2020–2021 Winter Break Math Challenges: Winners

Note: In the case of a tie, a special prize was given to a randomly selected winner out of the best scores, which is indicated by a (*) by their name.

Challenge 1: Digit puzzle

Total number of copies used (fewer is better; optimal score is 65):

(1) Division 1: Rishi Bhaumik (81)

(2) Division 2: Jayden Gong (97)

(3) Family division: Aggarson (85); Kehrig (78 – this is an alumni family)

Challenge 2: Approximations

Value obtained (closer to 2020 is better; optimal score is 2020):

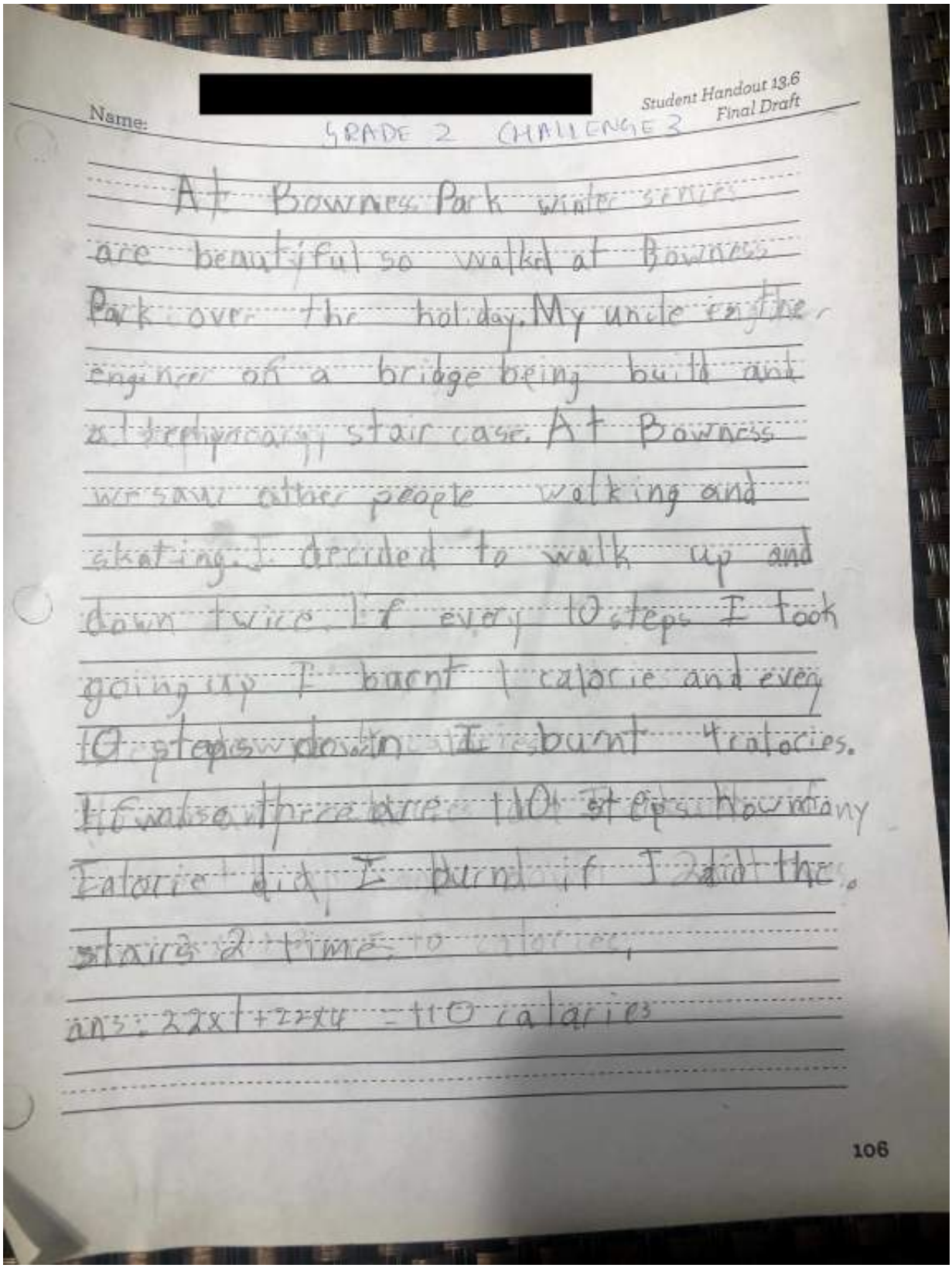
(1) Division 1: Rishi Bhaumik (2160)

(2) Division 2: Jaden Gong, Martin Liu, Armin Jessa(*), Liora Xu (2160)

(3) Family division: Aggarson (2030); Kehrig (2020 – this is an alumni family)

