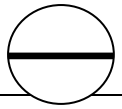
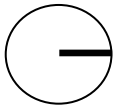
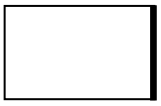
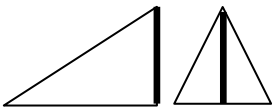
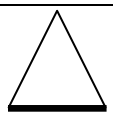
Finding Areas of Shapes

Bakers often need to know the area of a shape in order to plan their work.
A few formulas are required to find area.

First, some vocabulary:

Diameter	The distance from one edge of a circle to the other, passing through the center	
Radius	The distance from the centre of a circle to the outside edge	
Circumference	The length of the outside edge of a circle	
Area	The total of the inside of a shape	
Length	The longest side of a rectangle	
Width	The shortest side of a rectangle	
Perimeter	The distance around the outside edge of a rectangle or triangle	
Height	The distance from the base to the highest point of a triangle	
Base	The bottom edge of a triangle	

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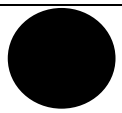
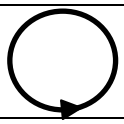
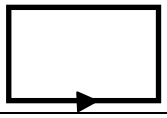
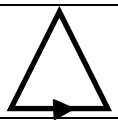
The formulas:

	Area of a circle	$A = 3.14 \times radius \times radius$
	Circumference of a circle	$C = 3.14 \times diameter$
	Area of a rectangle	$A = length \times width$
	Perimeter of a rectangle	$P = length + length + width + width$
	Area of a triangle	$A = \frac{1}{2} \times base \times height$
	Perimeter of a triangle	$P = side + side + side$

Example 1: Find the area of a circle with a diameter of 5.45 cm.

Answer:	First, choose the correct formula.	$A = 3.14 \times radius \times radius$
	Convert the diameter to radius. $diameter = 2 \times radius$ $radius = \frac{diameter}{2}$	$radius = \frac{5.45}{2}$ = 2.725 cm
	Plug the radius into the formula for area and solve.	$A = 3.14 \times 2.725cm \times 2.725cm$ $A = 23.32cm^2$

Example 2: Tara is making a multi-tier wedding cake. She plans to edge each tier of the cake stand with ribbon. If she uses cake stands with diameters of 14, 11, 8 and 5 inches, how much ribbon should she buy?

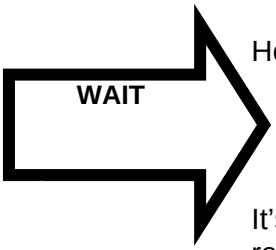
Answer:	First, identify which formula to use. The question is asking about the outside edge of the cake stands. The outside edge is the circumference.	$C = 3.14 \times diameter$

	Plug the diameter into the formula, and find the circumference of each tier.	$C = 3.14 \times 14\,in$ $C = 43.96\,in$ $C = 3.14 \times 11\,in$ $C = 34.54\ in$ $C = 3.14 \times 8\,in$ $C = 25.12\,in$ $C = 3.14 \times 5\,in$ $C = 15.70\,in$
	Add the circumferences for the tiers together to find the total length of ribbon needed.	$43.96 \text{ in} + 34.54 \text{ in}$ $+ 25.12 \text{ in} + 15.70 \text{ in}$ $= 119.32 \text{ in}$

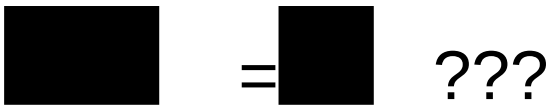
Example 3: Veronica is going to make brownies. The recipe that she wants to use calls for a $8in \times 8in$ pan, but all she has is a $9in \times 12in$ lasagna pan. If she doubles the recipe, will the brownies come out the same?

Answer:	First, choose the correct formula.	Area of a rectangle $A = length \times width$
	The total area of the two different pan sizes is what's important. We want to know if a $9in \times 12in$ pan is twice as big as an $8in \times 8in$ pan.	$A = 8in \times 8in$ $A = 64in^2$ $A = 9in \times 12in$ $A = 108in^2$
	The area of the lasagna pan is less than double the area of the smaller pan ($108/2 = 54$). If she doubles the recipe the brownies will be thicker than the recipe intends.	

In the last example, the $8in \times 8in$ pan was a square, but we used the rectangle formula to find the area.



