

SOL 6.10 – Circumference, Perimeter, Area, Surface Area, and Volume

6.10 The student will

- define pi (π) as the ratio of the circumference of a circle to its diameter;
- solve practical problems involving circumference and area of a circle, given the diameter or radius;
- solve practical problems involving area and perimeter; and
- describe and determine the volume and surface area of a rectangular prism.

Understanding the Standard:

- Experiences in deriving the formulas for area, perimeter, and volume using manipulatives such as tiles, one-inch cubes, adding machine tape, graph paper, geoboards, or tracing paper, promote an understanding of the formulas and facility in their use.[†]
- The perimeter of a polygon is the measure of the distance around the polygon.
- Circumference is the distance around or perimeter of a circle.
- The area of a closed curve is the number of nonoverlapping square units required to fill the region enclosed by the curve.
- The perimeter of a square whose side measures s is 4 times s ($P = 4s$), and its area is side times side ($A = s^2$).
- The perimeter of a rectangle is the sum of twice the length and twice the width [$P = 2l + 2w$, or $P = 2(l + w)$], and its area is the product of the length and the width ($A = lw$).
- The value of pi (π) is the ratio of the circumference of a circle to its diameter.
- The ratio of the circumference to the diameter of a circle is a constant value, pi (π), which can be approximated by measuring various sizes of circles.
- The fractional approximation of pi generally used is $\frac{22}{7}$.
- The decimal approximation of pi generally used is 3.14.
- The circumference of a circle is computed using $C = \pi d$ or $C = 2\pi r$, where d is the diameter and r is the radius of the circle.
- The area of a circle is computed using the formula $A = \pi r^2$, where r is the radius of the circle.
- The surface area of a rectangular prism is the sum of the areas of all six faces ($SA = 2lw + 2lh + 2wh$).
- The volume of a rectangular prism is computed by multiplying the area of the base, B , (length x width) by the height of the prism ($V = lwh = Bh$).

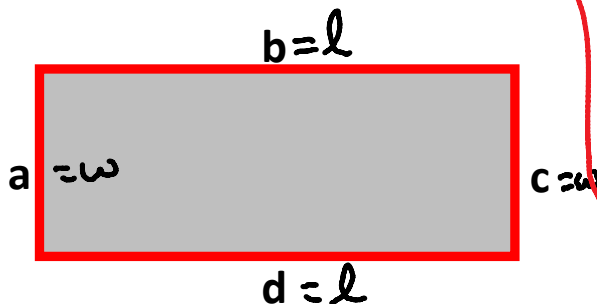


A handwritten equation in red ink: $\pi = \frac{C}{d}$. The equation is written inside a yellow circular highlight.

Vocabulary:

Perimeter - the measure of the distance around a figure

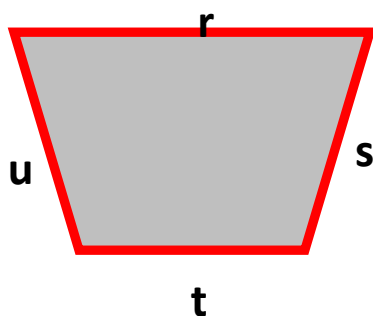
* around
outside
circumference
perimeter
outline
fencing