Here is one way to get exactly 2020:

$$\left\lfloor \sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\left\lfloor \sqrt{\sqrt{\left\lfloor \sqrt{\left\lfloor \left\lfloor \sqrt{\sqrt{((2+0!)!)!}} \right\rfloor ! \right\rfloor} \right\rfloor} \right\rfloor} \right\rfloor}}}} ! \right\rfloor ! + \sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\left(\left(- \left\lfloor - \sqrt{\sqrt{\left\lfloor \sqrt{\sqrt{((2+0!)!)!}} \right\rfloor !} \right\rfloor \right) ! \right) !}}}}}} \right\rfloor$$


Name: [redacted] Student Handout 13.6 Final Draft

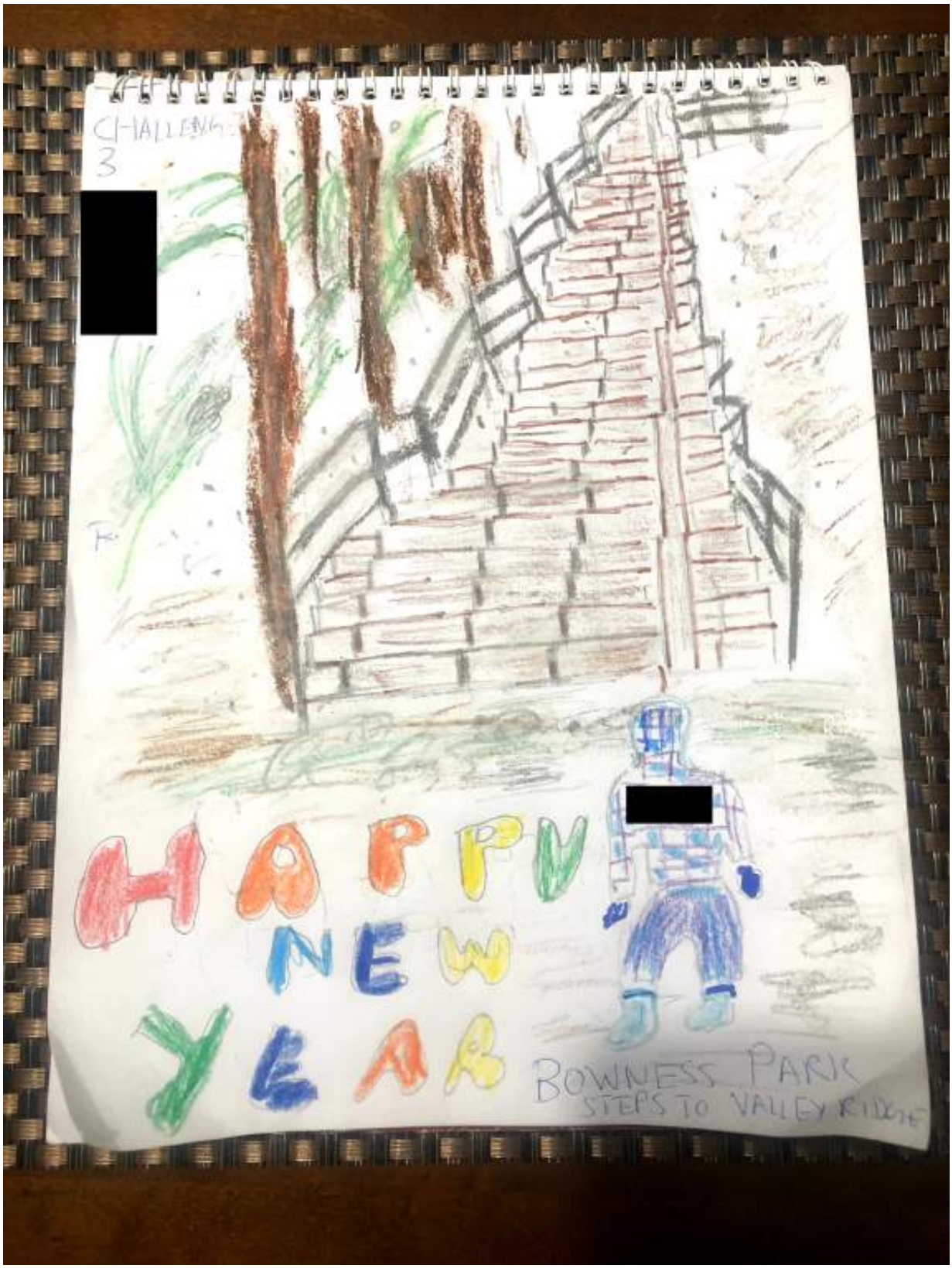
GRADE 2 CHALLENGE 3

At Bowness Park winter scenes are beautiful so walked at Bowness Park over the holiday. My uncle is the engineer on a bridge being built and is temporary stair case. At Bowness we saw other people walking and skating. I decided to walk up and down twice. If every 10 steps I took going up I burnt 1 calorie and every 10 steps down I burnt 4 calories. If I walked up three times 10 steps how many Calorie did I burn if I did the stairs 2 time to calories.

