MY! GRADE 12 APPLIED COURSE REFERENCE NOTES *(copy them if you want)*

UNITS A & E- PROBABILITY, PERMUTATIONS & COMBINATIONS

Fundamental Counting Principle (FCP): If one event can occur in '**a**' ways, a second event in '**b**' ways, a third event in '**c**' ways, and so on, then the number of ways that all events can occur one after the other is the product **a*b*c**…***Eg***: number of license plates we can make 26*26*26*10*10*10. **Watch** if *repetitions* are allowed or not.

Permutations: ***Order does matter***! 1st, 2nd, 3rd in a race of 12 runners. 12*11*10 possible choices. Or ${}_{12}P_3$.

Counting Non-Distinguishable Objects: **4 Red** balls, **2 Green** Balls. Number of *distinguishable* ways to arrange the 6 balls with 4 red and 2 green balls is $\frac{6!}{4!2!}$. Just like arranging YES and Nos. If only two different objects then = Combo.

Combinations. Arrangements of objects where ***order does not matter***. Selecting committees of people (no special positions or rewards), Lotto 6/49, etc.

Eg: how many ways can a committee of three people be formed from 12 people. $\mathbf{12C_3 = \frac{12!}{(12-3)!3!} = 220}$

$Prob(A) = P(A) = \frac{\#\ of\ Favoured\ Outcomes}{\#\ of\ Total\ Possible\ Outcomes}$; eg: **Prob(Draw a King)** = **4/52**. //**Sample space**: the list of all possible outcomes. Use a tree or table. // **Outcome**: the result of one trial of an experiment (eg: flipping one coin has only H or T outcome)// **Event**: A set of outcomes. **Eg**: rolling two dice, an event might be the set of outcomes where doubles were rolled.

Complement. The probability of an event happening is "***1 – the probability it won't happen***". **Complement** of event A is $\bar{A}$. So $\boldsymbol{P(\bar{A}) = 1 - P(A)}$. **At least once Probs**: Prob(**A's ≥ 1 time**) = $\boldsymbol{1 - P(no\ A's)}$

ODDS. Odds in favour = favourable:not favourable; *eg*. wins : losses. Odds Against = not favourable : favourable

Formulas: **Factorial**: **6! ≡ 6*5*4*3*2*1; Permutation**: $\boldsymbol{{}_nP_r = \frac{n!}{(n-r)!}}$; **Combination**: $\boldsymbol{{}_nC_r = \frac{n!}{(n-r)!r!}}$

Multiplying Probabilities: For successive events. *Keyword*: **AND**. Often one probability is *dependent* on the first. Often indicates whether something is drawn and with replacement or not.

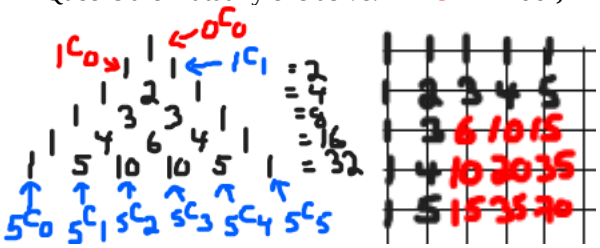
Independent example: Let **A** be event of being hit by bus. Let **B** be event of winning lottery. Both are independent events. Say P(A) = 0.01, and P(B) = 0.01. Prob of getting hit by a bus and winning the lottery = Prob(A **AND** B)= P(A)*P(B)=0.01*0.01=0.0001. Dependent example. Standard deck of cards. Probability of drawing a King **then** a Queen without replacing the first card. Let: $\mathbf{K_1}$= event of drawing King first draw; $\mathbf{Q_2}$ = event of drawing Queen second. **P(K_1 *and then* Q_2) = P(K_1)*P(Q_2 | K_1)**=$\frac{4}{52} * \frac{4}{51} = \frac{4}{663} = \mathbf{0.60\%}$

Adding Probabilities. For compound events, multiple events. *Keyword*: **OR**

Eg: Let **K = Set of all Kings**. Let **S = Set of all spades**.

Prob (**K OR S**) = P(**K**) + P(**S**) – Prob (**K AND S**). = $\frac{4}{52} + \frac{13}{52} - \frac{1}{52} = \frac{16}{52} = \frac{4}{13} = \mathbf{30.7\%}$ We are subtracting out the common card to set K **AND** set S; that is the **K♠** so we *don't double count* it. Mutually exclusive Events. The two events or sets that share no common outcomes! ie: Kings AND Queens are mutually exclusive. ***OR ≡ Add ; AND ≡ Multiply ***

Pathways. As per usual PASCAL triangle method, or use the secret combination! $\mathbf{{}_nC_r}$ where **n** is the total number of steps, **r** is *either* the downs or the rights. Doesn't matter what you count (downs or rights)! Just like selecting non-distinguishable objects.



