PERIMETER

INTRODUCTION

Perimeter is one-dimensional. It is a length or linear measurement that you can measure with a measuring tape. The perimeter of any figure, for example, rectangle, triangle or circle, is the distance around it.

$12" = 1'$	$144\ in^2 = 1\ ft^2$	$1{,}728\ in^3 = 1\ ft^3$
↓	↓	↓
perimeter	area	volume
One-dimensional	Two-dimensional	Three-dimensional
inches	in^2	in^3
feet	ft^2	ft^3
yards	yd^2	yd^3
mm	mm^2	mm^3
cm	cm^2	cm^3
m	m^2	m^3

When you have completed this chapter you will be able to:

- ❒ Calculate the perimeter of rectangles, squares, triangles, circles, parallelograms, trapezoids and hexagons using formulas.
- ❒ Calculate the perimeter of complex shapes using a combination of formulas.
- ❒ Solve word problems using perimeter.
- ❒ Solve applications using perimeter.

Calculating Perimeter

Always use the same steps to calculate perimeter.

Step 1: Draw a diagram and label it.

Remember: All measurements must be in the same unit of measurement before you calculate perimeter. Refer to the Measurements and Conversions chapter for help converting units.

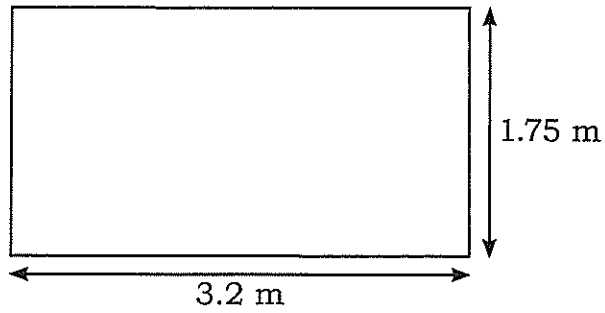
Step 2: Write the formula.

Step 3: Calculate the perimeter.

Example 1:

Calculate the perimeter of the rectangle below.

Step 1: Draw a diagram and label it.



Step 2: Write the formula.

$P = 2(L + W)$

Step 3: Calculate the perimeter.

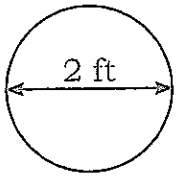
$P = 2(3.2 \text{ m} + 1.75 \text{ m}) = 2(4.95 \text{ m}) = 9.9 \text{ m}$

The perimeter is 9.9 m.

Example 2:

Calculate the circumference of the circle below.

Step 1: Draw a diagram and label it.



Step 2: Write the formula.

$C = \pi d$

Note: If your calculator does not have π, use 3.1416. Your answer will be slightly different because it is slightly less accurate.

Step 3: Calculate the circumference.

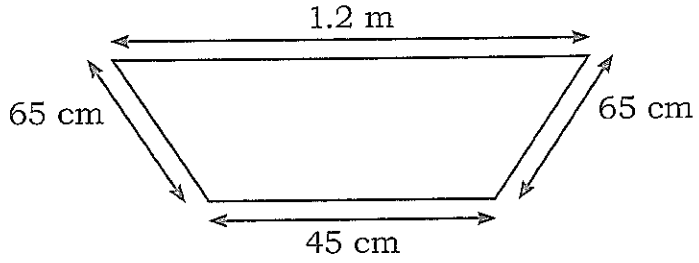
$C = \pi d = \pi \times 2 \text{ ft} = 6.28 \text{ ft}$

The circumference is 6.28 ft.

Example 3:

Calculate the perimeter of the trapezoid below.

Step 1: Draw a diagram and label it.



Note: One of the measurements is in metres. Convert metres to centimetres. 1.2 m = 120 cm

Step 2: Write the formula.

$P = s^1 + s^2 + s^3 + s^4$

Step 3: Calculate the perimeter.

$P = s^1 + s^2 + s^3 + s^4 = 65 \text{ cm} + 120 \text{ cm} + 65 \text{ cm} + 45 \text{ cm} = 295 \text{ cm}$

The perimeter is 295 centimetres.

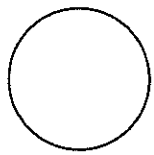
Calculate the perimeter of the following figures.

1) P =
Length = 47.8 cm
Width = 39.3 cm

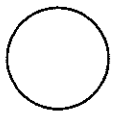
2) P =
Length = 18 in
Width = 2 ft - 4 in

Remember:
The bases are parallel.

