FINDING AREA, PERIMETER, AND CIRCUMFERENCE

Area, perimeter, and circumference are all measures of **two-dimensional shapes.** These are things you can think of as flat: a football field, a piece of paper, or a pizza. You're probably not interested in how high they are, but you might want to know their:

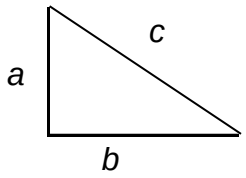
- **Perimeter** or **Circumference.** This is the total length of a shape's outline. If you built a fence around its edge, how long would that fence be? If you walked around the edges of this area, how far would you have gone? The length of a straight-sided shape's outline is called its **perimeter,** and the length of a circle's outline is called its **circumference.**

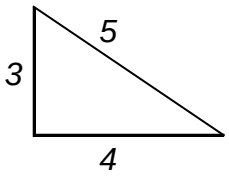
- **Area.** This is the total amount of space inside a shape's outline. If you wanted to paint a wall or irrigate a circular field, how much space would you have to cover?

Triangles

1. The **perimeter** of any triangle is the sum of its sides: a + b + c

   perimeter = a + b + c

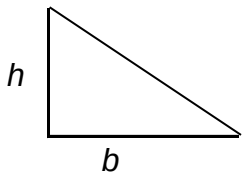


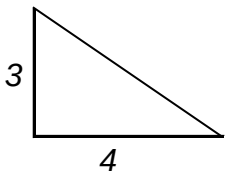


P = a + b + c
P = 3 + 5 + 4
P = 12

2. The **area** of any triangle is half its base times its height.

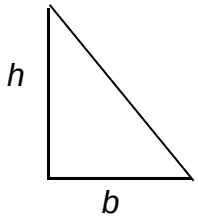
   area = *1/2 bh*

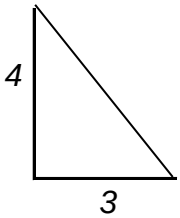




A = 1/2 bh
*A = 1/2 * 3 * 4*
*A = 1/2 * 12*
A = 6

It doesn't matter which of the triangle's short legs is the "base" and which is the "height": you get the same solution either way.



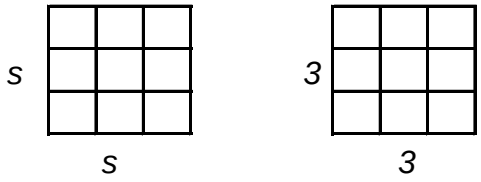


A = 1/2 bh
*A = 1/2 * 4 * 3*
*A = 2 * 3*
A = 6

Squares

1. A square is a kind of rectangle, and the **perimeter** of any rectangle is the sum of its four sides. Since all sides of a square are the same,

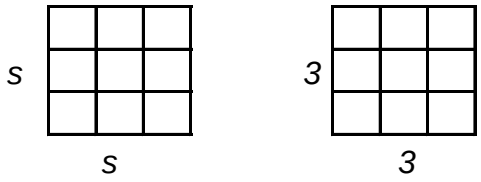
   perimeter = 4s



P = 4s
*P = 4 * 3*
P = 12

2. The **area** of a square is equal to any one of its sides times any other: *s * s* . Since that's the same as *s* squared,

   area = s^2

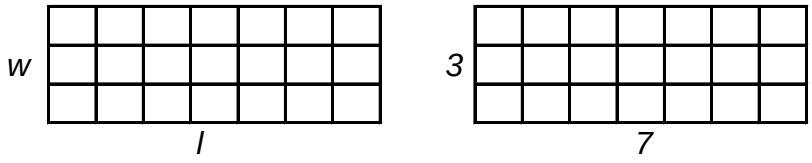


$A = s^2$
$A = 3^2$
*A = 3 * 3*
A = 9

Rectangles

1. The **perimeter** of a rectangle is the sum of its four sides. Since a rectangle has two equal short sides (width, *w*) and two equal long sides (length, *l*),

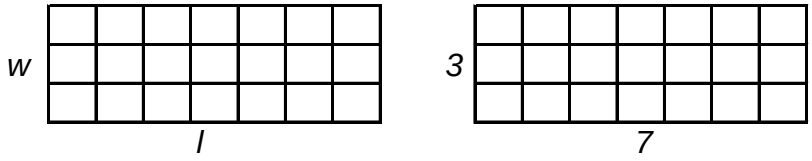
   perimeter = 2*l* + 2*w*



P = 2l + 2w
*P = (2 * 7) + (2 * 3)*
P = 14 + 6
P = 20

2. The **area** of a rectangle is equal to its length times its width.

   area = *l* * *w*



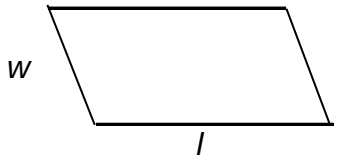
*A = l * w*
*A = 3 * 7*
A = 21

Parallelograms

Like squares and rectangles, parallelograms are **quadrilaterals**: they have four sides and four interior angles. In a parallelogram those angles are not right angles, but the opposite sides must still be parallel to each other.

