

Name Mrs. Dwiggins Date _____

Congruent Triangles: HL

HL—Hypotenuse, Leg
the hypotenuse and a leg of one right triangle
are congruent to the corresponding parts of
another triangle $\rightarrow \cong \Delta s$

State whether these pairs of triangles are congruent by HL. If not, write N.

- | | | |
|-------|-----|-------|
| ✓ 1. | 2. | ✓ 3. |
| ✓ 4. | 5. | 6. ✓ |
| ✓ 7. | 8. | ✓ 9. |
| ✓ 10. | 11. | 12. ✓ |

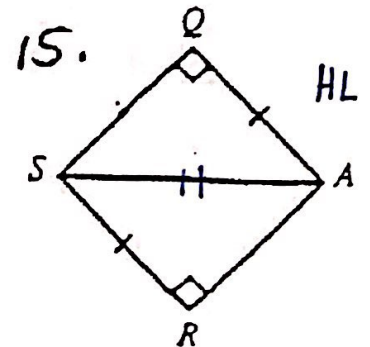
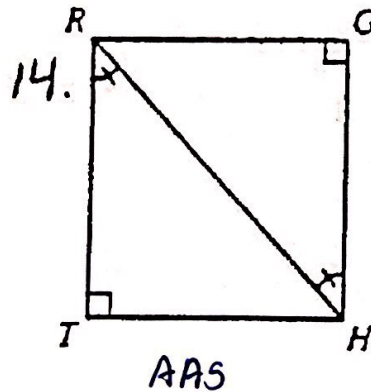
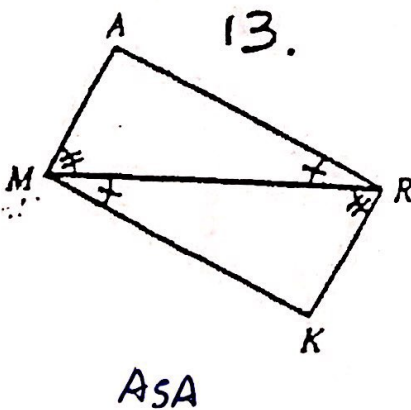
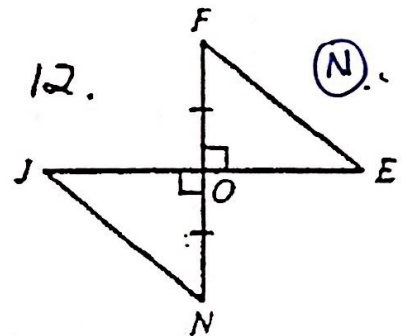
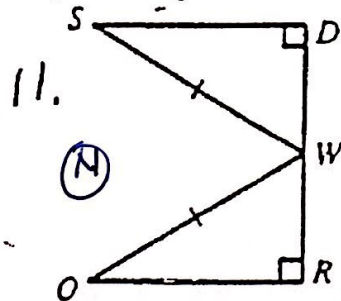
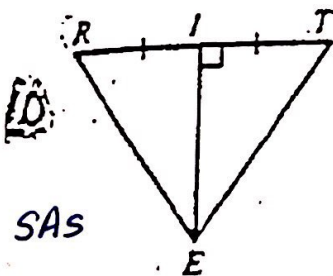
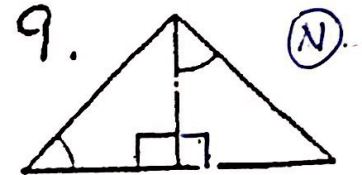
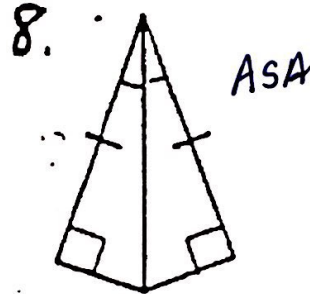
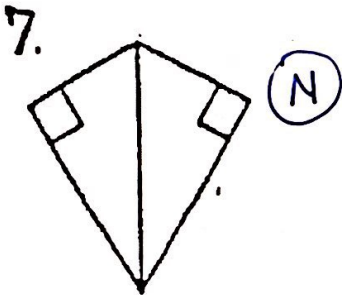
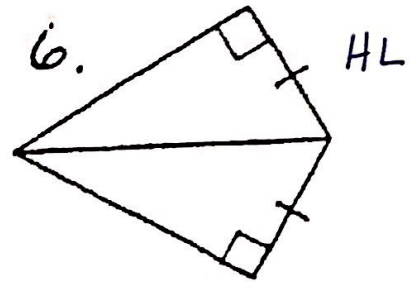
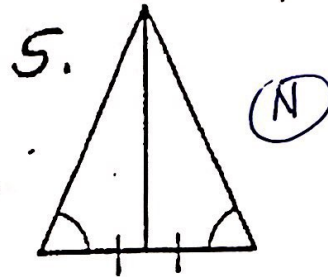
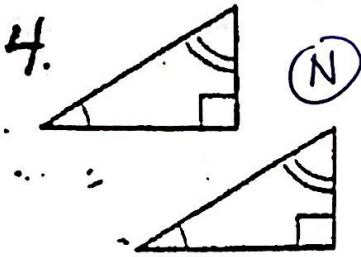
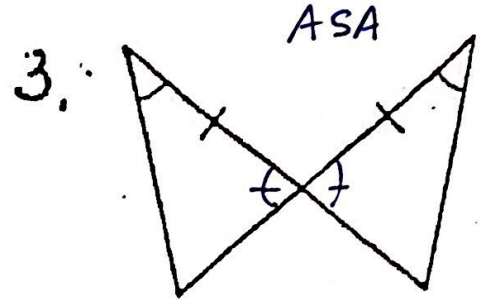
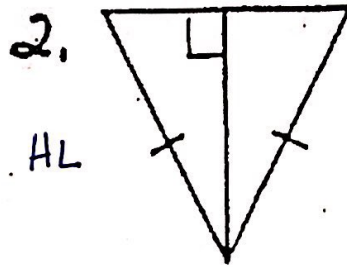
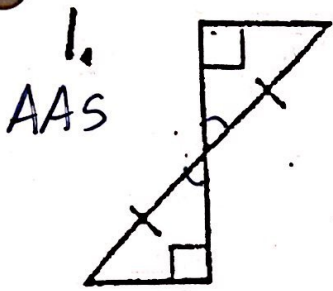
Name _____ Date _____

