2018 WMTC

少年组个人赛第一轮

Intermediate Level Individual Round 1

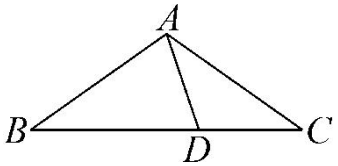
1. Known x and y are integers, how many (x, y) are there in the equation $\sqrt{x}+\sqrt{y}=\sqrt{333}$?

2. If a and b are both positive integers, and $\frac{a}{11}+\frac{b}{13}=\frac{142}{143}$, then $a+b=$_____.

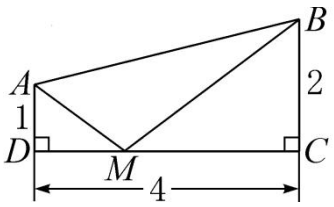
3. If the length of the three sides of a triangle are 2, k, and 5, then $18-\sqrt{9k^2-150k+625}-|3k-8|=$_____.

4. If a, b, c are continuous natural numbers, and $a^2+b^2+c^2=302$, then $a+b+c=$_____.

5. In triangle ABC, $AB=AC=BD$, $AD=CD=1$, then $AB=$_____.



6. In trapezoid $ABCD$, $\angle D=\angle C=90°$, point M on DC, if $AD=1$, $DC=4$, $BC=2$, $BM=2AM$, then $DM=$_____.



7. If x and y are real numbers, and

$$(x-\sqrt{x^2-2018})(y-\sqrt{y^2-2018})=2018,$$

then $5x^2-4y^2+3x-3y-2017=$_____.

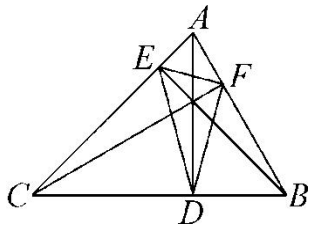
8. If $\sqrt[2017]{A-1}=2017, \sqrt[2018]{B+1}=2018$, then the single digit of $A+B$ is_____.

2018 WMTC

少年组个人赛第二轮

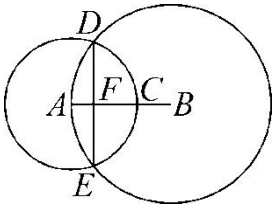
Intermediate Level Individual Round 2

9. If AD, BE, CF are three high line of triangle ABC, and in the triangle ABC, $\angle ABC=60^\circ$, $\angle DFE=90^\circ$, then $\angle CAB=$_____°.



10. If a, b, m are positive integers, $m<50$ and $m^2=9a^2+9b^2$, then there are _____ possible value of m.

11. If AB is a line segment, point C on AB, and $AC=2CB$. Take point A as the center of the circle and AC as the radius, making circle A. And take point B as the center of the circle and BA as the radius, making circle B. The two circles intersect at point D and E, AB and DE intersect at point F, if $AF=2$, then $BF=$_____.



12. From 1,2, 3, …, 9 get out three numbers, then the probability of the sum of the three numbers can divisible by 5 is_____.

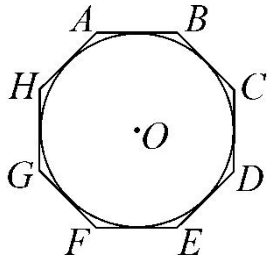
2018 WMTC

少年组个人赛第三轮

Intermediate Level Individual Round 3

13. Known b and c are integers, x^2+bx+c is a factor of $x^4+3x^3+8x^2+9x+15$ and $4x^4+13x^3+28x^2+20x+25$, if $x=4$, then the value of x^2+bx+c is _____.

14. Known $ABCDEFGH$ is a regular octagon, the area of its inter tangent circle is $\frac{\pi}{8}$, then the area of the regular octagon is _____.



2018 WMTC

少年组接力赛第一轮

Intermediate Level Relay Round 1

1-A

If $a=\dfrac{\sqrt{5}-1}{\sqrt{5}+1}$, then $8a^2-24a+18=$_____.

2018 WMTC

少年组接力赛第一轮

Intermediate Level Relay Round 1

1-B

Let **T** be the number you will receive.

If $x^2-8xy+y=10$, $y^2+10xy+x=\mathbf{T}$. Find the maximum value of $x+y$.

2018 WMTC

少年组接力赛第二轮

Intermediate Level Relay Round 2

2-A

If a，b，c are positive integers and $a+b+c=6$, ask how many（a，b，c）are there?

