



# Applying Area of Circles

Let's find the areas of shapes made up of circles.

## 9.1

## Math Talk: Expressions with Variables

For each expression, find an equivalent expression with fewer terms.

- $a + a + a + a$

- $a + a + a + b + b$

- $9x - x$

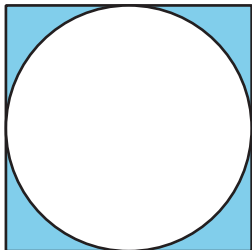
- $5 + 6x + 7$

## 9.2

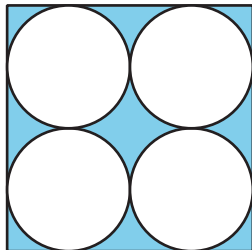
## Comparing Areas Made of Circles

1. Each square has a side length of 12 units. Compare the areas of the shaded regions in the 3 figures. Which figure has the largest shaded region? Explain or show your reasoning.

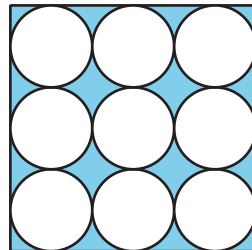
**A**



**B**

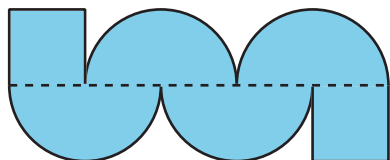


**C**

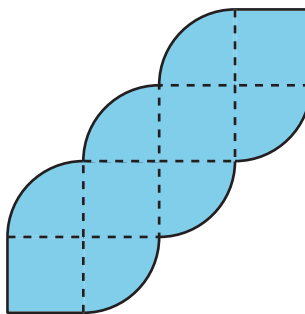


2. Each square in Figures D and E has a side length of 1 unit. Compare the area of the two figures. Which figure has more area? How much more? Explain or show your reasoning.

**D**



**E**



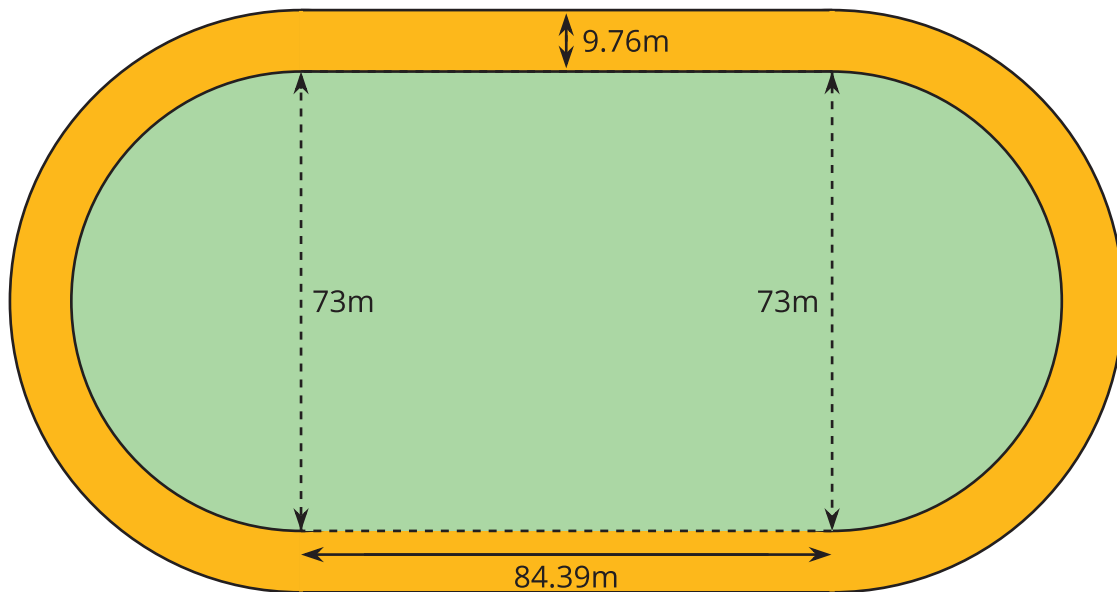
**Are you ready for more?**

Which figure has a longer perimeter, Figure D or Figure E? How much longer?

## 9.3

## The Running Track Revisited

The field inside a running track is made up of a rectangle 84.39 m long and 73 m wide, together with a half-circle at each end. The running lanes are 9.76 m wide all the way around.



What is the area of the running track that goes around the field? Explain or show your reasoning.

## Lesson 9 Summary

The relationship between  $A$ , the area of a circle, and  $r$ , its radius, is  $A = \pi r^2$ . We can use this to find the area of a circle if we know the radius. For example, if a circle has a radius of 10 cm, then the area is  $\pi \cdot 10^2$ , or  $100\pi \text{ cm}^2$ . We can also use the formula to find the radius of a circle if we know the area. For example, if a circle has an area of  $49\pi \text{ m}^2$  then its radius is 7 m and its diameter is 14 m.

Sometimes instead of leaving  $\pi$  in expressions for the area, a numerical approximation can be helpful. For the examples above, a circle of radius 10 cm has an area of about  $314 \text{ cm}^2$ . In a similar way, a circle with an area of  $154 \text{ m}^2$  has a radius of about 7 m.

We can also figure out the area of a fraction of a circle. For example, the figure shows a circle divided into 3 pieces of equal area. The shaded part has an area of  $\frac{1}{3}\pi r^2$ .

