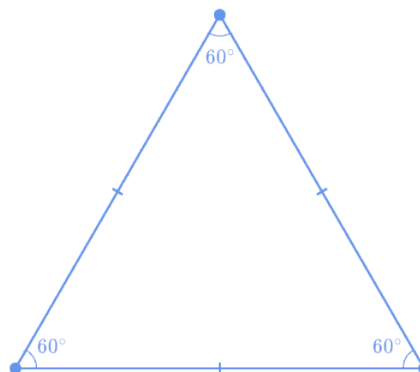
Hint 4 If the measures of all 3 angles are known, more than one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: a46c4b72.. 2013-10-18

12   x572fecbc70b353aa

Draw an isosceles right triangle with two side lengths 3.

  Given these criteria is the triangle unique? [[? interactive-graph 1]]
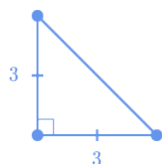
Ans | Yes |

No

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

An isosceles triangle has at least 2 side lengths equal. We are given 2 side lengths both equal to 3.

Hint 2 Let's draw 1 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 2 sides and the angle between them, we can draw only 1 triangle.

Hint 4 The triangle is unique.

Tags: Constructing triangles, CC.7.G.A.2
Version: 2e87ab50.. 2013-10-17

13 x651844ecfaac48e9

Draw a right triangle with two 45° angles.
  Given these criteria is the triangle unique? [[? interactive-graph 1]]
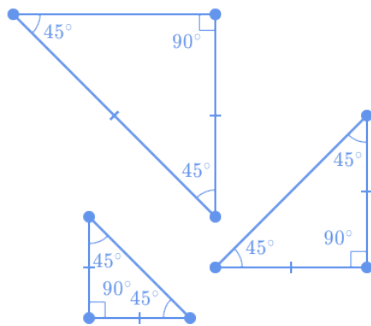
Ans Yes
  No

Hint 1 Lets start by drawing. A right triangle has one 90° angle.
  We have an isosceles right triangle. An isosceles right triangle has at least 2 side lengths equal and 2 45° angles.

Hint 2 We know the measure of all 3 angles but not the length of any side. 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: 85d97ee1.. 2013-10-17

14 x6763ceb1ec0ceb41

How many triangles can be drawn where the lengths of all 3 sides are known?
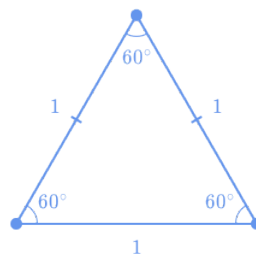
Ans None
  Only one
  More than one

Hint 1 A triangle is a plane figure with 3 straight sides and 3 angles. Can we satisfy the definition given the conditions? Let's try to draw a triangle where we known the lengths of all 3 sides.

Hint 2 For example, let's look at when all side lengths are 1. We have an equilateral triangle with equal sides and equal angles:

This triangle is unique, meaning no other triangle exists with exact same shape or size.

Hint 3 If the lengths of all 3 sides are known, only one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: def3450f.. 2013-10-18

15 x67ee6010588311f2

How many triangles can be drawn with side lengths 4, 6 and 10?
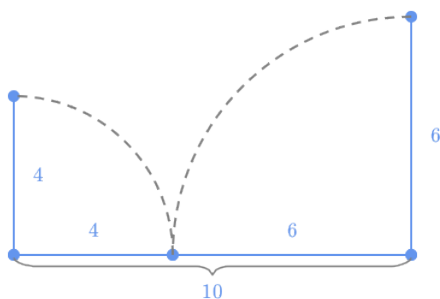
Ans None
  Only one
  More than one

Hint 1 A triangle is a plane figure with 3 straight sides and 3 angles. Can we satisfy the definition given the conditions? Let's try to draw a triangle given the conditions.

Hint 2 In general, the longest side of a triangle must be shorter than the sum of the two other sides. Because $4 + 6 = 10$, the two sides 4 and 6 cannot meet to form a third angle. We cannot create 3 angles to satisfy the definition of a triangle.

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

17   x6d7be6276bcb5815

Draw a right triangle with a height of 4 and base of 5.
    Given these criteria is the triangle unique? [[? interactive-graph 1]]

Ans   Yes
    No

16   x67fd10caf4f54df2

Draw a triangle with side lengths 3a, 4a and 5a where a > 0.
    Given these criteria is the triangle unique? [[? 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 2 sides and the angle between them, we can draw only 1 triangle.
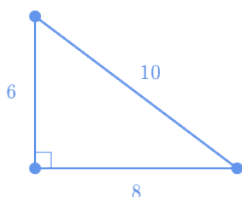
Hint 3   The triangle is unique.

Hint 1   Lets start by choosing a value for a where $a > 0$, then we can draw a triangle with side lengths $3a$, $4a$ and $5a$.

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

18   x72d893d1e3229dfd

How many triangles can be drawn side lengths of 3 and 4?

