

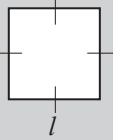
# 25. [Area]

## Skill 25.1 Calculating the area of squares and rectangles.

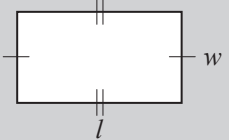
MMMaue 11 22 33 44  
MMLime 11 22 33 44

- Substitute known values into the appropriate formula:

Area of a square = length  $\times$  length  
 $A = l^2$



Area of a rectangle = length  $\times$  width  
 $A = lw$



- Q.** A boxing ring is a square with side length 5.2 m. What is the area of the ring?

**A.**  $A = l^2$  where  $l = 5.2$   
 $= 5.2 \times 5.2$  m  
 $= 27.04$  m<sup>2</sup>

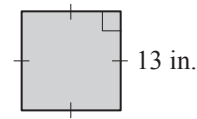
- a)** What is the area of a rectangular billiard table with a length of 3.7 m and a width of 1.9 m?

$A = l \times w$  where  $l = 3.7$  and  $w = 1.9$

$= 3.7 \times 1.9$

**7.03** m<sup>2</sup>

- b)** Find the area of the square.

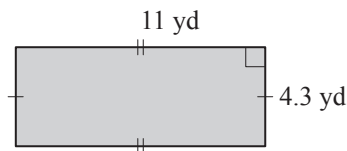


$A =$

$=$

**in.**<sup>2</sup>

- c)** Find the area of the rectangle.



$A =$

$=$

**yd**<sup>2</sup>

- d)** A baseball diamond is a square of side length of 90 ft. What is its area?

$A =$

$=$

**ft**<sup>2</sup>

- e)** The rectangular grounds of the Taj Mahal are 360 m long and 260 m wide. What is this area?

$A = l \times w$

$=$

**m**<sup>2</sup>

- f)** A rectangular badminton court measures 44 ft long and 20 ft wide. What is the area?

$A =$

$=$

**ft**<sup>2</sup>

- g)** The sport of fencing uses a rectangular space with a length of 14 m and a width of 2 m. What is the area of the fencing surface?

**m**<sup>2</sup>

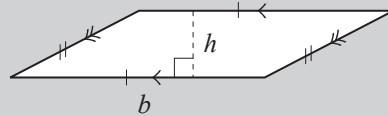
- h)** Paddy's rectangular iPod screen has a length of 30 mm and a width of 24 mm. What is the area of the iPod screen?

**mm**<sup>2</sup>

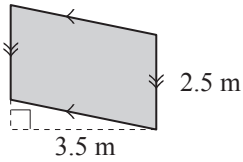
**Skill 25.2** Calculating the area of parallelograms.

- Substitute known values into the formula:

Area of a parallelogram = base  $\times$  height  
 $A = bh$

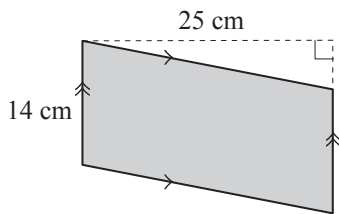


**Q.** Find the area of the parallelogram.



**A.**  $A = bh$  where  $b = 2.5$  and  $h = 3.5$   
 $= 2.5 \times 3.5 \text{ m}$   
 $= 8.75 \text{ m}^2$

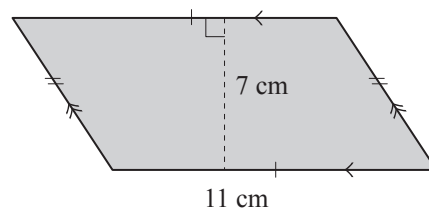
**a)** Find the area of the parallelogram.



$A = bh$  where  $b = 14$  and  $h = 25$

$= 14 \times 25 = \boxed{\text{cm}^2}$

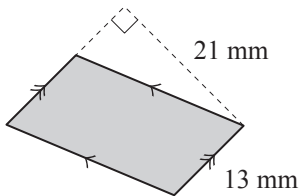
**b)** Find the area of the parallelogram.



$A =$

$= = \boxed{\text{cm}^2}$

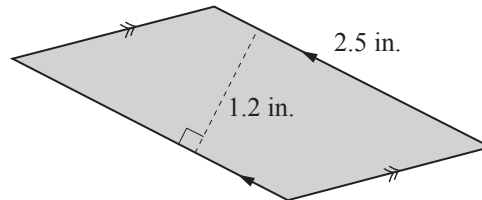
**c)** Find the area of the parallelogram.



$A =$

$= = \boxed{\text{mm}^2}$

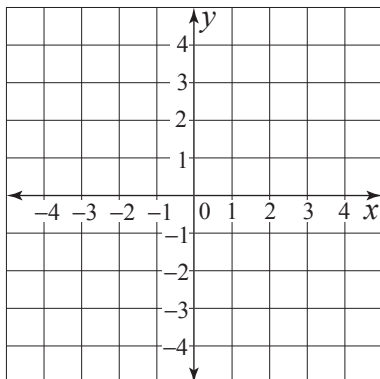
**d)** Find the area of the parallelogram.



