**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Grade \_\_\_\_\_\_**

**Directions:** Work on all problems. **Show your work.** Send in your solutions to Math Club.

We will discuss these problems on Tuesday, May 11 at 3:30pm via Zoom.

**Problem 1**

Luka is making lemonade to sell at a school fundraiser. His recipe requires  times as much water as sugar and twice as much sugar as lemon juice. He uses  cups of lemon juice. How many cups of water does he need?



**Problem 2**

Four friends do yardwork for their neighbors over the weekend, earning  and  respectively. They decide to split their earnings equally among themselves. In total how much will the friend who earned  give to the others?



**Problem 3**

Carrie has a rectangular garden that measures  feet by  feet. She plants the entire garden with strawberry plants. Carrie is able to plant  strawberry plants per square foot, and she harvests an average of  strawberries per plant. How many strawberries can she expect to harvest?



**Problem 4**

Three hexagons of increasing size are shown below. Suppose the dot pattern continues so that each successive hexagon contains one more band of dots. How many dots are in the next hexagon?

![[asy] // diagram by SirCalcsALot size(250); real side1 = 1.5; real side2 = 4.0; real side3 = 6.5; real pos = 2.5; pair s1 = (-10,-2.19); pair s2 = (15,2.19); pen grey1 = rgb(100/256, 100/256, 100/256); pen grey2 = rgb(183/256, 183/256, 183/256); fill(circle(origin + s1, 1), grey1); for (int i = 0; i < 6; ++i) { draw(side1*dir(60*i)+s1--side1*dir(60*i-60)+s1,linewidth(1.25)); } fill(circle(origin, 1), grey1); for (int i = 0; i < 6; ++i) { fill(circle(pos*dir(60*i),1), grey2); draw(side2*dir(60*i)--side2*dir(60*i-60),linewidth(1.25)); } fill(circle(origin+s2, 1), grey1); for (int i = 0; i < 6; ++i) { fill(circle(pos*dir(60*i)+s2,1), grey2); fill(circle(2*pos*dir(60*i)+s2,1), grey1); fill(circle(sqrt(3)*pos*dir(60*i+30)+s2,1), grey1); draw(side3*dir(60*i)+s2--side3*dir(60*i-60)+s2,linewidth(1.25)); } [/asy]]()



**Problem 5**

Three fourths of a pitcher is filled with pineapple juice. The pitcher is emptied by pouring an equal amount of juice into each of  cups. What percent of the total capacity of the pitcher did each cup receive?



**Problem 6**

Aaron, Darren, Karen, Maren, and Sharon rode on a small train that has five cars that seat one person each. Maren sat in the last car. Aaron sat directly behind Sharon. Darren sat in one of the cars in front of Aaron. At least one person sat between Karen and Darren. Who sat in the middle car?



**Problem 7**

How many integers between  and  have four distinct digits arranged in increasing order? (For example,  is one integer.)



**Problem 8**

Ricardo has  coins, some of which are pennies (-cent coins) and the rest of which are nickels (-cent coins). He has at least one penny and at least one nickel. What is the difference in cents between the greatest possible and least possible amounts of money that Ricardo can have?



**Problem 9**

Akash's birthday cake is in the form of a  inch cube. The cake has icing on the top and the four side faces, and no icing on the bottom. Suppose the cake is cut into  smaller cubes, each measuring  inch, as shown below. How many small pieces will have icing on exactly two sides?

![[asy] import three; currentprojection=orthographic(1.75,7,2);  //++++ edit colors, names are self-explainatory ++++ //pen top=rgb(27/255, 135/255, 212/255); //pen right=rgb(254/255,245/255,182/255); //pen left=rgb(153/255,200/255,99/255); pen top = rgb(170/255, 170/255, 170/255); pen left = rgb(81/255, 81/255, 81/255); pen right = rgb(165/255, 165/255, 165/255); pen edges=black; int max_side = 4; //+++++++++++++++++++++++++++++++++++++++  path3 leftface=(1,0,0)--(1,1,0)--(1,1,1)--(1,0,1)--cycle; path3 rightface=(0,1,0)--(1,1,0)--(1,1,1)--(0,1,1)--cycle; path3 topface=(0,0,1)--(1,0,1)--(1,1,1)--(0,1,1)--cycle;  for(int i=0; i<max_side; ++i){ for(int j=0; j<max_side; ++j){  draw(shift(i,j,-1)*surface(topface),top); draw(shift(i,j,-1)*topface,edges);  draw(shift(i,-1,j)*surface(rightface),right); draw(shift(i,-1,j)*rightface,edges);  draw(shift(-1,j,i)*surface(leftface),left); draw(shift(-1,j,i)*leftface,edges);  } }  picture CUBE; draw(CUBE,surface(leftface),left,nolight); draw(CUBE,surface(rightface),right,nolight); draw(CUBE,surface(topface),top,nolight); draw(CUBE,topface,edges); draw(CUBE,leftface,edges); draw(CUBE,rightface,edges);  int[][] heights = {{4,4,4,4},{4,4,4,4},{4,4,4,4},{4,4,4,4}};  for (int i = 0; i < max_side; ++i) { for (int j = 0; j < max_side; ++j) { for (int k = 0; k < min(heights[i][j], max_side); ++k) { add(shift(i,j,k)*CUBE); } } } [/asy]]()



**Problem 10**

Zara has a collection of  marbles: an Aggie, a Bumblebee, a Steelie, and a Tiger. She wants to display them in a row on a shelf, but does not want to put the Steelie and the Tiger next to one another. In how many ways can she do this?



**Problem 11**

After school, Maya and Naomi headed to the beach,  miles away. Maya decided to bike while Naomi took a bus. The graph below shows their journeys, indicating the time and distance traveled. What was the difference, in miles per hour, between Naomi's and Maya's average speeds?

![[asy] // diagram by SirCalcsALot unitsize(1.25cm); dotfactor = 10; pen shortdashed=linetype(new real[] {2.7,2.7});  for (int i = 0; i < 6; ++i) {     for (int j = 0; j < 6; ++j) {         draw((i,0)--(i,6), grey);         draw((0,j)--(6,j), grey);     } }  for (int i = 1; i <= 6; ++i) {     draw((-0.1,i)--(0.1,i),linewidth(1.25));     draw((i,-0.1)--(i,0.1),linewidth(1.25));     label(string(5*i), (i,0), 2*S);     label(string(i), (0, i), 2*W);  }  draw((0,0)--(0,6)--(6,6)--(6,0)--(0,0)--cycle,linewidth(1.25));  label(rotate(90) * "Distance (miles)", (-0.5,3), W); label("Time (minutes)", (3,-0.5), S);  dot("Naomi", (2,6), 3*dir(305)); dot((6,6));  label("Maya", (4.45,3.5));  draw((0,0)--(1.15,1.3)--(1.55,1.3)--(3.15,3.2)--(3.65,3.2)--(5.2,5.2)--(5.4,5.2)--(6,6),linewidth(1.35)); draw((0,0)--(0.4,0.1)--(1.15,3.7)--(1.6,3.7)--(2,6),linewidth(1.35)+shortdashed); [/asy]]()



**Problem 12**

For a positive integer  the factorial notation  represents the product of the integers from  to . (For example, .) What value of  satisfies the following equation?

![\[5! \cdot 9! = 12 \cdot N!\]]()

