Corresponding **P**arts of **C**ongruent **T**riangles are **C**ongruent

In a congruence statement, the order of the letters matters. Make sure you are matching up the corresponding parts.

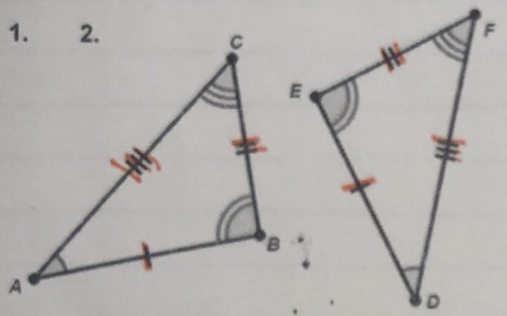
Honors Geometry – Congruence

Name:

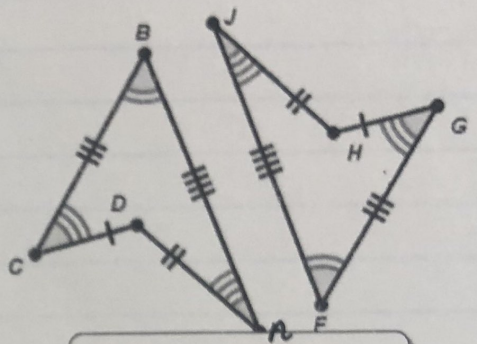
Any two congruent figures can be mapped onto one another using a series of rigid or isometric transformation (reflections, rotations, and translations).

Each of the following pairs of figures shown below are congruent. Write a congruence statement for each.

1. 2.

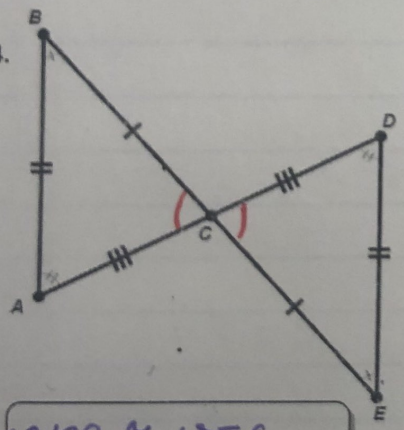


$\triangle ABC \cong \triangle DEF$

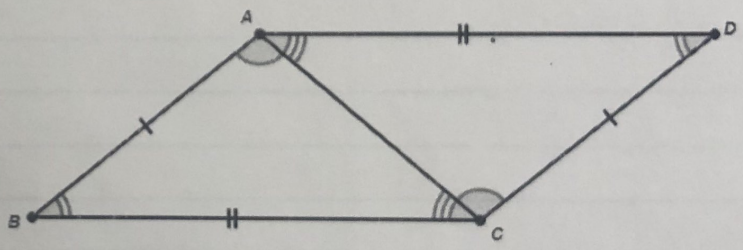


$ABCD \cong JFGH$

3. 4.



