# Valentine Candy Challenge

In honor of Valentines Day, each of you have been given a box of Necco® Tiny Conversation Hearts. I also have a box. Using the candy available in the room, do your best to define the contents of my box. The student who most accurately and specifically defines the contents of my box will receive my box of hearts as well as their own.

You must...

•Write your conclusion in a letter to me.

•Your letter must contain a convincing argument on how and why you are sure you have made an accurate prediction.

Create a chart, table, graph, diagram or model to support your solution.

<sup>•</sup>Use as much math language as possible.

•Write at least 1 sentence telling me something interesting you noticed about your solution.

Guidelines for the working environment:

<sup>•</sup>You may work alone or with a partner.

•When choosing a partner, you must choose someone with whom you can work appropriately and cooperatively. If 1

person in your partnership is doing more of the work than the other, an adult will terminate your partnership and you both will work alone.

- •When working in a partnership, each person must have his/her own solution to hand in.
- •You may not eat any candies until you get home. If you do, the entire contents of the box will be confiscated.
- •The noise level must be conducive to working.
- •Everyone must cooperate with each other in terms of sharing information about individual boxes of candy, respecting each other's candy and respecting people's working environment and materials.

Grade Levels 3 - 5

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### Context

It was Valentines Day and I wanted to introduce students to an engaging task, which involved probability and statistics. I was standing in line at a drug store and saw Necco® Conversation Hearts, bought 25 packages and then went home to create this task!

### What This Task Accomplishes

This task assesses student's concept of probability and whether or not it is best to use mean, median or mode to accurately determine outcomes. It also engages students in a discussion of

sample size and whether or not it makes a difference in the outcome of results.

### What the Student Will Do

Most students will begin dumping out their own packages of candy, then counting and sorting by color. Soon they realize that their box of candy is different than that of their peers and then begin collecting more data. Some students will analyze strictly the numbers of candies per box, while others will determine predictions about color, sayings on the candies, number of broken or deformed candies and other creative attributes. Many students naturally tend to want to average the class data. This is an excellent time to introduce the concepts of median and mode. Often the average is a decimal equivalent and students need to determine what to do with the remainder. When finding the average (mean), students sometimes see that although, for instance, the average may be 40 candies, only one person in the class has 40 candies, so it is not likely that my box would have that number. In this case, mode would be more acceptable.

### **Time Required for Task**

2 hours

### **Interdisciplinary Links**

This task was a great one to give at Valentines Day, but could be given at any holiday using different candy. One nice thing about conversation hearts was the multitude of attributes that students could use in making their determinations. Other ideas besides using candy are any pre-packaged materials. Craft materials would work (buttons, beads, pompoms, etc.) and other materials that would come in different colors and perhaps shapes.

### **Teaching Tips**

For students in class who have special needs and are unable to count up to 40, this task could be adapted in the following way. We gave students packages of Gummy Hearts and Arrows, as well as Conversation Hearts, so that students would have a choice in the food they wanted to investigate. Gummy Hearts and Arrows typically come only seven to a package and come in four colors and three shapes. This allowed students with special needs to participate in the same mathematical experience as their peers, while dealing with numbers which were more manageable.

### **Suggested Materials**

- Conversation Hearts candy (one box per student and one "answer" box for the teacher)
- Graph paper
- Calculators

### **Possible Solutions**

Results will vary. The way we determined the "winner" was by having students write their solutions on the board, opening and describing "my box" and then having the class determine whose description was most specific and accurate. This led to a great discussion!

Exemplars

#### **Benchmark Descriptors**

#### Novice

This student misunderstood the task. The student tried to accurately analyze the total number of hearts, but his/her conclusion is inaccurate and not mathematically based.

#### Apprentice

This student attempts to address two characteristics of hearts. Conclusions are random or weak and are not based on concepts of probability.

#### Practitioner

This student addresses two characteristics of hearts. The student appropriately uses equations and data collection to find a solution based on concepts of probability. Ideas are expressed using mathematical language and representation.

#### Expert

This student addresses multiple characteristics of hearts. S/he demonstrates understanding of probability concepts and an assessment of the accuracy of his/her solution. The solution clearly articulates the chosen approach and reasoning. The student uses sophisticated math language and representations to communicate his/her solution.

# Exemplars -

Novice

#### Novice







# Exemplars -

Novice

### Novice



### Apprentice

Student lists contents of his/her box and attempts to use an equation to show reasoning.

