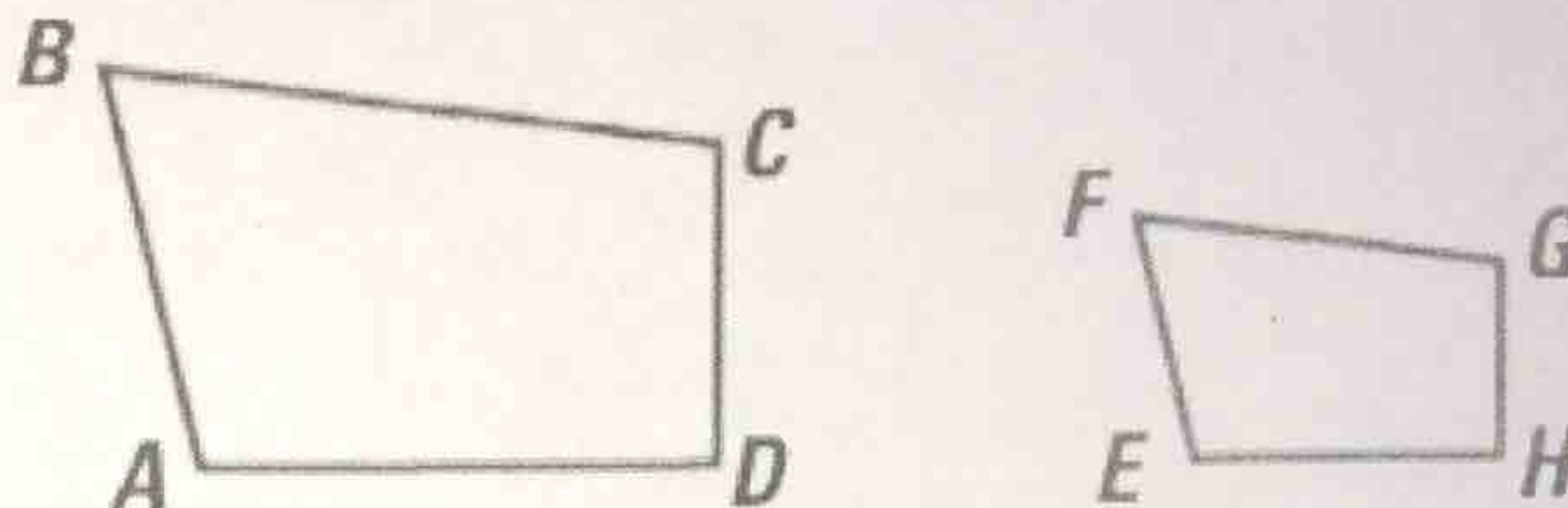# 6.3 Use Similar Polygons

similar polygons – 2 polygons whose corresponding angles are congruent and corresponding sides lengths are proportional

