

Congruent Figures

Name: _____ Date: _____ Score: _____ / 24

Quick Review

Two figures are **congruent** when one can be moved onto the other using only *rigid motions* — translations, reflections, and rotations. Congruent figures have exactly the same **size and shape**: matching (*corresponding*) sides are equal in length and matching angles are equal in measure. We write $\triangle ABC \cong \triangle DEF$, and the *order of the letters* tells you which parts match: *A* with *D*, *B* with *E*, *C* with *F*. If you know a pair is congruent, you can find missing sides and angles by matching them up.

◇ **Example:** $\triangle ABC \cong \triangle DEF$. If $AB = 7$ cm, $BC = 9$ cm, and $\angle A = 50^\circ$, find DE and $\angle D$.
 ⇒ The congruence statement lines up the parts for us. Since *A* matches *D* and *B* matches *E*, side *AB* matches side *DE* — so $DE = AB = 7$ cm. And angle $\angle A$ matches angle $\angle D$, so $\angle D = \angle A = 50^\circ$. Congruent figures simply copy each other part for part.

Answer: $DE = 7$ cm, $\angle D = 50^\circ$

PRACTICE

Use the congruence statement to find each missing measure.

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| 1. $\triangle ABC \cong \triangle DEF$, $AB = 5 \Rightarrow DE = ?$ _____ | 13. $\triangle ABC \cong \triangle DEF$, $\angle D = 30^\circ$, $\angle E = 80^\circ \Rightarrow \angle C = ?$ _____ |
| 2. $\triangle ABC \cong \triangle DEF$, $BC = 11 \Rightarrow EF = ?$ _____ | 14. If $\triangle ABC \cong \triangle DEF$, then $AB + BC$ equals _____ |
| 3. $\triangle ABC \cong \triangle DEF$, $AC = 8 \Rightarrow DF = ?$ _____ | 15. $\triangle GHI \cong \triangle JKL$, $GH = 2x$, $JK = 14 \Rightarrow x = ?$ _____ |
| 4. $\triangle ABC \cong \triangle DEF$, $\angle A = 40^\circ \Rightarrow \angle D = ?$ _____ | 16. $\triangle GHI \cong \triangle JKL$, $HI = x + 3$, $KL = 10 \Rightarrow x = ?$ _____ |
| 5. $\triangle ABC \cong \triangle DEF$, $\angle B = 75^\circ \Rightarrow \angle E = ?$ _____ | 17. $\triangle GHI \cong \triangle JKL$, $\angle G = 3x$, $\angle J = 60^\circ \Rightarrow x = ?$ _____ |
| 6. $\triangle ABC \cong \triangle DEF$, $\angle C = 65^\circ \Rightarrow \angle F = ?$ _____ | 18. Are two figures with equal sides but different angles congruent? _____ |
| 7. $\triangle PQR \cong \triangle STU$, $PQ = 13 \Rightarrow ST = ?$ _____ | 19. Perimeter of $\triangle ABC = 24$. $\triangle ABC \cong \triangle DEF$. Perimeter of $\triangle DEF = ?$ _____ |
| 8. $\triangle PQR \cong \triangle STU$, $QR = 6 \Rightarrow TU = ?$ _____ | 20. $\triangle ABC \cong \triangle DEF$, $DE = 9$, $EF = 12$, $DF = 15$. Perimeter of $\triangle ABC = ?$ _____ |
| 9. $\triangle PQR \cong \triangle STU$, $\angle Q = 90^\circ \Rightarrow \angle T = ?$ _____ | |
| 10. $\triangle PQR \cong \triangle STU$, $PR = 10$, $SU = ?$ _____ | |
| 11. Square $WXYZ \cong$ Square $ABCD$, $WX = 4 \Rightarrow AB = ?$ _____ | |

