11. From Example 1, a polygon with n sides can be divided into $n - 2$ triangles. By the Triangle Angle-Sum Theorem, the sum of the measures of the angles in a triangle is 180°. Therefore, the sum of the measures of the angles of a polygon is the number of triangles, $(n - 2)$, multiplied by the sum of the measures of the angles in each triangle, 180°.

12. $72^\circ, 90^\circ, 18^\circ$; by definition, right triangles have one interior angle with a value of 90°. Apply Theorems 6-1 and 6-2 to solve for the other two interior angles.

$$\begin{aligned} \theta_{\text{sum}} &= 180^\circ \cdot (n-2) \\ &= 180^\circ \cdot (5-2) \\ &= 180^\circ \cdot 3 \\ &= 540^\circ \end{aligned} \qquad \begin{aligned} \frac{\theta_{\text{sum}}}{n} &= \theta_{\text{interior}} \\ \frac{540^\circ}{3} &= \theta_{\text{interior}} \\ 108^\circ &= \theta_{\text{interior}} \end{aligned}$$

$$\begin{aligned} \theta_{\text{interior}} + \theta_{\text{exterior}} &= 180^\circ \\ 108^\circ + \theta_{\text{exterior}} &= 180^\circ \\ \theta_{\text{exterior}} &= 72^\circ \end{aligned} \qquad \begin{aligned} \theta_{\text{exterior}} + \theta_2 + 90^\circ &= 180^\circ \\ 72^\circ + \theta_2 + 90^\circ &= 180^\circ \\ \theta &= 18^\circ \end{aligned}$$

13. The Corollary to Theorem 6-1 states that the measure of an interior angle of a regular n-gon is $\frac{180^\circ \cdot (n-2)}{n}$. Find the number of sides of a regular polygon with interior angles measuring 40° by solving the equation $\frac{180^\circ (n-2)}{n} = 40^\circ$, which results in $n = \frac{360}{140} \approx 2.57$. Since n is not a whole number, a regular polygon cannot have an interior angle that measures 40°.

14. According to Theorem 6-1, the sum of the measures of the interior angles of a convex n-gon is $180^\circ \cdot (n - 2)$. By the Corollary, the individual measure of the interior angles can be found by dividing the sum of the measures of the interior angles by n. Jayesh should have multiplied 180° by 7 and then divided by 9.

15. The measure of each exterior angle is 180° minus the adjacent interior angle measure. There are n exterior angles. The sum S of the exterior angles of a polygon with n sides is equal to $n(180)$ minus the sum of the interior angle measures. Using the formula for the sum of the interior angles measures,

$S = n(180) - 180(n - 2)$

$= 180n - 180n - 180(-2)$

$= 360$

Thus, the sum of the measures of the exterior angles of a convex polygon is 360°.

16. By Theorem 6-2, the base angles of each triangle in the star are each 72° since they are the exterior angles of a regular pentagon. Since the 2 base angles of each triangle are the same, they are each isosceles. All of the triangles each have a side length in common, the side between the two base angles. So, they are all congruent by ASA.

17. 1440°, 144°; the polygon has 10 sides. First, apply Theorem 6-1 to find the sum of the interior angles.

$$\begin{aligned}\theta_{\text{sum}} &= 180^\circ \cdot (n - 2)\\ &= 180^\circ \cdot (10 - 2)\\ &= 180^\circ \cdot 8\\ &= 1440^\circ\end{aligned}$$

Use sum and apply the Corollary of Theorem 6-1 to find the measure of each interior angle.

$$\begin{aligned}\theta_{\text{interior}} &= \frac{\theta_{\text{sum}}}{n}\\ &= \frac{1440^\circ}{10}\\ &= 144^\circ\end{aligned}$$

18. 900°, 128.6°; the polygon has 7 sides. First, apply Theorem 6-1 to find the sum of the interior angles.

$$\begin{aligned}\theta_{\text{sum}} &= 180^\circ \cdot (n-2)\\ &= 180^\circ \cdot (7-2)\\ &= 180^\circ \cdot 5\\ &= 900^\circ\end{aligned}$$

Use the sum and apply the Corollary of Theorem 6-1 to find the measure of each interior angle.

$$\begin{aligned}\theta_{\text{interior}} &= \frac{\theta_{\text{sum}}}{n}\\ &= \frac{900^\circ}{7}\\ &= 128.6^\circ\end{aligned}$$

19. 18; apply the Corollary of Theorem 6-1 to find n.

$$\begin{aligned}\theta_{\text{interior}} &= \frac{180^\circ(n-2)}{n}\\ 160^\circ &= \frac{180^\circ(n-2)}{n}\\ 160n &= 180n - 360\\ 360 &= 20n\\ 18 &= n\end{aligned}$$

20. 5°; given $n = 72$, apply Theorem 6-2 to find the measure of each exterior angle.

$$\begin{aligned}\theta_{\text{exterior}} &= \frac{360^\circ}{n}\\ &= \frac{360^\circ}{72}\\ &= 5^\circ\end{aligned}$$

21. 6; Apply Theorem 6-2 to find n.

$$\begin{aligned}\theta_{\text{exterior}} &= \frac{360^\circ}{n}\\ 60^\circ &= \frac{360^\circ}{n}\\ 60^\circ \cdot n &= 360^\circ\\ n &= 6\end{aligned}$$

22. $x = 70$; 70°, 84°, 116°, 90°; One interior angle is given to equal 90°, and therefore the exterior angle of that angle is also 90°. Apply Theorem 6-2 to solve for x.