2018 WMTC

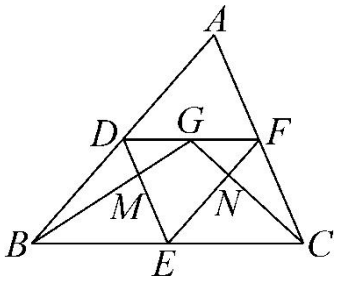
少年组接力赛第二轮

Intermediate Level Relay Round 2

2-B

Let **T** be the number you will receive.

Known triangle *ABC*, points *D*，*E*，*F*, and G are the midpoints of *AB*, *BC*, *AC*, and *DF* , respectively. If the area of △*GNF* is **T**, find the area of △*GBC*.



2018 WMTC

少年组接力赛第三轮

Intermediate Level Relay Round 3

3-A

Known $\overline{WMTC}$ is a four digits number, and W, M, T, C not equal to each other. If

$$W+M=T\times C,\quad W-M=T\div C,$$

Find $W+M+T+C$.

2018 WMTC

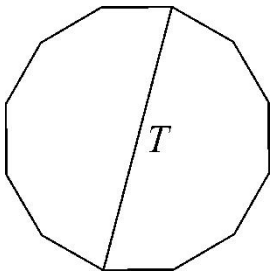
少年组接力赛第三轮

Intermediate Level Relay Round 3

3-B

Let **T** be the number you will receive.

If the length of a diagonal line of regular dodecagon is **T**, find the area of the regular dodecagon.



2018 WMTC

少年组团体赛

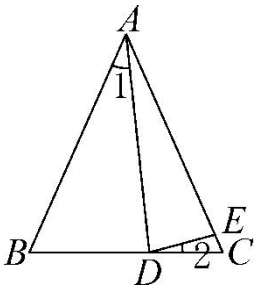
Intermediate Level Team Round

1. Known $x=\frac{1}{2-\sqrt{3}}$, if a is the decimal part of x, and b is the decimal part of $-x$, then the value of a^3+b^3+3ab is_____.

（Example: the decimal part of 1.6 is 0.6, the decimal part of -1.6 is 0.4）

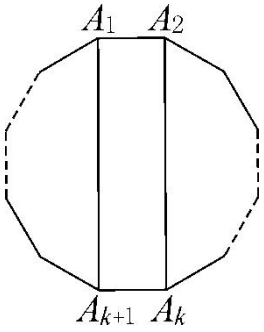
2. If the maximum of $\sqrt{2-x}+\sqrt{x-1}$ is a, and the minimum of $\sqrt{2-x}+\sqrt{x-1}$ is b, then the value of a^2+b^2 is_____.

3. In the triangle ABC, $AB=AC$, $AD=AE$, point D on BC, point E on AC, $\angle 1+\angle 2=45°$, then $\angle 1=$_____°.



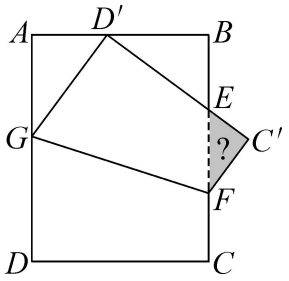
4. Solve equation: $\sqrt{2x^2+x}-\sqrt{3x^2-x}+2(\sqrt{2x+1}-\sqrt{3x-1})=0$, $x=$_____.

5. Known $A_1A_2A_3\cdots A_n$ is a regular n- polygon, and its area is 80, if $A_1A_2A_kA_{k+1}$ ($k\leq n$) is a rectangle and its area is 20, then $n=$_____.



6. Known two roots of the equation $x^2+px-636p=0$ are integers. Find the value of the prime number p.

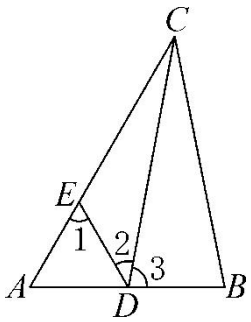
7. In the rectangle $ABCD$, AB=21, BC=27, AG=12, point G on AD, point F on BC, take GF as the axis and fold the lower part of the rectangle upwards, let point D fall to the point D' on the side AB, point C fall to the point C' outside the rectangle, $D'C'$ and BC intersect at point E. Find the area of triangle $EC'F$.



8. Known a, b, c are non - negative numbers, $3a+b-13c=-2$, and $2a+3b+17c=15$, if $m=3a+b-7c$, then the sum of the maximum and minimum values of $m=3a+b-7c$ is_____.

