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 $\angle A = 50°$, 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 $\angle D = \angle A = 50°$. Congruent figures simply copy each other part for part.

Answer: $DE = 7$ cm, $\angle D = 50°$

PRACTICE

Use the congruence statement to find each missing measure.

1. $\triangle ABC \cong \triangle DEF,\ AB = 5 \Rightarrow DE = ?$ _____
2. $\triangle ABC \cong \triangle DEF,\ BC = 11 \Rightarrow EF = ?$ _____
3. $\triangle ABC \cong \triangle DEF,\ AC = 8 \Rightarrow DF = ?$ _____
4. $\triangle ABC \cong \triangle DEF,\ \angle A = 40° \Rightarrow \angle D = ?$ _____
5. $\triangle ABC \cong \triangle DEF,\ \angle B = 75° \Rightarrow \angle E = ?$ _____
6. $\triangle ABC \cong \triangle DEF,\ \angle C = 65° \Rightarrow \angle F = ?$ _____
7. $\triangle PQR \cong \triangle STU,\ PQ = 13 \Rightarrow ST = ?$ _____
8. $\triangle PQR \cong \triangle STU,\ QR = 6 \Rightarrow TU = ?$ _____
9. $\triangle PQR \cong \triangle STU,\ \angle Q = 90° \Rightarrow \angle T = ?$ _____
10. $\triangle PQR \cong \triangle STU,\ PR = 10,\ SU = ?$ _____
11. Square $WXYZ \cong$ Square $ABCD,\ WX = 4 \Rightarrow AB = ?$ _____
12. $\triangle ABC \cong \triangle DEF,\ \angle A = 55°,\ \angle B = 65° \Rightarrow \angle F = ?$ _____
13. $\triangle ABC \cong \triangle DEF,\ \angle D = 30°,\ \angle E = 80° \Rightarrow \angle C = ?$ _____
14. If $\triangle ABC \cong \triangle DEF$, then $AB + BC$ equals _____
15. $\triangle GHI \cong \triangle JKL,\ GH = 2x,\ JK = 14 \Rightarrow x = ?$ _____
16. $\triangle GHI \cong \triangle JKL,\ HI = x + 3,\ KL = 10 \Rightarrow x = ?$ _____
17. $\triangle GHI \cong \triangle JKL,\ \angle G = 3x,\ \angle J = 60° \Rightarrow x = ?$ _____
18. Are two figures with equal sides but different angles congruent? _____
19. Perimeter of $\triangle ABC = 24$. $\triangle ABC \cong \triangle DEF$. Perimeter of $\triangle DEF = ?$ _____
20. $\triangle ABC \cong \triangle DEF,\ DE = 9,\ EF = 12,\ DF = 15$. Perimeter of $\triangle ABC = ?$ _____

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 $\angle P = 90°$ and $\angle Q = 35°$. 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. _____

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Answer Keys

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

Step-by-Step Explanations

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

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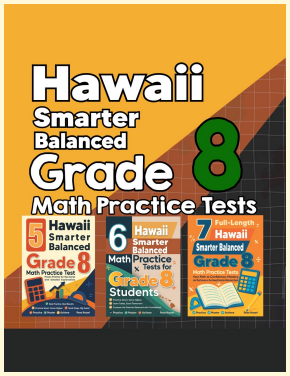

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