$\triangle ABC \cong \triangle DEC$

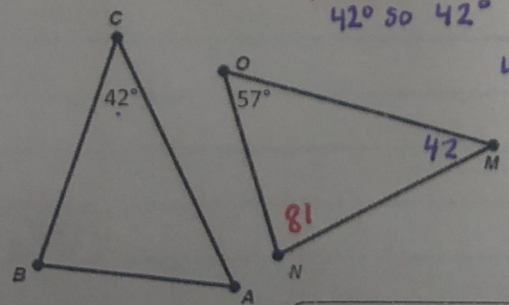


$\triangle ABC \cong \triangle CDA$

Given the following congruencies find the requested unknown angle

5. $\triangle ABC \cong \triangle ONM$

$\angle BCA \cong \angle NMO$
$42° \text{ so } 42°$



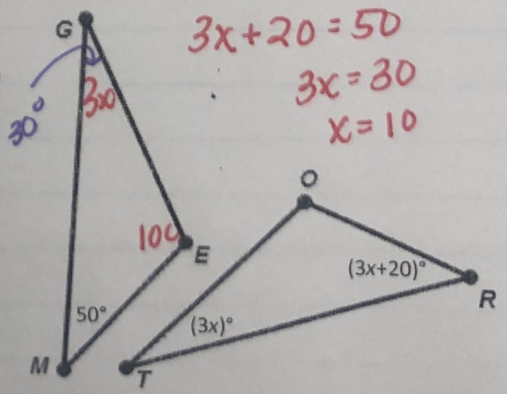
$42 + 57 = 99$

$180 - 99 = 81$

$m\angle MNO = 81°$

6. $\triangle GEM \cong \triangle TOR$

$3x + 20 = 50$
$3x = 30$
$x = 10$



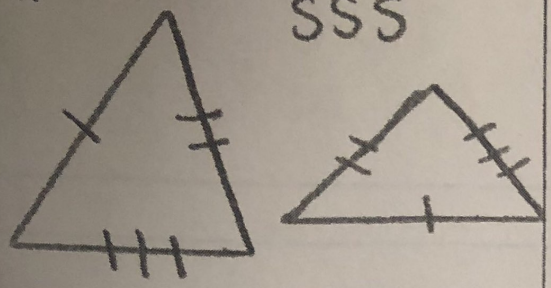
$180 - 80 = 100$

$m\angle GEM = 100°$

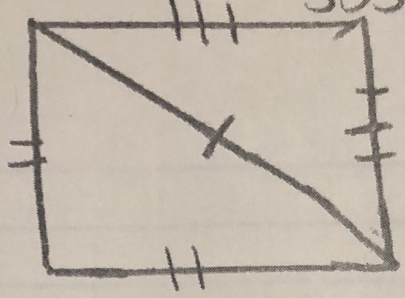
2

10. _____ 11. _____

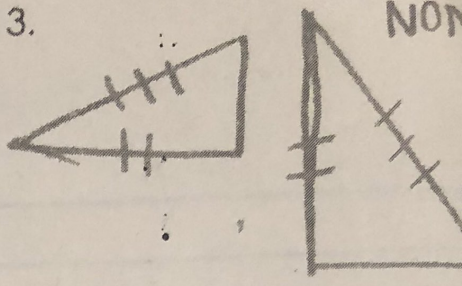
1. SSS



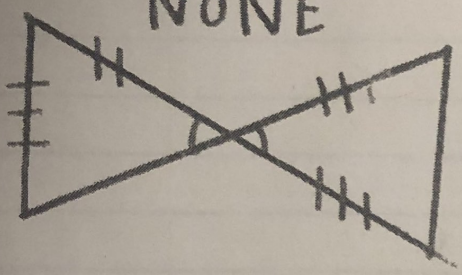
2. SSS



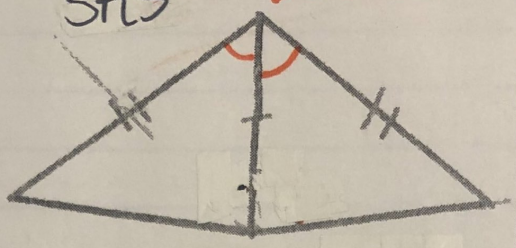
3. NON



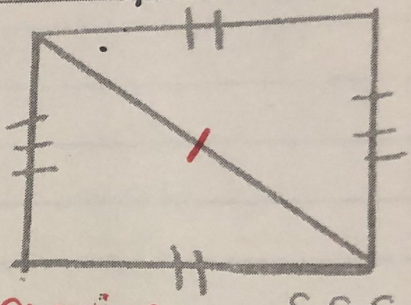
4. NONE



5. SAS included

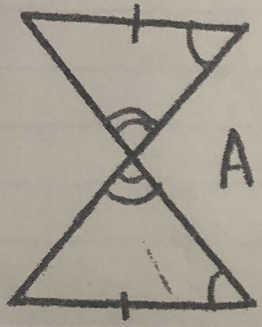


6.

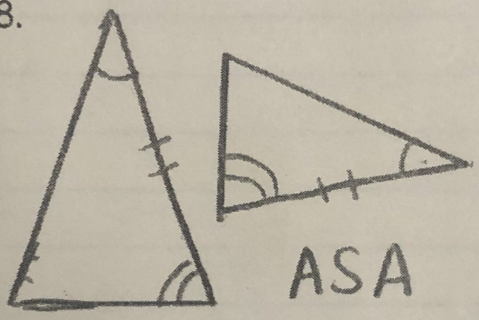


Reflexive SSS

7. AAS

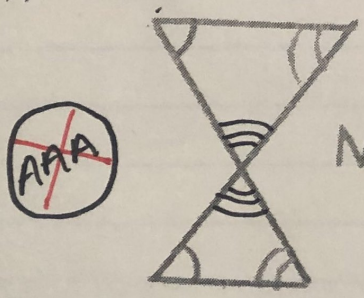


8.