Ex 1: In the diagram, ABCD is similar to EFGH. State the corresponding angles and the ratios of the corresponding sides.
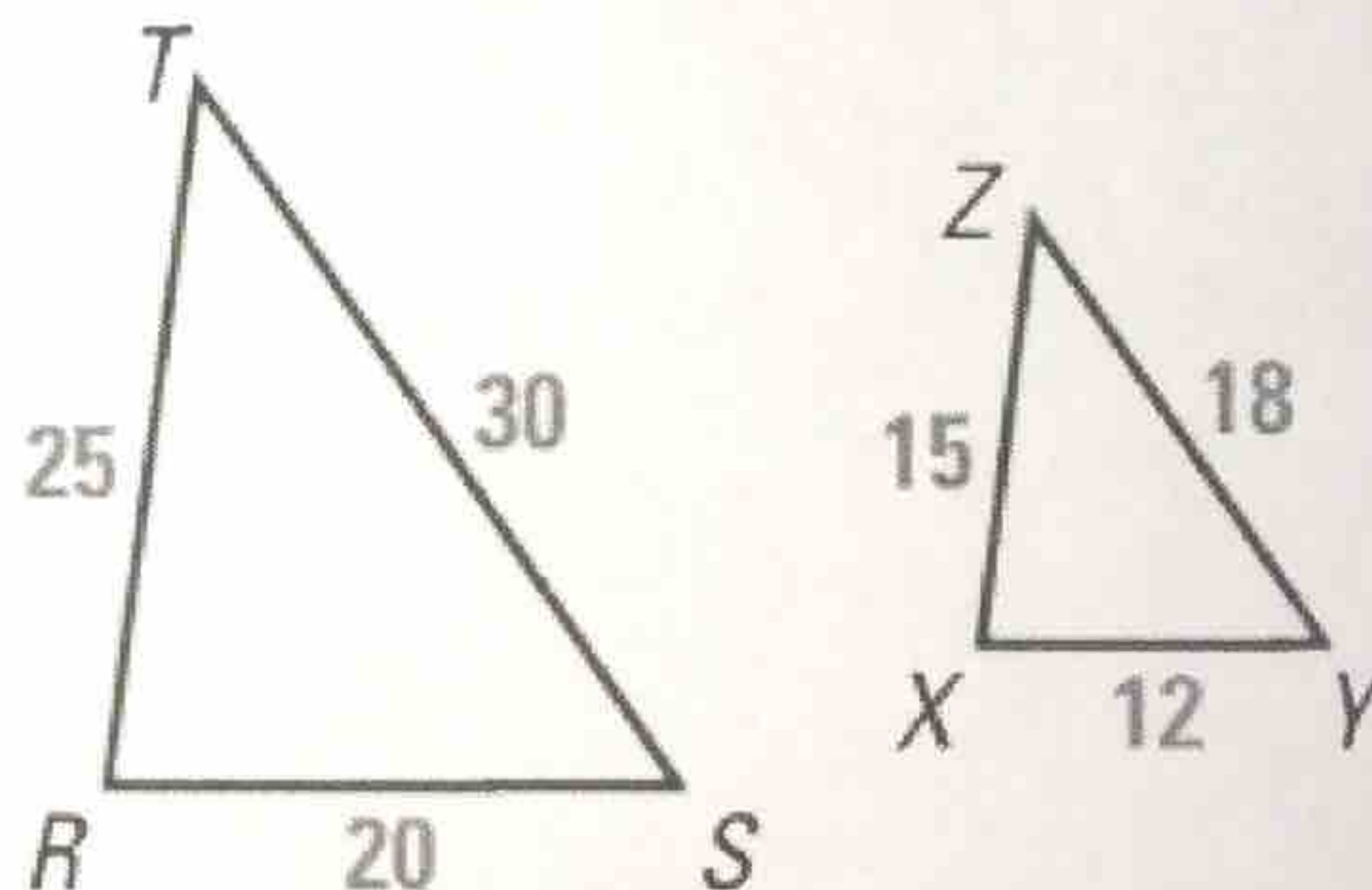
Corresponding Angles:

$$\angle A \cong \angle E \qquad \angle B \cong \angle F$$
$$\angle C \cong \angle G \qquad \angle D \cong \angle H$$

ABCD ~ EFGH

Ratios of Corresponding Sides:

$$\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{DA}{HE}$$

Ex 2: In the diagram, $\triangle RST \sim \triangle XYZ$.
(a) List all pairs of congruent angles
(b) Check that the ratios of corresponding side lengths are equal.
(c) Write the ratios in a **statement of proportionality**

ⓐ $\angle R \cong \angle X, \ \angle S \cong \angle Y, \ \angle T \cong \angle Z$

ⓑ $\dfrac{RS}{XY} = \dfrac{20}{12} = \boxed{\dfrac{5}{3}} \qquad \dfrac{ST}{YZ} = \dfrac{30}{18} = \boxed{\dfrac{5}{3}} \qquad \dfrac{TR}{ZX} = \dfrac{25}{15} = \boxed{\dfrac{5}{3}}$