Triangle Congruence

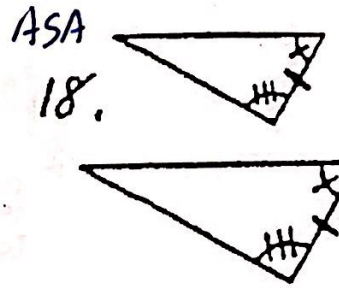
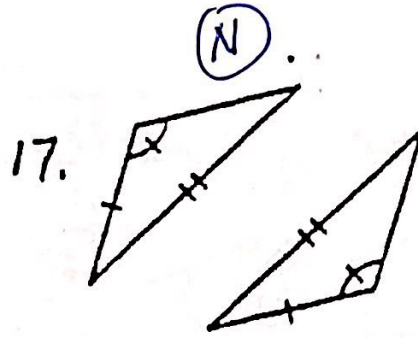
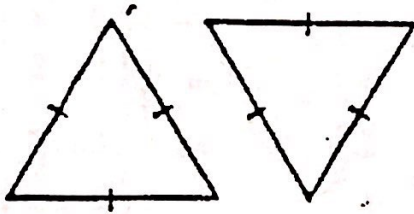
State whether these pairs of triangles are congruent by SSS, SAS, ASA, AAS, or HL. If none of these methods work, write N.

- | | | |
|----------|----------|----------|
| 1. SAS | 2. SSS | 3. N |
| 4. AAS | 5. ASA | 6. AAS |
| 7. SAS | 8. SAS | 9. SSS |
| 10. ASA | 11. HL | 12. SAS |
| 13. HL | 14. SAS | 15. N |

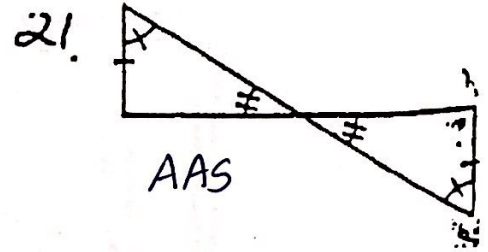
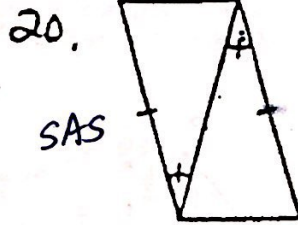
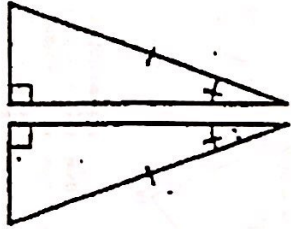
State which congruence method(s) can be used to prove the triangles congruent. If not method applies, say none.



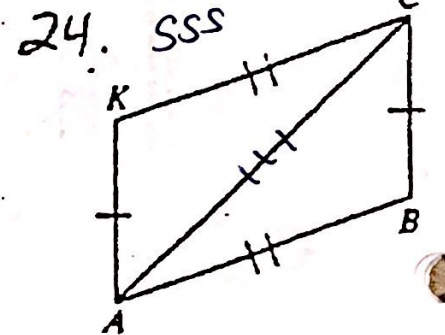
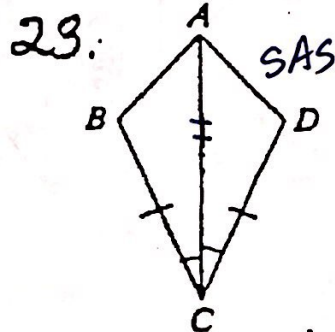
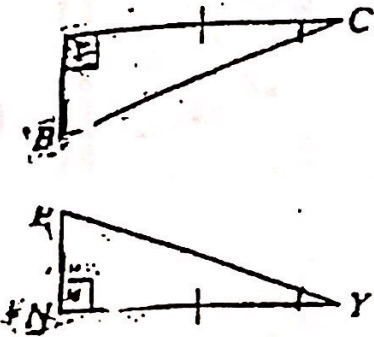
16. SSS