ASA

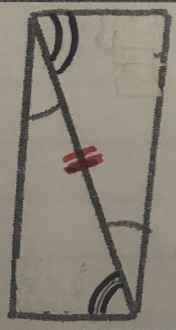
9.



~~AAA~~

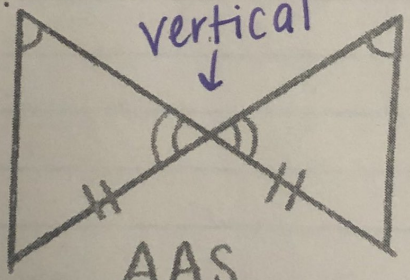
NON

10. ASA



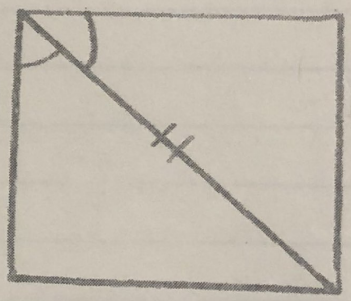
•Reflexive Property

11. vertical

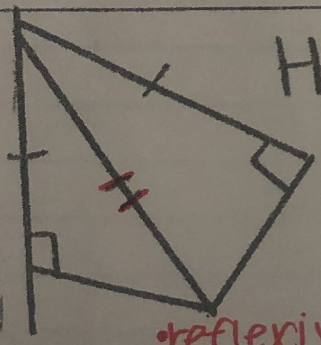


AAS

12. NONE

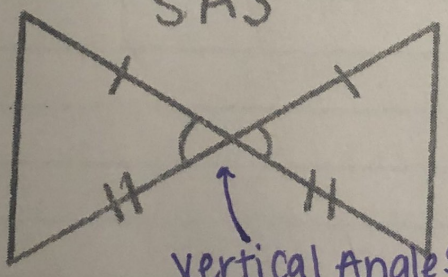


13. HL



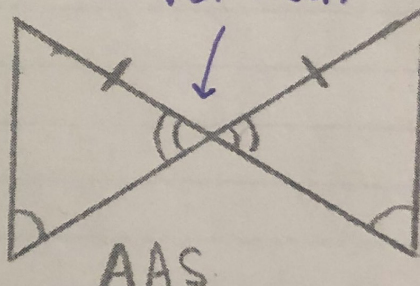
•reflexive

14. SAS



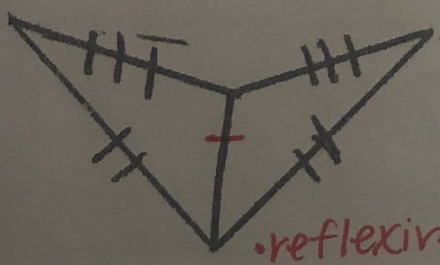
vertical Angles

15. vertical



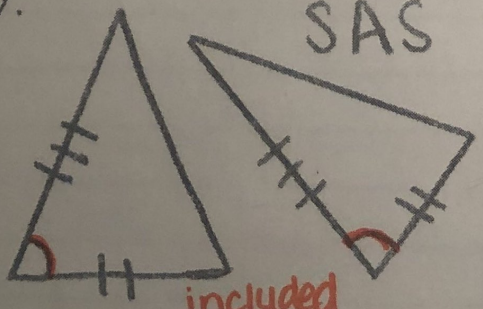
AAS

16. SSS



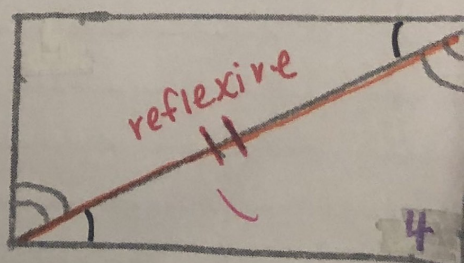
•reflexive

17. SAS



included

18. ASA included



reflexive

Triangle Proofs

- Two-column geometric proofs are essentially just tables with Statements on the left and a Reasons on the right.
- The statements we make are going to be the steps we take toward solving our problem.
- Reasons can consist of information given within the problem itself, definition, postulates, or theorems.

