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2020

**Team Challenge**

**Time Allowed: 40 Minutes**

Solve each puzzle and enter your final Answer in the space provider for each number.

1. As shown in the figure on the right, moving from A to B will pass through different parts of the cat. Each part is marked with a number. Add these numbers together, and the minimum value you can get is



**Suggested Solution:**  Through observation, the route is: 5 + 2 + 1 + 3 + 1 = 12.

2. What is the mass of a ?



 (a)



 (b)

**Suggested Solution:**





3. A number of people throw darts at the target shown below. Each person throws

 four darts, and each person scores 62 points. Assuming that no two people had

 the same set of scores on all their throws, could there have been as many

 as nine people playing the game?

**Suggested Solution:** First consider the case where all four darts hit the target. Then answer the question assuming one or more darts miss the target.

 To solve this problem we have to determine the number of different ways 62 can be written as a sum of at most four numbers from among the numbers on the target: 1, 9, 10, 11, 13, 18, 25 and 35. The numbers in the sum can be used more than once. There are only two even numbers so the scores contain 18, 18 or 10, 18, or 10, 10 or all odd numbers. This helps cut down the search and we find eight different ways to score 62 when all four darts hit the target:

 62 = 35 + 25 + 1 + 1

 = 35 + 13 + 13 + 1

 = 35 + 9 + 9 + 9

 = 25 + 25 + 11 + 1

 = 25 + 18 + 18 + 1

 = 25 + 18 + 10 + 9

 = 25 + 13 + 13 + 11

 = 18 + 18 + 13 + 13

 There is one additional possibility assuming not all darts hit the target, namely {35, 18, 9}.

 This shows that nine is the maximum number who could have played the game.



4. Observe the problem map, according to the pattern of the numbers in the figure, the question mark should be filled in

**Suggested Solution:** Take the numbers in the two adjacent circles, if both numbers are odd, Add; if both are even numbers, multiply; if one is odd and one is even Number, then subtract. According to the above rules, the number is equal to the overlapping part of the two circles. The answer is 20.

5. Each face of a cube is divided into four squares. Each of the 24 squares is to be painted with one of three colors in such a way that any two squares with a common edge have different colors. Can you arrange to have nine squares of the same color?

**Suggested Solution:**  Each of the cube’s corners border three squares and each square borders exactly one of the cube’s corners. Consequently, we can divide the squares into eight groups of three squares where the squares in each group share a common corner. The three squares in the same group must be painted differently, which means that the number of squares with the same color cannot be more than eight.

 Eight squares of the same color is possible, in many different ways. Here’s one:



6. Party *A*, *B*, *C* and *D*, with the same amount of money, jointly order several goods of the same specification. After the goods are purchased, Party *A*, Party *B* and Party *C* take 3, 7 and 14 pieces more than Ding respectively. At the final settlement, Party *B* shall pay d 14 yuan. How much should c pay Ding?

**Suggested Solution:**

 Think like this: A, B, C, D four people take out the same amount of money to order goods of the same specification, and each person should get the same amount of goods. However, Party A, B and C took 3, 7 and 14 pieces of goods more than D respectively. D should take back the money of [(3 + 7 + 14)] / 4 = 6 (pieces) of goods, a should take back the money of (6 – 3) = 3 (pieces) of goods, B should take out (7 – 6) = 1 (piece) of goods, C should take out (14 – 6) = 8 (pieces) of goods, of which 3 pieces are to a and 5 pieces are to d. It is known that Party B pays 14 yuan to D. It can be seen that the unit price of each piece of goods is 14 yuan. Therefore, C should pay D: 14 × 5 = 70 yuan). It is clearer to use "list method" to express it

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Actual per person Number of shares | As plannedAverage | Difference Number | Adjust distribution  (pay to solve) |
| Nail | 3 + *x* | 6 + *x* | Less 3 | (2) *C* pays a price of 3 pieces That is 14 × 3 = 42 yuan |
| B | 7 + *x* | 6 + *x* | 1 more |  |
| C | 14 + *x*  | 6 + *x* | 8 more | (1) |
| Ding | *x* | 6 + *x* | Less than 6 (3) | It is known that B paid 14 yuan to Ding, and C paid 5 pieces to D. Price: 14 × 5 = 70 (yuan) |

7. As shown in the figure below, there is a pattern of “sheep’s head”. The method is as follows: start from square 1, Make an isosceles right triangle with one side as its oblique side, and then make a square outward with its right angle side as its side By analogy, if the side length of square (1) is 32 cm, then what is the side length of square (7)?



**Suggested Solution:** As shown in the figure, the area of square ➀ is the area of square ➁ 2 times of that of the control group; ➁ the area of square No. ➂ is twice the area of square No. ➂. Calculation.

 By analogy, the area of ​​square ➅ is twice that of square ➆. Then, the area of ​​square ➆ is

 (32 × 32) ÷ 2 ÷ 2 ÷ 2 ÷ 2 ÷ 2 ÷ 2 = 16 square centimeters.

From 16 = 4 × 4, the side length of No. ➆ square is 4 cm.



8. As shown in the upper right picture, 3 small squares with side lengths of 3, 4, and 12 respectively cover part of the large square with side lengths of 13. Then the difference between the area of ​​the shadow in the large square with a side length of 13 and the area of ​​the shadow in the three small squares is

**Suggested Solution:** 132 – (32 + 42 + 122) = 0.

9. The following grid is made from 24 line segments, each 1 centimeter long. Is the figure traceable without lifting the pencil with a path of length less than 28 cm? (Some segments may have to be traversed twice.)

**Suggested Solution:**  The four corners of the figure need only be visited once, whereas the eight corners of the central “cross” which lie on the outside perimeter must each be visited at least twice. If one starts at one of the “cross” corners and ends at another, then one must trace at least three segments (between these corners) two times. The path therefore must be at least 24 + 3 = 27 cm long. The following figure shows that the grid can be traced by a path of length 27 cm.

10. Let represents the integer part of *x* where  *n* is an integer.

 Find the numerical value of 

**Suggested Solution:** We know that 

Then 

Similarly  are all less than 6.25, 

Then 

 Hence, the expression 