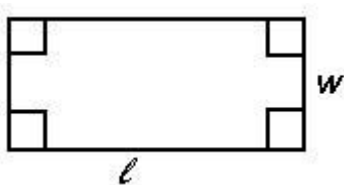**DETAILED SOLUTIONS AND CONCEPTS - SIMPLE GEOMETRIC FIGURES**
Prepared by Ingrid Stewart, Ph.D., College of Southern Nevada
Please Send Questions and Comments to ingrid.stewart@csn.edu. Thank you!

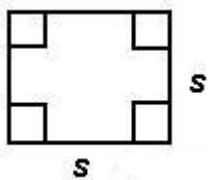**YOU MUST BE ABLE TO DO THE FOLLOWING PROBLEMS WITHOUT A CALCULATOR!**

Rectangle

Perimeter: $P = 2\ell + 2w$

Area: $A = \ell w$

NOTE: There is an implied multiplication between the letters! This is usually done in mathematics when letters or letters and numbers are factors of a product.
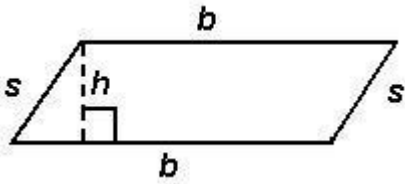
Square

Perimeter: $P = 4s$

NOTE: There is an implied multiplication between the number and the letter!

Area: $A = s^2$

Remember that $s^2 = s \times s$!

Parallelogram

The right and left side s are parallel and of equal length and the top and bottom b are also parallel and of equal length.

The height h must make a 90° angle with the base b.
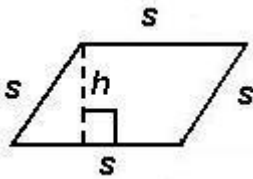
Perimeter: $P = 2s + 2b$

There is an implied multiplication between the numbers and the letters!

Area: $A = bh$, where h is the height and b is the base

There is an implied multiplication between the letters!

Rhombus

All sides are of equal length. The right and left side are parallel and the top and bottom are also parallel.

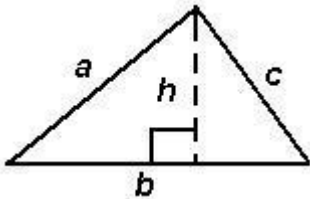The height h must make a 90° angle with the base b.

Perimeter: $P = 4s$

There is an implied multiplication between the number and the letter!

Area: $A = sh$
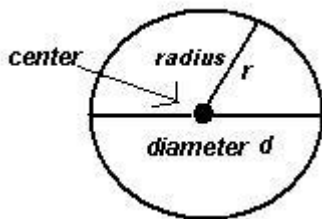
There is an implied multiplication between the letters!

Triangle

Perimeter: $P = a + b + c$

Area: $A = \frac{1}{2} bh$, where h is the height and b is the base

There is an implied multiplication between the number and the letters!

The line drawn from ANY vertex to the opposite side is called **altitude** or **height** of the triangle if and only if the two lines form a right angle. When finding the area of a triangle, we use any height h plus the side of the triangle the height forms a right angle with, which is called the base b.

Circle

Circumference: $C = 2\pi r$ (the perimeter of the closed curved line that forms the circle)
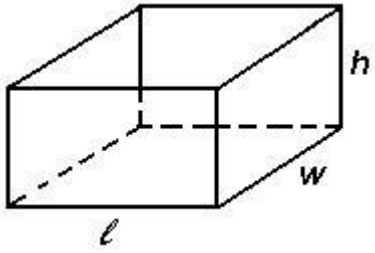
Diameter: $d = 2r$

There is an implied multiplication between the number and the letter!

Area: $A = \pi r^2$

The circle is a geometric figure with a special relationship between its circumference and its diameter. If we divide the circumference of any circle by its diameter, the quotient is always the same number.

The Greek letter π (pronounced pi) represents this value, which is a non-repeating, non-terminating decimal approximately equal to *3.141592654* or better known as *3.14*.
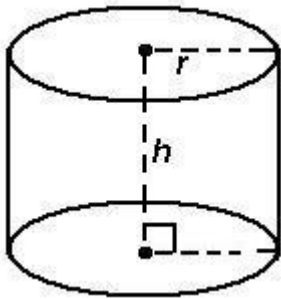
Right Prism

Volume: $V = \ell w h$

Surface Area: $SA = 2\ell h + 2wh + 2\ell w$

Right Circular Cylinder

The height **h** makes a **90°** angle with the circular base.