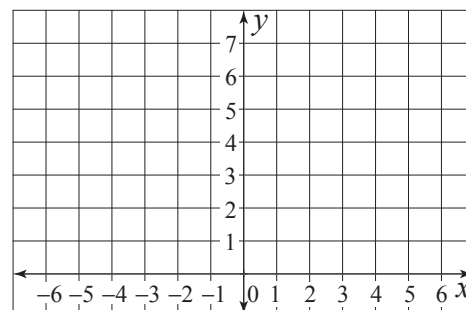
$A =$

$= = \boxed{\text{in.}^2}$

**e)** Graph the points  $A(-4,3)$ ,  $B(2,3)$ ,  $C(3,-2)$  and  $D(-3,-2)$  and use them to find the area of  $ABCD$ .



**f)** Graph the points  $A(1,5)$ ,  $B(6,5)$ ,  $C(-1,2)$  and  $D(-6,2)$  and use them to find the area of  $ABCD$ .

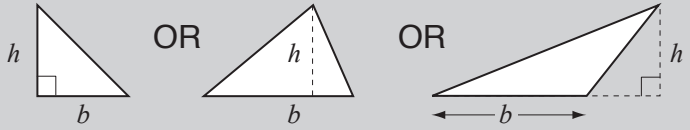


### Skill 25.3 Calculating the area of triangles.

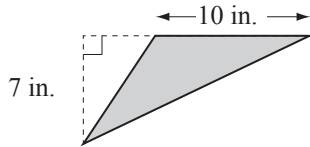
- Substitute known values into the formula:

$$\text{Area of a triangle} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$A = \frac{1}{2}bh$$



- Q.** Find the area of the scalene triangle.



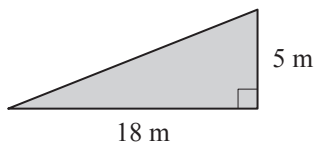
**A.**  $A = \frac{1}{2}bh$  where  $b = 10$  and  $h = 7$

$$= \frac{1}{2} \times 10 \times 7$$

Simplify:  $\div 2$

$$= 35 \text{ in.}^2$$

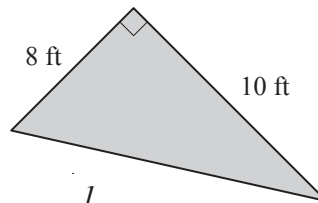
- a)** Find the area of the right triangle.



$$A = \frac{1}{2}bh \text{ where } b = 18 \text{ and } h = 5$$

$$= \frac{1}{2} \times 18 \times 5 = \boxed{\phantom{000}} \text{ m}^2$$

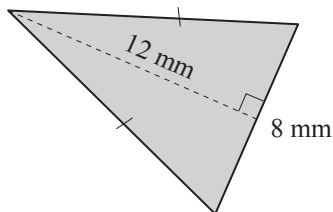
- b)** Find the area of the right triangle.



$$A = \frac{1}{2}$$

$$= \phantom{000} = \boxed{\phantom{000}} \text{ ft}^2$$

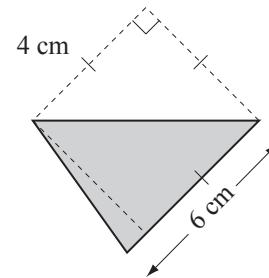
- c)** Find the area of the isosceles triangle.



$$A = \frac{1}{2}$$

$$= \phantom{000} = \boxed{\phantom{000}} \text{ mm}^2$$

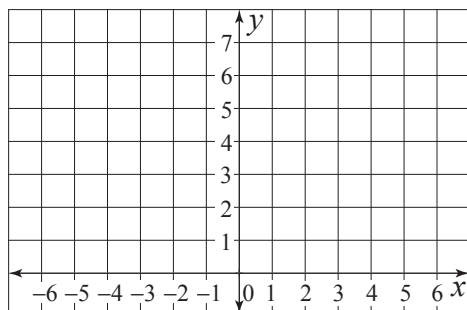
- d)** Find the area of the shaded scalene triangle.



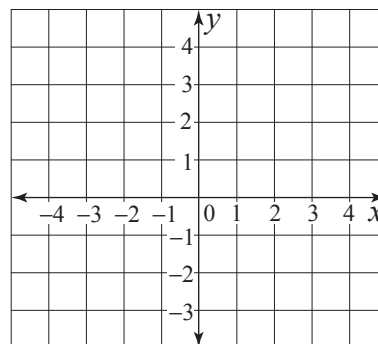
$$A =$$

$$= \phantom{000} = \boxed{\phantom{000}} \text{ cm}^2$$

- e)** Graph the points  $A(-6,2)$ ,  $B(-2,6)$  and  $C(5,2)$  and use them to find the area of  $\triangle ABC$ .




