

## 6.6 Use Proportionality Theorems

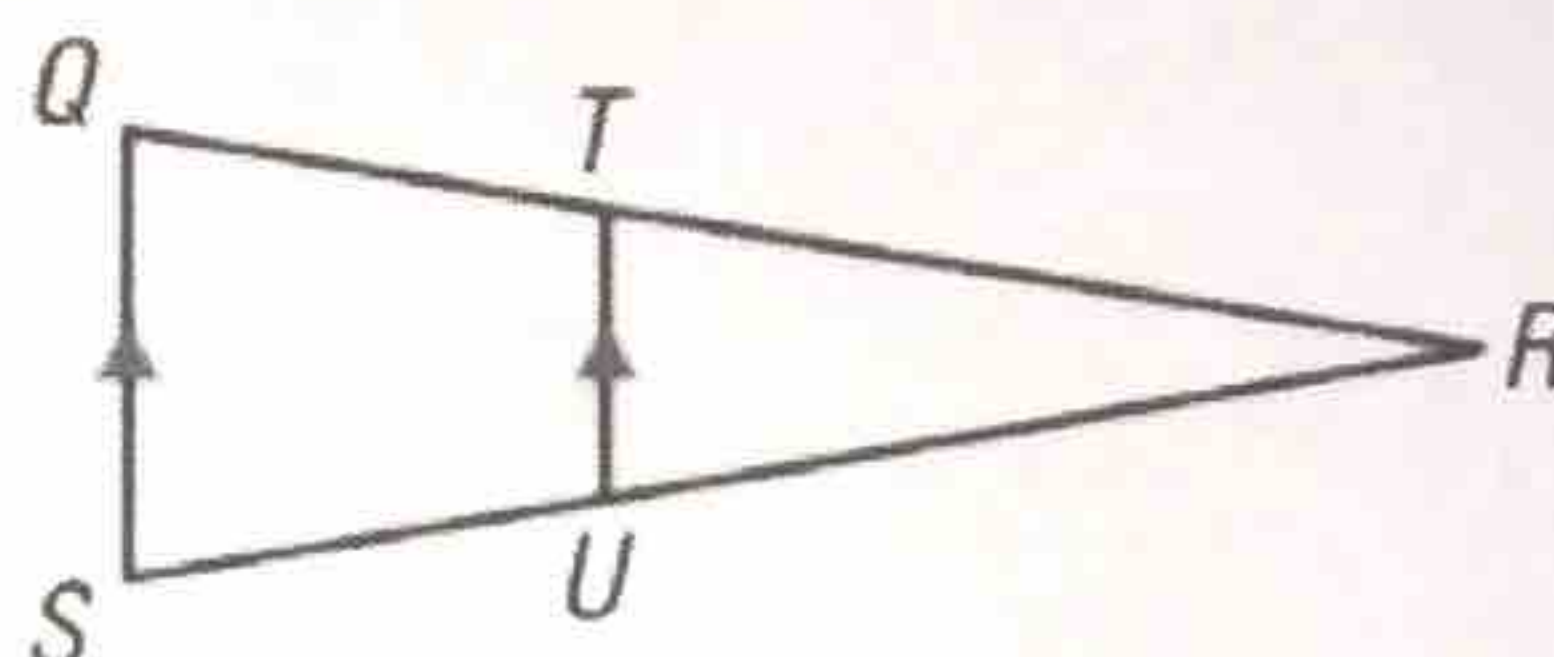
### THEOREMS

### For Your Notebook

#### THEOREM 6.4 Triangle Proportionality Theorem

If a line parallel to one side of a triangle intersects the other two sides, then it divides the two sides proportionally.

