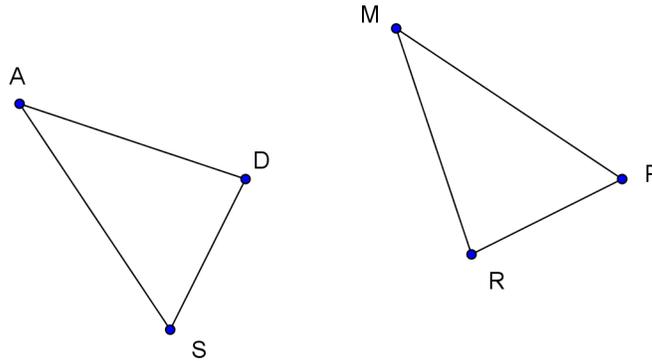
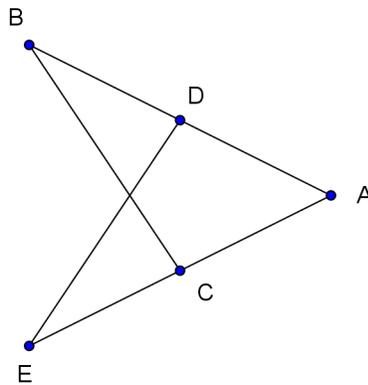


Show all work. Supply explanations when necessary. Partial credit will be awarded for correct work.

1. (6 points) In the figure below, suppose $\overline{AD} \cong \overline{MR}$, $\overline{SD} \cong \overline{RP}$, and $\angle D \cong \angle R$.

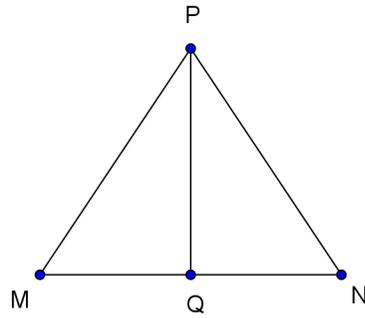


- (a) What congruence property justifies that the triangles are congruent?
- (b) Write a correctly ordered congruence relationship.
2. (4 points) In the figure below, suppose $\angle B \cong \angle E$ and $\overline{AE} \cong \overline{AB}$. What additional fact and what congruence property justify that $\triangle ABC \cong \triangle AED$?



3. (3 points) What does CPCTC stand for?

4. (6 points) In the figure below, $\overline{MP} \cong \overline{NP}$ and \overline{PQ} bisects $\angle MPN$.



(a) Prove that $\triangle MPQ \cong \triangle NPQ$

(b) What kind of triangle is $\triangle MPN$?

5. (3 points) Explain why you cannot construct a triangle with sides of lengths 8 in, 9 in, and 10 in.

6. (8 points) $\triangle ABC$ is a right triangle with the right angle at B .

(a) Find AC if $AB = 4$ and $BC = 6$.

(b) Find AB if $AC = 15$ and $BC = 3$.

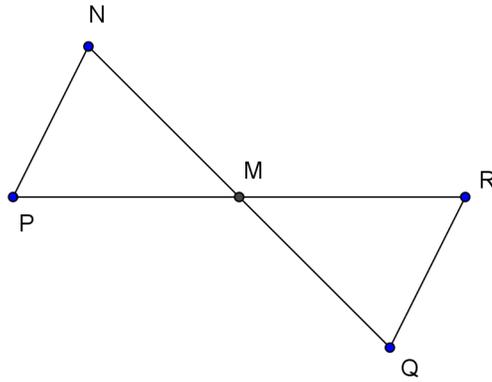
7. (2 points) An isosceles triangle is a triangle with at least two congruent sides. State one property of isosceles triangles.

8. (6 points) $\triangle ABC$ is an isosceles triangle with its vertex angle at A . Suppose $m(\angle A) = 100^\circ$.

(a) Find $m(\angle B)$.

(b) Which side of the triangle is the longest side? How do you know?

9. (6 points) In the figure below, $\angle P \cong \angle R$ and M is the midpoint of \overline{PR} .



- (a) Prove that $\triangle PMN \cong \triangle RMQ$
- (b) How do you know that $\angle N \cong \angle Q$?
10. (6 points) A parallelogram is a quadrilateral with two pairs of parallel sides. State two properties of parallelograms.
11. (6 points) In $\triangle ABC$, the side \overline{BC} has length 14 in. Suppose point D is the midpoint of \overline{AB} and point E is the midpoint of \overline{AC} . Find y if $m(\overline{DE}) = 4y - 1$.

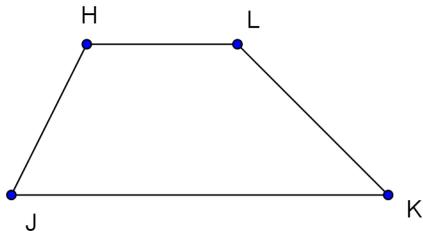
12. (9 points) Quadrilateral $ABCD$ is a kite with $\overline{AB} \cong \overline{BC}$.

(a) Use a straightedge to roughly sketch the kite.

(b) Prove that $\triangle ABD \cong \triangle CBD$

(c) How do you know that $\angle A \cong \angle C$?

13. (4 points) The figure shown below is a trapezoid with $\overline{HL} \parallel \overline{JK}$. Suppose $m(\angle H) = 107^\circ$ and $m(\angle K) = 58^\circ$. Find the measures of $\angle J$ and $\angle L$.



14. (3 points) Refer to the trapezoid in the problem above. Suppose A is the midpoint of \overline{HJ} and B is the midpoint of \overline{LK} . Explain how can AB be determined from HL and JK ?

15. (4 points) Use a straightedge to sketch an obtuse angle. Then bisect the angle using only compass and straightedge. Show all your steps.

16. (4 points) Use a straightedge to sketch a line segment. Then bisect the segment using only compass and straightedge. Show all your steps.

17. (4 points) In parallelogram $ABCD$, $m(\overline{AB}) = 5.1$, $m(\angle B) = 101^\circ$, and $m(\overline{BC}) = 11.7$. Roughly sketch the parallelogram and determine the measures of all angles and sides.

18. (2 points) Refer to the parallelogram above. Which one of the two diagonals is the longest? How do you know?

19. (10 points) Indicate whether each statement is true or false.

(a) _____ Every rhombus is a kite.

(b) _____ Every square is a rhombus.

(c) _____ Every rectangle is a square.

(d) _____ Every rhombus is a square.

(e) _____ Every kite is a parallelogram.

20. (4 points) A rectangle is a parallelogram with a right angle. Prove that a rectangle has four right angles.