1. The **perimeter** of a parallelogram is the sum of its four sides. Since a parallelogram has two equal short sides (width, *w*) and two equal long sides (length, *l*),

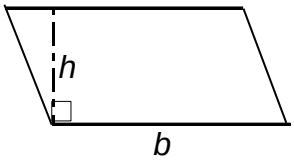
   perimeter = 2*l* + 2*w*

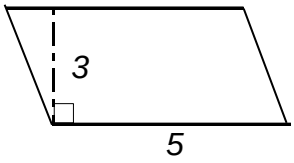


P = 2l + 2w
*P = (2*5) + (2 * 4)*
P = 10 +8
P = 18

2. The **area** of a parallelogram is equal to its base (another name for length) times its height. Its height is **not** the same as its width: height is measured by a vertical line perpendicular (at right angles to) the base.

   area = *b* * *h*





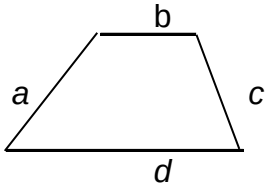
*A = b * h*
*A = 3 * 5*
A = 15

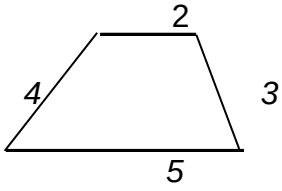
Trapezoids

A trapezoid is also a **quadrilateral**: it has four sides, but only two are parallel.

1. The **perimeter** of a trapezoid is the sum of its four sides.

   perimeter = a + b + c + d

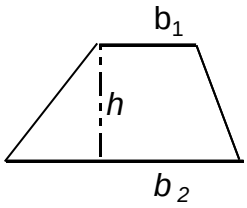


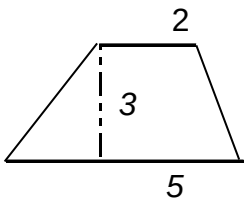


P = a + b + c + d
P = 2 + 3 + 4 + 5
P = 14

2. To find the **area** of a trapezoid, we use its two bases and its height:

   area = 1/2 (b_1 + b_2) (h)





*A = 1/2 (b_1 + b_2) * (h)*
*A = 1/2 (2 + 5) * 3*
*A = 1/2 * 7 * 3*
*A = 1/2 * 21*
A = 10.5

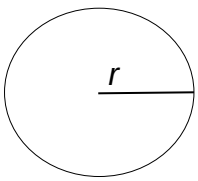
Circles

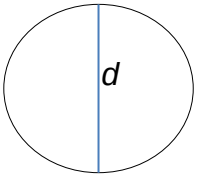
To find a circle's circumference or area, you first need to know either its

radius: *r* , the distance from its center to any point on its outer edge, or its

diameter: *d* , the length of a straight line through the circle's center that touches any two points on the outer edge.

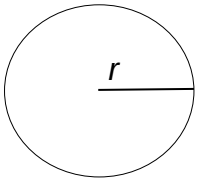
A circle's radius is always exactly half its diameter.

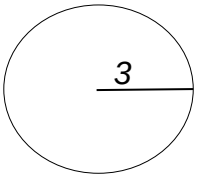




1. The circumference of any circle equals two times its radius multiplied by *pi* (π, approximately 3.14). We can also say it equals *pi* times its diameter.

   circumference = $2\pi r$ OR πd



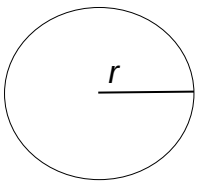


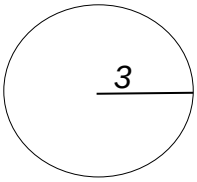
$C = 2\ \pi * 3$
$C = 6 * \pi$
$C \approx 18.84$

   Because 3.14 is only an approximate value for pi, we replace the "equals" sign (=) with the "approximately equals" sign (≈). For accuracy, some teachers prefer to use the symbol: the circumference of this circle is 6π.

2. To find the **area** of a circle, square its radius and multiply the result by *pi* .

   area = πr^2





$A = \pi r^2$
$A = 3^2 * \pi$
$A = (3 * 3) * \pi$
$A = 9 * \pi$
$A = 9\pi$ or ≈ 28.26

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