Word Problems

21. Two triangular sails are congruent, $\triangle ABC \cong \triangle DEF$. On the first sail, $AB = 6$ ft, $BC = 8$ ft, and $AC = 10$ ft. How much trim is needed to edge the second sail? _____
22. A factory stamps out congruent metal brackets. One bracket is $\triangle PQR$ with $\angle P = 90^\circ$ and $\angle Q = 35^\circ$. In the congruent bracket $\triangle STU$, what is $\angle U$? _____
23. A quilt uses congruent square patches. $WXYZ \cong ABCD$, and side WX measures 5 inches. A quilter sews 40 inches of border around patch $ABCD$. Is that exactly enough? _____
24. A logo is made of two congruent triangles. In $\triangle GHI \cong \triangle JKL$, side $GH = 2x + 1$ and its matching side $JK = 13$. Solve for x , then state the length of GH . _____



Answer Keys

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|--------------------------------------|--|
| 1. <input type="text" value="5"/> | 13. <input type="text" value="70°"/> |
| 2. <input type="text" value="11"/> | 14. <input type="text" value="DE + EF"/> |
| 3. <input type="text" value="8"/> | 15. <input type="text" value="7"/> |
| 4. <input type="text" value="40°"/> | 16. <input type="text" value="7"/> |
| 5. <input type="text" value="75°"/> | 17. <input type="text" value="20"/> |
| 6. <input type="text" value="65°"/> | 18. <input type="text" value="no"/> |
| 7. <input type="text" value="13"/> | 19. <input type="text" value="24"/> |
| 8. <input type="text" value="6"/> | 20. <input type="text" value="36"/> |
| 9. <input type="text" value="90°"/> | 21. <input type="text" value="24 ft"/> |
| 10. <input type="text" value="10"/> | 22. <input type="text" value="∠U = 55°"/> |
| 11. <input type="text" value="4"/> | 23. <input type="text" value="Yes; the perimeter of ABCD is 20 in, so 40 in is more than enough"/> |
| 12. <input type="text" value="60°"/> | 24. <input type="text" value="x = 6; GH = 13"/> |

Step-by-Step Explanations

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| <p>1. AB corresponds to DE, so they are equal: $DE = 5$.</p> <p>2. BC corresponds to EF, so $EF = 11$.</p> <p>3. AC corresponds to DF, so $DF = 8$.</p> <p>4. $\angle A$ corresponds to $\angle D$, so $\angle D = 40^\circ$.</p> <p>5. $\angle B$ corresponds to $\angle E$, so $\angle E = 75^\circ$.</p> <p>6. $\angle C$ corresponds to $\angle F$, so $\angle F = 65^\circ$.</p> <p>7. PQ corresponds to ST, so $ST = 13$.</p> <p>8. QR corresponds to TU, so $TU = 6$.</p> <p>9. $\angle Q$ corresponds to $\angle T$, so $\angle T = 90^\circ$.</p> <p>10. PR corresponds to SU, so $SU = 10$.</p> <p>11. WX corresponds to AB, so $AB = 4$.</p> <p>12. $\angle C = 180 - 55 - 65 = 60^\circ$, and $\angle F$ matches $\angle C$, so $\angle F = 60^\circ$.</p> <p>13. $\angle F = 180 - 30 - 80 = 70^\circ$, and $\angle C$ matches $\angle F$, so $\angle C = 70^\circ$.</p> <p>14. Each side copies its match, so $AB + BC = DE + EF$.</p> | <p>15. $GH = JK$, so $2x = 14$ and $x = 7$.</p> <p>16. $HI = KL$, so $x + 3 = 10$ and $x = 7$.</p> <p>17. $\angle G = \angle J$, so $3x = 60$ and $x = 20$.</p> <p>18. Congruent figures need <i>both</i> matching sides and matching angles equal.</p> <p>19. All sides copy over, so the perimeter is also 24.</p> <p>20. The sides of $\triangle ABC$ match $\triangle DEF$: $9 + 12 + 15 = 36$.</p> <p>21. The second sail copies every side of the first, so its perimeter is $6 + 8 + 10 = 24$ ft of trim.</p> <p>22. In $\triangle PQR$, $\angle R = 180 - 90 - 35 = 55^\circ$. Since R corresponds to U, $\angle U = 55^\circ$.</p> <p>23. Side AB matches $WX = 5$ in, so $ABCD$ has perimeter $4 \times 5 = 20$ in. 40 in of border is more than enough.</p> <p>24. Corresponding sides are equal, so $2x + 1 = 13$, giving $2x = 12$ and $x = 6$. Then $GH = 2(6) + 1 = 13$.</p> |
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