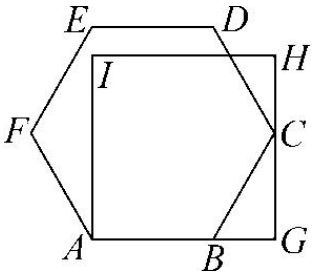
9. In the triangle ABC, $\angle B$=90°, AB=a, BC=b, a and b are integers, If AC=b+1, b<2018, then how many triangle ABC?

10. In the triangle ABC, point D on AB, and point E on CA. If $ED+DB=CE$, $\angle 1=\angle A=60°$, and $\angle 3=2\angle 2$, then $\angle DCB$=_____°.



11. Known α+1 and β +1 are roots of equation $x^2+cx+a=0$,and α and β are roots of equation $x^2+ax+b=0$, find the value of $a+b+c$.

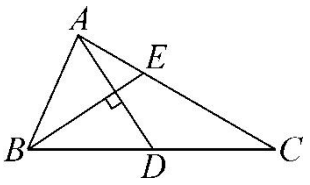
12. As shown in the picture, *ABCDEF* is a regular hexagon, *AGHI* is a square, and point *C* on *HC*, if *AB*=2, then *HC*=_____.



13. IF *a*, *b*, *c* are positive integers, and $a^2+b^2+c^2=441$, then the maximum value of *a*+*b*+*c* is_____.

14. If $a^2+b^2=6ab$, and $a>b>0$, then $\dfrac{a+b}{a-b}$=_____.

15. In the triangle *ABC*, *BD*＝*CD*, $\angle ABE=\angle CBE$, $AD\perp BE$, if *AD*=*BE*=6, then the length of *AC* is_____.



16. Suppose each of $x_1,x_2,x_3,\cdots,x_n$ can take on one of three numbers -2 , 0 and 1. If

$$x_1+x_2+x_3+\cdots+x_n=-37,\quad x_1^2+x_2^2+x_3^2+\cdots+x_n^2=83,$$

then $x_1^3+x_2^3+x_3^3+\cdots+x_n^3$=_____.

17. When a=1, 2, 3, …, 2018, if the roots of equation $x^2-2x-a^2-a=0(a>0)$ are α_1,β_1; α_2,β_2; α_3,β_3; … ; $\alpha_{2018},\beta_{2018}$, then $\frac{1}{\alpha_1}+\frac{1}{\beta_1}+\frac{1}{\alpha_2}+\frac{1}{\beta_2}+\frac{1}{\alpha_3}+\frac{1}{\beta_3}+\cdots+\frac{1}{\alpha_{2018}}+\frac{1}{\beta_{2018}}=$_____.

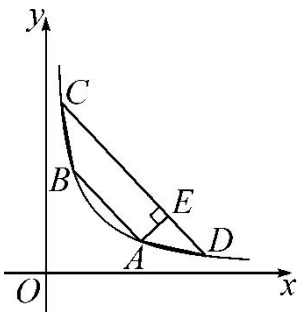
18. In $\triangle ABC$, if $y=2+\cos C\cos(A-B)-\cos^2 C$, then y has the largest value when $B=$_____°.

19. Known $y=ax^2+bx+c(a\neq 0)$, and $x_2-x_1=x_3-x_2=\cdots=x_7-x_6$, for $x_1,x_2,\cdots,x_6$ and $y_1,y_2,\cdots,y_6$, there is the following table:

x	x_1	x_2	x_3	x_4	x_5	x_6	x_7
y	10	32	70	124	194	278	382

One of the value of y is wrong, please give the correct value.

20. Known in the trapezoid $ABCD$, $BC=AD$, $BA\ //\ CD$, point E on CD, $\angle AED=90°$, $AB=2\sqrt{2}$, $CD=4\sqrt{3}$, $AE=\sqrt{2}$, points A, B, C, D on the image of inverse proportion function $y=\frac{k}{x}(k>0,x>0)$, find k.



2018WMTC Intermediate Level

Individual Rounds

1	2	3	4	5	6	7
4	12	1	30	$\frac{\sqrt{5}+1}{2}$	$\frac{4}{3}$	1
8	**9**	**10**	**11**	**12**	**13**	**14**
1	75	4	7	$\frac{4}{21}$	33	$\sqrt{2}-1$

Relay Rounds

1-B	2-B	3-B
4	120	147

Team Round

1	2	3	4	5	6	7	8	9	10
1	3	30	2	16	53	24	$\frac{91}{44}$	31	20
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
-3or2 9	3-$\sqrt{3}$	35	$\sqrt{2}$	$\frac{9}{2}\sqrt{5}$	-157	$-\frac{4036}{2019}$	60	280	3