Volume: $V = \pi r^2 h$

Surface Area: $SA = 2\pi r h + 2\pi r^2$

Remember that the "side" must have a length equal to the circumference of the circular top and bottom! See picture below!

the "side"

Problem 1:

Find the perimeter and the area of a rectangle whose length is 14 ft and whose width is 9 ft.

Perimeter Formula: $P = 2\ell + 2w$

$P = 2(14) + 2(9) = 28 + 18 = 46$

The perimeter of the rectangle is 46 ft.

Area Formula: $A = \ell w$

$A = 14(9) = 126$

Remember, there is an implied multiplication between the letters!

The area of the rectangle is 126 ft^2.

Problem 2:

Find the perimeter and the area a square that measures 5 cm on a side.

Perimeter Formula: $P = 4s$

$P = 4(5) = 20$

Remember, there is an implied multiplication between the number and the letter!

The perimeter of the square is 20 cm.

Area Formula: $A = s^2$

Remember that $s^2 = s \times s$!

$A = 5^2 = 5 \times 5 = 25$

The area of the square is 25 cm^2.

Problem 3:

Find the perimeter of a parallelogram that has sides of 30 ft and 18 ft.

Perimeter Formula: $P = 2s + 2b$

$P = 2(30) + 2(18) = 60 + 36 = 96$

Remember, there is an implied multiplication between the numbers and the letters!

The perimeter of the parallelogram is 96 ft.

Problem 4:

Find the perimeter of the triangle with sides a = 12.6 inches, b = 11 inches, and c = 6.2 inches.

Perimeter Formula: $P = a + b + c$

$P = 12.6 + 11 + 6.2 = 29.8$

The perimeter of the triangle is 29.8 in.

Problem 5:

A garden plot turned out to be a parallelogram with base 12 ft and height 6ft. What is the area of the garden plot?

Area Formula: $A = bh$, where h is the height and b is the base

$A = 12(6) = 72$

Remember, there is an implied multiplication between the letters!

The area of the garden plot is 72 ft^2.

Problem 6:

A parking lot plot turned out to be a triangle with base 6.2 m and height 10 m. What is the area of the parking lot?

Area Formula: $A = \frac{1}{2} bh$, where h is the height and b is the base
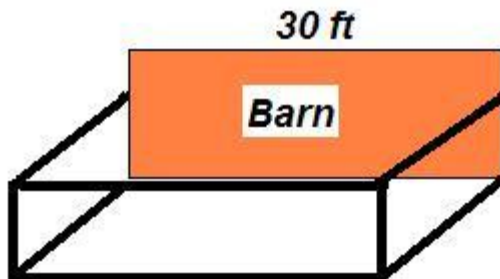
$A = \frac{1}{2} (6.2)(10) = 31m^2$

Remember, there is an implied multiplication between the number and the letters!

The area of the parking lot is 31 m^2.

Problem 7:

A farmer wants to build a rectangular pen for his cattle using as one side his barn that is 30 ft long. If 110 ft of chain link fencing is available at the local lumber yard, what is the length that each side adjacent to the barn can have?

Sometimes is is a good idea to make a picture. How about the following?

Since the pen is supposed to be rectangular, we know that the side of the fence opposite the barn also must be 30 ft long. So how much is left over for the width? Remember that the perimeter of a rectangle is calculated by adding its sides! Given that we have 110 ft of chain link fence and need 30ft for the side opposite the barn, we have **110 ft - 30 ft = 80 ft** left over for the sides adjacent to the barn. Again, we need to remember that the pen is supposed to be a rectangle.

Therefore, the length of each side adjacent to the barn must be 80 ft ÷ 2 = 40 ft.

Problem 8:

A flower lover would like to erect a fence around her rectangular rose garden. If her garden is 12 ft long and 15 ft wide and the fence costs $1.50 per foot, how much will she have to pay?

For this calculation, we have to use the perimeter formula $P = 2\ell + 2w$. to find out how much fence is needed.
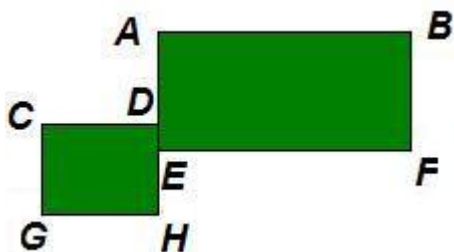
$$P = 2(12) + 2(15) = 54 \text{ ft}$$

We know that the fence costs $1.50 per foot, therefore, we'll have to calculate the total cost C as follows:

$$C = 54(1.50) = 81$$

Therefore, the flower lover has to pay $81 for her new fence around her rose garden.