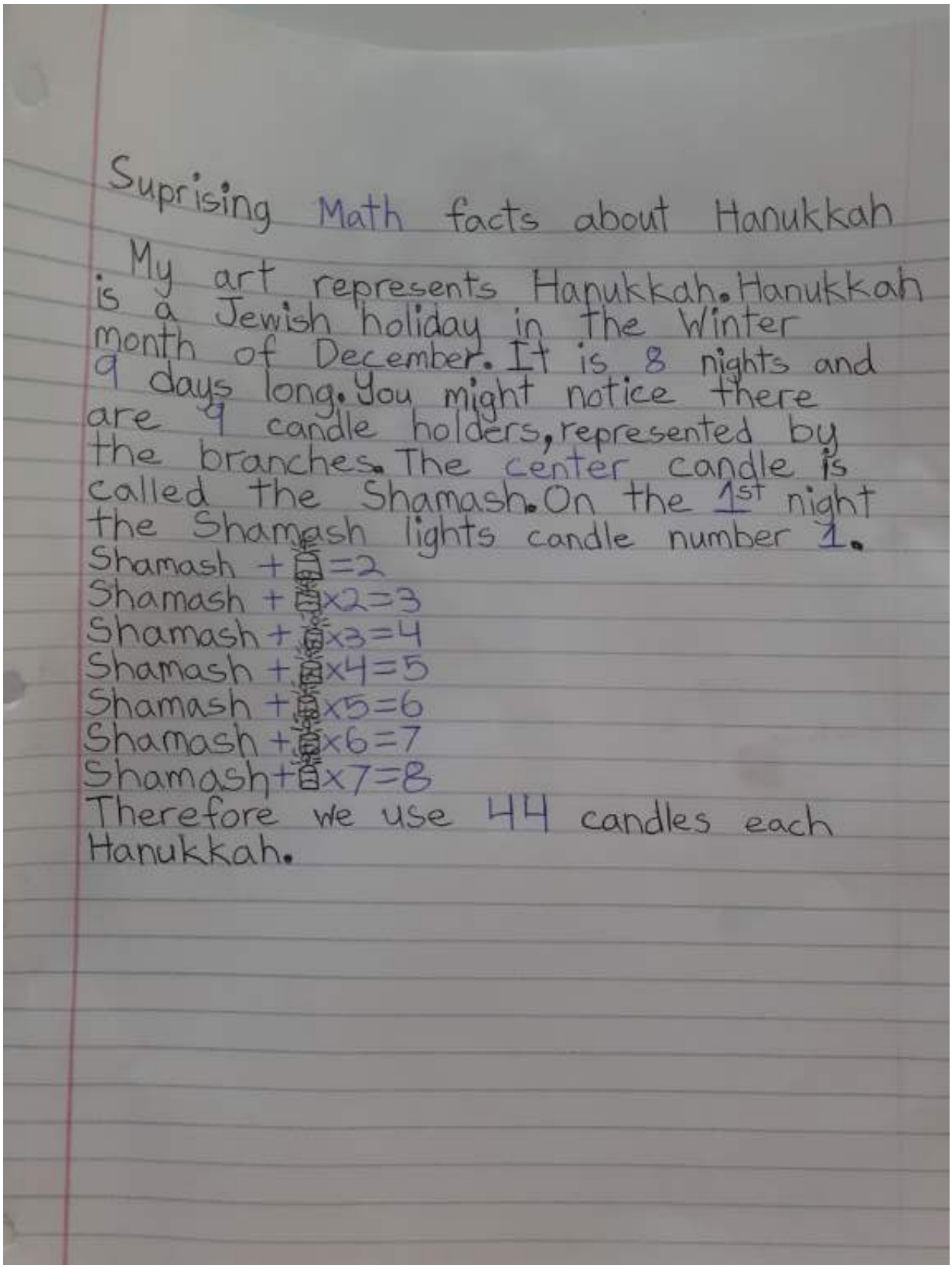
ans: 22x1 + 22x4 = 110 calories

106

Challenge 3: Art - Grade 