Name:_____ **Date:**_____

Geometry Notes Intro to Geo Proofs - 4: Basic Postulates

Postulates (aka Axioms)

A **postulate** (also called an **axiom**) is a statement (not a definition) that is accepted *without proof.*

A **theorem** is a statement that has been *proven* using definitions, postulates and previously proven theorems.

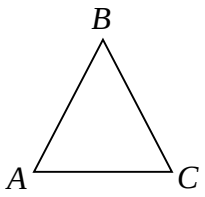
Basic Postulates

1. Reflexive Postulate:

2. Transitive Postulate: If two things both equal the same (third) thing, then they equal each other.

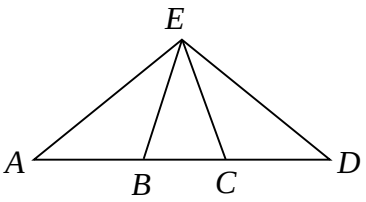
   Ex: If $a = c$ and $b = c$ then

   Ex: If $\overline{AB} \cong \overline{BC}$ and $\overline{BC} \cong \overline{CA}$ then



   Ex: Given: $\angle AEB \cong \angle BEC$, $\angle CED \cong \angle BEC$

   Conclusion:

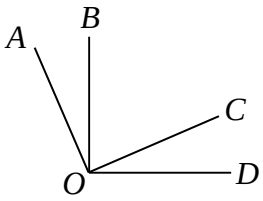


3. Substitution Postulate: Equal quantities may be substituted for each other in any expression.

   Ex: $2x + y = 6$
   $y = 3x + 1$

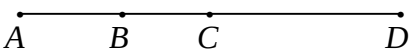
   Ex: Given: $m\angle AOB + m\angle BOC = 90°$
   $m\angle AOB = m\angle COD$

   Conclusion:

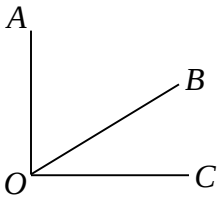


4. Partition Postulate: The whole equals

   Ex:



   Ex:



Ex: For each of the following, name the postulate illustrated.

a. Amy is the same height at Bob. Bob is the same height as Chris. So Amy is the same height as Chris.

b. Amy, Bob, Chris, Don, Emma and Fred are a hockey team. Fred is the goalie. George is another goalie. So Amy, Bob, Chris, Don, Emma and George are a hockey team.

c. Amy, Bob, Chris, Don, Emma and Fred are a hockey team. Fred is the goalie. Herb is baseball pitcher. So Amy, Bob, Chris, Don, Emma and Herb are a hockey team.

d. A soccer team is made up three forwards, four midfielders, three fullbacks and a goalkeeper.

e. A basketball team is made up a center, two forwards, two guards and a goalkeeper.

Ex: Which of the following is an example of the reflexive postulate?
(1) Amy looks in the mirror.
(2) Amy is the same height as Amy.
(3) Amy is the same height as Bob.
(4) Amy is taller than Bob. Bob is taller than Chris. So Amy is taller Chris.
(5) None of these.

Ex: Equality is transitive: If $a = b$ and $b = c$ then $a = c$. Which of the following are also transitive?

a. not equal to ($\neq$)

b. greater than ($>$)

c. parallel ($\parallel$)

d. perpendicular ($\perp$)

e. "lives in the same town as"

f. "lives next door to"

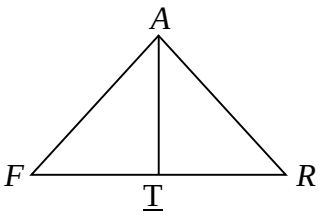
g. "goes to the same school as"

h. "is related to (by blood)"

Name _____

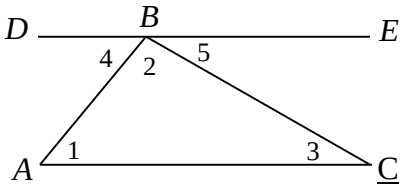
Geometry HW: Intro Geo Proofs – 4 Basic Postulates

For #1 - 4, name the postulate that justifies the conclusion.



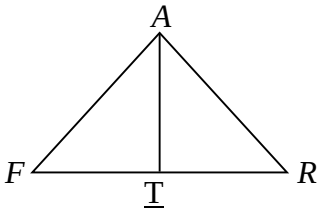
1. Given: $\overline{FT} \cong \overline{AT}$, $\overline{AT} \cong \overline{RT}$
   Conclusion: $\overline{FT} \cong \overline{RT}$

   Reason: _____



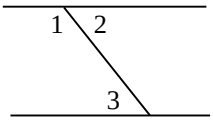
2. Given: (Diagram at right)
   Conclusion: $m\angle DBE = m\angle 4 + m\angle 2 + m\angle 5$

   Reason: _____



3. Given: (Diagram at right)
   Conclusion: $\overline{AT} \cong \overline{AT}$

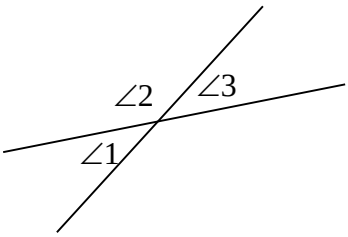
   Reason: _____



4. Given: $m\angle 1 + m\angle 2 = 180°$, $m\angle 2 = m\angle 3$ (Diagram at right)
   Conclusion: $m\angle 1 + m\angle 3 = 180$

   Reason: _____

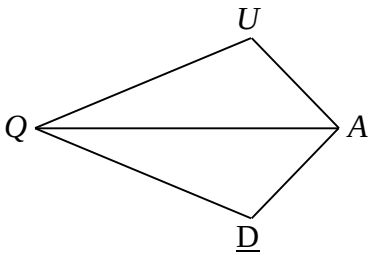
For the following, give a valid conclusion and a reason.