- f)** Graph the points  $A(-2,3)$ ,  $B(3,3)$  and  $C(-2,-3)$  and use them to find the area of  $\triangle ABC$ .

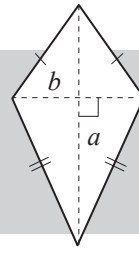


**Skill 25.4** Calculating the area of rhombi and kites.

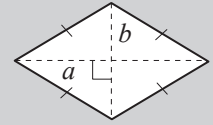
- Substitute known values into the formula:

Area of a kite or rhombus =  $\frac{1}{2} \times a \times b$  (where  $a$  is the long diagonal and  $b$  is the short diagonal)

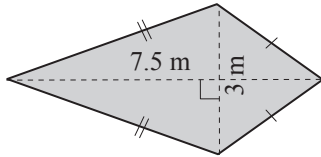
$$A = \frac{1}{2} ab$$



OR

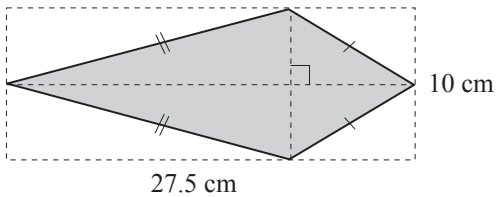


- Q.** Find the area of the kite.



**A.**  $A = \frac{1}{2} ab$  where  $a = 7.5$  and  $b = 3$   
 $= \frac{1}{2} \times 7.5 \times 3$   
 $= 11.25 \text{ m}^2$

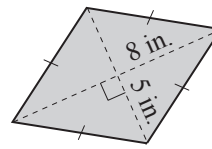
- a)** Find the area of the kite.



$A = \frac{1}{2} ab$  where  $a = 27.5$  and  $b = 10$

$= \frac{1}{2} \times 27.5 \times 10 = \boxed{\text{cm}^2}$

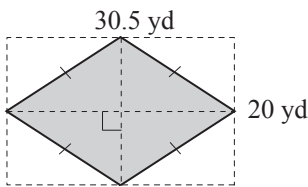
- b)** Find the area of the rhombus.



$A = \frac{1}{2} ab$

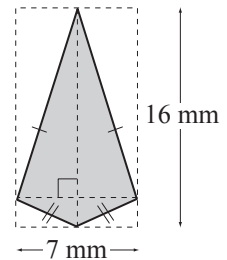
$= \boxed{\text{in.}^2}$

- c)** Find the area of the rhombus.



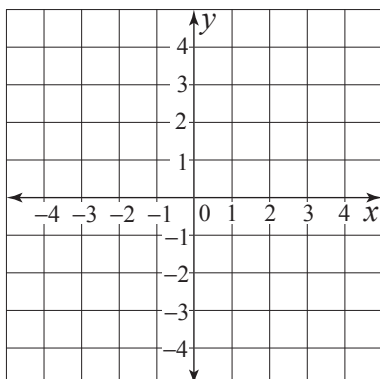
$A =$   
 $= \boxed{\text{yd}^2}$

- d)** Find the area of the kite.

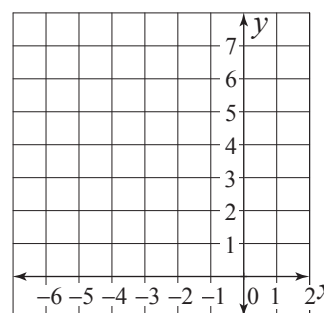


$A =$   
 $= \boxed{\text{mm}^2}$

- e)** Graph the points  $A(0,4)$ ,  $B(2,2)$ ,  $C(0,-3)$  and  $D(-2,2)$  and use them to find the area of the kite  $ABCD$ .



- f)** Graph the points  $A(-4,6)$ ,  $B(-2,3)$ ,  $C(-4,0)$  and  $D(-6,3)$  and use them to find the area of the rhombus  $ABCD$ .

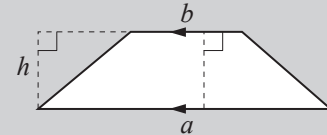


# Skill 25.5 Calculating the area of trapezoids.

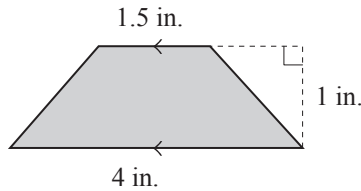
- Substitute known values into the formula:

Area of a trapezoid =  $\frac{1}{2} \times (a + b) \times \text{height}$  (where  $a$  and  $b$  are the parallel side lengths)

$$A = \frac{1}{2} (a + b)h$$



**Q.** Find the area of the trapezoid.



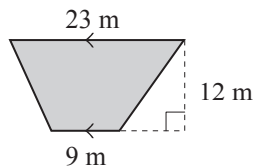
**A.**  $A = \frac{1}{2}(a + b)h$  where  $a = 4$ ,  $b = 1.5$  and  $h = 1$

$$= \frac{1}{2} \times (4 + 1.5) \times 1$$

$$= \frac{1}{2} \times 5.5$$

$$= 2.75 \text{ in.}^2$$

**a)** Find the area of the trapezoid.

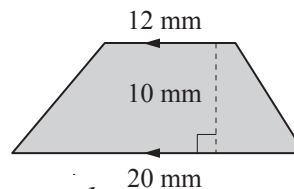


$$A = \frac{1}{2}(a + b)h = \frac{1}{2} \times (23 + 9) \times 12$$


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$$= \frac{1}{2} \times 32 \times 12 = \boxed{\text{m}^2}$$