*Proof:* Ex. 22, p. 402

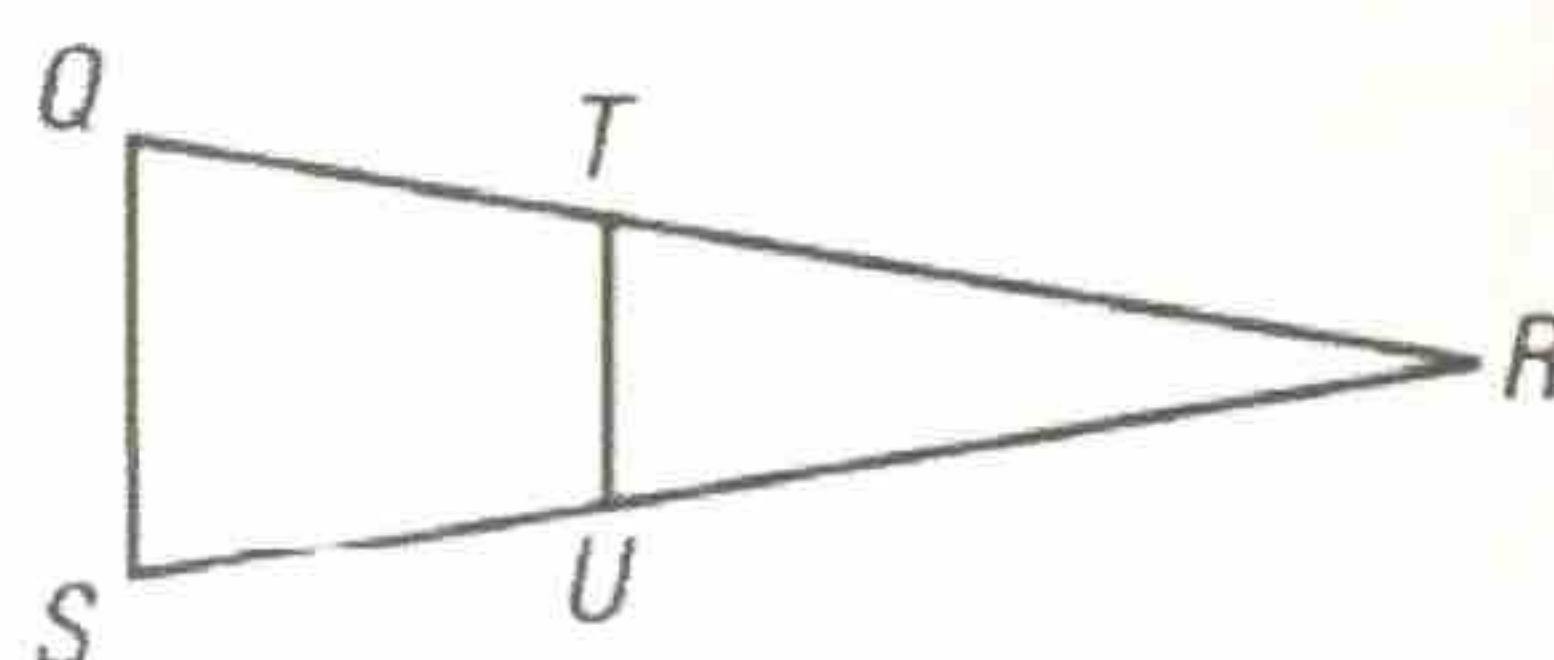


If  $\overline{TU} \parallel \overline{QS}$ , then  $\frac{RT}{TQ} = \frac{RU}{US}$ .

#### THEOREM 6.5 Converse of the Triangle Proportionality Theorem

If a line divides two sides of a triangle proportionally, then it is parallel to the third side.

