

# RIPMWC 2016 Round 1

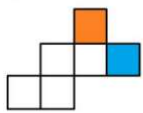
Time Duration: 1.5 hour

Name: \_\_\_\_\_

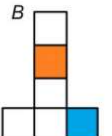
Marks: \_\_\_\_\_

1. What is  $\frac{1.02 + 2.04 + 4.08 + 8.16 + 16.32 + 32.64}{3.06 + 6.12 + 12.24 + 24.48}$  in its simplest form?
  - A. 1
  - B.  $\frac{7}{5}$
  - C.  $\frac{64}{45}$
  - D.  $\frac{357}{255}$
  - E. None of the above
  
2. Minnie, Nelson, Omar and Petra are arranging a Secret Santa gift exchange; they will each buy one gift for another member of the group, and each receive one gift. They are not allowed to receive their own gift. How many ways can they exchange gifts?
  - A. 8
  - B. 9
  - C. 16
  - D. 24
  - E. None of the above
  
3. When these nets are folded to make cubes, which (if any) will have blue and orange faces directly opposite each other?
 

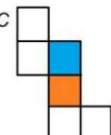
A



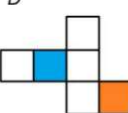
B



C

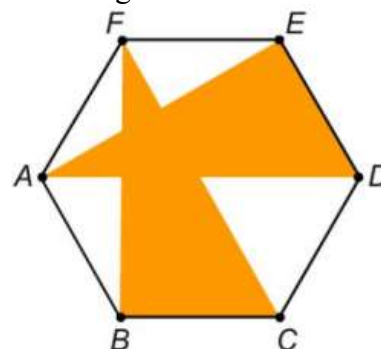


D



  - A. A
  - B. B
  - C. C
  - D. D
  - E. None of the above
  
4. How many perfect squares divide 2016?
  - A. 4
  - B. 5
  - C. 6
  - D. 44
  - E. None of the above

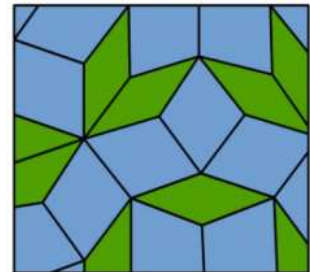
5. Christopher has a list of all the numbers from 1 to 100 (including both 1 and 100). He starts by deleting one of the numbers from the list, and proceeds as follows:  
 If any multiples of the last number deleted are still on the list, delete the largest such multiple.  
 Otherwise, delete the largest remaining factor of the last number deleted. Keep repeating this step until no more numbers can be deleted.  
 If the first number Christopher deletes is 71, what is the last number he will delete?  
 A. 1  
 B. 64  
 C. 97  
 D. 100  
 E. None of the above
6. Caroline, Dylan and Eddie are playing a game.  
 At the beginning of the game, they each have a number of counters. The counters are shared out between the players in the ratio 5:4:3. By the end of the game, the total number of counters is the same but the number of counters each player has is in the ratio 4:3:2. If one of them won 8 counters over the course of the game, how many counters did the three players have in total at the beginning of the game?  
 A. 36  
 B. 144  
 C. 288  
 D. 576  
 E. None of the above
7. For a whole number  $n$ ,  $n! = n \times (n-1) \times (n-2) \times \dots \times 3 \times 2 \times 1$ .  
 What is the remainder when  $1! + 2! + 3! + \dots + 2015! + 2016!$  is divided by 15?  
 A. 0  
 B. 3  
 C. 6  
 D. 8  
 E. None of the above
8. What proportion of the regular hexagon  $ABCDEF$  is shaded orange?
- A.  $\frac{7}{18}$   
 B.  $\frac{1}{2}$   
 C.  $\frac{5}{9}$   
 D.  $\frac{2}{3}$   
 E. None of the above



9. Colin forms a  $32 \times 9 \times 7$  cuboid from 2016 unit cubes. And paints the exterior of this cuboid red. How many of the 2016 unit cubes have 0 or 2 of their faces painted red?
- A. 168  
 B. 1218  
 C. 1226  
 D. 1242  
 E. None of the above

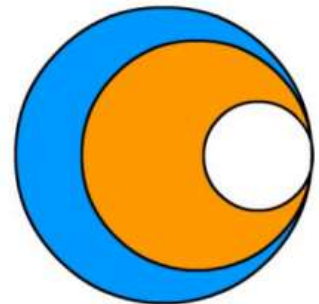
10. The image below shows part of a floor which is tiled by two different kinds of rhombus, one narrow and green, the other wide and blue. What is the difference between the biggest angle of the blue rhombuses and the smallest angle of the green rhombuses?

- A.  $36^\circ$   
 B.  $54^\circ$   
 C.  $60^\circ$   
 D.  $72^\circ$   
 E. None of the above



11. The figure below is formed of three circles with integer radius which intersect at a common point. The largest circle has a radius of 17 units. Given that the area shaded blue is the same as the area shaded orange, what is the sum of the radii of all three circles?