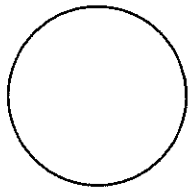
3) C =
Diameter = 29 mm



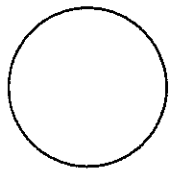
4) C =
Radius = 15 cm



5) C =
Diameter = 9 in

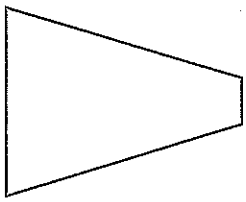


6) C =
Radius = 2.4 ft

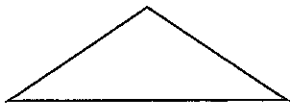


7) P =
Sides = 125 cm
Big base = 2 m
Small base = 1.2 m

8) P =
Sides = 2 ft
Big base = 5 ft
Small base = 18 in

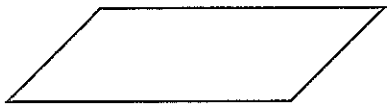


9) P =
Side 1 = 25 cm
Side 2 = 45 cm
Side 3 = 25 cm

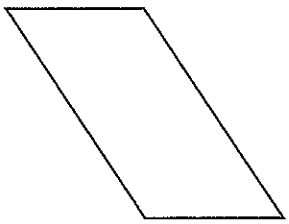


10) P =
Side 1 = 3 ft
Side 2 = 12 in
Side 3 = 3.5 ft

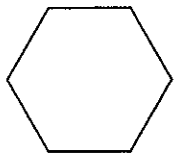
11) P =
Side 1 and 3 = 1.2 m
Side 2 and 4 = 55 cm



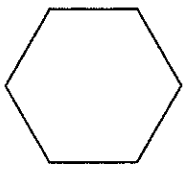
12) P =
Side 1 and 3 = 15 in
Side 2 and 4 = 29 in



13) P =
Side = 15 mm



14) P =
Side = 3.1 ft



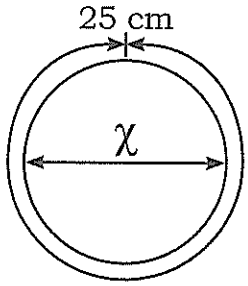
Calculating a Side when you know the Perimeter

If you know the perimeter and one of the sides you can calculate the missing side. Use the same formula you would if you were calculating the perimeter.

Example 1:

Calculate the diameter of a circle with a circumference of 25 cm. Round off your answer to two decimal places.

Step 1: Draw a diagram and label it.



Step 2: Write the formula.

$C = \pi d$

Step 3: Calculate the diameter.

$25 \text{ cm} = \pi d$

$\frac{25}{\pi} = d$

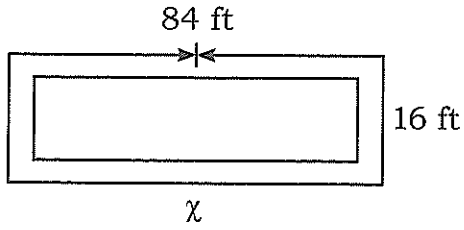
$7.96 = d$

The diameter of the circle is 7.96 cm.

Example 2:

Calculate the length of a rectangle that has a perimeter of 84 ft and a width of 16 ft.

Step 1: Draw a diagram and label it.



Step 2: Write the formula.

$P = 2(L + W)$

Step 3: Calculate the length.

$84 = 2(\chi + 16)$

$\frac{84}{2} = \chi + 16$

$42 = \chi + 16$

$42 - 16 = \chi$

$26 = \chi$

The length of the rectangle is 26 feet.

Calculate the missing side or diameter of the following figures. Round answers off to two decimal places.

1) Calculate the diameter of a circle with a circumference of 3.2 ft.

2) Calculate the diameter of a circle with a circumference of 15.8 m.

3) Calculate the radius of a circle with a circumference of 39 in.

Hint:

The radius is equal to half of the diameter.

4) Calculate the length of a rectangle that has a perimeter of 112 ft and a width of 12.5 ft.

5) Calculate the width of a rectangle that has a perimeter of 865 mm and a length of 310 mm.

6) Calculate the width of a rectangle that has a perimeter of 4 ft – 6 in and a length 1 ft – 9 in.

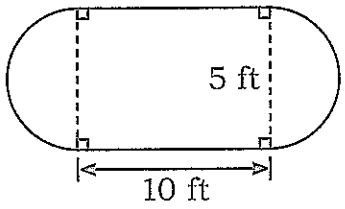
Calculating the perimeter of Complex Shapes

Sometimes you need to do several calculations to get the final answer. Many perimeter problems are a combination of common geometrical shapes. To solve these problems, you will need to divide the figure into shapes you are familiar with and calculate the perimeter of each of those shapes. You might need to use the same formula several times or you might need to use several different formulas.

Example 1:

Calculate the perimeter of the deck below.

