The number of cells of a bacteria doubles every 40 minutes. There was 24 cells at 10:00 am. Find the number of cells at the given times, the same day.

a = 24 cells b = 2 x = # of 40 min periods

a) Noon.

10:00 am to noon is 2 hours.
2 hours = (2)(60) = 120 minutes

x = 120÷40 = 3

$y = 24(2)^3 = 192$ cells

b) 5:00 pm.

10:00 am to 5:00 pm is 7 hours.
7 hours = (7)(60) = 420 minutes

x = 420÷40 = 10.5

$y = 24(2)^{10.5} = 34{,}756$ cells

The half-life of a certain medicine is 80 minutes. A patient was given a 200mg dose of at 6:00am. Find the amount of medicine in the patients system at the following times. Round to the nearest hundredth. a = 200mg b = 0.5 x = # of 80 min periods

a) 11:00 am.

6:00 am to 11:00 am is 5 hours.
5 hours = (5)(60) = 300 minutes

x = 300÷80 = 3.75

$y = 200(0.5)^{3.75} = 14.87$ mg

b) 3:30 pm.

6:00 am to 3:30 6m is 9.5 hours.
9.5 hours = (9.5)(60) = 570 minutes

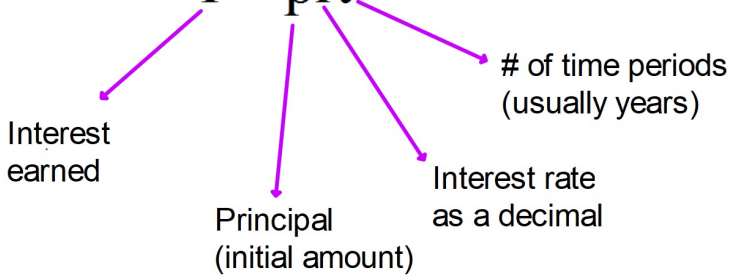
x = 570÷80 = 7.125

$y = 200(0.5)^{7.125} = 1.43$ mg

Simple Interest:

You only earn interest in the initial amount you invested.

Simple Interest: $I = prt$



You invest $10,000 in an account that pays 8% annual interest.

How much will you have after 10 years if you only get simple interest?

$I = 10000(.08)(10)$

Interest earned $= 8000$

Total amount after 10 years = Principal + Interest
= 10,000 + 8,000
= $18,000

Compounding Interest: earning interest on the interest.

You invest $10,000 in an account that pays 8% annual interest.

How much will you have after 10 years if interest is compounded annually?

end of 1st year you'll have: 10,000(1.08)
end of 2nd year you'll have: 10,000(1.08)(1.08)
end of 3rd year you'll have: 10,000(1.08)(1.08)(1.08)

This is basic exponential growth. After 10 years you'll have:
$10{,}000(1.08)^{10} = \$21{,}589.25$

You invest $10,000 in an account that pays 8% annual interest.

How much more will you have after 20 years if interest is compounded annually versus simple interest?

Simple Interest: $10{,}000 + 10{,}000(.08)(20) = \$26{,}000$

Compounded Interest: $10{,}000(1.08)^{20} = \$46{,}609.57$

What if you compound interest more often than once a year (annually)?

The **compound interest formula** is an exponential model that is used to calculate the value of an investment when interest is compounded.

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

P = the initial principal invested

r = annual interest rate, written as a decimal

n = number of compounding periods per year

A = the value of the account after t years

Example 2 **Try It!** **Understanding Continuously Compounded Interest**

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2. $3,000 is invested in an account that earns 3% annual interest, compounded monthly.

P = 3000 r = 0.03 n = 12

a. What is the value of the account after 10 years?

t = 10

$A = 3000(1+0.03/12)^{(12)(10)}$ = $4048.06

b. What is the value of the account after 100 years? t = 100

$A = 3000(1+0.03/12)^{(12)(100)}$ = $60,031.45