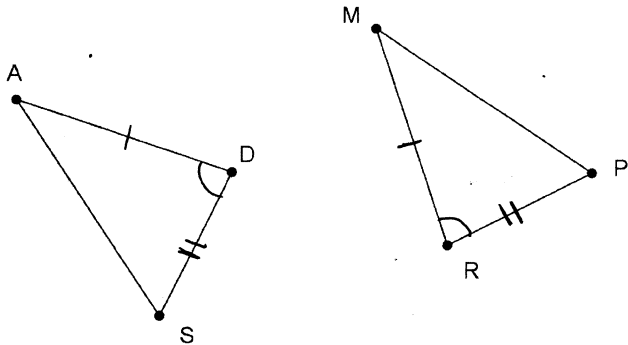


Math 096 - Test 3
 April 26, 2017

Name key Score _____

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 $\angle D \cong \angle R$.



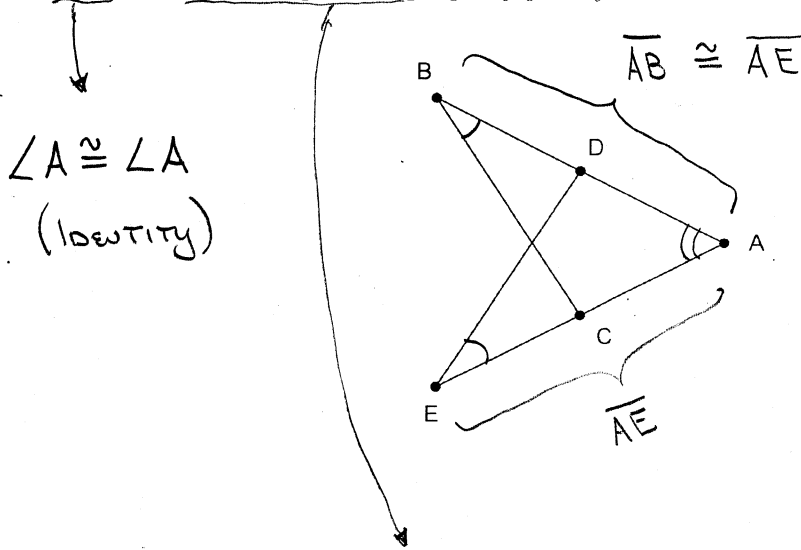
- (a) What congruence property justifies that the triangles are congruent?

SAS

- (b) Write a correctly ordered congruence relationship.

$$\triangle ADS \cong \triangle MRP$$

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 $\triangle ABC \cong \triangle AED$?



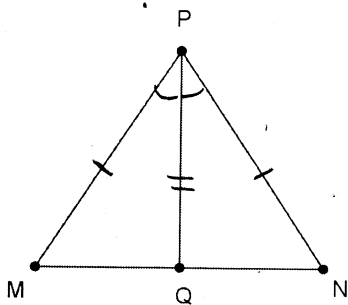
$\angle A \cong \angle A$
 (Identity)

ASA property

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

CORRESPONDING PARTS OF CONGRUENT TRIANGLES
ARE CONGRUENT.

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



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

SINCE \overline{PQ} BISECTS $\angle MPN$, $\angle MPQ \cong \angle NPQ$
(AS MARKED). ALSO, $\overline{PQ} \cong \overline{PQ}$ BY IDENTITY.

SO $\triangle MPQ \cong \triangle NPQ$
BY SAS.

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

ISOSCELES

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

↙ You CAN!

$$8+9 = 17 > 10$$

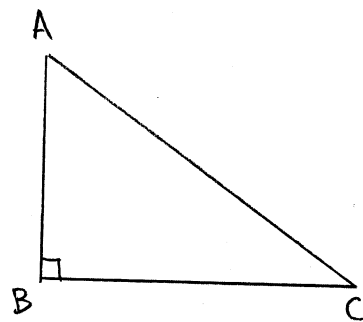
$$9+10 = 19 > 8$$

$$8+10 = 18 > 9$$

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

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

$$\begin{aligned} AC^2 &= 4^2 + 6^2 \\ &= 16 + 36 = 52 \\ AC &= \sqrt{52} \approx 7.2 \end{aligned}$$



