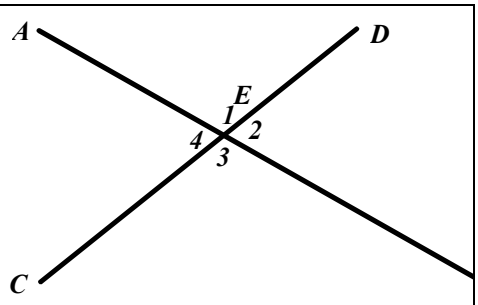
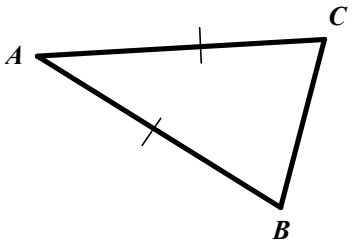
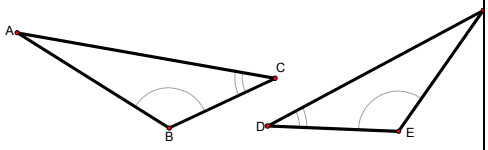
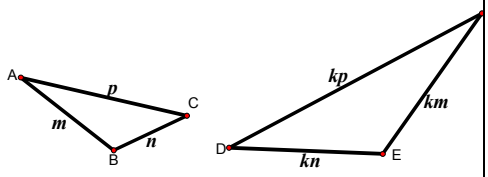
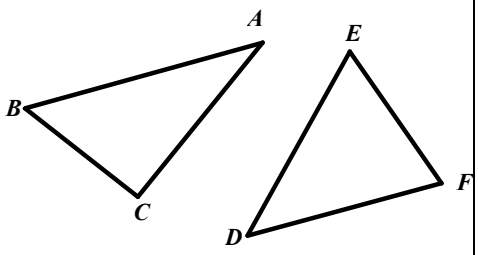
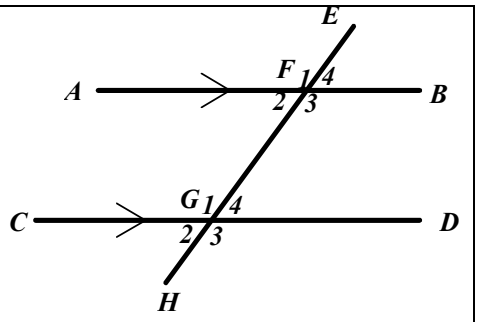
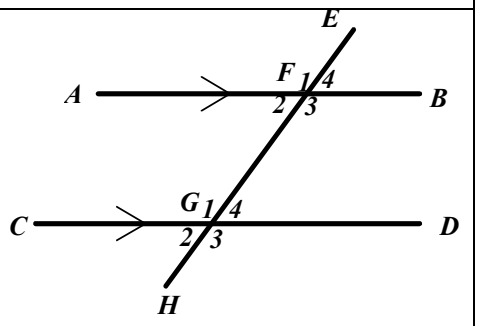
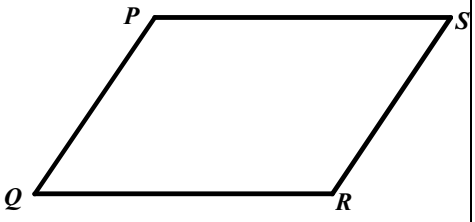
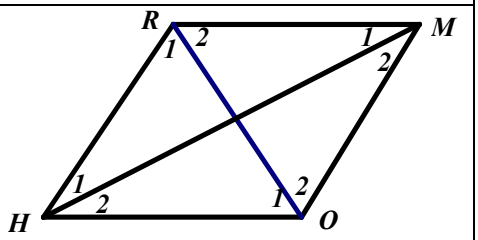
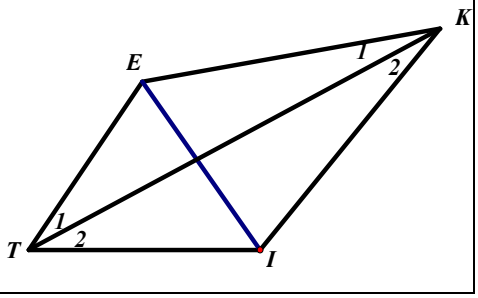
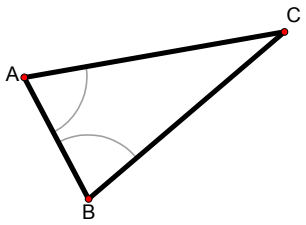
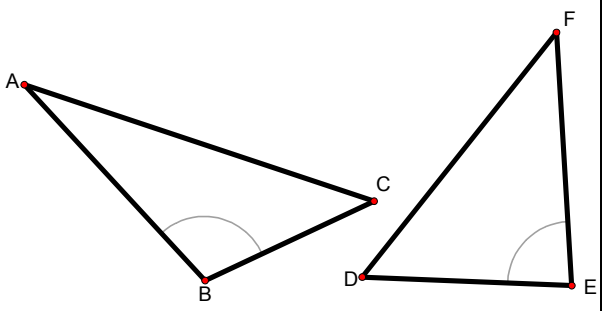
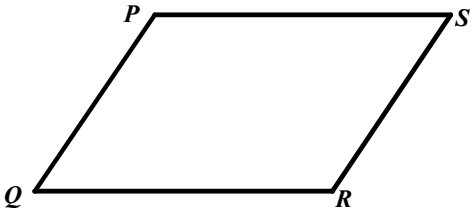
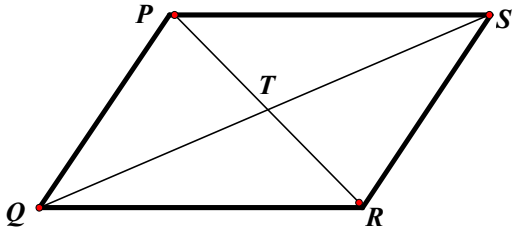
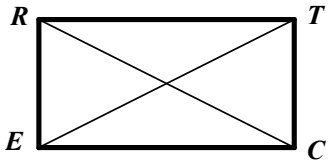
SUMMARY OF REASONS: GRADE 10