**b)** Find the area of the trapezoid.

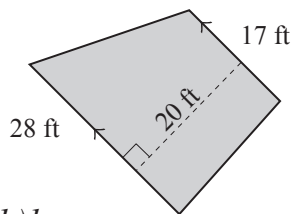


$$A = \frac{1}{2}(a + b)h =$$


---


$$= \boxed{\text{mm}^2}$$

**c)** Find the area of the trapezoid.

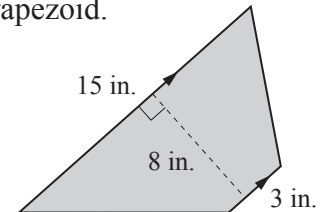


$$A = \frac{1}{2}(a + b)h =$$


---


$$= \boxed{\text{ft}^2}$$

**d)** Find the area of the trapezoid.

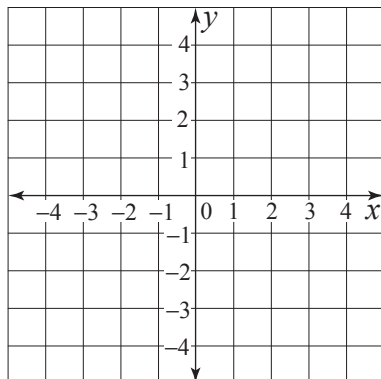


$$A =$$

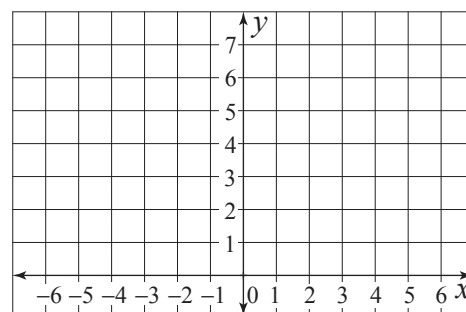

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$$= \boxed{\text{in.}^2}$$

**e)** Graph the points  $A(0,4)$ ,  $B(3,4)$ ,  $C(3,-2)$  and  $D(-4,-2)$  and use them to find the area of the trapezoid  $ABCD$ .




**f)** Graph the points  $A(-4,5)$ ,  $B(4,6)$ ,  $C(4,1)$  and  $D(-4,4)$  and use them to find the area of the trapezoid  $ABCD$ .

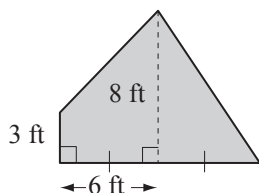


**Skill 25.6** Calculating the area of composite shapes (1).

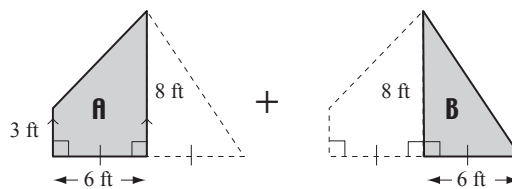
MMMaive 1 1 2 2 3 4 4  
MMLime 1 1 2 2 3 3 4 4

- Find and label the length of all sides.
- Break the shape into workable parts.
- Where possible substitute values into a known area formula.  
(see skills 25.1 to skill 25.5, pages 291 to 295)
- Add or subtract the area totals where necessary.

**Q.** Find the area of the plane figure.



**A.**



$$A_1 = \frac{1}{2}(a + b)h \text{ where } a = 3, b = 6 \text{ and } h = 8$$

$$= \frac{1}{2} \times (3 + 6) \times 8$$

$$\mathbf{A} = \frac{1}{2} \times 9 \times 8 = 36$$

trapezoid A

$$A_2 = \frac{1}{2}bh \text{ where } b = 6 \text{ and } h = 8$$

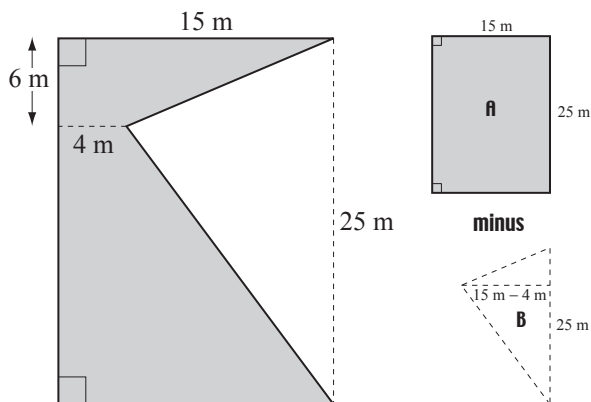
$$= \frac{1}{2} \times 6 \times 8$$

$$\mathbf{B} = \frac{1}{2} \times 48 = 24$$

triangle B

$$A = 36 + 24 = 60 \text{ ft}^2$$

**a)** Find the area of the shape.



$$A_1 = lw \text{ where } l = 25 \text{ and } w = 15 \text{ (for rectangular area A)}$$

