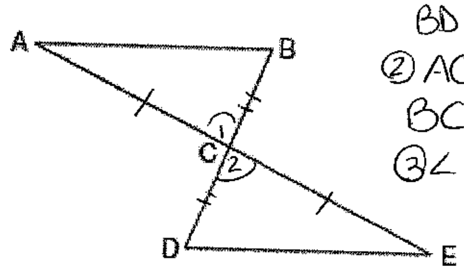
Name: Key Date: __________

Prove Lines are Parallel

1. Given: ΔABC and ΔEDC, C is the midpoint of $\overline{BD}$ and $\overline{AE}$

Prove: $\overline{AB} \parallel \overline{DE}$



S	R
① $\triangle ABC$, $\triangle EDC$ C is the midpoint of BD and AE	① Given
② $AC \cong EC$, $BC \cong DC$	② A midpoint divides a segment into 2 ≅ segments
③ $\angle 1 \cong \angle 2$	③ Intersecting lines form ≅ vertical ∠s
④ $\triangle ACB \cong \triangle ECD$	④ SAS≅SAS
⑤ $\angle B \cong \angle D$ or $\angle A \cong \angle E$	⑤ CPCTC
⑥ AB ∥ DE	⑥ If alternate interior ∠s are ≅ then the 2 lines cut by a transversal are ∥

2. Similar to #1

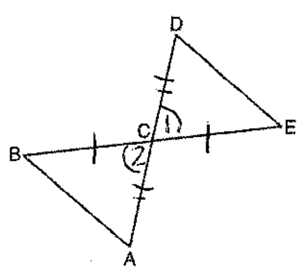
Given: $\overline{BE}$ and $\overline{AD}$ intersect at point C

$\overline{BC} \cong \overline{EC}$

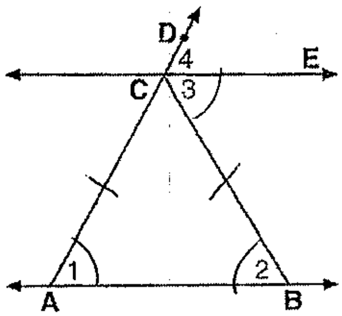
$\overline{AC} \cong \overline{DC}$

$\overline{AB}$ and $\overline{DE}$ are drawn

Prove: $\overline{BA} \parallel \overline{DE}$



3.

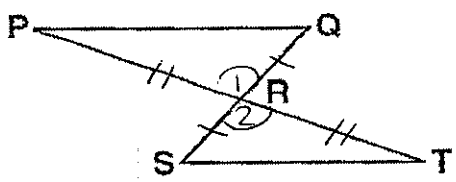


Given: $\angle 1 \cong \angle 3$
$\overleftrightarrow{CA} \cong \overleftrightarrow{CB}$

Prove: $\overleftrightarrow{CE} \parallel \overleftrightarrow{AB}$

S	R
① $\angle 1 \cong \angle 3$	① Given
② $CA \cong CB$	② Given
③ $\angle 1 \cong \angle 2$	③ In a $\triangle$ if 2 sides are $\cong$ then the $\angle$s opposite them are $\cong$
④ $\angle 2 \cong \angle 3$	④ Transitive
⑤ $CE \parallel AB$	⑤ If alternate interior $\angle$s are $\cong$ then the 2 lines cut by a transversal are $\parallel$

4.

