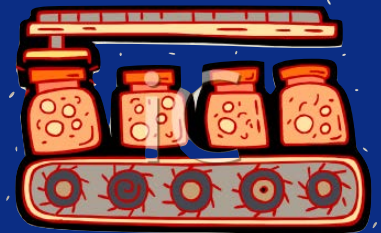
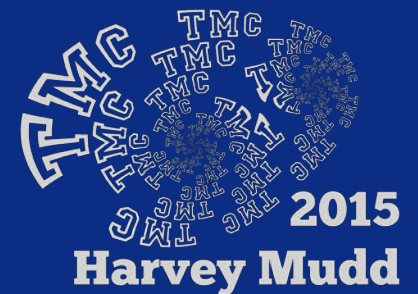


# Swan-style Task Factory



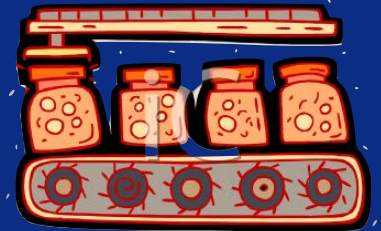
Elizabeth Statmore

@cheesemonkeysf



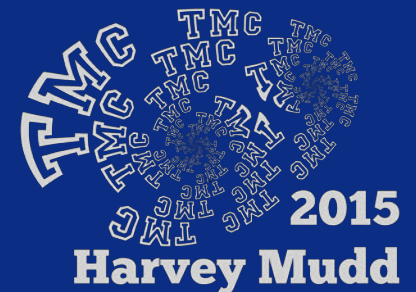
# Maker Faire

## Swan-style Task Factory



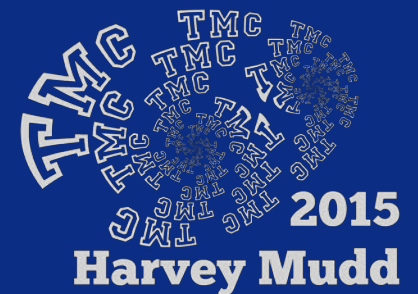
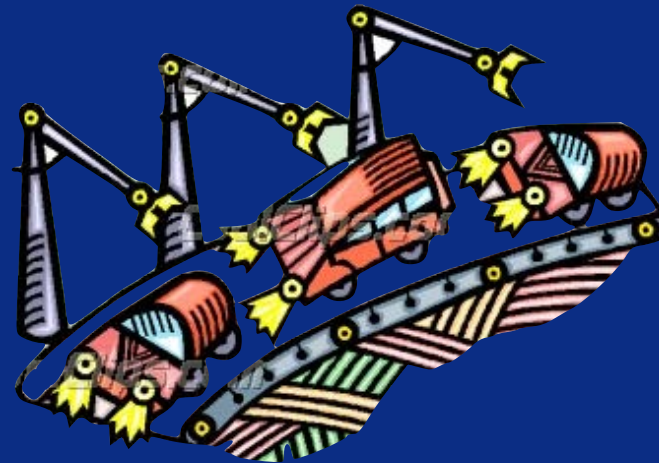
Elizabeth Statmore

@cheesemonkeysf



# On my way to #TMC14...

... I got waylaid by a great idea  
(Talking Points)



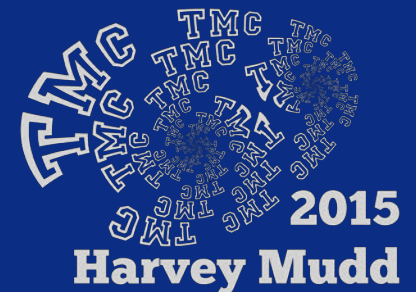
...but I still wanted to think  
about...



Swan's Design Principles

&

Task Types



So this is...



THAT  
talk.







# ...there are only 100 of them!

**Mathematics Assessment Project**  
CLASSROOM CHALLENGES  
Formative Assessment Lessons for High School

Home About MAP News Lessons Tasks Tests PD Modules TRU Math Suite Standards

### Index of Classroom Challenges

Classroom Challenges are lessons that support teachers in formative assessment. The 8 and 40 for 'Career and College Readiness' at High School Grades 9 and above. So concepts, others on solving non-routine problems.