ⓒ $\dfrac{RS}{XY} = \dfrac{ST}{YZ} = \dfrac{TR}{ZX}$

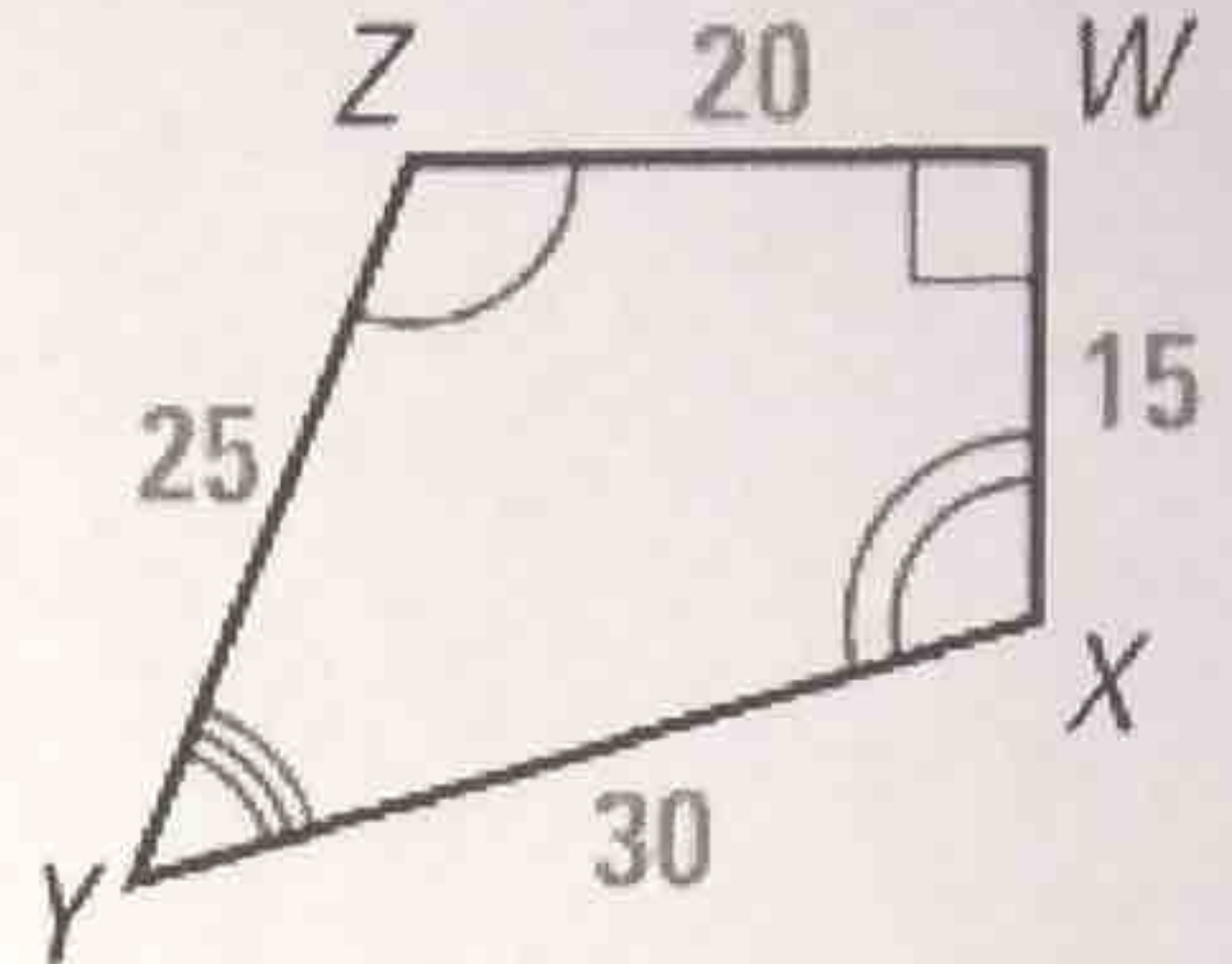scale factor – the ratio of the lengths of 2 corresponding sides of 2 similar polygons
