Unit 4B
Day 1

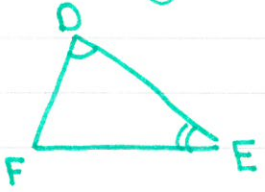
# Intro to Triangle Congruence

## Definition of Congruent Triangles:

Two triangles are congruent when they have 3 pairs of congruent corresponding sides and 3 pairs of congruent corresponding angles.

**Theorem:** If 2 angles of one triangle are congruent to 2 angles of another triangle, then the third angles are congruent.

If 



, then $\angle C \cong \angle F$.

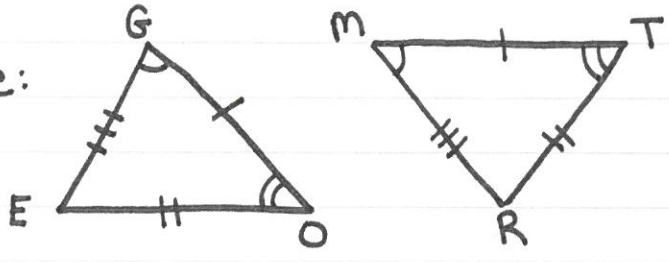
Example: Given $\triangle MON \cong \triangle DAY$, fill in the following:

$\angle M \cong$ _____ $\angle O \cong$ _____ $\angle N \cong$ _____

$\overline{ON} \cong$ _____ $\overline{MN} \cong$ _____ $\overline{OM} \cong$ _____

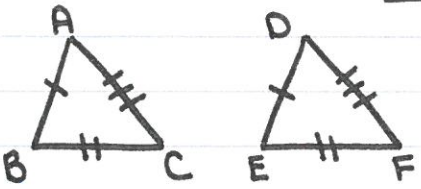
Example: $\triangle ACB \cong \triangle DEF$. $m\angle A = x + 10$, $m\angle D = 2x$ $x =$ _____

Example:



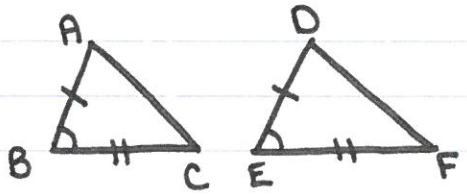

$\triangle GOE \cong \triangle$ _____

## "Short Cuts" to proving triangles are congruent:

① If 

, then $\triangle ABC \cong \triangle DEF$.

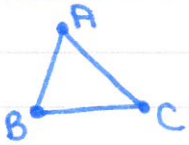
**SSS postulate:** If 3 sides of one $\triangle$ are $\cong$ to 3 sides of another $\triangle$, then the triangles are $\cong$.

② If 

, then $\triangle ABC \cong \triangle DEF$.

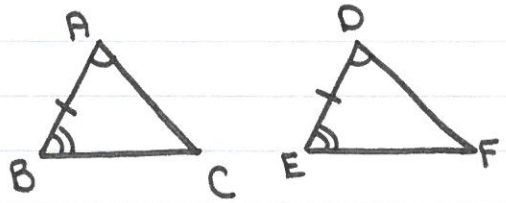
**SAS postulate:** If 2 sides and the included angle of one $\triangle$ are $\cong$ to 2 sides and the included angle of another $\triangle$, then the triangles are $\cong$.

*Side note*

Given 

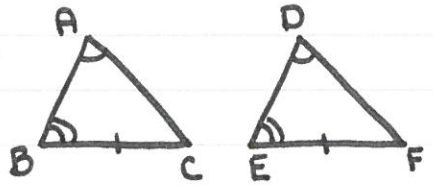
, what angle is included between sides $\overline{AC}$ & $\overline{BC}$?

Answer: $\angle C$

③ If 

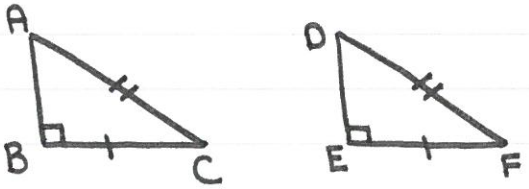
, then $\triangle ABC \cong \triangle DEF$.

**ASA postulate:** If 2 angles & the included side of one $\triangle$ are $\cong$ to 2 $\angle$'s & inc. side of other $\triangle$, then $\cong$.

④ If 

, then $\triangle ABC \cong \triangle DEF$.

**AAS theorem:** If 2 angles and a non-included side of one △ are congruent to 2 angles and a non-included side of another △, then the △'s are ≅.

⑤ If 

, then $\triangle ABC \cong \triangle DEF$

**HL theorem:** If the hypotenuse and leg of one RIGHT triangle are ≅ to the hypotenuse and leg of another RIGHT triangle, then the △'s are ≅.

↑ there is no "SSA" or "ASS" thm

HL is the only situation with 2 sides & a non-included angle.

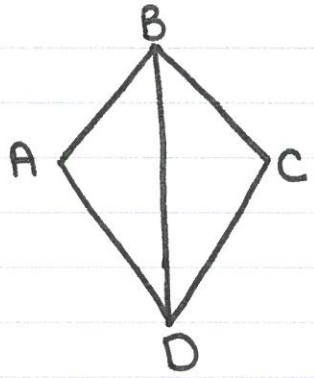
# Intro to triangle congruence proof...

Unit 4B
day 2

Proofs...

① Given: $\overline{AB} \cong \overline{CB}$, $\overline{AD} \cong \overline{CD}$

Prove: $\triangle ABD \cong \triangle CBD$




$\overline{AB} \cong \overline{CB}$ given

$\overline{AD} \cong \overline{CD}$ given

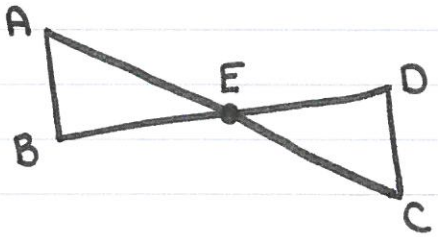
$\overline{BD} \cong \overline{BD}$ reflexive Prop of $\cong$

$\triangle ABD \cong \triangle CBD$

SSS $\cong$ postulate

② Given: $\overline{AE} \cong \overline{CE}$, $\overline{BE} \cong \overline{DE}$

Prove: $\triangle AEB \cong \triangle CED$




$\overline{AE} \cong \overline{CE}$ given

$\overline{BE} \cong \overline{DE}$ given

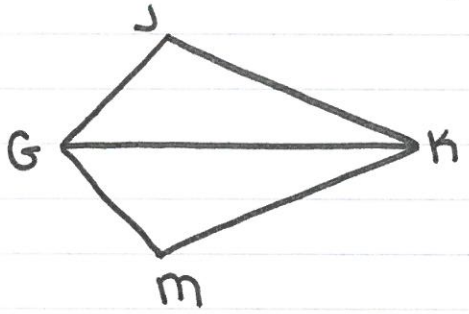
$\angle AEB \cong \angle DEC$ vertical $\angle$'s are $\cong$.

