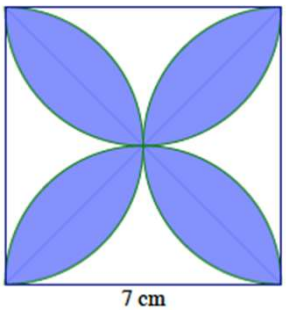
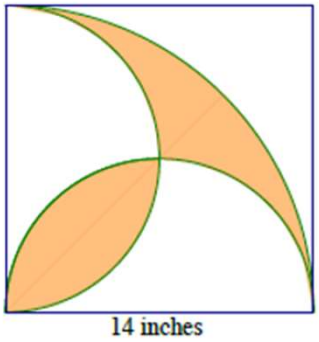
Shaded Area Worksheets

1. The diameters of four half circles are sides of a square with a side length of 7 cm.

a) Find the exact area of the shaded region.



2. A square with a side length of 14 inches is shown below, along with a quarter circle (with a side of the square as its radius) and two half circles (with diameters that are sides of the square). Write and explain a numerical expression that represents the area of the figure.



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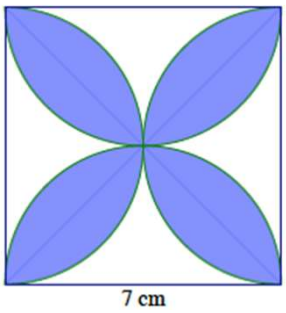


Figure 2 isolates one quarter of Figure 1. The shaded area in Figure 2 can be found as follows:

$$Shaded\ area\ =\ Area\ of\ the\ quarter\ circle\ -\ Area\ of\ the\ isosceles\ right\ triangle.$$

Shaded area: $\left(\frac{\pi}{4}\left(\frac{7}{2}\ \text{cm}\right)^2\right) - \left(\frac{1}{2}\cdot\frac{7}{2}\ \text{cm}\cdot\frac{7}{2}\ \text{cm}\right)$

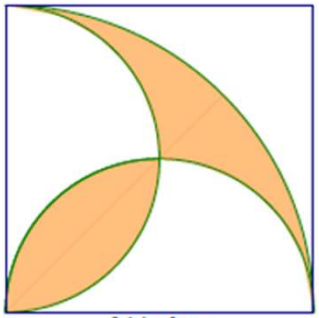
$$= \frac{49\pi}{16}\ \text{cm}^2 - \frac{49}{8}\ \text{cm}^2 = \frac{49}{16}(\pi - 2)\ \text{cm}^2$$

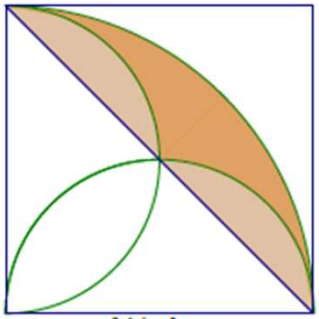
The area of the shaded region is $\frac{49}{16}(\pi - 2)\ cm^2$. *There are* 8 *such regions in the figure, so we multiply this answer by* 8.

Total shaded area: $8\left(\frac{49}{16}(\pi - 2)\right) = \frac{49}{2}(\pi - 2) = \frac{49\pi}{2} - 49$

The exact area of the shaded region is $\left(\frac{49\pi}{2} - 49\right)\ cm^2$.

2. A square with a side length of 14 inches is shown below, along with a quarter circle (with a side of the square as its radius) and two half circles (with diameters that are sides of the square). Write and explain a numerical expression that represents the area of the figure.





Numeric expression for the area: $\frac{1}{4}\pi(14\ in.)^2 - \left(\frac{1}{2}\cdot 14\ in.\cdot 14\ in.\right)$

The shaded area in Figure 1 is the same as the shaded area in Figure 2. This area can be found by subtracting the area of the right triangle with leg lengths of $14\ in.$ *from the area of the quarter circle with a radius of* $14\ in.$

$$\frac{1}{4}\pi(14\ in.)^2 - \left(\frac{1}{2}\cdot 14\ in.\cdot 14\ in.\right) = (49\pi - 98)\ in^2$$