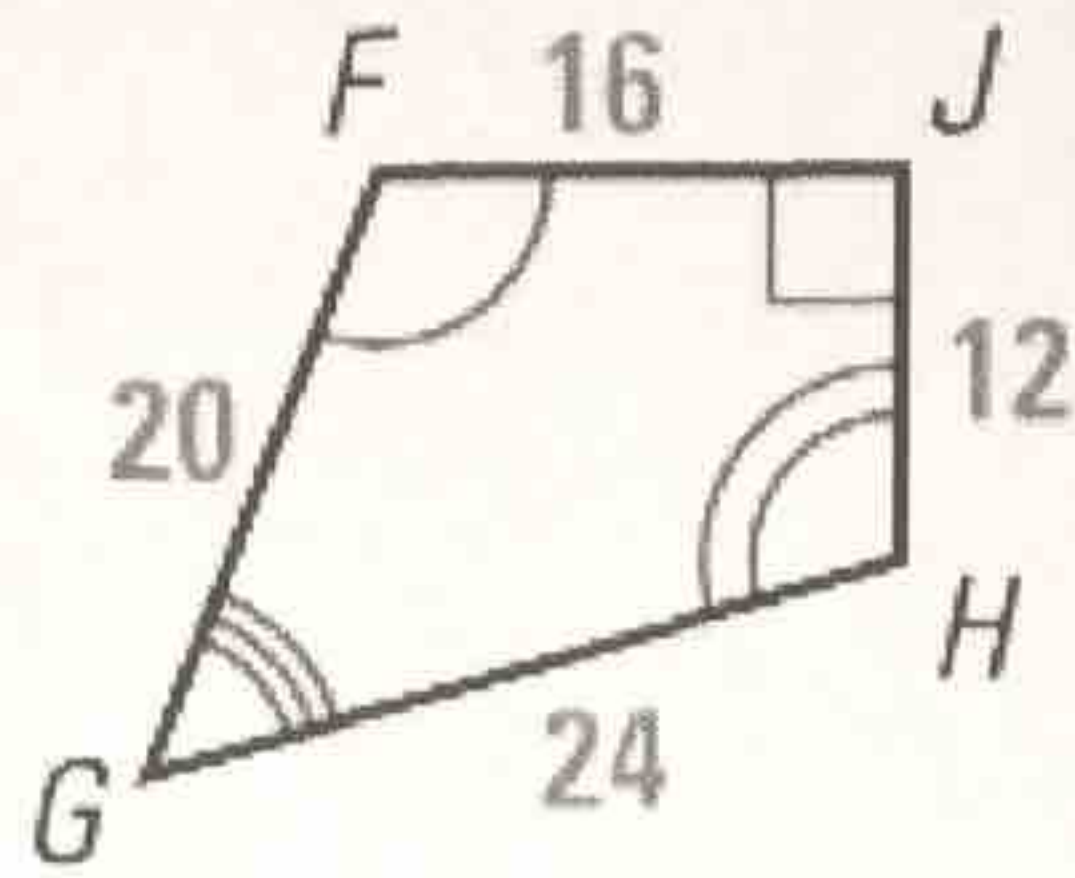
Ex 3: Determine whether the polygons are similar. If they are, write a similarity statement and find the scale factor of ZYXW to FGHJ.