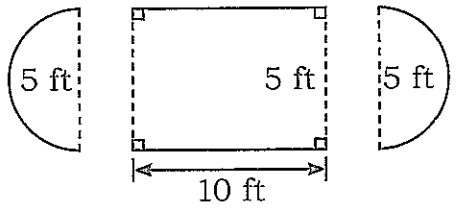
Step 1: Draw a diagram and label it.



Step 2: Write the formula(s).

The two half-circles make one complete circle. You need to calculate the circumference of the circle and add the two lengths of the rectangle. The two widths of the rectangle are not part of the perimeter.

$C = \pi d$



Step 3: Calculate the perimeter.

$C = \pi d = \pi \times 5 = 15.71$

(rounded off to two decimal places)

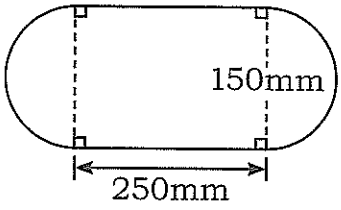
Add the two lengths of the rectangle to the circumference of the circle.

Total perimeter = 15.71 + 10 + 10 = 35.71 ft

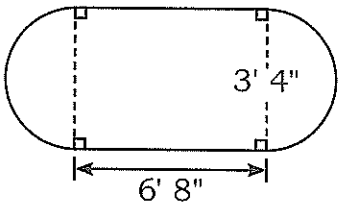
The perimeter of the deck is 35.71 ft.

Calculate the perimeter of the following complex shapes. Round off answers to two decimal places.