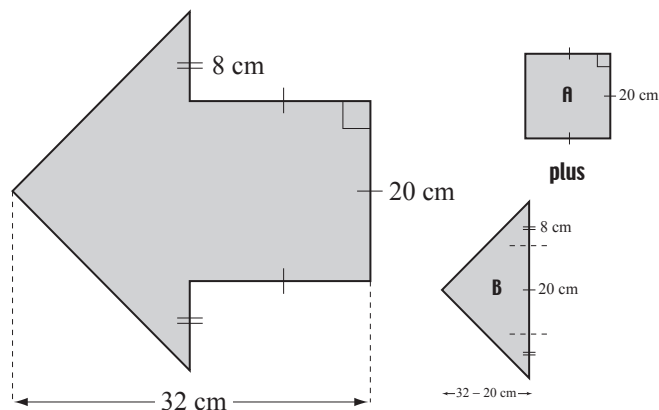
$$= 25 \times 15 = 375$$

$$A_2 = \frac{1}{2}bh \text{ where } b = 11 \text{ and } h = 6 \text{ (for triangular area B)}$$

$$= \frac{1}{2} \times 11 \times 6 = \frac{1}{2} \times 66 = 33$$

$$A = 375 - 33 = 342 \text{ m}^2$$

**b)** Find the area of the plane figure.



$$A_1 = l^2 \text{ (for square area A)}$$

$$= 20 \times 20 = 400$$

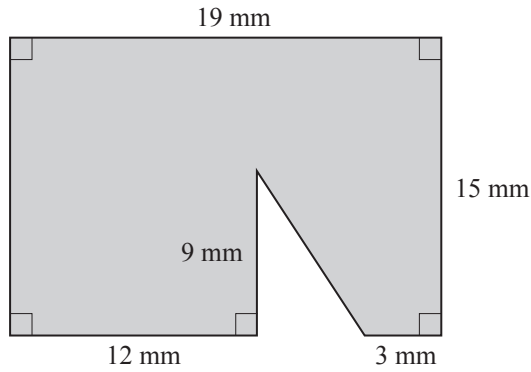
$$A_2 = \frac{1}{2}bh \text{ (for triangular area B)}$$

$$= \frac{1}{2} \times 32 \times 8 = 128$$

$$A = 400 - 128 = 272 \text{ cm}^2$$

**Skill 25.6** Calculating the area of composite shapes (2).

**c)** Find the area of the shape.



$A_1 =$  .....

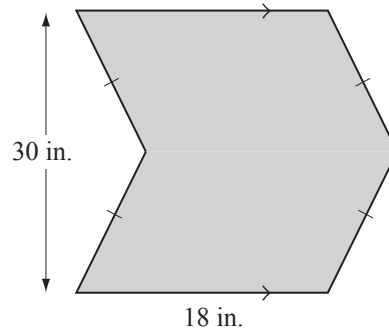
=

$A_2 =$  .....

=

*shape* = ..... =

**d)** Find the area of the plane figure.



$A_1 =$  .....

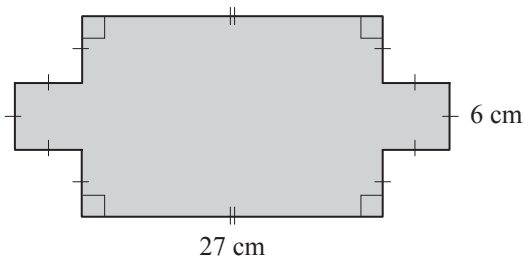
=

$A_2 =$  .....

=

*shape* = ..... =

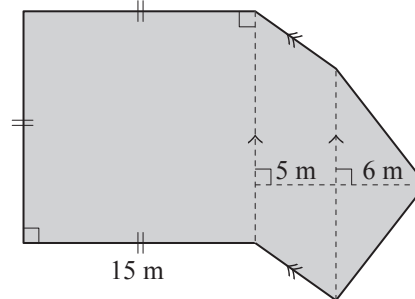
**e)** Find the area of the shape.



.....  
 .....  
 .....

*shape* = ..... =

**f)** Find the area of the plane figure.



.....  
 .....  
 .....

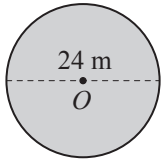
*shape* = ..... =

**Skill 25.7** Calculating the area of circles.

- Substitute known values into the formula:  
Hint: The diameter of a circle is equal to twice the radius.  
Pi ( $\pi$ ) gets its value because the diameter of any circle fits approximately 3.14 times around the circumference.