$\triangle AEB \cong \triangle CED$

SAS $\cong$ postulate

day 2

Given: $\overline{GJ} \cong \overline{GM}$
$\overline{GK}$ bisects $\angle JGM$




Prove: $\triangle GJK \cong \triangle GMK$

$\overline{GK}$ bisects $\angle JGM$
given
↓
$\angle JGK \cong \angle MGK$
def'n of an angle bisector

$\overline{GJ} \cong \overline{GM}$
given

$\overline{GK} \cong \overline{GK}$
Reflexive Property of Congruence

$\triangle GJK \cong \triangle GMK$
SAS ≅ postulate

* feromax.com/cgi-bin/ProveIt.pl
↓
bottom 4 ... challengers!!

FIVE STAR.
★★★★★
FIVE STAR.
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FIVE STAR.
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FIVE STAR.
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Notes - Day 2?
Day 3?

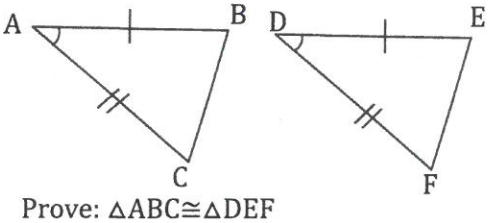
# Proofs Involving Congruent Triangles

First, let's analyze some proofs.

This is easy! All you have to do is explain in plain English what is going on in the proofs. We'll look at some examples first.

AE. 1.

Given: $\overline{AB}\cong\overline{DE}$ , $\overline{AC}\cong\overline{DF}$, and $\angle A\cong\angle D$




Prove: $\triangle ABC\cong\triangle DEF$

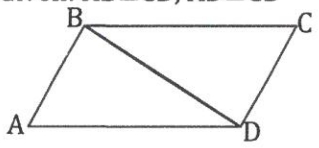
| Statements | Reasons |
|---|---|
| 1. $\overline{AB}\cong\overline{DE}$ | 1. Given |
| 2. $\overline{AC}\cong\overline{DF}$ | 2. Given |
| 3. $\angle A\cong\angle D$ | 3. Given |
| 4. $\triangle ABC\cong\triangle DEF$ | 4. SAS |

Analysis:

Working backward we must ask the key question, "How can we show that two triangles are congruent?" The answer? A triangle congruence theorem like SSS, SAS, ASA, AAS or HL. This gives us B1: $\triangle ABC\cong\triangle DEF$, by some property, but which one? To find out, start working forward. Listing all of the given information gives us a pair of angles $\angle A$ and $\angle D$ sandwiched between a pair of congruent sides $\overline{AB}\cong\overline{DE}$ and $\overline{AC}\cong\overline{DF}$. So this means we have $\triangle ABC\cong\triangle DEF$ by the SAS theorem which is B2: and the proof is complete.

AE. 2.

Given: $\overline{AB}\cong\overline{CD}$, $\overline{AD}\cong\overline{CB}$




Prove: $\triangle ABD\cong\triangle BCD$

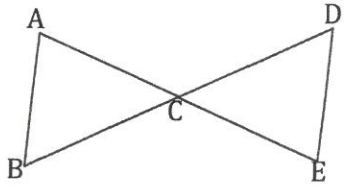
| Statements | Reasons |
|---|---|
| 1. $\overline{AB}\cong\overline{CD}$ | 1. Given |
| 2. $\overline{AD}\cong\overline{CB}$ | 2. Given |
| 3. $\overline{BD}\cong\overline{BD}$ | 3. Reflexive property |
| 4. $\triangle ABD\cong\triangle CDB$ | 4. SSS |

Analysis:

Working backward, we must ask the key question "How can we show that two triangles are congruent?" The answer? A triangle congruence theorem like SSS, SAS, ASA, AAS or HL. This gives us B1: $\triangle ABC\cong\triangle BCD$ bys ome property, but which one? Then start working forward. Listing all of the given information gives us two pairs of sides $\overline{AB}\cong\overline{CD}$ and $\overline{AD}\cong\overline{CB}$, but this is not enough. We need another pair of sides or an angle between them. Looking now at the diagram we have $\overline{BD}\cong\overline{BD}$ as a shared line. So this brings us to say $\triangle ABC\cong\triangle BCD$ by SSS which is B1 and the proof is complete.

AE. 3.

Given: $\overline{AE}$ Bisects $\overline{BD}$, $\angle B\cong\angle D$




Prove: $\triangle ABC\cong\triangle DBC$

| Statements | Reasons |
|---|---|
| 1. $\angle B\cong\angle D$ | 1. Given |
| 2. $\overline{AC}$ Bisects $\overline{BD}$ | 2. Given |
| 3. $\overline{BC}\cong\overline{DC}$ | 3. Definition of Bisect |
| 4. $\angle ACB\cong\angle DCE$ | 4. Vertical angles |
| 5. $\triangle ABC\cong\triangle DBC$ | 5. ASA |

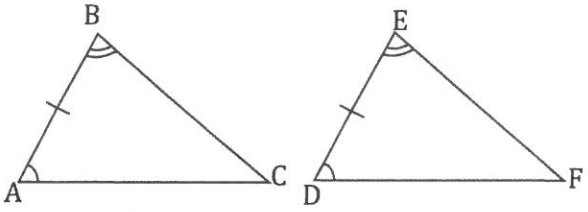
Analysis:

Working backward we must ask the key question, "How can we show that two triangles are congruent?" The answer? A triangle congruence theorem like SSS, SAS, ASA, AAS or HL. This gives us B1: $\triangle ABC\cong\triangle BCD$ by some property, but which one? Then start working forward. Listing all of the given information gives us a pair of angles $\angle B$ and $\angle D$, and $\overline{BD}$ and $\overline{AE}$ bisects $\overline{BD}$. If AE bisects $\overline{BD}$ then $\overline{BD}$ is cut in half at C so $\overline{BC}\cong\overline{DC}$! This is not enough though. Looking at the diagram we see vertical angles $\angle ACB\cong\angle DCE$, which gives us $\triangle ABC\cong\triangle BCD$ by the property ASA . This is B1 and the proof is complete.

For these fill in any missing statements or reasons.

1.

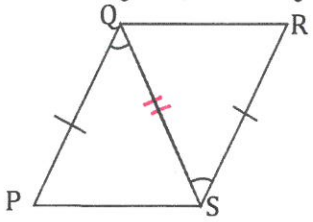
Given: $\overline{AB}\cong\overline{DE}$, $\angle B\cong\angle E$, and $\angle A\cong\angle D$




Prove: $\triangle ABC\cong\triangle DBC$

| Statements | Reasons |
|---|---|
| 1. $\overline{AB}\cong\overline{DE}$ | 1. Given |
| 2. $\angle B\cong\angle E$ | 2.Given |
| 3. $\angle A\cong\angle D$ | 3. Given |
| 4. $\triangle ABC\cong\triangle DEF$ | 4. ASA |

2. Given: $\overline{PQ}\cong\overline{RS}$, and $\angle PQS\cong\angle RSQ$

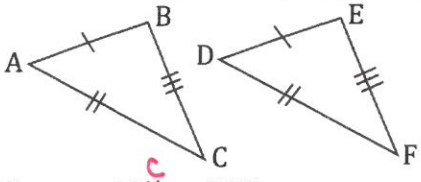



Prove: $\triangle ABC\cong\triangle DBC$

| Statements | Reasons |
|---|---|
| 1. $\overline{PQ}\cong\overline{RS}$ | 1. Given |
| 2. $\angle PQS\cong\angle RSQ$ | 2. Given |
| 3. $\overline{QS}\cong\overline{QS}$ | 3. Reflexive P.O.C. |
| 4. $\triangle PQS\cong\triangle RSQ$ | 4. SAS |

3.