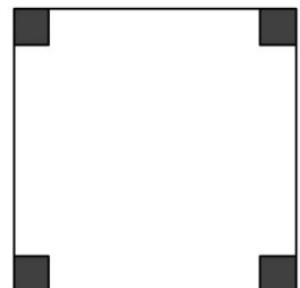
- A. 34 units  
 B. 37 units  
 C. 40 units  
 D. 43 units  
 E. None of the above



12. A square with side length 1 cm is removed from each corner of a square with side length 6 cm.

What is the area of the largest square that can be drawn in the remaining shape?

- A.  $16 \text{ cm}^2$   
 B.  $18 \text{ cm}^2$   
 C.  $24 \text{ cm}^2$   
 D.  $28 \text{ cm}^2$   
 E. None of the above



13. In some cultures it is considered unlucky when the 13<sup>th</sup> day of a month falls on a Friday. What is the most number of times this could happen in one calendar year (which could be a leap year)?

A. 1  
 B. 2  
 C. 3  
 D. 4  
 E. None of the above

14. Alice and Bob are the world's foremost cup stackers – people who build triangular towers out of cups.

Alice has exactly enough cups to build a tower 50 levels tall, and Bob has exactly enough cups to build a tower 38 levels tall. How many levels tall is the tallest tower they could build using all their cups together?

A. 63  
 B. 71  
 C. 79  
 D. 88  
 E. None of the above



15. Let  $x = 7^a + 21^b$ , where  $a$  and  $b$  are some positive integers. Which of the following could not be the last two digits of  $x$ ?

A. 20  
 B. 22  
 C. 24  
 D. 28  
 E. None of the above

16. For how many 4-digit numbers is the sum of the two middle digits equal to the sum of the two outer digits?

A. 615  
 B. 670  
 C. 1000  
 D. 2280  
 E. None of the above

17. Joanna and Kai's car has broken down, so their daughter Layla comes to fetch them in her own car. Only two people (including the driver) can fit into Layla's car, so they use the following procedure:

Layla drives Joanna some distance in the car, while Kai follows them on foot. Then Layla drops Joanna, who will continue on foot, and turns back, driving until she meets Kai. She picks up Kai and they drive onwards until they catch up with Joanna. Then Kai and Joanna swap, and the process continues for 3 more times until they all reach home. If Layla drives at a constant speed of 50 km/h and Joanna and Kai both walk at a constant speed of 4 km/h, for what fraction of her journey will Layla be alone in the car?

- A.  $\frac{2}{25}$   
 B.  $\frac{23}{50}$   
 C.  $\frac{23}{54}$   
 D.  $\frac{23}{77}$   
 E. None of the above

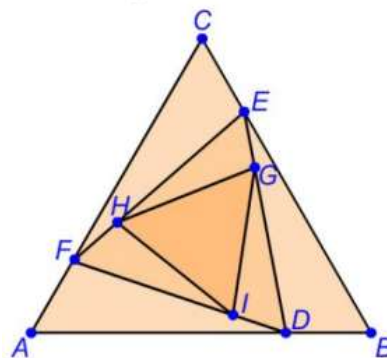
18. How many 5-digit numbers are there whose product of digits is 2016?

- A. 240  
 B. 480  
 C. 600  
 D. 960  
 E. None of the above

19.  $ABC$ ,  $DEF$  and  $GHI$  are equilateral triangles.  $D$  lies  $\frac{3}{4}$  of the way along  $AB$ ,  $E$  lies  $\frac{3}{4}$  of the way along  $BC$ , and  $F$  lies  $\frac{3}{4}$  of the way along  $CA$ . Similarly,  $G$  lies  $\frac{3}{4}$  of the way along  $DE$ ,  $H$  lies  $\frac{3}{4}$  of the way along  $EF$ , and  $I$  lies  $\frac{3}{4}$  of the way along  $FD$ .

What is the ratio of the area of triangle  $GHI$  to the area of the triangle  $ABC$ ?

- A. 1:5  
 B. 7:16  
 C. 9:16  
 D. 49:256  
 E. None of the above



20. Toby and Sam are playing a game. They have two bags of sweets. Bag A contains three sweets, and bag B contains six sweets.
- They take turns to remove at least one sweet according to this rule:  
On his turn, a player may take either as many sweets as he likes from one bag (including all the sweets in the bag), or the same number of sweets from both bags.
- The person who takes the last sweet is the winner. If Toby goes first, which of these 1<sup>st</sup> moves guarantees that he will win?
- A. Remove all sweets from bag A
  - B. Remove one sweet from bag A
  - C. Remove one sweet from bag B
  - D. Remove two sweets from bag B
  - E. None of the above