2: Rishi Bhaumik



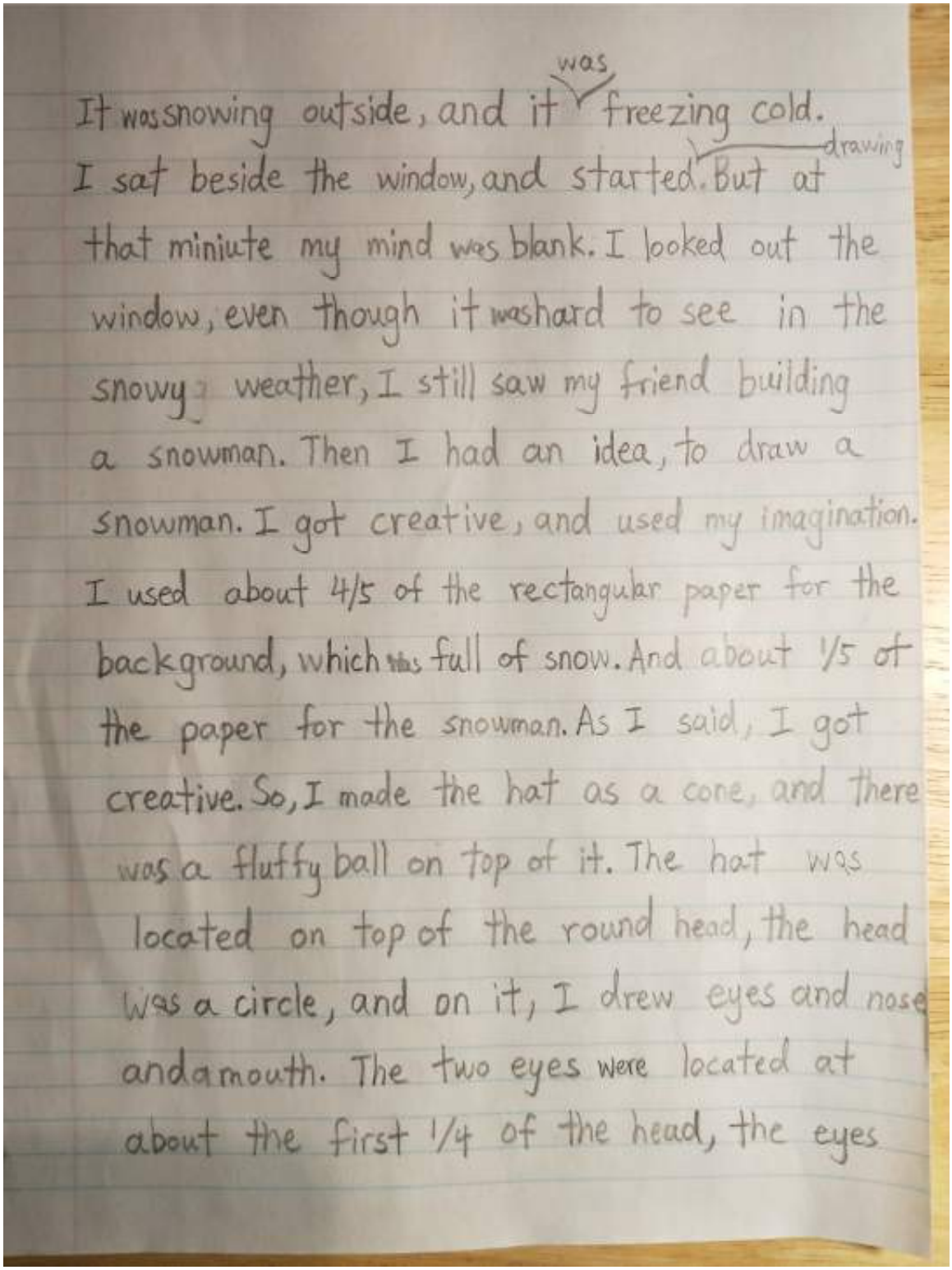
Challenge 3: Art - Grade 2: Rishi Bhaumik



