

2017 WMTC

儿童组个人赛第一轮

Junior Level Individual Round 1

1. Calculation: $4.\dot{2} \div 1.0\dot{5}$.

2. If x and y are non-zero natural numbers, and $3x+5y=36$, then find the value of $x+y$.

3. In the natural numbers of 1~1000, how many numbers are there when it divided by 3 get remainder 2, and divided by 5 get remainder 4?

4. If a , b , c , d are prime numbers, and

$$19 < d < 50, \quad \textcircled{1}$$

$$b - a = 12, \quad \textcircled{2}$$

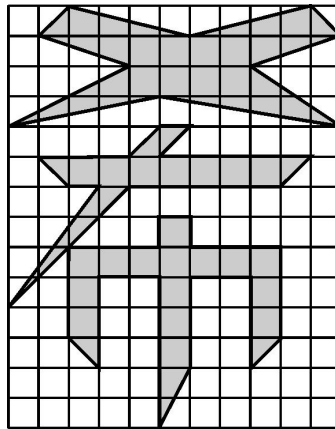
$$c - b = 6, \quad \textcircled{3}$$

$$d - c = 8, \quad \textcircled{4}$$

then find the value of $a+b+c+d$.

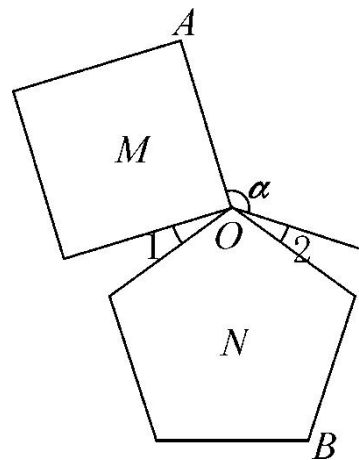
5. The six people A , B , C , D , E , F divide a piece of birthday cake. If A gets a seventh of the cake, B and C gets a third of the cake after A took away, D gets half of the cake after A , B , C took away. If E and F get 210g together, then the cake has not left. Find the original weight of this cake.

6. Find the area of the shaded region in the following 14×11 grid diagram.

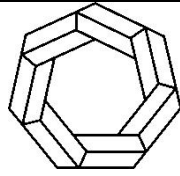


7. In this diagram, M is a square, N is a regular pentagon, and points O, A, B are in the same line. If $\angle 1 = \angle 2$, find $\angle \alpha$.

(The internal angle of regular pentagon is 108°)



8. In a math test, the average score of six students was 88. Their scores were different natural number from each other, and the highest score was 99, and the lowest score was 66. If rank their scores from high to low, then find the minimum score for the third student.



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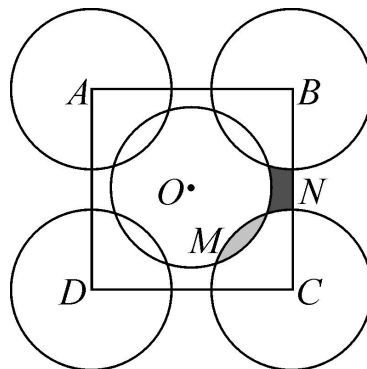
儿童组个人赛第二轮

Junior Level Individual Round 2

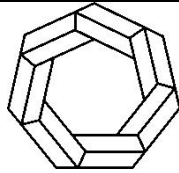
9. If A and B are two different non-zero natural numbers less than 1000, then find the maximum value of $\frac{A-B}{A+B}$.

10. It's 5:20 now. If after x minutes, the minute hand and the hour hand overlap together first time, then find the value of x .

11. The point O is the center of the square $ABCD$. If $AB = 5$, the radius of circle A, B, C, D, O is 2. Use M and N to represent the area of the two shadow regions of the graph respectively. Find the value of $M - N$. ($\pi = 3.14$)



12. The letter a, b, c are three different non-zero digit numbers. If $\overline{abc} + \overline{bc} + c = 724$, then find the value of $a+b+c$.



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儿童组个人赛第三轮

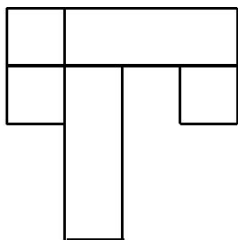
Junior Level Individual Round 3

13. Take n numbers from 2, 3, 5, 7, 11, 13, 17, 19, and calculate their sum. If the sum is just the product of two equal natural numbers, then how many values of n ?

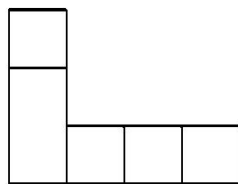
14. Make a three-dimensional with the cube and cuboid given in the following table.

	length	width	height	number
cube	1	1	1	1
cuboid A	1	1	2	1
cuboid B	1	1	3	3

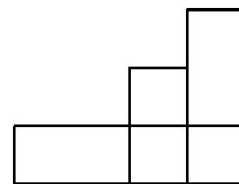
If the three views of this solid shape are shown below, then find the value of the surface area of this solid shape.