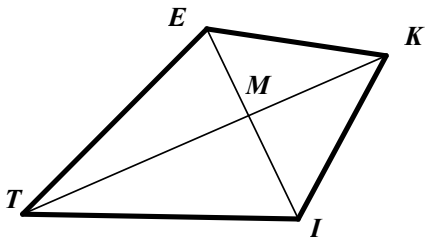
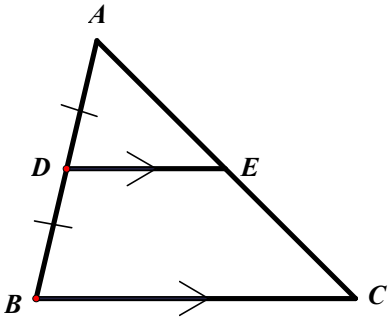
1. EQUAL ANGLES

AB and CD are straight lines intersecting at E $\left.\begin{array}{l}\hat{E}_1 = \hat{E}_3 \\ \hat{E}_2 = \hat{E}_4\end{array}\right\}$ (vert. opp $\angle$s)	
In ΔABC $AB = AC$ $\hat{C} = \hat{B}$ ($\angle s$ opp equal sides ΔABC)	
In Δs ABC and FED $\hat{B} = \hat{E}$ and $\hat{C} = \hat{D}$ $\hat{A} = \hat{F}$ (3rd $\angle$s of Δs)	
ΔABC ||| ΔFED (corr. sides prop[al]) $\left.\begin{array}{l}\hat{A} = \hat{F} \\ \hat{B} = \hat{E} \\ \hat{C} = \hat{D}\end{array}\right\}$ (corr. $\angle$s similar Δs)	
$\Delta ABC \equiv \Delta DEF$ (SSS or SAS or RHS) $\hat{A} = \hat{D}$ (or any other pairs of corr. $\angle$s not given equal)	