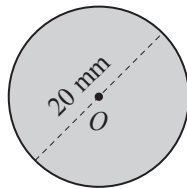
Area of a circle =  $\pi \times \text{radius} \times \text{radius}$   
 $A = \pi r^2$   
 where  $\pi \approx 3.14...$  or  $\frac{22}{7}$

- Q.** Using  $A = \pi r^2$  where  $\pi \approx 3.14$ , find the area of the circle.



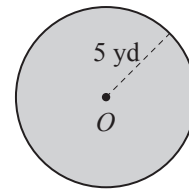
**A.**  $A = \pi r^2$  where  $d = 24$  so  $r = 12$   
 $= 3.14 \times 12 \times 12$   
 $= 3.14 \times 144$   
 $= 452.16 \text{ m}^2$

- a)** Using  $A = \pi r^2$  where  $\pi \approx 3.14$ , find the area of the circle.



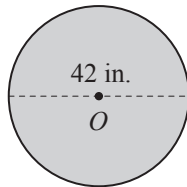
$A = \pi r^2$  where  $d = 20$  and  $r = 10 \text{ mm}$   
 $= 3.14 \times 10 \times 10$   
 $= 3.14 \times 100 = \boxed{\text{mm}^2}$

- b)** Using  $A = \pi r^2$  where  $\pi \approx 3.14$ , find the area of the circle.



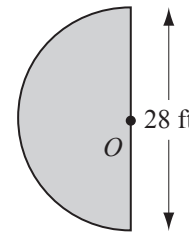
$A = \pi r^2$   
 $=$   
 $=$   $= \boxed{\text{yd}^2}$

- c)** Using  $A = \pi r^2$  where  $\pi \approx \frac{22}{7}$ , find the area of the circle.



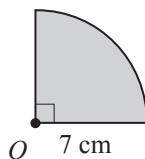
$A =$   
 $\text{shape} = \boxed{\text{in.}^2}$

- d)** Using  $\pi \approx \frac{22}{7}$  find the area of the semicircle.



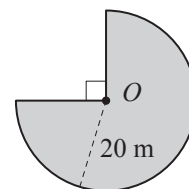
$A =$   
 $\text{shape} = \boxed{\text{ft}^2}$

- e)** Using  $\pi \approx \frac{22}{7}$  find the area of the quarter circle.



$A =$   
 $\text{shape} = \boxed{\text{cm}^2}$

- f)** Using  $\pi \approx 3.14$  find the area of the shape.

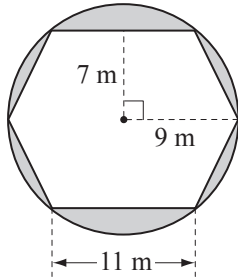


$A =$   
 $\text{shape} = \boxed{\text{m}^2}$

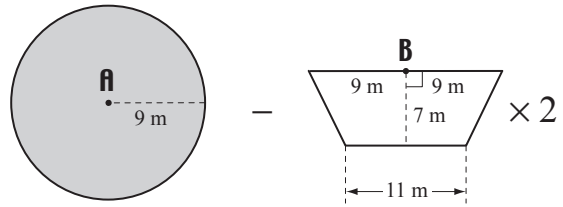
**Skill 25.8** Calculating the area of composite circular shapes (1).

- Find and label the length of all sides.
- Break the shape into workable parts.
- Where possible substitute values into a known area formula.  
(see skills 25.1 to 25.5, pages 291 to 295 and skill 25.7, page 298)
- Add or subtract the area totals where necessary.

**Q.** Use  $A = \pi r^2$  where  $\pi \approx 3.14$  to find the area of the shaded shape.



**A.**



$$A_1 = \pi r^2 \text{ where } r = 9$$

$$= 3.14 \times 9 \times 9$$

$$= 3.14 \times 81$$

$$A = 254.34$$

circle A

$$A_2 = \frac{1}{2}(a + b)h \text{ where } a = 18, b = 11 \text{ and } h = 7$$

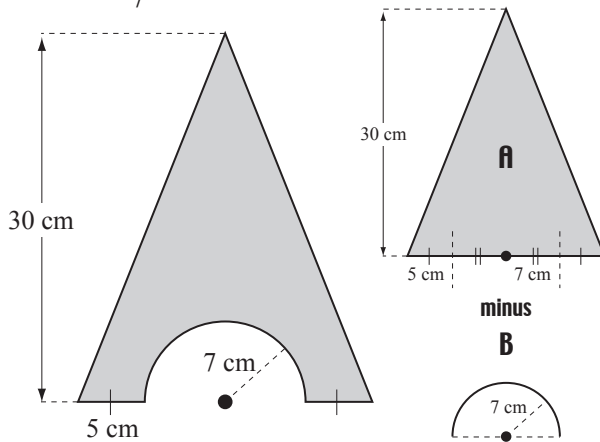
$$= \frac{1}{2} \times (18 + 11) \times 7 = \frac{1}{2} \times 203$$

$$B = \frac{1}{2} \times 203 \times 2 = 203$$

trapezoid  $\times 2$  B

$$A = 254.34 - 203 = 51.34 \text{ m}^2$$

**a)** Use  $\pi \approx \frac{22}{7}$  to find the shaded area.



$$A_1 = \frac{1}{2}bh \text{ where } b = 5 + 7 + 7 + 5 \text{ and } h = 30 \text{ (for triangular area A)}$$

