Problem C

# Stop Growing!

You are given five integers: $A_0$, $B_0$, $C_0$, $D_0$ and $E_0$. Each number in the sequence, $A_k$, $B_k$, $C_k$, $D_k$ and $E_k$ are calculated by the following formula:

$$A_k = A_{k-1} + B_{k-1}$$
$$B_k = B_{k-1} + C_{k-1}$$
$$C_k = C_{k-1} + D_{k-1}$$
$$D_k = D_{k-1} + E_{k-1}$$
$$E_k = E_{k-1} + A_{k-1}$$

For example, let's start with $A_0 = 2$, $B_0 = 1$, $C_0 = 0$, $D_0 = -1$, $E_0 = 4$.

| k | A | B | C | D | E |
|---|---|---|---|---|---|
| 0 | 2 | 1 | 0 | -1 | 4 |
| 1 | 3 | 1 | -1 | 3 | 6 |
| 2 | 4 | 0 | 2 | 9 | 9 |
| 3 | 4 | 2 | 11 | 18 | 13 |
| 4 | 6 | 13 | 29 | 31 | 17 |
| … | … | … | … | … | … |

The table above shows the iteration up to k = 4. These numbers might (or might not) grow to infinite.

Your task is to determine the minimum value $r \geq 0$ where $A_r + B_r + C_r + D_r + E_r \geq M$ for some integer M. In the example above, if M = 50, then r = 4, because:

$$A_4 + B_4 + C_4 + D_4 + E_4 = 6 + 13 + 29 + 31 + 17 = 96.$$

You can check for k = 0..3, there will be no k such that the sum of $A_k..E_k$ is no less than 50.

There might be some cases where it is not possible for the integers to reach M, output -1 if such case happened.

## Input

The first line of input contains an integer T ($T \leq 1{,}000$) denoting the number of cases. Each case contains six integers in a line $A_0$, $B_0$, $C_0$, $D_0$, $E_0$ and M ($-10^8 \leq A_0, B_0, C_0, D_0, E_0, M \leq 10^8$) as stated in the problem statement.

## Output

For each case, output "`Case #X: Y`", where `X` is case number starts from 1 and `Y` is the minimum value r such that the sum of $A_r..E_r$ is no less than M. output Y = -1 if there's no such r.

| Sample Input | Output for Sample Input |
|---|---|
| 4<br>2 1 0 -1 4 50<br>500 10 70 -100 -200 100<br>0 0 0 0 0 10<br>1 1 1 1 1 500 | Case #1: 4<br>Case #2: 0<br>Case #3: -1<br>Case #4: 7 |

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