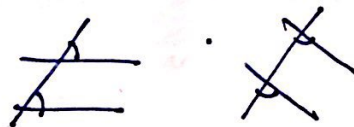
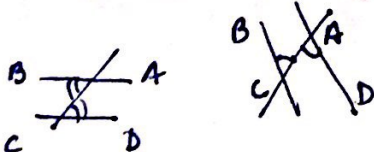
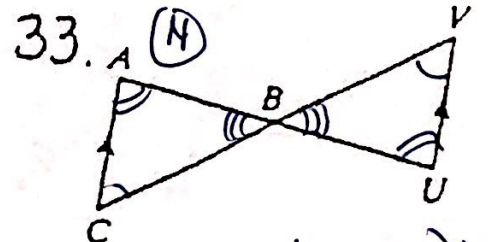
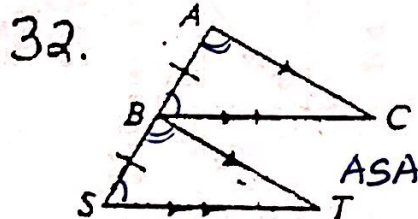
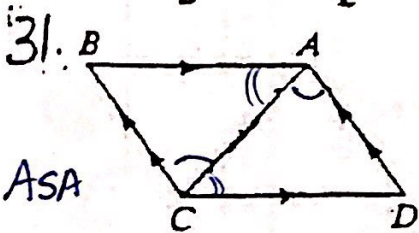
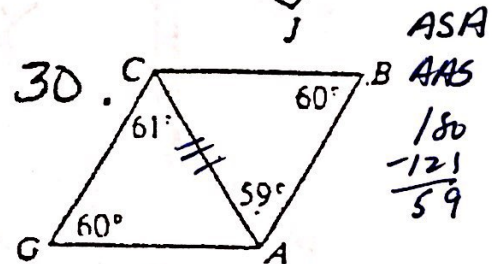
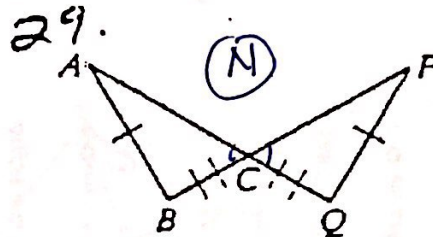
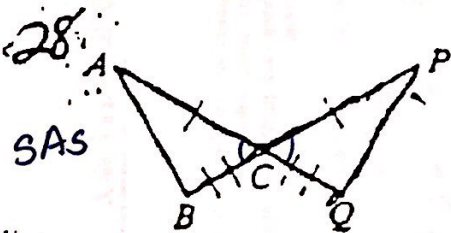
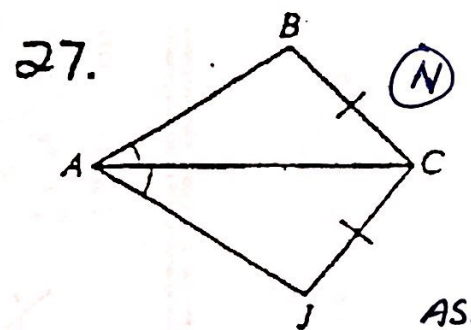
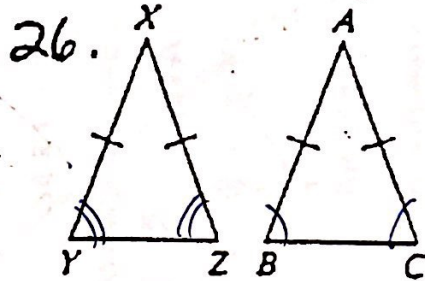
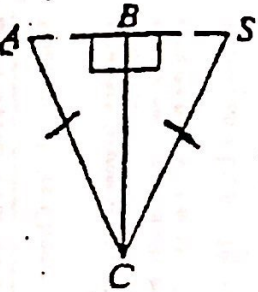
19. AAS



22. ASA



25. HL



1 ARE WE CONGRUENT? #1

Blackline 4.6.1



Structure: Boss/Secretary

Determine whether the following triangles are congruent. If so, complete the congruence statement and write the postulate or theorem that justifies the congruence. Otherwise, state that the "congruence cannot be determined."

1.

$\triangle BCA \cong \triangle EDF$
Justification: **SAS**

2.

$\triangle MOP \cong \triangle AER$
Justification: **SSS**

3.

$\triangle DOG \cong \triangle TAC$
Justification: **SAS**

4.

$\triangle GEO \cong \triangle CBD$
Justification: **SAS**

5.

$\triangle DON \cong \triangle CBD$
Justification: **SAS**

6.

$\triangle AKM \cong \triangle AKR$
Justification: **SAS**

7.

$\triangle ABD \cong \triangle CDB$
Justification: **HL**

8.

$\triangle BIE \cong \triangle AKE$
Justification: **SAS**

2 ARE WE CONGRUENT? #2

Blackline 4.6.2



Structure: Pairs Check

Draw each diagram on your own paper and mark each diagram with the given information. Determine whether the triangles are congruent. If they are congruent, write the theorem or postulate vertically, justifying each part of the theorem or postulate, and complete the triangle congruence statement.

1. Given: $\overline{AB} \cong \overline{ED}$; $\overline{BC} \cong \overline{DC}$; $\angle B \cong \angle D$

SAS

$\triangle ABC \cong \triangle EDC$

2. Given: $\overline{MO} \cong \overline{TO}$; $\overline{NO} \cong \overline{PO}$

SAS

$\triangle MON \cong \triangle TOP$

3. Given: $\angle W \cong \angle C$; $\overline{WA} \cong \overline{CA}$

ASA

$\triangle PAW \cong \triangle PCA$

4. Given: $\angle A \cong \angle C$; $\angle ADB \cong \angle CBD$

AAS

$\triangle ABD \cong \triangle CBD$

5. Given: $\angle G \cong \angle M$

AAS

$\triangle GHE \cong \triangle HME$

6. Given: $\angle M \cong \angle T$; $\angle P \cong \angle N$

not congruent

Applying Theorems

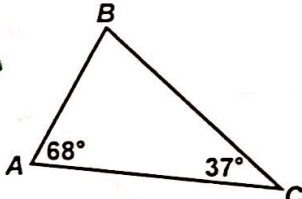
Review the following theorems. Then complete Problems 1 – 8.