*Proof:* Ex. 26, p. 402



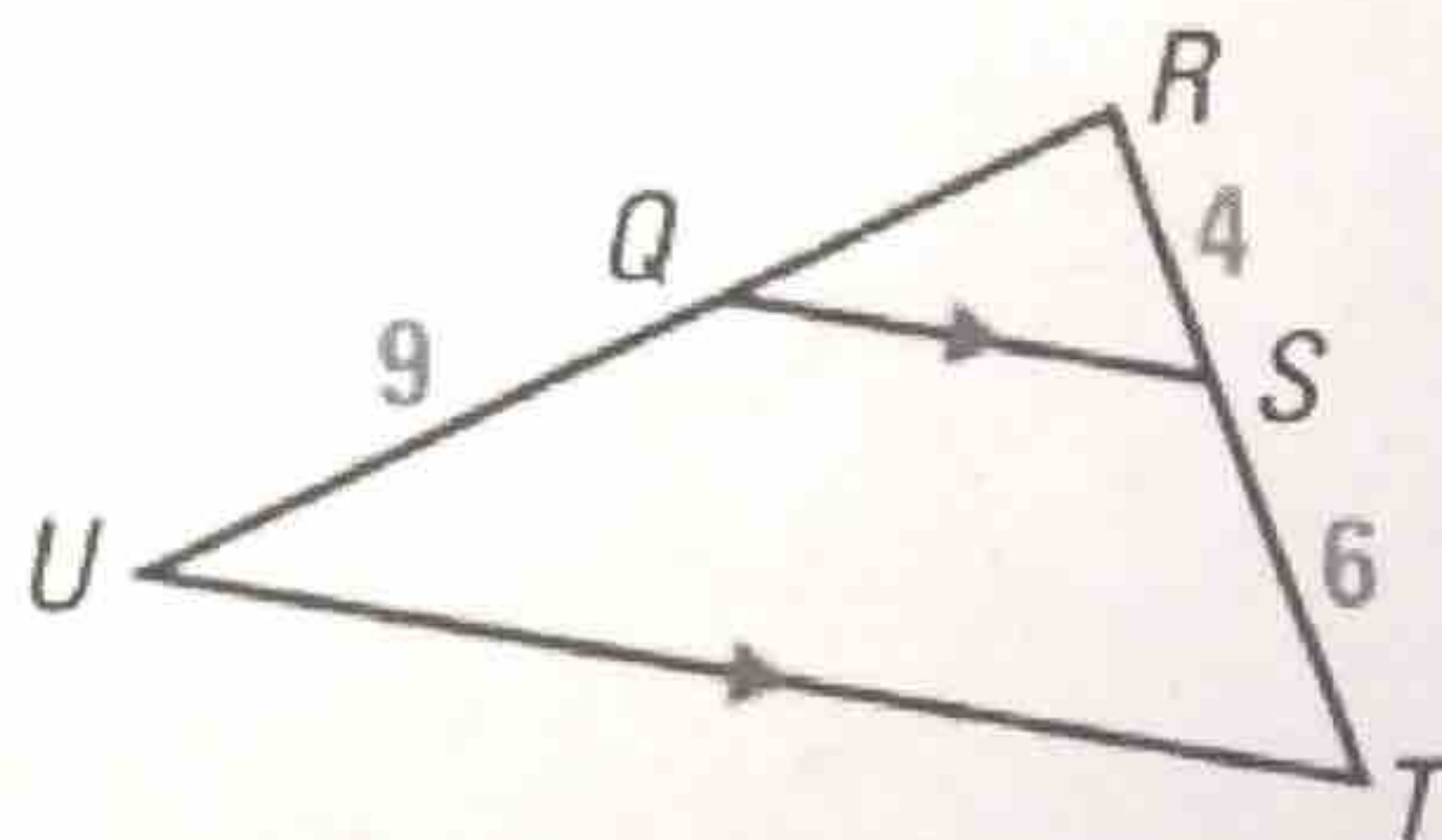
If  $\frac{RT}{TQ} = \frac{RU}{US}$ , then  $\overline{TU} \parallel \overline{QS}$ .

**Ex 1:** In the diagram,  $\overline{QS} \parallel \overline{UT}$ ,  $RS = 4$ ,  $ST = 6$ , and  $QU = 9$ . What is the length of  $\overline{RQ}$ ?

$$\frac{RQ}{QU} = \frac{RS}{ST}$$

$$\frac{RQ}{9} = \frac{4}{6}$$

$$\boxed{RQ = 6}$$



\* Theorems 6.4 and 6.5 also make it clear that if the lines are not parallel then the proportion is not true.



