

Geometric Growth Applications

1. In 1990 the world population was 5.2953 billion people. It is projected that the world population in 2025 will be 8.4724 billion people. If this projection were based on geometric growth, what would be the annual growth rate of the world population. Use a calculator to make a table of estimates of the world population between 2000 and 2010.
2. Someone starts a rumour by telling two people. Each person who hears the rumour tells it to two more people within five minutes. These people each tell two more people within the next five minutes, and so on. What is the minimum number of people that will hear the rumour within an hour?
3. Many photocopiers have a feature that reduces the image of the original. Usually the maximum reduction capability is 64%. How many reductions, at the maximum setting, would be needed to reduce the image to less than 10% of its original size?
4. Five years ago, \$10 000 was invested at 6%/a compounded semi-annually. Today the interest rates have risen to 7%/a compounded annually. If the original investment and accumulated interest is rolled into the new investment conditions, how much will it be worth in five years?
5. Faith invests \$500 in a high yield bond at 12%/a compounded monthly.
 - a) How much is the bond worth in 15 months?
 - b) After how many months is the investment worth \$650?
6. To take advantage of the tax deductions that Registered Retirement Savings Plan (RRSP) contributions can provide, Mike borrows \$3000 at 9%/a compounded semi-annually and invests it in an RRSP, which he estimates will give a return of 8%/a compounded annually.
 - a) How much interest will be charged on the loan over three years?
 - b) How much will the RRSP investment be worth in three years?
 - c) What loss will Mike take over three years?
 - d) Explain why this type of financial activity might still be to Mike's advantage?
7. Recent estimates, based on data from satellite observations, report 775 million hectares of rain forest remaining. The average annual rate of deforestation in the world is 0.77%. How many million hectares of rain forest will be lost in the next decade?

8. According to an old tale, the inventor of chess, Sissa Dahir, was granted anything he wished by the Indian king, Shirham. Sissa asked for one grain of wheat for the first square on the chess board, two grains for the second square, four grains for the third, eight for the fourth, and so on, for all 64 squares. "Is that all you wish for?" asked the king, unknowingly.
- a) How much grain did Sissa ask for?
 - b) If one grain of wheat has a mass of 65 mg, how many years of Canada's annual production did Sissa ask for? Canada produced about 25 million metric tonnes of wheat per year on average over the previous decade.
9. On July 20, 1969, Neil Armstrong and Edwin Aldrin were the first people to land on the moon, via the Apollo 11 space mission. The force of gravity on the moon is approximately one seventh the force of gravity on the earth. If a bouncing ball on the moon returns to 90% of the height from which it is dropped, what is the total distance that a ball dropped from a height of 3 m would travel by the sixth bounce?

Questions taken (with changes) from MATHPOWER 12, Western edition pages 300 - 309