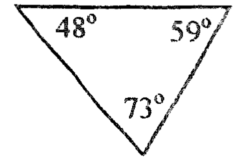
TRIANGLES

The sum of the measures of the three angles of any triangle is 180°

example: For the triangle at the right,

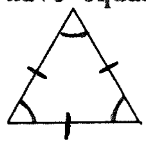
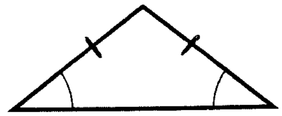
$48^\circ + 59^\circ + 73^\circ = 180^\circ$



Classification of Triangles

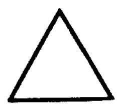
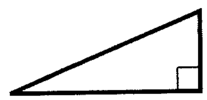
BY SIDES:

equilateral	isosceles	scalene
(all sides have equal measure)	(two sides have equal measure)	(no sides have equal measure)


BY ANGLES:

acute	right	obtuse
(all angles measure less than 90°)	(an angle measures 90°)	(an angle measures more than 90°)

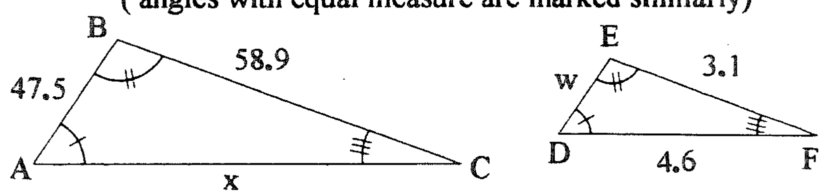




Similar Triangles

(same shape, but not necessarily the same size)
Corresponding angles are the same measure.
Corresponding sides are proportional in length.

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$

Triangle ABC is similar to triangle DEF
(angles with equal measure are marked similarly)

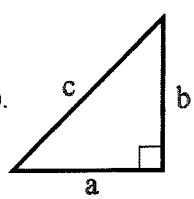


To find x, we use the proportion $\frac{x}{4.6} = \frac{58.9}{3.1}$ To find w, we use the proportion $\frac{w}{47.5} = \frac{3.1}{58.9}$

Pythagorean Theorem

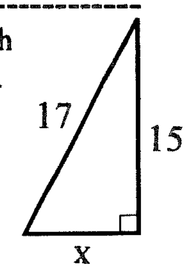
The sum of the squares of the two shortest sides of a right triangle (the legs) equals the square of the longest side (the hypotenuse).

$$a^2 + b^2 = c^2$$



Find x, the missing length in the triangle at the right.

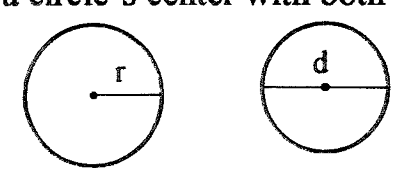
$x^2 + (15)^2 = (17)^2$
$x^2 + 225 = 289$
$x^2 = 64$
$x = 8$



CIRCLES

r = radius (line segment from the center of a circle to any point on the circle)
d= diameter (line segment passing through a circle's center with both endpoints on the circle)

[Note that $d = 2r$]



Circumference (distance around a circle)

$C = \pi d$ or $2\pi r$

Area

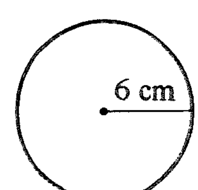
$A = \pi r^2$

$$\pi = \frac{C}{d} \approx 3.14$$

For the circle at the right,

$C = 2\pi r = 2\pi(6\text{ cm}) = 12\pi\text{ cm} = 37.699\text{ cm}$

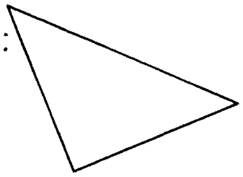
$A = \pi(6\text{ cm})^2 = \pi(36\text{ cm}^2) = 36\pi\text{ cm}^2 = 113.097\text{ cm}^2$