Challenge 3: Art - Grade 3: Jonathan Mandel

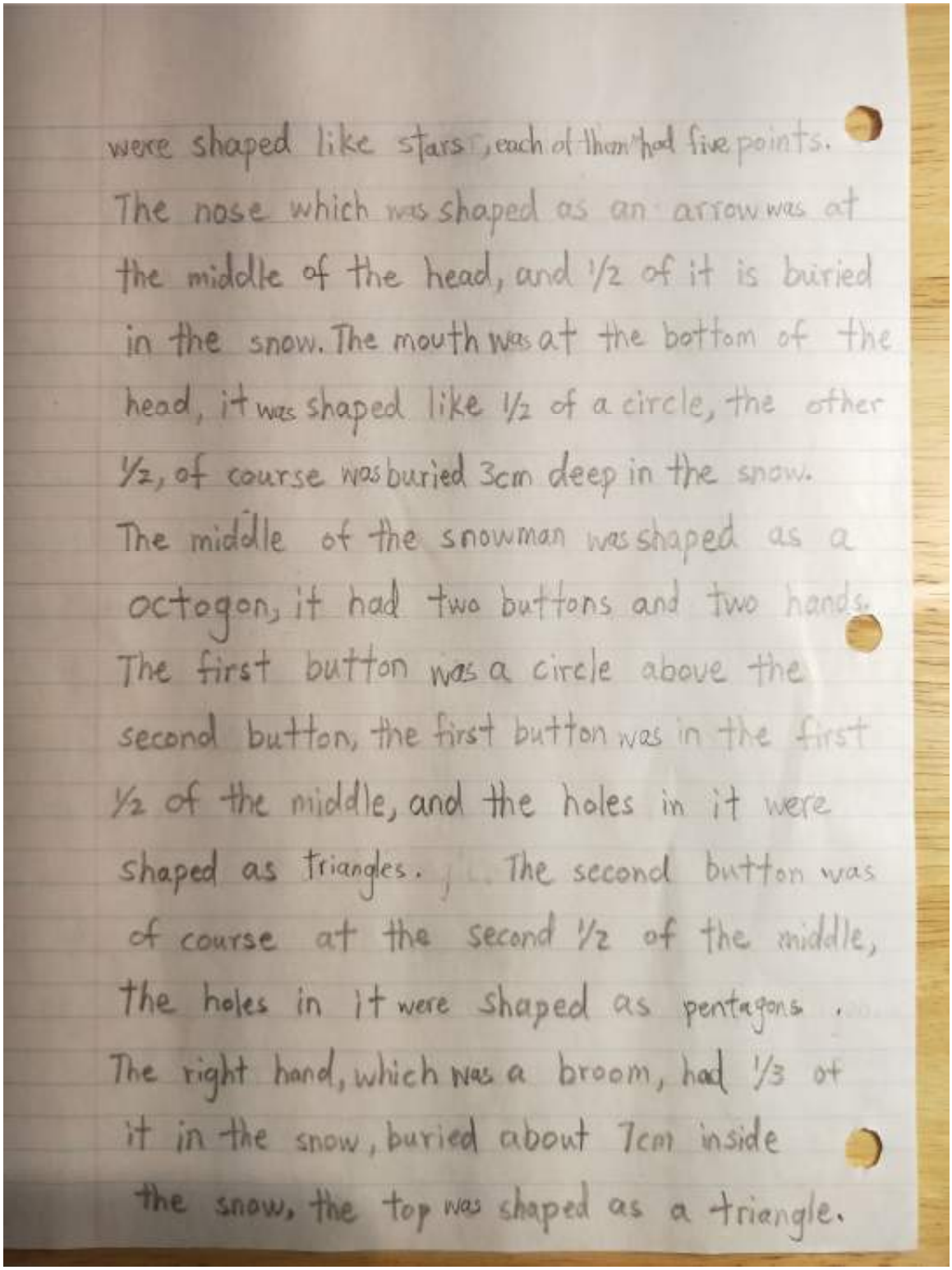
Challenge 3: Art - Grade 3: Jonathan Mandel

