RIPMWC 2015 Round 1

Time Duration: 1.5 hour Name: ___________ Marks: ___________

1. If $A \otimes B = \frac{B}{A} + \frac{2A}{B} + 2015$, then $(5 \otimes 10) - (10 \otimes 15)$ is
   A. 0
   B. $\frac{1}{6}$
   C. $\frac{1}{3}$
   D. 2015
   E. None of the above

2. Find the sum 4 + 8 + 16 + 32 + 64 + 128 + 256 + 512 + 1024 + 2048.

   A. 4092
   B. 4094
   C. 4096
   D. 4098
   E. None of the above

3. Which of the following numbers has the same number of divisors (including 1 and the number itself) as 2015? (note that $2015 = 5 \times 13 \times 31$)

   A. 43
   B. 64
   C. 128
   D. 1000
   E. None of the above

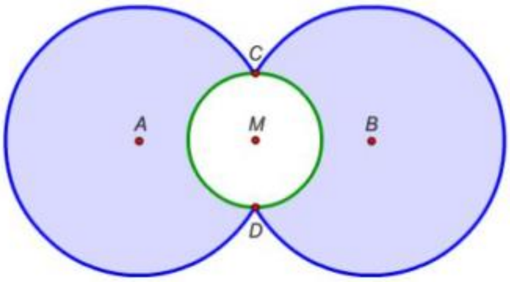
4. What is the value of $\frac{2002.2002+20022002+200220022002}{2015.2015+20152015+201520152015}$?

   A. $\frac{154}{155}$
   B. $\frac{155}{156}$
   C. $\frac{156}{157}$
   D. $\frac{90}{20}$
   E. None of the above

5. Two circles of equal radius with centres at *A* and *B* intersect at the points *C* and *D*. A further circle is drawn passing through both *C* and *D*, with its centre which is the mid-point of *A* and *B* and which is also mid-point of *D* and *C*.

   Given that the smaller circle has half the radius of one of the bigger circles, what is the ratio of the outer perimeter (marked in blue) of the shaded area to the inner perimeter (marked in green)?

   A. 10:3
   B. 3:1
   C. 11:6
   D. 2π-1： π
   E. None of the above

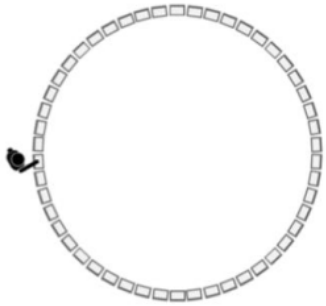


6. After a football game, each of the 11 players in a football team puts both their boots in one bag. The 4 defenders in the team wear red boots but the other players wear black boots.
   You begin taking boots out of the bag at random, one at a time, without replacement. What is the largest number of boots you might have to take out to get at least one pair of red boots worm by a defender?

   A. 15
   B. 16
   C. 17
   D. 18
   E. None of the above

7. 50 boxes are arranged in a circle, and numbered from 1 to 50. A boy walks around the circle, placing 1 cent in box number 1, 2 cents in box number 2, 3 cents in box number 3, and so on till he gets back to where he started. He continues walking, and on the second time round, he stops at every even numbered box, and removes the money in it. On the third time round, he stops at every box which is a multiple of 3. If the box contains money, he removes it, but if it is empty, he replaces the original amount. On the fourth time round, he does the same with every box which is a multiple of 4. If he continues this way, what will be the total amount left in the boxes after he has walked around the circle 50 times?

   A. \$6.25
   B. \$4.25
   C. \$3.28
   D. \$1.40
   E. None of the above



8. As shown below, Aaron writes down all the multiples of 5 from 5 to 2015 inclusive to form a number

510152025 … 20102015

How many digits are there in this number?

A. 1380
B. 1389
C. 1391
D. 1393
E. None of the above

9. In the time it takes Ben to walk 11 steps, Charlie walks 9 steps. If Charlie covers the same distance in 5 steps as Ben does 7 steps, what is the ratio of the speed of Ben to the speed of Charlie?

A. 63:55
B. 55:63
C. 77:45
D. 45:77
E. None of the above

10. I pick a whole number. If it is even, I divide it by 2, if it is odd then I multiply it by 3 and then add 5. I then repeat this process with the new number formed.

Starting with the number 15, I form the sequence

$15 \rightarrow 50 \rightarrow 25 \rightarrow 80 \rightarrow 40 \rightarrow 20 \ldots$

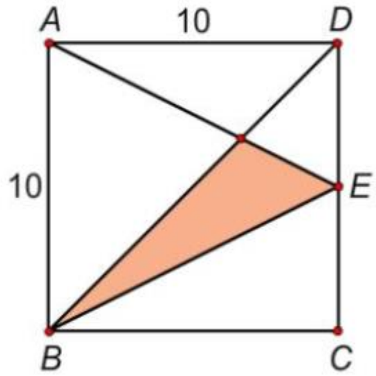
Consider the sequences starting with the numbers 1 to 10. What is the smallest number which does not appear in any of the above sequences?

