Questions 1 to 7 are worth 4 marks each.

1. $2-0\times2+4=$ 6 .

先括号
再乘除
后加减

2. In the following calculations, the same shape represents the same number. Fill in the blanks.

分组

$\rightarrow 9+9+9+\square=32$

group $\diamond+\square=9$

$\square=(5)$

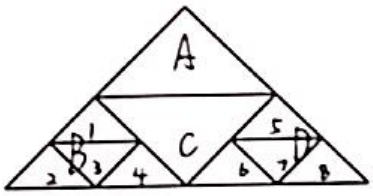
$\diamond=(4)$

$\square: 32-27=5$

$\diamond: 9-5=4$

3. How many triangles are there?

分类枚举



小: 8

中: 4

大: 1

共: $8+4+1=13$

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

Sum $7+2+6=15$ 中 ✓

$3+1+4=8$ 小

$8+5+9=22$ 大

$8+(7)=15$

$3+7=10$ ×

$1+7=8$ ✓

1 and 8

5. $1\times9+2=11$
$12\times9+3=111$
$123\times9+4=1111$
.....

列表找规律

According to the above pattern, Δ and O are 2 numbers, $\Delta\times9+O=1111111$.
What is the sum of the digits in Δ and O?
(For example: the sum of the digits in 123 and 4 is 1+2+3+4=10.)

7 "1"s

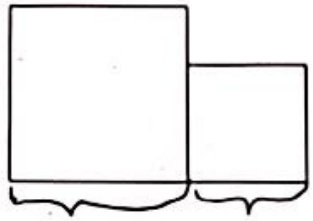
number of "1"s : 2 3 4 ... 7

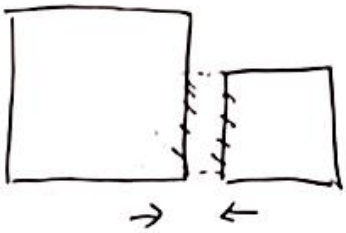
digits sum : 1+2 1+2+3 1+2+3+4 ... 1+2+3+4+5+6+7 = 28

6. Perimeter is the total length around the outside of a shape. The following figure consists of two squares, with the perimeter of the large square being 36cm and the perimeter of the small square being 20cm. What is the perimeter of this composite shape?

Perimeter of square : Side

Side x 4





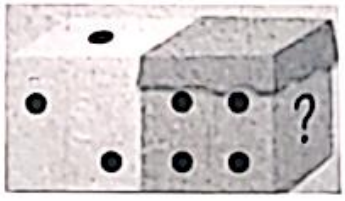
剪拼找变化

36÷4=9cm 20÷4=5cm

36+20-5-5 = 46cm

7. Each cube dice has six faces with 1, 2, 3, 4, 5, and 6 points, and the sum of the points on any two opposite faces is 7. The sum of the points on any two overlapping faces is 8. How many points are there on the face where the "?" is located?

分类讨论



left: 2 → 5
1 → 6
only 3 and 4

right: 4 → 3
only 1, 2, 5 and 6

4 + 4 = 8 ×
3 + 5 = 8 ✓

5 → 2

Questions 8 to 14 are worth 6 marks each.

8. $1 \div 2 \times 2 \div 3 \times 3 \div 4 \times 4 \div \cdots \div 2022 \times 2022 \div 2023 \times 2023 \times 2024 =$ 2024

$1 \times 2024 = 2024$

同时 ×、÷ 同一个数，结果不变.

9. David and his friends went to the Mayday Noah's Ark concert. They spent a total of $2050 and bought a total of 11 tickets for CAT6 and CAT7. Among them, CAT6 tickets cost $200 per ticket, and CAT7 tickets cost $170 per ticket. How many CAT7 tickets did they buy?

假设法.

11 CAT6 : $11 \times 200 = 2200$

$2200 - 2050 = 150$

$200 - 170 = 30$

$150 \div 30 = 5$

10. If it is specified that numbers like 121, 6666 and 2442 that read the same from left to right and from right to left are called "palindromes". So, among all the 4-digit numbers, how many "palindromes" are there?