$$
\begin{aligned}
&90 + x + (x + 14) + (2x - 24) = 360 \\
&4x + 80 = 360 \\
&4x = 280 \\
&x = 70
\end{aligned}
$$

Use $x = 70$ to solve for the measure of each interior angle.

$$
\begin{aligned}
&(2x - 24)^\circ = (140 - 24)^\circ = 116^\circ \\
&(x + 14)^\circ = (70 + 14)^\circ = 84^\circ \\
&x^\circ = 70^\circ
\end{aligned}
$$

23. $x = 50$; four 120° interior angles and four 150° interior angles;

The polygon has 8 sides. Use Theorem 6-1 to solve for x.

$$
\begin{aligned}
&\theta_{\text{sum}} = 180^\circ \cdot (n - 2) \\
&4\,(4x - 80)^\circ + 4\,(2x + 50)^\circ = 180^\circ \cdot (8 - 2) \\
&(16x - 320) + (8x + 200) = 180 \cdot 6 \\
&24x - 120 = 1080 \\
&24x = 1200 \\
&x = 50
\end{aligned}
$$

Use $x = 50$ to solve for the measure of each exterior angle.

$$
\begin{aligned}
\theta_1 &= (4x - 80)^\circ & \theta_2 &= (2x + 50)^\circ \\
&= (4(50) - 80)^\circ & &= (2(50) + 50)^\circ \\
&= 120^\circ & &= 150^\circ
\end{aligned}
$$

24. $x = 40$; four 100° interior angles and two 160° interior angles;

The polygon has 6 sides. Use Theorem 6-1 to solve for x.

$$\begin{aligned}
&\theta_{\text{sum}} = 180^\circ \cdot (n - 2) \\
&4\,(3x - 20)^\circ + 2\,(4x)^\circ = 180^\circ \cdot (6 - 2) \\
&(12x - 80) + (8x) = 180 \cdot 4 \\
&20x - 80 = 720 \\
&20x = 800 \\
&x = 40
\end{aligned}$$

Use $x = 40$ to solve for the measure of each exterior angle.

$$\begin{aligned}
\theta_1 &= (3x - 20)^\circ & \theta_2 &= (4x)^\circ \\
&= (3(40) - 20)^\circ & &= (4(40))^\circ \\
&= 100^\circ & &= 160^\circ
\end{aligned}$$

25. Subtract 110° from 180° to find the exterior angle at the Start/Finish, and then set the sum of the exterior angles equal to 360°.

$$\begin{aligned}
&m\angle 1 + (180^\circ - 110^\circ) + 50^\circ + 70^\circ + 90^\circ = 360^\circ \\
&m\angle 1 + 280^\circ = 360^\circ \\
&m\angle 1 = 80^\circ
\end{aligned}$$

26. She can use the equilateral triangles, squares, and regular hexagons. The sides of the figures must be able to align with each other without overlapping. So, the interior angles will form 360° around a point. By Corollary to Theorem 6-1, the interior angles of each polygon are 60°, 90°, 108°, and 120°. The triangle, square, and hexagon have an interior angle that divides evenly into 360°.

27. No, the interior angle at point A is 105°, so the cameras must cover 255°. Each camera must have a 127.5° field of view. Use the parallel lines $\overline{AB}$ and $\overline{DC}$ to find the angle from the left horizontal line $\overline{ED}$ to the sloped edge of $\overline{DC}$, which is 165°; then note that there is 90° from the vertical line $\overline{AE}$ to the horizontal $\overline{ED}$ and add that to find the total outside angle of A.
$165^\circ + 90^\circ = 255^\circ$

28. I. 4 D. 90°

II. 6 A. 120°

III. 16 B. 157.5°

IV. 18 C. 160°

29. (B); the polygon has $s = 7$ sides. Apply the Corollary to Theorem 6-1 to find the interior angle.

$$\theta_{\text{interior}} = \frac{180^\circ(s-2)}{s}$$
$$= \frac{180^\circ(7-2)}{7}$$
$$\approx 129^\circ$$

Since the interior and exterior angles form a straight angle, solve for n°.

$$m\angle n + 129^\circ = 180^\circ$$
$$m\angle n = 51^\circ$$

30. **Part A:** Yes; when the tables are put together, the interior angle measure where each table meets is 120°. If a polygon is formed by the tables, it will be regular. Solve $\frac{180\cdot(n-2)}{n} = 120^\circ$ to get $n = 6$, which is a whole number; so a regular hexagon can be formed from placing the tables together.

Part B: 6, so that each table forms a side of the polygon.

Part C: 54° and 126°

$$\begin{aligned}\theta_{\text{interior}} &= \frac{180^\circ(n-2)}{n}\\ &= \frac{180^\circ(5-2)}{5}\\ &= \frac{180^\circ(3)}{5}\\ &= 108^\circ\end{aligned}$$

The angle from two tables and the interior angle make a full circle and is equal to 360°.

$$\begin{aligned}2\theta_1 + 108^\circ &= 360^\circ\\ 2\theta_1 &= 252^\circ\\ \theta_1 &= 126^\circ\end{aligned}$$

A trapezoid has 2 pairs of equal angles that sum to 360°.

$$\begin{aligned}2\theta_1 + 2\theta_2 &= 360^\circ\\ 2(126^\circ) + 2\theta_2 &= 360^\circ\\ 2\theta_2 &= 108^\circ\\ \theta_2 &= 54^\circ\end{aligned}$$