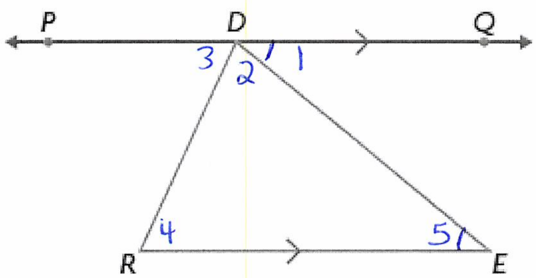
2.3 Angle Properties in Triangles and Proofs

Recall: All interior angles of a triangle add up to 180°.

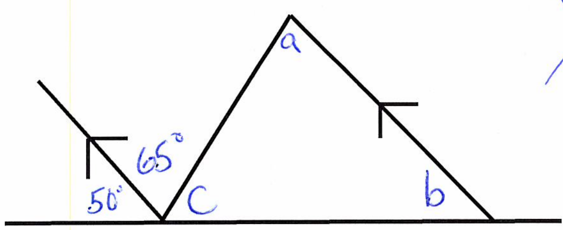
We will prove, deductively, that the **sum of the measures** of the **interior angles** of any triangle is 180°.

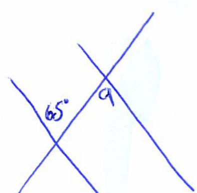


Statement	Reason
$\angle 1 = \angle 5$	alt. interior angles of parallel lines are equal
$\angle 3 = \angle 4$	"
$\angle 1 + \angle 2 + \angle 3 = 180$	They form a straight line
$\angle 5 + \angle 2 + \angle 4 = 180$	Substitution.

Therefore the sum of the interior angles of any triangles is 180°.

Example1: Determine the measures of a,b,c





$\Rightarrow \boxed{\angle a = 65}$ b/c of corresponding ∡'s.

$\Rightarrow \angle c + 50 + 65 = 180$ straight line

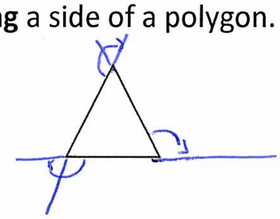
$\boxed{\angle c = 65^\circ}$

$\Rightarrow \angle a + \angle b + \angle c = 180$ Sum of the angles in a Δ add to 180°

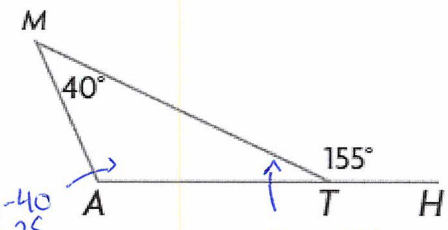
$65 + \angle b + 65 = 180$

$\boxed{\angle b = 50^\circ}$

Exterior angles are formed by **extending** a side of a polygon. For example, extend one side of this triangle to make an exterior angle:



<u>Example 2</u> In the diagram, angle MTH is an exterior angle of ΔMAT. Determine the measures of the unknown angles in ΔMAT.



$180-40-25 = 115°$

$180-155 = 25°$

What relationship do you notice about angle AMT, angle MAT and the exterior angle MTH?

$\angle AMT + \angle MAT = \angle MTH$

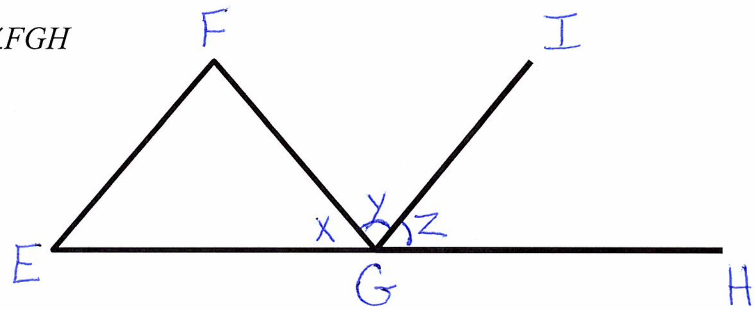
<u>Example 3</u> Prove deductively using a two column proof that an exterior angle of a triangle is equal to the sum of the two non- adjacent sides.

Statement	Justification
1.) $\angle d + \angle c = 180°$	Supplementary ∠'s that form a straight line
2.) $\angle c = 180 - \angle d$	
3.) $\angle a + \angle b + \angle c = 180°$	Sum of interior angles of a triangle ~~add to~~ is 180°
4.) $\angle a + \angle b + (180 - \angle d) = 180°$	Substitution.
5.) $\angle a + \angle b - \angle d = 0$	Subtracted 180 from both sides
6.) $\angle a + \angle b = \angle d$	add ∠d to both sides.

Assignment Pg 90 #2,3,5,7,9-12, 14, 15 EXTENSION #18

Example4: In $\triangle EFG, GI$ bisects $\measuredangle FGH$

a) If $\measuredangle E = \measuredangle y$, prove GI // EF.



$\measuredangle E = \measuredangle y$ given

$\measuredangle y = \measuredangle z$ because GI bisects $\measuredangle FGH$

$\measuredangle E = \measuredangle Z$ transitive property

GI // EP Corresponding angles $\angle FEG = \angle IGH$