有序枚举

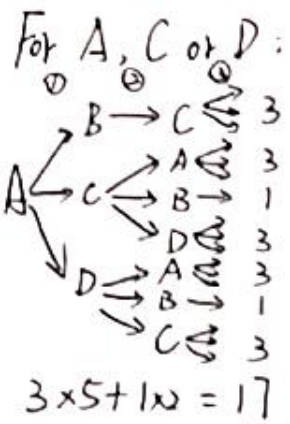
10 { 1001 2001 ⋯ 9009
1111
⋮ ⋮
1991 ⋯ 9999 } 9

$10 \times 9 = 90$

11. Alvin, Beryl, Celia and Derek are passing the ball, and Beryl always passes it to Celia every time. They have passed the ball 3 times. How many different passing situations are there?(For example, A→D→B→C, this is one passing situation)

1. 不能确定，分类讨论
2. 分步问题，画树形图

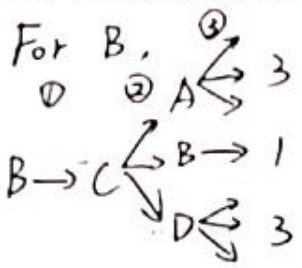
For A, C or D:



$3\times5+1\times2=17$

$17\times3=51$.

For B,



$3\times2+1=7$

$51+7=58$

12. The same letter represents the same number, while different letters represent different numbers. What is the four-digit number $\overline{ABCD}$?

首位分析

$$\begin{array}{r} C\ D\ C \\ +\ 1\ B\ C \\ \hline A\ B\ C\ D \end{array}$$

$A=1$.

$C=9$ or 8

If $C=8$.

$$\begin{array}{r} 8\ 6\ 8 \\ +\ 1\ 0\ 8 \\ \hline 1\ 0\ 7\ 6 \end{array}$$

If $C=9$

$$\begin{array}{r} 9\ 8\ 9 \\ +\ 1\ 0\ 9 \\ \hline 1\ 0\ 9\ 8 \end{array}$$

1098

13. Ada works part-time at a restaurant and her daily salary is the same. If she works for 30 days, she can buy a pair of shoes and have $240 left. After working for 25 days, she took her salary. After buying the shoes, she had $190 left. So how much do the shoes cost?

反面考虑

5 days: $240-190=50$

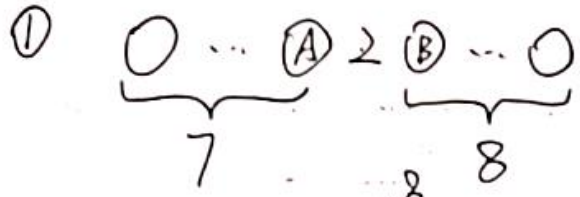
1 day: $50\div5=10$

30 days: $10\times30=300$ or $50\times6=300$

Shoes: $300-240=\$60$

14. Some students lined up in a row. From left to right, Anna is the 7th student; From right to left, Brendan is the 8th student; There are two students between these two people. How many students are there in total? Write all the answers.