$$\frac{ZY}{FG} = \frac{25}{20} = \frac{5}{4}$$

$$\frac{YX}{GH} = \frac{30}{24} = \frac{5}{4}$$

$$\frac{XW}{HJ} = \frac{15}{12} = \frac{5}{4}$$

$$\frac{WZ}{JF} = \frac{20}{16} = \frac{5}{4}$$
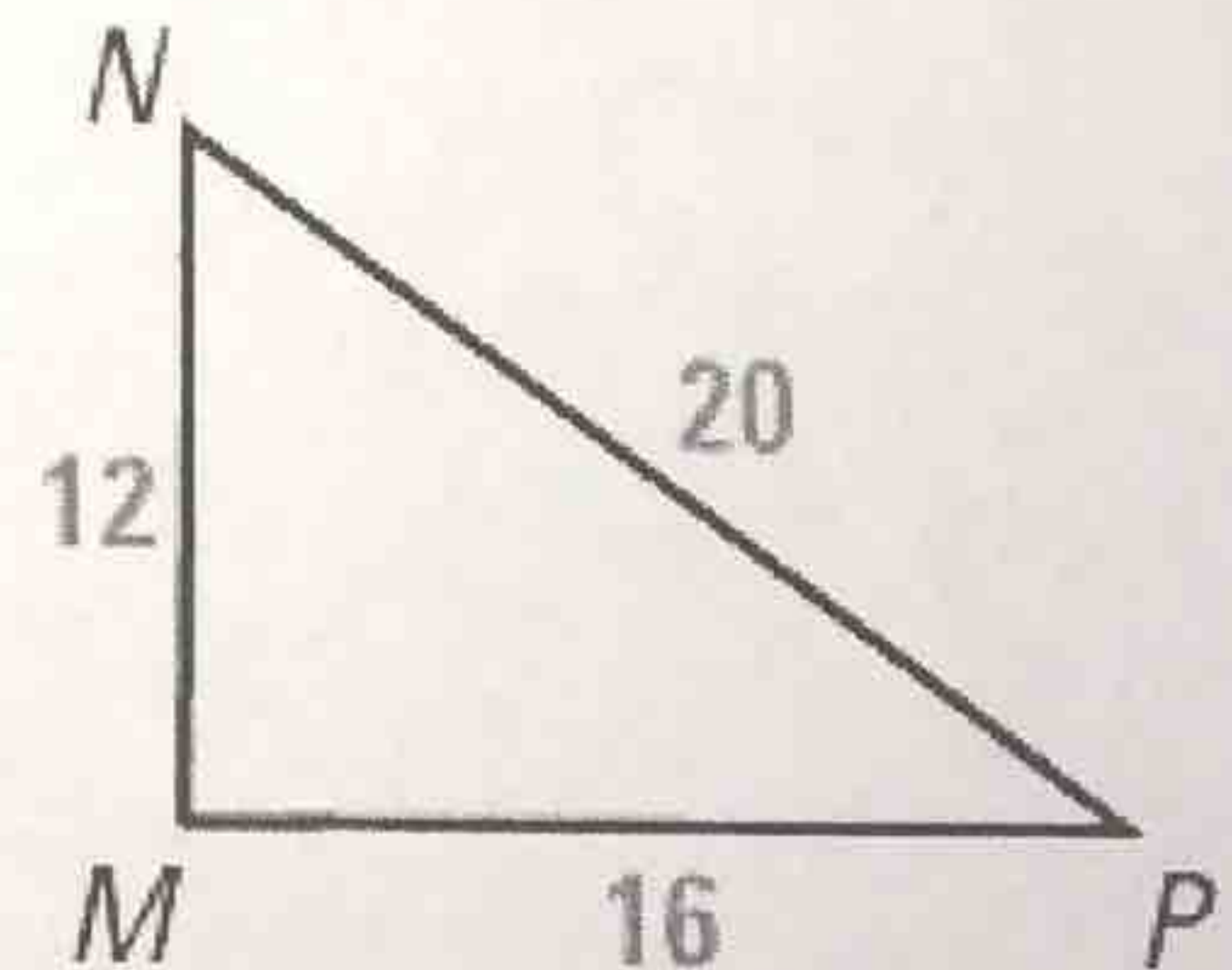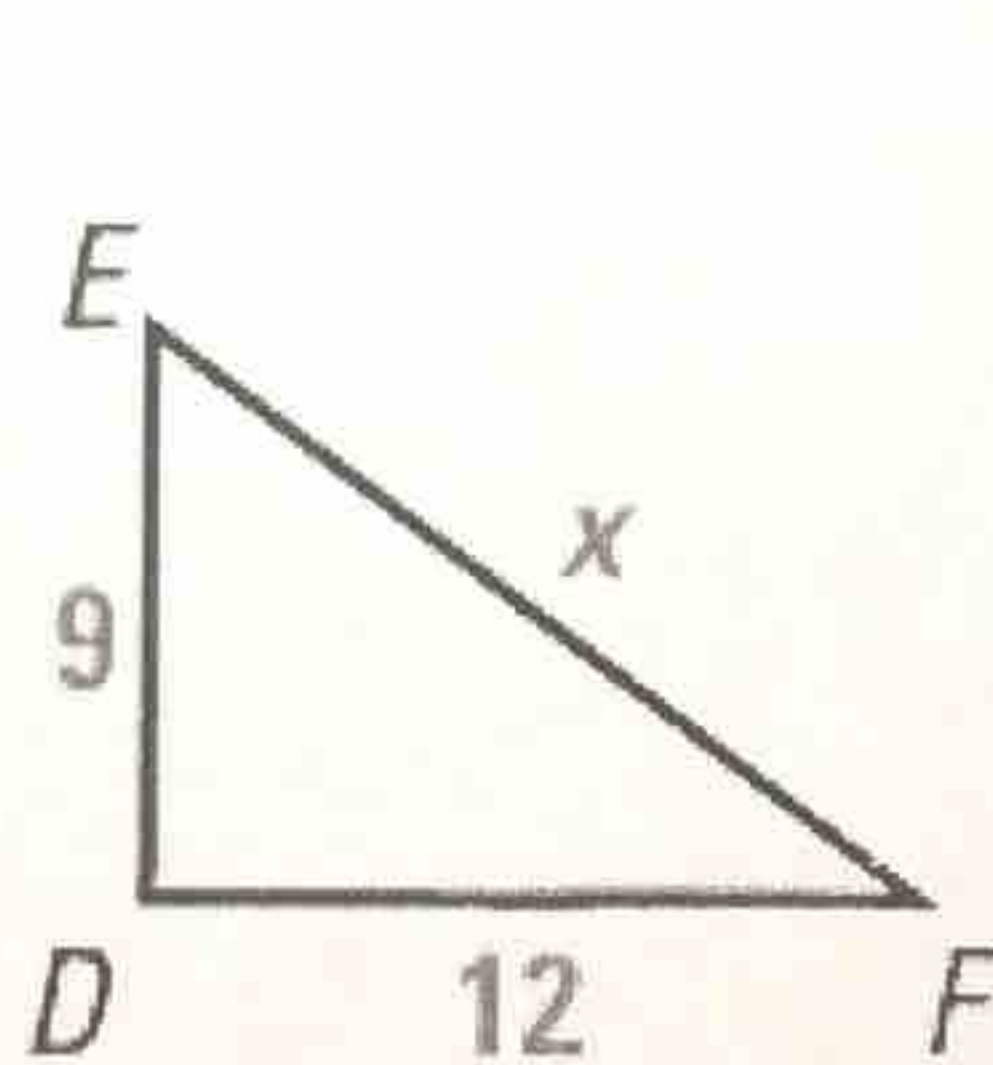
ZYXW ~ FGHJ