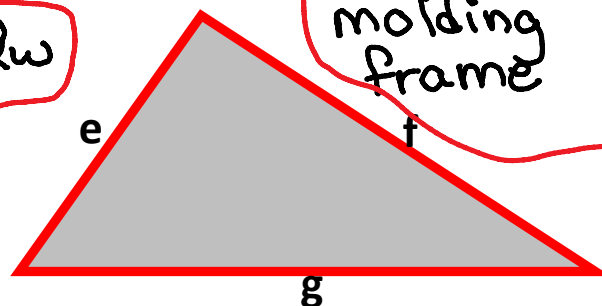
$$P = a + b + c + d$$

$$P = 2l + 2w$$

border
edging
rope off
enclose
trim
surround
molding
frame



$$P = r + s + t + u$$



$$P = e + f + g$$

Area - the number of square units needed to cover a surface or figure

* Cover
inside
wall paper

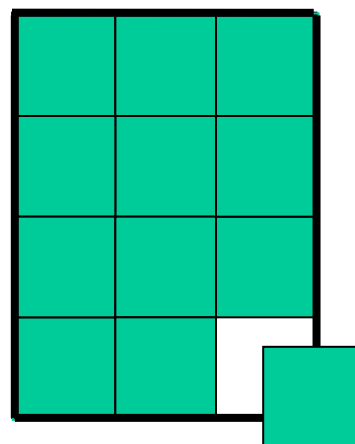
tile
carpet
paint 2-D
blanket

Area = 12 Square Units

$$A_{\square} = lw$$

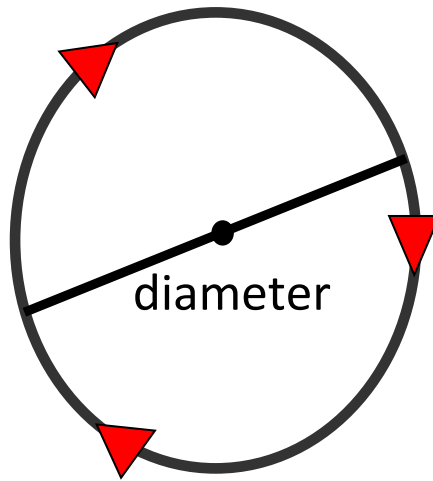
$$A_{\triangle} = \frac{1}{2}bh$$

$$A_{\square} = s^2$$



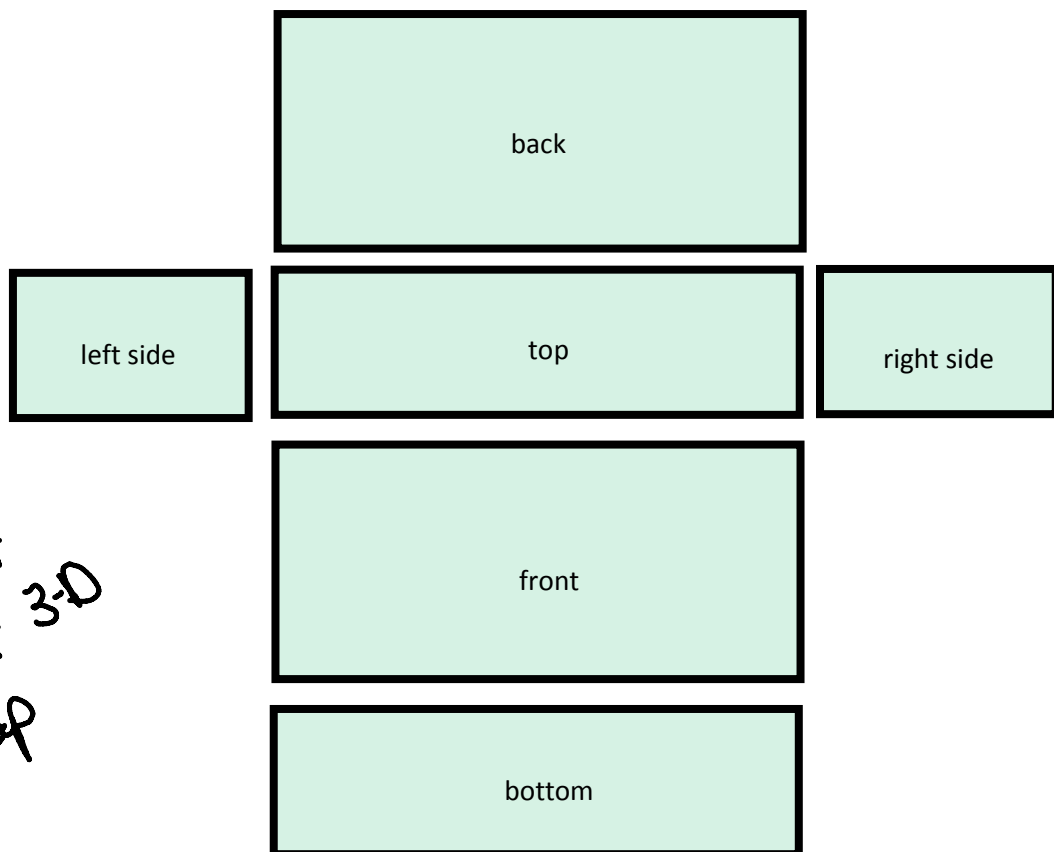
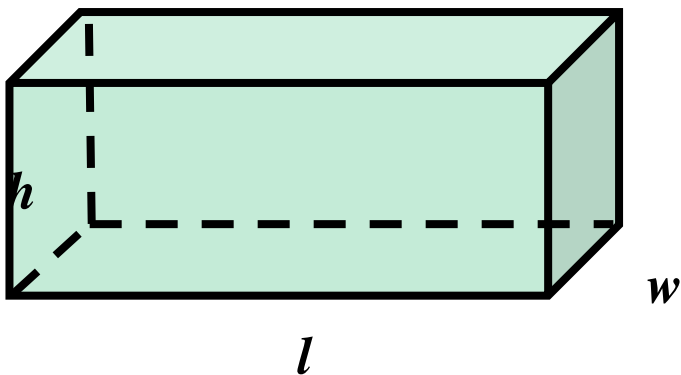
Answer:
Square
units