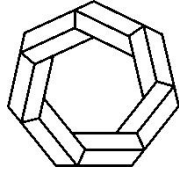
From the above



From the front



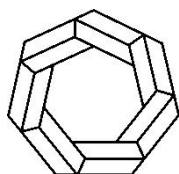
From the right



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儿童组接力赛第一轮
Junior Level Relay Round 1

1-A

Jake is 11 years old in 2017. How many years that the sum of all the digits of years is three times as much as the sum of all the digits of Jake's age from the year 2018 to 2050?

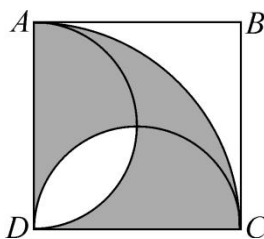


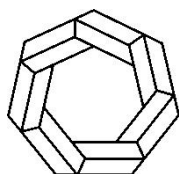
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Junior Level Relay Round 1

1-B

Let T be the number you will receive.

As shown in figure, if $AB = T$, find the area of the shadow part. ($\pi=3$)

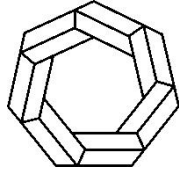




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Junior Level Relay Round 2

2-A

Known a, b are two natural numbers. If $(a+b)(a-b) = 2017$, then
find the value of $\frac{a+2016}{b+2017}$.

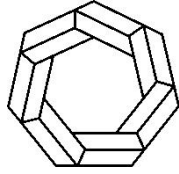


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儿童组接力赛第二轮
Junior Level Relay Round 2

2-B

Let T be the number you will receive.

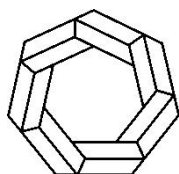
The length of a square edge is T , and there are 9 identical circles without a common area in the square. Find the maximum of the sum of the circumference of all circles. ($\pi=3$)



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Junior Level Relay Round 3

3-A

The sides of the triangle are the natural numbers, and the perimeter is the sum of three different one-digit prime numbers. How many equilateral triangles are there in these triangles?

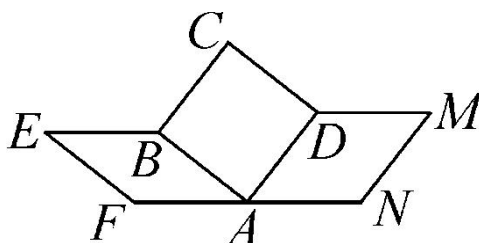


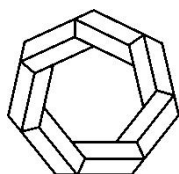
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儿童组接力赛第三轮
Junior Level Relay Round 3

3-B

Let T be the number you will receive.

As shown in figure, the area of the diamond $ABEF$ is T , and the area of the diamond $ADMN$ is 2.1. Find the area of the square $ABCD$.



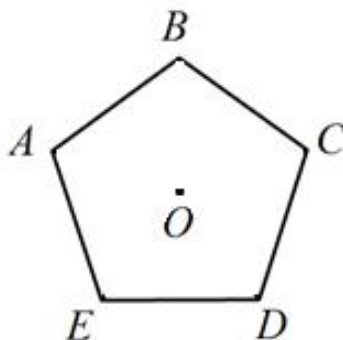


2017 WMTC

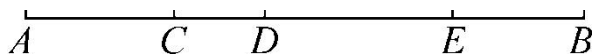
儿童组团体赛

Junior Level Team Round

1. Point O is the center of the regular pentagon $ABCDE$, point A is clockwise rotated 2017° around point O , and point A reaches point M , find $\angle MOE$.



2. In the graph, the length of AC , CD , DE , EB are natural number. If $AB=100$, find the maximum value of $AC+AD+AE+AB+CD+CE+CB+DE+DB+EB$.



3. $[x]$ is the largest integer not greater than x . If $x=a.b$ (b is one-digit) and $[x+0.1]+[x+0.2]+\cdots+[x+0.9]=104$, find the value of x .

4. If the sum S_n of all the numbers in Fig. n is 2875, find the value of

n .

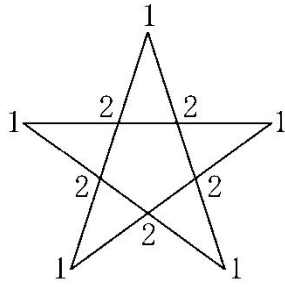


Fig.1 ($S_1=15$)

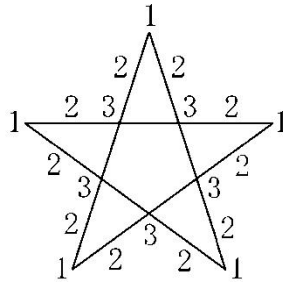


Fig.2 ($S_2=40$)

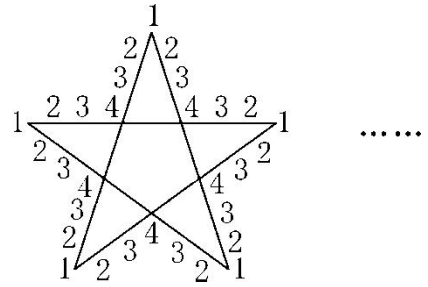


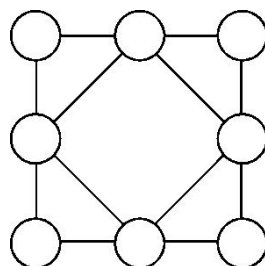
Fig.3 ($S_3=75$)

5. If the perimeter of triangle is 2017, then how many isosceles triangles when the length of the triangle's all sides are the natural numbers?

