Math 123 Common Formula Sheet

Financial Formulas

Simple Interest

$$I = Prt$$
$$A = P(1 + rt)$$

Compound Interest

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

Continuously compounded Interest

$$A = Pe^{rt}$$

Annuities

Value of an annuity compounded n times a year

$$A = \frac{P\left[\left(1+\frac{r}{n}\right)^{nt} - 1\right]}{\left(\frac{r}{n}\right)}$$

Regular Payments Needed to Achieve a Financial Goal

$$P = \frac{A\left(\frac{r}{n}\right)}{\left[\left(1+\frac{r}{n}\right)^{nt} - 1\right]}$$

Income Taxes

Adjusted Gross Income =
  Gross Income – Adjustments

Taxable Income =
  Adjusted Gross Income – (Exemptions + Deductions)

Income Tax =
  Tax computation – Tax credits

Installment Loans

Amount Financed =
  Cash Price – Down Payment

Total Installment Price =
  Total of All Monthly Payments + Down Payment

Finance Charge =
  Total Installment Price – Cash Price

Loan Payment Formula for installment Loans

$$PMT = \frac{P\left(\frac{r}{n}\right)}{\left[1 - \left(1+\frac{r}{n}\right)^{-nt}\right]}$$

Effective Annual Yield

$$Y = \left(1 + \frac{r}{n}\right)^{n} - 1$$

Average Daily Balance

Step 1) Make a table that shows the beginning date of the billing period, each transaction date, and the unpaid balance for each date.

Step 2) Add a column to the table that shows the number of days at each unpaid balance

Step 3) Add a final column to the table that shows each unpaid balance multiplied by the number of days that the balance is outstanding

Step 4) Find the sum of the products in the final column of the table. This dollar amount is the sum of the unpaid balances for each day in the billing period.

Step 5) Compute average daily balance

$$= \frac{\text{sum of unpaid balances for each day in the period}}{\text{number of days in billing period}}$$

Conversions Tables

Length

12 inches	1 foot
3 feet	1 yard
36 inches	1 yard
5280 feet	1 mile
1 inch	2.54 cm
1 foot	30.48 cm
1 yard	0.9 m
1 mile	1.6 km

Area

1 sq. foot	144 sq. inches
1 sq. yard	9 sq. feet
1 acre	43,560 sq. feet
1 sq. mile	640 acres
1 sq. inch	6.5 sq. cm
1 sq. foot	0.09 sq. m
1 sq. yard	0.8 sq. m
1 sq. mile	2.6 sq. km
1 acre	0.4 hectare

Capacity

2 pints	1 quart
4 quarts	1 gallon
1 gallon	128 ounces
1 cup	8 ounces
1 cubic yard	~200 gallons
1 cubic foot	~7.48 gallons
231 cubic inches	~1 gallons
$1 cm^3$	1mL
$1 dm^3 = 1000 cm^3$	1 L
$1 m^3$	1kL

Weight

16 ounces	1 pound
2000 pounds	1 ton (T)
1 ounce	28 grams
1 pound	0.45 kilograms
1 ton(T)	0.9 tonne (t)

Water Weight

$1 cm^3$	1 g
$1 dm^3$	1 kg
$1 m^3$	1000kg = 1t

Metric System Prefixes

kilo – k	kilometer	= 1000 meters
hecto – h	hectometer	= 100 meters
deca – da	decameter	= 10 meters
no prefix	meter	= 1.0 meter
deci – d	decimeter	= 0.1 meters
centi – c	centimeter	= 0.01 meters
milli – m	millimeter	=0.001 meters

Temperature

Celsius to Fahrenheit $\qquad F = \frac{9}{5}C + 32$

Fahrenheit to Celsius $\qquad C = \frac{5}{9}(F - 32)$

Celsius to Kelvin $\qquad K = C + 273.15$

Kelvin to Celsius $\qquad C = K - 273.15$

Algebra

Slope intercept form (line) $\qquad y = mx + b$

Standard form (quadratic) $\qquad ax^2 + bx + c = 0$

The quadratic formula

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

X-coordinate for the vertex of a parabola

$$x = -\frac{b}{2a}$$

Geometry

Trapezoid Area $\qquad A = \frac{1}{2}(b_1 + b_2)h$

Prism Volume $\qquad V = Bh$

Cylinder Volume $\qquad V = \pi r^2 h$

Pyramid Volume $\qquad V = \frac{1}{3}Bh$

Cone Volume $\qquad V = \frac{1}{3}\pi r^2 h$

Sphere Volume $\qquad V = \frac{4}{3}\pi r^3$

Counting

Factorial Notation	$n! = n(n-1)(n-2)\cdots 2\cdot 1$
Zero Factorial	$0! = 1$
Permutation	$_nP_r = \dfrac{n!}{(n-r)!}$
Permutation of duplicate items	$\dfrac{n!}{p!q!r!\cdots}$
Combination	$_nC_r = \dfrac{n!}{(n-r)!r!}$

Statistics

Computing the Standard Deviation for a Data Set

1. Find the mean of the data items.
2. Find the deviation of each data item from the mean:

$$\text{data item} - \text{mean}.$$

3. Square each deviation:

$$(\text{data item} - \text{mean})^2.$$

4. Sum the square deviations:

$$\sum(\text{data item} - \text{mean})^2.$$

5. Divide the sum in step 4 by n – 1, where n represents the number of data items:

$$\frac{\sum(\text{data item} - \text{mean})^2}{n-1}$$

6. Take the square root of the quotient in step 5. This value is the standard deviation for the data set.

$$\text{Standard deviation} = \sqrt{\frac{\sum(data\ item-mean)^2}{n-1}}$$

$$\text{z-score} = \frac{\text{data item} - \text{mean}}{\text{standard deviation}}$$