Pi - π = $\frac{\text{circumference}}{\text{diameter}} \approx 3.14159... \frac{22}{7}$



Circumference	Area of a Circle
$C = 2\pi r$ C = perimeter of a circle	$A = \pi r^2$
	<p>Answer : square units</p>

Surface Area



* Cover
Paint 3-D
wrap

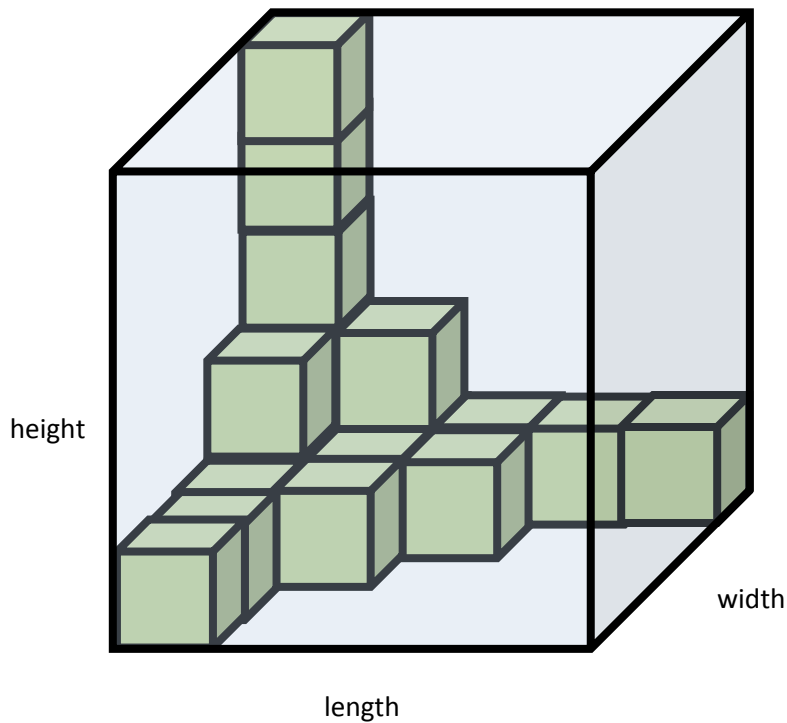
Surface Area (S.A.) = sum of areas of faces

$$SA = \underline{2lw} + \underline{2lh} + \underline{2wh}$$

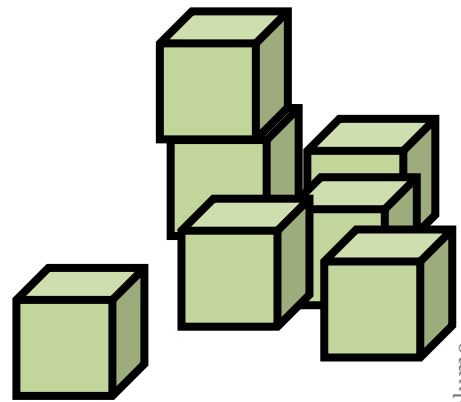
$$\quad \quad \quad + \quad \quad +$$

Answer : square units

Volume of a Prism



FILL



Volume = length x width x height

$$V = \underline{lw}h$$

Answer : measured in cubic units

Essential Understandings:

What is the relationship between the circumference and diameter of a circle?

