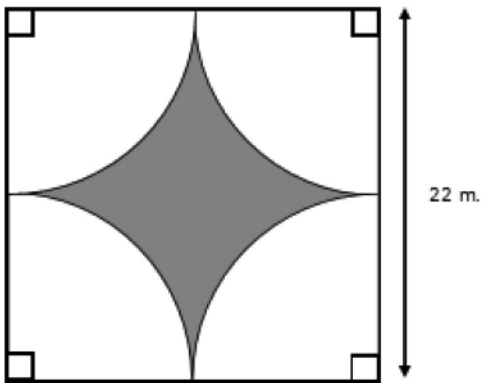Name _____     Date _____
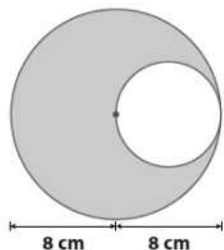
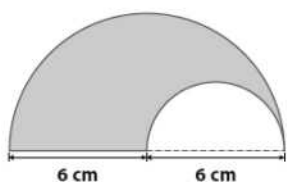## Composite Area Problems

The unshaded regions are quarter circles.  Approximate the area of the shaded region.  Use $\pi \approx 3.14$.

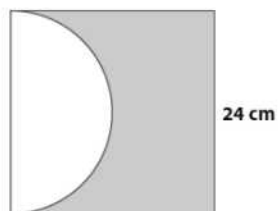

22 m.

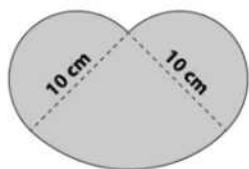1. Find the area of the shaded region. Use $3.14$ for $\pi$.



2. The figure shows two semicircles. Find the area of the shaded region. Use $3.14$ for $\pi$.



3. The figure shows a semicircle and a square. Find the area of the shaded region. Use $3.14$ for $\pi$.



4. The figure shows two semicircles and a quarter of a circle. Find the area of the shaded region. Use $3.14$ for $\pi$.

5. Jillian is making a paper flower motif for an art project. The flower she is making has four petals; each petal is formed by three semicircles as shown below. What is the area of the paper flower? Provide your answer in terms of $\pi$.
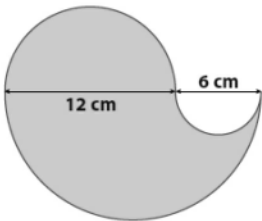


6. The figure is formed by five rectangles. Find the area of the unshaded rectangular region.
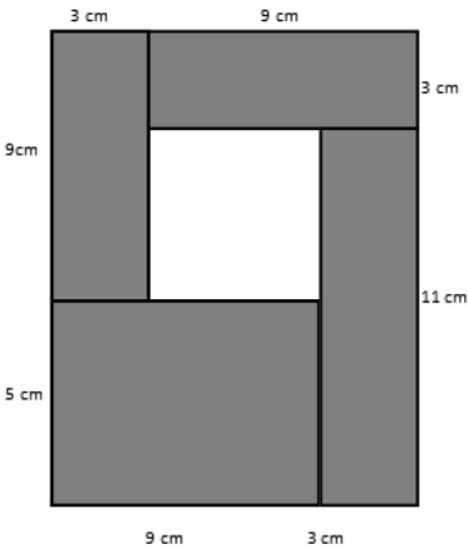


7. The smaller squares in the shaded region each have side lengths of 1.5 m. Find the area of the shaded region.
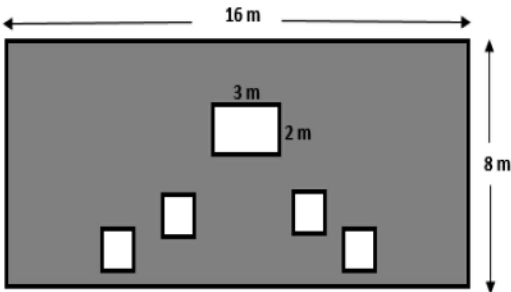
8. Find the area of the shaded region.



9.
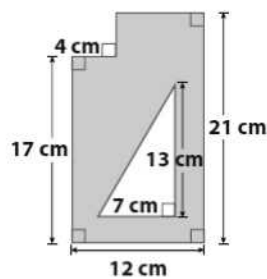
    a.    Find the area of the shaded region.
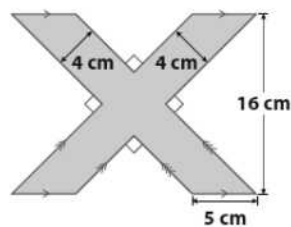


    b.    Draw two ways the figure above can be divided in four equal parts.
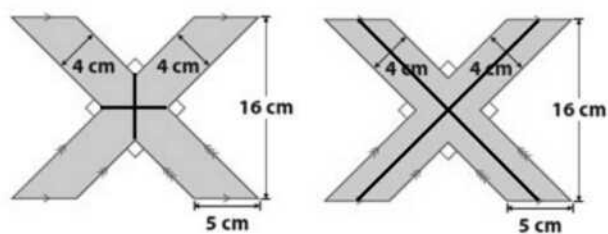


    c.    What is the area of one of the parts in (b)?

