

NAME: Key
 MATH 1470 Fall 2004 Tintera
 PRACTICE TEST 1: Linear Models. Covers Chapters 0-1

Remember this is just a drill. You will get a 'check' for attempting it. Give it your best try. Good luck!

1. The following table gives the number of veterans from World War II who are in civil service.¹

t	y	Δt	Δy	$\frac{\Delta y}{\Delta t}$
Year	# Veterans			
0	1991			
1	1992	1	-342	-342
2	1993	1	-349	-349
3	1994	1	-355	-355
4	1995	1	-362	-362

Median slope $\frac{-349 + -355}{2} = -352$
 Starting value 8841

- (10 points) Is a linear model reasonable for this data? Why or why not?
- (10 points) Regardless of your answer to (a), write down a linear model for this data based on your calculations. Be sure to tell me what your variables mean.
- (5 points) According to your model, what is the meaning of the slope. (The answer will be negative!)
- (5 points). Use your model to predict the #Veterans from WW II in civil service in 1996.

a) Either: Yes, a linear ~~is~~ reasonable since the slopes, $\Delta y / \Delta t$ are all approximately -350 or No, the slopes are gradually ~~decreasing~~ for -342 to -362

b) The Rough-N-Ready method gives
 $y = -352t + 8841$ $y = \# \text{ vets in civil service}$
 $t = \text{yrs since 1991}$
 as a linear model

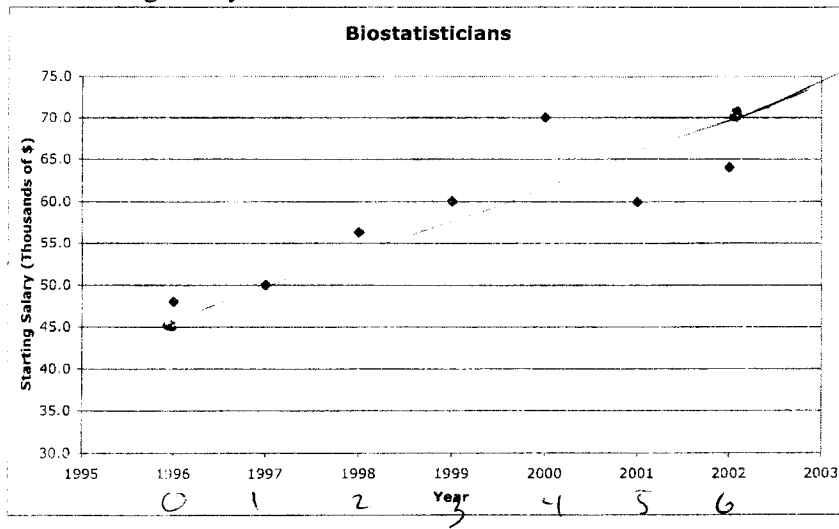
c) The slope is the annual decrease of $\# \text{ vets}$ in civil service

d) In 1996, $t = 5 \text{ yrs}$. So per the model predicts $y = -352 \times 5 + 8841 = 787081$ WW II vets will be in civil service in 1996

¹ Data from <http://www.va.gov/vetstats/tab3.xls>, accessed 28 September, 2003

2. For the graphs below, a) identify an appropriate linear model. (Hint: sketch a single line following the trend of the data.)

The starting salary for Biostatisticians from 1996 to 2002.



Your line & details of your answer may vary

Points on model line (0, 45); (6, 70)

$$M = \frac{70 - 45}{6 - 0} = \frac{25}{6} = 4.1667$$

= 4.2 to 2 decimal places

Linear Model formula (with description of variables):

$$y = 4.2t + 45.0$$

y = starting salary for thousands of biostatisticians (\$)
 t = yrs since

b) Is the linear model appropriate for this data set? Be sure to justify your answer.

either

Yes, a linear model is appropriate since the line captures the trend of the data. Both the model and data in general show an increase in salary over time. or

No. The data varies too much from the line to make reasonable predictions.

c) Regardless of your answer to (b), use the model to predict the starting salary for biostatisticians in 2005.

In 2005, $t = 9$ yrs since 1996. So the starting salary for biostatisticians will be $y = 4.2(9) + 45.0 = \$82,800$ in 2005.

3. (5 points each for model identification and justification, 4 points each for model.) Identify each of the verbal situations as appropriate for linear models or not. Be sure to justify your choice of model. Write down models where linear or exponential models are appropriate. Be sure to define what your variable stands for.

a) A farmer expects his pigs to grow at a rate of 10 lbs per month from the 50 lbs he bought them at..

Model (linear or not linear): *linear*

Justification: *constant increase of 10 lbs/mo*

Formula, if appropriate: $y = 10t + 50$ $y = \text{wt of pig}$
 $t = \text{months since purchase}$

b) The number of people employed in the country fell, but has recently begun rising.

Model (linear or not linear): *Not linear*

Justification: ~~both~~ *There is both an increase & decrease in the number employed as a trend.*

Formula, if appropriate: *N/A*

c) The number of commercial shrimping licenses has decreased by 23 per year from a high of 1238 in 1998.

Model (linear or not linear): *linear*

Justification: *There is a constant decrease of 23/yr.*

Formula, if appropriate: $y = -23t + 1238$
 $y = \# \text{ commercial shrimping licenses}$
 $t = \# \text{ yrs since 1998.}$