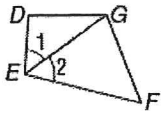
Acc. Geometry
5.3 Practice Indirect Proof

Name Key
Date

1. **Complete the proof.**



Given: $\angle 1 \cong \angle 2$ and $\overline{DG}$ is not congruent to $\overline{FG}$.
Prove: $\overline{DE}$ is not congruent to $\overline{FE}$.

3. Assume that $\overline{DE} \cong \overline{FE}$ Assume the conclusion is false.

4. $\overline{EG} \cong \overline{EG}$ Reflexive Prop

5. $\triangle EDG \cong \triangle EFG$ SAS

6. $\overline{DG} \cong \overline{FG}$ CPCTC

7. This contradicts the given information, so the assumption must be false

8. Therefore, $\overline{DE}$ is not $\cong$ $\overline{FE}$

Write an indirect proof for each of the following.

2. **Given:** ΔLMO
Prove: A triangle cannot have two right angles.

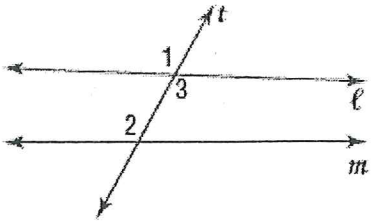
Assume a $\triangle$ can have two right $\angle$.

Let $m\angle L = 90$ and $m\angle M = 90$ by def of right $\angle$. Then $\angle A + \angle B + \angle C > 180$ which contradicts the $\triangle$ sum theorem

The assumption that a $\triangle$ can have two right $\angle$ is false
Therefore, A $\triangle$ cannot have two right $\angle$s.

3.

Given: $m\angle 2 \neq m\angle 1$
Prove: $\ell \nparallel m$



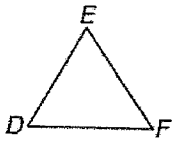
Assume $\ell \parallel m$

If $\ell \parallel m$, then $m\angle 1 = m\angle 2$ because $\parallel$ lines form $\cong$ corresponding $\angle$s, but this contradicts the given information.

The assumption that $\ell \parallel m$ is false
Therefore, $\ell \nparallel m$.

Write an indirect proof for each of the following.

4. **Given:** $\angle D \ncong \angle F$.
Prove: $DE \neq EF$

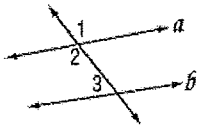


Assume DE = EF

If DE = EF then $\angle D = \angle F$ by the isosceles $\triangle$ theorem, but this contradicts the given info.

The assumption that DE = EF is false
Therefore, $DE \neq EF$.

5. **Given:** $m\angle 2 + m\angle 3 \neq 180$
Prove: $a \nparallel b$

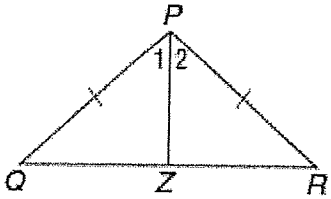


Assume a || b

If a || b, then $m\angle 2 + m\angle 3 = 180$ because || lines form supplementary consecutive interior $\angle$s, which contradicts the given info.

The assumption a || b is false
Therefore $a \nparallel b$.

6. **Given:** $\overline{PQ} \cong \overline{PR}$
$\angle 1 \ncong \angle 2$
Prove: $\overline{PZ}$ is not a median of $\triangle PQR$.



Assume $\overline{PZ}$ is a median of $\triangle PQR$

If $\overline{PZ}$ is a median, then Z is a midpoint of QR by definition. If Z is a midpoint then $QZ \cong RZ$. By the Reflexive property $PZ \cong PZ$. $\triangle PQZ \cong \triangle PRZ$ by SSS and $\angle 1 \cong \angle 2$ by CPCTC, which contradicts the given information.

The assumption that $\overline{PZ}$ is a median is false
Therefore $\overline{PZ}$ is not a median.

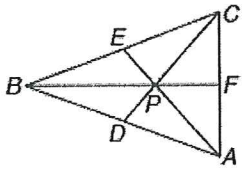
Alternate
* Instead of $PZ \cong PZ$ by Reflexive Prop you could say $\angle Q = \angle R$ by isos $\triangle$ theorem and $\triangle PQZ \cong \triangle PRZ$ by SAS *

NAME _____ DATE _____ PERIOD _____

5-1 Practice

Bisectors, Medians, and Altitudes

ALGEBRA In $\triangle ABC$, $\overline{BF}$ is the angle bisector of $\angle ABC$, $\overline{AE}$, $\overline{BF}$, and $\overline{CD}$ are medians, and P is the centroid.



1. Find x if $DP = 4x - 3$ and $CP = 30$. $4.5 = x$

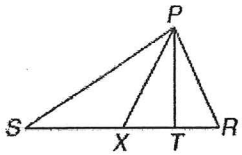
2. Find y if $AP = y$ and $EP = 18$. $36 = y$

3. Find z if $FP = 5z + 10$ and $BP = 42$. $2.2 = z$

4. If $m\angle ABC = x$ and $m\angle BAC = m\angle BCA = 2x - 10$, is $\overline{BF}$ an altitude? Explain.

$\overline{BF}$ is an altitude because if $x = 40$ and $\overline{BF}$ is an angle bisector then $\angle BAF = 70$; $\angle ABF = 20$ and by $\triangle$ Sum $\angle AFB = 90$, so $\overline{BF} \perp \overline{AC}$

ALGEBRA In $\triangle PRS$, $\overline{PT}$ is an altitude and $\overline{PX}$ is a median.



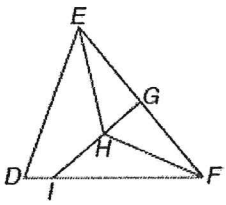
5. Find RS if $RX = x + 7$ and $SX = 3x - 11$.

$RS = 32$

6. Find RT if $RT = x - 6$ and $m\angle PTR = 8x - 6$.

$RT = 6$

ALGEBRA In $\triangle DEF$, $\overline{GI}$ is a perpendicular bisector.



7. Find x if $EH = 16$ and $FH = 6x - 5$.

$x = 3.5$

8. Find y if $EG = 3.2y - 1$ and $FG = 2y + 5$.

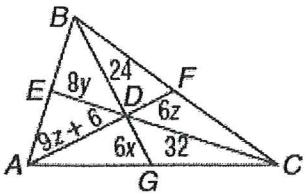
$y = 5$

9. Find z if $m\angle EGH = 12z$.

$z = 7.5$

Points E, F, G are the midpoints of sides AB, BC, and AC respectively.

10. Find the value of each variable.



$x = 2$

$y = 2$

$z = 2$

Lesson 5-1