10. The figure is a rectangle made out of triangles. Find the area of the shaded region.

11. The figure consists of a right triangle and an eighth of a circle. Find the area of the shaded region. Use $\frac{22}{7}$ for $\pi$.

The unshaded regions are quarter circles. Approximate the area of the shaded region. Use $\pi \approx 3.14$.
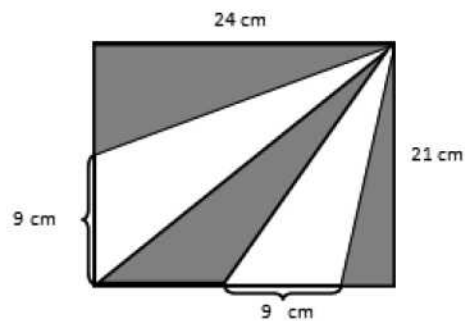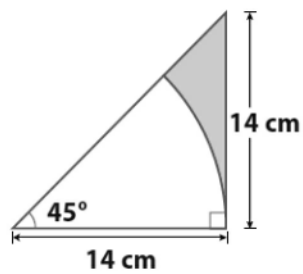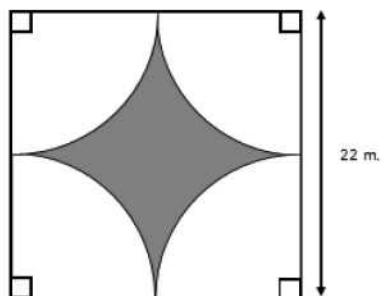
*Area of the square − area of the 4 quarter circles = area of the shaded region*

$(22 \text{ m} \cdot 22 \text{ m}) - ((11 \text{ m})^2 \cdot 3.14)$

$484 \text{ m}^2 - 379.94 \text{ m}^2 = 104.06 \text{ m}^2$

*The area of the shaded region is approximately* $04.06 \text{ m}^2$.



22 m.

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1.  **Find the area of the shaded region. Use $3.14$ for $\pi$.**
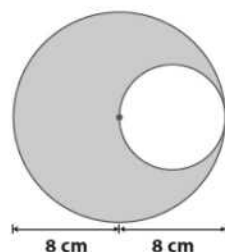
    *Area of large circle– area of small circle*

    $(\pi \times (8 \text{ cm})^2) - (\pi \times (4 \text{ cm})^2)$

    $(3.14)(64 \text{ cm}^2) - (3.14)(16 \text{ cm}^2)$

    $200.96 \text{ cm}^2 - 50.24 \text{ cm}^2 = 150.72 \text{ cm}^2$

    *The area of the region is approximately* $150.72 \text{ cm}^2$.

    

    8 cm    8 cm

2.  **The figure shows two semicircles. Find the area of the shaded region. Use $3.14$ for $\pi$.**
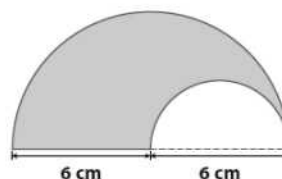
    *Area of large semicircle region − area of small semicircle region = area of the shaded region*

    $\left(\dfrac{1}{2}\right)(\pi \times (6 \text{ cm})^2) - \left(\dfrac{1}{2}\right)(\pi \times (3 \text{ cm})^2)$

    $\left(\dfrac{1}{2}\right)(3.14)(36 \text{ cm}^2) - \left(\dfrac{1}{2}\right)(3.14)(9 \text{ cm}^2)$

    $56.52 \text{ cm}^2 - 14.13 \text{ cm}^2 = 42.39 \text{ cm}^2$

    *The area is approximately* $42.39 \text{ cm}^2$.

    

    6 cm    6 cm

3.  **The figure shows a semicircle and a square. Find the area of the shaded region. Use $3.14$ for $\pi$.**
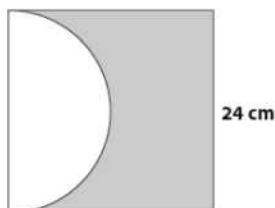
    

    24 cm

    *Area of the square − area of the semicircle*

    $(24 \text{ cm} \times 24 \text{ cm}) - \left(\dfrac{1}{2}\right)(\pi \times (12 \text{ cm})^2)$
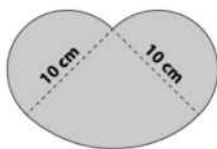
    $576 \text{ cm}^2 - \left(\dfrac{1}{2}\right)(3.14 \times 144 \text{ cm}^2)$

    $576 \text{ cm}^2 - 226.08 \text{ cm}^2 = 349.92 \text{ cm}^2$

    *The area is approximately* $349.92 \text{ cm}^2$.