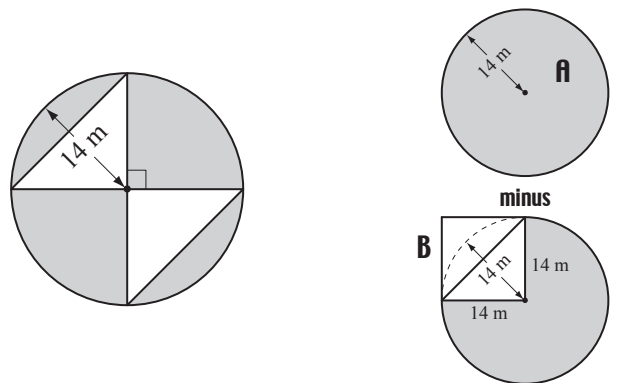
$$= \frac{1}{2} \times 24 \times 30 = 360$$

$$A_2 = \frac{1}{2}\pi r^2 \text{ where } r = 7 \text{ (for semicircular area B)}$$

$$= \frac{1}{2} \times \frac{22}{7} \times 7 \times 7 = 11 \times 7 = 77$$

$$A = 360 - 77 = \boxed{\phantom{000}} \text{ cm}^2$$

**b)** Use  $\pi \approx \frac{22}{7}$  to find the shaded area.



$$A_1 = \pi r^2 \text{ where } r = 14 \text{ (for circular area A)}$$

$$= \phantom{000} = \phantom{000}$$

$$A_2 = l^2 \text{ (for square area B)}$$

$$= \phantom{000} = \phantom{000}$$

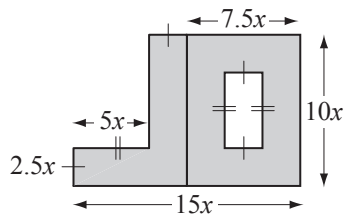
$$A = \phantom{000} = \boxed{\phantom{000}} \text{ m}^2$$



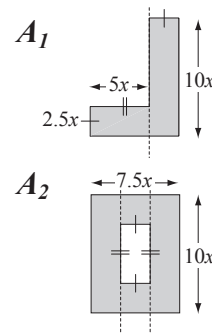
### Skill 25.9 Expressing the area of two-dimensional shapes in algebraic form (1).

- Break the shape up into workable parts.
- Write the formula for each part separately.
- Add the parts.

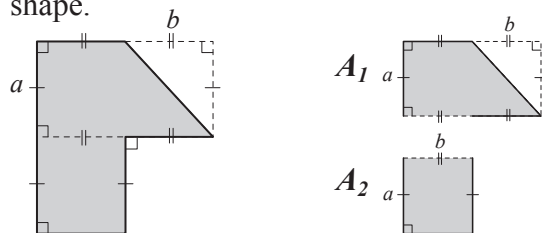
**Q.** Write a formula for the perimeter  $A$  of the shape.



**A.**  $A_1 = 10x \cdot 2.5x + 5x \cdot 2.5x$   
 $= 25x + 12.5x$   
 $= 37.5x$   
 $A_2 = 10x \cdot 7.5x - 5 \cdot 2.5x$   
 $= 75x - 12.5x$   
 $= 62.5x$   
 $A = A_1 + A_2$   
 $= 37.5x + 62.5x$   
 $= 100x$