$\frac{C}{d} = \pi$ Circumference is about 3 times
as much as the diameter

What is the difference between area and perimeter?

Perimeter = outside
Area = inside

What is the relationship between area and surface area?

Area = 2-D shape
Surface Area = 3-D shape

Essential Knowledge & Skills:


The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- Derive an approximation for pi (3.14 or $\frac{22}{7}$) by gathering data and comparing the circumference to the diameter of various circles, using concrete materials or computer models.
- Find the circumference of a circle by substituting a value for the diameter or the radius into the formula $C = \pi d$ or $C = 2\pi r$.
- Find the area of a circle by using the formula $A = \pi r^2$.
- Apply formulas to solve practical problems involving area and perimeter of triangles and rectangles.
- Create and solve problems that involve finding the circumference and area of a circle when given the diameter or radius.
- Solve problems that require finding the surface area of a rectangular prism, given a diagram of the prism with the necessary dimensions labeled.
- Solve problems that require finding the volume of a rectangular prism given a diagram of the prism with the necessary dimensions labeled.

Practice:

1. Clinton purchased a **circular** rug to **cover** part of a floor. The diameter of the rug is 8 feet. Rounded to the nearest whole number, what **area** of the floor will the rug cover?

$$A = \pi r^2$$

$$3.14(4)^2 = 50.24 \text{ ft}^2$$


2. A **circular** pool has a **radius of 12 feet**. What is the approximate distance **around** the pool, rounded to the nearest foot?

$$C = 2\pi r$$

$$2(3.14)(12) = 75.36 \text{ ft}$$

3. Dana has a **rectangular** garden that she wishes to **fence** in. If the dimensions of the garden are **15 feet by 13 feet**, what is the minimum amount of fencing that she needs to enclose her garden?

$$p = 2l + 2w$$

$$2(15) + 2(13) = 56 \text{ ft}$$



4. Leo is designing a **circular** table top with a **diameter of 10 feet**.

- a. Which is closest to the **circumference** of this table top?

- A. 314.2 feet
B. 78.5 square feet
☒ C. 31.4 feet
D. 15.7 square feet

$$C = \pi d$$

$$3.14(10) = 31.4 \text{ ft}$$

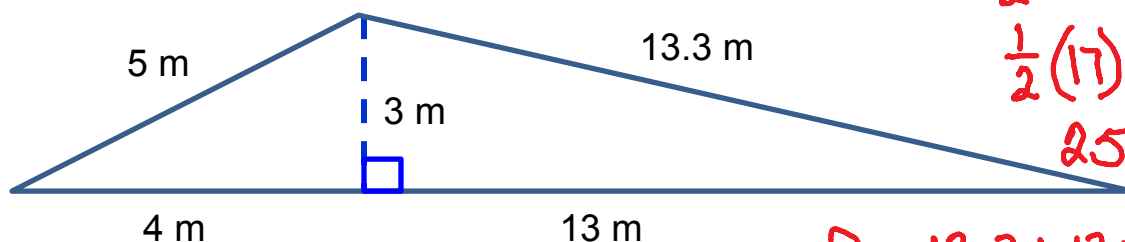
- b. Which is closest to the **area** of this table top?

- A. 314.2 feet
☒ B. 78.5 square feet
C. 31.4 feet
D. 15.7 square feet

$$A = \pi r^2$$

$$3.14(5)^2 = 78.5 \text{ ft}^2$$

5. This **triangle** represents a section of a garden. (Figure is not drawn to scale.) What are the **area** and **perimeter** of the garden?



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

$$\frac{1}{2}(17)(3) = 25.5 \text{ m}^2$$

$$P = 13.3 + 13 + 4 + 5$$

$$35.3 \text{ m}$$