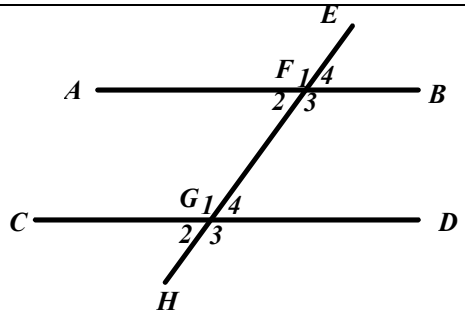
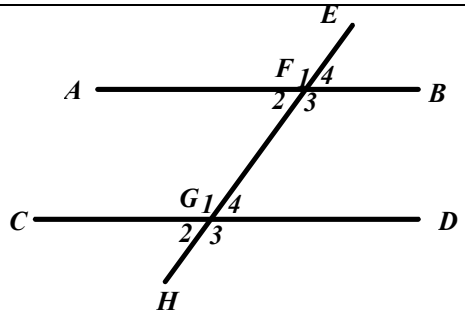
EH cuts $AB \parallel CD$ at F and G $\left.\begin{array}{l}\hat{F}_1 = \hat{G}_1 \\ \hat{F}_2 = \hat{G}_2 \\ \hat{F}_3 = \hat{G}_3 \\ \hat{F}_4 = \hat{G}_4\end{array}\right\}$ (corr. $\angle$s $AB \parallel CD$)	
EH cuts $AB \parallel CD$ at F and G $\left.\begin{array}{l}\hat{F}_2 = \hat{G}_4 \\ \hat{F}_4 = \hat{G}_2\end{array}\right\}$ (alt. $\angle$s $AB \parallel CD$)	
$PQRS$ is a parallelogram $\left.\begin{array}{l}\hat{P} = \hat{R} \\ \hat{Q} = \hat{S}\end{array}\right\}$ (opp. $\angle$s $\parallel$gram $PQRS$)	
$RHOM$ is a rhombus with diagonals RO and HM $\left.\begin{array}{l}\hat{R}_1 = \hat{R}_2 \\ \hat{H}_1 = \hat{H}_2 \\ \hat{O}_1 = \hat{O}_2 \\ \hat{M}_1 = \hat{M}_2\end{array}\right\}$ (diags. of rhombus bisect $\angle$s)	
$KITE$ is a kite with $KI = KE$ and $TI = TE$ $\left.\begin{array}{l}\hat{K}_1 = \hat{K}_2 \\ \hat{T}_1 = \hat{T}_2\end{array}\right\}$ (one diag. of kite bisects $\angle$s)	

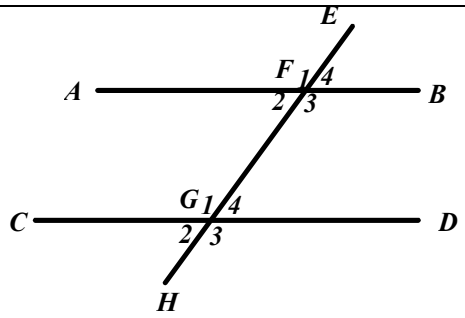
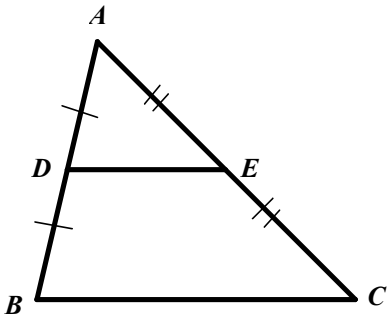
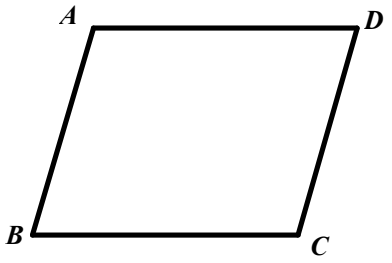
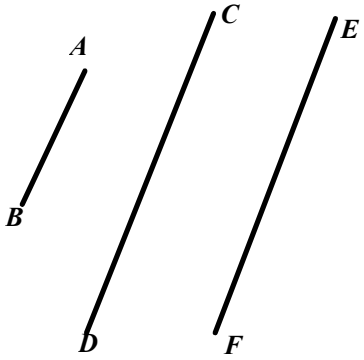
2. EQUAL LINE SEGMENTS

