Grade 11 Applied Reference Notes

Rev: 2013-09-26

UNIT A – QUADRATIC FUNCTIONS

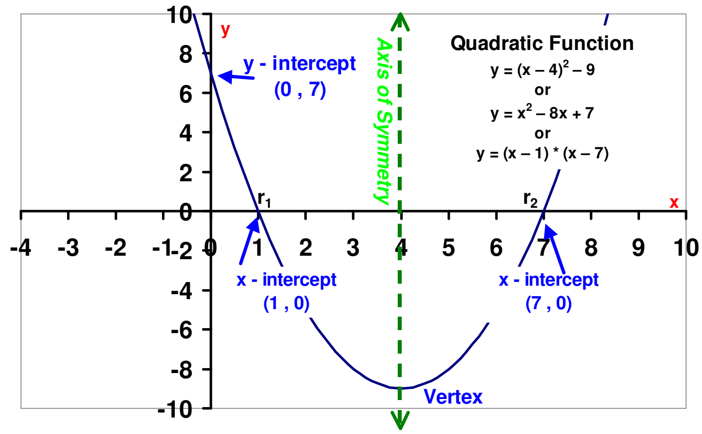
Quadratic Functions: $y = ax^2 + bx + c$ general form. Curve is a parabola. Use graph to find vertex. Has axis of symmetry through the vertex or can also find axis of symmetry midway between roots r_1 and r_2 : $x_{symmetry} = \frac{r_1 + r_2}{2}$. Evaluate function for axis of symmetry to find **y** of vertex. Has **Min** or **Max** on **range**. Has two or fewer **x**-intercepts. Sometimes written as Standard Form or **Vertex Form**

$y = a*(x - h)^2 + k$; where (h, k) is the vertex **or Factored Form: $y = (x - r_1)(x - r_2)$.**

Vertex: Point where quadratic curve (parabola) bottoms out or else peaks, where curve reaches a minimum or maximum. **Y-intercept**: where ***x* = 0** (*ie: crossing the y-axis*) , just evaluate for ***x* =0**.

x*- intercept(s)**: where ***y = 0 (ie: crossing the x-axis*)*. **Min or Max**: the ***y*** coordinate of the vertex.

Domain: what values the ***x*** can have; $-\infty < x < \infty$ **for all lines , quadratics, …** **Range:** what the function value or, ***y,*** can be. **Ex**: **Range**: $-9 \le y < \infty$.



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: Entering Data. Enter data points as follows. (You need at least 3 or 4 points).. Press **STAT** Select **1:EDIT** . Clear Lists 1 and 2 (Cursor to the top of each column and press **CLEAR ENTER**). Entering **independent** data in $\mathbf{L_1}$. Enter **dependent** data in $\mathbf{L_2}$. (the data must be in increasing order by independent variable)

Plotting Data. Plotting data is similar to graphing data. De-select all **Y=** formulas or clear them so they will not graph. The equals sign will be highlighted if they *are* to be graphed. .Select **STAT PLOT** by pressing **2nd** **Y=**. Select **Plot 1**. Turn on Plot 1. Put plot into the *Scatter Plot* mode. Make sure the data is being taken from lists $\mathbf{L_1}$ and $\mathbf{L_2}$. Select the largest *mark* possible. Press **GRAPH**. You should have a plot of your data!. You may need to use **ZOOM** **9:ZOOMSTAT** to fit the data

Data Regression. Now that you have your data entered let the TI83 calculate the *coefficients* of the type of curve you want. This is a statistical operation, **fitting the best curve to the data**. Do it like this: Go to Catalogue [**2nd** **0**]and select **DiagnosticOn .**. **ENT** . Press **STAT** . Select **CALC**. Select desired regression (in this case: **QuadReg**). Press **ENTER .** The screen will show you the **a**, **b**, **c** coefficients for the function that best fits the data. Make sure it makes sense! Go to the **Y=** window. Put the cursor in the first function (**Y1=**). Press **VARS** . Select **5:STATISTICS**. Select **EQ**. Select **RegEQ**. Press **GRAPH**. Both your raw data and the best fit curve will appear!!

UNIT B – RATES, SCALE AND MEASUREMENT

Rates: comparison of two different numbers having different units. **50 km / hr**; **$5/litre**.

Speed is a **rate; speed = distance / time; ex: 45km / 30 minutes is 90 km per hour.**

A *constant* rate has a *constant* straight line **slope** on a graph**.**

Scale of a model (or map): $\frac{Model\ Length}{Actual\ Length}$**.** Eg: **1/50,000 map;** 1cm on map = 50,000 cm on earth. (500m)

$Vol_{Prism} = Area_{base} * height$

$Vol_{cyl} = \pi * r^2 * h$

$Vol_{sphere} = \frac{4}{3}\pi r^3$

SA = Sum of Area of faces.

$SA_{Sphere} = 4\pi r^2$

Circle: Circum = $\pi d = 2\pi r$

Area = πr^2**.**

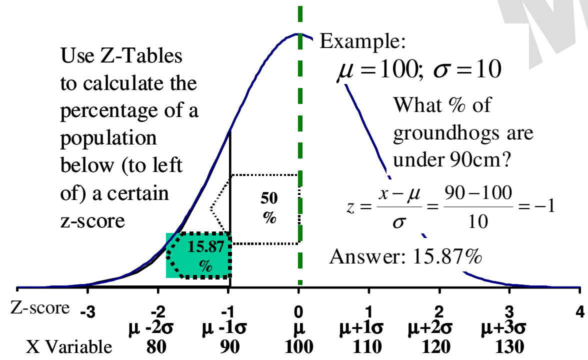
Triangle: Area = $\frac{1}{2} * b * h$ **;**

b and h are always ⊥

UNIT C – PROOFS.