A. 11
B. 12
C. 15
D. 17
E. None of the above

11. A staircase consists of 8 steps. John walks from the bottom to the top, each time climbing 1, 2 or 3 steps. How many different ways can he climb the staircase?

A. 64
B. 72
C. 81
D. 91
E. None of the above

12. In the figure below, *ABCD* is a square of length 10 cm and *E* is the mid-point of *CD*. Find $\dfrac{\text{area of the shaded region}}{\text{area of the square ABCD}}$.



A. $\frac{2}{13}$
B. $\frac{1}{6}$
C. $\frac{2}{11}$
D. $\frac{3}{13}$
E. None of the above

13. Find the remainder when number 2010201120120000201320142015 is divided by 88.

A. 11
B. 33
C. 55
D. 65
E. None of the above

14. Two different integers are selected from 1 to 19 inclusive. In how many of these combinations of 2 numbers are their sum a multiple of 3?

A. 42
B. 50
C. 54
D. 57
E. None of the above

15. Peter and Ryan set off for school together and must arrive at their school 25 km away at the same time. They share the use of the only available bicycle. Ryan sets out riding at 10km/h, leaves the bicycle and walks at 6 km/h. Peter walks at 5 km/h, reaches the bicycle and rides at 12 km/h. Find the distance in km for which Ryan rides the bicycle.

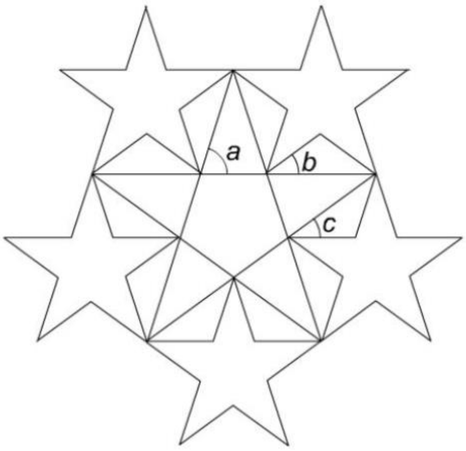
A. 11
B. $11\frac{3}{7}$
C. $12\frac{1}{3}$
D. $13\frac{1}{3}$
E. None of the above

16. The value of $\frac{1}{31}+\frac{1}{31+62}+\frac{1}{31+62+93}+...+\frac{1}{31+62+93+...+2015}$ is

A. $\frac{128}{2013}$
B. $\frac{65}{1023}$
C. $\frac{128}{2015}$
D. $\frac{66}{2033}$
E. None of the above

17. A pattern is formed using 6 regular 5-pointed stars as shown. What is the relation between *a*, *b* and *c*?

A. $a=2b+c$
B. $a=b+2c$
C. $b=2c-a$
D. $a+b+c=180^{\circ}$
E. None of the above

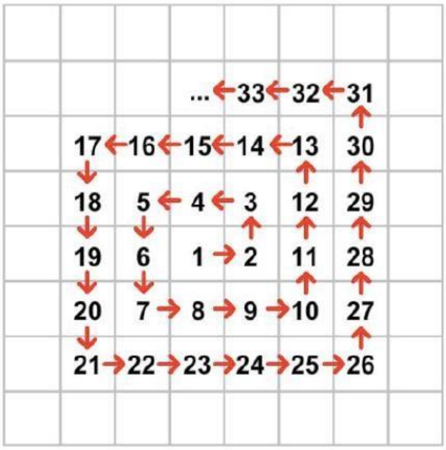


18. There are 4 bags labelled *A*, *B*, *C* and *D*. 8 identical coins are then distributed into the 4 bags such that each bag must contain at least one coin. Find the number of possible ways that this can be done.

A. 24
B. 30
C. 32
D. 35
E. None of the above

19. If the whole numbers are written in an anticlockwise spiral on a square grid as shown, which number appears directly above 2015?

A. 1840
B. 2014
C. 2016
D. 2202
E. None of the above



20. Jack and Ken play a game of picking up coins from a pile of 2015 coins. They take turn to pick up coins with Jack starting first. The rules of the game require each person to pick up only 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11 coins at each turn and the person to pick up the last coin is the loser. How many coins should Jack pick up at his first turn to ensure that he will be the winner?

A. 2
B. 5
C. 6
D. 11
E. None of the above