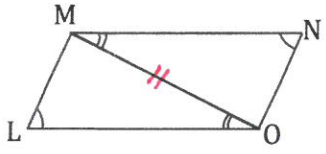
Given: $\overline{AB}\cong\overline{DE}$, $\overline{AC}\cong\overline{DF}$, and $\overline{BC}\cong\overline{EF}$




Prove: $\triangle ABC\cong\triangle DEF$

| Statements | Reasons |
|---|---|
| 1. $\overline{AB}\cong\overline{DE}$ | 1. Given |
| 2. $\overline{AC}\cong\overline{DF}$ | 2. Given |
| 3. $\overline{BC}\cong\overline{EF}$ | 3. Given |
| 4. $\triangle ABC\cong\triangle DEF$ | 4. SSS |

4. Given: $\angle L\cong\angle N$, $\angle LOM\cong\angle NMO$

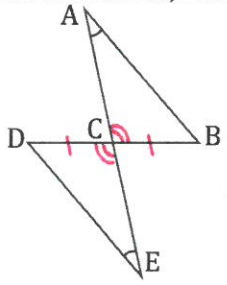



Prove: $\triangle LMO\cong\triangle NOM$

| Statements | Reasons |
|---|---|
| 1. $\angle L\cong\angle N$ | 1. Given |
| 2. $\angle LOM\cong\angle NMO$ | 2. Given |
| 3. $\overline{MO}\cong\overline{MO}$ | 3. Reflexive Property |
| 4. $\triangle LMO\cong\triangle NOM$ | 4. AAS |

5.

Given: $\overline{AE}$ bisects $\overline{BD}$, $\angle A\cong\angle E$

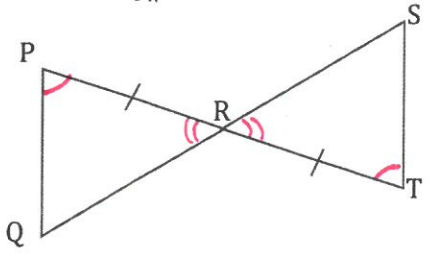



Prove: $\triangle ABC\cong\triangle EDC$

| Statements | Reasons |
|---|---|
| 1. $\angle A\cong\angle E$ | 1. Given |
| 2. $\overline{AE}$ bisects $\overline{BD}$ | 2. Given |
| 3. $\overline{BC}\cong\overline{DC}$ | 3. Definition of Bisect |
| 4. $\angle ACB\cong\angle DCE$ | 4. Vertical $\angle$'s are $\cong$ |
| 5. $\triangle ABC\cong\triangle EDC$ | 5. AAS |

6.

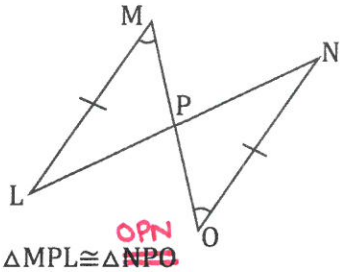
Given: $\overline{PQ}\parallel\overline{ST}$, $\overline{PR}\cong\overline{TR}$




Prove: $\triangle PQR\cong\triangle TSR$

| Statements | Reasons |
|---|---|
| 1. $\overline{PR}\cong\overline{TR}$ | 1. Given |
| 2. $\overline{PQ}\parallel\overline{ST}$ | 2. Given |
| 3. $\angle P\cong\angle T$ | 3. Alt Int $\angle$'s are $\cong$ if lines are $\parallel$. |
| 4. ~~$\angle ACB\cong\angle DCE$~~ $\angle PBQ\cong\angle SRT$ | 4. $\&$ vertical $\angle$'s are $\cong$ |
| 5. $\triangle PQR\cong\triangle TSR$ | 5. ASA |

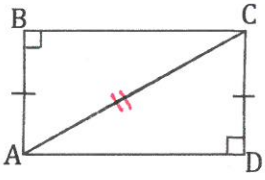
7. Given: $\overline{LM} \cong \overline{NO}$, and $\angle M \cong \angle O$




Prove: $\triangle MPL \cong \triangle$ ~~NPO~~ OPN

| Statements | Reasons |
|---|---|
| 1. $\overline{LM} \cong \overline{NO}$ | 1. Given |
| 2. $\angle M \cong \angle O$ | 2. Given |
| 3. $\angle MPL \cong \angle NPO$ | 3. Vertical $\angle$s are $\cong$ |
| 4. $\triangle MPL \cong \triangle OPN$ | 4. AAS |

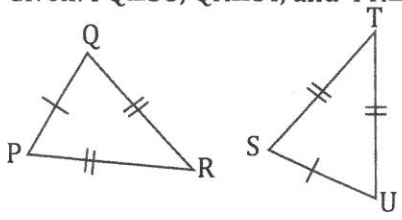
8. Given: $\overline{AB} \cong \overline{DC}$, $\angle B$ & $\angle D$ are rt $\angle$'s




Prove: $\triangle ABC \cong \triangle CDA$

| Statements | Reasons |
|---|---|
| 1. $\overline{AB} \cong \overline{DC}$, $\angle B$ & $\angle D$ are rt $\angle$'s | 1. Given |
| 2. $\overline{AC} \cong \overline{AC}$ | 2. Reflexive |
| 3. $\triangle ABC \cong \triangle CDA$ | 3. HL |

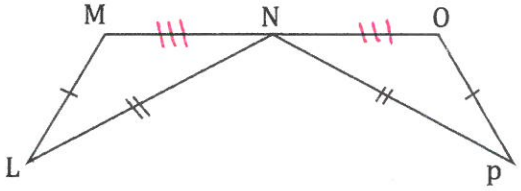
9. Given: $\overline{PQ} \cong \overline{SU}$, $\overline{QR} \cong \overline{ST}$, and $\overline{PR} \cong \overline{TU}$




Prove: $\triangle PQR \cong \triangle UST$

| Statements | Reasons |
|---|---|
| 1. $\overline{PQ} \cong \overline{SU}$ | 1. Given |
| 2. $\overline{QR} \cong \overline{ST}$ | 2. Given |
| 3. $\overline{PR} \cong \overline{TU}$ | 3. Given |
| 4. $\triangle PQR \cong \triangle UST$ | 4. SSS |

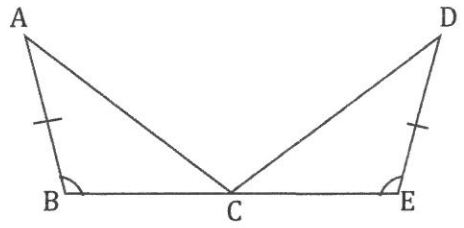
10. Given: N is the midpoint of $\overline{MO}$, $\overline{LM} \cong \overline{OP}$, and $\overline{LN} \cong \overline{PN}$




Prove: $\triangle LMN \cong \triangle PON$

| Statements | Reasons |
|---|---|
| 1. $\overline{LM} \cong \overline{OP}$ | 1. Given |
| 2. $\overline{LN} \cong \overline{PN}$ | 2. Given |
| 3. N is the Midpoint of $\overline{MO}$ | 3. Given |
| 4. $\overline{MN} \cong \overline{ON}$ | 4. Midpoint def'n |
| 5. $\triangle LMN \cong \triangle PON$ | 5. SSS |