5. Given: $m\angle 1 + m\angle 2 = 180$; $m\angle 3 = m\angle 1$.

   Conclusion: _____

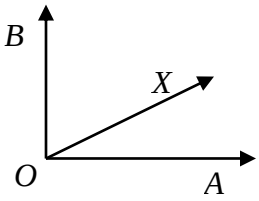
   Reason: _____



6. Given: $\overline{QA}$ bisects $\angle UAD$.

   Conclusion: _____

   Reason: _____



7. Given: $m\angle AOB = 90$.
   Statement: $m\angle AOB = m\angle AOX + m\angle XOB$

   Conclusion: _____

   Reason: _____

   Conclusion: _____

   Reason: _____

You should already know the following from previous assignments but read it anyway.

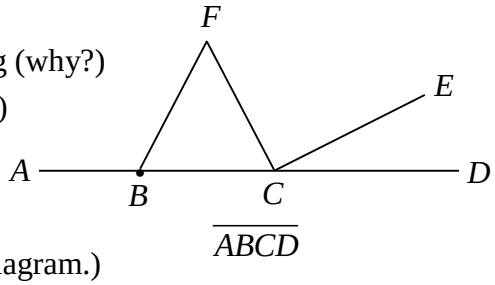
If two line segments are added or subtracted, the result is another line segment. (See diagram below.)

Ex: a. $\overline{AC}+\overline{CD}=\overline{AD}$ b. $\overline{AC}-\overline{AB}=\overline{BC}$

c. $\overline{AB}+\overline{CD}=$ nothing (why?) d. $\overline{BC}-\overline{AB}=$ nothing (why?)

e. $\overline{AC}+\overline{BD}=$ nothing (why?) f. $\overline{BD}+\overline{AC}=$ nothing (why?)

g. $\overline{AC}+\overline{CE}=$ nothing (why?)



$\overline{ABCD}$

If two angles are added or subtracted, the result is another angle. (Same diagram.)

Ex: a. $\angle FCE + \angle ECD = \angle FCD$ b. $\angle ABF + \angle DCF$ = nothing (why?)

c. $\angle BCE - \angle FCE = \angle BCF$ d. $\angle ABF - \angle FBC$ = nothing (why?)

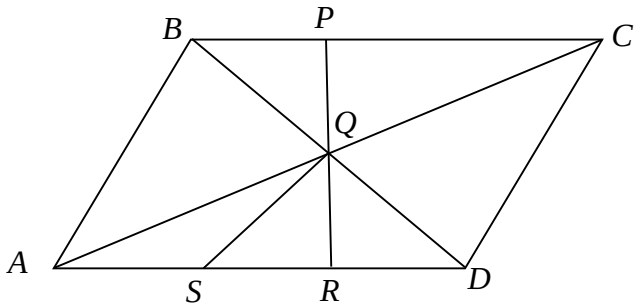
8. Use the diagram at right to answer the following:

a. $\overline{BP}+\overline{PC}=$ _____ b. $\overline{AS}+\overline{SD}=$ _____ .

c. $\overline{AS}+\overline{RD}=$ _____ d. $\overline{AQ}+\overline{QD}=$ _____ .

e. $\overline{BD}-\overline{BQ}=$ _____ f. $\overline{AD}-\overline{AS}=$ _____ .

g. $\overline{AD}-\overline{SR}=$ _____ h. $\overline{AR}-\overline{RD}=$ _____ .



9. Use the same diagram to answer the following:

a. $\angle ABD + \angle DBC =$ _____ .

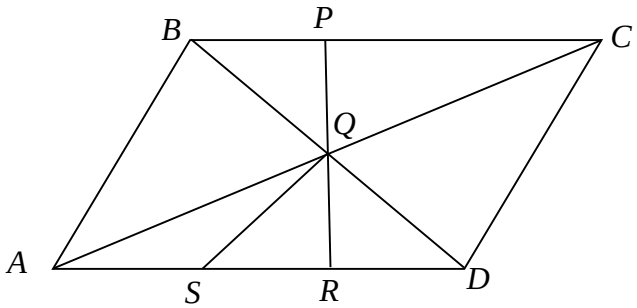
b. $\angle AQR + \angle DQR =$ _____ .

c. $\angle RDQ + \angle RSQ =$ _____ .

d. $\angle BQC - \angle BQP =$ _____ .

e. $\angle CQS - \angle CQD =$ _____ .

f. $\angle DCQ - \angle PCQ =$ _____ .



10. If M is the midpoint of $\overline{AY}$, $AM = x + 8$ and $AY = 3x^2$, find the numerical length of $\overline{AY}$.

11. If $\overline{HOT}$ is the perpendicular bisector of $\overline{DOG}$, $HO = 2x + 1$, $OT = 3x - 2$, $DO = 4x - 5$, and $OG = 2x + 3$, find the numerical length of $\overline{HOT}$.