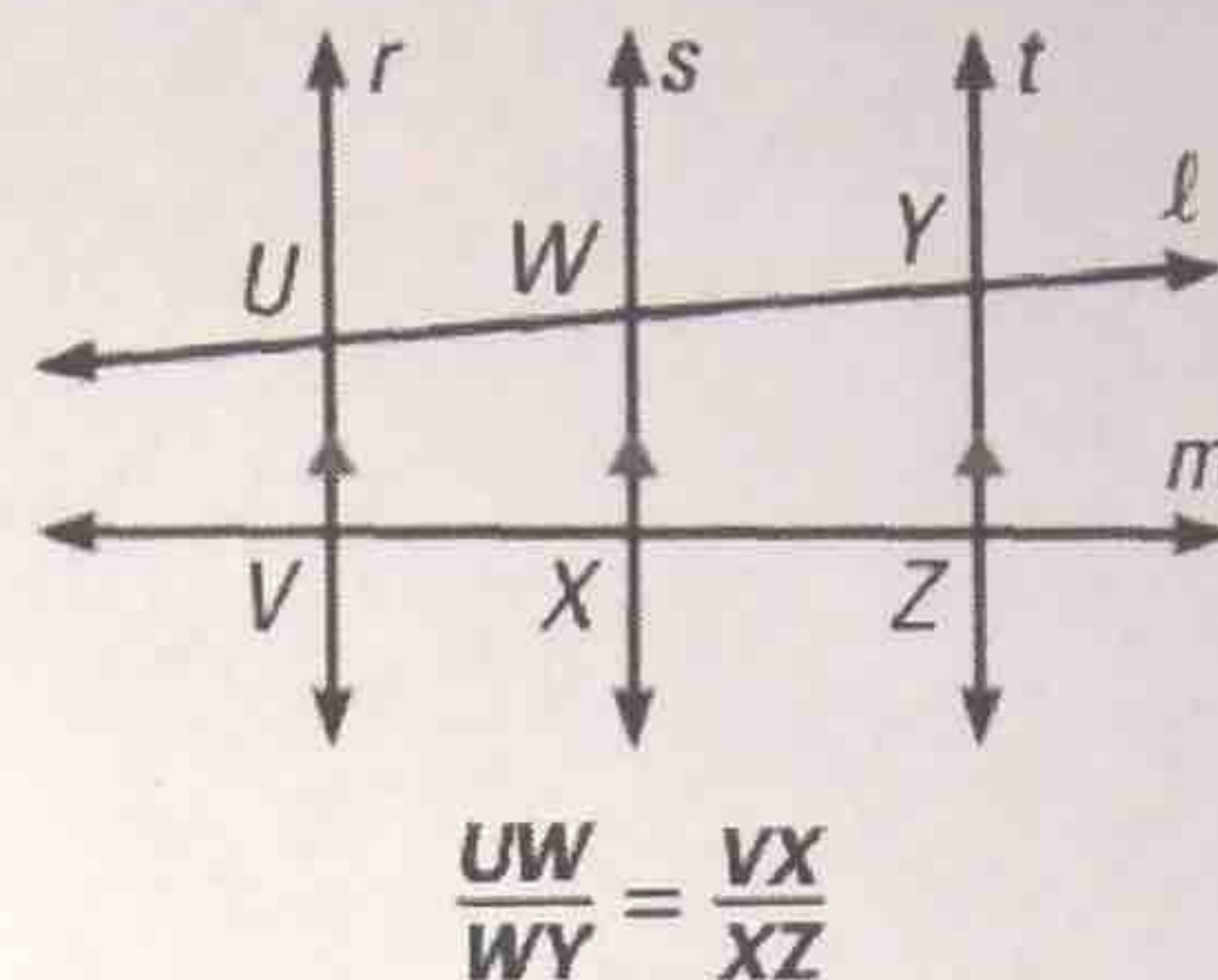
## THEOREMS

## For Your Notebook

### THEOREM 6.6

If three parallel lines intersect two transversals, then they divide the transversals proportionally.