Challenge 3: Art - Grade 4: Martin Liu

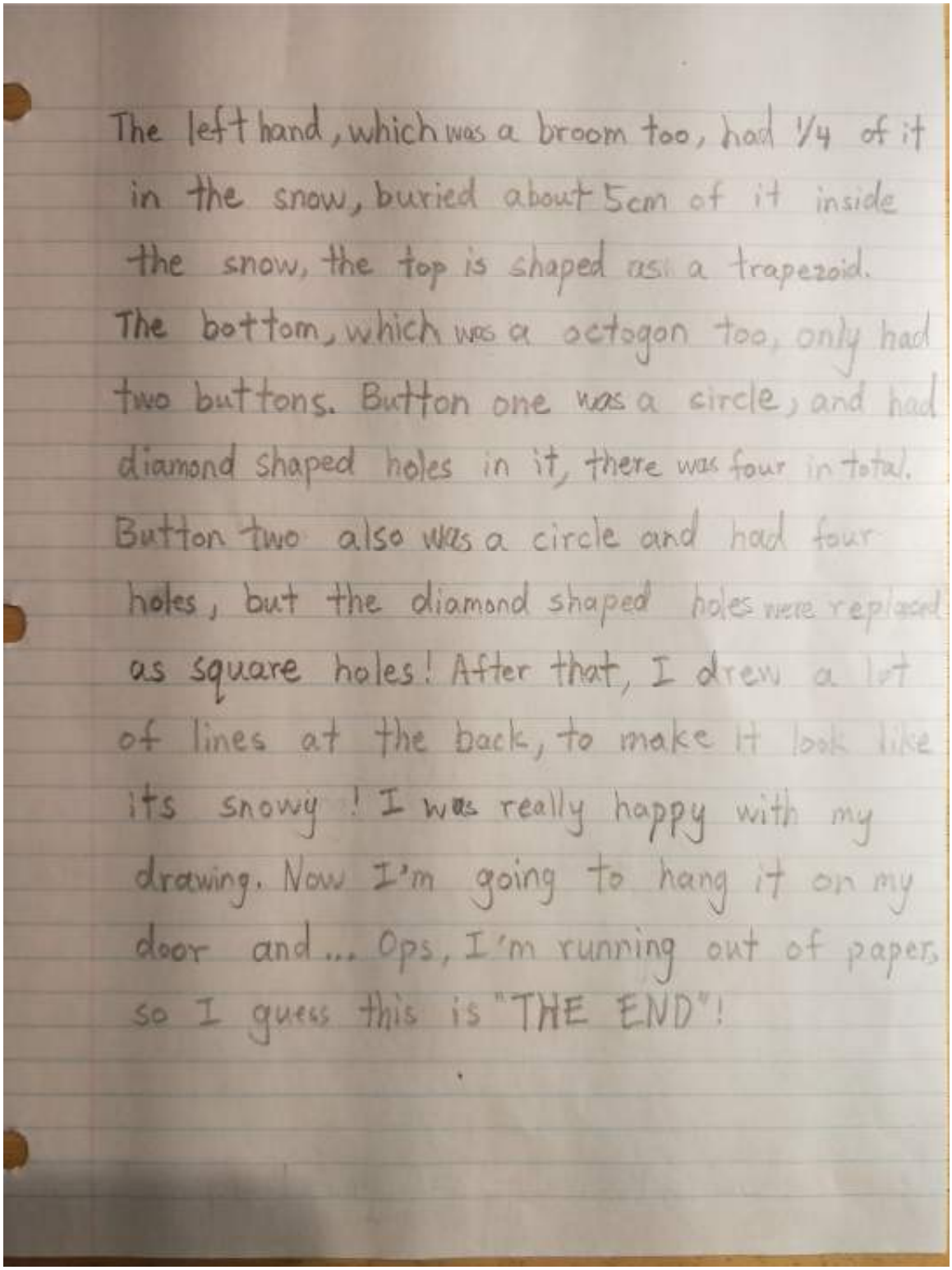


It was snowing outside, and it was freezing cold. I sat beside the window, and started drawing. But at that miniute my mind was blank. I looked out the window, even though it was hard to see in the snowy weather, I still saw my friend building a snowman. Then I had an idea, to draw a snowman. I got creative, and used my imagination. I used about 4/5 of the rectangular paper for the background, which was full of snow. And about 1/5 of the paper for the snowman. As I said, I got creative. So, I made the hat as a cone, and there was a fluffy ball on top of it. The hat was located on top of the round head, the head was a circle, and on it, I drew eyes and nose and a mouth. The two eyes were located at about the first 1/4 of the head, the eyes

Challenge 3: Art - Grade 4: Martin Liu


were shaped like stars, each of them had five points. The nose which was shaped as an arrow was at the middle of the head, and 1/2 of it is buried in the snow. The mouth was at the bottom of the head, it was shaped like 1/2 of a circle, the other 1/2, of course was buried 3cm deep in the snow. The middle of the snowman was shaped as a octogon, it had two buttons and two hands. The first button was a circle above the second button, the first button was in the first 1/2 of the middle, and the holes in it were shaped as triangles. The second button was of course at the second 1/2 of the middle, the holes in it were shaped as pentagons. The right hand, which was a broom, had 1/3 of it in the snow, buried about 7cm inside the snow, the top was shaped as a triangle.

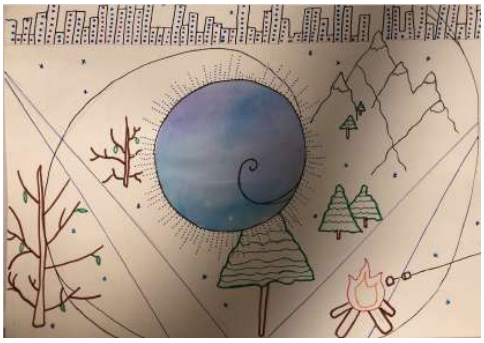
Challenge 3: Art - Grade 4: Martin Liu

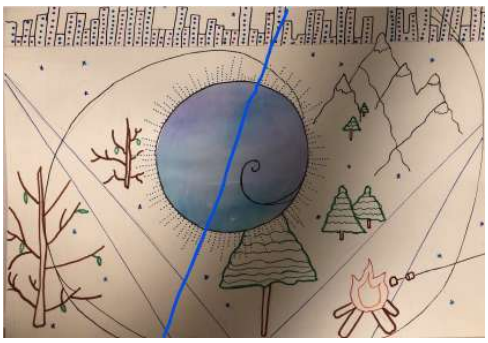

The left hand, which was a broom too, had 1/4 of it in the snow, buried about 5cm of it inside the snow, the top is shaped as a trapezoid. The bottom, which was a octogon too, only had two buttons. Button one was a circle, and had diamond shaped holes in it, there was four in total. Button two also was a circle and had four holes, but the diamond shaped holes were replaced as square holes! After that, I drew a lot of lines at the back, to make it look like its snowy! I was really happy with my drawing. Now I'm going to hang it on my door and... Ops, I'm running out of paper, so I guess this is "THE END"!

Challenge 3: Art - Grade 4: Martin Liu

The way that the pine cone represents math is in the spirals. In nature, many plants showcase the Fibonacci Sequence and Lucas Numbers. In my picture, I drew a Fibonacci pine cone with spirals of 8 one way, and 5 the other, as shown with the blue and white glue. 8 and 5 are Fibonacci numbers, therefore proving again that these numbers are truly nature's numbers.