$CA = CB$ (sides opp. equal angles in ΔAE	
If $\Delta ABC \equiv \Delta FED$ (RHS or SAS or AAS) $AB = FE$ (corr sides ΔABC ≡ ΔFED) This applies to all corresponding sides not used in proving congruence	
$PQRS$ is a parallelogram $\left.\begin{matrix} PQ = SR \\ QR = PS \end{matrix}\right\}$ (opp. sides $\parallel$ gram $PQRS$)	
$PQRS$ is a parallelogram Diagonals intersect at T $\left.\begin{matrix} PT = TR \\ QT = TS \end{matrix}\right\}$ (diags of $\parallel$ gram $PQRS$)	
$RECT$ is a rectangle $RC = ET$ (diags. rectangle RECT)	

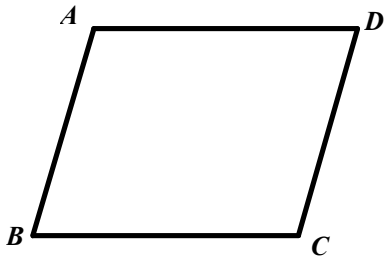
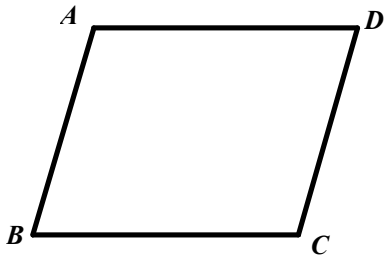
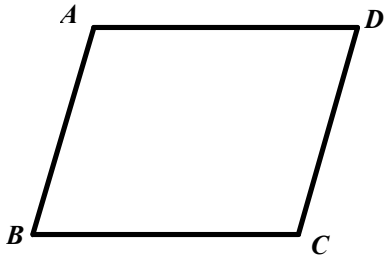
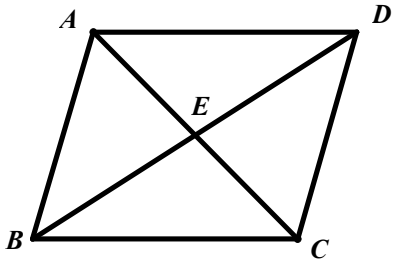
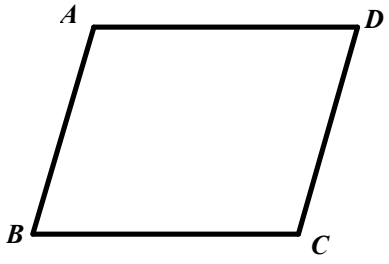
$KITE$ is a kite with $KI = KE$ and $TI = TE$ $EM = MI$ (bisected diag. of kite KITE)	
In ΔABC $AD = DB$ and $DE \parallel BC$ $\therefore AE = EC$	

