Answers

MODULE 15 **Proofs with Triangles and Quadrilaterals**

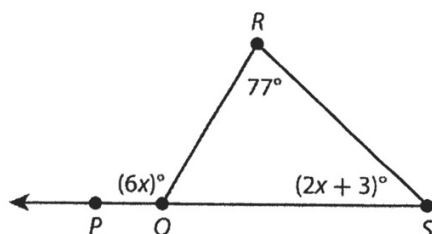1. What is the sum of the interior angles of an octagon?

$$S = (8-2)\,180$$
$$= 6(180)$$
$$= 1080°$$

2. A polygon has an interior angle sum of 2520°. How many sides must the polygon have? Show all work.

$$S = (n-2)\,180$$
$$2520 = (n-2)\,180$$
$$14 = n-2$$
$$16 = n$$
$$\boxed{16 \text{ sides}}$$

Use the figure for 3–4.

$\triangle QRS$ is shown.

3. What is $m\angle S$? Show your work.
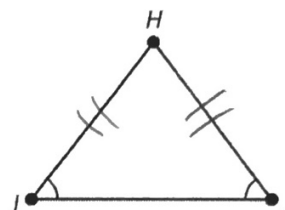
$$6x = 77 + 2x + 3$$
$$4x = 80$$
$$x = 20$$

$$m\angle S = 2(20) + 3 = 43°$$

4. Which definition, postulate, or theorem can you use to justify your answer?

Ext. $\angle$ Thm.

Use the figure for 5–6.

$\triangle HIJ$ is shown.

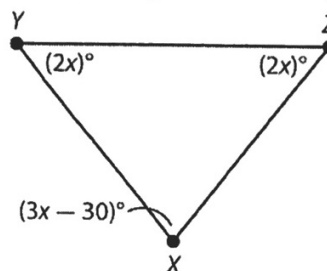5. Explain how you know that $\triangle HIJ$ is an isosceles triangle.

$\overline{HI} \cong \overline{HJ}$ by conv. of isosceles $\triangle$ Thm. So $\triangle HIJ$ is isosceles by definition.

6. Can $m\angle J$ be determined if $m\angle H = 74°$? If so, calculate $m\angle J$. If not, explain why not.

Yes. $m\angle I + m\angle J + 74 = 180$
$$m\angle I + m\angle J = 106$$
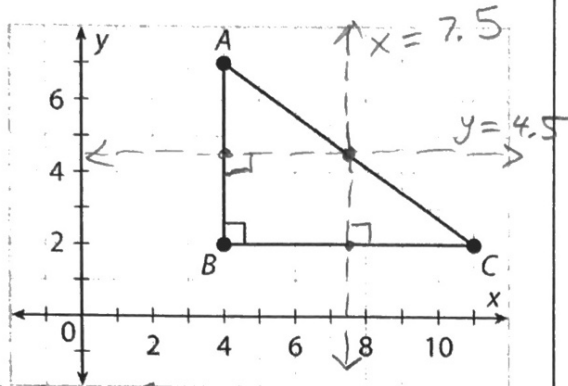Since $m\angle I = m\angle J$,
$$2\,m\angle J = 106$$
$$\boxed{m\angle J = 53°}$$

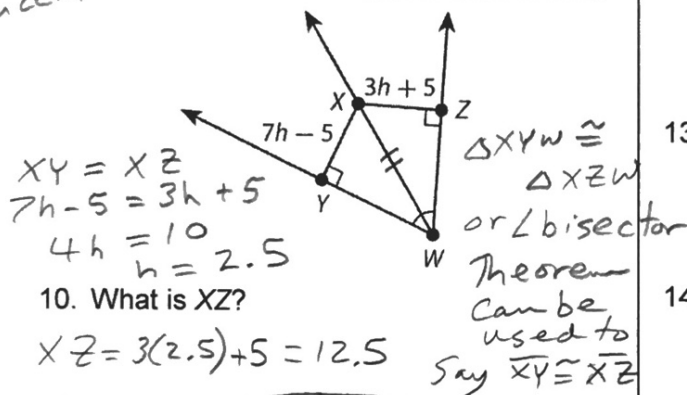7. Is $\triangle XYZ$ equilateral, isosceles, or neither? Explain your reasoning.

$$2x + 2x + 3x - 30 = 180$$
$$7x = 210$$
$$x = 30$$

$m\angle Y = 60°$, $m\angle Z = 60°$, $m\angle X = 90 - 30 = 60°$. Since $\triangle XYZ$ is equiangular, it must also be equilateral.

9. What is the circumcenter of $\triangle ABC$?

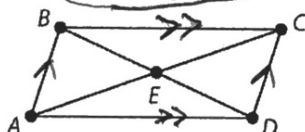$x = 7.5$

$y = 4.5$

$\perp$ bisectors meet at circumcenter

$(7.5, 4.5)$

$XY = XZ$
$7h - 5 = 3h + 5$
$4h = 10$
$h = 2.5$

$\triangle XYW \cong \triangle XZW$
or $\angle$ bisector Theorem can be used to say $\overline{XY} \cong \overline{XZ}$

10. What is XZ?

$XZ = 3(2.5) + 5 = 12.5$

11. ABCD is a (parallelogram.)

Opp. Sides $\cong$ in a $\square$.

Determine whether each statement is True or False.

not necessarily true.

A $\overline{AE} \cong \overline{BE}$ ○ True   ● False

B $\overline{AB} \cong \overline{CD}$ ● True   ○ False

C $\overline{AD} \parallel \overline{BC}$ ● True   ○ False

D $\overline{AE} \cong \overline{EC}$ ● True   ○ False
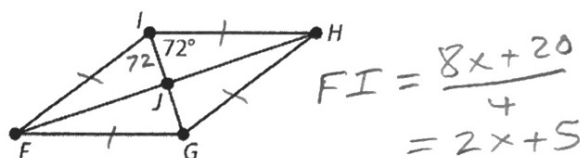
Defn. of $\square$.

Diags. bisect each other

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12. Compare the diagonals of a rhombus and rectangle, where neither is a square. How are they the same? How are they different?

Diag. of a rectangle are $\cong$.

Diag. of a rhombus are $\perp$.

But, Diagonals bisect each other in both cases because both rectangles and rhombi are parallelograms

Use the figure for 13–15.

FIHG is a rhombus.

$72°$ $72°$

$FI = \dfrac{8x + 20}{4}$

$= 2x + 5$

13. The perimeter of FIHG is $8x + 20$. What is the measure of $\overline{FI}$ in terms of x?

$FI = 2x + 5$

14. What is the measure of $\angle FIH$?

$m\angle FIH = 144$

Diags. bisect $\angle$s in opp. a Rhombus

15. Can the measure of $\angle FJG$ be determined? If so, give the measure. If not, explain why not.

Yes. $m\angle FJG = 90°$ Since Diags. are $\perp$ in a Rhombus.

16. Fill in the blank with the correct point of concurrency.

A Perpendicular bisectors intersect at the

Circumcenter.

B Angle bisectors intersect at the

Incenter.