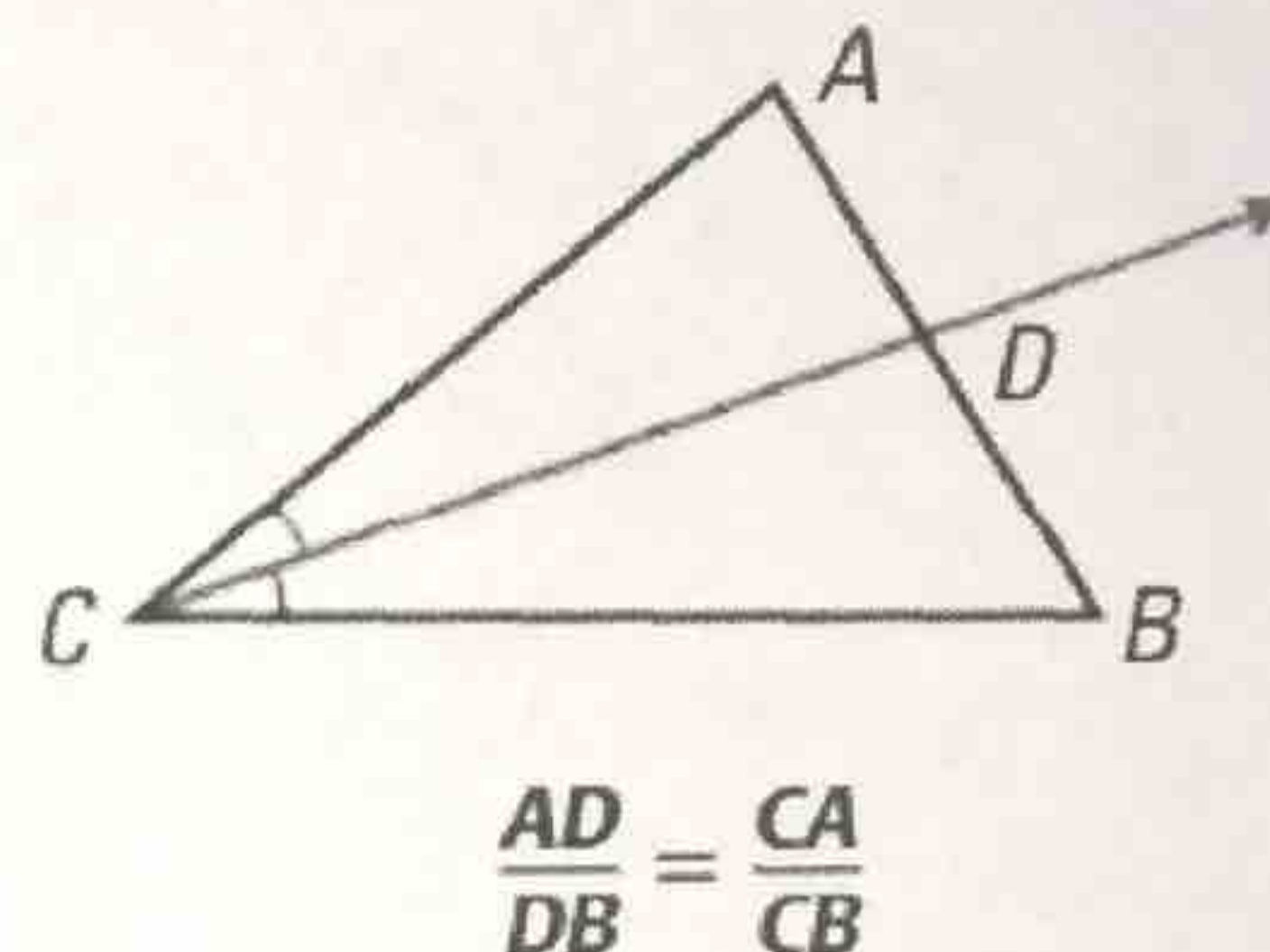
*Proof:* Ex. 23, p. 402



### THEOREM 6.7

If a ray bisects an angle of a triangle, then it divides the opposite side into segments whose lengths are proportional to the lengths of the other two sides.

