

# THE BEAST: All the math formulas that matter on the ACT

## Exponents

$$A^0 = 1 \quad A^1 = A$$

$$A^{\frac{1}{2}} = \sqrt{A}$$

$$\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$$

$$\sqrt{a}\sqrt{b} = \sqrt{ab}$$

$$A^m A^n = A^{m+n}$$

$$(A^m)^n = A^{mn}$$

$$\frac{A^m}{A^n} = A^{m-n}$$

$$A^{-m} = \frac{1}{A^m}$$

## Quadratic Equations

$$(a + b)^2 = a^2 + 2ab + b^2$$

$$(a - b)^2 = a^2 - 2ab + b^2$$

$$(a + b)(a - b) = a^2 - b^2$$

## Quadratic Formula

$$Ax^2 + bx + c = 0$$

$$\rightarrow x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

## Distance-Time Formula

$$\text{Speed } (v) = \frac{\text{Distance } (d)}{\text{Time } (t)} \quad t = \frac{d}{v}$$

## Linear Equations

$$y = mx + b$$

The y intercept is  $b$  ( $x=0$ )

The slope is  $m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$

A perpendicular line has a slope of  $-\frac{1}{m}$

## Distance Formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

## Midpoint Formula =

$$\left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

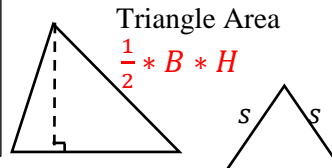
## Perfect Squares

$$11^2 = 121; 12^2 = 144; 13^2 = 169;$$

$$14^2 = 196; 15^2 = 225; 16^2 = 256;$$

## Percent

$$\frac{\%}{100} = \frac{\text{is}}{\text{of}} = \frac{\text{part}}{\text{whole}}$$



## Pythagorean Theorem

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

3, 4, 5  
5, 12, 13  
6, 8, 10  
7, 24, 25  
8, 15, 17

## Imaginary Numbers

When squared,  $i$  gives a negative result

$$i * i = -1 \quad i = \sqrt{-1} \quad \sqrt{(-x)} = i\sqrt{x}$$

$$i^1 = i; i^2 = -1; i^3 = -i; i^4 = 1; i^5 = i^1$$

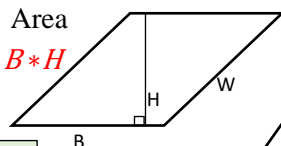
## Logarithms

$$\log_a a^x = x$$

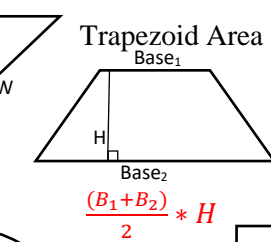
$$\log_a x + \log_a y = \log_a (xy)$$

$$\log_a x - \log_a y = \log_a \left( \frac{x}{y} \right)$$

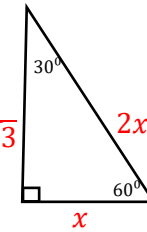
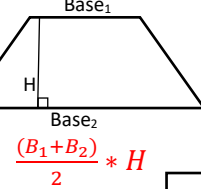
## Parallelogram



## Isosceles Triangle



## Trapezoid Area



## Probability

$$\frac{\text{desired outcomes}}{\text{possible outcomes}}$$

## Circles

$$\text{Area} = \pi r^2$$

$$\text{Circumference} = 2\pi r$$

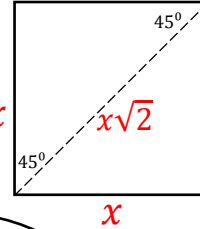
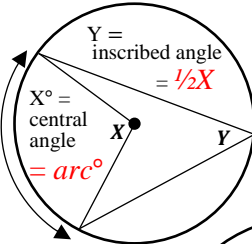
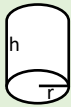
If midpoint =  $(a, b)$  and radius =  $r$ , then circle formula =

$$(x - a)^2 + (y - b)^2 = r^2$$

## Cylinders

$$\text{Area: } 2(\pi r^2) + h * 2\pi r$$

$$\text{Volume: } \pi r^2 * h$$



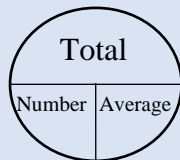
Sum of angles in a regular polygon with  $n$  sides:  
 **$180(n-2)$**

$$\# \text{ of diagonals} = \frac{1}{2} * n(n - 3)$$

## Averages

Average =  $\text{Total} / \text{number}$

Weighted Average = add the values for each occurrence; divide by total occurrences.



## Ellipse



$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

Major axis =  $2a$   
minor axis =  $2b$

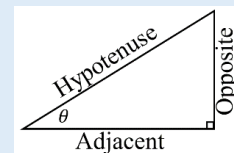
## Trig: SOHCAHTOA

$$\sin \theta = \frac{\text{Opp}}{\text{Hyp}} \quad \csc \theta = \frac{1}{\sin}$$

$$\cos \theta = \frac{\text{Adj}}{\text{Hyp}} \quad \sec \theta = \frac{1}{\cos}$$

$$\tan \theta = \frac{\text{Opp}}{\text{Adj}} \quad \cot \theta = \frac{1}{\tan}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$



$\cong$  Congruent (shape and size)  
 $\sim$  Similar (shape)