4. The figure shows two semicircles and a quarter of a circle. Find the area of the shaded region. Use $3.14$ for $\pi$.



*Area of two semicircles + area of quarter of the larger circle*

$$2\left(\frac{1}{2}\right)(\pi \times (5 \text{ cm})^2) + \left(\frac{1}{4}\right)(\pi \times (10 \text{ cm})^2)$$

$$(3.14)(25 \text{ cm}^2) + (3.14)(25 \text{ cm}^2)$$

$$78.5 \text{ cm}^2 + 78.5 \text{ cm}^2 = 157$$

*The area is approximately $157 \text{ cm}^2$.*

5. Jillian is making a paper flower motif for an art project. The flower she is making has four petals; each petal is formed by three semicircles as shown below. What is the area of the paper flower? Provide your answer in terms of $\pi$.
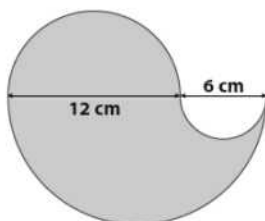


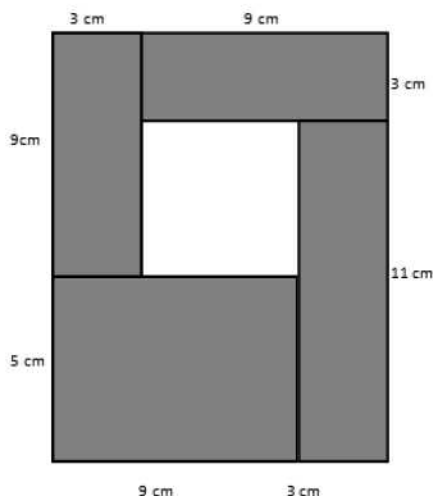*Area of medium semicircle + (area of larger semicircle − area of small semicircle)*

$$\left(\frac{1}{2}\right)(\pi \times (6 \text{ cm})^2) + \left(\left(\frac{1}{2}\right)(\pi \times (9 \text{ cm})^2) - \left(\frac{1}{2}\right)(\pi \times (3 \text{ cm})^2)\right)$$

$$18\pi \text{ cm}^2 + 40.5\pi \text{ cm}^2 - 4.5\pi \text{ cm}^2 = 54\pi \text{ cm}^2$$

$$54\pi \text{ cm}^2 \times 4 = 216\pi \text{ cm}^2$$

*The area is $16\pi \text{ cm}^2$.*

6. The figure is formed by five rectangles. Find the area of the unshaded rectangular region.



*Area of the whole rectangle − area of the sum of the shaded rectangles = area of the unshaded rectangular region*
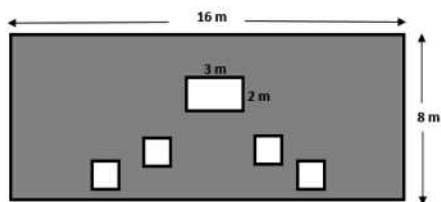
$$(12 \text{ cm} \times 14 \text{ cm}) - \big(2(3 \text{ cm} \times 9 \text{ cm}) + (11 \text{ cm} \times 3 \text{ cm}) + (5 \text{ cm} \times 9 \text{ cm})\big)$$

$$168 \text{ cm}^2 - (54 \text{ cm}^2 + 33 \text{ cm}^2 + 45 \text{ cm}^2)$$

$$168 \text{ cm}^2 - 132 \text{ cm}^2 = 36 \text{ cm}^2$$

*The area is $36 \text{ cm}^2$.*

**7.** The smaller squares in the shaded region each have side lengths of $1.5$ m.  Find the area of the shaded region.



*Area of the $16$ m by $8$ m rectangle $-$ the sum of the area of the smaller unshaded rectangles $=$ area of the shaded region*

$$(16 \text{ m} \times 8 \text{ m}) - \big((3 \text{ m} \times 2 \text{ m}) + (4(1.5 \text{ m} \times 1.5 \text{ m}))\big)$$
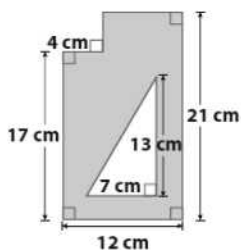
$$128 \text{ m}^2 - \big(6 \text{ m}^2 + 4(2.25 \text{ m}^2)\big)$$

