**4.1 Classifying Triangles**

**Goal: Classify triangles by their sides and by their measures.**

**Triangle**: a figure formed by three \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ joining three noncolinear \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Vertex**: a point that joins two \_\_\_\_\_\_\_\_\_\_\_\_ of the triangle

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| **Classification of Triangles by Sides** |
| **Equilateral** \_\_\_\_\_\_\_ congruent sides | **Isosceles**\_\_\_\_\_\_\_ congruent sides | **Scalene**\_\_\_\_\_\_\_ congruent sides |
| **Classification of Triangles by Angles** |
| **Equiangular**\_\_\_\_\_ congruent angles | **Acute**\_\_\_\_\_ acute angles | **Right**\_\_\_\_\_ right angle | **Obtuse**\_\_\_\_\_ obtuse angle |

**Classify each triangle by its sides.**



**Classify the triangle by its angles.**



**Classify each triangle by its angles AND sides.**

**Determine if a triangle can be both classifications. If possible, draw the type of triangle.**

Obtuse and scalene? Right and isosceles?

Equilateral and acute? Right and acute?

Scalene and isosceles? Obtuse and equilateral?

Obtuse and isosceles? Scalene and acute?

**Identify which side is opposite each angle.**



**4.2 Angle Measures of Triangles**

**Goal: Find interior and exterior angle measures in triangles.**

**Interior Angles:** when the sides of a triangle are extended, the three original angles are the interior angles.

**Exterior Angles**: when the sides of a triangle are extended, the angles that are adjacent to the interior angles are the exterior angles.

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| **Triangle Sum Theorem:** The sum of the measures of the angles of a triangle is \_\_\_\_\_\_\_\_\_\_\_\_ | **\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_** |

**Find the measure of** $∠1$**.**

a) \_\_\_\_\_\_\_\_ b) \_\_\_\_\_\_\_\_ c) \_\_\_\_\_\_\_\_

d) \_\_\_\_\_\_\_\_ e) \_\_\_\_\_\_\_\_ f) \_\_\_\_\_\_\_\_

**Find the value of x. Then find the measure of each angle.**

a) x = \_\_\_\_\_\_\_\_ b) x = \_\_\_\_\_\_\_\_

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| **Exterior Angle Theorem:** the measure of an exterior angle of a triangle is equal to the \_\_\_\_\_\_\_\_ of the measures of the two nonadjacent \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ angles | **\_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_** |

**Find the measure of each missing angle.**

a) \_\_\_\_\_\_\_\_ b) \_\_\_\_\_\_\_\_ c) \_\_\_\_\_\_\_\_

d) \_\_\_\_\_\_\_\_ e) \_\_\_\_\_\_\_\_ f) \_\_\_\_\_\_\_\_

**Find the value of x.**

a) x = \_\_\_\_\_\_\_ b) x = \_\_\_\_\_\_

**4.3 Isosceles and Equilateral Triangles**

**Goal: Use properties of isosceles and equilateral triangles to find side lengths and angle measures.**

**Isosceles Triangle Vocabulary**

**Legs:** the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sides

**Base**: the side that is not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Base angles:** the two angles at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| **Base Angles Theorem**: If two sides of a triangle are congruent, then the angles \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of them are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | If $\overbar{AB}≅\overbar{AC}$, then\_\_\_\_\_\_ $≅$ \_\_\_\_\_\_ |
| **Converse of the Base Angles Theorem:** If two \_\_\_\_\_\_\_\_\_\_\_\_\_\_ are congruent, then the sides \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of them are congruent | If $∠B≅∠C$, then\_\_\_\_\_\_ $≅$ \_\_\_\_\_\_ |

**Find the value of x. If x is an angle, also find the measure of each angle.**

a) x = \_\_\_\_\_\_\_\_\_\_ b) x = \_\_\_\_\_\_\_\_\_\_ c) x = \_\_\_\_\_\_\_\_\_\_



d) x = \_\_\_\_\_\_\_\_\_\_ e) x = \_\_\_\_\_\_\_\_\_\_ f) x = \_\_\_\_\_\_\_\_\_\_

g) x = \_\_\_\_\_\_\_\_\_\_ h) x = \_\_\_\_\_\_\_\_\_\_ i) x = \_\_\_\_\_\_\_\_\_\_