**Volume:** Cube:  $V = s^3$  Cone:  $V = \frac{1}{3} \pi r^2 h$   
Pyramid:  $V = \frac{1}{3} lwh$  Sphere:  $V = \frac{4}{3} \pi r^3$

# THE BEAST: All the math formulas that matter on the ACT

## Exponents

$A^0 = A^1 =$   
 $A^{\frac{1}{2}} =$   
 $\sqrt{\frac{a}{b}} =$   
 $\sqrt{a}\sqrt{b} =$   
 $A^m A^n =$   
 $(A^m)^n =$   
 $\frac{A^m}{A^n} =$   
 $A^{-m} =$

## Quadratic Equations

$(a + b)^2 =$   
 $(a - b)^2 =$   
 $(a + b)(a - b) =$

## Quadratic Formula

$Ax^2 + bx + c = 0$   
 $\rightarrow x =$

## Distance-Time Formula

$Speed (v) =$   
 $Time (t) =$

## Linear Equations

$y = mx + b$   
 The y intercept is \_\_\_\_\_  
 The slope is \_\_\_\_\_ = \_\_\_\_\_ = \_\_\_\_\_  
 A perpendicular line  
 has a slope of \_\_\_\_\_

## Distance Formula

$d =$

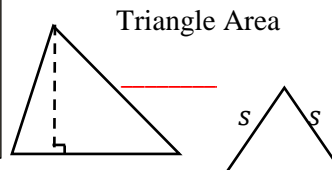
## Midpoint Formula =

## Perfect Squares

$11^2 =$      $12^2 =$      $13^2 =$   
 $14^2 =$      $15^2 =$      $16^2 =$

## Percent

$----- = \frac{part}{whole}$

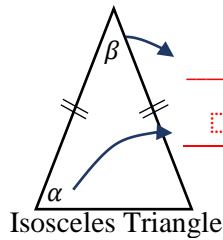


## Pythagorean Triplets

$a^2 + b^2 = c^2$   
 3, \_\_\_\_\_, \_\_\_\_\_  
 5, \_\_\_\_\_, \_\_\_\_\_  
 6, \_\_\_\_\_, \_\_\_\_\_  
 7, \_\_\_\_\_, \_\_\_\_\_  
 8, \_\_\_\_\_, \_\_\_\_\_

## Imaginary Numbers

When squared,  $i$  gives a negative result  
 $i * i =$      $i = \sqrt{-x} =$   
 $i^1 =$  ;  $i^2 =$  ;  $i^3 =$  ;  $i^4 =$  ;  $i^5 =$

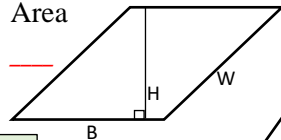


## Equilateral Triangle Area

## Logarithms

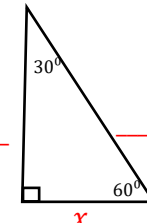
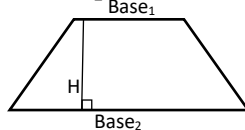
$\log_a a^x =$  \_\_\_\_\_  
 $\log_a x + \log_a y =$  \_\_\_\_\_  
 $\log_a x - \log_a y =$  \_\_\_\_\_

## Parallelogram Area



## Isosceles Triangle

## Trapezoid Area

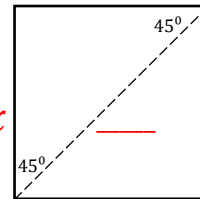
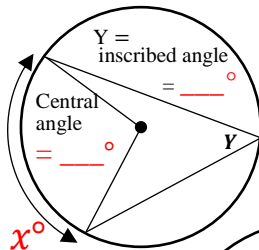


## Probability

\_\_\_\_\_

## Circles

Area = \_\_\_\_\_  
 Circumference = \_\_\_\_\_  
 If midpoint =  $(a, b)$   
 and radius =  $r$   
 then circle formula = \_\_\_\_\_

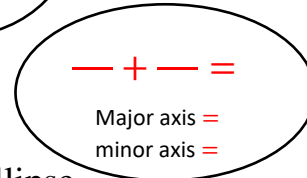
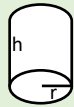


Sum of angles  
in a regular  
polygon with  
n sides:

# of diagonals = \_\_\_\_\_

## Cylinders

Volume = \_\_\_\_\_  
 Surf. Area = \_\_\_\_\_

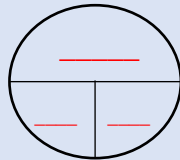


## Ellipse



## Averages

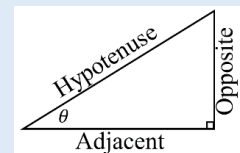
Average = \_\_\_\_\_  
 Weighted Average = \_\_\_\_\_



## Trig: SOHCAHTOA

$\text{Csc } \theta =$  \_\_\_\_\_     $\text{Cot } \theta =$  \_\_\_\_\_  
 $\text{Tan } \theta =$  \_\_\_\_\_     $\text{Sin } \theta =$  \_\_\_\_\_  
 $\text{Cos } \theta =$  \_\_\_\_\_     $\text{Sec } \theta =$  \_\_\_\_\_

$\tan \theta = \frac{\theta}{\theta}$



$\infty$  ( )  
 $\sim$  ( )

**Volume:** Cube:  $V =$     Cone:  $V =$   
 Pyramid:  $V =$     Sphere:  $V =$