This art piece is both winter-themed and math-related. The far away buildings on the horizon are the lengths of pi in order from left to right (3.14159…) Starting from the right side of the z-axis, and going right in a spiral are the digits of the e-number. On the right side of the z-axis, the trees are coated with snow and the mountain tops are also covered in snow. On the contrary, on the left side of the z-axis, all of the leaves haven't disappeared just yet. Thus, the left side represents "light" winter (beginning of winter) while the right side represents harsher weather conditions and "extreme" winter. The e-number (2.71828182) is commonly used in math 30-1 and calculus (which I noticed when doing both courses). I wrote 114 e-numbers around the circle and there are usually **six** "leaves" on a snowflake. When divided, the answer given is the 8th prime number, number 19. This is also digit **six** of the fibonacci sequence. I have incorporated the fibonacci sequence into my artwork by using it as a spiral (which symbolizes wind because it is winter and it's very cold.) Thus, I have incorporated math-related concepts such as pi, the fibonacci sequence, the z-axis, and e number in my artwork. I have also developed prominent connections using symbolism (ex. comparing and contrasting the two winter conditions using the z-axis), and connected these concepts to winter (ex. fibonacci sequence represents wind - common weather in winter).





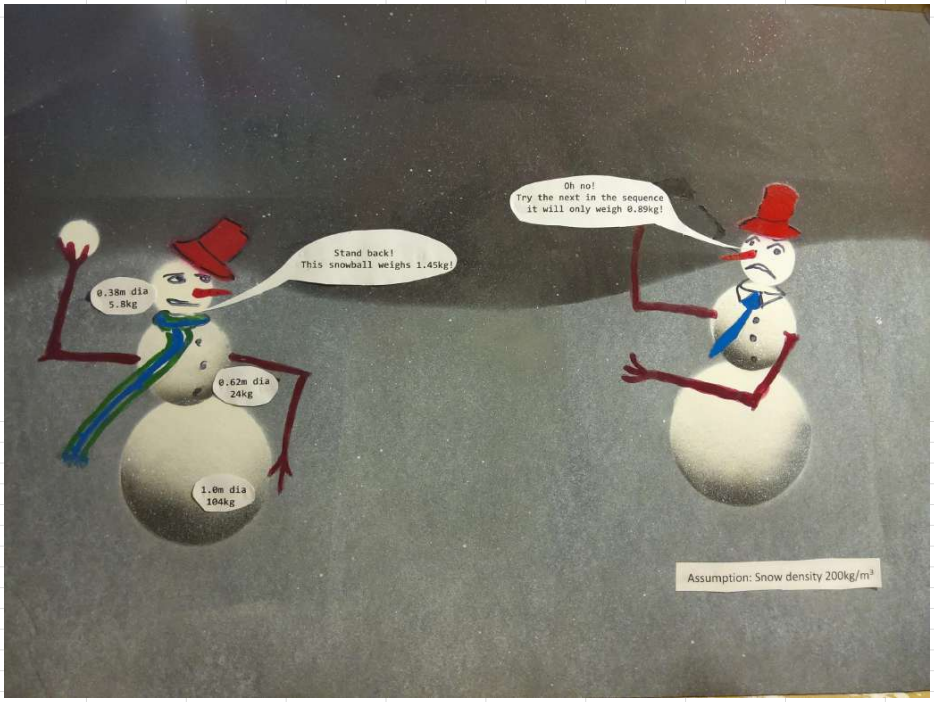
Blue line on the second image is the z-axis.

THE DRAWING

THE PARAGRAPH

For our drawing, we decided to relate a Calgary winter to the golden ratio and fibonacci sequence. We sized the snowballs diameter to the golden ratio. The golden ratio is the ratio in which you get if you were to divide a larger number of the Fibonacci sequence by the previous number in the sequence. There are many circumstances in which you would find the golden ratio in nature (some examples are: sunflowers, huricanes, shells and many more). How we did that is we took the large snowball then divided its diameter by phi (i.e. the golden ratio which equals 1.61803398875). We continued doing that for all the snowballs of the snowmen including the snowball that is about to be thrown. We also included the diameter of the spheres in which we used to calculate the mass of the balls. The equation we used to calculate the mass is 4/3πr^3 (volume) multiplied by the average density of compacted snow (200kg/m^3). We did this to all the snowballs.