The [Brief Guide for teachers and administrators \(PDF\)](#) is recommended reading before. Each lesson is downloadable as an all-in-one PDF to print out, and a supporting Power

#### Finding a Lesson

There are several ways of navigating:

1. Use the menu on the left to browse by grade and topic area, or search for a key
2. Go to the [Standards](#) tab to find lessons linked to a particular content standard or
3. The complete set of lessons is listed below in alphabetic order.

**High School**

- ▶ Number and Quantity
- ▶ Algebra and Functions
- ▶ Geometry
- ▶ Probability and Statistics

**Grade 6**

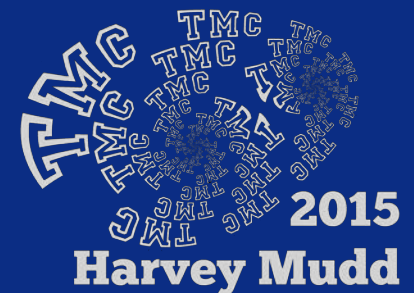
- Adding and Subtracting Directed Numbers
- Creating a Measure of Slope
- Designing 3D Products: Candy Cartons
- Evaluating Statements About Number Operations
- Evaluating Statements: Consecutive Sums
- Finding Factors and Multiples
- Interpreting Equations
- Interpreting Multiplication and Division

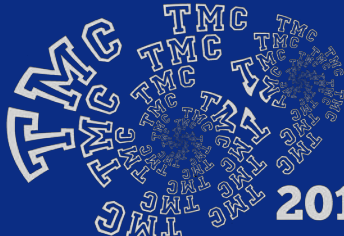
**Grade 7**

- Analyzing Games of Chance
- Applying Angle Theorems
- Classifying Proportions
- Comparing Data Using
- Comparing Strategies for
- Describing and Defining
- Describing and Defining
- Designing a 3D Product



• <http://map.mathshell.org>





**2015**

**Harvey Mudd**







# You can use Swan's writings to improvise your own Swan-style tasks

**Mathematics Assessment Project**  
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### Index of Classroom Challenges

Classroom Challenges are lessons that support teachers in formative assessment. They are available for High School Grades 9 and above. Some are for 'Career and College Readiness' at High School Grades 9 and above. Some are for concepts, others on solving non-routine problems.

The [Brief Guide for teachers and administrators \(PDF\)](#) is recommended reading before using any of the lessons. Each lesson is downloadable as an all-in-one PDF to print out, and a supporting PowerPoint.

#### Finding a Lesson

There are several ways of navigating:

1. Use the menu on the left to browse by grade and topic area, or search for a key word.
2. Go to the [Standards](#) tab to find lessons linked to a particular content standard or standard for mathematical practices.
3. The complete set of lessons is listed below in alphabetic order.

**High School**

- ▶ Number and Quantity
- ▶ Algebra and Functions
- ▶ Geometry
- ▶ Probability and Statistics

**Grade 6**

- Adding and Subtracting Directed Numbers
- Creating a Measure of Slope
- Designing 3D Products: Candy Cartons
- Evaluating Statements About Number Operations
- Evaluating Statements: Consecutive Sums
- Finding Factors and Multiples
- Interpreting Equations
- Interpreting Multiplication and Division

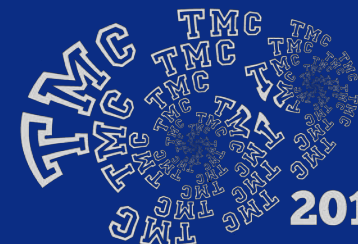
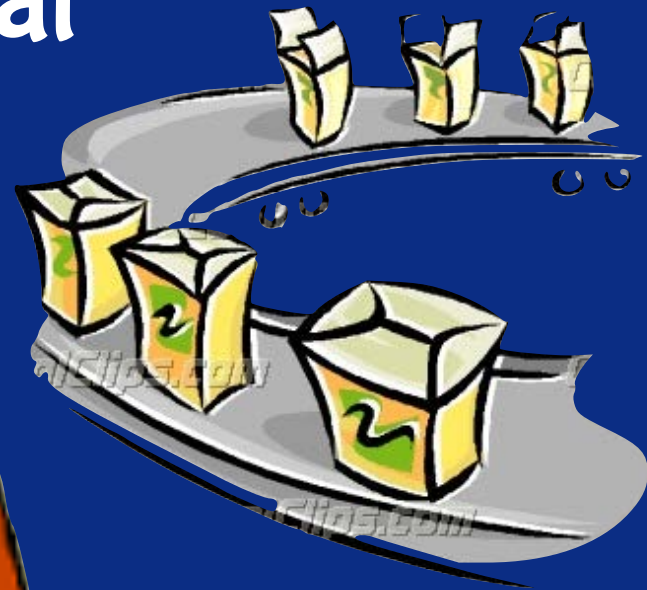
**Grade 7**