Triangle Sum Theorem: The sum of the measures of the angles of a triangle is 180.

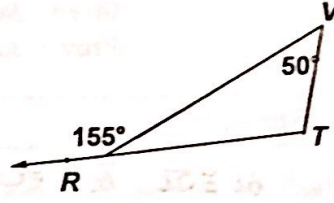
Exterior Angle Theorem: The measure of each exterior angle of a triangle equals the sum of the measures of its two remote interior angles.

► Determine the value of the unknown(s).

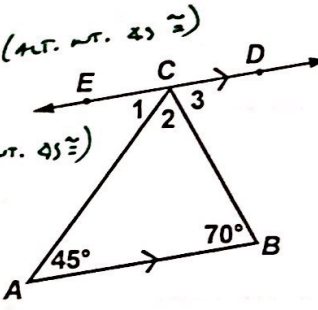
1) $m\angle B =$
 $65 + 37 + m\angle B = 180$
 $105 + m\angle B = 180$
 $m\angle B = 75^\circ$



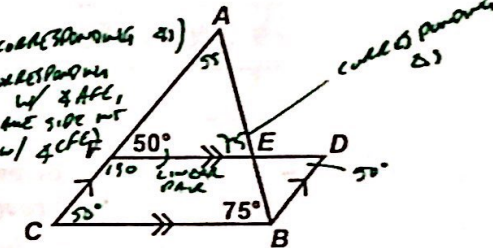
2) $m\angle T =$
 $155 = 50 + m\angle T$
 $105 = m\angle T$



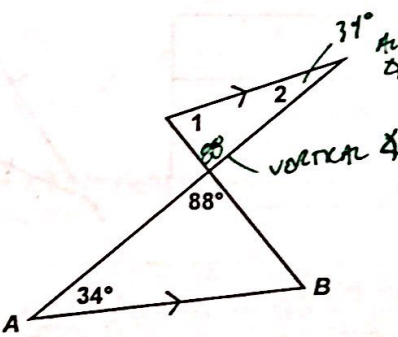
3) $m\angle 1 = 45^\circ$ (Alt. Int. Angs)
 $m\angle 2 = 65^\circ$
 $m\angle 3 = 70^\circ$ (Alt. Int. Angs)
 $45 + 70 + x = 180$
 $115 + x = 180$
 $x = 65$



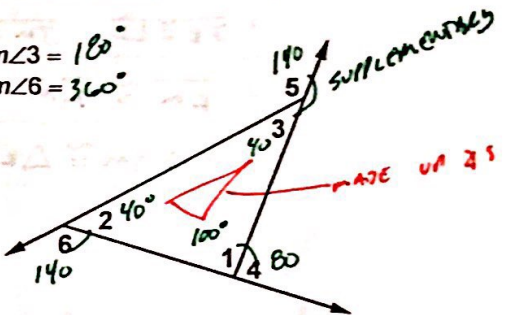
4) $m\angle A = 55^\circ$
 $m\angle C = 50^\circ$
 $m\angle D = 50^\circ$
 $50 + 75 + x = 180$
 $x = 55$



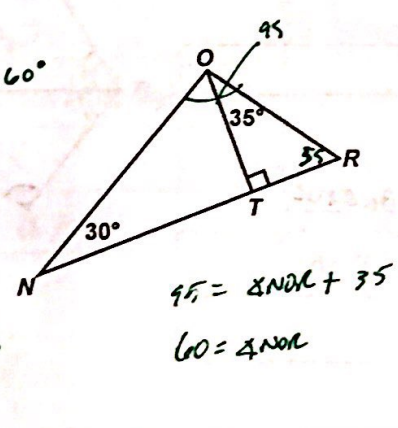
5) $m\angle 1 = 58^\circ$
 $m\angle 2 = 31^\circ$
 $34 + 88 + x = 180$
 $x = 58$



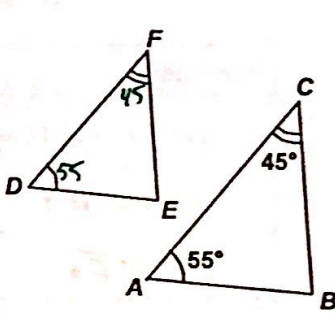
6) $m\angle 1 + m\angle 2 + m\angle 3 = 180^\circ$
 $m\angle 4 + m\angle 5 + m\angle 6 = 360^\circ$
 $140 + 140 + 80 = 360$



7) $m\angle R = 55^\circ$
 $m\angle NOT = 60^\circ$
 $m\angle NOR = 15^\circ$
 $35 + 90 + x = 180$
 $x = 55$
 $30 + 55 + x = 180$
 $x = 95$



8) $m\angle E = 80^\circ$
 $55 + 45 + x = 180$
 $x = 80$

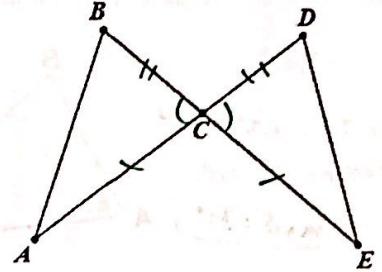


Geometry – Congruent Triangle Proof fill-in-the-blank HW

For each problem, do the following:

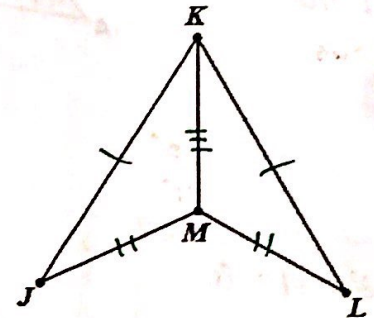
- Show the given information in the diagram (using tick marks to show congruent side and arcs to show congruent angles).
- Show any other congruent parts you notice (from vertical angles, sides shared in common, or alternate interior angles with parallel lines).
- Give the postulate or theorem that proves the triangles congruent (SSS, SAS, ASA, AAS, HL).
- Finally, fill in the blanks to complete the proof.

1. Given: $\overline{BC} \cong \overline{DC}$; $\overline{AC} \cong \overline{EC}$
 Prove: $\triangle BCA \cong \triangle DCE$



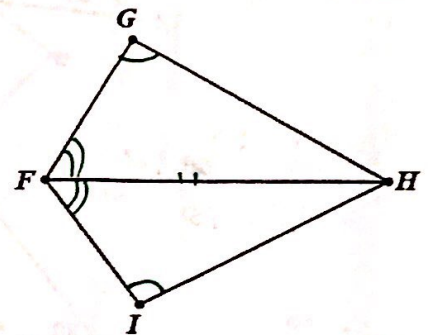
Statements	Reasons
1. $\overline{BC} \cong \overline{DC}$ $\overline{AC} \cong \overline{EC}$	1. Given
2. $\angle BCA \cong \angle DCE$	2. Vertical \angle s Theorem
3. $\triangle BCA \cong \triangle DCE$	3. SAS

2. Given: $\overline{JK} \cong \overline{LK}$; $\overline{JM} \cong \overline{LM}$
 Prove: $\triangle KJM \cong \triangle KLM$



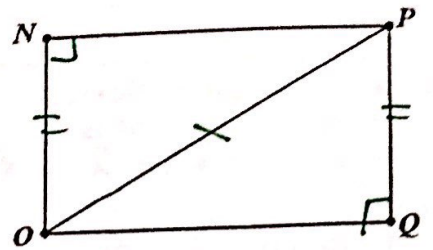
Statements	Reasons
1. $\overline{JK} \cong \overline{LK}$ $\overline{JM} \cong \overline{LM}$	1. Given
2. $\overline{KM} \cong \overline{KM}$	2. Reflexive Prop.
3. $\triangle KJM \cong \triangle KLM$	3. SSS

3. Given: $\angle G \cong \angle I$; \overline{FH} bisects $\angle GFI$
 Prove: $\triangle GFH \cong \triangle IFH$



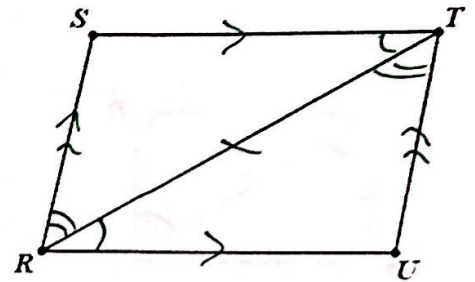
Statements	Reasons
1. $\angle G \cong \angle I$; \overline{FH} bisects $\angle GFI$	1. Given
2. $\angle GFH \cong \angle IFH$	2. Def. of <u>bisector</u>
3. $\overline{FH} \cong \overline{FH}$	3. Reflexive Prop.
4. $\triangle GFH \cong \triangle IFH$	4. SAS

4. Given: $\angle N$ and $\angle Q$ are right angles; $\overline{NO} \cong \overline{PQ}$
 Prove: $\triangle ONP \cong \triangle PQO$



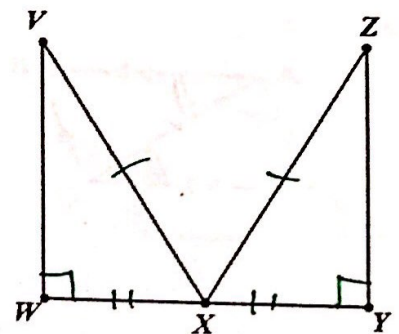
Statements	Reasons
1. $\angle N$ and $\angle Q$ are right angles	1. GIVEN
2. $\triangle ONP$ and $\triangle PQO$ are <u>RIGHT</u> triangles	2. Def. of right triangle
3. $\overline{OP} \cong \overline{OP}$	3. Reflexive Prop.
4. $\overline{NO} \cong \overline{PQ}$	4. GIVEN
5. $\triangle ONP \cong \triangle PQO$	5. HL

5. Given: $\overline{ST} \parallel \overline{RU}$; $\overline{SR} \parallel \overline{TU}$
 Prove: $\triangle SRT \cong \triangle UTR$



Statements	Reasons
1. $\overline{ST} \parallel \overline{RU}$	1. GIVEN
2. $\angle STR \cong \angle TRU$	2. If lines \parallel , alt. int. \angle s \cong
3. $\overline{SR} \parallel \overline{TU}$	3. GIVEN
4. $\angle SRT \cong \angle UTR$	4. IF LINES \parallel , ALTERNATE INTERIOR \angle s \cong .
5. $\overline{RT} \cong \overline{RT}$	5. REFLEXIVE PROPERTIES OF \cong .
6. $\triangle SRT \cong \triangle UTR$	6. ASA