Problem 9:

In the figure below side BF measures 8 inches, side AH measures 11 inches, side AB measures 10 inches, side GC measures 5 inches, and side CD measures 4 inches. What is the perimeter of this figure?

If AB is 10, then $FE = 10$.

$BF = 8$

$EH = AH - BF = 11 - 8 = 3$

If $CD = 4$, then $HG = 4$.

If **GC = 5**, then **DH = 5**.

DA = AH - DH = 11 - 5 = 6

P = AB + BF + FE + EH + HG + GC + CD + DA

$\quad$ **= 10 + 8 + 10 + 3 + 4 + 5 + 4 + 6 = 50**

The perimeter of the rectangular figure measures 50 inches.

Problem 10:

Find the area of a circle whose diameter is 12 cm. Use 3.14 for π!

$\quad$ Diameter Formula: **d = 2r**

$\quad$ Area Formula: **A = πr^2**

To find the area we need a radius. Given is the diameter, which is twice the radius. Therefore, the radius must be 6 cm.

Then **A = 3.14(6^2) = 3.14(36) = 113.04**.

Remember, there is an implied multiplication between the number ▭ and the letter!

The area of the circle is 113.04 cm^2.

Problem 11:

Find the circumference of a circle whose diameter is 16 cm. Use 3.14 for π!

$\quad$ Diameter Formula: **d = 2r**

$\quad$ Circumference formula: **C = 2π r** (the perimeter of the closed curved line that forms the circle)

To find the circumference we need a radius. Given is the diameter, which is twice the radius. Therefore, the radius must be 8 cm.
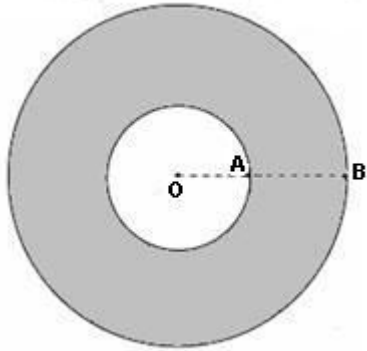
Then **C = 2(3.14)(8) = 50.24**. It is customary in mathematics to write π after the numeric factor.

Remember, there is an implied multiplication between the numbers 2 and π and the letter!

The circumference of the circle is 50.24 cm.

Problem 12:

Find the area of the shaded ring rounded to the nearest hundredth. Assume that the point O is the center of both the small and the large circle. The distance OA, which is the radius of the small circle, is 5 meters and the distance OB, which is the radius of the large circle, is 11 meters. Use 3.14 for π!

We can find the area of the shaded ring by subtracting the area of the small circle from the area of the large circle!

That is,

$$A_{shaded} = A_{large} - A_{small}$$

and given the area formula $A = \pi r^2$, we get

$$A_{shaded} = 3.14\,(11)^2 - 3.14\,(5)^2$$
$$= 3.14\,(121) - 3.14\,(25)$$
$$= 301.44$$

The area of the shaded ring measures 301.44 m².

Problem 13:

Determine the volume and the surface area of the given right prism, where height = 2 inches, width = 3 inches, and length = 4 inches.

Volume Formula: $V = \ell\,w\,h$

Surface Area Formula: $SA = 2\ell h + 2wh + 2\ell w$

$$V = 4(3)(2) = 24$$

$$SA = 2(4)(2) + 2(3)(2) + 2(4)(3) = 52$$

The volume of the prism is 24 cubic inches and its surface area is 52 square inches.

Problem 14:

Determine the volume and the surface area of the right circular cylinder, where h = 4 m and r = 2 m. Round to two decimal places. Use 3.14 for π!

Volume Formula: $V = \pi r^2 h$

Surface Area Formula: $SA = 2\pi r h + 2\pi r^2$

$V = 3.14(2)^2(4) = 50.24$

$SA = 2(3.14)(2)(4) + 2(3.14)(2)^2 = 75.36$

The volume of the cylinder is *50.24* cubic meters and its surface area is 75.36 square meters.

Problem 15:

Determine the volume and the surface area of a cube where height = 1 inches, width = 1 inches, and length = 1 inches.

Volume Formula: $V = \ell w h$

Surface Area Formula: $SA = 2\ell h + 2wh + 2\ell w$

$V = 1(1)(1) = 1$

$SA = 2(1)(1) + 2(1)(1) + 2(1)(1) = 6$

The volume of the cube is 1 cubic inch and its surface area is 6 square inches.