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| **Equilateral Theorem:** If a triangle is equilateral, then it is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  If $\overbar{AB}≅\overbar{AC}≅\overbar{BC}$, then \_\_\_\_\_ $≅$ \_\_\_\_\_ $≅$ \_\_\_\_\_\_ |
| **Equiangular Theorem:** If a triangle is equiangular, then it is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  If $∠A≅∠B≅∠C$, then \_\_\_\_\_ $≅$ \_\_\_\_\_ $≅$ \_\_\_\_\_\_ |

**\*\*Each angle in an equiangular triangle will always be \_\_\_\_\_\_\_\_\_\_\_**

**Find the value of each variable.**

a) x = \_\_\_\_\_\_\_\_\_\_ b) x = \_\_\_\_\_\_\_\_\_\_ c) x = \_\_\_\_\_\_\_\_\_\_



d) y = \_\_\_\_\_\_\_\_\_\_ e) y = \_\_\_\_\_\_\_\_\_\_ f) x = \_\_\_\_\_\_ y = \_\_\_\_\_\_\_



**4.4 Part A: The Distance Formula**

**Goal: Find the distance between two coordinates.**

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| **The Distance Formula** |
| Image result for the distance formula**For any two coordinates** $A(x\_{1}, y\_{1})$ **and** $B(x\_{2}, y\_{2})$**, the distance between A and B is written AB and is**  | **Step 1**: \_\_\_\_\_\_\_\_\_\_ in the coordinates**Step 2**: Simplify \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**Step 3**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ each parenthesis. Remember! Squaring a negative number makes it positive.**Step 4**: \_\_\_\_\_\_\_\_\_\_\_ together the two numbers**Step 5**: Simplify the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**Why will your answer never be a negative number?**

**Find the distance between each pair of coordinates.**

a) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ b) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ $C\left(-3, -4\right) and D(-2, 5)$ d) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_$ E\left(0, -4\right) and F(4, 0)$

e) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ $G\left(-8, 10\right) and H(-2, 7)$ f) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ $I\left(11, 13\right) and J(-1, -5)$

**4.4 Part B: The Pythagorean Theorem**

**Goal: Use the Pythagorean Theorem to find missing sides of right triangles.**

**Legs of a right triangle:** the sides that form the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Hypotenuse**: the side \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the right angle

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| **The Pythagorean Theorem** |
| In a right triangle, the square of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is equal to the sum of the squares of the lengths of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ | \_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_ = \_\_\_\_\_\_\_\_ |

**Use the Pythagorean theorem to find each missing side length. If necessary, round to the nearest tenth.**

a) c = \_\_\_\_\_\_\_\_\_\_\_\_\_ b) b = \_\_\_\_\_\_\_\_\_\_\_\_\_ c) a = \_\_\_\_\_\_\_\_\_\_\_\_

d) x = \_\_\_\_\_\_\_\_\_\_\_\_\_ e) x = \_\_\_\_\_\_\_\_\_\_\_\_\_ f) x = \_\_\_\_\_\_\_\_\_\_\_\_

**Pythagorean triple:** a set of three positive integers a, b, and c that satisfy the equation $a^{2}+b^{2}=c^{2}$.

**Tell whether the given side lengths form a Pythagorean triple.**

a) 8, 10, 6 b) 7, 8, 9 c) 14, 50, 48

**Draw and label a picture of the situation, then use the Pythagorean Theorem to solve.**

a) To hang lights on her house, Ms. Blaseg placed a 15 foot ladder 3 feet from the base of her house. How high up the house will the ladder reach?

b) Steve is turning half of his backyard into a chicken pen. His backyard is a 24 meter by 45 meter rectangle. He wants to put a chicken wire fence that stretches diagonally from one corner to the opposite corner. How many meters of fencing will Steve need?

c) A ship leaves port and travels 100 km east then turns south and travels 75 km. How far from the port is the ship?

d) A wire is stretched from the top of a 12 foot pole to a stake 5 feet from the base of the pole. How long is the wire?