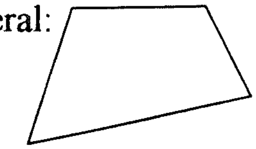


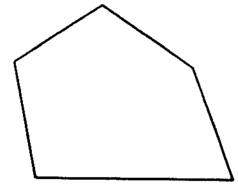
POLYGONS, QUADRILATERALS, PERIMETER

POLYGON: A closed plane figure formed by three or more line segments.
(named according to its number of sides)

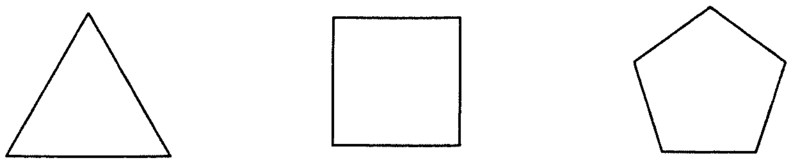
examples:

triangle: 

quadrilateral: 

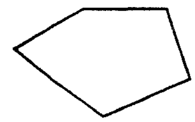
pentagon: 

REGULAR POLYGON: A polygon with all sides (and angles) having equal measure.

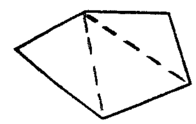
examples: 

THE SUM OF THE ANGLE MEASURES OF AN n-SIDED POLYGON IS $(n-2)180^\circ$

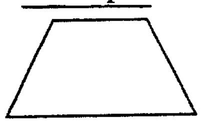
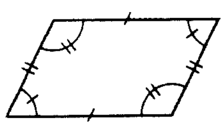
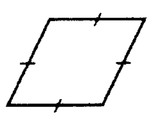
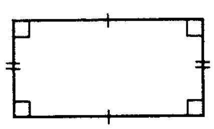
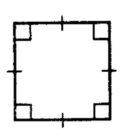
example: The sum of the measures of the angles of a pentagon (5 sides) is $(5-2)180^\circ=(3)180^\circ=540^\circ$



Note: Observe that a pentagon may be divided into 5-2=3 triangles.
(Or in general, an n-sided polygon may be divided into n-2 triangles)



CLASSIFICATION OF QUADRILATERALS

Quadrilateral	Example	Characteristics
TRAPEZOID		exactly one pair of parallel sides
PARALLELOGRAM		opposite sides are parallel opposite sides have equal measure opposite angles have equal measure
RHOMBUS		parallelogram with all sides having equal measure
RECTANGLE		parallelogram with four right angles
SQUARE		rectangle with all sides having equal measure

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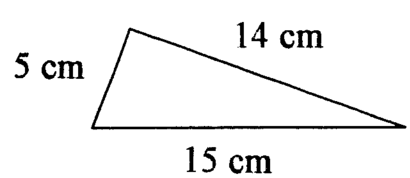
PERIMETER: The sum of the measures of the sides of a polygon.

example: The perimeter of the polygon at the right is
15 cm + 14 cm + 5 cm = 34 cm.



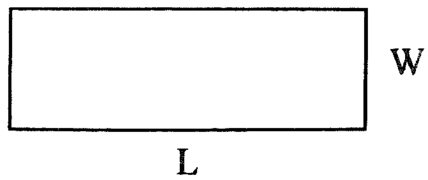
AREA

Figure:

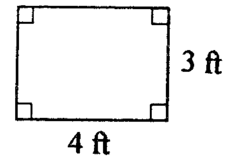
Example:

