D3P2

4 4 6 ∘ ∘ ∘

∘ ∘ ∘ * ∘ ∘

∘ 4 5 6 ∘ ∘

D4P2

id / winning numbers

(1,4)	$c(1) = c(2) + c(3) + c(4) + c(5) + 1$
(2,2)	
(3,2)	$c(2) = c(3) + c(4) + 1$
(4,1)	$c(3) = c(4) + c(5) + 1$
(5,0)	$c(4) = c(5) + 1$
(6,0)	$c(5) = 1$

(6,0) unreachable

(1,4) +1	(1,4) +1
(2,2) +1 +1	(2,2) +1 +1
(3,2) +1 +1 +1	(3,2) +1 +1 +2
(4,1) +1 +1 +1 +1	(4,1) +1 +1 +2 +4
(5,0) +1 +1 +1 +1	(5,0) +1 +1 +4 +8
(6,0) +1	(6,0) +1 =4 =8 =12
	=6
	=30 ✓

D5P2

DSL

this is the general rule:

$m_i(v) = d_i + (v - s_i)$

seeds: 79 14 55 13

1 seed-to-soil map:
50 98 2
52 50 48

2 soil-to-fertilizer map:
0 15 37
37 52 2
39 0 15

3 fertilizer-to-water map:
49 53 8
0 11 42
42 0 7
57 7 4

4 water-to-light map:
88 18 7
18 25 70

5 light-to-temperature map:
45 77 23
81 45 19
68 64 13

6 temperature-to-humidity map:
0 69 1
1 0 69

7 humidity-to-location map:
60 56 37
56 93 4

$M1(v) = \begin{cases} 98\text{-}100 \to -48 + v \\ 50\text{-}98 \to +2 + v \end{cases}$

$M2(v) = \begin{cases} 0\text{-}15 \to 39 + v \\ 15\text{-}52 \to -15 + v \\ 52\text{-}54 \to -15 + v \end{cases}$

$M = M2(M1(v)) = \begin{cases} 0\text{-}15 \to 39 + v \\ 15\text{-}50 \to -15 + v \\ 50\text{-}52 \to -13 + v \\ 52\text{-}54 \to -13 + v \\ 54\text{-}98 \to 2 + v \\ 98\text{-}100 \to -48 + v \end{cases}$

minimize M

$M(0) = 39$
$M(15) = 0$
$M(50) = 37$
$M(52) = 39$
$M(54) = 56$
$M(98) = -50$

seed 15 has the lowest "fertilizer requirement"

$r_0 = (a_0, b_0)$ $a_0 < b_0$ | assume
$r_1 = (a_1, b_1)$ $a_1 < b_1$ |

$b_0 <= a_1$ (disj.) $(a_0, b_0)(a_1, b_1)$
$a_0 < a_1 < b_0 < b_1$ $(a_0, a_1)(a_1, b_0)(b_0, b_1)$
$a_0 = a_1 < b_0 < b_1$ $(a_0, b_0)(b_0, b_1)$
$a_1 < a_0 < b_0 < b_1$ $(a_1, a_0)(a_0, b_0)(b_0, b_1)$

$(a_0, b_0)(a_1, b_1)$ pf $b_0 < = a_1$ (disjoint)

$(a_0, a_1)(a_1, b_0)(b_0, b_1)$ $r_0 \cap r_1$
$(a_0, a_1)(a_1, b_1)(b_1, b_0)$ $r_0 \subset r_1$
$(a_1, a_0)(a_0, b_0)(b_0, b_1)$ $r_1 \subset r_0$
$(a_1, a_0)(a_0, b_1)(b_1, b_0)$ $r_1 \cap r_0$

~~remove~~ invalid ranges (or) invalid/null ranges (x,x)