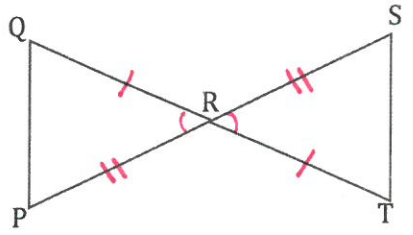
11. Given: C is the midpoint of $\overline{BE}$, $\angle B \cong \angle E$, and $\overline{AB} \cong \overline{DE}$




Prove: $\triangle ABC \cong \triangle DEC$

| Statements | Reasons |
|---|---|
| 1. $\angle B \cong \angle E$ | 1. Given |
| 2. $\overline{AB} \cong \overline{DE}$ | 2. Given |
| 3. C is midpoint of $\overline{BE}$ | 3. Given |
| 4. $\overline{BC} \cong \overline{EC}$ | 4. Midpoint def'n |
| 5. $\triangle ABC \cong \triangle DEC$ | 5. SAS |

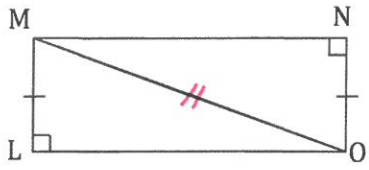
12. Given: $\overline{QT}$ bisects $\overline{SP}$, $\overline{SP}$ bisects $\overline{QT}$




Prove: $\triangle QRP \cong \triangle$ ~~SRT~~ TRS

| Statements | Reasons |
|---|---|
| 1. $\overline{QT}$ bisects $\overline{SP}$ | 1. Given |
| 2. $\overline{SP}$ bisects $\overline{QT}$ | 2. Given |
| 3. $\overline{QR} \cong \overline{TR}$ | 3. Definition of Bisect |
| 4. $\overline{PR} \cong \overline{SR}$ | 4. Def'n of Bisect |
| 5. $\angle QRP \cong \angle SRT$ | 5. Vertical Angles are $\cong$ |
| 6. $\triangle QRP \cong \triangle$ ~~SRT~~ TRS | 6. SAS |

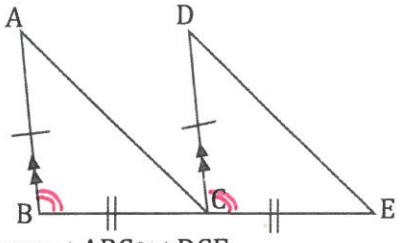
13. Given: $\overline{LM}\cong\overline{NO}$, $\angle L$ & $\angle N$ are rt $\angle$'s




Prove: $\triangle LMO\cong\triangle NOM$

| Statements | Reasons |
|---|---|
| 1. $\overline{LM}\cong\overline{NO}$; $\angle L$ & $\angle N$ are rt $\angle$'s | 1. Given |
| 2. $\overline{MO}\cong\overline{MO}$ | 2. Reflexive |
| 3. $\triangle LMO\cong\triangle NOM$ | 3. HL |

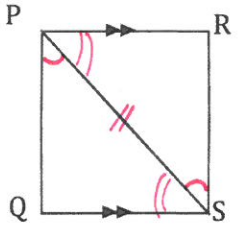
14. Given: $\overline{AB}\cong\overline{DC}$, $\overline{AB}\parallel\overline{DC}$, and $\overline{BC}\cong\overline{CE}$




Prove: $\triangle ABC\cong\triangle DCE$

| Statements | Reasons |
|---|---|
| 1. $\overline{AB}\cong\overline{DC}$ | 1. Given |
| 2. $\overline{AB}\parallel\overline{DC}$ | 2. Given |
| 3. $\overline{BC}\cong\overline{CE}$ | 3. Given |
| 4. $\angle ABC\cong\angle DCE$ | 4. Corresponding Angles are $\cong$ if lines are $\parallel$ |
| 5. $\triangle ABC\cong\triangle DCE$ | 5. SAS |

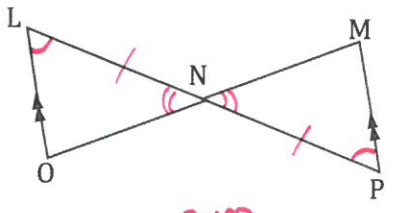
15. Given: $\overline{PR}\parallel\overline{QS}$, $\angle QPS\cong\angle RSP$




Prove: $\triangle PQS\cong\triangle SRP$

| Statements | Reasons |
|---|---|
| 1. $\overline{PR}\parallel\overline{QS}$ | 1. Given |
| 2. $\angle QPS\cong\angle RSP$ | 2. Given |
| 3. $\angle PSQ\cong\angle SPR$ | 3. Alternate Interior $\angle$'s $\cong$ in $\parallel$ lines |
| 4. $\overline{PS}\cong\overline{PS}$ | 4. Reflexive Property |
| 5. $\triangle ABD\cong\triangle CDB$ | 5. ASA |

16. Given: $\overline{LP}$ bisects $\overline{MO}$, $\overline{LO}\parallel\overline{MP}$

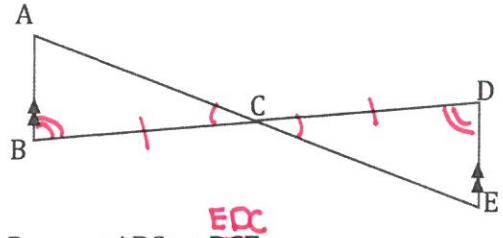



Prove: $\triangle LNO\cong\triangle PNM$

| Statements | Reasons |
|---|---|
| 1. $\overline{LP}$ bisects $\overline{MO}$ | 1. Given |
| 2. $\overline{LO}\parallel\overline{MP}$ | 2. Given |
| 3. $\overline{LN}\cong\overline{PN}$ | 3. def'n of bisector |
| 4. $\angle L\cong\angle P$ | 4. Alternate Interior $\angle$'s are $\cong$ if lines are $\parallel$ |
| 5. $\angle LNO\cong\angle PNM$ | 5. Vertical Angles are $\cong$ |
| 6. $\triangle LNO\cong\triangle PNM$ | 6. ASA |

17.

