Determining Measures Using Similarity

The same ideas you used to determine the parts of congruent triangles apply to similar triangles. The statement tells you which **angles are congruent**, and which **sides are similar**. Example: $△$*RST*$ \~ △$*MNP*

|  |  |
| --- | --- |
| *Angles are easy…they’re just congruent.*$ △$*RST*$ \~ △$*MNP* | *Sides are* ***similar****, which means we have to set up fractions.* *We have to go by the written order, because we don’t know* ***small, medium,*** *and* ***large****.*  ***First triangle in the statement always goes on the top!***$△$*RST*$ \~ △$*MNP* |
| $$∠R≅∠M$$$$∠S≅∠N$$$$∠T≅∠P$$ | *RS is similar to MN*$$\frac{RS}{MN}$$ | *ST is similar to NP*$$\frac{ST}{NP}$$ | *RT is similar to MP*$$\frac{RT}{MP}$$ |

Remember, if the sides are similar, then the fractions are equal.

They also equal the **scale** fraction, which is sometimes called the “**similarity ratio**.”

‘

|  |  |  |
| --- | --- | --- |
| **EXAMPLE**$△$*DEF*$ \~ △$*IHG.* $IG=?$ $m∠I=?$ *D* is *I*, *E* is *H*, and *F* is *G.*So, $m∠I=m∠D=$Based on the *written order*, my fractions are:$$\frac{DE}{IH} and \frac{EF}{HG} and \frac{DF}{IG}$$$$\frac{DE}{IH} and \frac{8}{4} and \frac{10}{IG}$$$$\frac{8}{4}=\frac{10}{IG}$$$$8\left(IG\right)=10\left(4\right)$$$$8\left(IG\right)=40 $$$$IG= $$ | 1. $△$*JKL*$ \~ △$*NMP.* $JK=?$ $m∠J=?$ | 2. $△$*QRS*$ \~ △$*VUT.* $QS=?$ $m∠U=?$ |
| **EXAMPLE**$△$*ABC*$ \~ △$*ZYX.* $BC=?$ $m∠C=?$*A* is *Z, B* is *Y*, and *C* is *X.*So, $m∠C=m∠X=$The fractions are:$$\frac{AB}{ZY} and \frac{BC}{YX} and \frac{AC}{ZX}$$$$\frac{12}{18} and \frac{BC}{12} and \frac{AC}{7}$$*I’m looking for BC, so that’s what I use.*$$\frac{12}{18}=\frac{BC}{12} \rightarrow reduce\rightarrow \frac{2}{3}=\frac{BC}{12}$$$$2(12)=BC\left(3\right)$$$$24=BC\left(3\right) $$$$8=BC\rightarrow Sym. Prop\rightarrow BC= $$ | 3. $△$*QRS*$ \~ △$*PNM.* $PN=?$ $m∠P=?$ | 4.$ △$*TWV*$ \~ △$*ZYX.* $XZ=?$ $m∠W=?$ |
| **EXAMPLE**$△$*MNP*$ \~ △$*RQP.* $MN=3$, $NP=6$, and $QP=8$.$ RQ=?$*M* is *R, N* is *Q,* and *P* is *P.*The fractions are:$$\frac{MN}{RQ} and \frac{NP}{QP} and \frac{MP}{RP}$$$$\frac{3}{RQ} and \frac{6}{8} and \frac{MP}{RP}$$$$\frac{3}{RQ}=\frac{6}{8} \rightarrow reduce\rightarrow \frac{3}{RQ}=\frac{3}{4}$$$$3(4)=3\left(RQ\right)$$$$12=3\left(RQ\right)$$$$4=RQ\rightarrow Sym. Prop\rightarrow RQ= $$ | 5. $△$*ABC*$ \~ △$*FGH.* $GH=18$, $AB=4$, and $BC=12$.$ FG=?$ | 6. $△$*RAT*$\~ △$*BAN.* $RT=10$, $RA=15$, and $BN=6$.$ BA=?$ |
| **EXAMPLE**$△$*BCD*$ \~ △$*EFG*. If the similarity ratio (or scale) is $\frac{4}{3}$, what is *CD*?The fractions are:

|  |  |  |  |
| --- | --- | --- | --- |
| SCALE | $$\frac{BC}{EF}$$ | $$\frac{CD}{FG}$$ | $$\frac{BD}{EG}$$ |
| $$\frac{4}{3}$$ | $$\frac{BC}{6}$$ | $$\frac{CD}{9}$$ | $$\frac{BD}{9}$$ |

*Since I want CD, I’ll use that fraction.*$$ \frac{4}{ 3}=\frac{CD}{9} $$$$ 4\left(9\right)=CD\left(3\right)$$$$ 36=CD\left(3\right)$$$$12=CD\rightarrow Sym. Prop.\rightarrow CD=$$ | 7. $△$*DRT*$ \~△$*SGP*. If the similarity ratio (or scale) is $\frac{3}{10}$, what is *GP*? | 8. $△$*ABC* $\~△$*WXY*. If the similarity ratio (or scale) is $\frac{6}{5}$, what is *WY*? |
| **EXAMPLE**$△$*LMN*$ \~ △$*PQR*. If the similarity ratio (or scale) is $\frac{2}{5}$, what is *PR*?The fractions are:

|  |  |  |  |
| --- | --- | --- | --- |
| SCALE | $$\frac{LM}{PQ}$$ | $$\frac{MN}{QR}$$ | $$\frac{LN}{PR}$$ |
| $$\frac{2}{5}$$ | $$\frac{5}{PQ}$$ | $$\frac{13}{QR}$$ | $$\frac{12}{PR}$$ |

*Since I want PR, I’ll use that fraction.*$$ \frac{2}{ 5}=\frac{12}{PR} $$$$2\left(PR\right)=12\left(5\right) $$$$ 2\left(PR\right)=60 $$$$PR= $$ | 9. $△$*HUN*$ \~△$*GRY*. If the similarity ratio (or scale) is $\frac{5}{3}$, what is *RY*? | 10. $△$*FOR*$ \~△$*MED*. If the similarity ratio (or scale) is $\frac{7}{4}$, what is *FR*? |