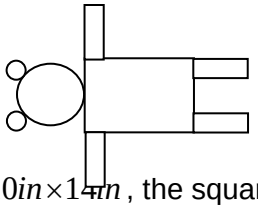
How is that okay? Isn't there another formula for squares?



It's okay because squares are actually a special type of rectangle – they're rectangles that have four sides of equal length.

All of the rectangle formulas can be used on squares!

Example 4: A teddy bear cake is made out a sheet cake, a square cake cut into 4 equal strips, a circle cake and two cupcakes. They are arranged like so:



The sheet cake is $10in \times 14in$, the square cake is $8in \times 8in$, the circular cake has a diameter of $9in$ and the cupcakes have radii of $1.5in$. What is the perimeter of the finished cake?

Answer:

First, divide the $8in \times 8in$ cake into 4 parts.

$$8in \div 4 = 2in$$

The arms and legs are $8in \times 2in$ pieces.

Find the circumferences of the circular cakes.

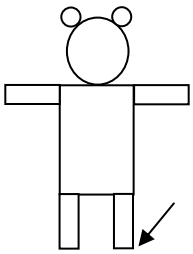
$$C = 3.14 \times diameter$$
$$C = 3.14 \times 9in$$
$$C = 28.26in$$

In the case of the cupcakes, the radius needs to be converted to a diameter before using the formula.

$$diameter = 2 \times radius$$
$$diameter = 2 \times 1.5in$$
$$diameter = 3in$$

$$C = 3.14 \times diameter$$
$$C = 3.14 \times 3in$$
$$C = 9.42in$$

The perimeter is the distance around the outside edge of the cake.



Right side (starting at leg) =
$$8 + (14 - 2) + 8 + 2 = 30\ in$$

Top (starting at top of right arm)=
$$8 + 10 + 8 + 28.26 + (2 \times 9.42) = 73.10\ in$$

Left side (same as right) = $30\ in$

Bottom (starting at leg) =
$$2 + 8 + (10 - 4) + 8 + 2 = 26\ in$$

$$Total = 30 + 73.10 + 30 + 26 = 159.10\ in$$

→ *Notice that where the legs and arms meet the body, the width of the arm/leg isn't included in the perimeter. This is because the area where the parts meet isn't on the outside of the cake.*

Practice Problems

Practice calculating area and perimeter (as indicated) for the shapes and dimensions given below.

1.	circle	radius = 10 cm	Area
2.	triangle	base = 5 cm, height = 4 cm	Area
3.	rectangle	length = 13 in, width = 2 in	Perimeter
4.	circle	diameter = 6 in	Circumference
5.	rectangle	length = 9 in, width = 9 in	Area
6.	circle	diameter = 8 cm	Area
7.	triangle	base = 7 cm, sides = 5 cm	Perimeter
8.	circle	radius = 4 in	Circumference
9.	rectangle	length = 6 in, width = 6 in	Perimeter
10.	triangle	height = 14 cm, base is one-fourth of the height	Area

11. Alison is making a mouse cake for her nephew's birthday party. She plans to use two circular cakes with diameters of *6 in.* and a larger circular cake with a *14 in.* diameter. What will the area of the finished cake be?

12. Trey is constructing a VW bug cake for a car dealership. He make the tires out of two cupcakes of radius *2.5 inches* and half of a circular cake *15 in.* diameter for the car body. What is the area of the VW bug cake?

13. A cake has a diameter of 9 in. It is cut into 16 pieces. What is the area of one piece of cake? (Round to the nearest whole number)

14. Melissa is building a cityscape using a variety of rectangular sheet cakes. She uses five rectangles measuring *12 in. × 4 in., 8 in. × 3 in., 9 in. × 5 in., 13 in × 2 in, and 7 in. × 3 in.* Assuming these rectangles are assembled in the order listed, with all rectangles being placed so the length is vertical, what is the area of cake needed? What will the perimeter be? (Hint: review Example 4).

Answers

1. 314 cm^2
2. 10 cm^2
3. 30 in
4. 18.84 in
5. 81 in^2
6. 50.24 cm^2
7. 17 cm
8. 25.12 in
9. 24 in
10. 24.5 cm
11. 210.38 in^2
12. 127.56 in^2
13. 4 in^2
14. Area = 164 in^2, Perimeter = 68 in