SOLUTIONS FOR SPRING CUP MATHEMATICAL OLYMPIAD (P1 & P2)

Questions 1 to 7 are worth 4 marks each.

1. The same figure below represents the same number. Which number do the square and triangle represent respectively?
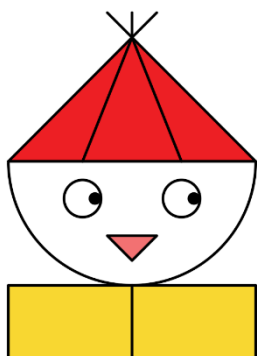
$$\square + \square + \square + \triangle + \triangle = 25 \qquad \square = (\quad)$$

$$\square + \triangle = 11 \qquad \triangle = (\quad)$$

Solution:
Replace a square and a triangle as a whole with 11, so a square plus two 11s is 25.
A square is equal to 3. A triangle is equal to 8.

2. How many more triangles are there than rectangles in the figure below?

Answer: _____

Solution:
Triangle:

 : 3+2+1=6

 : 1

Total: 6+1=7

Rectangle:

 : 2+1=3

Difference: 7-3=4

3. Fill in the blanks according to the pattern.

★○△□☆●△□☆○▲□☆○＿＿

Solution:

The four figures are repeated, so the following figures is a triangle and a square.

In every four figures, the black figures are the first, second and third, so the next should be the fourth.

4. How many natural numbers are there in the sequence?

$$7,\ 8,\ 9,\ \ldots\ ,\ 67,\ 68,\ 69$$

Answer: ＿＿＿＿＿

Solution:

There are 69 numbers from 1 to 69. From 7 to 69, the first six numbers are missed. 69-6=63

5. Five 10s plus four 1s equals to ＿＿＿＿.

Solution:

50+4=54

6. The pony, calf, crocodile and elephant had a race. According to the dialogue below, the fastest runner is the ＿＿＿＿.

I run slower than the elephant.

pony

I run faster than the elephant.

crocodile

I'm not the fastest.

calf

I run slower than the calf.

elephant

Solution:

The pony runs slower than the elephant. The pony is certainly not the fastest.

The crocodile and calf run faster than elephants, but the calf is not the fastest.

So the fastest is the crocodile.

7. In the equation below, write "+" or "-" between each two numbers such that the equation is true.

$$1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 = 13$$

Solution:

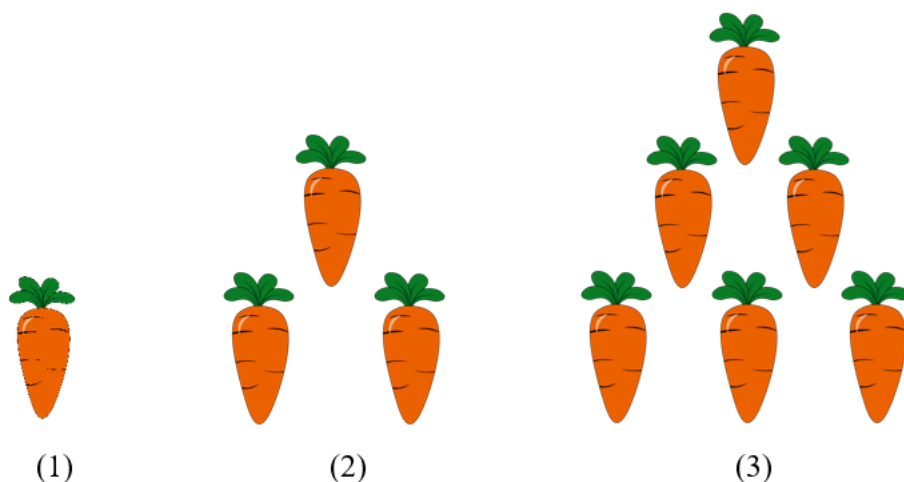7+6=13, you can try to use the first five numbers to figure out 7.