Statements and Reasons

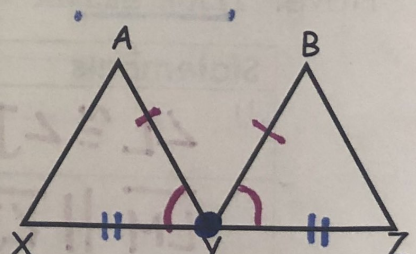
If...	Then the reason is...
an angle or side is marked on the picture, or if it is given in the directions,	Given
you recognize that the shapes share a side,	Reflexive
you see alternate interior angles, parallel lines!	Alternate interior angles are congrent.
you see vertical angles,	vertical angles are congruent.
the statement states that the triangles are congruent,	ASA, AAS, SAS, SSS, HL
the triangles have already been proven to be congruent, and now we are trying to prove a side or angle is congruent,	CPCTC Corresponding Parts of Congruent Triangle are Congruent

Don't forget to ALWAYS mark your pictures!

Example 1:

Given: Y is the midpoint of $\overline{XZ}$, $\overline{AY} \cong \overline{BY}$, and $\angle AYX \cong \angle BYZ$..

Prove: $\triangle XYA \cong \triangle ZYB$



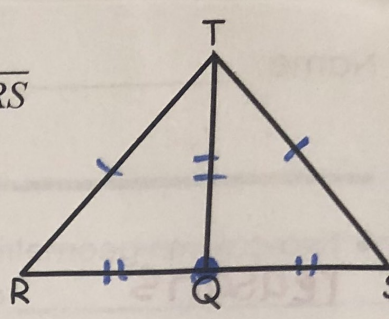
SAS

Statements	Reasons
1) $\overline{AY} \cong \overline{BY}$	Given
2) $\angle AYX \cong \angle BYZ$.	Given
3) Y is the midpoint of $\overline{XZ}$	Given
4) $\overline{XY} \cong \overline{YZ}$	Definition of Midpoint
5) $\triangle XYA \cong \triangle ZYB$	SAS

Example 2:

Given: $\triangle RTS$ is isosceles with legs $\overline{RT}$ and $\overline{TS}$. Q is the midpoint of $\overline{RS}$

Prove: $\triangle RTQ \cong \triangle STQ$, Base $\angle$s Thm.

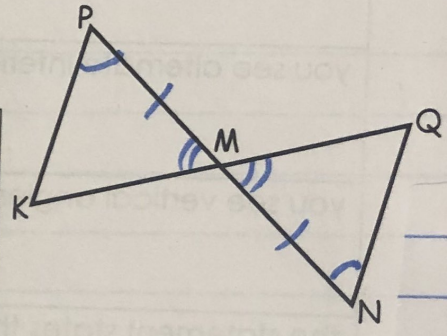


Statements	Reasons
1) $\triangle RTS$ is Isos	Given
2) $\overline{RT} \cong \overline{TS}$	Defn. Isosceles Triang
3) Q is midpoint	Given
4) $\overline{RQ} \cong \overline{QS}$	Defn midpoint
5) $\overline{TQ} \cong \overline{TQ}$	Reflexive Prop.
6) $\triangle RTQ \cong \triangle STQ$	SSS
7) $\angle R \cong \angle S$	CPCTC

Example 3:

Given: $\angle P \cong \angle N, \overline{PM} \cong \overline{NM}$

Prove: $\triangle PMK \cong \triangle NMQ$

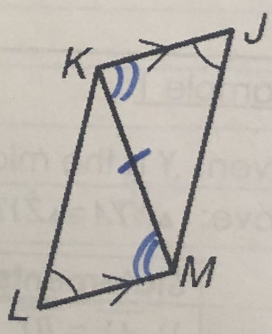


Statements	Reasons
1) $\angle P \cong \angle N$	Given
2) $\overline{PM} \cong \overline{NM}$	Given
3) $\angle PMK \cong \angle NMQ$	V.A.T
4) $\triangle PMK \cong \triangle NMQ$	ASA

Example 4:

Given: $\angle L \cong \angle J, \overline{LM} \parallel \overline{KJ}$

Prove: $\triangle LKM \cong \triangle JMK$



	Statements	Reasons
A	1) $\angle L \cong \angle J$	Given
A	2) $\overline{LM} \parallel \overline{KJ}$	Given
	3) $\angle KML \cong \angle JKM$	Alt Interior
S	4) $\overline{KM} \cong \overline{KM}$	Reflexive
	5) $\triangle LKM \cong \triangle JMK$	AAS

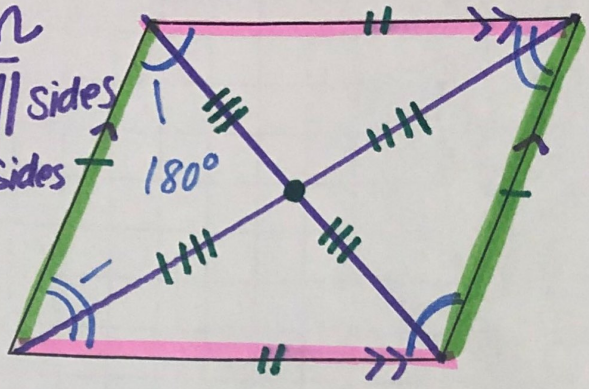
Quadrilaterals Graphic Organizer

QUADRILATERAL NAME	SIDE PROPERTIES	ANGLE PROPERTIES	DIAGONALS PROPERTIES
KITE A QUADRILATERAL WITH TWO DISTINCT PAIRS OF CONGRUENT CONSECUTIVE SIDES.	▪ IN A KITE THERE ARE TWO PAIR OF ADJACENT, CONGRUENT SIDES	▪ NON-VERTEX ANGLES ARE CONGRUENT ▪ VERTEX ANGLES ARE BISECTED BY A DIAGONAL	▪ DIAGONALS ARE ⊥ 90°
TRAPEZOID A QUADRILATERAL WITH EXACTLY ONE PAIR OF PARALLEL SIDES.	▪ THE TWO PARALLEL SIDES OF THE TRAPEZOID ARE CALLED THE BASES	▪ THE CONSECUTIVE ANGLES BETWEEN THE BASES OF THE TRAPEZOID ARE SUPPLEMENTARY	
ISOSCELES TRAPEZOID A TRAPEZOID WITH TWO CONGRUENT LEGS.	▪ IN AN ISOSCELES TRAPEZOID THE NON-PARALLEL SIDES ARE CONGRUENT	▪ BOTH SETS OF BASES ANGLES OF AN ISOSCELES TRAPEZOID ARE CONGRUENT (FIND ONE ANGLE YOU CAN FIND THEM ALL)	▪ THE DIAGONAL OF AN ISOSCELES TRAPEZOID ARE CONGRUENT
PARALLELOGRAM A QUADRILATERAL WITH TWO PAIRS OF PARALLEL SIDES.	▪ OPPOSITE SIDES ARE PARALLEL AND CONGRUENT	▪ OPPOSITE ANGLES ARE CONGRUENT ▪ CONSECUTIVE ANGLES ARE SUPPLEMENTARY (FIND ONE ANGLE YOU CAN FIND THEM ALL)	▪ THE DIAGONALS BISECT EACH OTHER
RHOMBUS AN EQUILATERAL PARALLELOGRAM.	ALL OF THE SAME PROPERTIES OF A PARALLELOGRAM ▪ ALL SIDES ARE CONGRUENT	ALL OF THE SAME PROPERTIES OF A PARALLELOGRAM ▪ OPPOSITE ANGLES ARE CONGRUENT ▪ CONSECUTIVE ANGLES ARE SUPPLEMENTARY	ALL OF THE SAME PROPERTIES OF A PARALLELOGRAM AND... 90° ▪ THE DIAGONALS OF A RHOMBUS ARE ⊥ BISECTORS OF ONE ANOTHER ▪ THE DIAGONALS OF A RHOMBUS ARE ANGLE BISECTORS
RECTANGLES AN EQUIANGULAR PARALLELOGRAM.	ALL OF THE SAME PROPERTIES OF A PARALLELOGRAM ▪ OPPOSITE SIDES ARE CONGRUENT	ALL OF THE SAME PROPERTIES OF A PARALLELOGRAM ▪ ALL ANGLES ARE CONGRUENT ALL RIGHT ANGLES	ALL THE SAME PROPERTIES OF A PARALLELOGRAM AND... ▪ THE DIAGONALS OF A RECTANGLE ARE CONGRUENT
SQUARES AN EQUIANGULAR AND EQUILATERAL PARALLELOGRAM. A REGULAR QUADRILATERAL.	ALL OF THE SAME PROPERTIES OF A PARALLELOGRAM, RECTANGLE AND RHOMBUS ▪ ALL SIDES ARE CONGRUENT	ALL OF THE SAME PROPERTIES OF A PARALLELOGRAM, RECTANGLE AND RHOMBUS ▪ ALL ANGLES ARE RIGHT ANGLES	ALL OF THE SAME PROPERTIES OF A PARALLELOGRAM, RECTANGLE AND RHOMBUS ▪ THE DIAGONALS OF A SQUARE ARE CONGRUENT, ⊥, BISECT ONE ANOTHER 90°