分类讨论

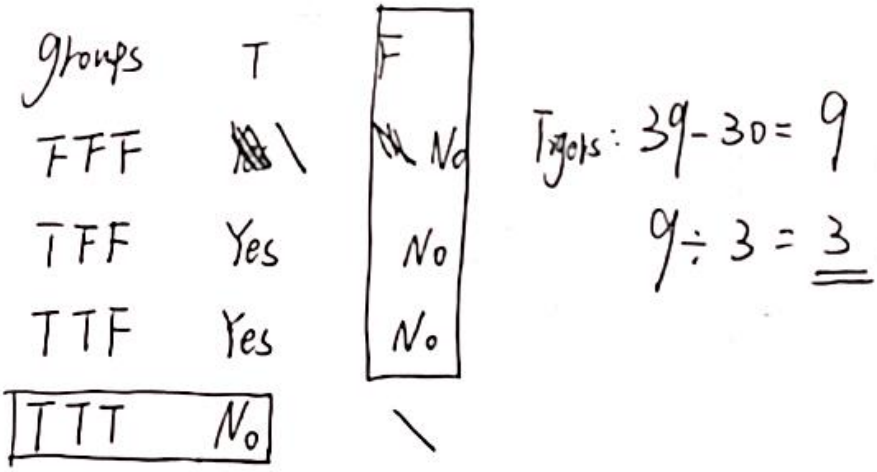


17 or 11

Questions 15 to 19 are worth 8 marks each.

15. 30 tigers and 30 foxes are divided into 20 groups, with 3 animals in each group. Tigers always tell the truth and foxes always tell lies. When asked if there are foxes in the group, 39 of these 60 animals answered "no". So how many groups without foxes are there?

推理：列表



16. Four rectangles form a shape, and the length of each side of the rectangle is uncertain, so the shape of the entire shape is also uncertain. For example, Figure 1 and figure 2 are possible shapes. However, no matter how the length of each side changes, the perimeter of the rectangle $ABED$ is always 15cm, and the perimeter of the rectangle $EFIH$ is always 25cm. What is the maximum area of this entire shape?

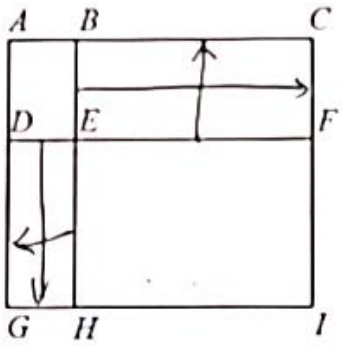


Figure 1

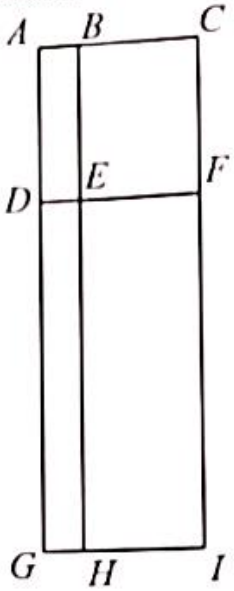


Figure 2

P: 15+25 = 40 cm

l+w: 40÷2 = 20 cm

1. 列多法.
2. 和一定，差小积大.

l	w	Area
1	19	19
2	18	36
3	17	51
⋮	⋮	⋮
10	10	100

difference 减小 ↓

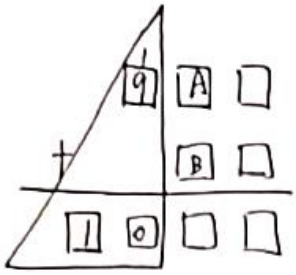
Area 增大 ↓

100 cm²

17. Select 9 numbers from the 10 numbers from 0 to 9 without repetition and fill them in the boxes in the following figure, so that the equation holds. What is the maximum four-digit number in the following figure?

□□+□□□=□□□□

1. 横式变竖式
2. 数大，首位开始每一位大



~~0~~, ~~1~~, 2, 3, 4, 5, 6, 7, 8, ~~9~~

A+B = 18 ×

= 17 ×

= 16 ×

= 15 ✓

8+7=15 →

~~0~~, ~~1~~, 2, 3, 4, ~~5~~, 6, ~~7~~, ~~8~~, ~~9~~

$$\begin{array}{r} 98\square \\ +\quad 7\square \\ \hline 105\square \end{array}$$

三最大 = 6. 2+4=6.

↓

$$\begin{array}{r} 984 \\ +\quad 72 \\ \hline 1056 \end{array}$$

1056

18. ~~Choose a non~~-zero whole number, if it is even, divide it by 2. If it is odd, multiply it by 3 and add 1. So we can get a new whole number. If we keep using this method, many of them will eventually become 1. For example: 5 is an odd number, so $5\times3+1=16$, 16 is an even number, so $16\div2=8$, $8\div2=4$, $4\div2=2$, $2\div2=1$. So, 5 needs to go through 5 times to become 1 for the first time. What is the sum of all the numbers that needs 10 times to become 1 for the first time?