6. Given: $\angle W$ and $\angle Y$ are right angles; $\overline{VX} \cong \overline{ZX}$; X is the midpoint of \overline{WY}
 Prove: $\triangle VWX \cong \triangle ZYX$

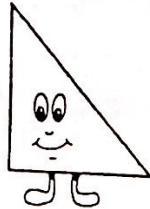


Statements	Reasons
1. $\angle W$ and $\angle Y$ are right angles	1. GIVEN
2. $\angle W \cong \angle Y$	2. Def. of right triangle
3. $\overline{VX} \cong \overline{ZX}$; X is the midpoint of \overline{WY}	3. GIVEN
4. $\overline{WX} \cong \overline{XY}$	4. Def. of midpoint
5. $\triangle VWX \cong \triangle ZYX$	5. HL

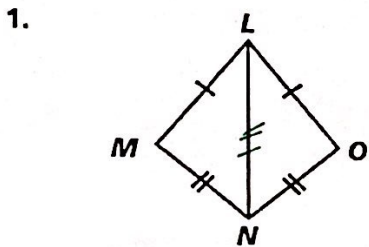
Name _____

Proving Congruence

TIPS! 1. By the Reflexive Property, a segment is congruent to itself. $\overline{XY} \cong \overline{XY}$
2. This symbol \rightarrow indicates parallel lines.

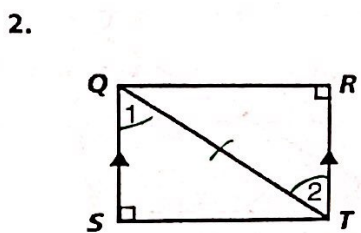


Draw straight lines to match each statement within the proof to its reason. Each set will have an extra unused reason. The uncrossed letters will spell out a word.



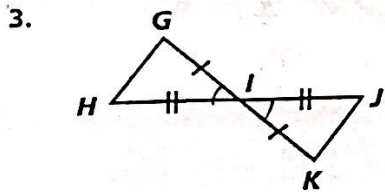
- | Statement | Reason |
|--|----------------------|
| 1. $\overline{LM} \cong \overline{LO}$ | A • SAS Congruence |
| 2. $\overline{MN} \cong \overline{ON}$ | • SSS Congruence |
| 3. $\overline{LN} \cong \overline{LN}$ | • Given |
| 4. $\triangle LMN \cong \triangle LON$ | • Given |
| | • Reflexive Property |

A



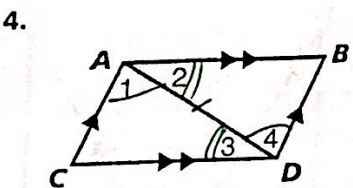
- | | |
|--|-----------------------------|
| 1. $\overline{QS} \parallel \overline{RT}$ | W • Reflexive Property |
| 2. $\angle R \cong \angle S$ | • AAS Congruence |
| 3. $\angle 1 \cong \angle 2$ | • Alternate Interior Angles |
| 4. $\overline{QT} \cong \overline{QT}$ | • SAS Congruence |
| 5. $\triangle QST \cong \triangle TRQ$ | • Right Angle Congruence |
| | • Given |

W
E



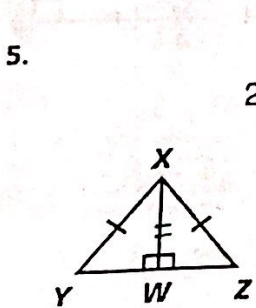
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|--|---------------------|
| 1. $\overline{GI} \cong \overline{KI}$ | S • Vertical Angles |
| 2. $\overline{HI} \cong \overline{JI}$ | U • SAS Congruence |
| 3. $\angle GIH \cong \angle KIJ$ | • Given |
| 4. $\triangle GIH \cong \triangle KIJ$ | • Given |
| | O • SSS Congruence |

S
O



- | | |
|---|-------------------------------|
| 1. $\overline{AC} \parallel \overline{BD}, \overline{AB} \parallel \overline{CD}$ | P • Alternate Interior Angles |
| 2. $\angle 1 \cong \angle 4, \angle 2 \cong \angle 3$ | M • AAS Congruence |
| 3. $\overline{AD} \cong \overline{AD}$ | E • Reflexive Property |
| 4. $\triangle ADC \cong \triangle DAB$ | A • Given |
| | • ASA Congruence |

M



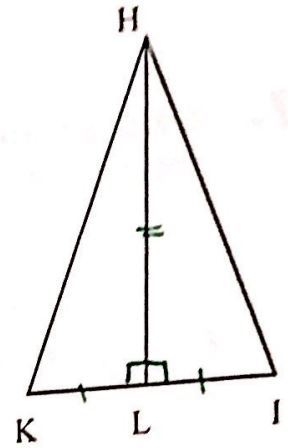
- | | |
|--|------------------------------------|
| 1. $\angle XWY$ and $\angle XWZ$ are right angles | TI • Definition of Right Triangles |
| 2. $\triangle XWY$ and $\triangle XWZ$ are right triangles | • Given |
| 3. $\overline{XY} \cong \overline{XZ}$ | E! • SAS Congruence |
| 4. $\overline{XW} \cong \overline{XW}$ | • HL Congruence |
| 5. $\triangle XWY \cong \triangle XWZ$ | • Reflexive Property |
| | • Given |

E!