Ans   None
    Only one
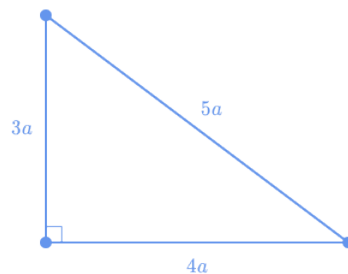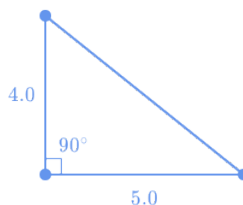   More than one

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 nonzero positive number and draw many triangles of same shape but different sizes.
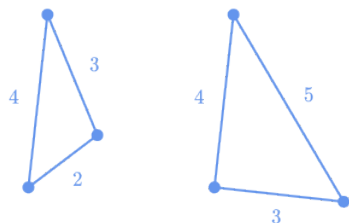
Hint 4   The triangle is not unique.

Hint 1   Without knowing at least 1 angle measure, we cannot create a unique triangle with only one shape and size.

6

Hint 2   We can draw many triangles with side lengths 3 and 4.

Hint 3   If we only know 1 angle and 1 side length, more than one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: 58c104bc.. 2013-10-18

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 3 straight sides and 3 angles. The 3 angles always add up to 180°.

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

$$= 2 \cdot 60° + 70°$$
$$= 120° + 70°$$
$$= 190°$$
$$> 180°$$

The 3 angles sum up to a value greater than 180°.

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

Tags: Constructing triangles, CC.7.G.A.2
Version: bc3efef4.. 2013-10-18

20   xb9aa47b3de982d55
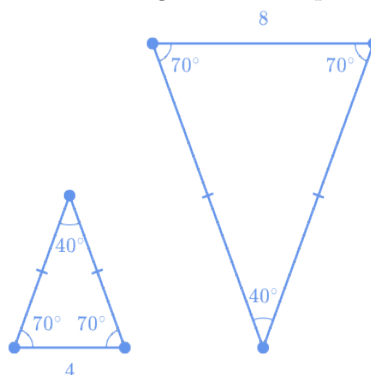
Draw an isosceles triangle with two 70° angles.
   Given these criteria is the triangle unique?   [[? interactive-graph 1]]

Ans   Yes
    `No`

Hint 1   Lets start by drawing an isosceles triangle with 2 70° angles. An isosceles triangle has at least 2 side lengths equal and 2 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: 5f43d2fc.. 2013-10-17

21   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 3 straight sides and 3 angles. The 3 angles always add up to 180°.
   A right triangle has a 90° angle.

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

$$= 40° + 60° + 90°$$
$$= 190°$$
$$> 180°$$

The 3 angles sum up to a value greater than 180°.

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

Tags: Constructing triangles, CC.7.G.A.2
Version: aabc8e4a.. 2013-10-18

22   xc001c788d01d9e5f

Draw a triangle where side length 4 is not between two angles 58° and 90°.
   Given these criteria is the triangle unique?   [[? interactive-graph 1]]
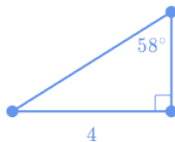
Ans   `Yes`
    No

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 2 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 2 angles and the length of 1 side not between the angles, so we can draw only 1 triangle.

Hint 4 The triangle is unique.

Tags: Constructing triangles, CC.7.G.A.2
Version: 9534c031.. 2013-10-17

23   xc256611ab7d92e83

Draw a triangle with side length 5 between two 58° angles.
   Given these criteria is the triangle unique? [[? interactive-graph 1]]
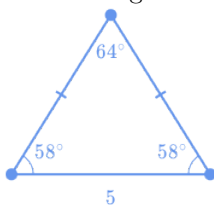
Ans ⟨Yes⟩
   No

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

Hint 2 From the side 5, lets draw 2 58° angles. Since we have 2 equal angles, we have an isosceles triangle. An isosceles triangle has at least 2 sides equal in length.
   Since we have 2 58° angles, the third angle must be 64°. The sum of 3 angles in a triangle will always be 180°.

Hint 3 We know the measure of 2 angles and the length of the side between the angles, so we can draw only 1 triangle.

Hint 4 The triangle is unique.

Tags: Constructing triangles, CC.7.G.A.2
Version: 5ba2ed08.. 2013-10-17

24   xc40b1278855716df

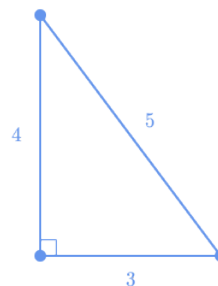**Draw a triangle with side lengths 3, 4 and 5.**
   Given these criteria is the triangle unique? [[? interactive-graph 1]]

Ans ⟨Yes⟩
   No

Hint 1 Lets start by drawing. We know the lengths of all 3 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 3 sides, we can draw only 1 triangle.

Hint 3 The triangle is unique.

Tags: Constructing triangles, CC.7.G.A.2
Version: b5262e6e.. 2013-10-17

25   xcfae18d2af4efa34

Draw a scalene triangle with angles 45°, 60° and 75°.
   Given these criteria is the triangle unique? [[? interactive-graph 1]]

**Ans** Yes
   ⟨No⟩

Hint 1 Lets start by drawing. While keeping 1 angle, we can change the side lengths to create 1 of the other 2 angles.
   For example, while keeping a 60° angle, we can change the side lengths to create the 45° angle. The final angle will be 75°.