2+5=7, you can try to use the first four numbers to figure out 2.

Obviously, 1+2+3-4=2.

So, the answer is: 1+2+3-4+5+6=13

Questions 8 to 14 are worth 6 marks each.

8. The naughty rabbit Coco put some carrots into four figures, the first three are as shown in the figure below. According to this pattern, there are _____ carrots in total.

(1)   (2)   (3)

Solution:

The fourth figure: 1+2+3+4=10

Total: 1+3+6+10=20

9. Lily's home is 45 meters away from school. One day when Lily was heading to school, after walking 9 meters, she realised that she forgot to pack her assignment. She went back home to take her assignment, then went to school. What is the total distance Lily travelled?
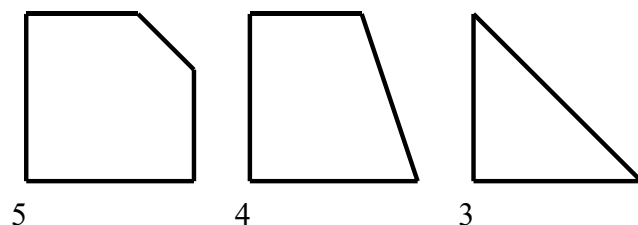
Answer: _____

Solution:

45+9+9=63

10. Given a square piece of paper, if we cut off a corner, how many possible numbers of corners can we form?

Answer: _____

Solution:
Three.
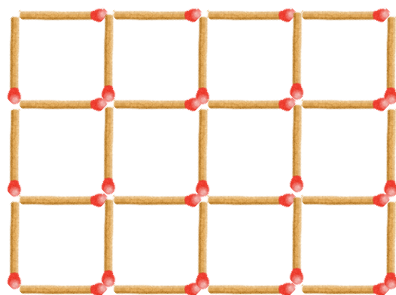

5   4   3

11. Alex and Ben compete to climb the stairs. They start from the first floor at the same time and their speed remains the same. When Alex reaches the third floor, Ben has reached the fourth floor. When Alex reaches the fifth floor, Ben has reached the _____ floor.
Solution:
When Alex reaches the third floor, Ben reached the fourth floor. This means Alex climbed two floors and Ben climbed three floors.
So when Alex reached the fifth floor, he actually climbed 4 floors, and then Ben climbed 6 floors to the seventh floor.

12. There are _____ matchsticks in total.

Solution:

The horizontal matchstick: $4 \times 4 = 16$

The upright matchstick: $3 \times 5 = 15$

Total: $16 + 15 = 31$

13. Fill in the blanks according to the pattern.

2, 1, 4, 1, 6, 2, 8, 3, 10, 5, 12, (   ), (   ), 13
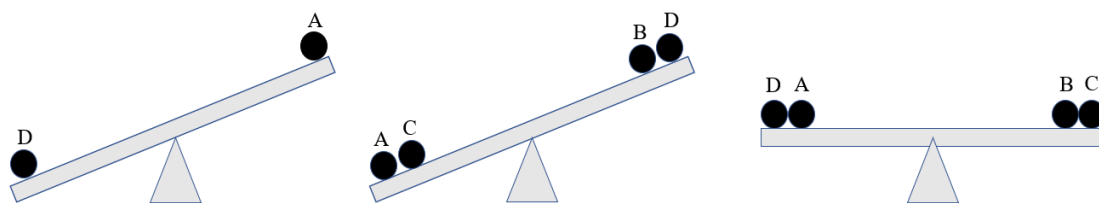
Solution:

There is no rule between two adjacent numbers.