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partition + sort

all $(a_i, b_i) \cap (a_{i+1}, b_{i+1})$ except for $i = n$ $i+1 = m$

$(a_1, b_1)(a_2, b_2) \ldots (a_n, b_n)(a_m, b_m)(a_{m+1}, b_{m+1}) \ldots$

partition

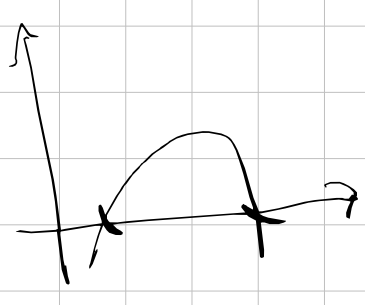
$[(a_1, b_1) \ldots (a_n, b_n)]$ $[(a_m, b_m) \ldots]$

sort sort

flatten

partition : is disjoint ? return separate ranges
otherwise sort

	R1	R2	R3	t_{max}
Time:	7	15	30	
Distance:	9	40	200	d_{max} d_r



for each ms of button pressed 1 mm/ms

ex. R1

1	H	H	H	H	H
2		H	H	H	H
3			H	H	H
4				H	H
5					H
6					
7					
d	6	5	4	3	2

$d = t_t -$

$d = (t - t_h) \times t_h$

$d = t t_h - t_h^2$

ex. R1 $t_h = 1$

$d(t_h) = 7 \cdot 1 - 1^2 = 6$

$d(2) = 7 \cdot 2 - 4 = 10$

$d(0) = 0$ $\quad 7 \cdot t_h - t_h^2 = 0$

$d(7) = 0$ $\quad t_h^2 = 7 \cdot t_h$ (0,7) (9)

$-t_h^2 + 7t_h - 9$ $\quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$d = \frac{-7 \pm \sqrt{7^2 - 4(-1)(-9)}}{2(-1)}$

$d = \frac{-7 \pm \sqrt{49 - 36}}{-2} = \frac{-7 + \sqrt{13}}{-2}$ $\quad \frac{-7 - \sqrt{13}}{-2}$

$\frac{-7 + 3.6}{-2} = \frac{-3.4}{-2} = \lceil 1.7 \rceil > 2$

$\frac{-7 - 3.6}{-2} = \frac{-10.6}{-2} = \lfloor 5.3 \rfloor > 6$ $\quad 6 - 2 = 4$

	R1	R2	R3	R4
t_{max}	46	85	75	82
d_r	208	1412	1257	1410

$d = t t_h - t_h^2$

R1. $d_{R1}(t_h) = 46 \cdot t_h - t_h^2$

$d_{R1} - d_{rR1} = 46 \cdot t_h - t_h^2 - 208$

$(d_{R1} - d_{rR1})(0) = \frac{-46 \pm \sqrt{4 \cdot (-1)(-208)}}{-2}$

$\frac{-t_{max} \pm 4(-1)(-d_r)}{-2}$ $\quad \frac{-46 \pm \sqrt{4 \cdot 208}}{-2}$

$\frac{-t_{max} \pm \sqrt{4 d_r}}{-2}$

R1 $\lceil 8.57 \rceil \to 9$ $\quad \lfloor 37.4 \rfloor \to 37$ $\quad 37 - 9 = 28$

R2 $\frac{-85 \pm \sqrt{4 \cdot 1412}}{-2}$ $\quad \lceil 4.9 \rceil = 5$ $\quad \lfloor 80.07 \rfloor = 80$ $\quad 80 - 5 = 75$

R3 $\frac{-75 \pm \sqrt{4 \times 1257}}{-2}$

	R1	R2	R3	R4
t_{max}	46	85	75	82
d_r	208	1412	1257	1410

$\lceil 2.04 \rceil = 2$ $\quad \lfloor 72.9 \rfloor = 72$ $\quad 72 - 2 = 70$

R4 $\frac{-82 \pm \sqrt{4 \times 1410}}{-2}$ $\quad 78 - 4 = 74$

$\lceil 3.45 \rceil = 4$ $\quad \lfloor 78.5 \rfloor = 78$

DSP2

$M_0 \cap M_1 = [(79,93,0)] \cap [(50,98,2),(98,100,-45)]$

1. sort → 50, 79, 93, 98, 98, 100
2. pair up [(50,79),(79,93),(93,98),(98,98),(98,100)]
3. remove dupes
4. lookup (50,79) intersects w/ (50,98,2) → (50,79,2)
   (79,93) → (79,93,0), (50,98,2) → (79,93,2)
   (93,98) → (50,98,2) → (93,98,2)
   (98,100) → (98,100,−45) → (98,100,−45)
5. result (50,79,2),(79,93,2),(93,98,2),(98,100,−45) =

