Trickier Constuctions

Short-answer questions about tricky constructions.

Problem 1 *Construct a square. Explain the steps in your construction.*

Problem 2 *Construct a regular hexagon. Explain the steps in your construction.*

Problem 3 *Your friend Margy is building a clock. She needs to know how to align the twelve numbers on her clock so that they are equally spaced on a circle. Explain how to use a compass and straightedge construction to help her out. Illustrate your answer with a construction and explain the steps in your construction.*

Problem 4 *Construct a triangle given two sides of a triangle and the angle between them. Explain the steps in your construction.*

Problem 5 *State the SAS Theorem.*

Problem 6 *Construct a triangle given three sides of a triangle. Explain the steps in your construction.*

Problem 7 *State the SSS Theorem.*

Problem 8 *Construct a triangle given a side and two angles where one of the angles does not touch the given side. Explain the steps in your construction.*

Problem 9 *State the SAA Theorem.*

Problem 10 *Construct a triangle given a side between two given angles. Explain the steps in your construction.*

Problem 11 *State the ASA Theorem.*

Problem 12 *Explain why when given an isosceles triangle, that two of its angles have equal measure. Hint: Use the SAS Theorem.*

Problem 13 *Construct a figure showing that a triangle cannot always be uniquely determined when given an angle, a side adjacent to that angle, and the side opposite the angle. Explain the steps in your construction and explain how your figure shows what is desired. Explain what this says about the possibility of a SSA theorem. Hint: Draw many pictures to help yourself out.*

Problem 14 *Give a construction showing that a triangle is uniquely determined if you are given a right-angle, a side touching that angle, and another side not touching the angle. Explain the steps in your construction and explain how your figure shows what is desired.*

Problem 15 *Construct a triangle given two adjacent sides of a triangle and a median to one of the given sides. Explain the steps in your construction.*

Problem 16 *Construct a triangle given two sides and the altitude to the third side. Explain the steps in your construction.*

Problem 17 *Construct a triangle given a side, the median to the side, and the angle opposite to the side. Explain the steps in your construction.*

Problem   18   *Construct a triangle given an altitude, and two angles not touching the altitude. Explain the steps in your construction.*

Problem   19   *Construct a triangle given the length of one side, the length of the the median to that side, and the length of the altitude of the opposite angle. Explain the steps in your construction.*

Problem   20   *Construct a triangle, given one angle, the length of an adjacent side and the altitude to that side. Explain the steps in your construction.*

Problem   21   *Construct a circle with a given radius tangent to two other given circles. Explain the steps in your construction.*

Problem   22   *Does a given angle and a given opposite side uniquely determine a triangle? Explain your answer.*

Problem   23   *You are on the bank of a river. There is a tree directly in front of you on the other side of the river. Directly left of you is a friend a known distance away. Your friend knows the angle starting with them, going to the tree, and ending with you. How wide is the river? Explain your work.*

Problem   24   *You are on a boat at night. You can see three lighthouses, and you know their position on a map. Also you know the angles of the light rays from the lighthouses. How do you figure out where you are? Explain your work.*

Problem   25   *Construct a triangle given an angle, the length of a side adjacent to the given angle, and the length of the angle's bisector to the opposite side. Explain the steps in your construction.*

Problem   26   *Construct a triangle given an angle, the length of the opposite side, and the length of the altitude of the given angle. Explain the steps in your construction.*

Problem   27 *Construct a triangle given one side, the length of the altitude of the opposite angle, and the radius of the circumcircle. Explain the steps in your construction.*

Problem   28 *Construct a triangle given one side, the length of the altitude of an adjacent angle, and the radius of the circumcircle. Explain the steps in your construction.*

Problem   29 *Construct a triangle given one side, the length of the median connecting that side to the opposite angle, and the radius of the circumcircle. Explain the steps in your construction.*

Problem   30 *Construct a triangle given one angle and the lengths of the altitudes to the two other angles. Explain the steps in your construction.*

Problem   31 *Construct a circle with a given radius tangent to two given intersecting lines. Explain the steps in your construction.*

Problem   32 *Given a circle and a line, construct another circle of a given radius that is tangent to both the original circle and line. Explain the steps in your construction.*

Problem   33 *Construct a circle with three smaller circles of equal size inside such that each smaller circle is tangent to the other two and the larger outside circle. Explain the steps in your construction.*