Section 4.2: Linear models – building linear functions from data

Don't do any graphs in this section by hand. Just write see calculator for any questions that ask you to sketch a graph.

The correlational coefficient (r) is the statistical technique used to measure strength of linear association, r, between two continuous variables, i.e. closeness with which points lie along the regression line, and lies between -1 and +1

- if r = 1 or -1 it is a perfect linear relationship
- if r = 0 there is no linear relationship between x & y

Conventionally:

$|r|>0.8$ => very strong relationship

$0.6 \leq |r|$ strong relationship

$0.4 \leq |r|$ moderate relationship

$0.2 \leq |r|$ weak relationship

#1-6: Use the data provided in the table to complete the following:

a) Create a scatter plot of the data

b) Use the linear regression feature on your calculator to find the equation of the line of best fit. $y = 2.43x + 2.86$

c) What is the value of r? .95

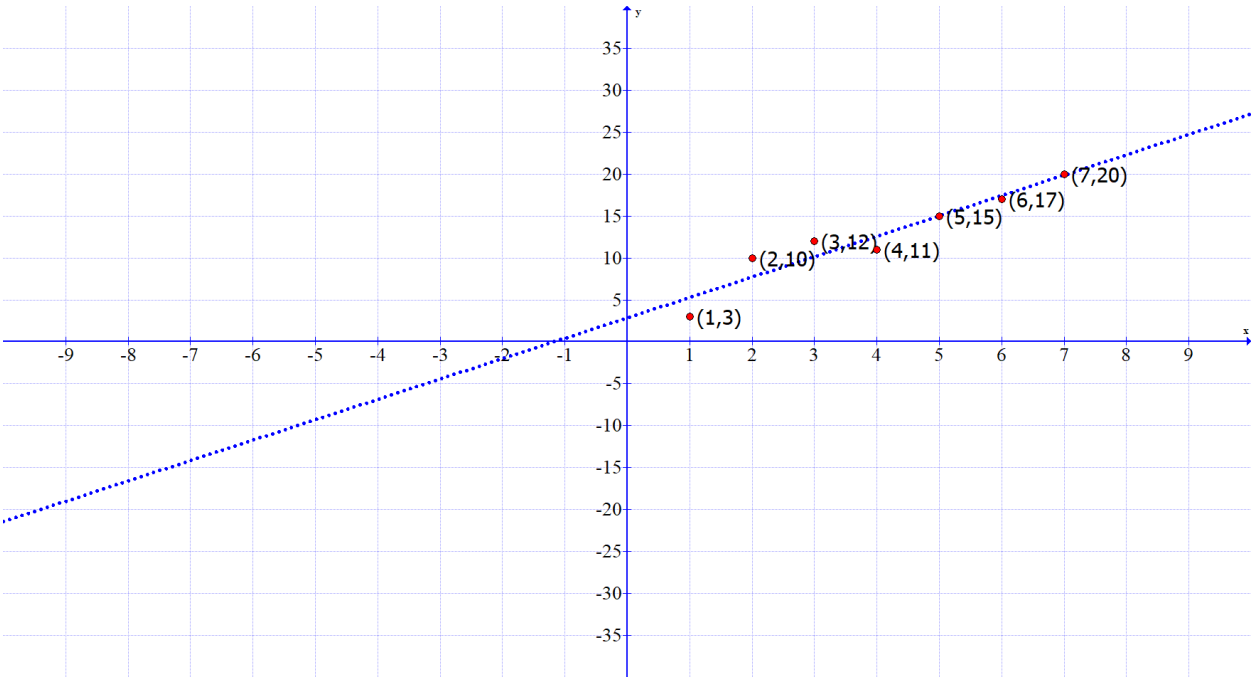
d) How strong is the linear relationship? "Very Strong"

e) If there is a very strong relationship use the equation to predict the y-value that corresponds to x = 10. $y = 2.43(10) + 2.86$

$y = 27.16$

1)

x	1	2	3	4	5	6	7
y	3	10	12	11	15	17	20



#1-6: Use the data provided in the table to complete the following:

a) Create a scatter plot of the data

b) Use the linear regression feature on your calculator to find the equation of the line of best fit. $y = -6.46x + 37.14$

c) What is the value of r? $r = -0.91$

d) How strong is the linear relationship? Very Strong

e) If there is a very strong relationship use the equation to predict the y-value that corresponds to x = 10.