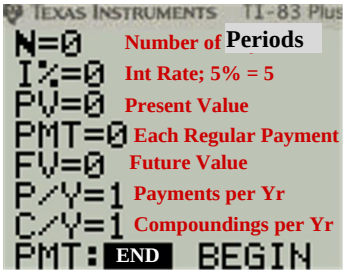
UNIT B – PERSONAL FINANCE

Simple Interest: $I = P*r*t$ and **A = P + I** ; so: **A = P(1 + r*t)**

Compound Interest: $A = P\left(1 + \frac{r}{n}\right)^{nt}$ **; where A** = Total Amount **or FV** [$], **P** = Principal [$] or **PV**, **r** = *annual* percentage rate[%/yr], little **n** is compounding frequency (C/Y times per year), **t** is time [years].

Rule of 72: **If I% • years = 72** ***then*** *double*

*Big **N** =Number of Periods = annuity payments per year * years*



TVM Calculator

$ you put in is negative (-)

Net Worth = Total Assets – Total Liabilities

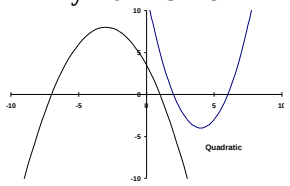
$$\textbf{Gross Debt Service ratio [max 32\%]} = \frac{\left(\begin{matrix}\text{Monthly Mortgage} \\ \text{Payment}\end{matrix} + \begin{matrix}\text{Monthly Property} \\ \text{Taxes}\end{matrix} + \begin{matrix}\text{Monthly Heating} \\ \text{Costs}\end{matrix}\right)}{\text{Gross Monthly Income}}$$

$$\textbf{Debt – to – equity ratio [max 50\%]} = \frac{(\text{Total Liabilities} - \text{Mortgage})}{\text{Net worth}}$$

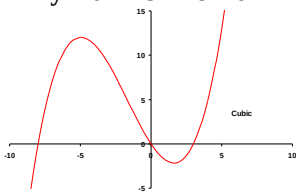
$$\text{Rate of Return \%} = \frac{\left(\begin{matrix}\text{Current Value} \\ \text{of Portfolio}\end{matrix} - \begin{matrix}\text{Previous Value} \\ \text{of Portfolio}\end{matrix}\right)}{\text{Previous Value of Portfolio}} * 100$$

UNIT C: FUNCTIONS. Intercepts, zeros, intersections of two curves, max, min, asymptotes

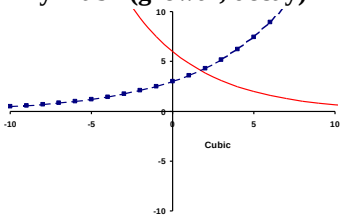
Quadratic $y = ax^2+bx+c$



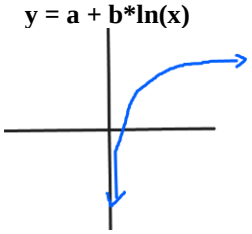
Cubic $y = ax^3+bx^2+cx+d$



Exponential $y = ab^x$ **(growth, decay)**



Logarithmic $y = a + b*\ln(x)$



Logs. If $2^3 = 8$ then $\log_2 8 = 3$. **Change of Base:** $log_a x = \frac{log_{10} x}{log_{10} a}$; **eg:** $log_2 8 = \frac{log_{10} x}{log_{10} 2} = 3$

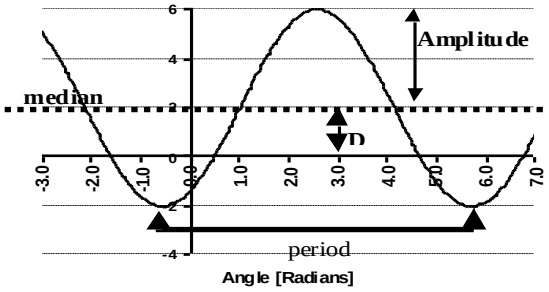
UNIT F – SINUSOIDAL FUNCTIONS

y =Asin(Bx + C) + D **A** is the Amplitude, **B** is the number times a cycle fits into **2π**. (or ***360°***). Large **B** squishes the cycles in the *x*-domain. $T = Period = \frac{2\pi}{B} or \frac{360^\circ}{B}$.