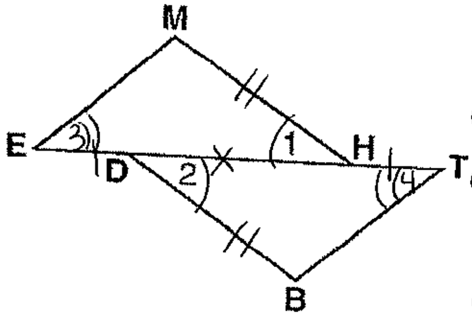


Given: $\overline{PT}$ and $\overline{QS}$ bisect each other

Prove: $\overline{PQ} \parallel \overline{ST}$

S	R
① PT & QS bisect each other	① Given
② $PR \cong TR$ $QR \cong SR$	② A segment bisector divides a segment into 2 $\cong$ segments
③ $\angle 1 \cong \angle 2$	③ Intersecting lines form $\cong$ vertical $\angle$s
④ $\triangle PRQ \cong \triangle TRS$	④ SAS $\cong$ SAS
⑤ $\angle P \cong \angle T$ or $\angle Q \cong \angle S$	⑤ CPCTC
⑥ $PQ \parallel ST$	⑥ If alternate interior $\angle$s are $\cong$ then the 2 lines cut by a transversal are $\parallel$

5.



Given: $\overline{ED} \cong \overline{HT}$

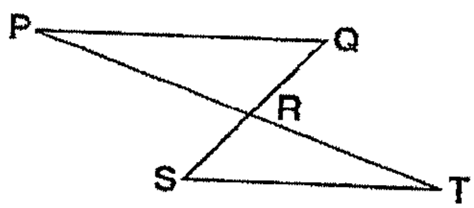
$\angle 1 \cong \angle 2$

$\overline{MH} \cong \overline{DB}$

Prove: $\overline{EM} \parallel \overline{TB}$

S	R
① $ED \cong TH$	① Given
② $DH \cong DH$	② Reflexive Property
③ $ED + DH \cong TH + DH$	③ Addition Postulate
④ $EH = ED + DH$ $TD = TH + DH$	④ Partition Postulate
⑤ $EH \cong TD$	⑤ Substitution Postulate
⑥ $\angle 1 \cong \angle 2$	⑥ Given
⑦ $MH \cong BD$	⑦ Given
⑧ $\triangle EHM \cong \triangle TDB$	⑧ SAS $\cong$ SAS
⑨ $\angle 3 \cong \angle 4$	⑨ CPCTC
⑩ $EM \parallel TB$	⑩ If alternate interior $\angle$s are $\cong$ then the 2 lines cut by a transversa are $\parallel$

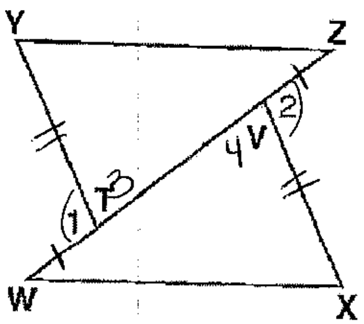
6. same as #4



Given: $\overline{PT}$ and $\overline{QS}$ bisect each other

Prove: $\overline{PQ} \parallel \overline{ST}$

7.



Given: $\angle 1 \cong \angle 2$
$\overline{WT} \cong \overline{VZ}$
$\overline{YT} \cong \overline{VX}$

Prove: (a) $\overline{YT} \parallel \overline{VX}$

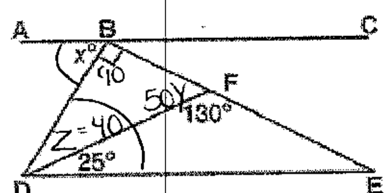
S	R
① $\angle 1 \cong \angle 2$	① Given
② $YT \parallel VX$	② If alternate exterior $\angle$s are $\cong$ then the 2 lines cut by a transversal are $\parallel$

OR

S	R
① $\angle 1 \cong \angle 2$	① Given
② $\angle 1 + \angle 3 = 180$ $\angle 2 + \angle 4 = 180$	② A straight $\angle$ measures 180°
③ $\angle 1 + \angle 3 \cong \angle 2 + \angle 4$	③ Substitution Postulate
④ $\angle 1 + \angle 3 \cong \angle 2 + \angle 4$ $-\angle 1 \quad -\angle 2$ $\angle 3 \cong \angle 4$	④ Subtraction Postulate
⑤ $YT \parallel VX$	⑤ If alternate interior $\angle$s are $\cong$ then the 2 lines cut by a transversal are $\parallel$

8.