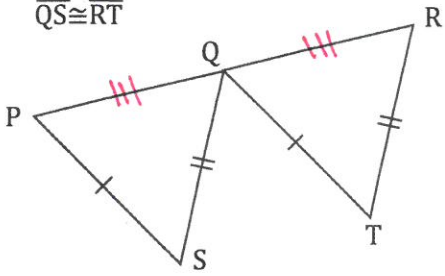
Given: $\overline{AE}$ bisects $\overline{BD}$, $\overline{AB}\parallel\overline{DE}$




Prove: $\triangle ABC\cong\triangle EDC$

| Statements | Reasons |
|---|---|
| 1. $\overline{AE}$ bisects $\overline{BD}$ | 1. Given |
| 2. $\overline{AB}\parallel\overline{DE}$ | 2. Given |
| 3. $\overline{BC}\cong\overline{DC}$ | 3. def'n of bisect |
| 4. $\angle ACB\cong\angle DCB$ | 4. Vert $\angle$'s are $\cong$ |
| 5. $\angle B\cong\angle D$ | 5. Alternate Interior $\angle$'s $\cong$ if lines are $\parallel$ |
| 6. $\triangle ABC\cong\triangle EDC$ | 6. ASA |

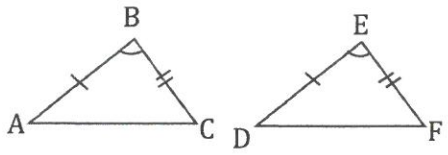
18. Given: Q is the midpoint of $\overline{PR}$. $\overline{PS}\cong\overline{QT}$ and $\overline{QS}\cong\overline{RT}$




Prove: $\triangle PQS\cong\triangle RQT$

| Statements | Reasons |
|---|---|
| 1. Q is mdpt of $\overline{PR}$ | 1. Given |
| 2. $\overline{PS}\cong\overline{QT}$ | 2. Given |
| 3. $\overline{QS}\cong\overline{RT}$ | 3. Given |
| 4. $\overline{PQ}\cong\overline{RQ}$ | 4. Midpoint def'n |
| 5. $\triangle ABC\cong\triangle DBC$ $\triangle PQS\cong\triangle RQT$ | 5. SSS |

19. Given: $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$, and $\angle B \cong \angle E$




Prove: $\triangle ABC \cong \triangle DEF$

$\overline{AB} \cong \overline{DE}$ given

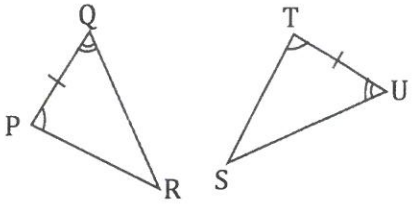
$\overline{BC} \cong \overline{EF}$ given

$\angle B \cong \angle E$ given

$\triangle ABC \cong \triangle DEF$

SAS

20. Given: $\overline{PQ} \cong \overline{TU}$, $\angle P \cong \angle T$, and $\angle Q \cong \angle U$




Prove: $\triangle PQR \cong \triangle TUS$

$\overline{PQ} \cong \overline{TU}$ given

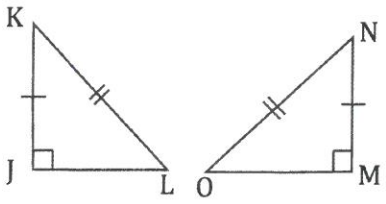
$\angle P \cong \angle T$ given

$\angle Q \cong \angle U$ given

$\triangle PQR \cong \triangle TUS$

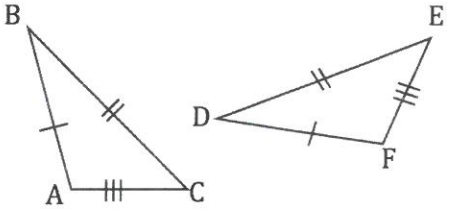
ASA

21. Given: $JK \cong MN$, $KL \cong NO$




Prove: $\triangle JKL \cong \triangle MNO$

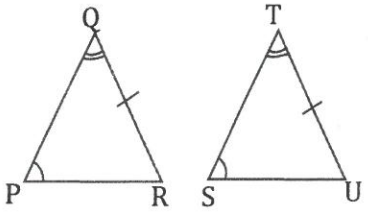
22. Given: $\overline{AB} \cong \overline{DF}$, $\overline{BC} \cong \overline{DE}$, and $\overline{AC} \cong \overline{EF}$




Prove: $\triangle ABC \cong \triangle FDE$

23.

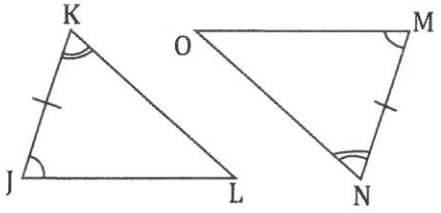
Given: $\angle P \cong \angle S$, $\angle Q \cong \angle T$, and $\overline{QR} \cong \overline{TU}$




Prove: $\triangle PQR \cong \triangle STU$

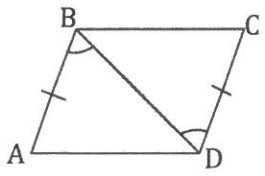
24.

Given: $\angle J \cong \angle M$, $\overline{JK} \cong \overline{MN}$ and $\angle K \cong \angle N$



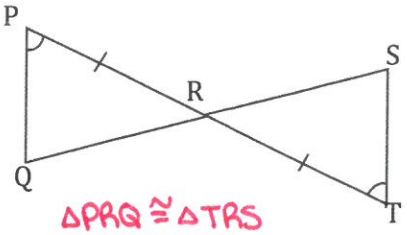

Prove: $\triangle JKL \cong \triangle MNO$

25. Given: $\overline{AB} \cong \overline{CD}$, $\angle ABD \cong \angle CDB$




Prove: $\triangle ABD \cong \triangle CDB$

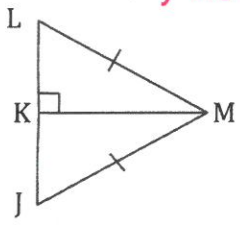
26. Given: $\overline{PR} \cong \overline{TR}$, $\angle P \cong \angle T$




$\triangle PRQ \cong \triangle TRS$

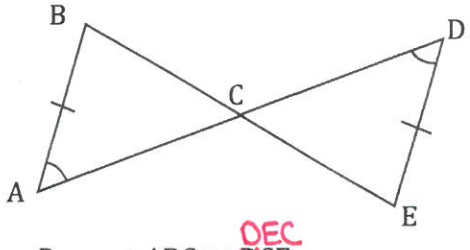
Prove: $\triangle ABC \cong \triangle DBC$

27. Given: $\overline{LM} \cong \overline{JM}$, $\overline{LJ} \perp \overline{KM}$




Prove: $\triangle LKM \cong \triangle JKM$

28. Given: $\overline{AB} \cong \overline{ED}$, $\angle A \cong \angle D$

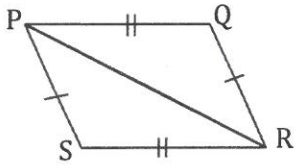



DEC

Prove: $\triangle ABC \cong \triangle DCE$

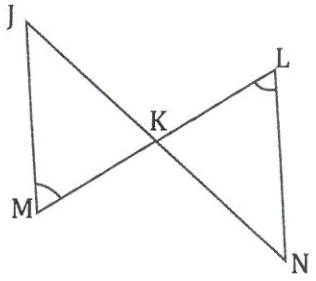
29.

Given: $\overline{PS} \cong \overline{QR}$, $\overline{PQ} \cong \overline{SR}$




Prove: $\triangle PRS \cong \triangle RPQ$

30. Given: $\overline{JN}$ Bisects $\overline{ML}$, $\angle M \cong \angle L$




Prove: $\triangle MJK \cong \triangle LNK$

Notes... day3?
day4?

# Proofs Involving CPCTC

How to fix your car....