Quadrilaterals are polygons with four sides.

Parallelogram

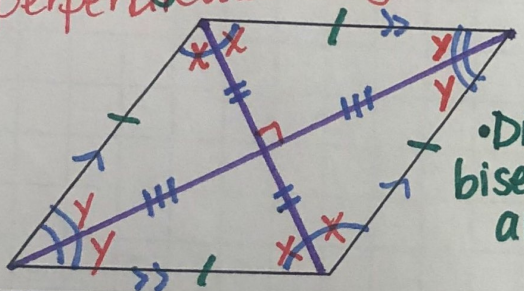
- 2 sets opposite ∥ sides
- 2 sets opposite ≅ sides
- Consecutive ∠s are supp.
- Opposite ∠s ≅



- diagonals bisect eachother

Rhombus

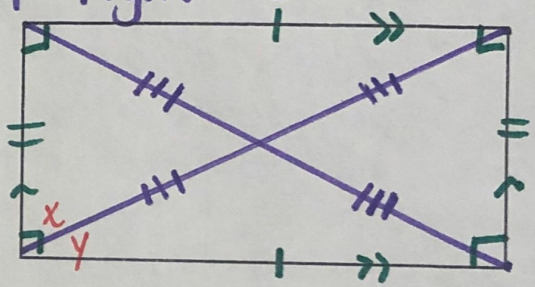
- All the properties of a parallelogram.
- All congruent sides
- perpendicular diagonals



- Diagonals bisect angles

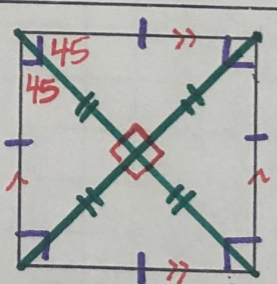
Rectangle

- All parallelogram properties
- Diagonals are ≅
- All right ∠s



Square

All properties of parallelogram, rhombus rectangle.

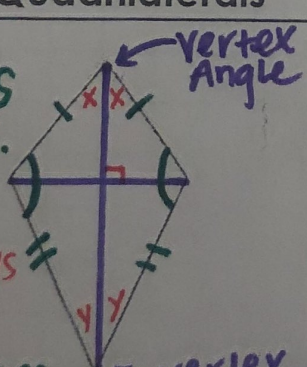


$a^2 + b^2 = c^2$

Other Quadrilaterals

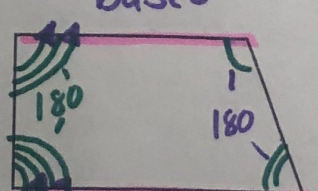
Kite

- 2 sets consec. ≅ sides
- Diagonals are ⊥
- vertex ∠s are bisected



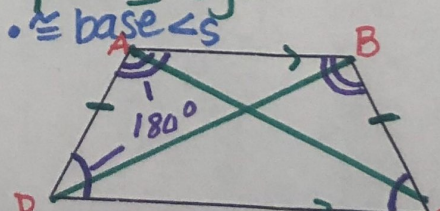
Trapezoid

- One set parallel bases



Isosceles Trapezoid

- pair ≅ legs
- ≅ base ∠s



- congruent diagonals

$\overline{AC} \cong \overline{BD}$

GSE Geometry

Name: _____ Date: _____

Congruent Triangles and CPCTC

1. $\Delta PQR \cong \Delta XYZ$. List three pairs of angles that are congruent. $\angle P \cong \angle X$ $\angle Q \cong \angle Y$ $\angle R \cong \angle Z$

2. $\Delta ABC \cong \Delta JKL$. List three pairs of sides that are congruent.

