Class notes from February 27

Discussion of the Arm Chair Problem

Entry

Specialize with a model.
Test ways to record possible moves so a pattern can emerge.

Attack

Can it be done? Make a conjecture.
Ask a more general question. What positions can be reached.
Keep a record of the direction the chair is facing
Are coordinates useful?
Specialize. What points can a fixed corner of the chair reach?

If you conjecture, it can't be done. Two natural questions arise, "why can it not be done?" and "what is possible to do?" This last question is an important aspect of problem solving. By generalizing the original question, it opens up the original question so that a larger pattern can emerge. By following the direction the chair faces of the progress or each corner leads to a familiar chessboard pattern. Problems such as the Arm Chair Problem lie in a field of study known as Transformational Geometry.

Conjecturing is at the heart of the mathematical thinking.

So far in this class the problems we have tackled have given us some experience in conjecturing. The following question will open up an opportunity for in-depth study of conjecturing in using just one problem. It is fertile ground due to the numerous approaches that can be taken. Like with the palindrome question, using symbols maybe helpful, but not necessarily required. Use care. As we know symbols are powerful but sometime they obscure the inner workings and implications or a problem.

Sums

Certain numbers can be expressed as sum of consecutive numbers. For example,

9=2+3+4 or 11=5+6 or 22=4+5+6+7

Exactly which numbers have this property?

If stuck - Try lots of examples
Change the question, extend it.
Specialize systematically, try different systems
As always LOOK FOR PATTERNS

Once you have resoled this problem, I will post a case study of a possible attack on this problem. This will give a good venue for discussion and an opportunity to think about our own processes.

Read the articles posted. The following two problems also should be done for next class. Keep notes on your conjectures as you resolve each. And by all means, HAVE FUN!

Square Differences

Which numbers can be expressed as the difference of two perfect squares?

Sums of Squares

Hmmm …

$2^2+3^2+6^2=7^2$
$3^2+4^2+12^2=13^2$
$4^2+5^2+20^2=21^2$

Is this part of a general pattern?

$3^2+4^2=5^2$
$10^2+11^2+12^2=13^2+14^2$
$21^2+22^2+23^2+24^2=25^2+26^2+27^2$

Is this part of a general pattern?