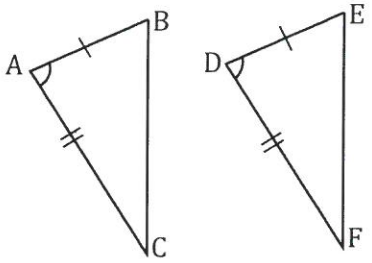
Okay, remember that to use CPCTC (Corresponding Parts of Congruent Triangles are Congruent), it's like saying that the carburetor from a '57 Chevy will be the same as the carburetor from another '57 Chevy. But, if you have two carburetors from two unknown cars, who knows if they are same or not? Okay, maybe a experienced mechanic could tell, but not me.

So remember... BEFORE YOU USE CPCTC YOU MUST PROVE THAT THE TRIANGLES IN QUESTION ARE CONGRUENT FIRST!!!

Let's analyze a couple of these, and then we will get to practicing...

Ex. 1.

Given: $\overline{AB}\cong\overline{DE}$, $\angle A\cong\angle D$, and $\overline{AC}\cong\overline{DF}$




Prove: $\angle C\cong\angle F$

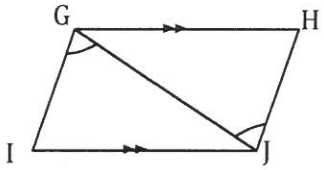
| Statements | Reasons |
|---|---|
| 1. $\overline{AB}\cong\overline{DE}$ | 1. Given |
| 2. $\angle A\cong\angle D$ | 2. Given |
| 3. $\overline{AC}\cong\overline{DF}$ | 3. Given |
| B2: 4. $\triangle ABC\cong\triangle DEF$ | 4. SAS |
| B1: 5. $\angle C\cong\angle F$ | 5. CPCTC |

Analysis:

Working backwards, the statement "Prove: $\angle C\cong\angle F$" begs the key question ,"How can we show two segments from two different triangles are congruent?" The answer? CPCTC. This means that if we can prove the triangles are congruent then $\angle C\cong\angle F$ because they are corresponding parts of congruent triangles. So B1: $\angle C\cong\angle F$ by CPCTC. This then begs the second key question, "How can I show two triangles are congruent?" This means B2 will be $\triangle ABC\cong\triangle DEF$ by some congruence property. Which one? Now we work forward and see we have. $\overline{AB}\cong\overline{DE}$, $\angle A\cong\angle D$, and $\overline{AC}\cong\overline{DF}$ which are all given, This means $\triangle ABC\cong\triangle DEF$, which is B2, and the proof is complete.

Ex. 2.

Given: $\overline{GH}\|\overline{IJ}$, $\angle IGJ\cong\angle HJG$




Prove: $\overline{IG}\cong\overline{HJ}$

| Statements | Reasons |
|---|---|
| 1. $\overline{GH}\|\|\overline{IJ}$ | 1. Given |
| 2. $\angle IGJ\cong\angle HJG$ | 2. Given |
| 3. $\angle HGJ\cong\angle IJG$ | 3. Alternate Interior |
| 4. $\overline{GJ}\cong\overline{GJ}$ | 4. Reflexive Property |
| B2: 5. $\triangle IGJ\cong\triangle HJG$ | 5. ASA |
| B1: 6. $\overline{IG}\cong\overline{HJ}$ | 6. CPCTC |

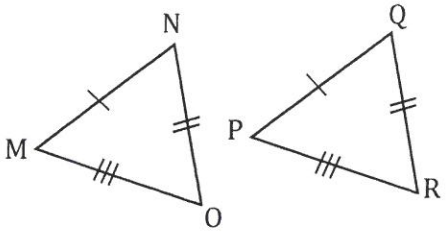
Analysis:

Working backwards, the statement "Prove: $\overline{IG}\cong\overline{HJ}$" begs the key question ,"How can we show two segments from two different triangles are congruent?" The answer? CPCTC. This means that if we can prove the triangles are congruent then $\overline{IG}\cong\overline{HJ}$ because they are corresponding parts of congruent triangles. So B1 $\overline{IG}\cong\overline{HJ}$ by CPCTC. This then begs the second key question, "How can I show two triangles are congruent?" This means B2 will be $\triangle IGJ\cong\triangle HJG$ by some congruence property. Which one? Now we work forward and see we have $\overline{GH}\|\overline{IJ}$, and $\angle IGJ\cong\angle HJG$, Given. We know when we see parallel lines we look for alternate interior or corresponding angles. We have alternate interior angles $\angle HGJ\cong\angle IJG$. We also have $\overline{GJ}$ as a shared side. This means $\triangle IGJ\cong\triangle HJG$ by ASA, which is B2, and the proof is complete.

Write an analysis of each proof below.

1. Given: $\overline{MN} \cong \overline{PQ}$, $\overline{NO} \cong \overline{QR}$, and $\overline{OM} \cong \overline{RP}$

Analysis:

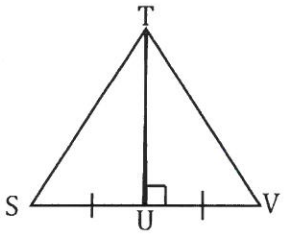



Prove: $\angle M \cong \angle P$

| Statements | Reasons |
|---|---|
| 1. $\overline{MN} \cong \overline{PQ}$ | 1. Given |
| 2. $\overline{NO} \cong \overline{QR}$ | 2. Given |
| 3. $\overline{OM} \cong \overline{RP}$ | 3. Given |
| B2: 4. $\triangle MNO \cong \triangle PQR$ | 4. SSS |
| B1: 5. $\angle M \cong \angle P$ | 5. CPCTC |

2. Given: $\overline{SU} \cong \overline{UV}$

Analysis:

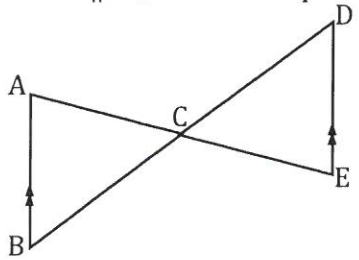



Prove: $\overline{ST} \cong \overline{VT}$

| Statements | Reasons |
|---|---|
| 1. $\overline{SU} \cong \overline{UV}$ | 1. Given |
| 2. $\overline{TU} \cong \overline{TU}$ | 2. Reflexive Properties |
| B2: 3. $\triangle STU \cong \triangle VUT$ | 3. HL |
| B1: 4. $\overline{ST} \cong \overline{VT}$ | 4. CPCTC |

3. Given: $\overline{AB} \| \overline{DE}$, C is the midpoint of $\overline{AE}$

Analysis:

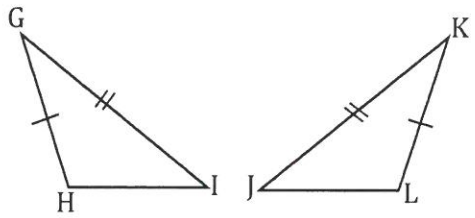



Prove: $\overline{BC} \cong \overline{DC}$

| Statements | Reasons |
|---|---|
| 1. $\overline{AB} \cong \overline{DE}$ | 1. Given |
| 2. C is the midpoint of $\overline{AE}$ | 2. Given |
| 3. $\angle BAC \cong \angle DEC$ | 3. Alternate Interior |
| 4. $\overline{AC} \cong \overline{EC}$ | 4. Def. of Midpoint |
| 5. $\angle ACB \cong \angle DCE$ | 5. Vertical Angles |
| B2: 6. $\triangle ABC \cong \triangle DEF$ | 6. ASA |
| B1: 7. $\overline{BC} \cong \overline{DC}$ | 7. CPCTC |

Fill in the missing information in each proof.

