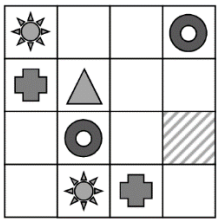
Name: _____ Grade: _____ School: _____

Note: All your scratch work counts for full credit. Answer without a trace may not receive credit. This packet will be collected for consideration of full or partial credit.

Section 1: Multiple Choice (300 points/30 min)

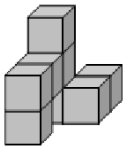
1. Alice has to place different shapes in the table so that each distinct shape appears exactly once in each row and each column.

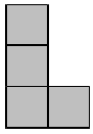
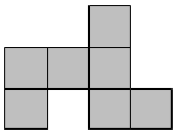
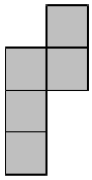
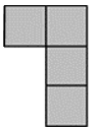
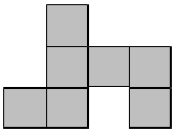


What shape should Alice place in the grey square?

A) 
B) 
C) 
D) 
E) 

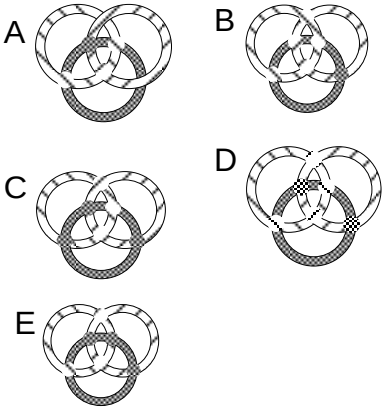
2. The solid in the picture was made by sticking eight equal cubes together. What does this solid look like when seen from above?



A) 
B) 
C) 
D) 
E) 

3. A number of identical 1000 mL empty bottles are placed in a row under identical faucets. The first faucet is turned on. When there are 50 mL in the bottle, the second faucet is started. When there are 50 mL in the second bottle, the third faucet is opened. This process continues until the first bottle is full and then all the faucets are turned off. At this time, which bottle has only 450 mL of liquid?
A) 9th
B) 10th
C) 11th
D) 12th
E) 13th

4. The Borromean Rings are three rings linked in such a way that: if any of the three rings is cut, the other two are no longer linked. Which of the answer choices represents the Borromean Rings?

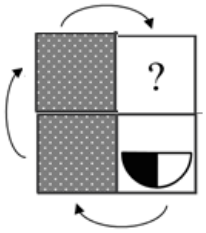


5. Zoe has two cards with numbers on both sides of the cards – four numbers in total. The sum of the four numbers equals 32; the sum of the two numbers on the first card is equal to the sum of the two numbers on the second card. What are the hidden numbers?

A) 8 and 7
B) 8 and 6
C) 11 and 4
D) 9 and 6
E) 10 and 5

6. 

Helena turns the card over about its left, top, and then bottom edge, as shown below.

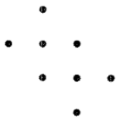


What does Helena see?

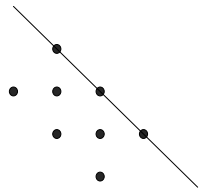
A) 
B) 
C) 
D) 
E) 

7. Let's say that a ***unit*** square is a square formed using 4 neighboring points on a grid:

Consider the number of unit squares we can make using these grid points:



How many <u>more</u> unit squares can we draw if we reflect (mirror) the points across the line?



A) 1
B) 2
C) 3
D) 4
E) 5

8. Arrange the fitness balls according to their size from the biggest to the smallest one. The red ball is smaller than the blue one, the yellow one is bigger than the green one, and the green one is bigger than the blue one. What is the correct order of the fitness balls?
A) green, yellow, blue, red
B) red, blue, yellow, green
C) yellow, green, red, blue
D) yellow, green, blue, red
E) blue, yellow, green, red

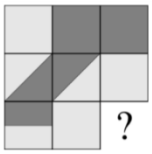
9. What was the date on the first day of the 10^{th} century (A.D.)?
A) 1/1/900
B) 1/1/901
C) 1/1/999
D) 1/1/1000
E) 1/1/1001

10. Among all 2-digit positive integers, the sums of the digits of two consecutive numbers differ either by 1 or by which one of the following:
A) 0
B) 2
C) 4
D) 6
E) 8

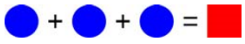
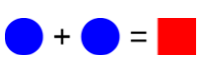
11. On a full tank of fuel, a cruise ship can travel 450 miles. With only ⅕ of the tank of fuel is left, which of the following is the farthest harbor it can reach without refueling?
A) Orangeport, 140 miles away
B) Redport 120 miles away
C) Greenport, 100 miles away
D) Tawnyport, 80 miles away
E) Pinkport, 60 miles away

12. An operation consists of taking a positive integer and dividing all its even digits by 2. What is the largest number of such operations that must be performed one after the other on a number before all its digits are odd?
A) 1
B) 2
C) 3
D) 4
E) there is no largest number of operations