Scale factor: $\frac{5}{4}$

Ex 4: In the diagram, $\triangle DEF \sim \triangle MNP$. Find the value of x.

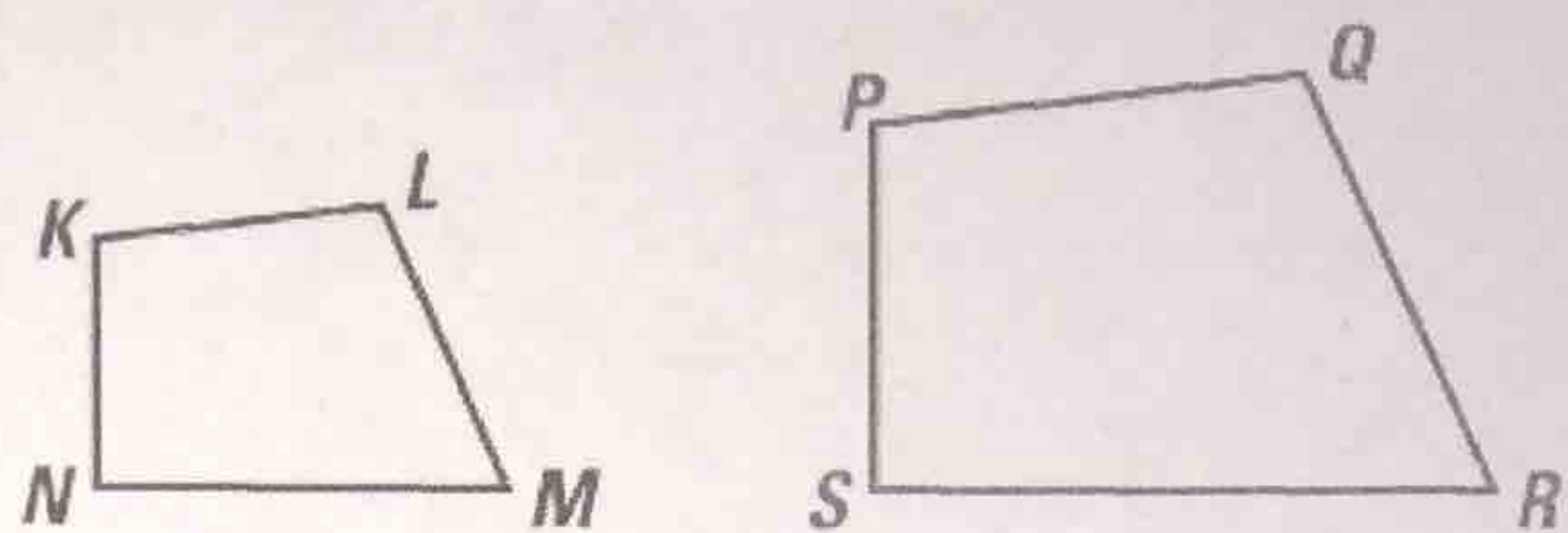$$\frac{MN}{DE} = \frac{NP}{EF}$$

$$\frac{12}{9} = \frac{20}{x}$$

$$12x = 180$$

$$x = 15$$

THEOREM 6.1 Perimeters of Similar Polygons

If two polygons are similar, then the
ratio of their perimeters is equal to
the ratios of their corresponding
side lengths.

If $KLMN \sim PQRS$, then $\dfrac{KL + LM + MN + NK}{PQ + QR + RS + SP} = \dfrac{KL}{PQ} = \dfrac{LM}{QR} = \dfrac{MN}{RS} = \dfrac{NK}{SP}$.

Proof: Ex. 38, p. 379

Two congruent figures are always similar. The scale factor is 1 : 1.

Corresponding Lengths in Similar Polygons

If two polygons are similar, then the ratio of any two corresponding
lengths in the polygons is equal to the scale factor of the similar polygons.

<u>Ex 5</u>: In the diagram, Δ TPR ~ Δ XPZ. Find the length of the altitude $\overline{PS}$.

scale factor: $\dfrac{TR}{XZ} = \dfrac{6+6}{8+8} = \dfrac{12}{16} = \dfrac{3}{4}$

$\dfrac{PS}{PY} = \dfrac{3}{4}$

$\dfrac{PS}{20} = \dfrac{3}{4}$

$\boxed{PS = 15}$