$\overline{AB} \cong \overline{JK}$ $\overline{BC} \cong \overline{KL}$ $\overline{AC} \cong \overline{JL}$

3. Suppose $\Delta ABC \cong \Delta EFG$. For each of the following, name the corresponding part.

a. $\angle A$ $\angle E$

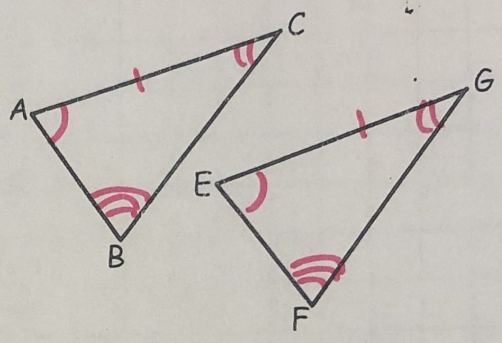
b. $\angle BCA$ $\angle FGE$

c. $\overline{AC}$ $\overline{EG}$

d. $\angle F$ $\angle B$

e. $\angle GEF$ $\angle CAB$

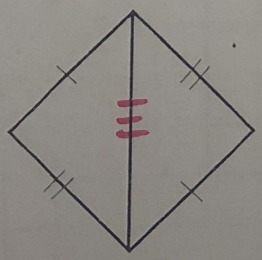
f. $\overline{GE}$ $\overline{CA}$



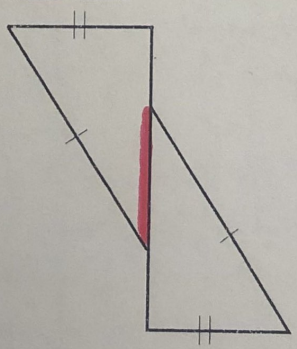
4. Suppose $\Delta AEB \cong \Delta DEC$. Which angle in ΔDEC corresponds to $\angle ABE$? $\angle DCE$

If congruent, state the congruence postulate, SSS, SAS, ASA, AAS, or HL. If not congruent, write none.

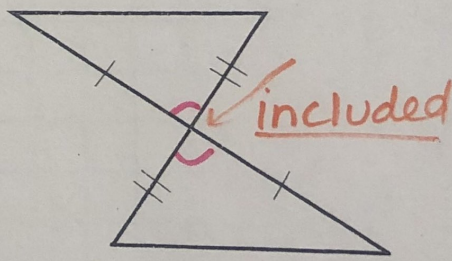
5. SSS



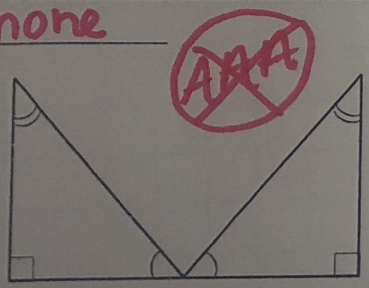
6. none



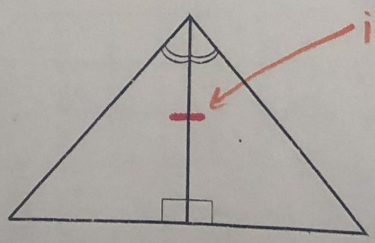
7. SAS



8. none



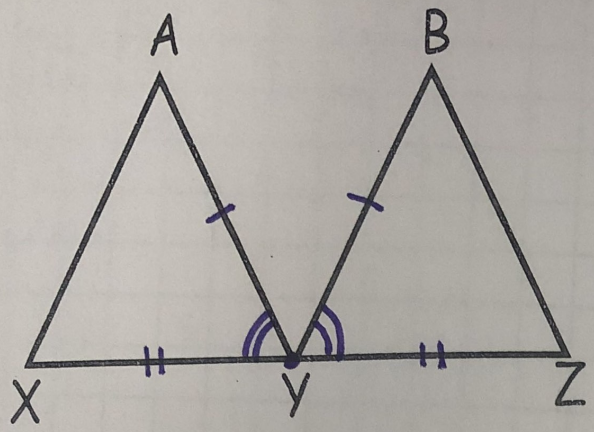
9. ASA



GSE Geometry

For the following problems, complete the triangle congruence statement and name the postulate that justifies the statement.