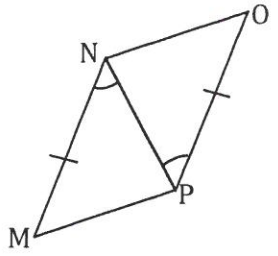
4. Given: $\overline{GH} \cong \overline{KL}$, $\angle G \cong \angle K$, and $\overline{GI} \cong \overline{KJ}$




Prove: $\overline{HI} \cong \overline{LJ}$

| Statements | Reasons |
|---|---|
| 1. $\overline{GH} \cong \overline{KL}$ | 1. Given |
| 2. | 2. Given |
| 3. $\overline{GI} \cong \overline{KJ}$ | 3. |
| 4. | 4. SAS |
| 5. $\overline{HI} \cong \overline{LJ}$ | 5. |

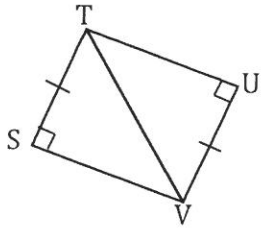
5. Given: $\angle MNP \cong \angle OPN$, and $\overline{MN} \cong \overline{OP}$




Prove: $\overline{MP} \cong \overline{NO}$

| Statements | Reasons |
|---|---|
| 1. | 1. Given |
| 2. $\overline{MN} \cong \overline{OP}$ | 2. |
| 3. $\overline{NP} \cong \overline{NP}$ | 3. |
| 4. $\triangle MNP \cong \triangle OPN$ | 4. |
| 5. | 5. CPCTC |

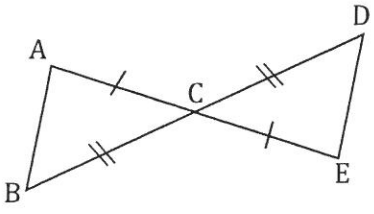
6. Given: $\overline{ST} \cong \overline{VU}$




Prove: $\angle SVT \cong \angle UTV$

| Statements | Reasons |
|---|---|
| 1. | 1. Given |
| 2. | 2. Reflexive Property |
| 3. | 3. HL |
| 4. $\angle SVT \cong \angle UTV$ | 4. |

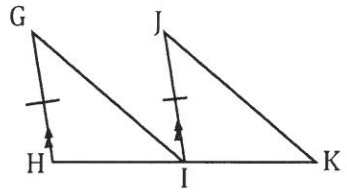
7. Given: $\overline{AC} \cong \overline{CE}$, $\overline{DC} \cong \overline{BC}$




Prove: $\angle B \cong \angle D$

| Statements | Reasons |
|---|---|
| 1. | 1. |
| 2. | 2. Given |
| 3. $\angle ACB \cong \angle DCE$ | 3. |
| 4. $\triangle ABC \cong \triangle DEF$ | 4. |
| 5. $\angle B \cong \angle D$ | 5. |

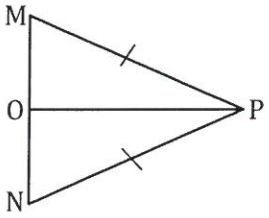
8. Given: $\overline{GH} \| \overline{JI}$, I is the midpoint of HK and $\overline{GH} \cong \overline{JI}$




Prove: $\angle G \cong \angle J$

| Statements | Reasons |
|---|---|
| 1. $\overline{GH} \| \overline{JI}$ | 1. |
| 2. I is the midpoint of $\overline{HK}$ | 2. |
| 3. | 3. Given |
| 4. $\overline{HI} \cong \overline{IK}$ | 4. |
| 5. | 5. Corresponding |
| 6. | 6. SAS |
| 7. $\angle G \cong \angle J$ | 7. |

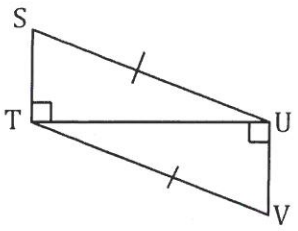
9. Given: $\overline{MP} \cong \overline{NP}$, $\overline{MN} \perp \overline{OP}$




Prove: $\overline{MO} \cong \overline{ON}$

| Statements | Reasons |
|---|---|
| | |
| 1. | 1. Given |
| 2. $\overline{MN} \perp \overline{OP}$ | 2. |
| 3. $\overline{OP} \cong \overline{OP}$ | 3. |
| 4. $\triangle MOP \cong \triangle NOP$ | 4. |
| 5. | 5. |

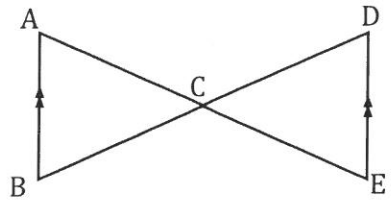
10. Given: $\overline{SU} \cong \overline{VT}$




Prove: $\overline{ST} \cong \overline{UV}$

| Statements | Reasons |
|---|---|
| 1. $\overline{SU} \cong \overline{VT}$ | 1. |
| 2. | 2. |
| 3. | 3. HL |
| 4. | 4. CPCTC |

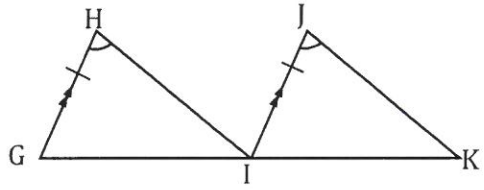
11. Given: $\overline{AB} \| \overline{DE}$, $\overline{AE}$ bisects $\overline{BD}$




Prove: $\overline{AC} \cong \overline{EC}$

| Statements | Reasons |
|---|---|
| 1. | 1. |
| 2. | 2. Given |
| 3. $\angle ABC \cong \angle EDC$ | 3. |
| 4. $\angle ACB \cong \angle DCE$ | 4. |
| 5. | 5. Def of Bisect |
| 6. $\triangle ABC \cong \triangle EDC$ | 6. |
| 7. | 7. |

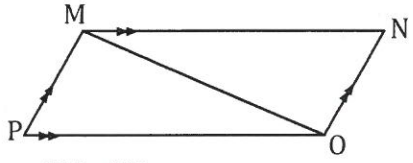
12. Given: $GH \| IJ$, $\angle H \cong \angle J$ and $GH \cong IJ$




Prove: $\angle GIH \cong \angle IKJ$

| Statements | Reasons |
|---|---|
| 1. | 1. Given |
| 2. $\angle H \cong \angle J$ | 2. |
| 3. | 3. |
| 4. | 4. Alternate Interior |
| 5. | 5. |
| 6. | 6. CPCTC |

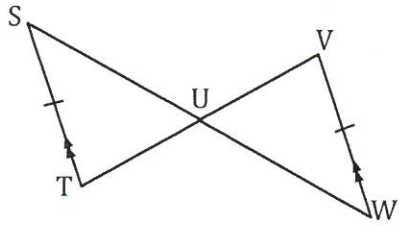
13. Given: $PM \| NO$, $MN \| PO$,




Prove: $PM \cong ON$

| Statements | Reasons |
|---|---|
| 1. $PM \| ON$ | 1. |
| 2. | 2. Given |
| 3. $\angle PMO \cong \angle NOP$ | 3. |
| 4. | 4. Alternate Interior |
| 5. $\overline{MO} \cong \overline{MO}$ | 5. |
| 6. | 6. ASA |
| 7. | 7. |