UNIT D - STATISTICS

The mean, $\bar{x}$ *or* μ, or average, of a set of scores is found by adding the scores together and then dividing the sum by the number of scores.
Mode is the most frequent data or measurement.
.**Median**: half of the data is more, half the data is less. Put in order, find the middle data (if even then average between the two centre data points.
Range: (**Max – Min**) of data. **Lower Quartile** Q_1, the centre of lower half of data, **Upper Quartile,** Q_3, the centre of Upper Half of data.
Inter-quartile Range: Q_3-Q_1. **σ** is *Std Deviation*.
68-95-99 Rule: On a ***normal distribution***: **68%** of data fall between **-1σ** and **+1σ**. **95%** of data fall between **–2σ** and **+2σ.**
99% of data falls between **–3 σ** and **+3σ.**
$z = \frac{x-\mu}{\sigma}$ is the **z-score**. Use the standard z-scores to find the area (probability) to the **left** of the z score. Always draw the diagram!



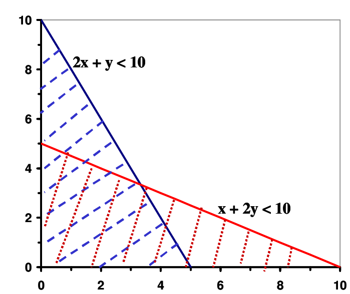
TI83 Hints: Data Entry: **STAT** **EDIT** **Use** L_1 **and also** L_2 **if have frequency counts.** Use **STAT** **CALC** **1: 1VAR STATS** (Use **1:VAR STATS** L_1,L_2 ***if*** have frequency of data in L_2). Histogram. Turn on Plots using **2nd** **Y=** . ZOOM **9:ZoomStat** Change **Window** so that categories (**Xscl**) are correct width. Use **TRACE** to see values on Histogram.

UNIT E – RESEARCH PROJECT

This research project will be issued under separate cover. Topics will vary depending on the student

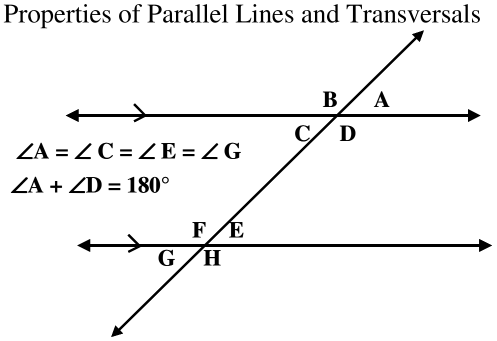
UNIT F – SYSTEMS OF INEQUALITIES

Example inequalities: **4>2** (4 is **greater than** 2, or 2 is **less than** 4); **7 ≤ 7** (seven is **less than *or* equal to** seven), etc. **Inequality Algebra.** ***Don't forget*** to ***change direction*** of inequality when **multiply** or **divide** by a negative number. Eg: **–2x > 6→ x < –3.**
Plotting Linear Inequalities: ***Solve*** for ***y***; ***plot*** the line on graph; use broken line if no equality involved; ***shade*** the half of the universe that makes the inequality true (use ***the test point*** method *if necessary*). **Linear Programming**. (Use the Linear Programming calculation template). Graph all the inequalities. Find the corners of the feasible area (polygon formed by the ***constraint*** lines cross); **evaluate** the '***objective***' profit equation at each corner to find which corner gives the **optimal** solution.



UNIT G - TRIGONOMETRY

Properties of Parallel Lines and Transversals



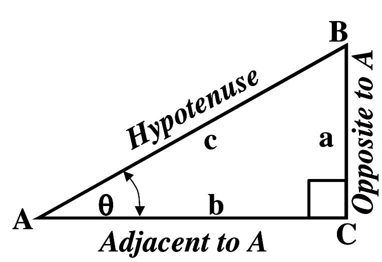
Alternate (aka: vertical angles) are congruent.

Sum of interior angles of an n-sided polygon is:
sum = (n – 2) * 180°.

Triangle Congruence:
Side-Angle-Side. SAS. If for two Δs two pairs of sides are the same length and the included angles are the same, then the Δs are congruent
Side-Side-Side. SSS. If for two Δs all three pairs of sides are the same length, then the Δs are congruent
Angle-Side-Angle. If for two Δs two pairs of angles are the same measure and the included side is the same length, then the Δs are congruent.

Knowing any three parts of a triangle you can solve for the other three. (except one case). **SOH, CAH, TOA.** $\sin\theta = \frac{Opp}{Hyp}$, $\cos\theta = \frac{Adj}{Hyp}$; $\tan\theta = \frac{Opp}{Adj}$.

Inverse trig. **If** $\tan\theta = x$ **then** $\theta = \tan^{-1} x$, etc.
Cosine Law: $a^2 = b^2 + c^2 - 2bc * \cos(A)$. Used when two sides and the included angle are known or when all three sides are known and want to know an angle.



Sine Law: $\frac{a}{SinA} = \frac{b}{SinB} = \frac{c}{SinC}$. Works when the Cosine law does not. Watch for the ambiguous case where the shortest side is given and it is across from a given angle. Watch for impossible triangles. In all of these laws **angles A, B, C** are the corners across from **sides a, b, c**.