3. LINES PARALLEL

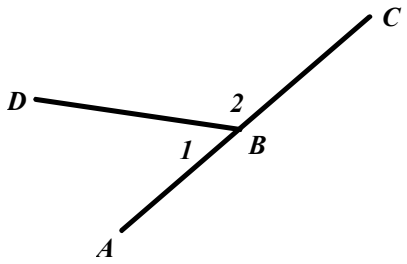
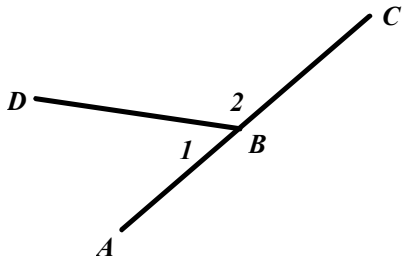
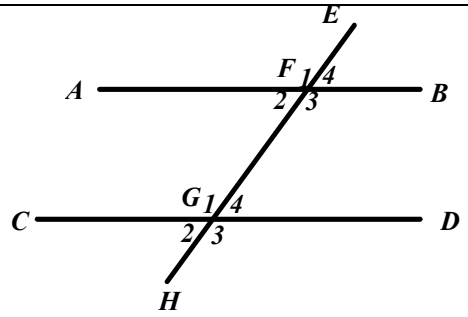
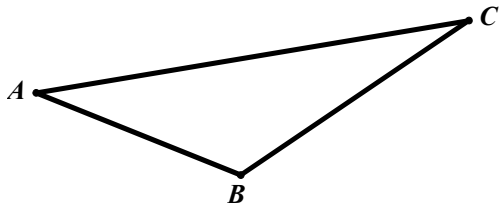
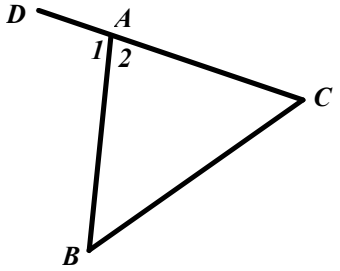
$\left.\begin{array}{l}\hat{F}_1 = \hat{G}_1 \\ \text{or } \hat{F}_2 = \hat{G}_2 \\ \text{or } \hat{F}_3 = \hat{G}_3 \\ \text{or } \hat{F}_4 = \hat{G}_4\end{array}\right\}$ Given or proved But these are corr. $\angle$s $\therefore AB \parallel CD$	
$\left.\begin{array}{l}\hat{F}_2 = \hat{G}_4 \\ \text{or } \hat{F}_3 = \hat{G}_1\end{array}\right\}$ Given or proved But these are alt. $\angle$s $\therefore AB \parallel CD$	

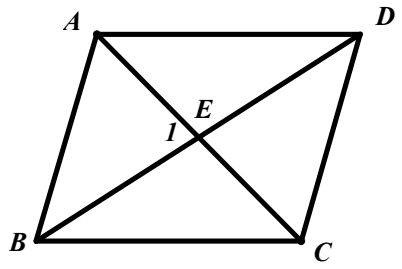
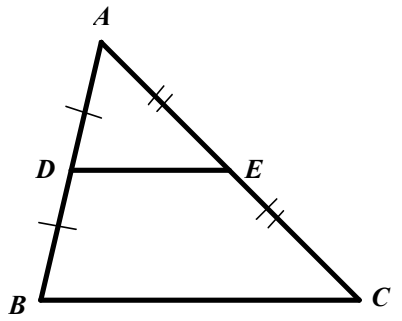
$\left.\begin{array}{l}\hat{F}_2+\hat{G}_1=180^0\\ \text{or } \hat{F}_3+\hat{G}_4=180^0\end{array}\right\}$ Given or proved But these are co-int. $\angle$s $\therefore AB \parallel CD$	
In ΔABC $AD = DB$ (Given or proved) $AE = EC$ (Given or proved) $\therefore DE \parallel BC$	
$ABCD$ is a $\parallel$gram / rhom/rect/square $\left.\begin{array}{l}AD \parallel BC\\ AB \parallel DC\end{array}\right\}$(Opp sides $\parallel$gram/rhom/rect/square)	
$AB \parallel CD$ (Given or proved) $EF \parallel CD$ (Given or proved) $\therefore AB \parallel EF$ (Both $\parallel CD$)	