seeds: 79 14 55 13

seed-to-soil map: M_1

50 98 2 = 98-100 → 50-52 → −48 +v

52 50 48 50-98 → 52-100 → +2 +v

soil-to-fertilizer map: M_2

0 15 37 15-52 → 0-37 → −15 +v

37 52 2 52-54 → 37-39 → −15 +v

39 0 15 0-15 → 39-54 → 39 +v

fertilizer-to-water map: M_3

49 53 8 53-61 → 49-57 → −4

0 11 42 11-53 → 0-42 → −11

42 0 7 0-7 → 42-49 → +42

57 7 4 7-11 → 57-61 → +50

water-to-light map: M_4

88 18 7 18-25

18 25 70 25-95 → 18-88 → −7

light-to-temperature map: M_5

45 77 23 77-100 → −32

81 45 19 45-64

68 64 13 64-77 → +2

temperature-to-humidity map: M_6

0 69 1 69-70 → −69

1 0 69 0-69 → +1

humidity-to-location map: M_7

60 56 37 56-93 → +4

56 93 4 93-97

$[(50,98,2),(98,100,-45)]$

$M_0 \cap M_1$

$\bigcap_{i=0}^{2} M_i = [(50,98,2),(98,100,-45)]$

$M_2 = [(0,15,39),(15,52,-15),(52,54,-15)]$

$(50,98,2) \sim (52,100,0)$ match w/ M_2 $(52,54,$

$M_0 \cap M_1 = (79,93,2)$

$\bigcap_{i=0}^{3} M_i = (79,93,2)$ 81-95

$\bigcap_{i=0}^{4} M_i = (79,93,-5)$ 74-88

$M_4 = (74,77,+2),(77,88,-32)$

+5

$M_5 \rightarrow (79,82,-3),(82,93,-37)$

79-3=76

=82

$M_i \cap M_{i+1}$

foreach m_i in M_i
→ resolve $m_i\,(a,b,c) = (a+c, b+c, b)$
→ sort and trim?

$M_{0,4} = \left(\bigcap_{i=0}^{4} M_i = [(79,93,-5)] \right) -5 = [(74,88,0)]$

$M_5 = [(45,64,0),(64,77,+2),(77,100,-32)]$

map/sort → 45, 64, 74, 77, 77, 88, 100

trim 74-88

74, 77, 88

back to M_0 domain

$= [(74,77,2),(77,88,-32)]$ +5

D7.2

games:

- 5ok
- 4ok
- fh
- triple
- 2pair
- pair
- singles

5ok { 4J + 1X
5X ?

4ok
4J + 1X
4X + 1Y
3X + 1J + 1Y
⋮

hypothesis: move from J to highest one

4ok

ex 1

3X + 1Y + 1J
↓
4X + 1Y + 0J

ex 2

2X + 1Y + 2J ✓

D8P2

example:

LR

11A = (11B, XXX)
11B = (XXX, 11Z)
11Z = (11B, XXX)
22A = (22B, XXX)
22B = (22C, 22C)
22C = (22Z, 22Z)
22Z = (22B, 22B)
XXX = (XXX, XXX)

term.

11Z, 22Z (N)

11A	L	22A	11A L → 2
11B	R	22B	11B R → 1
11Z	L	22C	22A L → 3
11B	R	22Z	22B R → 2
11Z	L	22B	22C L → 1
11B	R	22C	22B L
11Z		22Z	22B N

d / s

	11A	11B	11Z	22A	22B	22C	22Z	XXX
11A	0							
11B		0						
11Z			0					
22A				0				
22B					0			
22C						0		
22Z							0	
XXX								0

DSP2

$$m_1(v) = a_1 + v$$
$$m_2(v) = a_2 + v$$
$$\vdots$$
$$m_n(v) = a_n + v$$

$$m_i(v) = \begin{cases} c_1 + v & \text{if cond 1} \\ c_2 + v & \text{if cond 2} \\ c_3 + v & \vdots \\ c_4 + v & \\ \vdots & \end{cases}$$

$$m_2(m_1(v)) = a_2 + a_1 + v$$

$$m_n(\ldots m_2(m_1(v)) = a_2 + a_1 \cdots a_n + v$$