- Analyzing Games of Chance
- Applying Angle Theorems
- Classifying Proportions
- Comparing Data Using Statistics
- Comparing Strategies for Solving Problems
- Describing and Defining Geometric Figures
- Describing and Defining Geometric Figures
- Designing a 3D Product

Your old textbooks provide some  
great starting points...

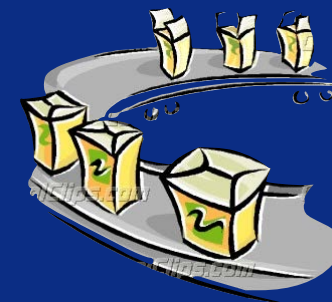


You can use Swan's research to  
improvise your own rich tasks to  
jump-start mathematical  
conversations!



**2015**  
**Harvey Mudd**

# For example, here's an old textbook matching problem...



(A)  $r = 2$

(B)  $\theta = \frac{\pi}{4}$

(C)  $r \cos \theta = 2$

(D)  $\theta = \frac{3\pi}{4}$

(E)  $r = 1 + \cos \theta$

(F)  $r = 2 \cos \theta$

(G)  $r \sin \theta = 2$

(H)  $\theta = \frac{5\pi}{4}$

29.  $r = 2$

30.  $\theta = \frac{\pi}{4}$

31.  $r = 2 \cos \theta$

32.  $r \cos \theta = 2$

33.  $r = 1 + \cos \theta$

34.  $r = 2 \sin \theta$

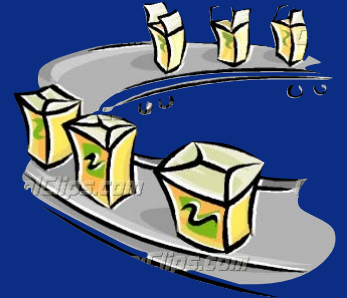
35.  $\theta = \frac{3\pi}{4}$

36.  $r \sin \theta = 2$



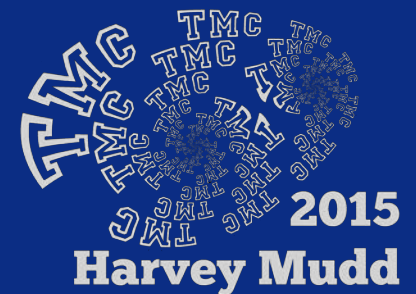


...that I turned into a Swan-style rich task using Swan's design principles:



# GRAPH this CRITTER!

 $x^2 + y^2 = 4$ 29. $r = 2$	 $y = x$ 30. $\theta = \frac{\pi}{4}$	 $(x-1)^2 + y^2 = 1$ 31. $r = 2 \cos \theta$	 $x = 2$ 32. $r \cos \theta = 2$
 $x^2 + y^2 = \sqrt{x^2 + y^2} + x$ 33. $r = 1 + \cos \theta$	 $x^2 + (y-1)^2 = 1$ 34. $r = 2 \sin \theta$	 $y = -x$ 35. $\theta = \frac{3\pi}{4}$	 $y = 2$ 36. $r \sin \theta = 2$