4. PARALLELOGRAMS

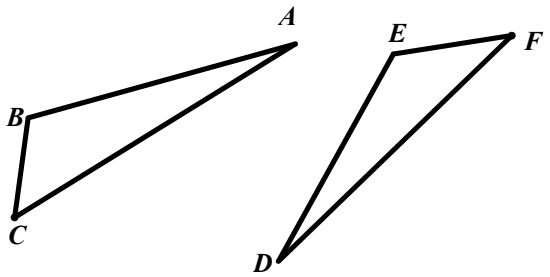
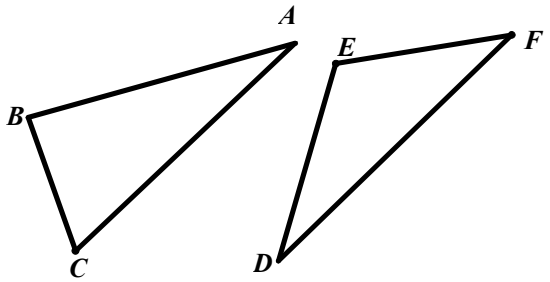
$AD \parallel BC$ (Given or proved) $AB \parallel DC$ (Given or proved) $\therefore ABCD$ is a $\parallel$gram (Both prs opp sides $\parallel$)	
$AD = BC$ (Given or proved) $AB = DC$ (Given or proved) $\therefore ABCD$ is a $\parallel$gram (Both prs opp sides equal)	
$\hat{A} = \hat{C}$ (Given or proved) $\hat{B} = \hat{D}$ (Given or proved) $\therefore ABCD$ is a $\parallel$gram (Both prs opp angles equal)	
$AE = EC$ (Given or proved) $BE = ED$ (Given or proved) $\therefore ABCD$ is a $\parallel$gram (Diags. bisect each other)	
$AD = BC$ (Given or proved) and $AD \parallel BC$ (Given or proved) OR $AB = DC$ (Given or proved) and $AB \parallel DC$ (Given or proved) $\therefore ABCD$ is a $\parallel$gram (One pr. opp sides equal and $\parallel$)	

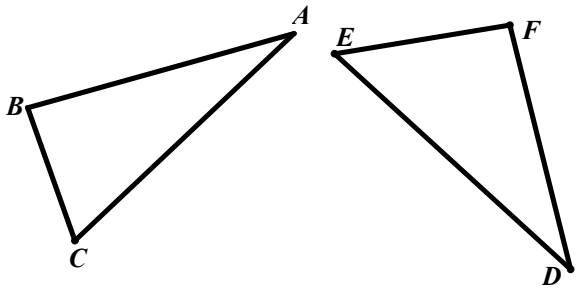
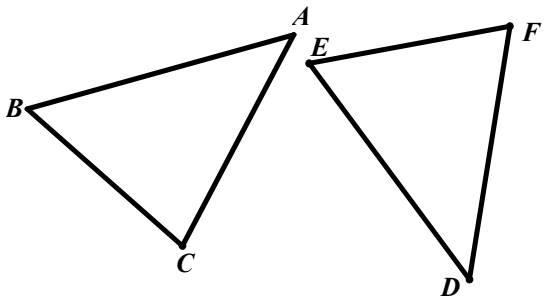
5. OTHER DEDUCTIONS

ABC is a straight line $\hat{B}_1 + \hat{B}_2 = 180^0$ (adj. $\angle$s on str. line ABC)	
$\hat{B} + \hat{B}_2 = 180^0$ (given or proved) But these are adj. $\angle$s $\therefore ABC$ is a straight line	
$AB \parallel CD$ is cut by transversal $EFGH$ $\left.\begin{array}{l}\hat{F}_2 + \hat{G}_1 = 180 \\ \hat{F}_3 + \hat{G}_4 = 180^0\end{array}\right\}$ (co-int. $\angle$s $AB \parallel CD$)	
$\hat{A} + \hat{B} + \hat{C} = 180^0$ (3$\angle s$ of ΔABC)	
Side CA of ΔABC is produced to D $\hat{A}_1 = \hat{B} + \hat{C}$ (Ext $\angle$ of Δ = sum int. opp. $\angle$s)	

