Determining Measures Using Similarity and Congruence

Using Similarity

Step 1: Use the table to create the fractions for the sides (angles are just equal to their matches)

Step 2: Plug in what you know

Step 3: Set useful side fractions equal to each other & solve

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| **EXAMPLE**$△$*DEF*$ \~ △$*IHG.* $IG=?$ $m∠I=?$

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| --- | --- | --- | --- |
| **DE** | **EF** | **DF** | $$∠D≅∠I$$**So,** $$ |
| **IH** | **HG** | **IG** |
|  | **8****4** | **10****IG** |

$$\frac{2}{1}=\frac{10}{IG}$$$$2IG=10$$$$$$ | 1. $△$*JKL*$ \~ △$*NMP.* $JK=?$ $m∠J=?$ | 2. $△$*QRS*$ \~ △$*VUT.* $QS=?$ $m∠U=?$ |
| 3. $△$*ABC*$ \~ △$*ZYX.* $BC=?$ $m∠C=?$ | 4. $△$*QRS*$ \~ △$*PNM.* $PN=?$ $m∠P=?$ | 5.$ △$*TWV*$ \~ △$*ZYX.* $WV=?$ $m∠W=?$ |
| **EXAMPLE**$△$*MNP*$ \~ △$*RQP.* $MN=3$, $NP=6$, and $QP=8$.$ RQ=?$

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| --- | --- | --- | --- | --- |
| *3* | **MN** | **NP** | **MP** |  |
| *4* | **RQ** | **QP** | **RP** |
|  | **3****RQ** | **6****8** |  |

$$\frac{3}{RQ}=\frac{3}{4}$$$$12=3RQ$$$$4=RQ$$$$$$ | 6. $△$*ABC*$ \~ △$*FGH.* $GH=18$, $AB=4$, and $BC=12$.$ FG=?$ | 7. $△$*RAT*$\~ △$*BAN.* $RT=10$, $RA=15$, and $BN=6$.$ BA=?$ |
| 8. $△PQR\~△DEF. PQ=8, $$$PR=4, and DF=8. DE=?$$ | 9. $△CAR\~△PET. AR=7, $$$PE=2, and CA=14. ET=?$$ | 10. $△ABC\~△LMN. AB=3, $$$LM=9, and BC=5. MN=?$$ |

If you know the similarity ratio (also called scale), which is what the side fraction should equal (top is the first triangle), then set the side fractions equal to the scale and solve.

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| **EXAMPLE**$△$*BCD*$ \~ △$*EFG*. If the similarity ratio (or scale) is $\frac{4}{3}$, what is *CD*?

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| **4** | **BC** | **CD** | **BD** |  |
| **3** | **EF** | **FG** | **EG** |
| ***I want*** $CD:$ | **CD****9** |  |

$$\frac{4}{3}=\frac{CD}{9}$$$$36=3CD$$$$12=CD$$$$$$ | 11. $△$*DRT*$ \~△$*SGP*. If the similarity ratio (or scale) is $\frac{3}{10}$, what is *GP*? | 12. $△$*ABC* $\~△$*WXY*. If the similarity ratio (or scale) is $\frac{6}{5}$, what is *WY*? |

Using Congruence:

Step 1: Identify which parts match (the ones that would be above each other on a similarity table)

Step 2: Set them equal and solve

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| **EXAMPLE**$△$*DEF* $≅ △$*PQR.* Determine the value of *x*.

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| $$DE=PQ$$ | $$EF=QR$$ | $$DF=PR$$ |
| $$DE=PQ$$ | $$x-8=QR$$ |  |
|  | $$x-4=2x-10$$ |

$$-4=x-10 $$$6=x $$$ $$ | 5. $△$*ABC* $≅ △$*EFD.* Determine the value of *x*. | 6. $△$*GHI* $≅ △$*LJK.* Determine the value of *x*. |
| **EXAMPLE**$△$*CAT* $≅ △$*DOG.* $m∠A =\left(4x-3\right)˚$*,* $m∠T =\left(5x+10\right)˚$*,* and $m∠G =\left(6x-1\right)˚$*.* $m∠O =?$

|  |  |
| --- | --- |
| $$m∠C=m∠D$$ | *No info* |
| $$m∠A=m∠O$$ | $$4x-3=m∠O$$ |
| $$m∠T=m∠G$$ | $$5x+10=6x-1$$ |

$$5x+10=6x-1$$$$10=x-1 $$Plug it in… $11=x$$$m∠O=4\left(11\right)-3= x =11$$ | 9. $△$*HER* $≅ △$*MIT.* $m∠H =\left(2x-9\right)˚$*,* $m∠E =\left(3x-2\right)˚$*,* and $m∠I =\left(x+26\right)˚$*.* $m∠E=?$ | 10. $△$*BRO* $≅ △$*WNS.* $m∠R =\left(x+7\right)˚$*,* $m∠N =\left(5x-73\right)˚$*,* and $m∠S =\left(x+13\right)˚$*.* $m∠S=?$ |
| $△$*DAZ* $≅ △$*ELZ.* $DZ =5x+1$*,* $AZ =2x-3$*,* and $LZ =x+4$*.* $DZ=?$ | 11. $△$*LOG* $≅ △$*REG.* $LG=7x-5$*,* $RG=5x+3$*,* and $EG=4x$*.* $EG=?$ | 12. $△$*BAT* $≅ △$*MAN.* $BA=3x+4$*,* $AN =4x-3$*,* and $AT=5x-5$*.* $AN=?$ |