Math 7: Handout 16
Math Battle. Graphs of Quadratic Functions

Graphs of quadratic functions

- We know how to draw the graph of $y = x^2$. It's a parabola.
- We know that the graph of $y = x^2 + b$ can be obtained from the graph of $y = x^2$ by shifting up by b units (or down, if $b < 0$)
- We know that the graph of $y = (x + a)^2$ can be obtained from the graph of $y = x^2$ by shifting *left* by a units (or right, if $a < 0$).
- Based on the two fact above, we can draw a graph of any function of the type $y = (x + a)^2 + b$.

We can transform any quadratic function $y = x^2 + px + q$ to $y = (x + a)^2 + b$ by completing the square.

Homework

1. Use completing the square method to draw the following graphs:

   (a) $y = x^2 - 5x + 5$ (b) $y = x^2 - 4x + 2$ (c) $y = x^2 - x - 1$

   (d) $y = -x^2 + 3x - 0.5$ (e) $y = x^2 + 4x - 45$

Math Battle

1. Two math teams have to toss a coin to determine which team begins the competition. However, they only have a coin which is known to be loaded: if you toss it, chances of drawing heads and tails are different (and unknown). Can you find a way for these two teams to use this coin and still have a toss-up in which each team has equal chances of winning?
2. In a convex n-gon, no three diagonals intersect at a single point. How many intersection points of diagonals are there (not counting the vertices)?
3. Below you can find translations of some English sentences into Hawaian:

He has seven big brothers	Ehiku ona kaikuaana
Mary has one brother	Ekahi o Mele kaikunane
He has one little brother	Ekahi ona kaikaina
Mary has no big sisters	Aohe o Mele kaikuaana
John has one sister	Ekahi o Keone kaikuahine
I have one canoe	Ekahi ou waa
She has no little sisters	Aohe ona kaikaina

   Translate from Hawaian: "Aohe ou kaikuaana" and explain how you did it.
4. 20 cities are connected by 172 roads. Is it true that using these roads, it is possible to get from any city to any other?
5. From the usual 8×8 chessboard one corner square is removed. Can this board be covered by 3×1 rectangles without overlapping?
6. Each of 64 friends has some urgent news she wants to share with her friends, so they start calling each other. Each phone call lasts one hour (they love to talk…). Find a way for them to call each other so that each friend learns all the news in the shortest possible time. (During one phone call, you can tell as many news as you like.)