AWESOME!

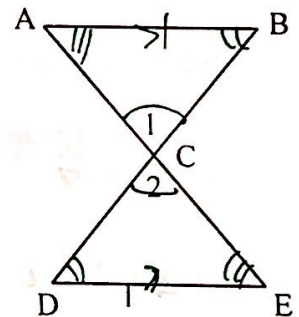
5. Given: \overline{HL} is the perpendicular bisector of \overline{KI}
 Prove: $\triangle K LH \cong \triangle I LH$

Statements	Reasons
1. $\overline{HL} \perp$ bisector of \overline{KI}	1. GIVEN
2. $\angle K LH$ & $\angle I LH$ right angles.	2. DEFINITION OF PERPENDICULAR BISECTOR
3. $\angle K LH \cong \angle I LH$	3. Right angles are \cong
4. $\overline{KL} \cong \overline{LI}$	4. DEFINITION OF BISECTOR
5. $\overline{HL} \cong \overline{HL}$	5. REFLEXIVE PROPERTY OF CONGRUENCE
6. $\triangle K LH \cong \triangle I LH$	6. SAS

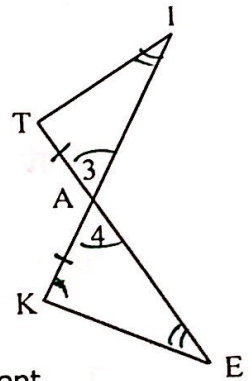


6. Given: $\overline{AB} \cong \overline{DE}$, $\overline{AB} \parallel \overline{DE}$
 Prove: $\triangle ABC \cong \triangle EDC$

Statements	Reasons
1. $\overline{AB} \cong \overline{DE}$ $\overline{AB} \parallel \overline{DE}$	1. GIVEN
2. $\angle 1 \cong \angle 2$	2. Vertical angles are \cong
3. $\angle B \cong \angle D$ or $\angle A \cong \angle E$	3. Alternate interior angles of \parallel lines are \cong
4. $\triangle ABC \cong \triangle EDC$	4. ASA or AAS



7. Given: $\overline{TA} \cong \overline{KA}$, $\angle I \cong \angle E$
 Prove: $\triangle ATI \cong \triangle AKE$



$$\overline{TA} \cong \overline{KA}$$

$$\angle I \cong \angle E$$

$$\angle 3 \cong \angle 4$$

a) Given

b) Given

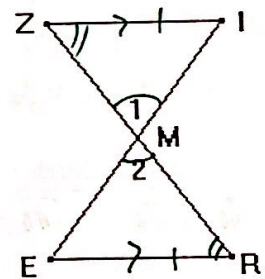
Vertical angles are congruent

$$d) \triangle ATI \cong \triangle AKE$$

e) AAS

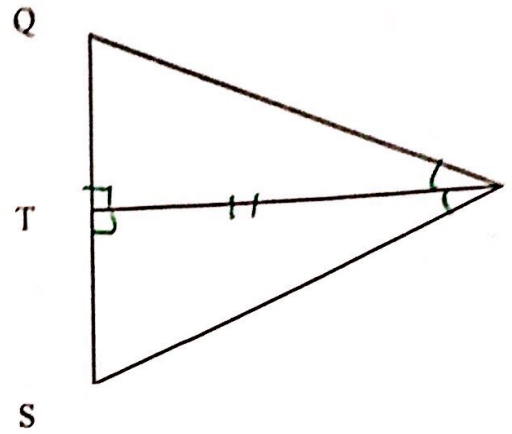
8. Given: $\overline{ZI} \parallel \overline{ER}$, $\overline{ZI} \cong \overline{ER}$

Prove: $\triangle ZIM \cong \triangle REM$



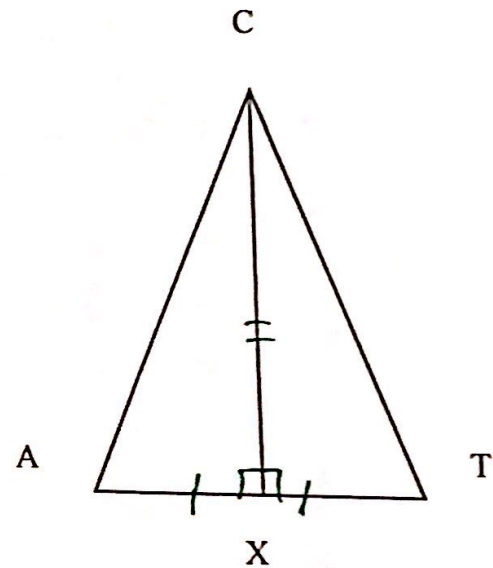
Statements	Reasons
1. $\overline{ZI} \parallel \overline{ER}$, $\overline{ZI} \cong \overline{ER}$	1. Given
2. $\angle 1 \cong \angle 2$	2. Vertical angles are \cong
3. $\angle Z \cong \angle R$ OR $\angle I \cong \angle E$	3. IF LINES \parallel , ALT. INT. \angle s \cong .
4. $\triangle ZIM \cong \triangle REM$	4. AAS

9. Given: \overline{RT} bisects $\angle QRS$
 $\overline{RT} \perp \overline{QS}$
 Prove: $\triangle QTR \cong \triangle STR$