# Another student poster:

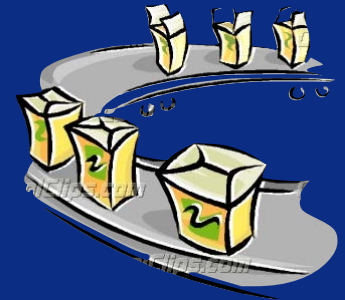


Table 6 Block 1

Identifying Polar Graphs

30.  $\theta = \frac{\pi}{4}$

\* Look to the Unit circle for  $\frac{\pi}{4}$

\* No radius means no circle just the  $\theta$

32.  $r \cos \theta = 2$

\* convert to Rectangular form  
 $x \cos \theta = 2$   
 $x = 2$

36.  $r \sin \theta = 2$

\* convert to Rectangular form  
 $r \sin \theta = 2$   
 $y = 2$

35.  $\theta = \frac{3\pi}{4}$

\* Look to the Unit circle for  $\frac{3\pi}{4}$

\* No radius means no circle just the  $\theta$

29.  $r = 2$

\* radius is 2

\* No  $\theta$  means it simply will be a circle with the radius as 2

31.  $r = 2 \cos \theta$

\* Basic cos graph

\* Because the coefficient is two the radius is one

34.  $r = 2 \sin \theta$

\* Basic Sin graph

\* Because the coefficient is two the radius is one

33.  $r = 1 + \cos \theta$

\* Because of the "+1" you know it is a cardioid

\* On the polar axis because of cos





# The Five Swan Task Types



Card sort



Card matching



A / S / N



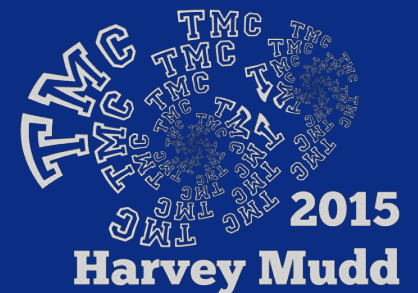
Create a new problem



Analyzing reasoning  
pathways

# The Five Swan Task Types

DIFFERENT  
COLLABORATIVE  
GOALS



# The Five Swan Task Types

Card Sorts/  
Classification

getting students to  
**NOTICE**  
**PROPERTIES**  
of objects

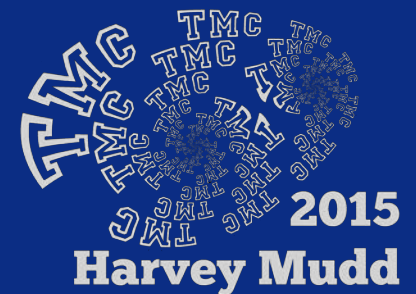


# The Five Swan Task Types

**Card  
Matching**

getting students to  
**INTERPRET &  
CONNECT**

multiple representations



# The Five Swan Task Types

*Always/*

*Sometimes/*

*Never*

getting students to

**GENERALIZE**

mathematical

principles or

properties

# The Five Swan Task Types

Create a  
**NEW** problem  
to trade &  
solve

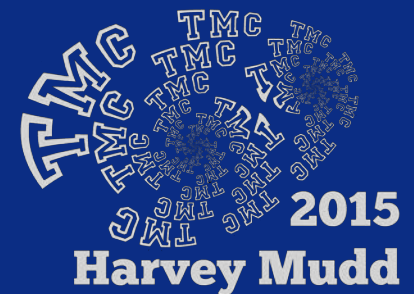
getting students to  
think **FORWARDS**  
& **BACKWARDS**

# The Five Swan Task Types

Analyzing REASONING getting students to GENERALIZE ABOUT PATHWAYS

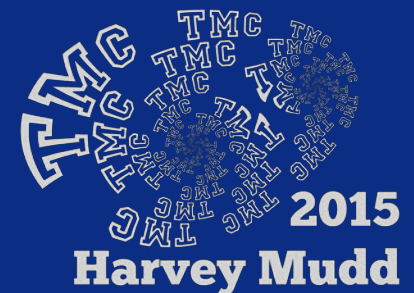
So now, your task . . .

Learn about the Task Types  
by doing a Card Sort  
of their properties  
of the different Swan–style  
tasks



# CARD SORT – COLUMN HEADINGS

- Task Type
- Pedagogical Purpose
- Externalizes inner process of \_\_\_ing
- Typical format
- easily enriched by...
- variations to try...





So now, your task . . .

a matching poster  
of your own



# Resources — on the #TMC15 wiki

