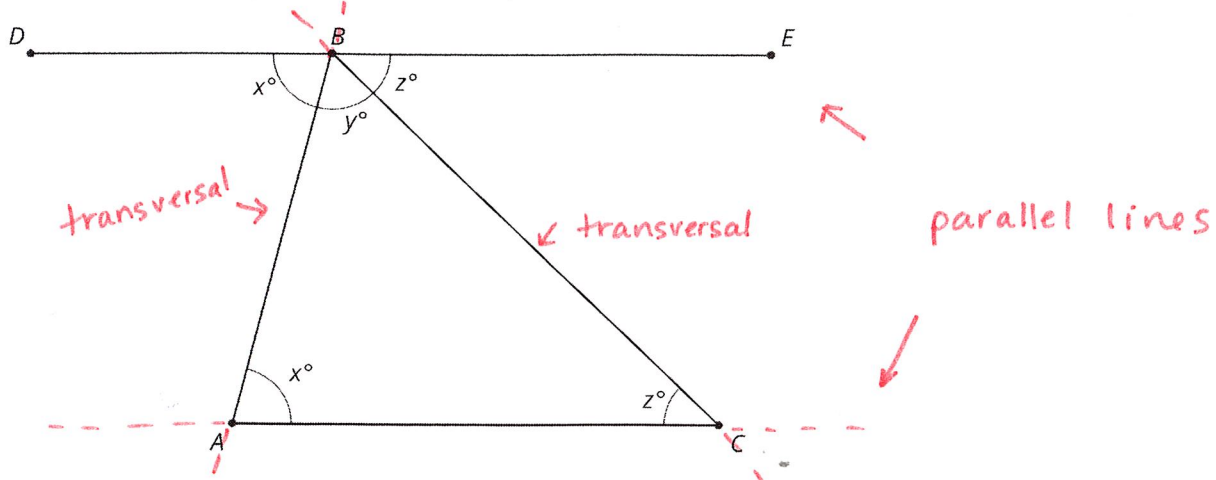


Lesson 16

Using parallel lines and rotations, we can understand why the angles in a triangle always add to 180° . Here is triangle ABC . Line DE is parallel to AC and contains B .



A 180 degree rotation of triangle ABC around the midpoint of AB interchanges angles A and DBA so they have the same measure: in the picture these angles are marked as x° . A 180 degree rotation of triangle ABC around the midpoint of BC interchanges angles C and CBE so they have the same measure: in the picture, these angles are marked as z° . Also, DBE is a straight line because 180 degree rotations take lines to parallel lines. So the three angles with vertex B make a line and they add up to 180° ($x + y + z = 180$). But x, y, z are the measures of the three angles in $\triangle ABC$ so the sum of the angles in a triangle is always 180° !

OR (using same picture)

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$$\angle DBA + \angle B + \angle CBE = 180^\circ \text{ because they are a straight line}$$

$$\left. \begin{aligned} \angle DBA &= \angle A \\ \angle CBE &= \angle C \end{aligned} \right\} \text{ alternate interior angles}$$

$$\text{so } \angle B + \angle C + \angle A = 180^\circ$$