Statements	Reasons
1. \overline{RT} bisects $\angle QRS$ & $\overline{RT} \perp \overline{QS}$	1. Given
2. $\angle QRT \cong \angle SRT$	2. Definition of bisector
3. $\angle QTR$ and $\angle STR$ are right angles	3. Definition of \perp
4. $\angle QTR \cong \angle STR$	4. Right angles are congruent
5. $\overline{TR} \cong \overline{TR}$	5. Reflexive Prop. \cong
6. $\triangle QTR \cong \triangle STR$	6. ASA

10. Given: X is the midpoint of \overline{AT}
 $\angle CXA$ and $\angle CXT$ are right angles
 Prove: $\triangle CXA \cong \triangle CXT$



X is the midpoint of \overline{AT}

a) Given

c) $\overline{AX} \cong \overline{XT}$

Def of midpoint

$\angle CXA$ and $\angle CXT$ are right angles

b) Given

d) $\angle CXA \cong \angle CXT$

d) Def. of RT. \angle s

$\overline{CX} \cong \overline{CX}$

REFLEXIVE PROP.

$\triangle CXA \cong \triangle CXT$

f) SAS

Name _____
Date _____ Period _____

Write a congruence statement for each pair of triangles.

1. $\triangle YAP \cong \triangle LPA$

2. $\triangle NOE \cong \triangle SOE$

Which postulate, if any, could you use to prove the two triangles congruent? If not enough information is given, write *not possible*.

3. SAS

4. HL

5. not possible

6. SSS

7. ASA

8. AAS

9. Open-Ended Draw a picture to represent $\triangle CEO \cong \triangle HDF$. Name all of the pairs of corresponding congruent parts.

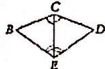
10. Find the value of the variable.

$108 = 3x$
 $x = 36$

ii. Given: $\overline{AT} \cong \overline{GS}$, $\overline{AT} \parallel \overline{GS}$
Prove: $\triangle GAT \cong \triangle TSG$

Reasons	Statements
1. $\overline{AT} \cong \overline{GS}$	1. Given
2. $\overline{AT} \parallel \overline{GS}$	2. Given
3. $\overline{GT} \cong \overline{GT}$	3. Reflexive
4. $\angle SGT \cong \angle GTA$	4. ASA
5. $\triangle GAT \cong \triangle TSG$	5. SAS

*12. Prove: $\overline{BE} \cong \overline{DE}$



Reasons	Statements
1. $\angle BCE \cong \angle DCE$	1. Given
2. $\angle BCE \cong \angle DCE$	2. Given
3. $\overline{CE} \cong \overline{CE}$	3. Reflexive Property of \cong
4. $\triangle BCE \cong \triangle DCE$	4. ASA
5. $\overline{BE} \cong \overline{DE}$	5. CPCTC

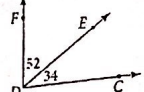
Find the values of x and y .

13. $x = 11$, $y = 13$

14. $y = 15$

15. $y = 15$

16. What is $m\angle CDF$?



- A. 18 B. 86 C. 94 D. 274

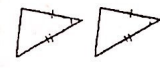
17. Which angles could an obtuse triangle have?

- I. a right angle
II. two acute angles
III. an obtuse angle
IV. two vertical angles
- F. I and II G. II and III
H. III and IV I. I and IV

18. Quadrilateral $ABCD \cong QRST$. Which segment is congruent to \overline{TS} ?

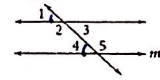
- F. \overline{AB} G. \overline{BC} H. \overline{CB} I. \overline{DC}

19. By which postulate or theorem are the triangles congruent?



- A. SAS B. SSS C. ASA D. AAS

20. Which condition(s) will allow you to prove that $\ell \parallel m$?

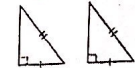


- I. $\angle 1 \cong \angle 4$
II. $\angle 2 \cong \angle 5$
III. $m\angle 2 + m\angle 4 = 180$
IV. $\angle 3 \cong \angle 4$
- F. III only G. I and III only
H. II and IV only I. I, II, III, and IV

21. $\triangle LMN \cong \triangle HIJ$. Which of the following are not necessarily true?

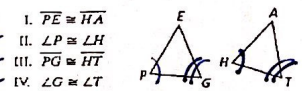
- I. $\angle L \cong \angle H$
II. $\angle N \cong \angle I$
III. $\overline{LM} \cong \overline{IJ}$
IV. $\overline{LN} \cong \overline{HI}$
- A. I and II B. II and III
C. III and IV D. I and IV
E. none of the above

22. By which theorem or postulate are the triangles congruent?



- A. AAS B. SAS C. AAA D. HL

23. Which statements can you use to prove $\triangle PEG \cong \triangle HAT$ by the ASA Postulate?



- I. $\overline{PE} \cong \overline{HA}$
II. $\angle P \cong \angle H$
III. $\overline{PG} \cong \overline{HT}$
IV. $\angle G \cong \angle T$
- A. I, II, and IV B. I, III, and IV
C. II, III, and I D. I, II, and IV
E. none of the above

24. What additional information would you need to prove $\triangle NOT \cong \triangle NET$ by the HL Theorem?

- A. $\overline{NO} \cong \overline{NE}$
B. $\angle OTN \cong \angle ETN$
C. $\overline{NT} = 2\overline{NO}$
D. $\overline{NO} \cong \overline{TE}$
E. none of the above

