7.3 Modelling Data Using Exponential Functions

Investigate the Math: pg. 454

Number of Tosses	Number of Tails		Prediction for Tails on Next Toss
0	100 Initial sample size:		50
1	50	51.1	25
2	28	24.9	14
3	11	12.8	5.5
4	5	6.5	2.5
5	5	2.9	2.5
6	3	1.6	1.5
7	3	1.2	1.5
8	3	0.8	1.5
9	2	0.5	1
10	1		

Answer questions A - I below

D. decreasing... the ratio between consecutive terms should be 1/2

F. $y = a(b)^x$

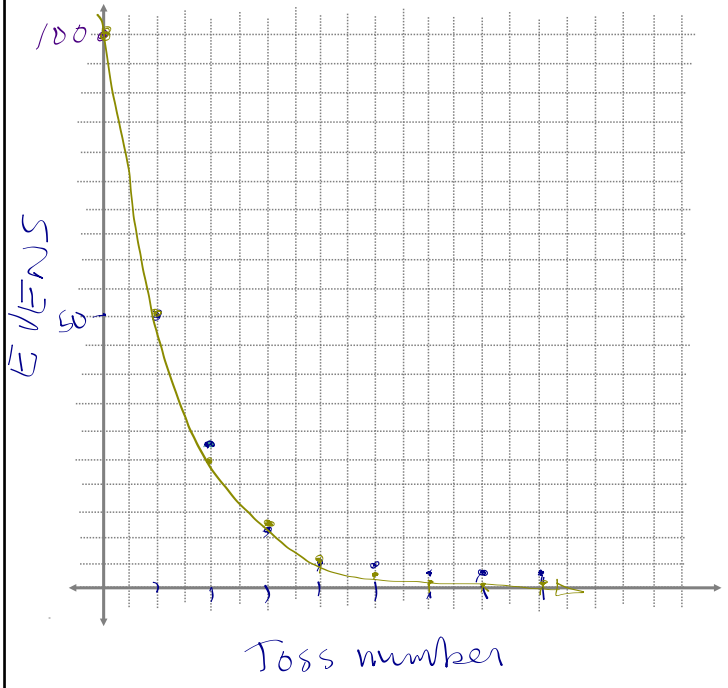
$a = 81.23528$

$b = 0.54884$

G. should all be similar

I. $D: \{x \in \mathbb{R}\}$

$R: \{y \in \mathbb{R} \mid y > 0\}$

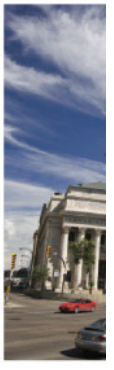


EXAMPLE 1 Creating graphical and algebraic models of given data

The population of Canada from 1871 to 1971 is shown in the table below. In the third column, the values have been rounded.

Year	Actual Population of Canada	Population of Canada (millions)
1871	2 436 297	2.44
1881	3 229 633	3.23
1891	3 737 257	3.74
1901	5 418 663	5.42
1911	7 221 662	7.22
1921	8 800 249	8.80
1931	10 376 379	10.38
1941	11 506 655	11.51
1951	14 009 429	14.01
1961	18 238 247	18.24
1971	21 568 305	21.57

Statistics Canada



Top: Main St
Bottom: Mai
2010.

a) Using graphing technology, create a graphical model and an algebraic exponential model for the data.

b) Assuming that the population growth continued at the same rate to 2011, estimate the population in 2011. Round your answer to the nearest million.

a) $y = 2.652207(1.021798)^x$ b) value = 140 $\Rightarrow y \doteq 55$ M

EXAMPLE 2 Solving a problem using an exponential regression model

Sonja did an experiment to determine the cooling curve of water. She placed the same volume of hot water in three identical cups. Then she recorded the temperature of the water in each cup as it cooled over time. Her data for three trials is given as follows.

Trial 1

Time (min)	Temperature (°C)
0	80
5	69
10	61
20	45
30	34
40	26

Trial 2

Time (min)	Temperature (°C)
0	75
5	66
10	59
20	44
30	32
40	23

Trial 3

Time (min)	Temperature (°C)
0	78
5	68
10	61
20	44
30	33
40	25

a) Construct a scatter plot to display the data. Determine the equation of the exponential regression function that models Sonja's data.

b) Estimate the temperature of the water 15 min after the experiment began. Round your answer to the nearest degree.

c) Estimate when the water reached a temperature of 30 °C. Round your answer to the nearest minute.

$y = 78.68124(0.971517)^x$

$\Rightarrow 51°C$

$\hookrightarrow y_2 = 30 \rightarrow$ get POI.

$t = 33.37$ min

Homefun: Pg. 461 # 4-6, 8, 12, 17

QUIZ tomorrow: 7.1–7.3