BASIC MATH SKILLS FOR INTRODUCTORY FINANCE

TOPICS COVERED

- Exponents
- Sigma Notation for Addition
- Order of Operations
- Solving Equations

EXPONENTS

Multiplication can be seen as a shorthand for addition:

$$
\begin{aligned}
5 \times 3 &= 3 + 3 + 3 + 3 + 3 \\
&= 5 + 5 + 5
\end{aligned}
$$

Exponents can be seen as a shorthand for multiplication:

$$5^3 = 5 \times 5 \times 5$$

PROPERTIES OF EXPONENTS

A negative exponent can be made positive by taking the reciprocal of the base:

$$x^{-2} = \frac{1}{x^2}$$

We can add exponents when common bases are multiplied together:

$$x^5 \times x^2 = x^{5+2} = x^7$$

Division is similar:

$$\frac{x^7}{x^7} = x^{7-7} = x^0 = 1$$

SUMMARY OF EXPONENTS

- Exponents are like a shorthand for multiplication
  - $x^3 = x \times x \times x$
- Exponent changes sign with the reciprocal of the base
  - $x^{-2} = \frac{1}{x^2}$
- Add exponents when multiplying common bases
  - $x^2 \times x^2 = x^{2+2} = x^4$
    - Anything to the power 0 equals 1
      - $x^0 = 1$

SIGMA NOTATION FOR ADDITION

Sometimes we might have a series of numbers:

$$1, 2, 3, 4, 5, \ldots, 100.$$

If we wanted to add these all up, this would be hard to represent:

1+2+3+4+5+6+7+8+9+10+11+12+13+14+15+16+17+18+19

Sigma notation makes this much easier:

$$\sum_{i=1}^{100} x_i = 1 + 2 + 3 + 4 + 5 + \ldots + 100$$

x_i is often replaced by a function of x

Example of a series summation:

$$f(x) = x^2$$

$$\sum_{i=1}^{5} f(x_i) = \sum_{i=1}^{5} x_i^2$$

$$= 1 + 4 + 9 + 16 + 25 = 55$$

SUMMARY OF SIGMA NOTATION

- Sigma Notation is a short hand for lengthy addition
  - $\sum_{i=1}^{100} x_i = 1 + 2 + 3 + 4 + 5 + \ldots + 100$
- We can even add a series where a function is applied t
  - $\sum_{i=1}^{5} f(x_i) = \sum_{i=1}^{5} x_i^2 = 1 + 4 + 9 + 16 + 25$

ORDER OF OPERATIONS

- Math statements are evaluated in a systematic way
- PEMDAS
  - *Parentheses, Exponents, Multiplication, Division, Addition, Subtraction*
- Parentheses ( ) are evaluated first
- Addition and subtraction are evaluated last
- Operations go from left to right

EXAMPLE

$$P = \frac{F}{(1+r)^t}$$

Suppose we know $F = 12, r = 0.1$, and $t = 2$. How can we evaluate this?

EXAMPLE

$$P = \frac{12}{(1+0.1)^2} = \frac{12}{(1.1)^2}$$

$$= \frac{12}{1.21} \approx 9.92$$

ORDER OF OPERATIONS SUMMARY

- Math statements are evaluated in a systematic way
- PEMDAS
  - *Parentheses, Exponents, Multiplication, Division, Addition, Subtraction*
- No matter how complicated, there is a unique way to evaluate mathematical statements.

SOLVING EQUATIONS

- Equations are statements of equality with unkown variables
- Our objective is usually to solve for the unkown variables
- We can solve as long as the number of unique equations equals the number of unkowns
- We will discuss how to solve a single equation with a single unknown variable

- Since equations are equalities, we can do whatever we like as long as we do it to both sides
- Our objective is usually to *isolate* the unknown variable
  - This is considered a solution.

EXAMPLE

- $P = \frac{F}{(1+r)^t}$
- Suppose we know $P = 100$, $F = 300$, and $t = 12$

- $100 = \frac{300}{(1+r)^{12}}$ [multiply both sides by $(1+r)^{12}$]
- $100 \times (1+r)^{12} = 300$ [divide both sides by 100]
- $(1+r)^{12} = \frac{300}{100} = 3$

- $(1+r)^{12} = 3$ [Raise both sides to $(1/12)$]
- $1 + r = 3^{1/12}$ [Subtract 1]
- $r = 3^{1/12} - 1 = 0.0959$

EQUATION SOLVING SUMMARY

- Follow PEMDAS
- Manipulate both sides of the equation equally
- Isolate the variable of interest
- Be creative - don't worry if it's not immediately obvious