So:

2, 4, 6, 8, 10, 12, (14)

1, 1, 2, 3, 5, (8), 13

14. There are four small balls with different weights. According to the figure below,

please rank the balls from the heaviest to the lightest: ____ > ____ > ____ > ____.
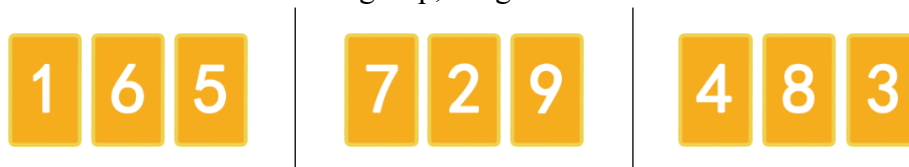

Solution:

(1) D > A

(2) C > B

(3) C > D > A > B

Questions 15 to 19 are worth 8 marks each.

15. There are 3 groups of numbers below. Which 2 numbers can we swap such that when we sum the numbers in each group, we get the same answer?

Solution:

1+6+5+7+2+9+4+8+3=45

45÷3=15

The sum of the first group is 12, and the sum of the second group is 18, so the first group needs to be increased by 3.
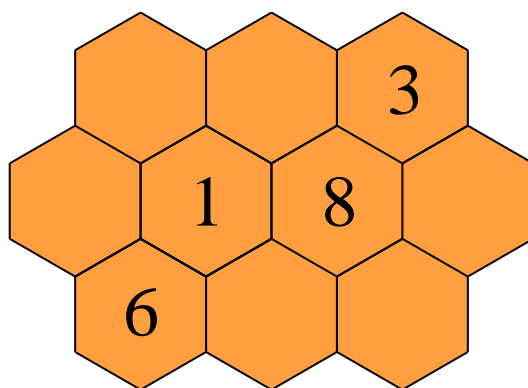
So exchange 6 and 9.

16. Bajie and Wukong compete to eat steamed buns. After the competition, Wukong said, "Even if I eat six more steamed buns, the number of steamed buns I eat is still 2 less than that of Bajie." So how many more steamed buns did Bajie eat than Wukong?

Solution:
2+6=8

17. A smart bee needs to fill in 10 numbers, 0-9, on the hive so that the difference between any two numbers with a common side is not 1. For example, 1 and 6 are two numbers with a common side, and their difference is 5 instead of 1.
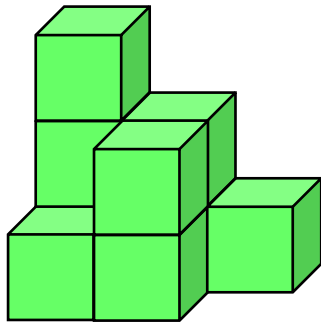
Solution:
There are the most boxes around 8. These positions cannot be filled with 7 or 9.
Then 7 and 9 can only be filled in the two boxes on the left.
2 or 4 cannot be filled around 3. 2 or 0 cannot be filled around 1. Hence, the position of 2 and 4 can be determined.

18. Below, we have a figure made of cubes. Now we paint the outer faces green. Each cube has 6 faces. Among all the faces of these cubes, how many faces are not coloured in total?

Solution:
Total: 6×9=54
Coloured: 6×2+5×2+5×2=32
54-32=22

19. In the grid below, fill in the empty squares with numbers 1~6 such that every column and row will not have a repeated number. What are the values of ▲ and ★ respectively?

1				3	
	3	6		2	4
6		★			
4			3		1
2	6		5	4	▲
	4				

Solution:

First, we start with the rows with the most numbers: row 2 and row 5. Doing this, you will be able to get the red numbers as shown below. Immediately, we can see that ▲ has to be 3. Continue filling in the rest of the boxes and we will find that ★ is 3.

1	2	4	6	3	5
5	3	6	1	2	4
6	1	3	4	5	2
4	5	2	3	6	1
2	6	1	5	4	3
3	4	5	2	1	6

Questions 20 is worth 10 marks.

20. In your opinion, from question 1 to 19, your favourite question is question _____, the most difficult question is question _____. (As long as your answer is within 1 to 19, you get full marks, otherwise you get zero.)