3. The number of dust mites increases 2.5% each hour. If there are 2000 dust mites now find the number of dust mites after each amount of time. Round to the nearest whole number.

$100 + 2.5 = 102.5\%$
$b = 1.025$
$y = 2000(1.025)^x$
$x = \#\ hrs$

a) 8 hours.
$x = 8$
$y = 2000(1.025)^8 = \boxed{2437}$

b) 2 days
$2\ days = 48\ hrs$
$x = 48$
$y = 2000(1.025)^{48} = \boxed{6543}$

c) 1 week
$1\ week = 7\ days$
$7\ days = 168\ hrs$
$x = 168$
$y = 2000(1.025)^{168} = \boxed{126,660}$

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4. Due to the heat the amount of water is decreasing 3% every 20 minutes. There are 150 gallons at 1:00 pm. Find the amount of water at each time on the same day. Round to the nearest hundredth.

$100 - 3 = 97\%$
$b = .97$
$y = 150(.97)^x$
$x = \#\ 20\ min\ periods$
since 1:00pm

a) 3:00 pm
1:00pm to 3:00pm = 2 hrs
2 hrs = 120 min
$x = \frac{120\ min}{20} = 6$
$y = 150(.97)^6 = \boxed{124.95}$

b) 10:00 am
1:00pm to 10:00am = $-3$ hrs
$-3\ hrs = -180\ min$
$x = \frac{-180\ min}{20} = -9$
$y = 150(.97)^{-9} = \boxed{197.31}$

c) 5:30 pm
1:00 pm to 5:30pm = $4\frac{1}{2}$ hrs
$4\frac{1}{2}$ hrs = 270 min
$x = \frac{270\ min}{20} = 13.5$
$y = 150(.97)^{13.5} = \boxed{99.43}$

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6. The number of cases of flu is increasing 22% every 4 days. On February 1 there were 176 cases of flu.

$100 + 22 = 122\%$
$b = 1.22$
$y = 176(1.22)^x$
$x = \#\ 4\ day\ periods$

a. Find the number of cases on February 13.
Feb 1 to Feb 13 = 12 days
$x = \frac{12\ days}{4} = 3$
$y = 176(1.22)^3 = \boxed{320}$

b. Find the nmber of cases of flu on February 22.
Feb 1 to Feb 22 = 21 days
$x = \frac{21\ days}{4} = 5.25$
$y = 176(1.22)^{5.25} = \boxed{500}$

c. Find the nmber of cases of flu on January 25.
Feb 1 to Jan 25 = $-7$ days
$x = \frac{-7\ days}{4} = -1.75$
$y = 176(1.22)^{-1.75} = \boxed{124}$

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7. A single celled organism doubles every 30 minutes. There are 48 cells in the culture at 10:00 am. Find the number of cells at the given time, the same day.

$b = 2$
$y = 48(2)^x$
$x$ is $\#$ 30min periods since 10:00 am

a. 1:30 pm
10:00am to 1:30pm = $3\frac{1}{2}$ hrs
$3\frac{1}{2}$ hrs $\cdot 60 = 210$ min
$x = \frac{210}{30} = 7$
$y = 48(2)^7 = \boxed{6144}$

b. 5:45 pm
10:00am to 5:45pm = 7hr 45min
7hrs 45min = 465 min
$x = \frac{465}{30} = 15.5$
$y = 48(2)^{15.5} = \boxed{2,224,366}$

c. 8:00 am
10:00am to 8:00am
= 2 hrs in the past
$x = \frac{-120\ min}{30\ min} = -4$
$y = 48(2)^{-4} = \boxed{3}$

8. A certain radioactive material has a half-life of 1.5 hours. At noon is 500 grams of this material. Find the amount of material remaining at each time. Round to the nearest tenth.

$b = \frac{1}{2}$

$y = 500 \left(\frac{1}{2}\right)^x$

$x = \#$ of 1.5 hr periods from noon

a) 9:00 pm that same night.

noon to 9:00pm = 9 hrs

$x = \frac{9}{1.5} = 6$   $y = 500\left(\frac{1}{2}\right)^6$

$= \boxed{7.8 g}$

b) Noon the previous day.

noon to noon = 24 hrs/1.5 = 16   but it's back in time so $x = -16$

$y = 500\left(\frac{1}{2}\right)^{-16} = \boxed{32,768,000}$

Practice Sheet: Exponential growth and decay.