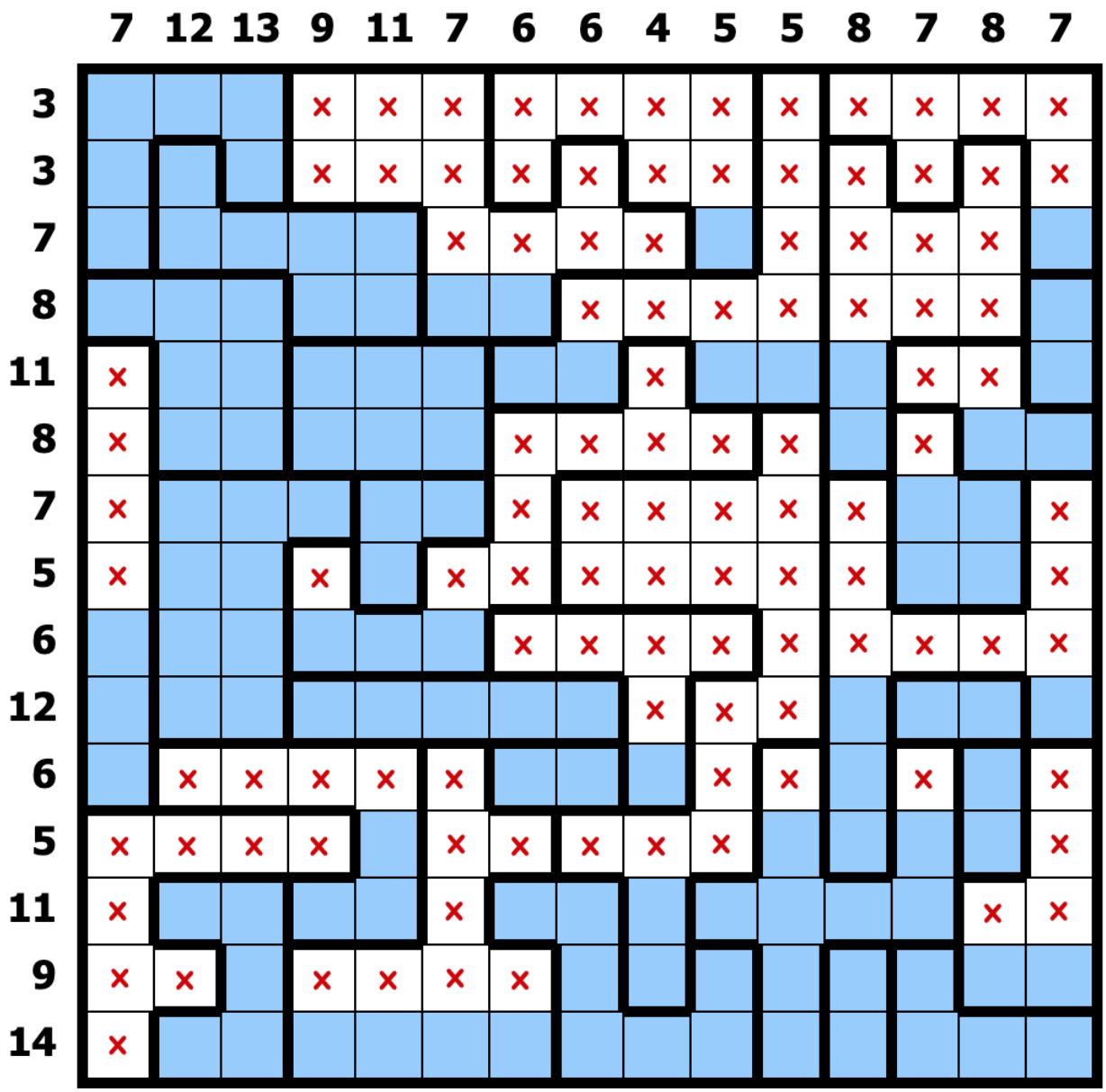
Our picture was painted on paper with airbrush and traditional brush, then we scanned it into this google sheet.



Challenge 3: Art - Family division: Wuntke

Challenge 4: Aquarium

Correct solutions submitted by: Martin Liu, Gong family(*), Hosseinzadeh family, Kehrig family, Wuntke family.



Challenge 5: Suguru

Correct solutions submitted by: Martin Liu, Gong family, Hosseinzadeh family, Kehrig family, Rao family(*), Wuntke family.

3	1	2	5	3	5	1	5	1	3	1	2	1	3	1	4
4	5	3	4	2	4	2	4	2	4	5	3	5	2	5	2
2	1	2	1	5	1	3	1	5	3	2	1	4	3	4	1
4	5	4	3	4	2	4	2	4	1	5	3	2	1	2	5
3	2	1	2	1	3	1	3	5	2	4	1	5	4	3	1
1	5	4	5	4	2	5	2	4	1	3	2	3	2	5	2
2	3	1	3	1	3	4	1	3	5	4	5	4	1	4	3
1	5	2	4	2	5	2	5	2	1	2	1	2	3	2	1
3	4	3	1	3	1	3	1	4	3	4	3	5	1	5	3
5	1	5	2	4	2	4	2	5	1	2	1	2	3	2	1
4	3	4	3	5	1	3	1	3	4	3	4	5	1	5	3
1	2	5	1	4	2	5	4	2	1	5	2	3	2	4	2
3	4	3	2	5	3	1	3	5	3	4	1	4	5	3	1
1	5	1	4	1	2	5	2	4	2	5	3	2	1	4	2
4	3	2	5	3	4	3	1	5	1	4	1	5	3	5	1
2	1	4	1	2	1	2	4	3	2	5	2	4	1	2	3