RECTANGLE

$$A = LW$$

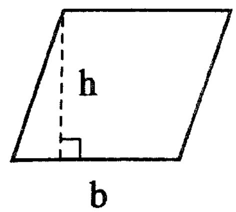


$A = (4\text{ ft})(3\text{ ft})$
$= 12\text{ ft}^2$

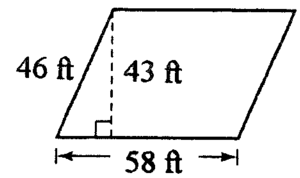


PARALLELOGRAM

$$A = bh$$

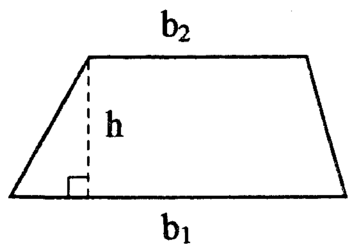


$A = (58\text{ ft})(43\text{ ft})$
$= 2494\text{ ft}^2$

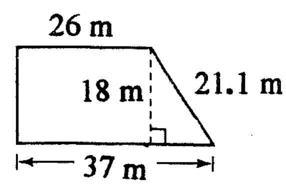


TRAPEZOID

$$A = \tfrac{1}{2}(b_1 + b_2)h$$

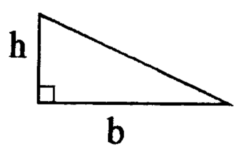


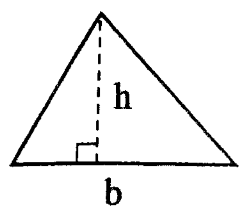
$A = \tfrac{1}{2}(37\text{ m} + 26\text{ m})18\text{ m}$
$= \tfrac{1}{2}(63\text{ m})7\text{ m}$
$= 220.5\text{ m}^2$



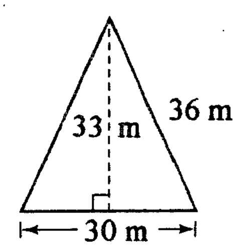
TRIANGLE

$$A = \tfrac{1}{2}(bh)$$





$A = \tfrac{1}{2}[(30\text{ m})(33\text{ m})]$
$= \tfrac{1}{2}(990\text{ m}^2)$
$= 495\text{ m}^2$



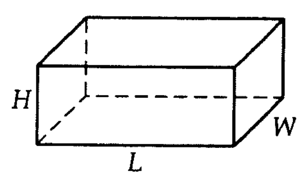
SURFACE AREA

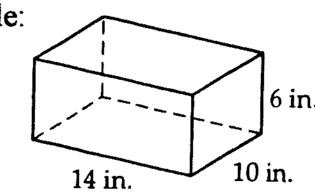
Figure:

Example:

RECTANGULAR SOLID

$$S = 2LW + 2LH + 2WH$$

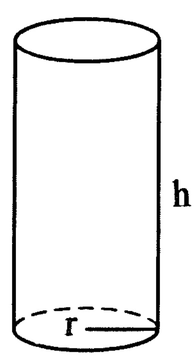


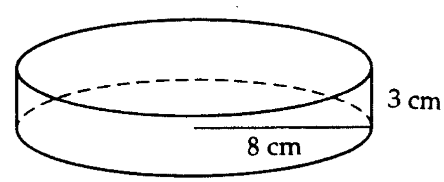


$S = 2(14\text{ in})(10\text{ in}) + 2(14\text{ in})(6\text{ in}) + 2(10\text{ in})(6\text{ in})$
$= 280\text{ in}^2 + 168\text{ in}^2 + 120\text{ in}^2 = 568\text{ in}^2$

RIGHT CIRCULAR CYLINDER

$$S = 2\pi r^2 + 2\pi rh$$





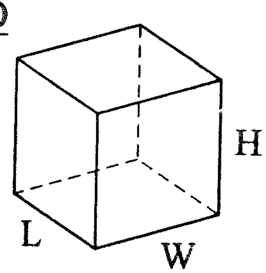
$S = 2\pi(8\text{ cm})^2 + 2\pi(8\text{ cm})(3\text{ cm})$
$= 2\pi(64\text{ cm}^2) + 48\pi\text{ cm}^2$
$= 128\pi\text{ cm}^2 + 48\pi\text{ cm}^2$
$= 176\pi\text{ cm}^2 = 552.9203\text{ cm}^2$