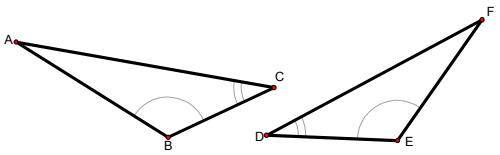
If $ABCD$ is a rhombus/square/kite $\left.\begin{array}{l}\hat{E}_1 = 90^0 \\ \text{or } AC \perp BD\end{array}\right\}$ $\left\{\begin{array}{l}\text{diags of rhombus/square/kite} \\ \text{cut at rt } \angle\text{s}\end{array}\right.$	
In ΔABC $AD = DB$ and $AE = EC$ $\therefore BC = 2DE$ or $DE = \frac{1}{2}BC$	

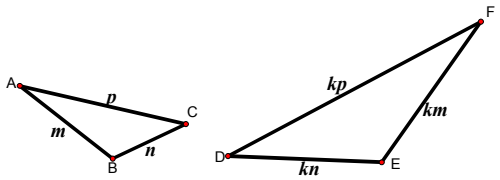
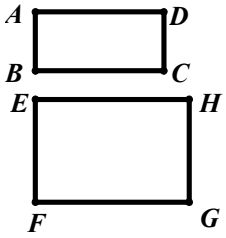
6. CONGRUENCE

In Δs ABC and DEF $\left.\begin{array}{l}AB = DE \\ BC = EF \\ AC = DF\end{array}\right\}$ (Given or proved) $\therefore \Delta ABC \equiv \Delta DEF$ (SSS) $\left.\begin{array}{l}\hat{A} = \hat{D} \\ \hat{B} = \hat{E} \\ \hat{C} = \hat{F}\end{array}\right\}$ (Corr. parts $\Delta ABC \equiv \Delta DEF$)	
In Δs ABC and DEF $\left.\begin{array}{l}AB = DE \\ \hat{A} = \hat{F} \\ AC = DF\end{array}\right\}$ (Given or proved) $\therefore \Delta ABC \equiv \Delta DEF$ (SAS) $\left.\begin{array}{l}BC = EF \\ \hat{B} = \hat{E} \\ \hat{C} = \hat{F}\end{array}\right\}$ (Corr. parts $\Delta ABC \equiv \Delta DEF$)	

In Δs ABC and DFE $\left.\begin{array}{l}\hat{B}=\hat{F}=90^0\\ AC=DE\\ AB=DF \text{ or } BC=EF\end{array}\right\}$ (Given or proved) $\therefore \Delta ABC \equiv \Delta DEF$ (RHS) $\left.\begin{array}{l}BC=EF\\ \text{or } AB=DF\\ \hat{C}=\hat{E}\\ \hat{A}=\hat{D}\end{array}\right\}$ (Corr. parts $\Delta ABC \equiv \Delta DEF$)	
In Δs ABC and DEF $\left.\begin{array}{l}AB=DE\\ \text{or } AC=DF\\ \text{or } BC=EF\\ \hat{A}=\hat{D}\\ \text{and } \hat{B}=\hat{E}\end{array}\right\}$ (Given or proved) $\therefore \Delta ABC \equiv \Delta DEF$ (AAS) $\left.\begin{array}{l}AB=DE\\ \text{and/or}\\ BC=EF\\ \text{and/or}\\ AC=DF\end{array}\right\}$ (Corr. parts $\Delta ABC \equiv \Delta DEF$)	

7. SIMILARITY

In Δs ABC and DEF if *any* two angles are equal $\Delta ABC \,\|\|\|\, \Delta DEF$ and so 1. Third angles are equal 2. Corresponding sides are in proportion	

In Δs ABC and DEF if *all sides* are in proportion: $AB : BC : AC = DE : EF : DF$ $\Delta ABC \,|||\, \Delta DEF$ and so 1. The corr. angles are equal 2. If $DE = kAB$ then area $\Delta DEF = k^2 \times$ area ΔDEF	
In all polygons except Δs, for polygons to be similar: 1. *all* angles must be equal *and* 2. *all* sides must be in proportion So rect. $ABCD$ is *not* similar to rect. $EFGH$ unless $AB : BC = EF : FG$