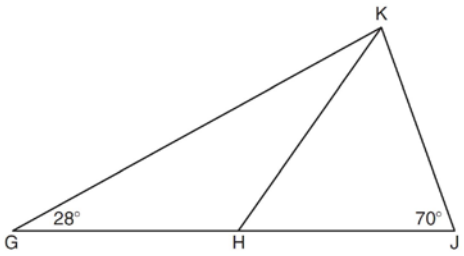
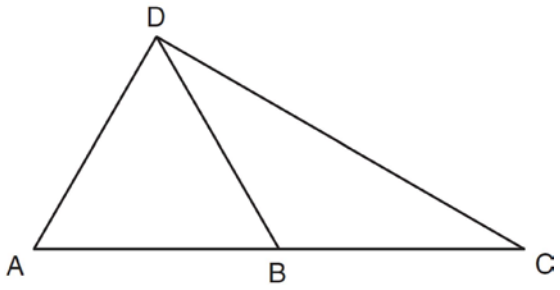
G.CO.C.10: Isosceles Triangle Theorem 2

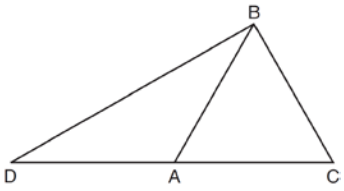
1 In the diagram below of $\triangle GJK$, H is a point on $\overline{GJ}$, $\overline{HJ} \cong \overline{JK}$, $m\angle G = 28$, and $m\angle GJK = 70$. Determine whether $\triangle GHK$ is an isosceles triangle and justify your answer.



2 In the diagram below of $\triangle ACD$, B is a point on $\overline{AC}$ such that $\triangle ADB$ is an equilateral triangle, and $\triangle DBC$ is an isosceles triangle with $\overline{DB} \cong \overline{BC}$. Find $m\angle C$.

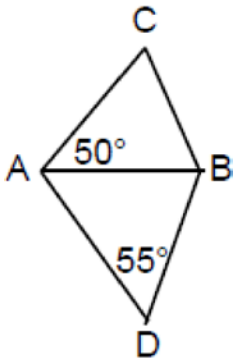


3 In the diagram of $\triangle BCD$ shown below, $\overline{BA}$ is drawn from vertex B to point A on $\overline{DC}$, such that $\overline{BC} \cong \overline{BA}$.

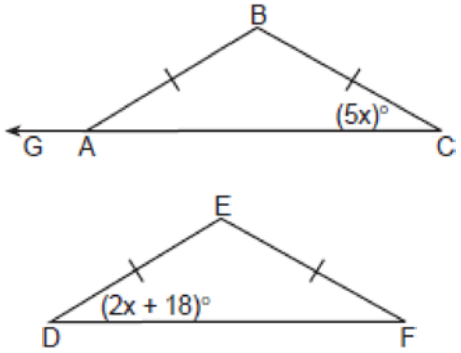


In $\triangle DAB$, $m\angle D = x$, $m\angle DAB = 5x - 30$, and $m\angle DBA = 3x - 60$. In $\triangle ABC$, $AB = 6y - 8$ and $BC = 4y - 2$. [Only algebraic solutions can receive full credit.] Find $m\angle D$. Find $m\angle BAC$. Find the length of $\overline{BC}$. Find the length of $\overline{DC}$.

4 In the accompanying diagram, $\triangle ABC$ and $\triangle ABD$ are isosceles triangles with $m\angle CAB = 50$ and $m\angle BDA = 55$. If $AB = AC$ and $AB = BD$, what is $m\angle CBD$?



5 In the accompanying diagram, isosceles $\triangle ABC \cong$ isosceles $\triangle DEF$, $m\angle C = 5x$, and $m\angle D = 2x + 18$. Find $m\angle B$ and $m\angle BAG$.



6 In $\triangle RST$, $m\angle RST = 46$ and $\overline{RS} \cong \overline{ST}$. Find $m\angle STR$.

7 In triangle CEM, $CE = 3x + 10$, $ME = 5x - 14$, and $CM = 2x - 6$. Determine and state the value of x that would make CEM an isosceles triangle with the vertex angle at E.

