REPORT TO CLIENT

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Communication10

Answer: Site5

Because the scientists seem to have infinite time, even though they can only save one site on each month they still would save the whole sites. From a long-time perspective, there is no need to decide which site they should save first. Whereas, if they only get limited on time, for example they only have one month. Then, Site5 would be the best choice to get the max value.

Communication11

Answer: 701

When the scientists decide to transport the species, which are living in the site5. Their strategy is to bring as much value as possible even there could be lost in the kind of species.

Transport Plan:

As we can see from the figure blow, the max value seems to have a linear connection with the capacity. That's because the pack plan is packing species 16 first. Packing species 16 as many as the container can. Than, the second species is species 9, and the third is species 7.

Species	0	6	7	9	16
Quantity	0	0	4	1	13

Table-1

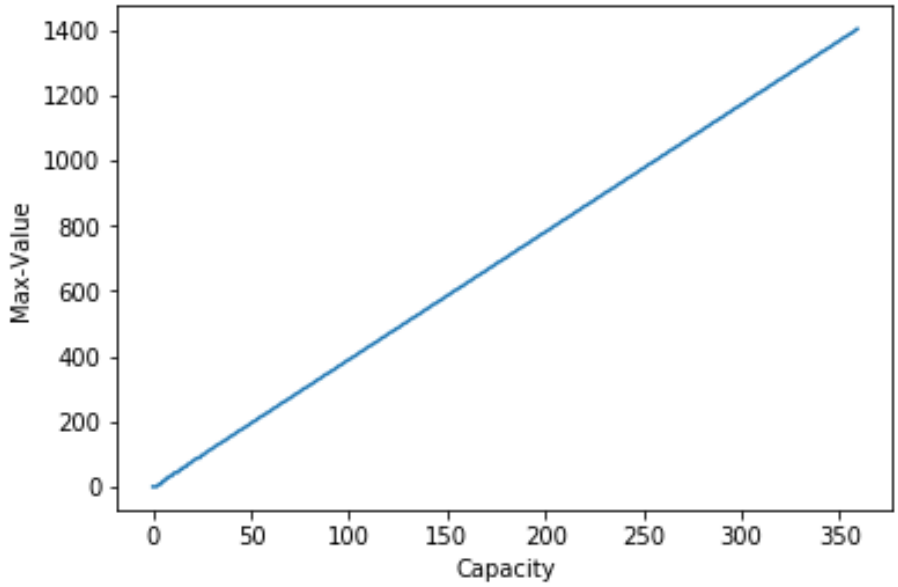

Figure-1

Communication12

Answer: 13.86

The new constrain is the lost rate 0.2 for each site which has not been restored. And, our client's strategy is saving sites in a fixed sequence, [5,3,1,6,0,8,7,4,2]. The answer means they are more likely to save 13 species.

Some Compares:

Sequence	Outcome
[5,3,0,6,1,8,7,4,2]	13.85
[5,3,6,0,1,8,7,4,2]	13.90
[5,6,3,0,1,8,7,4,2]	13.81
[5,6,3,0,1,2,7,4,8]	13.98
[5,6,3,0,1,4,7,2,8]	13.98
[5,6,3,0,1,4,2,7,8]	14.02

Table-2

Communication13

Answer: 14.48

Samely, the site5 is the first choice. Through the research, if we set the lost probability as 0.99, we would get the expect number of species are saved as 5.1, which means the site5 is the best choice.

We also assume that we do not known which sites are lost but only to know how many of them would be survived. Then, we calculate the max number of species have been saved at the end(Table3). The answer 14.48 means that the number of sites we can save is around 5. After mulpitle with the probability the expect value is 15.32. Certainly, we would not know the whole outcomes.

The number of sites which are saved	1	2	3	4	5	6	7	8	9
The max expect value of species are saved	5	8	11	13	15	17	19	20	20

Table-3

Then, we also try to utilize greedy algorithm to calculate the expect value by picking up the best outcomes for each step because we always afraid that next month all the sites would be lost at the same time. Finally, we get 14.13, which means the strategy is not good enough.

Finally, we purely use dynamic programming and calculate the answer of 14.48. The strategy behind is to always see the whole outcome and pick up the max expect value in the whole outcomes.

Communication14

Answer: 14.25

In communication 14, the lost probabilities are changing based on the map and whether a site is adjacent to a lost site. As a result, we adjust the value function to fit the new condition. Interestingly, if we increase the parameter that for each adjacent site becomes lost, the lost probability would increase 0.2, rather than 0.05. Then, we get the expect value of 13.79 which is not quite small than we thought.

Communication15

Answer: 0.512

In communication 15, we are no longer required to calculate the expect value but the probability to save the species 9,10,17,19. The sites contains the species are site 4,5,6 and 7.

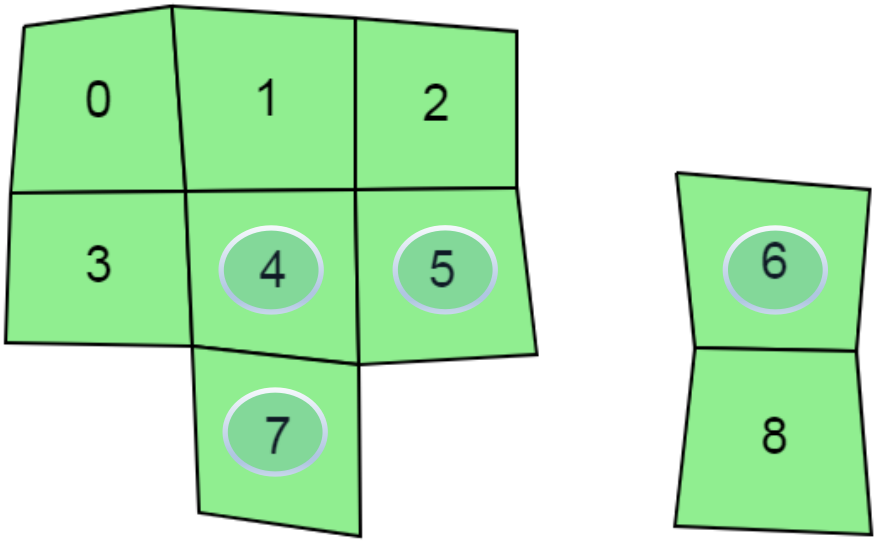

Figure-2

If we would like to maximise the probability of saving all these species. We should first save the site 4,5,6 and 7 as much as we can, especial site 7 which contains two species we are interested. Then, after we have saved site 7, we would save site 4 because site 4 is much easier to be lost. Then, we save the site 6 to fit the requirement. Otherwise we would fail if we do not focus on the 4 sites at the beginning.