VOLUME

Figure: Example:

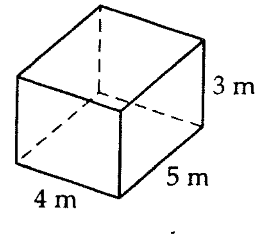
RECTANGULAR SOLID

$V = LWH$



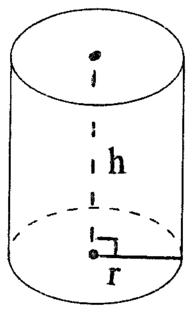
$V = (4\text{ m})(5\text{ m})(3\text{ m})$

$= 60\text{ m}^3$



RIGHT CIRCULAR CYLINDER

$V = \pi r^2 h$

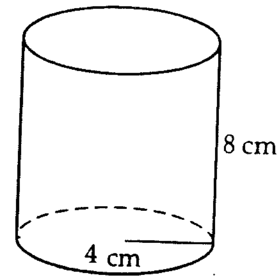


$V = \pi(4\text{ cm})^2(8\text{ cm})$

$= \pi(16\text{ cm}^2)(8\text{ cm})$

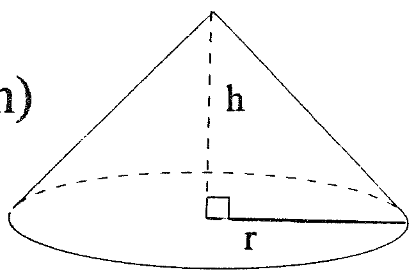
$= 128\pi\text{ cm}^3$

$= 402.124\text{ cm}^3$



CONE

$V = ⅓(\pi r^2 h)$

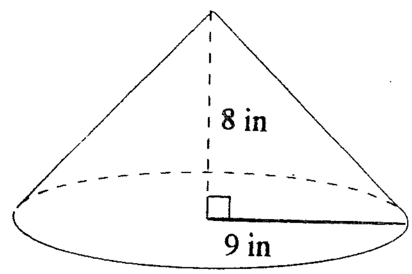


$V = \frac{1}{3}[\pi(9\text{ in})^2(8\text{ in})]$

$= \frac{1}{3}[\pi(81\text{ in}^2)(8\text{ in})]$

$= \frac{1}{3}(648\pi\text{ in}^3)$

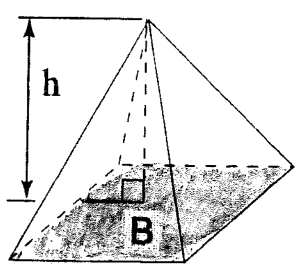
$= 216\pi\text{ in}^3 = 678.584\text{ in}^3$



PYRAMID

$V = ⅓(Bh)$

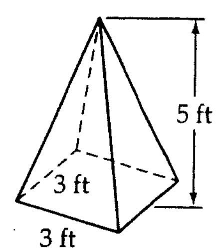
[B is the area of the base]



$V = \frac{1}{3}[(3\text{ ft})(3\text{ ft})]\,(5\text{ ft})$

$= \frac{1}{3}[(9\text{ ft}^2)(5\text{ ft})]$

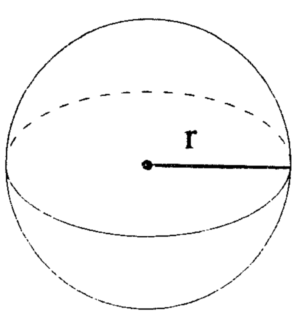
$= \frac{1}{3}(45\text{ ft}^3) = 15\text{ ft}^3$



(square base)

SPHERE

$V = \frac{4}{3}(\pi r^3)$



$V = \frac{4}{3}[\,\pi\,(7\text{ cm})^3\,]$

$= \frac{4}{3}[\,\pi\,(343\text{ cm}^3)\,]$

$= 457.33\pi\text{ cm}^3 = 1436.755\text{ cm}^3$