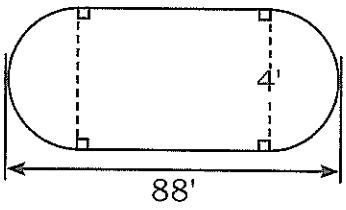
1) P =



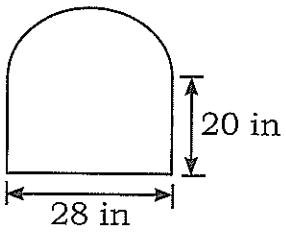
2) P =



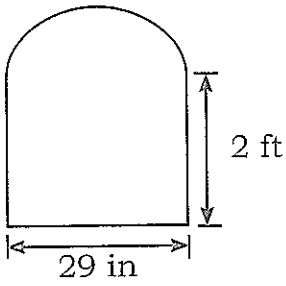
3) P =



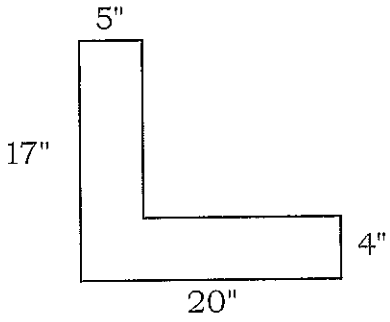
4) P =



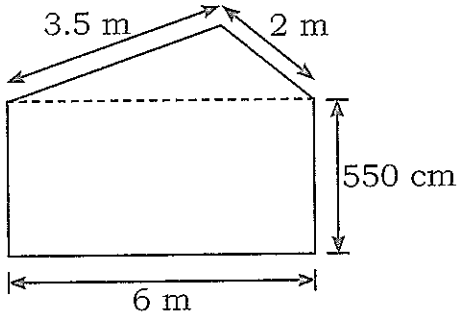
5) P =



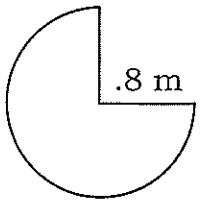
6) P =



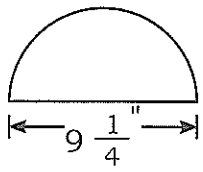
7) P =



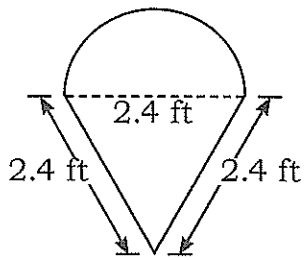
8) P =



9) P =



10) P =



ANSWER KEY

GEOMETRY - PERIMETER

Page 140, **Calculating Perimeter**

1) $P = 2(L + W) = 2(47.8 + 39.3\ cm) = 174.2\ cm$
2) $2\ ft = 24\ in$
   $P = 2(L + W) = 2(18 + 28) = 92\ in$
3) $C = \pi d = \pi \times 29 = 91.11\ mm$
4) $diameter = 2 \times r = 2 \times 15 = 30\ cm$
   $C = \pi d = \pi \times 30 = 94.25\ cm$
5) $C = \pi d = \pi \times 9 = 28.27\ in$
6) $diameter = 2 \times r = 2 \times 2.4 = 4.8\ ft$
   $C = \pi d = \pi \times 4.8 = 15.08\ ft$
7) $125\ cm = 1.25\ m$
   $P = s^1 + s^2 + s^3 + s^4 = 2 + 1.25 + 1.2 + 1.25 = 5.7\ m$
8) $18\ in = 1.5\ ft$
   $P = s^1 + s^2 + s^3 + s^4 = 5 + 2 + 1.5 + 2 = 10.5\ ft$
9) $P = s^1 + s^2 + s^3 = 25 + 45 + 25 = 95\ cm$
10) $12\ in = 1\ ft$
    $P = s^1 + s^2 + s^3 = 3 + 1 + 3.5 = 7.5\ ft$
11) $55\ cm = 0.55\ m$
    $P = s^1 + s^2 + s^3 + s^4 = 1.2 + 0.55 + 1.2 + 0.55 = 3.5\ m$
12) $P = s^1 + s^2 + s^3 + s^4 = 15 + 29 + 15 + 29 = 88\ in$
13) $P = 6s = 6 \times 15 = 90\ mm$
14) $P = 6s = 6 \times 3.1 = 18.6\ ft$

Page 143, **Calculating a Side when you know the Perimeter**

1) $c = \pi d$

   $3.2 = \pi d$

   $\frac{3.2}{\pi} = d$

   $1.02\ ft = d$

2) $c = \pi d$

   $15.8 = \pi d$

   $\frac{15.8}{\pi} = d$

   $5.03\ m = d$

3) $c = \pi d$

$39 = \pi d$

$\frac{39}{\pi} = d$

$12.41 = d$

radius = $12.41 \div 2 = 6.21$ in

4) $P = 2(L + W)$

$112 = 2(L + 12.5)$

$112 = 2L + 25$

$112 - 25 = 2L$

$\frac{87}{2} = L$

$43.50 \text{ ft} = L$

5) $P = 2(L + W)$

$865 = 2(310 + W)$

$865 = 620 + 2W$

$865 - 620 = 2W$

$\frac{245}{2} = W$

$122.50 \text{ mm} = W$

6) 4 ft – 6 in = 4.5 ft

1 ft – 9 in = 1.75 ft

$P = 2(L + W)$

$4.5 = 2(1.75 + W)$

$4.5 = 3.5 + 2W$

$4.5 - 3.5 = 2W$

$\frac{1.0}{2} = W$

$0.50 \text{ ft} = W$

Page 146, **Calculating the Perimeter of Complex Shapes**

1) $C = \pi d = \pi \times 150 = 471.24$ mm
Total perimeter = $471.24 + 250 + 250 = 971.24$ mm

2) 3' - 4" = 3.33'
6' - 8" = 6.67'
$C = \pi d = \pi \times 3.33 = 10.46'$
Total perimeter = $10.46 + 6.67 + 6.67 = 23.8'$

3) $C = \pi d = \pi \times 4 = 12.57'$
Length of one side = $88 - 2 \times r = 88 - 2 \times 2 = 88 - 4 = 84'$
Total perimeter = $12.57 + 84 + 84 = 180.57'$

4) $C = \pi d = \pi \times 28 = 87.96$ in
Circumference of half a circle = $87.96 \div 2 = 43.98$ in
Total perimeter = $43.98 + 20 + 28 + 20 = 111.98$ in

5) 29 in = 2.42 ft
$C = \pi d = \pi \times 2.42 = 7.6$ ft
Circumference of half a circle = $7.6 \div 2 = 3.8$ ft
Total perimeter = $3.8 + 2 + 2.42 + 2 = 10.22$ ft

6) Missing $side_1 = 17 - 4 = 13"$
Missing $side_2 = 20 - 5 = 15"$
Total perimeter = $17 + 20 + 4 + 15 + 13 + 5 = 74"$

7) $550\ cm = 5.50\ m$
$P = 5.5 + 6 + 5.5 + 2 + 3.5 = 22.5\ m$

8) diameter = radius × 2 = 0.8 × 2 = 1.6 m
$C = \pi d = \pi \times 1.6 = 5.03\ m$
Circumference of three-quarters of a circle = 5.03 × 0.75 = 3.77 m
Total circumference = 3.77 + 0.8 + 0.8 = 5.37 m

9) $9\frac{1}{4}" = 9.25"$
$C = \pi d = \pi \times 9.25 = 29.06"$
Circumference of a half-circle = 29.06 ÷ 2 = 14.53"
Total circumference = 14.53 + 9.25 = 23.78"

10) $C = \pi d = \pi \times 2.4 = 7.54\ ft$
Circumference of a half-circle = 7.54 ÷ 2 = 3.77 ft
Total perimeter = 3.77 + 2.4 + 2.4 = 8.57 ft