Hint 2 We know the measure of 3 angles but not the length of any side. We can draw many triangles of the same shape but different sizes.

Hint 3 The triangle is not unique.
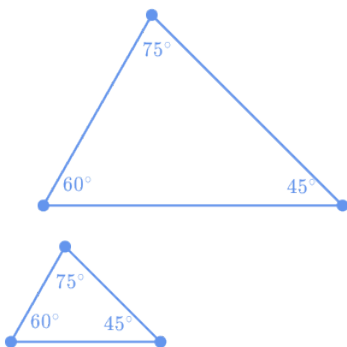
Tags: Constructing triangles, CC.7.G.A.2
Version: 5ef1e69a.. 2013-10-18

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26 xdba9a2b900c8bbcd

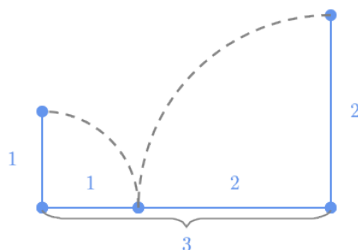**How many triangles can be drawn with side lengths 1, 2 and 3?**

Ans | None |
Only one
More than one

Hint 1 A triangle is a plane figure with 3 straight sides and 3 angles. Can we satisfy the definition given the conditions? Let's try to draw a triangle given the conditions.

Hint 2 In general, the longest side of a triangle must be shorter than the sum of the two other sides. Because $1+2 = 3$, the two sides 1 and 2 cannot meet to form a third angle. We cannot create 3 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
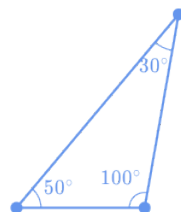**Version:** 2feadc91.. 2013-10-18

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27 xe06107bc78ca0b3c

How many triangles can be drawn with angles 30°, 50° and 100°?
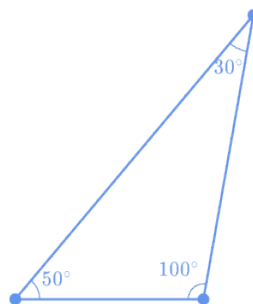
Ans None
Only one
| More than one |

Hint 1 We know the measure of 3 angles but not the length of any side. We can draw many triangles with the same shape but different size.

Hint 2

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

Tags: Constructing triangles, CC.7.G.A.2
Version: a599ba59.. 2013-10-18

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28 xe937d430ba8d75d8

How many triangles can be drawn with one 45° and a side length of 5?

Ans None
Only one
| More than one |

Hint 1 A triangle is a plane figure with 3 straight sides and 3 angles.

The 3 angles always add up to 180°. We only know 1 angle is 45°. We can't find the measures of the other 2 angles.

Hint 2 We know the length of only 1 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.
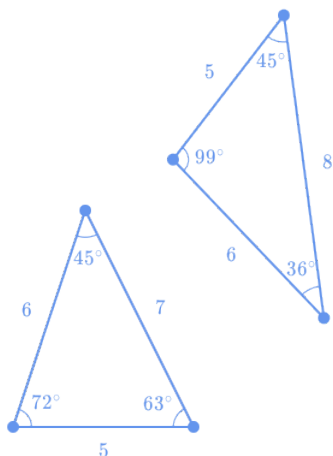
Hint 3 If we only know 1 angle and 1 side length, more than one triangle can be drawn.

Tags: Constructing triangles, CC.7.G.A.2
Version: 82a35698.. 2013-10-18

29   xf51994a651ca1d7f

Draw a triangle with angles 30°, 50° and 100°.
   Given these criteria is the triangle unique? [[? interactive-graph 1]]
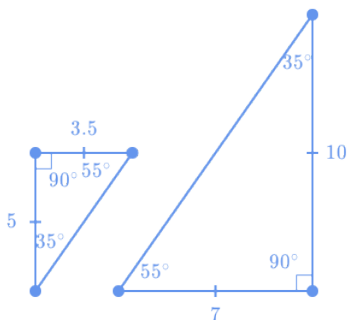
Ans Yes
   No

Hint 1 Lets start by drawing. While keeping 1 angle, we can change the side lengths to create 1 of the other 2 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 3 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
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30   xf9872931929ac56c

Draw a triangle with side lengths 5, 12 and 13.
   Given these criteria is the triangle unique? [[? interactive-graph 1]]

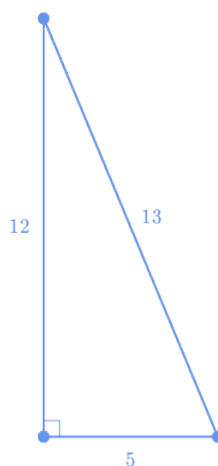**Ans** Yes
   No

Hint 1 Lets start by drawing. We know the lengths of all 3 sides. How many triangles can we draw?

Hint 2 Since we are given the measures of 3 sides, we can draw only 1 triangle. The triangle with side lengths 5, 12 and 13 is a right triangle.

Hint 3 The triangle is unique.

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