Download this PDF to your computer and go to
www.livescribe.com/player
On iOS, open the PDF in Livescribe+.

No quiz 04/14

§6.8 (cont'd)
(Lect Notes pp 100-101)

NOT K

③ See Notes

| Amount of time | Number of mosquitoes |
|---|---|
| 0 hours → 0 days | 1000 mosquitoes |
| 48 hours → 2 days | 1900 mosquitoes |
| 4 days → 4 days | 3610 mosquitoes |
| 6 days → 6 days | 6859 mosquitoes |
| 8 days | 13032.1 |
| 10 days | 24760.99 |
| 12 days | 47045.88 |
| 14 days | 89387.1739 |

÷2 ÷2 ÷2

$\frac{1900}{1000} = 1.9$ $\frac{3610}{1900} = 1.9$ mult. 1.9

If it's not on the table you can NOT use the table

Since short way cannot be use to find when there will be 70000 mosquitoes we must use "the long way"

$A(t) = A_0 e^{kt}$

Goal: Find $A_0$ and $k$

$A_0 = 1000$ we have to determine $k$

$A(t) = 1000e^{k(t)}$

we already used $0 \Rightarrow 1000$ so now we use $t=2$, $A=1900$

$1900 = 1000e^{k(2)}$

$\frac{1900}{1000} = \frac{1000}{1000}e^{2k}$



livescribe

No quiz
04/14

§6.8 (cont'd)
(Lect. Notes pp 100-101)

NOT K

(3) see Notes

| Amount of time | Number of mosquitoes |
|---|---|
| 0 hours → 0 days (add 2) | 1000 mosquitoes → $\frac{1900}{1000} = 1.9$ |
| 48 hours → 2 days (add 2) | 1900 mosquitoes → $\frac{3610}{1900} = 1.9$ |
| 4 days → 4 days (add 2) | 3610 mosquitoes |
| 6 days → 6 days (add 2) | 6859 mosquitoes (mult 1.9) |
| 8 days | 13032.1 |
| 10 days | 24760.99 |
| 12 days | 47045.88 |
| 14 days | 89387.1739 |

If its not on the table you can NOT use the table

Since's short way cannot be use to find when there will be 70000 mosquitoes we must use "the long way"

$A(t) = A_0 e^{kt}$

Goal: Find $A_0$ and $k$

$A_0 = 1000$ we have to determine $k$

$A(t) = 1000e^{k(t)}$

we already used $0 \Rightarrow 1000$ so now we use $t = 2$, $A = 1900$

$1900 = 1000e^{k(2)}$

$\frac{1900}{1000} = \frac{1000e^{2k}}{1000}$

$1.9 = e^{2K}$

$\square^{\square} = 0 \iff \log_{\square} 0 = \square$

$\frac{\ln 1.9}{2} = \frac{2K}{2}$

$K = \frac{\ln 1.9}{2}$ → leave as exact value. do NOT round

Goal Achieved

Now rewrite fcn

$A(t) = 1000e^{\left(\frac{\ln 1.9}{2}\right)t}$

We now know the relationship between A and t If we know one, we can solve for the other!

Last step: Replace A(t) with 70000 and solve for t

$\frac{70000}{1000} = \frac{1000e^{\left(\frac{\ln 1.9}{2}\right)t}}{1000}$

$70 = e^{\left(\frac{\ln 1.9}{2}\right)t}$

$e^{\left(\frac{\ln 1.9}{2}\right)t} = 70 \iff \log_{e} 70 = \left(\frac{\ln 1.9}{2}\right)t$

$\left(\frac{\ln 1.9}{2}\right)t = \ln 70$

$$\left(\frac{2}{\ln 1.9}\right)\left(\frac{\ln 1.9}{2}\right)t = \left(\frac{2}{\ln 19}\right)\frac{\ln 70}{1}$$

$$t = \frac{2\ln 70}{\ln 1.9} \approx 13.2382\ldots \approx 13.25 \text{ days}$$

This is approx.

13 days, 6 hours

exact final answer

NOW it is okay to use Calculator

Step 1
Know what you have to use "long way"

Step 2
Find $A_0$ and $k$
(use the information given)

Step 3
→ use when you the relationship between $A$ and $t$.
If you know one, you can solve for the other

(6) See notes:

The long way

$A(t) = A_0 e^{kt}$

Goal: Find $A_0$ and $k$

$A_0$ = ??? unknown

we have to determine $k$

$A(t) = A_0 e^{kt}$

For a half-life problem, the amount is half of what you started with. We started with $A_0$.

So after 5600 years, we have $\frac{1}{2} A_0$

$$\frac{\frac{1}{2}A_0}{A_0} = \frac{A_0 e^{k \cdot 5600}}{A_0}$$

$$\frac{1}{2} = e^{5600k}$$

$$e^{5600k} = \left(\frac{1}{2}\right) \iff 5600k = \log_{[e]}\left(\frac{1}{2}\right)$$

$$\frac{5600k}{5600} = \frac{\ln \frac{1}{2}}{5600}$$

$$k = \frac{\ln \frac{1}{2}}{5600}$$ → leave as exact value. Do NOT round

Goal achieved ✓

Now rewrite the fcn. $A(t) = A_0 e^{\left(\frac{\ln \frac{1}{2}}{5600}\right)t}$

We now know the relationship between A and t. If we know one, we can solve for the other.

Today the amount is 64% of $A_0$, or simply $0.64 A_0$

Last step: Replace A(t) with $0.64A_0$ and solve for t.

$$\frac{0.64A_0}{A_0} = \frac{A_0 e^{\left(\frac{\ln \frac{1}{2}}{5600}\right)t}}{A_0}$$

$$0.64 = e^{\left(\frac{\ln \frac{1}{2}}{5600}\right)t} \iff \log_e 0.64 = \left(\frac{\ln \frac{1}{2}}{5600}\right)t$$

$$\left(\frac{5600}{\ln \frac{1}{2}}\right)\left(\frac{\ln \frac{1}{2}}{5600}\right)t = \frac{\ln 0.64}{1}\left(\frac{5600}{\ln \frac{1}{2}}\right)$$

$$t = \frac{5600 \ln 0.64}{\ln \frac{1}{2}}$$

$$t = 3605.594603\ldots$$

The cabin is approximately 3606 years old.

Set browser settings to allow all cookies
Log into MyMathlab.
Look at your dashboard.

"The Long Way"

$A(t) = A_0 e^{kt}$

Goal. Find $A_0$ and $k$
$A_0$ = ?? (unknown)

k is given to us
$k = -0.000216$

Now rewrite fcn

$$A(t) = A_0 e^{-0.0001216t}$$

We now know the relationship between A and t. If we know one, we can solve for the other.

Today the amount is 25% of $A_0$ or simply $0.25A_0$ or $\frac{1}{4}A_0$

Last step

Replace A(t) with $0.25A_0$ and solve for t

$$\frac{0.25A_0}{A_0} = \frac{A_0 e^{-0.0001216t}}{A_0}$$

$$\ln \log_e 0.25 = -0.0001216t$$

$$\frac{\ln 0.25}{-0.0001216} = \frac{-0.0001216t}{-0.0001216}$$

$$t = \frac{\ln 0.25}{-0.0001216} = 11400 \text{ years}$$