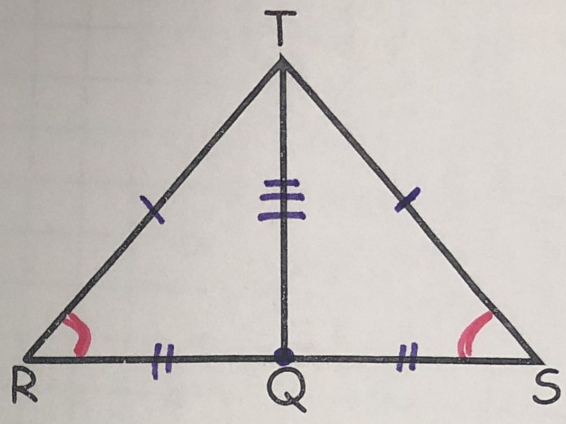
10.



Y is the **midpoint** of XZ, AY ≅ BY and ∠AYX ≅ ∠BYZ. ← given

ΔXYA ≅ ZYB by SAS

11.

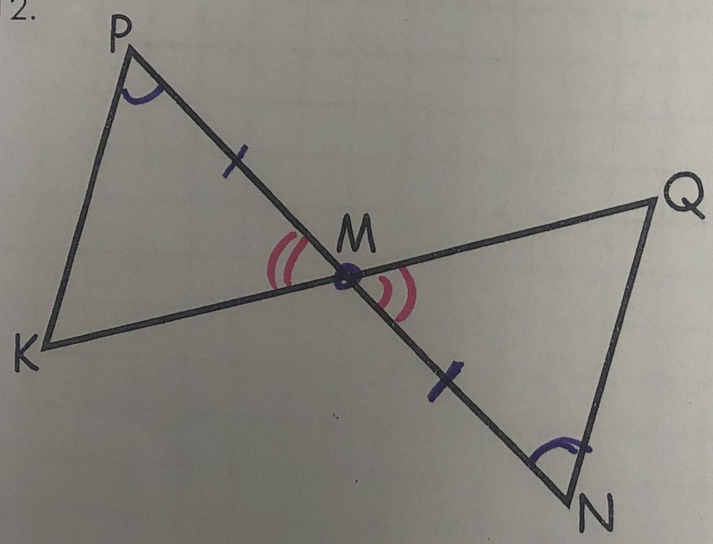


SAS

ΔRTS is **isosceles** with legs RT and TS. Q is the **midpoint** of RS.

ΔRTQ ≅ STQ by SSS

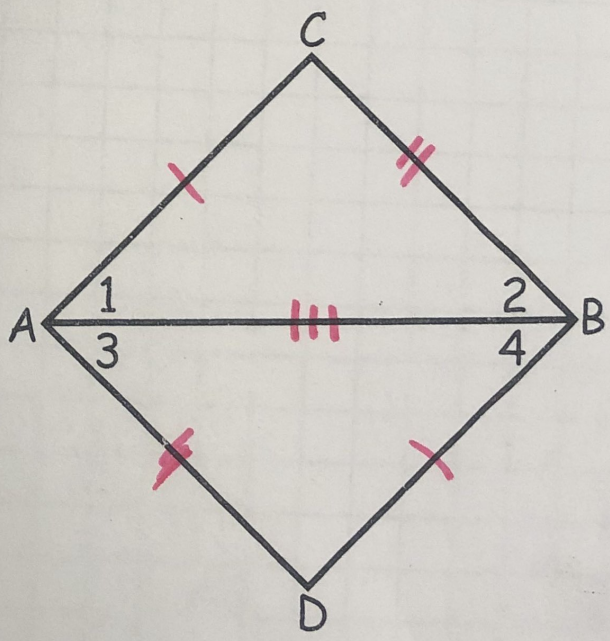
12.



∠P ≅ ∠N and M is the **midpoint** of PN.

ΔPMK ≅ NMQ by ASA

13.



AC ≅ BD and AD ≅ BC

ΔABD ≅ BAC by SSS