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

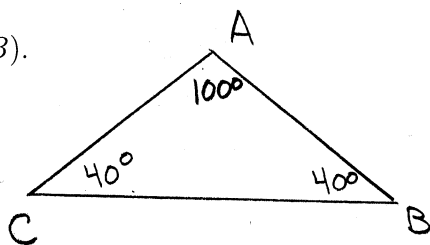
$$\begin{aligned} AB^2 + 3^2 &= 15^2 \\ AB^2 + 9 &= 225 \quad AB^2 = 216 \\ AB &= \sqrt{216} \approx 14.7 \end{aligned}$$

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

BASE \angle 'S ARE CONGRUENT.

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

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



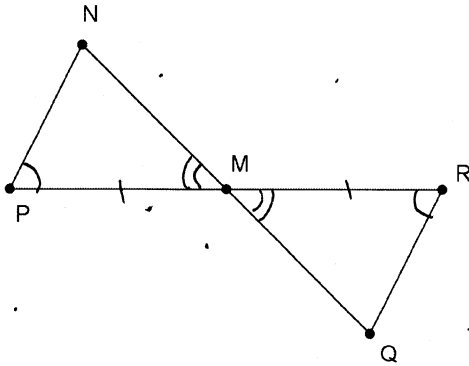
$$180^\circ - 100^\circ = 80^\circ$$

$$80^\circ / 2 = 40^\circ$$

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

\overline{BC} IS LONGEST BECAUSE IT IS
OPPOSITE THE BIGGEST \angle .

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



- (a) Prove that $\triangle PMN \cong \triangle RMQ$

M IS THE MIDPOINT OF $\overline{PR} \Rightarrow \overline{PM} \cong \overline{RM}$
 (AS MARKED). $\angle NMP \cong \angle QMR$ BECAUSE

THEY ARE VERTICAL \angle 'S. $\triangle PMN \cong \triangle RMQ$

By ASA.

- (b) How do you know that $\angle N \cong \angle Q$?

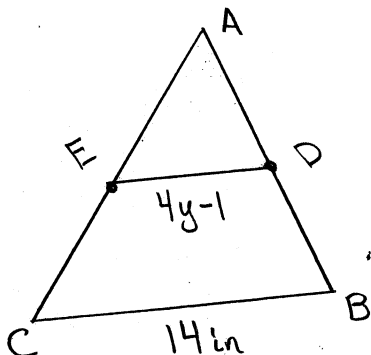
CPCTC

10. (6 points) A parallelogram is a quadrilateral with two pairs of parallel sides. State two properties of parallelograms.

① OPPOSITE SIDES ARE CONGRUENT.

② OPPOSITE ANGLES ARE CONGRUENT.

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 $m(\overline{DE}) = 4y - 1$.



$$2(4y-1) = 14$$

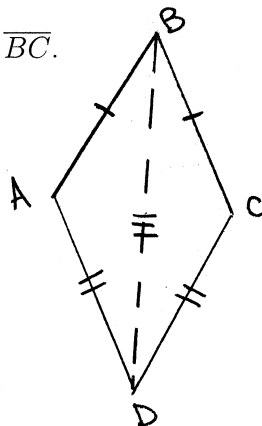
$$4y-1 = 7$$

$$4y = 8$$

$$y = 2 \text{ in}$$

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 $\triangle ABD \cong \triangle CBD$

$$\overline{AB} \cong \overline{CB} \text{ AND } \overline{AD} \cong \overline{CD}$$

BECAUSE IT IS A KITE.

$$\overline{BD} \cong \overline{BD} \text{ BY IDENTITY.}$$

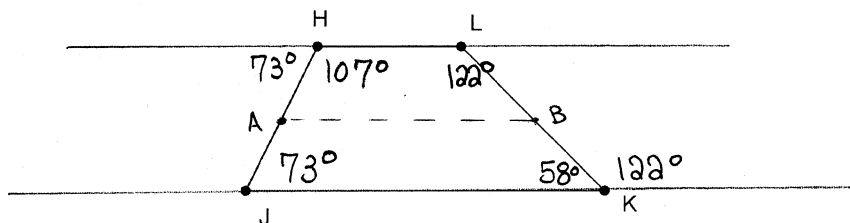
$$\triangle ABD \cong \triangle CBD$$

By SSS.