6. If $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$, and $a^3 = a \times a \times a$, $b^3 = b \times b \times b$, then find the remainder of $1^3 + 2^3 + 3^3 + \dots + 2017^3$ divided 3.

7. \overline{ab} and \overline{cd} are two digits, and \overline{ab} is a prime number, and \overline{cd} is the multiple of 3 and 31. If $\overline{ab} \times \overline{cd} = \overline{mnpq}$, and m, n, p, q are consecutive numbers, then find the value of \overline{ab} .

8. If you must paint the circles in red, yellow or green, and make the adjacent circles different colors, then how many methods are there?



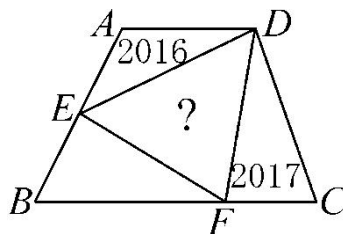
9. If x, y, z are prime numbers, $x+y+z=100$, then find the maximum value of xyz .

10. If $a * b = \frac{ab}{a+b}$, find the value of $63 * 126 * 252 * 504 * 1008 * 2016$.

11. The continuous natural numbers from 11 to a , where the sum of the largest 5 numbers can be divisible by 7, find the value of a .

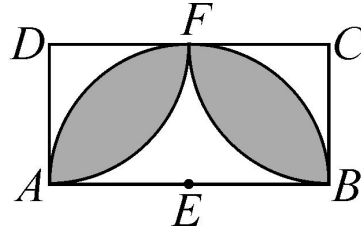
12. The three digit \overline{abc} is a prime number, and a, b, c are different prime numbers. Find the value of \overline{abc} .

13. The quadrilateral $ABCD$ is a trapezoidal. If $AE = \frac{1}{2}AB$, $BF = \frac{2}{3}BC$, and the area of $\triangle ADE$ is 2016, and the area of $\triangle DFC$ is 2017, then find the area of $\triangle DEF$.



14. There are 10 natural numbers greater than zero, in which the largest one is a , and the difference between any two numbers is not equal, find the minimum value of a .

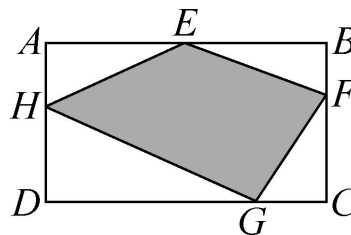
15. As shown in the figure, $ABCD$ is a rectangle, $AB=2BC$, the sector $EAFB$ is a semicircle, the sector DFA and sector CFB are a quarter of circles. If the area of the shadow is S_1 , the area of the blank part is S_2 , $S_1 - S_2 = 18\pi - 54$, then find the value of AB .



16. Fill 0, 1, 2, ..., 8 in the following grid, and make the quotient and the remainder of the three numbers that each row and each column divided by 3 different from each other respectively. Find the value of $A+B$.
(There, 0, 2, 3 have been filled in.)

0	A	
	3	2
B		

17. As shown in the figure, the quadrilateral $ABCD$ is a rectangle, and point H is on AD , $AE = \frac{1}{2}AB$, $BF = \frac{1}{3}BC$, $CG = \frac{1}{4}CD$. If the area of rectangle $ABCD$ is twice the area of quadrilateral $EFGH$, then find the value of $\frac{AH}{AD}$.



18. As shown in the table, the first row is the continuous natural numbers from 1. And from the second row, each number is equal to the sum of the two numbers that above it and on the top right of it.

Example: $3=1+2$, $24=11+13$.

1	2	3	4	5	6	...
3	5	7	9	11	13	...
8	12	16	20	24	28	...
20	28	36	44	52	60	...
...

If A is the number in the table, and 400 is above A , 896 is on the right of A , then find the value of A .

19. Take n numbers from 1 to 2017. If the last digit of the product of these numbers is 6, then find the maximum value of n .

20. If \overline{abcd} is a four digit number, and $a \leq b \leq c \leq d$, then call it an “upward” four digit number. How many “upward” four digit numbers are there?

2017WMTC Junior Level

Individual Rounds

1	2	3	4	5	6	7
4	10 or 8	66	76 or 100	735	49.5	126°
8	9	10	11	12	13	14
90	$\frac{499}{500}$	$7\frac{3}{11}$	0.03	19	6	46

Relay Rounds

1-B	2-B	3-B
10	9	2.9

Team Round

1	2	3	4	5	6	7	8	9	10
71°	596	11.5	23	504	1	73	18	4514	32
11	12	13	14	15	16	17	18	19	20
23	523 or 257	4033	91	6	13	$\frac{1}{3}$	832	1613	495