

Exponential Growth

Imagine in the future you own a company and are going to hire someone to work for you. The person you hire says he will work for 1 penny the first day, and have his pay double each day. At the end of the month, you would only have to pay him the final day's wage. So, his total pay would be 1 cent, doubled thirty times. Would you hire him? How much would you owe him on the last day (1 cent doubled 30 times).

Here is the start:

day 1 is 1¢, day 2 is 2¢, day 3 is 4¢, day 4 is 8¢, day 5 is 16¢, day 6 is 32¢, day 7 is 64¢, day 8 is 128¢ or \$1.28, day 9 is \$2.56, and so on up to 30 doublings. So far, the pay has been doubled nine times, so 21 more doublings to go.

Note, this is called exponential growth. The key idea is how long does it take for something to double? To find the doubling time, simply divide 69.3 by the interest rate. Or, you can use the number 70 instead to make the math easier. For example, if you owe money on your credit card and pay 20% interest, the doubling time would be $70 \div 20 = 3.5$ years. (The unit would be years since the interest rate is 20% per year. So, at this rate, if you owe \$10 on your credit card, how much would you owe after 14 years or 4 doublings. Easy to calculate $\$10 \times 2 \times 2 \times 2 \times 2 = ?$) Of course, credit cards also add an extra monthly fee for late payments which would have to add. You do not want to imagine 30 doublings.