

## 11-2 Areas of Parallelograms, Triangles, and Rhombuses

Although proofs of most area formulas are easy to understand, detailed formal proofs are long and time consuming. Therefore, we will show the key steps of each proof.

### Theorem 11-2

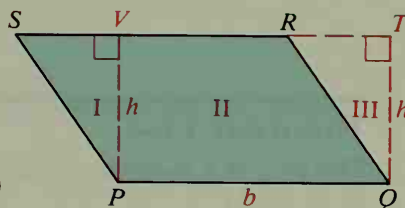
The area of a parallelogram equals the product of a base and the height to that base. ( $A = bh$ )

Given:  $\square PQRS$

Prove:  $A = bh$

#### Key steps of proof:

1. Draw altitudes  $\overline{PV}$  and  $\overline{QT}$ , forming two rt.  $\triangle$ .
2. Area I = Area III ( $\triangle PSV \cong \triangle QRT$  by HL or AAS)
3. Area of  $\square PQRS$  = Area II + Area I  
 $\quad\quad\quad = \text{Area II} + \text{Area III}$   
 $\quad\quad\quad = \text{Area of rect. } PQTV$   
 $\quad\quad\quad = bh$

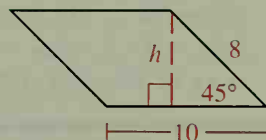


**Example 1** Find the area of the parallelogram shown.

**Solution** Notice the  $45^\circ$ - $45^\circ$ - $90^\circ$  triangle.

$$h = \frac{8}{\sqrt{2}} = \frac{8}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{8\sqrt{2}}{2} = 4\sqrt{2}$$

$$A = bh = 10 \cdot 4\sqrt{2} = 40\sqrt{2}$$



### Theorem 11-3

The area of a triangle equals half the product of a base and the height to that base. ( $A = \frac{1}{2}bh$ )

Given:  $\triangle XYZ$

Prove:  $A = \frac{1}{2}bh$

#### Key steps of proof:

1. Draw  $\overline{XW} \parallel \overline{YZ}$  and  $\overline{ZW} \parallel \overline{YX}$ , forming  $\square WXYZ$ .
2.  $\triangle XYZ \cong \triangle ZWX$  (SAS or SSS)
3. Area of  $\triangle XYZ = \frac{1}{2} \cdot \text{Area of } \square WXYZ$   
 $\quad\quad\quad = \frac{1}{2}bh$