In the accompanying diagram, $\overline{ABC} \parallel \overline{DE}$, $m\angle FDE = 25^\circ$, $m\angle DFE = 130^\circ$, and $m\angle ABD = x^\circ$.



What is the value of x? Explain your reasoning.

$$y + 130 = 180$$
$$-130 \quad -130$$
$$y = 50$$

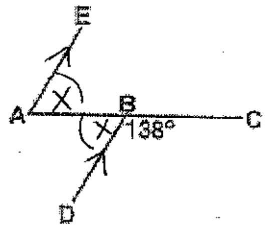
$$90 + 50 + Z = 180$$
$$140 + Z = 180$$
$$-140 \quad -140$$
$$Z = 40$$

$$X = Z + 25$$
$$X = 40 + 25$$
$$\boxed{X = 65}$$

$\angle$s of a Δ add up to 180°
A straight $\angle$ measures 180°
$\parallel$ lines cut by a transversal form $\cong$ alternate interior $\angle$s

9.

In the accompanying diagram, $\overline{ABC}$, m∠DBC = 138°, and $\overline{AE} \parallel \overline{DB}$.



Find m∠EAB.

$$x + 138 = 180$$
$$-138 \quad -138$$
$$\boxed{x = 42^\circ}$$

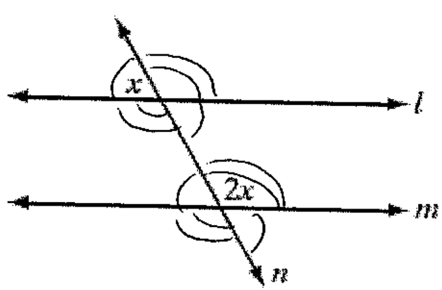
10.

Two parallel lines are cut by a transversal. The measures of two alternate interior angles are represented by $10x - 9$ and $8x + 15$. Find the value of x.

$$10x - 9 = 8x + 15$$
$$-8x \qquad -8x$$
$$2x - 9 = 15$$
$$+9 \quad +9$$
$$\frac{2x}{2} = \frac{24}{2}$$
$$\boxed{x = 12}$$

11.

In the figure given, if $l \parallel m$, what is the measure of $\angle x$?



(1) 15°

(2) 30°

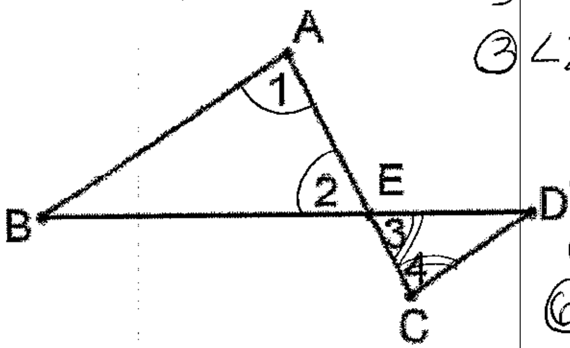
(3) 45°

(4) 60°

$$x + 2x = 180$$
$$\frac{3x}{3} = \frac{180}{3}$$
$$\boxed{x = 60}$$

12.

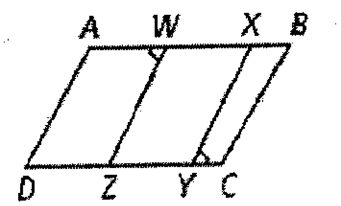
Given: $\angle 1 \cong \angle 2, \angle 3 \cong \angle 4$
Prove: $\overline{AB} \parallel \overline{CD}$



S	R
① $\angle 1 \cong \angle 2$	① Given
② $\angle 3 \cong \angle 4$	② Given
③ $\angle 2 \cong \angle 3$	③ Intersecting lines form ≅ vertical ∠s
④ $\angle 1 \cong \angle 3$	④ Transitive
⑤ $\angle 1 \cong \angle 4$	⑤ Transitive
⑥ AB ∥ CD	⑥ If alternate interior ∠s are ≅ then the 2 lines cut by a transverso are ∥

13.