13. Which tile must be added to the picture so that the total light area is as large as the total dark area?



A) 
B) 
C) 
D) 
E) 

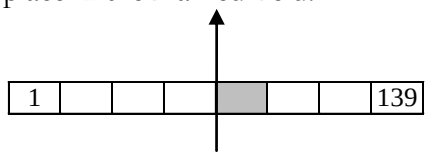
14. 
Imagine that the circles represent the same number and the same is true for the squares. Which one is true?
A) 
B) 
C) 
D) 
E) 

15. Cristi has to sell 10 glass bells that vary in price: 1 dollar, 2 dollars, 3 dollars, 4 dollars, 5 dollars, 6 dollars, 7 dollars, 8 dollars, 9 dollars, 10 dollars. In how many ways can Cristi divide all the glass bells in three packages so that all the packages have the same price?
A) 1
B) 2
C) 3
D) 4
E) Such a division is not possible.

Section 2: Open-Ended (300 points/30 min)

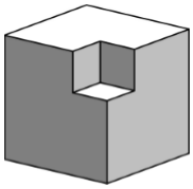
16. Roy bought 1 liter of orange juice. He drank 150 milliliters and gave 400 milliliters to Rob. Rob drank 2 deciliters and returned the rest to Roy. How many centiliters of juice does Roy have now?

17. In a game, fields that are equally far from the center must be filled with numbers that are equidistant from 70. For example, 1 is 69 units far from 70 and so is 139. Moreover, the numbers must be in strictly increasing order from left to right. What is the largest number Roy can place in the marked field?



18. Kalle knows that $1111 \times 1111 = 1234321$. What is the answer of 2222×3333?

19. From a wooden cube with side 3cm we cut out at the corner a little cube with side 1cm (see picture). What is the number of faces of the solid after cutting out such a small cube at each corner of the big cube?



20. Four friends play a board game that requires 2 partners. Each round takes 20 minutes and they only have 40 minutes to play. Regardless which round they are playing, in how many different ways can be set up?

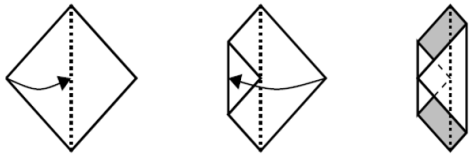
21. Four distinct positive integers have a least common multiple of 210. However, any two of these numbers have a greatest common factor of 7. What is the sum of the four numbers?

22. The number 100 is multiplied either by 2 or by 3, then the result is increased either by 1 or by 2. Then the new result is divided either by 3 or by 4. If the final result is a whole number, what is this final result?

23. Parisa sets her marbles in groups of equal size on the desk. After she arranged the marbles in groups of 3, she found that there were 2 marbles left. Then she arranged the marbles in groups of 5, and again there were 2 marbles left. At least how many more marbles does she need so that there won't be any left when she arranges them in groups of 3 and in groups of 5?

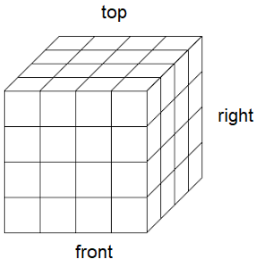
24. Kristy discovered that someone had eaten her jar of honey. She suspected one of her 4 friends: Alice, Brenda, Cherry or Danna. Alice said that Brenda ate the honey. Brenda said that it was Danna. Cherry denied eating the honey. Danna also denied eating the honey. Who told the truth and who ate the honey if <u>only one of them</u> is telling the truth?

25. A square-shaped piece of paper is folded twice as shown in the picture. The area of the original square is 64 cm^2. What is the total area of the shaded rectangles?

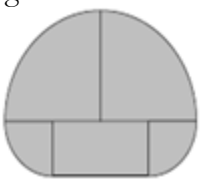


Section 3 :Bonus (100 points/15 min)

1. Basil used small white cubes to construct a cube as below. He painted red on the visible sides: right, top, and front. Then, he painted the rest sides blue. How many cubes have red and blue paint?



2. The figure below is formed from 5 pieces. One of the pieces is a rectangle with a length of 10 cm and a width of 5 cm, and the other pieces are quarters of two different circles. What is the area of this figure?



Name: _____ Grade: _____ School: _____

Score: _____/800 + _____/100

Base points = 200 for all students

Total points = earned points + base points

1	(A) (B) (C) (D) (E)	16	
2	(A) (B) (C) (D) (E)	17	
3	(A) (B) (C) (D) (E)	18	
4	(A) (B) (C) (D) (E)	19	
5	(A) (B) (C) (D) (E)	20	
6	(A) (B) (C) (D) (E)	21	
7	(A) (B) (C) (D) (E)	22	
8	(A) (B) (C) (D) (E)	23	
9	(A) (B) (C) (D) (E)	24	
10	(A) (B) (C) (D) (E)	25	
11	(A) (B) (C) (D) (E)		
12	(A) (B) (C) (D) (E)		
13	(A) (B) (C) (D) (E)		
14	(A) (B) (C) (D) (E)		
15	(A) (B) (C) (D) (E)		