**a)** Write a formula for the area  $A$  of the shaded shape.



$A_1 = lw - \frac{1}{2}bh = a \cdot 2b - \frac{1}{2}ba = \frac{3ab}{2}$

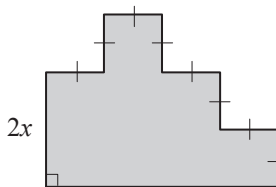
$A_2 = lw = a \cdot b = ab$

$A = A_1 + A_2$

$A = \frac{3ab}{2} + ab$

$A = \frac{5ab}{2}$

**b)** Write a formula for the area  $A$  of the shaded shape.



$A_1 =$

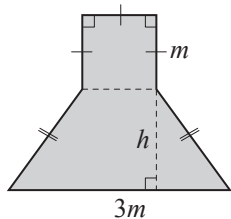
$A_2 =$

$A_3 =$

$A =$

$A =$

**c)** Write a formula for the area  $A$  of the shaded shape.



$=$

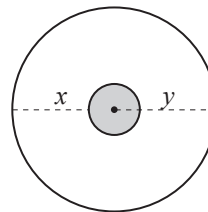
$=$

$=$

$A =$

$A =$

**d)** Write a formula for the area  $A$  of the shaded shape.



$=$

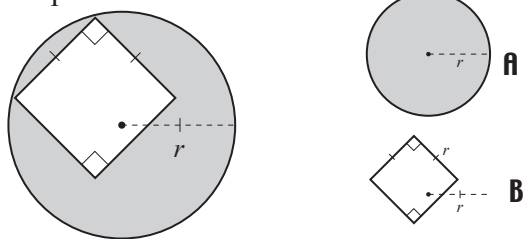
$A =$

$A =$

**Skill 25.9** Expressing the area of two-dimensional shapes in algebraic form (2).

MMMaue 11 22 33 44  
MMLime 11 22 33 44

**e)** Write a formula for the area  $A$  of the shaded shape.



$A_1 = \pi r^2$  (for circular area **A**)

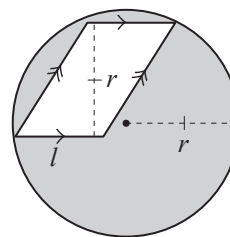
$A_2 = l^2$  (for square area **B**)

$= r^2$

$A =$

$A =$

**f)** Write a formula for the area  $A$  of the shaded shape.



$A_1 =$

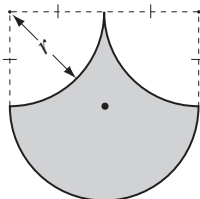
$A_2 =$

$=$

$A =$

$A =$

**g)** Write a formula for the area  $A$  of the shaded shape.



$=$

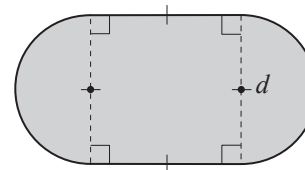
$=$

$=$

$A =$

$A =$

**h)** Write a formula for the area  $A$  of the shaded shape.



$=$

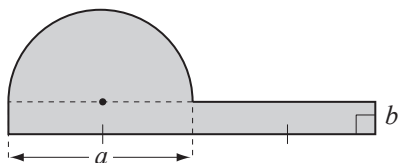
$=$

$=$

$A =$

$A =$

**i)** Write a formula for the area  $A$  of the shaded shape.



$A_{rectangle} =$

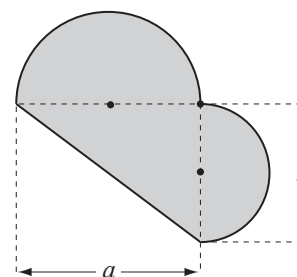
$A_{semicircle} =$

$=$

$A =$

$A =$

**j)** Write a formula for the area  $A$  of the shaded shape.



$A_{triangle} =$

$A_{semicircle 1} =$

$A_{semicircle 2} =$

$A =$

$A =$

**Skill 25.10** Finding the area of a shape when the height, or the diagonal, or the perimeter of the shape is given.

- Draw a diagram if necessary and mark all the information given.
- Use the appropriate formula to deduce the area.

**Q.** If the circumference of a round pizza is 22 inches, its area will be  $\frac{121}{\pi}$  in.<sup>2</sup> True or false?

**A.**  $C = 2\pi r$  where  $C = 22$  in.

$$22 = 2\pi r$$

$$r = \frac{22}{2\pi} \Rightarrow r = \frac{11}{\pi}$$

$$A = \pi r^2$$

Substitute the value of  $r$  into the area formula:

$$A = \pi \times \left(\frac{11}{\pi}\right)^2 = \pi \times \frac{121}{\pi^2} = \frac{121}{\pi}$$

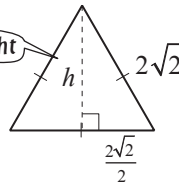
The answer is **true**.

**a)** If the side length of an equilateral triangle is  $2\sqrt{2}$ , find its area.

Use Pythag. to find height

$$h^2 + \left(\frac{2\sqrt{2}}{2}\right)^2 = (2\sqrt{2})^2$$

$$h^2 + 2 = 8 \Rightarrow h^2 = 6 \Rightarrow h = \sqrt{6}$$



Use Area of  $\Delta$

$$A = \frac{1}{2}(2\sqrt{2} \times \sqrt{6}) = \sqrt{12} =$$

**b)** The area of a square pen is 361 yd<sup>2</sup>. What length is a side of the pen?

.....

.....

..... =  yd

**c)** If the diagonal of a square is 10 in., find its area.

.....

.....

..... =  in.<sup>2</sup>

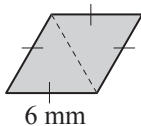
**d)** What is the area of an equilateral triangle with a side length of  $2\sqrt{5}$  ft? [Hint: Pythagorean theorem will help.]

.....

.....

..... =  ft<sup>2</sup>

**e)** What is the area of the rhombus? [Reduce the radical to simplest form.]



.....

.....

..... =  mm<sup>2</sup>

**f)** If the circumference of a circle is 30 mm, its area will be  $\frac{215}{\pi}$  mm<sup>2</sup>. True or false?

.....

.....

..... =