

# MATH AT A GLANCE

## EQUATIONS

$$\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c} \quad \frac{a}{b+c} \neq \frac{a}{b} + \frac{a}{c} \quad a(b+c) = ab+ac$$

**PEMDAS** is a mnemonic for remembering the correct order of operations: (P)arentheses, (E)xponents, (M)ultiplication/(D)ivision, (A)ddition/(S)ubtraction.

## DIVISIBILITY

5 is a **factor** of 10; 10 is a **multiple** of 5.  
1 is not a prime; 2 is the only even prime.

## EXPONENTS

$$a^b \times a^c = a^{b+c} \quad (a^b)^c = a^{bc} \quad \frac{a^b}{a^c} = a^{b-c}$$

$$a^c \times b^c = (ab)^c \quad a^{\frac{b}{c}} = \sqrt[c]{a^b} \quad \sqrt{ab} = \sqrt{a} \times \sqrt{b}$$

$$x^0 = 1 \quad \sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}} \quad a^{-b} = \frac{1}{a^b}$$

$$\sqrt{a} + \sqrt{b} \neq \sqrt{a+b}$$

## NUMBER PROPERTIES

even  $\pm$  even = even      even  $\times$  even = even  
odd  $\pm$  odd = even      odd  $\times$  odd = odd  
even  $\pm$  odd = odd      odd  $\times$  even = even

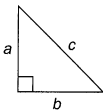
## ANGLES

**Supplementary** angles form a line and sum to 180°.  
**Vertical** angles are across from each other and are equal.  
**Corresponding** angles are equal.

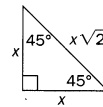
## TRIANGLES

The sum of the interior angles of a triangle = 180°.  
Area =  $\frac{1}{2}(\text{base})(\text{height})$

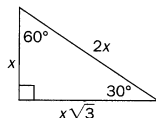
**The Pythagorean Theorem:**  $a^2 + b^2 = c^2$



**Pythagorean Triplets:** 3 : 4 : 5 and 5 : 12 : 13  
45-45-90 triangles are in the ratio of  $x : x : x\sqrt{2}$ .



30-60-90 triangles are in the ratio of  $x : x\sqrt{3} : 2x$ .



## POLYGONS

If you add a side to a figure, add 180° to the sum of the interior angles.

## CIRCLES

$$\text{Diameter} = (2)(\text{radius})$$

$$\text{Circumference} = (2)(\pi)(\text{radius})$$

$$\text{Area} = (\pi)(\text{radius})^2$$

$$\frac{x}{360} = \frac{\text{length of arc}}{\text{circumference}} = \frac{\text{area of arc}}{\text{area of circle}}$$

A line tangent to a circle is perpendicular to the radius at the point of contact.

## FUNCTIONS

**Domain** = the inputs      **Range** = the outputs

## INEQUALITIES

Flip the inequality sign when you multiply or divide by a negative.

## ABSOLUTE VALUE

**Absolute value:** the distance from 0 on the number line  
Absolute value is never negative.

## PERCENTS

$$\text{Percent} = \frac{\text{part}}{\text{whole}} \times 100\%$$

$$\text{Percent change} = \frac{\text{actual change}}{\text{original amount}} \times 100\%$$

## RATIOS

Distance = rate  $\times$  time  
**Direct variation:**  $y = kx$       **Inverse variation:**  $xy = k$

## AVERAGES

Average =  $\frac{\text{sum of terms}}{\text{number of terms}}$   
**Median:** the middle number when the numbers are listed in order  
**Mode:** the number that appears most often

## SOLIDS

Volume of a rectangular solid = (length)(width)(height)  
Volume of a right cylinder =  $\pi(\text{radius})^2(\text{height})$

## LINEAR GRAPHS

**Slope-intercept form:**  $y = mx + b$   
 $m$  = slope       $b$  = the y-intercept  
Slope =  $\frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$

Parallel lines have equal slopes.  
Perpendicular lines have negative reciprocal slopes.

## COORDINATE PLANES

**Midpoint formula:**  $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$   
**Distance formula:**  $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

## NON-LINEAR GRAPHS

A quadratic function graphs as a parabola.  
 $f(x) + n$  moves the graph  $n$  units up  
 $f(x) - n$  moves the graph  $n$  units down  
 $f(x + n)$  moves the graph  $n$  units left  
 $f(x - n)$  moves the graph  $n$  units right

## PROBABILITY

Probability =  $\frac{\# \text{ of desired outcomes}}{\# \text{ of possible outcomes}}$   
If A is independent of B, the probability that both A and B will occur is the product of the two probabilities.