$$128 \text{ m}^2 - 15 \text{ m}^2 = 113 \text{ m}^2$$

$$113 \text{ m}^2$$

*The area is $113$ m$^2$.*

**8.** Find the area of the shaded region.



*Area of the sum of the rectangles $-$ area of the right triangle $=$ area of shaded region*

$$\big((17 \text{ cm} \times 4 \text{ cm}) + (21 \text{ cm} \times 8 \text{ cm})\big) - \left(\left(\frac{1}{2}\right)(13 \text{ cm} \times 7 \text{ cm})\right)$$
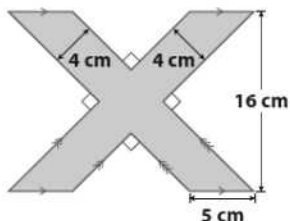
$$(68 \text{ cm}^2 + 168 \text{ cm}^2) - \left(\frac{1}{2}\right)(91 \text{ cm}^2)$$

$$236 \text{ cm}^2 - 45.5 \text{ cm}^2 = 190.5 \text{ cm}^2$$

*The area is $190.5$ cm$^2$.*

**9.**
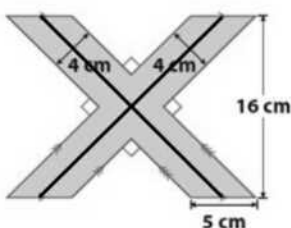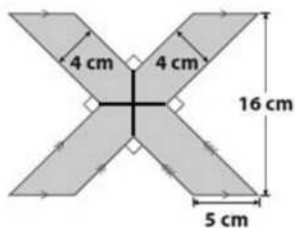
    **a.** Find the area of the shaded region.



*Area of the two parallelograms $-$ area of square in the center $=$ area of the shaded region*

$$2(5 \text{ cm} \times 16 \text{ cm}) - (4 \text{ cm} \times 4 \text{ cm})$$

$$160 \text{ cm}^2 - 16 \text{ cm}^2 = 144 \text{ cm}^2$$

*The area is $144$ cm$^2$.*

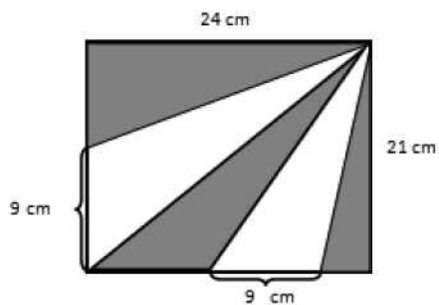    **b.** Draw two ways the figure above can be divided in four equal parts.



    **c.** What is the area of one of the parts in (b)?

$$144 \text{ cm}^2 \div 4 = 36 \text{ cm}^2$$

*The area of one of the parts in (b) is $6$ cm$^2$.*

10. The figure is a rectangle made out of triangles. Find the area of the shaded region.

24 cm

21 cm

9 cm

9 cm

*Area of the rectangle − area of the unshaded triangles = area of the shaded region*
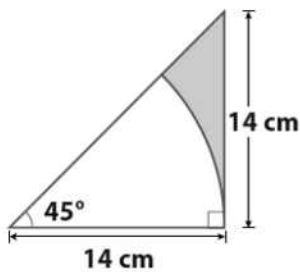
$$(24 \text{ cm} \times 21 \text{ cm}) - \left(\left(\frac{1}{2}\right)(9 \text{ cm} \times 21 \text{ cm}) + \left(\frac{1}{2}\right)(9 \text{ cm} \times 24 \text{ cm})\right)$$

$$504 \text{ cm}^2 - (94.5 \text{ cm}^2 + 108 \text{ cm}^2)$$

$$504 \text{ cm}^2 - 202.5 \text{ cm}^2 = 301.5 \text{ cm}^2$$

*The area is $301.5 \text{ cm}^2$.*

11. The figure consists of a right triangle and an eighth of a circle. Find the area of the shaded region. Use $\dfrac{22}{7}$ for $\pi$.

14 cm

45°

14 cm

*Area of right triangle − area of eighth of the circle = area of shaded region*

$$\left(\frac{1}{2}\right)(14 \text{ cm} \times 14 \text{ cm}) - \left(\frac{1}{8}\right)(\pi \times 14 \text{ cm} \times 14 \text{ cm})$$

$$\left(\frac{1}{2}\right)(196 \text{ cm}^2) - \left(\frac{1}{8}\right)\left(\frac{22}{7}\right)(2 \text{ cm} \times 7 \text{ cm} \times 2 \text{ cm} \times 7 \text{ cm})$$

$$98 \text{ cm}^2 - 77 \text{ cm}^2 = 21 \text{ cm}^2$$

*The area is approximately $21 \text{ cm}^2$.*