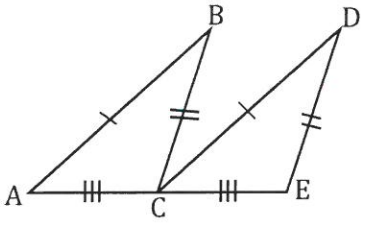
14. Given: $\overline{ST} \| \overline{WV}$, and $\overline{ST} \cong \overline{VW}$




Prove: $\overline{SU} \cong \angle \overline{WU}$

| Statements | Reasons |
|---|---|
| 1. | 1. Given |
| 2. | 2. Given |
| 3. | 3. Alternate Interior |
| 4. $\angle SUT \cong \angle WUV$ | 4. |
| 5. | 5. AAS |
| 6. | 6. |

15. Given: $\overline{AB} \cong \overline{CD}$, $\overline{BC} \cong \overline{DE}$, and $\overline{AC} \cong \overline{CE}$

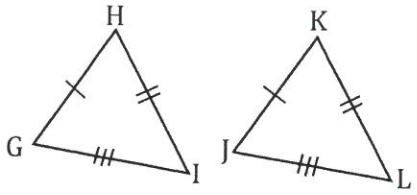



Prove: $\angle A \cong \angle DCE$

| Statements | Reasons |
|---|---|
| 1. $\overline{AB} \cong \overline{CD}$ | 1. |
| 2. $\overline{BC} \cong \overline{DE}$ | 2. |
| 3. | 3. Given |
| 4. | 4. |
| 5. | 5. |

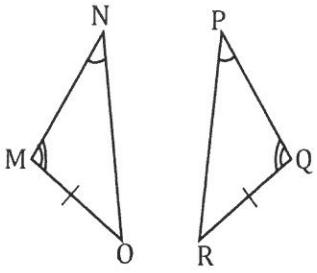
Write a two column proof for each.

16. Given: $\overline{GH} \cong \overline{JK}$, $\overline{HI} \cong \overline{KL}$, and $\overline{IG} \cong \overline{LJ}$



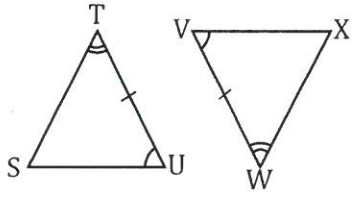

Prove: $\angle I \cong \angle L$

17. Given: $\angle N \cong \angle P$, $\angle M \cong \angle Q$, and $\overline{MO} \cong \overline{QR}$



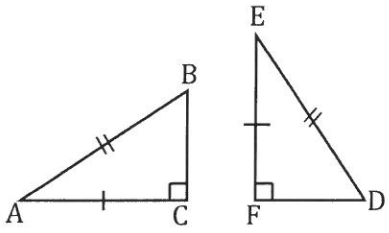

Prove: $\angle O \cong \angle R$

18.
Given: $\angle U \cong \angle V$, $\angle T \cong \angle W$, and $\overline{TU} \cong \overline{VW}$



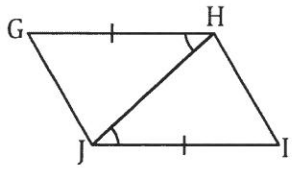

Prove: $\angle S \cong \angle X$

19. Given: $\overline{AC} \cong \overline{EF}$, and $\overline{AB} \cong \overline{ED}$



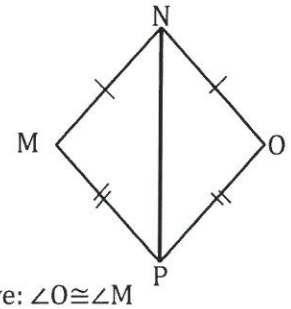

Prove: $\overline{BC} \cong \overline{FD}$

20.
Given: $\overline{GH} \cong \overline{JI}$, $\angle GHJ \cong \angle IJH$



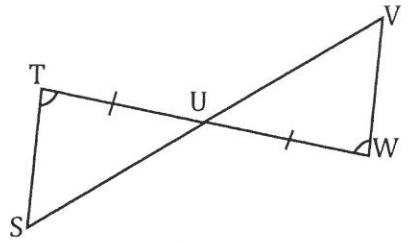

Prove: $\overline{GJ} \cong \overline{HI}$

21. Given: $\overline{MN} \cong \overline{NO}$, $\overline{MP} \cong \overline{OP}$



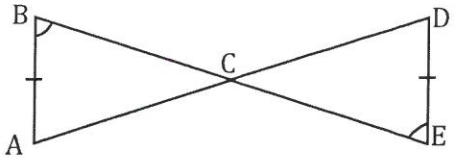

Prove: $\angle O \cong \angle M$

22. Given: $\overline{TU} \cong \overline{WU}$, $\angle T \cong \angle W$



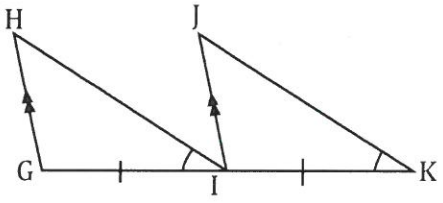

Prove: $\overline{TS} \cong \overline{WV}$

23. Given: $\overline{AB} \cong \overline{DE}$, $\angle B \cong \angle E$



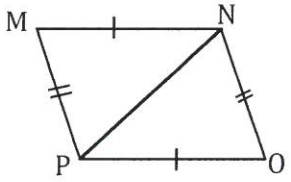

Prove: $\overline{AC} \cong \overline{DC}$

24. Given: $\overline{HG} \| \overline{JI}$, $\overline{GI} \cong \overline{IK}$, and $\angle HIG \cong \angle JKI$



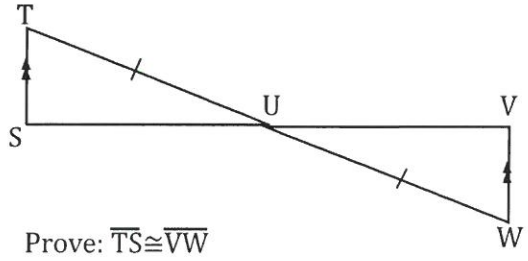

Prove: $\angle C \cong \angle F$

25. Given: $\overline{MN} \cong \overline{PO}$, $\overline{MP} \cong \overline{NO}$



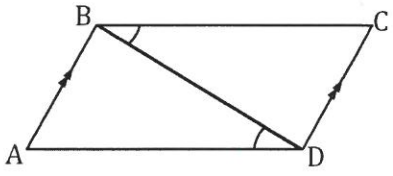

Prove: $\angle M \cong \angle O$

26. Given: $\overline{TS} \| \overline{VW}$, $\overline{TU} \cong \overline{WU}$




Prove: $\overline{TS} \cong \overline{VW}$

27. Given: $\overline{AB} \| \overline{DE}$, $\angle CBD \cong \angle ADB$




Prove: $\overline{BC} \cong \overline{AD}$