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

CPCTC

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 $\angle L$.



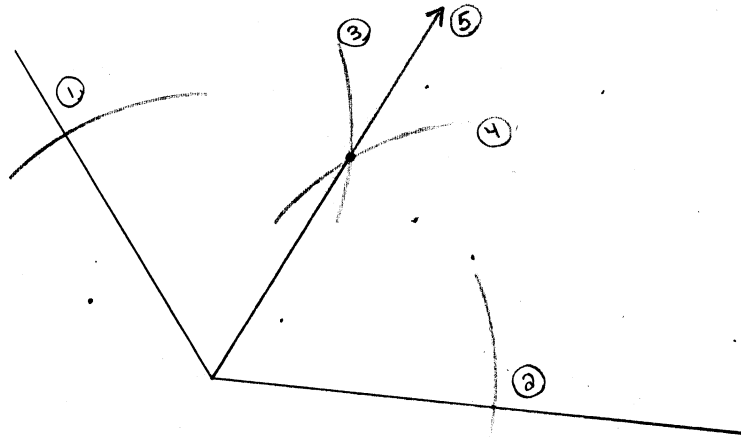
$$m(\angle J) = 73^\circ$$

$$m(\angle L) = 122^\circ$$

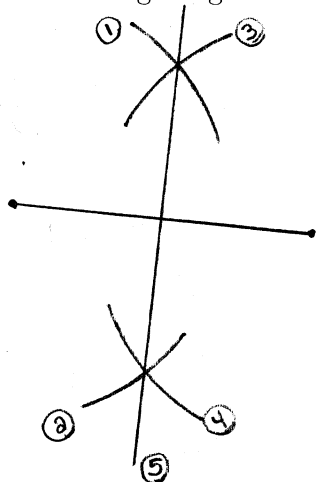
14. (3 points) Refer to the trapezoid in the problem above. Suppose A is the midpoint of \overline{HJ} and B is the midpoint of \overline{LK} . Explain how can AB be determined from HL and JK ?

$$\text{MEDIAN } AB = \frac{HL + JK}{2}$$

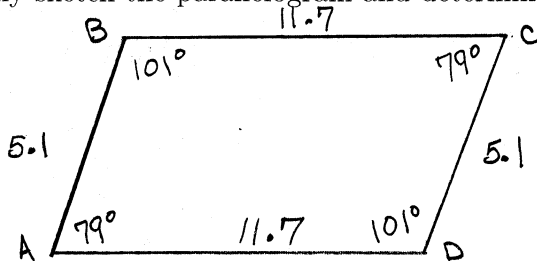
15. (4 points) Use a straightedge to sketch an obtuse angle. Then bisect the angle using only compass and straightedge. Show all your steps.



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?

\overline{AC} IS LONGER THAN \overline{BD}
 BECAUSE IT IS OPPOSITE THE
 BIGGER ANGLE.

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

(a) T Every rhombus is a kite.

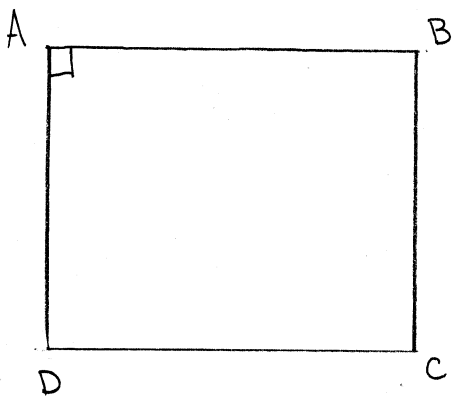
(b) T Every square is a rhombus.

(c) F Every rectangle is a square.

(d) F Every rhombus is a square.

(e) F 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.



BECAUSE ABCD IS

A PARALLELOGRAM, CONSECUTIVE
∠'S ARE SUPPLEMENTARY.

THEREFORE, IF $m(\angle A) = 90^\circ$,

THEN $m(\angle B) = 90^\circ$.

SINCE OPPOSITE ∠'S OF A
PARALLELOGRAM ARE CONGRUENT,

$m(\angle C) = m(\angle A) = 90^\circ$ &

$m(\angle D) = m(\angle B) = 90^\circ$.