

Kangaroo.Study

# RIPMWC 2023

Mock Exam

Name:

Grade:

School:

1. Calculate:  $\frac{\frac{1}{2}}{1+\frac{1}{2}} + \frac{\frac{1}{3}}{(1+\frac{1}{2})\times(1+\frac{1}{3})} + \dots + \frac{\frac{1}{2023}}{(1+\frac{1}{2})\times(1+\frac{1}{3})\times\dots\times(1+\frac{1}{2023})}$

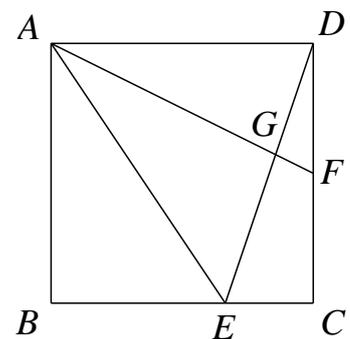
- A.  $\frac{1011}{1012}$
- B.  $\frac{2022}{2023}$
- C.  $\frac{2021}{2022}$
- D.  $\frac{1010}{1011}$
- E. None of the above

2. The table below contains 100 numbers. What is their sum?

2011	2012	2013	...	2019	2020
2012	2013	2014	...	2020	2021
2013	2014	2015	...	2021	2022
⋮	⋮	⋮	⋮	⋮	⋮
2020	2021	2022	...	2028	2029

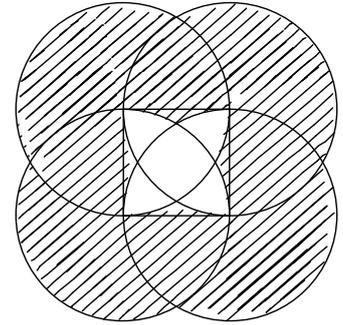
- A. 201550
- B. 202300
- C. 202000
- D. 201620
- E. None of the above

3. In the figure below, there is a square  $ABCD$  with a side length of 1. If  $BE=2EC$ ,  $CF=FD$ , find the area of triangle  $AEG$ .



- A.  $\frac{1}{3}$
- B.  $\frac{2}{5}$
- C.  $\frac{3}{7}$
- D.  $\frac{2}{7}$
- E. None of the above

4. As shown in the figure below, the square in the middle has a side length of 1. The four vertices of the square are the centers of four circles, and the sides of the square are the radii of these four circles. Find the area of the entire shaded region. (Take  $\pi$  as 3.14 )



- A. 8.28
- B. 7.14
- C. 7.28
- D. 8.14
- E. None of the above

5. Starting from the number “2023”, Alex writes down a string of numbers such that each number is the unit digit of the product of its previous two numbers. For example,  $2 \times 3 = 6$  so Alex writes down “6”,  $3 \times 6 = 18$  so Alex writes down “8” after “6” ... In the end, Alex obtained a string of numbers : 20236884... Counting from the leftmost number which is the number “2”, what is the 2023<sup>rd</sup> digit of this string of numbers?

- A. 3
- B. 6
- C. 8
- D. 4
- E. None of the above

6. There are 4 identical bottles, each containing a certain amount of oil. By putting two bottles together on the scale every time, the weights are recorded as follows: 8, 9, 10, 11, 12, 13. If the total weight of the 4 bottles when they are empty is a prime number, the total weight of the oil from the 4 bottles (not including the weight of the bottles) is also a prime number, what is the total weight of the oil from the two heaviest bottle (not including the weight of the bottles).

- A. 11
- B. 12
- C. 11.5
- D. 10.5
- E. None of the above

7. Two cars, X and Y, both depart from place A and keep travelling back and forth between place A and place B nonstop: once they reach place B, they immediately turn back and travel towards place A; once they reach place A, they immediately turn back and travel towards place B. The two cars meet each other for the first and second time both at place C which is somewhere between place A and B. Given that the speed of car X is faster than car Y, the speed of car X is how many times the speed of car Y?

- A. 2
- B. 3
- C. 1.5
- D. 2.5
- E. None of the above

8. In a community club, the ratio of male members to female members is 3:2. The members are put into three groups A, B and C where the ratio of the number of members is 10:8:7. In group A, the ratio of male to female is 3:1, in group B, the ratio of male to female is 5:3. What is the ratio of male to female in group C?

- A. 4:9
- B. 1:2
- C. 2:5
- D. 5:7
- E. None of the above

9. Solution A, B and C are 48% alcohol solution, 62.5% alcohol solution and  $\frac{2}{3}$  alcohol solution respectively. The total weight of the three solutions is 100kg and the weight of solution A is equal to the weight of solution B and C combined. If all three solutions are mixed, the result is a 56% alcohol solution. How many kg of alcohol are there in solution C originally?