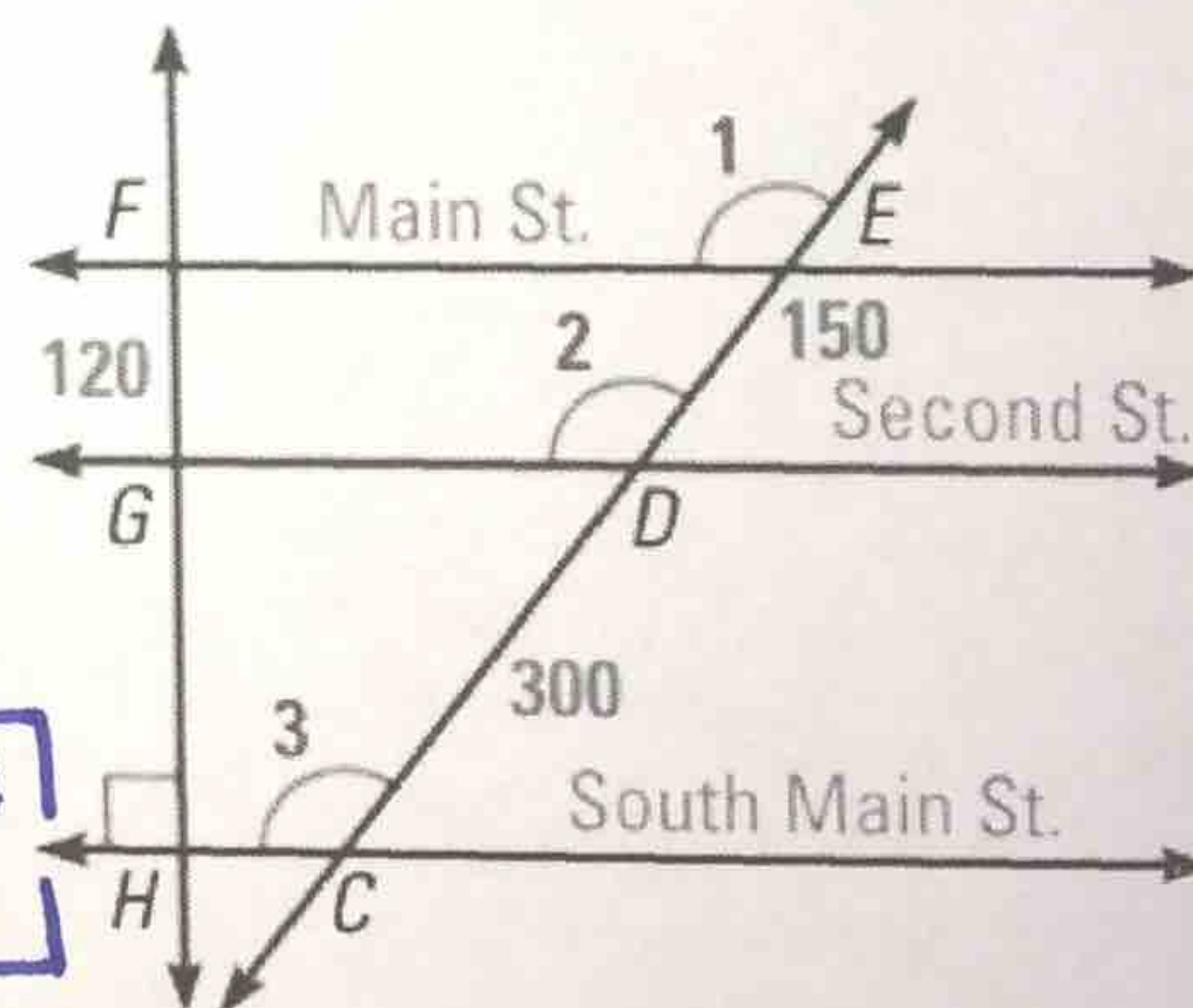
*Proof:* Ex. 27, p. 403



**Ex 2:** In the diagram,  $\angle 1$ ,  $\angle 2$ , and  $\angle 3$  are all congruent and  $GF = 120$  yards,  $DE = 150$  yards, and  $CD = 300$  yards. Find the distance  $HF$  between Main Street and South Main Street.

$$\begin{aligned}\frac{HG}{GF} &= \frac{CD}{DE} \\ \frac{HG+GF}{GF} &= \frac{CD+DE}{DE} \\ \frac{HF}{120} &= \frac{300+150}{150} \\ \frac{HF}{120} &= \frac{450}{150} \\ HF &= 360\end{aligned}$$

The distance is 360 yds.



**Ex 3:** In the diagram,  $\angle QPR \cong \angle RPS$ . Use the given side lengths to find the length of  $\overline{RS}$ .

$$\begin{aligned}\frac{RQ}{RS} &= \frac{PQ}{PS} \\ \frac{15-x}{x} &= \frac{7}{13} \\ 7x &= 13(15-x) \\ 7x &= 195-13x \\ 20x &= 195 \\ x &= 9.75\end{aligned}$$

$RS = 9.75$

