



Problem of the Week

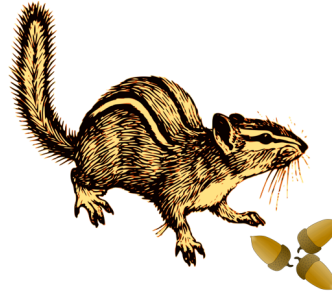
Problem B and Solution

Joey Prepares for Winter

Problem

Joey the chipmunk will soon be hibernating, so he's gathering acorns, his food supply for the long winter months.

Joey has four acorns remaining from the previous day, and has gathered acorns over the last few hours as shown in the following table.

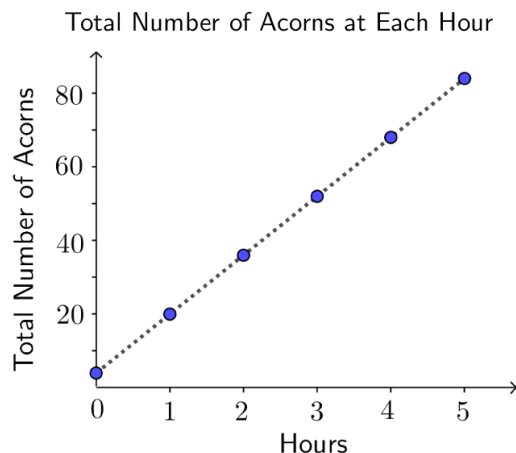


Hour	0	1	2	3	4	5
Total Number of Acorns	4	20	36	52	68	84

- (a) Is the total number of acorns a linear growing pattern? Verify your answer by creating a graph.
- (b) Suppose Joey continues collecting acorns at this same rate.
- How many acorns would Joey have collected by the end of Hour 12?
 - How many hours would it take him to collect at least 330 acorns?
 - Write an algebraic expression to represent the total number of acorns Joey would have after collecting for n hours.

Solution

- (a) Looking at the data, we see that the number of acorns increases by the same amount each hour; Joey is collecting acorns at a rate of 16 per hour. So we expect that the pattern of the total number of acorns is a growing linear pattern. This is verified by the following graph.





- (b) (i) Hour 12 is 7 more hours after Hour 5. Since Joey will collect 16 acorns in each of those hours, he will have $7 \times 16 = 112$ more acorns, giving a total of $84 + 112 = 196$ acorns by the end of Hour 12.
- (ii) To collect at least 330 acorns in total, Joey needs $330 - 196 = 134$ more acorns than he has after 12 hours. After 8 more hours, he would have $8 \times 16 = 128$ more acorns. After 9 more hours, he would have $9 \times 16 = 144$ more acorns. Therefore, he will need to collect acorns for 9 more hours to get to at least 330 acorns. Thus, he will need a total of $12 + 9 = 21$ hours to collect at least 330 acorns.
- ALTERNATIVELY: Joey initially has 4 acorns, so to get to 330 acorns, he needs to collect 326 more acorns. Since he collects 16 acorns per hour, this would take him $326 \div 16 = 20\frac{3}{8}$ hours. This means he will have 330 acorns during the 21st hour. That is, he will need to collect for 21 hours to get at least 330 acorns.
- (iii) After n hours of collecting 16 acorns each hour, Joey would have $16 \times n$ acorns. Given that he starts with four leftover acorns, Joey would have a total of $(16 \times n) + 4$ acorns.