- A. 12
- B. 15
- C. 17
- D. 21
- E. None of the above

10. A 6-digit number N consists of six distinct non-zero numbers and N is divisible by 11. By rearranging the six digits of N, at least how many new 6-digit numbers (not including the number N) can be obtained such that they are also divisible by 11?

- A. 36
- B. 35
- C. 72
- D. 71
- E. None of the above

11. Three classes A, B and C from Guang Ming Primary School were asked to put up 14 shows during their School Annual Day. If every class must put up at least 3 shows, how many possible ways can the 14 shows be assigned to the three classes?

- A. 42
- B. 21
- C. 5
- D. 30
- E. None of above

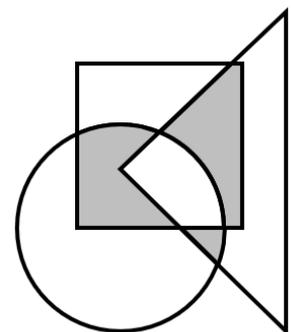
12. Out of all the natural numbers that are strictly less than 2023 (including 0), how many numbers are there that give the same remainder when divided by 20 and when divided by 23? (Remainder can be zero).

- A. 4
- B. 5
- C. 99
- D. 100
- E. None of above

13. There are 10 multiple choice questions in a math contest. Each participant gets 10 points at the beginning. For every question answered correctly, 3 points will be added. For every question answered incorrectly, 1 point will be deducted. For every unattempted question, no points will be added or deducted. At least how many participants is needed to guarantee 4 participants get the same marks?

- A. 124
- B. 121
- C. 115
- D. 114
- E. None of above

14. In the figure below, a triangle, a square and a circle are placed on top of each other. Given that they each has area  $60\text{cm}^2$ , the total area of the shaded region is  $40\text{cm}^2$  and the total area covered by the three shapes is  $100\text{cm}^2$ , what is the area of the overlapping part of all three shapes?

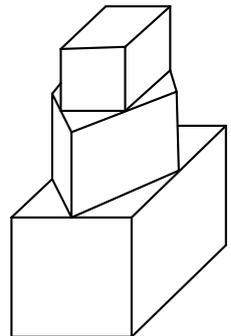


- A. 40
- B. 35
- C. 30
- D. 20
- E. None of above

15. When Lilia started writing her homework sometime between 8am and 9am in the morning, the hour hand and minute hand overlapped each other exactly. When Lilia finished writing her homework sometime between 10am and 11am, the hour hand and minute hand overlapped each other exactly again. How long did it take for Lilia to finish writing her homework?

- A. 2h10min
- B. 2h11min
- C.  $2\text{h}10\frac{10}{11}\text{min}$
- D.  $2\text{h}10\frac{7}{11}\text{min}$
- E. None of above

16. Lawrence stacked some cubes to form a tower such that the four bottom corners of every cube must touch the midpoint of the edges of the cube that it is stacked on (the figure below is an example of this with three cubes). Given that the edge length of the lowest cube is 2 and the total surface area of the tower exceeds 39 (including the bottom area of the lowest cube), at least how many cubes are there in the tower Lawrence built?



- A. 5
- B. 6
- C. 7
- D. 8
- E. None of the above

17.  $\lfloor a \rfloor$  denotes the greatest integer less than or equal to  $a$ . For example,  $\lfloor 1.9 \rfloor = 1$  and  $\lfloor \frac{17}{4} \rfloor = 4$ .

Find the value of  $\left\lfloor \frac{1}{\frac{1}{10} + \frac{1}{11} + \frac{1}{12} + \dots + \frac{1}{19}} \right\rfloor$

- A. 0
- B. 1
- C. 2
- D. 3
- E. None of the above

18. Among the 2023 natural numbers from 1 to 2023, how many number  $a$  are there such that  $2023+a$  is divisible by  $2023-a$ .

- A. 11
- B. 10
- C. 12
- D. 13
- E. None of the above

19. Worker A, B and C working alone can finish a project in 36, 30 and 48 days respectively. If worker A, B and C work together on the same project but worker C rests for  $X$  days ( $X$  is a whole number) while worker A and B never rest, the entire project can be finished in  $Y$  days ( $Y$  is a whole number). What is the value for  $X$ ?

- A. 9
- B. 10
- C. 11
- D. 12
- E. None of the above

20. As shown in the figure below, the trapezium  $ABCD$  has an area of 12. If  $AB=2CD$ ,  $E$  is the midpoint of  $AC$  and  $BE$  is extended to  $F$  such that  $BF$  and  $AD$  intersect at point  $F$ . The area of quadrilateral  $CDEF$  is \_\_\_\_\_.

- A. 2
- B.  $\frac{7}{3}$
- C.  $\frac{7}{4}$
- D.  $\frac{8}{3}$
- E. None of the above