Apprentice

Dear Miss Amico, Prombel em fond this 00+ T char+ that chart Q making b¥ many hearts had T how shows I how that is 50 all. v V think T prombelen out ٠ this found Your 40 hearts in had You the only was pecause  $\mathbf{T}$ box 46. 50 that had Who WON have think you L why is your in boy. hearts 46 is Well that xo 7 50 do think had you what T think box. Your ,n 10 pink 9 yellow, had Gorange, You and reen. purple, 6 white Q Student is unable to apply concepts Student addresses color of probability to conclusion. S/he Sincerly, of hearts, as well as the makes his/her conclusions based number of hearts in the on the number of hearts in his/her

box.

box.

### Apprentice



#### Practitioner



### Practitioner



Practitioner

Dear Mrs. Hason, I have finished the Valentine Candy Challenge problem at 11st. I think that you have 43 candies in your box with Torange, 6 purple, 8 white, Tyellow, 7 green and 8pink. Niether of these two characteristics are probably perfect because I took the mean (average). In case you haven't realized, I found out have many of each color and the number of candies you have in your box. First I asked around my classroom to see how many of each color and how many candies in all. I then added colors and totals alike then divided then to get the average. The results I have already told. you. I hop you enjoyed Valentines Day.

Uses accurate math language to express approach.



#### Expert

Student shows understanding of factors affecting accuracy.

Demonstrates understanding of averaging and rounding.

My assignment was to find out the average around, size, color, etc. of hearts in a ward "Ting conversation Hearts box etc. find the answer to my problem. I went around the room asking each. peran how many hearts the had and the amount of each color many hearts the had and the in their box. I wrote down my information in a sheet of paper.

at the and of the day, when we you went home, they ate there candy. and I was still missing seven (1) people's anousts of each when of hearts. This could cause my averages to change, so, I only used the data on people who collected all the info on in my calculations. I find the average anoul of hearts in a box, I added up have namy hearts and person and divided by ter. the number of people's information I was using (424= 10=929) The solution to the equation was 42.4. constant to 42 hearts average per box. To find the average wight of are heart I weighed my 43 hearts ma scale (with green: Jackers) which should that 43 hearts weighed about 44.5 grams. I divided this by 43 which equalled 1.0595.318 grams on average per heart I maltiplied this by 42.4 & find the average weight of candy per box, 44.9381073670802 grams. I had also clucted other data, which I planned to use too, for

> Student addresses weight of individual hearts as well as a box of hearts.

### Expert

The student reflects on accuracy of his/her results and factors that could affect the accuracy.

my representation.) Jhis was my data surveyed on the amount of each color hearts each person received in their box. So first the persentages of each color hearts in a box, I divided 100 by 424 (the total amount of hearts surveyed in my calculations). I then multiplied that quotient by the total amount of whatever color heart I was percentaging (example: let ~= total amount of range hearts, litt= total amount of hearts, 100=t xn=% out of 100 of orange hearts). Jonny representations I chose a pric chart to represent.

the percentage of each don heart in a box of fuents. and a box bar graph to show the average amount of each color freque in a box.

an unaure about the accuracy of information T because I moticed how widely the amount of each cola heart per box varies also, my ripermation could vary because my weighing was not dove or digetal socle( y such a then exists, I want we) a estimated the decimal part of the weight Ŧ and 80 hearts was 5 because the scale's pointed The 4 just about in the middle of 44 and 45 ممدر grans, this and cause my averages to vary by a for hurdroths. On the other hard, I think my was as accurate as I (mild make it. data

Student uses an algebraic formula to explain how s/he found the percentage of hearts of each color.

#### Expert

Average Color Distribution Among Neco® Hearts

Well labeled, colored, accurate graph, to express part of the solution.



### Expert

		13.9%	153 Venau	9. 13.2 ) purple	% [2.6]	57. 181°h n Tink	10.75% White
Andrew	43	6	7	5	7	6	4
Alexa	44						
Bethany	39						
Chad	48	6	٩	5	10	10	6
Chanda	41						
Carolynn	45	つ	۲	Ч	ų	6	/0
Joanna	43	3	7	D	8	10	3
kevin	44						
Bill	39	7	ų	6	5	13	4
Tommy	40	2	7	6	7	6	12
Thomas	41	9	5	2	10	1	6
Metts	45						
Mad Sty	41	4	ų	6	9	17	7
Stephanie	39						
Justin	y3	1	9	5	5	9	フ
Katie	43	7	6	5	6	8	11
Lindsay	44						
			Student includes chart of data.				

Average Amount per box: 42.352941 Average weight of total. Student includes chart of data. Gaps in chart are addressed in written explanation.

### Expert

Average amount of hearts = 92 (424)

Summary of student conclusions.

Average weight of one heart: 1.0575238 grams

### Expert