**4.5 The Converse of the Pythagorean Theorem**

**Goal: Use side lengths to determine whether triangles are acute, obtuse, or right.**

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| **Classifying Triangles Using the Converse of the Pythagorean Theorem** |
| **In** $∆ABC$ **with longest side C….** |
| If **\_\_\_\_\_\_ \_\_\_\_\_\_ + \_\_\_\_\_\_**then the triangle is **acute**. | If **\_\_\_\_\_\_ \_\_\_\_\_\_ + \_\_\_\_\_\_**then the triangle is **right**. | If **\_\_\_\_\_\_ \_\_\_\_\_\_ + \_\_\_\_\_\_**then the triangle is **obtuse.** |

**Classify the triangle with the given side lengths as acute, right, or obtuse.**

a) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ b) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ c) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ e) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ f) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

g) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ h) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ i) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

$1, 8, \sqrt{65}$ $ \sqrt{33}, 9, 7$ $4, 9, \sqrt{104}$

**4.6 Medians of Triangles**

**Goal: Draw medians and centroids. Use properties of medians to find missing lengths.**

**Median**: a segment from the vertex to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the opposite side.

**Centroid**: the point at with the medians of the triangle \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Use a ruler to draw all three medians in each triangle. Label the centroid of each triangle X.**







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| **Intersections of Medians of a Triangle** |
| The medians of a triangle intersect at a point that is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the distance from each vertex to the midpoint of the opposite side. | If $P$ is the centroid of $∆ABC$, then$AP=\frac{2}{3}\\_\\_\\_\\_$ **and** $BP=\frac{2}{3}\\_\\_\\_\\_$**and** $CP=\frac{2}{3}\\_\\_\\_\\_$ |

**P is the centroid of** $∆LMN$**. Find QP and PN.**

a) QP = \_\_\_\_\_\_ PN = \_\_\_\_\_\_\_ b) QP = \_\_\_\_\_\_ PN = \_\_\_\_\_\_\_ c) QP = \_\_\_\_\_\_ PN = \_\_\_\_\_\_\_

**D is the centroid of** $∆ABC$**. Find CD and CE.**

a) CD = \_\_\_\_\_\_ CE = \_\_\_\_\_\_\_ b) CD = \_\_\_\_\_\_ CE = \_\_\_\_\_\_\_ c) CD = \_\_\_\_\_\_ CE = \_\_\_\_\_\_\_

**P is the centroid of each triangle. Use the information given to find the lengths.**

a) BD = \_\_\_\_\_\_\_\_\_ b) EH = \_\_\_\_\_\_\_\_\_ c) KM = \_\_\_\_\_\_\_

**AngLegs – Is it a Triangle?**

**4.7 Investigation**

**Determine if a triangle can be made with the following colors as sides. List the side length of each color and whether or not it makes a triangle.**

Orange: 5 cm Purple: 7 cm Green: 9 cm

Yellow: 10 cm Blue: 12 cm Red: 14 cm

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| --- | --- | --- | --- | --- |
| **Colors of Sides** | **Length of side 1** | **Length of side 2** | **Length of side 3** | **Did it make a triangle?** |
| 1. Purple, purple, orange |  |  |  |  |
| 2. Orange, green, yellow |  |  |  |  |
| 3. Green, orange, red |  |  |  |  |
| 4. Orange, blue, red |  |  |  |  |
| 5. Orange, purple, orange |  |  |  |  |
| 6. Blue, orange, purple |  |  |  |  |
| 7. Orange, orange, blue |  |  |  |  |
| 8. Purple, orange, yellow |  |  |  |  |
| 9. Orange, purple, red |  |  |  |  |
| 10. Green, yellow, blue |  |  |  |  |

Go back and observe the side lengths, find a rule for when the side lengths make a triangle.

Find a rule for when the side lengths do not make a triangle.

**4.7 Triangle Inequalities**

**Goal: Use triangle measures to decide which side is the longest and which angle is the largest.**

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| If one side of a triangle is longer than another side, then the angle opposite the longer side is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ than the angle opposite the shorter side. | **If** $BC>AB$**, then** $m∠$**A \_\_\_\_\_\_** $m∠C$ |
| If one angle of a triangle is larger than another angle, then the side opposite the larger angle is \_\_\_\_\_\_\_\_\_\_\_\_\_\_ than the side opposite the smaller angle. | **If** $m∠D>m∠E$**, then** $EF \\_\\_\\_\\_\\_\\_\\_\\_\\_DF$ |

**Name the angles from largest to smallest.**

**Name the sides from longest to shortest.**

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| **Triangle Inequality Theorem:** The sum of the lengths of any two sides of a triangle is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than the length of the third side. |  |

**Determine whether the side lengths can form a triangle.**

a) 3, 5, 9 b) 7, 5, 12 c) 6, 9, 4

d) 18, 9, 11 e) 20, 36, 13 f) 8.5, 7.2, 3.4