



## 9<sup>th</sup> World Mathematics Team Championship 2018

### Junior Relay Detailed Solutions

**R1-A** Note that 135, 246 and 987 do not have common digits. If  $\overline{abc}$  is nice then there are three choices for  $a$  then two for  $b$  and one for  $c$ . In total  $3 \cdot 2 \cdot 1 = 6$ .

Answer: 6

T = TNYWR (The Number You Will Receive)

**R1-B** Solution: We use the fact that for the picture It is true that  $S_1 S_4 = S_2 S_3$ .

$S_1$	$S_2$
$S_3$	$S_4$

Using that  $T = 6$  we find  $A = 4$ ,  $B = 2$ ,  $C = 3$  and  $D = 3$  for total area of 32

3	6	3
B=2	A=4	2
C=3	T=6	D=3

Answer: 32

**R2-A** To obtain 1 to 4 we need at least three coins; to obtain 1 to 9 we need at least four coins; to obtain 1 to 19 we need at least five coins; to obtain 1 to 49 we need at least seven coins; to obtain 1 to 100 we need at least eight coins.

The set 1, 1, 2, 5, 10, 20, 20 and 50 works.

Answer: 8

T = TNYWR (The Number You Will Receive)

**R2-B**  $S_{AMCN} = \frac{1}{2}S_{ABCD} = 12$  and  $S_{CMN} = 4$  giving  $S_{AMN} = 12 - 4 = 8 \text{ cm}^2$ .

Answer: 8 cm<sup>2</sup>

**R3-A** The number of games is 28 and the number of wins is  $79 - 2 \cdot 28 = 23$ .

The number of draws is  $28 - 23 = 5$ .

Answer: 5

T = TNYWR (The Number You Will Receive)

**R3-B** Since  $(a + 8) - (b + 3) = a + 5 - b$  is divisible by 11 we have  $a + 5 - b = 0$  or 11 implying  $b = a + 5$  (then  $0 < a < 5$  and  $b > 5$ ) or  $a = b + 6$  (then  $a > 5$ ,  $b < 4$ ).

Further,  $a + 5$  is divisible by 3, so  $a = 1, 4$  or  $7$ .

For  $a = 1$  we have  $b = 6$ ; for  $a = 4$  we have  $b = 9$ ; and for  $a = 7$  we have  $b = 1$ .

Answer: 13.