## SEQUENCES

If  $a_1$  is the first term in the sequence,  $a_n$  is the  $n$ th term, and  $r$  is the ratio between terms, then  $a_n = a_1 \times r^{n-1}$ .

## SETS

**Union** ( $\cup$ ): the set of elements that are in either or both of the original sets  
**Intersection** ( $\cap$ ): the set of elements common to the original sets

## TEST PREP AND ADMISSIONS

### GRAMMAR AT A GLANCE

#### VERB TENSES

Use present tense verbs for actions or states occurring in the present time, habitual actions, and things that are always true.

- I **am** a student.
- They **eat** in the cafeteria every day.
- Grass **is** green.

Use past tense verbs for actions or states that took place at a specific time in the past and are now completed.

- I **went** to the Grand Canyon last summer.

Use future tense verbs for actions expected in the future.

- I **will call** you on Wednesday.

Use present perfect tense verbs for actions or states that started in the past and continue into the present, occurred in the past and may occur again in the future, or occurred at an unspecified time in the past.

- I **have been living** here for two years.
- I **have heard** that song several times.
- Anna **has seen** that movie already.

Use past perfect tense verbs for past actions or states that were completed prior to other past actions or states.

- I turned on my computer and saw that I **had failed** to save my work.

Use future perfect tense verbs for future actions or states that will take place before other future actions or states.

- By the end of this week, I **will have worked** forty hours.

#### PRONOUNS

A pronoun must agree in number with its antecedent.

- **Mary** was late because **she** forgot to set the alarm.
- **Seniors** will get **their** report cards next Friday.

Use the subjective case when a pronoun is the subject of a verb or after a linking verb like *to be*.

- **She works** for an insurance company.
- It was **I** who brought the balloons.

Use the objective case when a pronoun is the object of a verb, verb form, or preposition.

- I called **him** on the phone.
- Asking **them** to go was a big mistake.
- Give that to **me**.

#### MODIFIERS

Adjectives modify nouns and pronouns.

- A woman in a **white** dress stood next to the **old** tree.
- Our house has two porches; the **larger** one is in the back.

Adverbs modify verbs, adjectives, and other adverbs.

- They looked **approvingly** at the **neatly** dressed girls.
- That movie was **very** long.
- Don't eat **too quickly**.

#### RUN-ONS AND FRAGMENTS

A sentence that does not contain at least one independent clause is a fragment.

- *Fresh corn on sale at the farmer's market.*

A sentence fragment can be corrected by adding the missing element(s) of the sentence.

- *Fresh corn **is** on sale at the farmer's market.*

A sentence containing multiple independent clauses that are not properly combined is a run-on.

- *The children had been playing in the park, they were covered with mud.*

A run-on sentence can be corrected by making each clause a separate sentence:

- *The children had been playing in the park. They were covered with mud.*

by combining the independent clauses with a semicolon:

- *The children had been playing in the park; they were covered with mud.*

by making one of the clauses subordinate:

- *Because the children had been playing in the park, they were covered with mud.*

or by joining the clauses with a comma and a coordinating conjunction.

- *The children had been playing in the park, so they were covered with mud.*

Coordinating conjunctions are *for, and, nor, but, or, yet, so*. Use the mnemonic FANBOYS to help you remember them.

#### SUBJECT-VERB

A verb must agree with its subject in person.

A first person subject means someone is making a statement about himself. First person subjects are the pronouns *I* and *we*.

- *I am going to Paris.*
- *We are going to Paris.*

A second person subject means someone is speaking to someone else. The second person subject is the pronoun *you*.

- *You are going to Paris.*

A third person subject makes a statement about some other person, place, or thing. The third person subjects are the pronouns *he, she, it, one, and they*, as well as all nouns.

- *He is going to Paris; Annalise is going with him.*
- *The flight will take eight hours.*

A verb must agree with its subject in number.

A singular subject requires the singular form of the verb.

- *Michelle takes the bus to school every morning.*

A plural subject requires the plural form of the verb.

- *Michelle and Abby take the bus to school every morning.*

A verb's subject may not be the noun closest to it.

- *Wild animals in jungles all over the world are endangered.*

Collective nouns are grammatically singular.

- *This collection of paintings was widely viewed.*
- *The committee is studying the impact of the new law.*