8 Vertex angle A of isosceles triangle ABC measures 20° more than three times $m\angle B$. Find $m\angle C$.

9 The perimeter of an isosceles triangle is 71 centimeters. The measure of one of the sides is 22 centimeters. What are all the possible measures of the other two sides?

10 Hersch says if a triangle is an obtuse triangle, then it cannot also be an isosceles triangle. Using a diagram, show that Hersch is incorrect, and indicate the measures of all the angles and sides to justify your answer.

11 Dylan says that all isosceles triangles are acute triangles. Mary Lou wants to prove that Dylan is *not* correct. Sketch an isosceles triangle that Mary Lou could use to show that Dylan's statement is not true. In your sketch, state the measure of *each* angle of the isosceles triangle.

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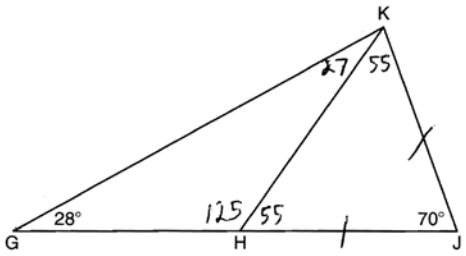
Answer Section

1 ANS:

No, $\angle KGH$ is not congruent to $\angle GKH$.



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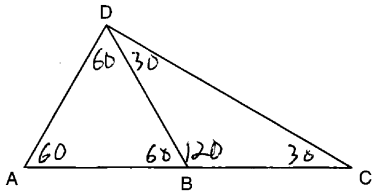
2 ANS:

30.



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3 ANS:

$x + 3x - 60 + 5x - 30 = 180$

$9x - 90 = 180$

$9x = 270$

$x = 30 = \text{m}\angle D$

$5(30) - 30 = 120$

$\text{m}\angle BAC = 180 - 120 = 60$

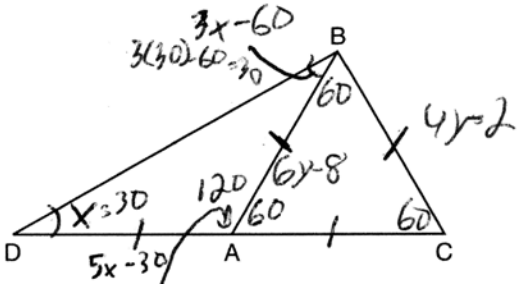
$6y - 8 = 4y - 2$

$2y = 6$

$y = 3$

$4(3) - 2 = 10 = \overline{BC}$

$\overline{DC} = 10 + 10 = 20$



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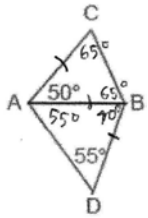
4 ANS:

135. $\text{m}\angle CBD = 65° + 70° = 135°$



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5 ANS:

$m\angle B = 120$ and $m\angle BAG = 150$. $5x = 2x + 18$, $3x = 18$, $x = 6$. Therefore the triangles' congruent angles are 30°.

REF: 060838a

6 ANS:

67. $\frac{180 - 46}{2} = 67$

REF: 011029ge

7 ANS:

$5x - 14 = 3x + 10$

$2x = 24$

$x = 12$

REF: 082326geo

8 ANS:

32. $A = 3x + 20$, $B = x$, $C = x$. $3x + 20 + x + x = 180$, $5x + 20 = 180$, $x = 32$

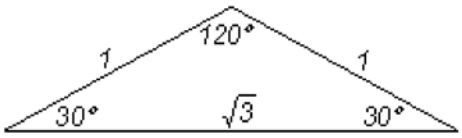
REF: 010223a

9 ANS:

If the measure of the second side is also 22, the measure of the third side is 27 (71 – (22 + 22)). If the second and third sides are equal, their measures are 24.5 $(\frac{71 - 22}{2})$ each.

REF: 060733a

10 ANS:



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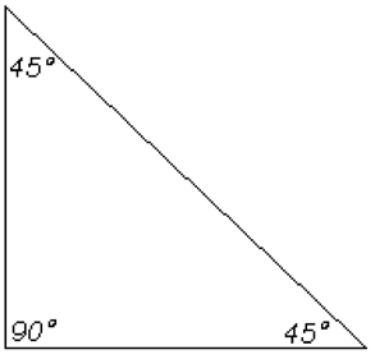
11 ANS:



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