C and **B** work together for horizontal ***phase shift*** to affect where cycle starts. Horizontal **Phase Shift of sine curve = −C/B.**

D is the Median value; half the data is above; half below so **D** is the vertical displacement upwards from x-axis of all the data.

D = (Max + Min)/2. **Max= D + A , Min = D – A.**



Radians: Exactly **π** radians in 180°. Conversion factor is: **π^r/180°.**

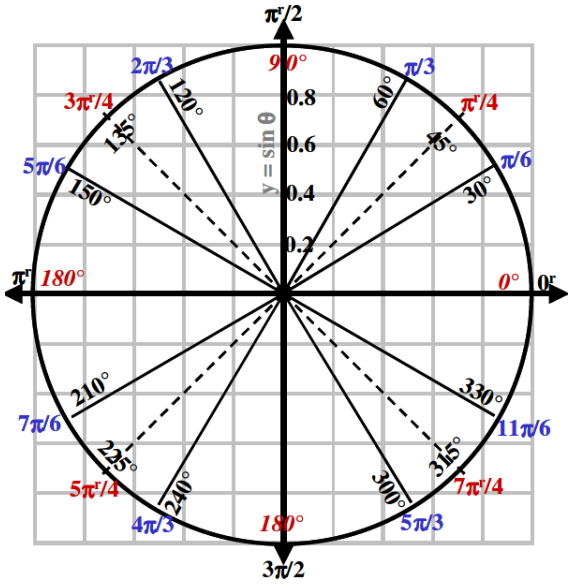
Eg: 60°= 60° *π^r/180° = $\frac{\pi}{3}$ **= 1.22 radians.**

$\frac{4\pi^r}{9} = \frac{4\pi^r}{9} * \frac{180^\circ}{\pi^r} = 80^\circ$

Make sure calculator is in proper Degree or Radian mode!

Use **Zoom** **7:TRIG .**

Sine Regressions are ***always*** calculated as proper radians.



LOGIC NOTES: Truth Table

A	B	A ∧ B	A ∨ B	A → B	A ↔ B	A'
T	T	T	T	T	T	F
T	F	F	T	F	F	F
F	T	F	T	T	F	T
F	F	F	F	T	T	T

UNIT G – DESIGN AND MEASUREMENT (*you will be provided geometric formulae*)

Common Conversions: **1 in = 2.54 cm.** ***1m = 3.28 ft.*** **1 m = 39.37 in. 1 Kg = 2.21 lbs.** 1 ImpGal = 4.55 l.

1 km = 0.6214 mi. *Example*: $3\text{mi} * \frac{1\,km}{0.6214\,mi} = 4.83km$

Kilo: *k* = 1,000. **Centi: *c*** = 1/100. **Milli: m** = 1/1000. 1ft = 12 inches. 1 yard = 3 ft

Common Geometric Formulas. **Circle: A = πr^2 ; C = πd** *or* **2πr.** **Triangle: A = $\frac{1}{2}$bh**

Vol_{prism} = $Base_{area}$*h. $Vol_{RecPrism}$ = (l*w)*h. Vol_{Cyl} = πr^2*h. $Vol_{Pyramid}$ = 1/3 * Vol_{Prism}

Vol_{Sphere} = $(4/3)\pi r^3$. SA is sum of area of all faces and sides. **SA_{Cyl} = $2\pi r^2 + 2\pi rh$.**

TI 83 HINTS: Find A Vertex: Use **2nd** **TRACE** **3:minimum** or **4:maximum** . Dance left of the vertex → **ENTER**, dance right of the vertex → **ENTER**, then move to approximate guess → **ENTER**. **Find Y-Intercept:** Evaluate the function at **X = 0**. **2nd** **TRACE** **1:value** and enter **X = 0.** **Find X-intercept(s) (or Zeros or Roots):** Find the 'zeros' to solve a quadratic. **2nd** **TRACE** **2:zero** . A bit left: **ENT** a bit right: **ENT**, guess: **ENT** . **Find the Intersection of two curves (or lines)** . **2nd** **TRACE** **5: intersect.** Used to solve a quadratic also

Regression: Enter sufficient data points into **L_1** and **L_2** using **STAT** **EDIT** . Plot the Points by turning on **STAT PLOT** (**2nd Y=**). Find regression equation: **STAT** **CALC** **[???]Reg** **ENTER** on blank line. . Then when you get ***[???]Reg*** (or ExpReg, or QuadReg or …) on Main Screen append **VARS** **Y-VARS** **FUNCTION** **Y1** to paste the regression into **Y_1=** equation. Then **Graph** . Select **ZOOM** **9:ZoomStat** will fit scatter plot perfectly.