倒推

×2 → even

−1, ÷3 → odd

⑩ ⑨ ⑧ ⑦ ⑥ ⑤ ④ ③ ② ①

1 ← 2 ← 4 ← 8 ← 16 ← 32 ← 64 ← 128 ← 256 ← 512 ← 1024

21 ← 42 ← 84 ← 168

85 ← 170

5 ← 10 ← 20 ← 40 ← 80 ← 160

13 ← 26

3 ← 6 ← 12 ← 24

$168+1024+170+160+26+24=1572$

19. Fill in an arrow in each blank cell at the edge, and the number in the square represents the number of arrows pointing to that number. The direction of the arrow can be up, down, left, right, top left, bottom left, top right, or bottom right, but each arrow points to at least one number. For example, the filling method in Figure 2 is the answer to Figure 1. Please fill in the arrow in Figure 3 according to this rule. How many arrows are pointing to the bottom right direction?

大数考虑.
做好标记
分类讨论

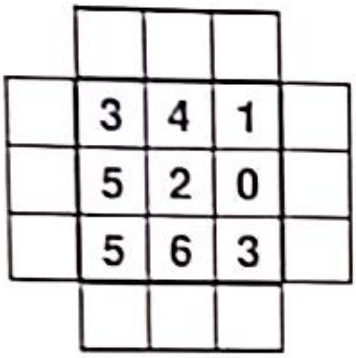


Figure 1

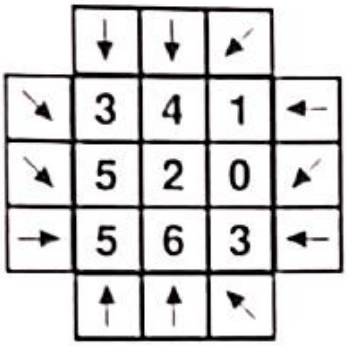


Figure 2

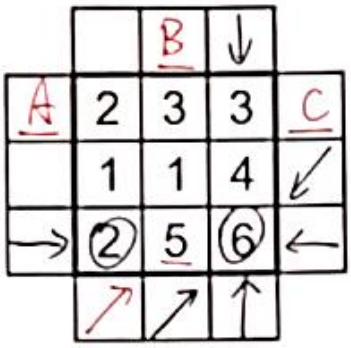
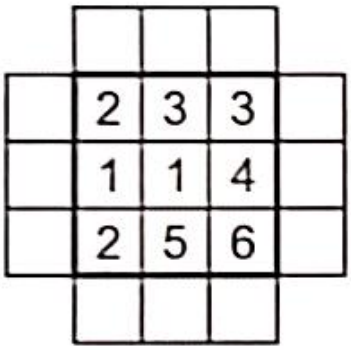
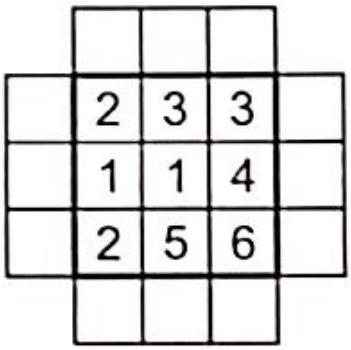


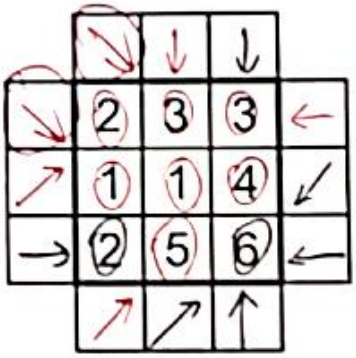
Figure 3

BC ×　　AC ×　　AB ✓

If necessary, you can use the following Figure 3:







2