Error Analysis A classmate said that $\overline{AB} \parallel \overline{DC}$ based on the diagram at the right. Explain your classmate's error.



There are no:

- ≅ alternate interior ∠s
- ≅ corresponding ∠s
- ≅ alternate exterior ∠s
- same side of the transversal supplementary interior ∠s

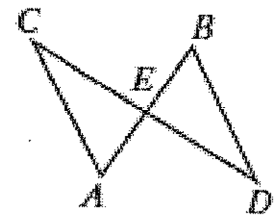
14. Similar to #4 & 6

If $\overline{AB}$ and $\overline{CD}$ bisect each other at point E, prove:

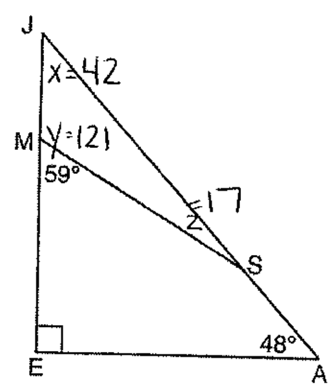
a. $\triangle CEA \cong \triangle DEB$

b. $\angle ECA \cong \angle EDB$

c. $\overline{CA} \parallel \overline{DB}$



15. In the diagram of $\triangle JEA$ below, $m\angle JEA = 90$ and $m\angle EAJ = 48$. Line segment MS connects points M and S on the triangle, such that $m\angle EMS = 59$.



What is $m\angle JSM$? Explain your reasoning.

$$x+90+48=180$$
$$x+138=180$$
$$-138 \quad -138$$
$$x=42$$

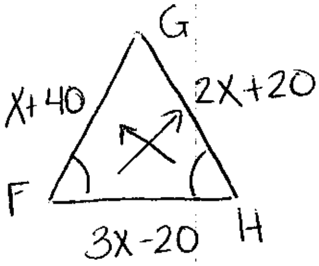
$$y+59=180$$
$$-59 \quad -59$$
$$y=121$$

$$x+y+z=180$$
$$42+121+z=180$$
$$163+z=180$$
$$-163 \quad -163$$
$$\boxed{z=17}$$

A △ ∠s add up to 180°

A straight ∠ measures 180°

16. In ΔFGH, $m\angle F = m\angle H$, $GF = x + 40$, $HF = 3x - 20$, and $GH = 2x + 20$. Find the length of $\overline{GH}$ and justify your answer.

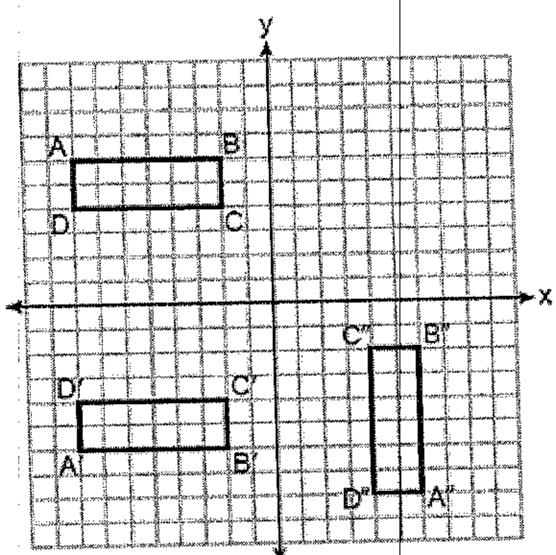


$$x+40 = 2x+20$$
$$-x \qquad -x$$
$$40 = x+20$$
$$-20 \qquad -20$$
$$20 = x$$

$$2(20)+20$$
$$40+20$$
$$\boxed{60}$$

17.

A sequence of transformations maps rectangle $ABCD$ onto rectangle $A''B''C''D''$, as shown in the diagram below.



Describe the sequence of transformations illustrated above.

$r_{x\text{-axis}}$ followed by a R_{90}