CORNERSTONE CHRISTIAN COLLEGE
www.cornerstone.wa.edu.au

Name: _____
Class: _____
Due date: _____/___/____
Mark: _____

Year 10 Mathematics 2014. Topic 5&7, Functions & Graphing Investigation

Functions, Graphs, Curves and Circles in Society

You are to investigate the occurrence, use and application of quadratic, exponential, or hyperbolic functions and/or of circles and/or their graphs in society.

This investigation is worth 10% of your year grade.

Assessed:
Expand binomial products and factorise monic quadratic expressions using a variety of strategies (ACMNA233), exploring the method of completing the square to factorise quadratic expressions and solve quadratic equations, identifying and using common factors, including binomial expressions, to factorise algebraic expressions using the technique of grouping in pairs using the identities for perfect squares and the difference of squares to factorise quadratic expressions. (Non-monics included)

Explore the connection between algebraic and graphical representations of relations such as simple quadratics, circles and exponentials using digital technology as appropriate (ACMNA239), sketching graphs of parabolas, and circles, applying translations, reflections and stretches to parabolas and circles, sketching the graphs of exponential functions using transformations

Solve simple quadratic equations using a range of strategies (ACMNA241), using a variety of techniques to solve quadratic equations, including grouping, completing the square, the quadratic formula and choosing two integers with the required product and sum.

Advice for students:

1. The booklet is provided for you to show your ideas, working, sketches, number and algebra. Use it to show drafts of the work you do, but try to keep the first page (inside front cover) for use as an index. If you run out of room, feel free to carefully add on more pages. Additional booklets can be provided at no extra cost!
2. You may choose to present your work in any written or printed form, as a web page or PowerPoint presentation. It must be legible (easy to read), logical, and address the main points given in this document. All work must be submitted in printed form by the due date, including a printed version if a webpage or pptx.
3. The time allocated is three weeks of class time during weeks 6, 7 & 8, together with the associated homework time of 25 minutes per lesson. This is a total of 3 x (4 x 55) + 3 x (4 x 25) minutes = 960 minutes, or 16 hours. The quantity and quality of work produced should reflect this time allocation.
4. Ideas.
    a. There are too many ideas to provide an exhaustive list here, but you could consider:
        i. Curves in architecture
        ii. Curves in boat building
        iii. Functions and equations in bridge building. See http://christopherpoole.weebly.com/
        iv. Population growth
        v. Disease spread
        vi. Ballistic missiles
        vii. Orbits
        viii. Growth in new technologies
        ix. Applications in sports

5. Starting out.
    a. Getting started is half the battle. Do not leave it too late.
6. Note that most natural or made-made systems will only approximate a perfect function. There may be some deviation at the extremes, but many systems can be shown to approximate to a quadratic or exponential model.
7. Thinking.
    a. Leave space in your booklet to write down ideas that you have as you have them. You may want to come back to them later. Keep a record of all your work.
    b. Don't get frustrated if one idea does not work – try something else (but keep you earlier work).
    c. Sleeping on a problem really works. Stop, take a break, and come back to it again.
8. Systematic exploration.
    a. First try a very simple case, then build up systematically to more difficult cases.
    b. Keep track of your work - be organised.
    c. Some ideas will be dead ends, some will lead to infinite possibilities.
    d. Be prepared for lots of hackwork early on. Sometimes pages of work can be summarised later with one general statement or "big idea".
    e. Use the investigation statement as a starting point. Do not feel constrained by the statement – use it as a launching pad for ideas. Go both in-depth into the statement and extend beyond the statement.
9. This is an individual assignment. The expectation is that the work submitted is wholly your own.
10. All material sourced from other authors must be properly referenced. The bulk of the work should be your own. Investigations consisting of cut-and-paste material from the internet will receive a very low mark.

Marking.

Unlike many mathematics assessments this investigation is very open-ended with no one-line "right" answer. There is no rigid marking key or rubric. Marking will be based more on an overall impression of the work than a standard test would be. You will be assessed on mathematical thinking rather than rote learning. There may well be a relationship that you would be expected to deduce or arrive at, but a lot of consideration will be given to:

1. The range of functions or graphs investigated (but one function investigated in-depth could counter this!)
2. The depth of functions investigated (but investigating several functions could counter this!)
3. The manner in which the investigation has been carried out systematically.
4. The mathematical content, including the application of previously studied material & new work.
5. The quality of any summary (organisation, structure, fluency, clarity, presentation)

Work will be allocated a grade on the following scale:

Grade	%
A+	100
A	90
A-	80
B+	75
B	70
B-	65
C+	60
C	55
C-	50
D+	45
D	40
D-	35
E+	30
E	20
E-	10