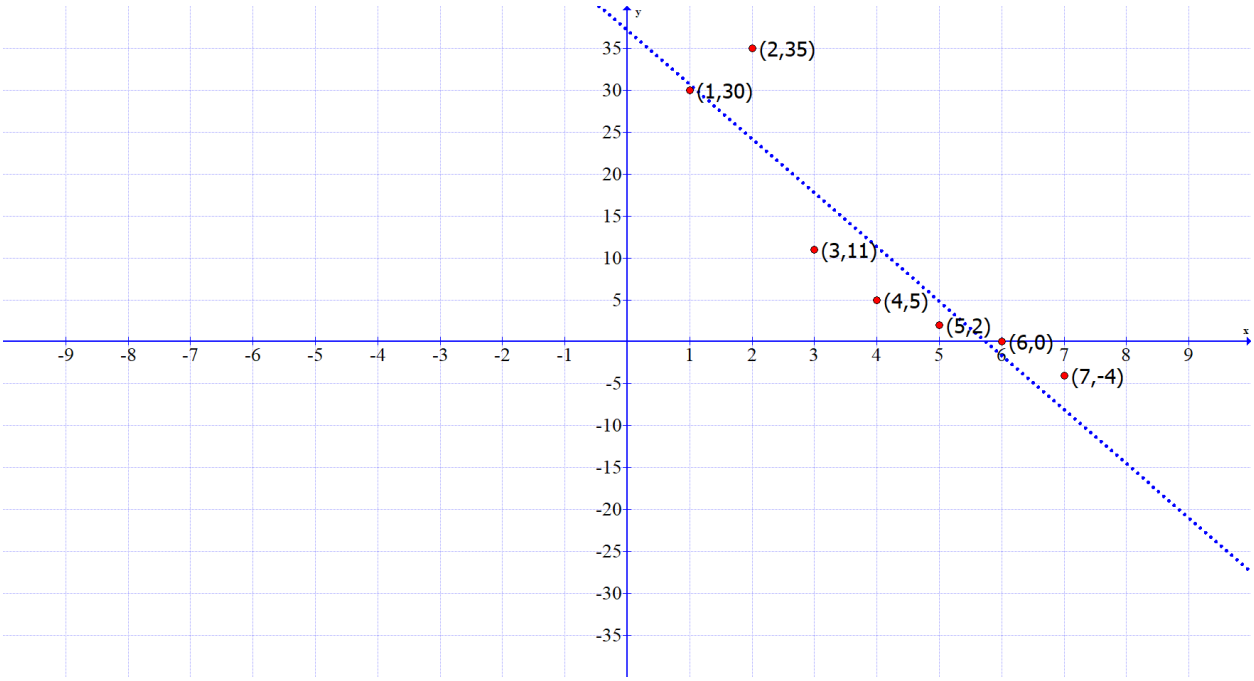
$y = -6.46(10) + 37.14$

$y = -27.46$

3)

x	1	2	3	4	5	6	7
y	30	35	11	5	2	0	-4

3a)



#1-6: Use the data provided in the table to complete the following:

a) Create a scatter plot of the data

b) Use the linear regression feature on your calculator to find the equation of the line of best fit. $y = -7.5x + 48.57$

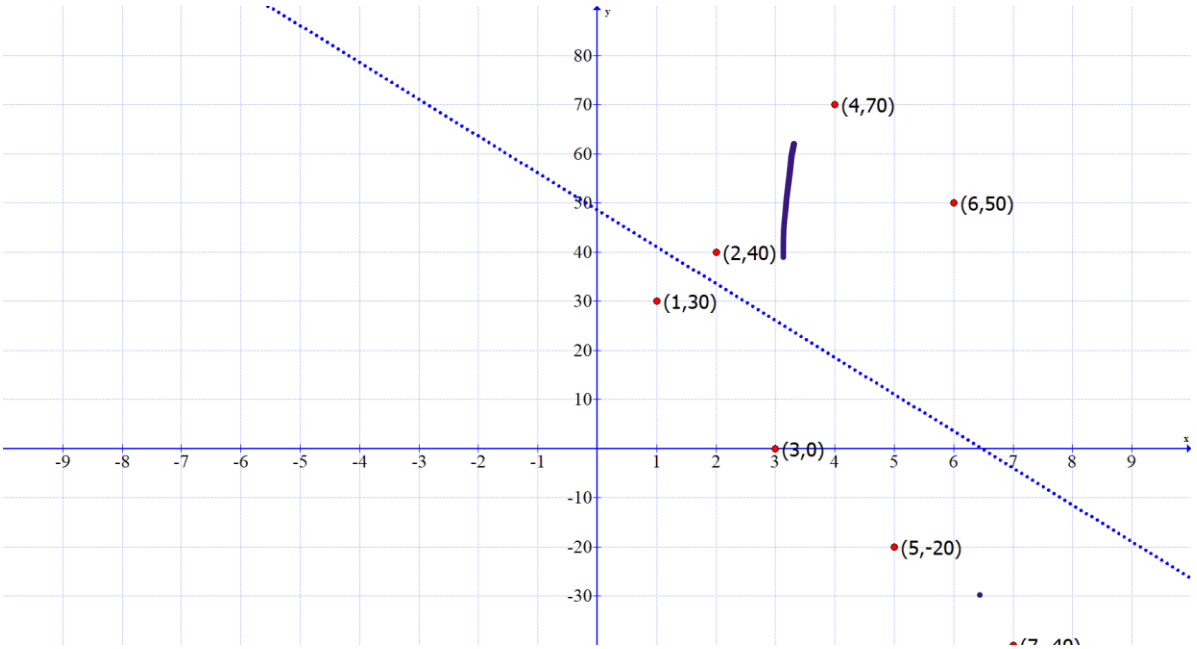
c) What is the value of r? $r = -0.41$

d) How strong is the linear relationship? Moderate

e) If there is a very strong relationship use the equation to predict the y-value that corresponds to x = 10. Skip / not very strong

5)

x	1	2	3	4	5	6	7
y	30	40	0	70	-20	50	-40



7) As Earth's population continues to grow, the solid waste generated by the population grows with it. Governments must plan for disposal and recycling of ever-growing amounts of solid waste. Planners can use data from the past to predict future waste generation and plan for enough facilities for disposing of and recycling the waste.

(Don't graph by hand. Write see Calculator for you answer.)

Given the following data on the waste generated in the USA from 1980 - 2020

Year	Amount of plastic waste in thousands of tons
1980	6,830
1990	17,130
2000	25,550
2010	31,400
2020 (est)	37,500

a) Make a scatterplot of the data, letting *x* represent the number of years since 1980. Use x = 0 to represent 1980. See next page

b) Use a graphing calculator to fit a linear function to the data. (round to 2 decimals if appropriate) $y = 756.1x + 8560$ or $P(T) = 756.1T + 8560$

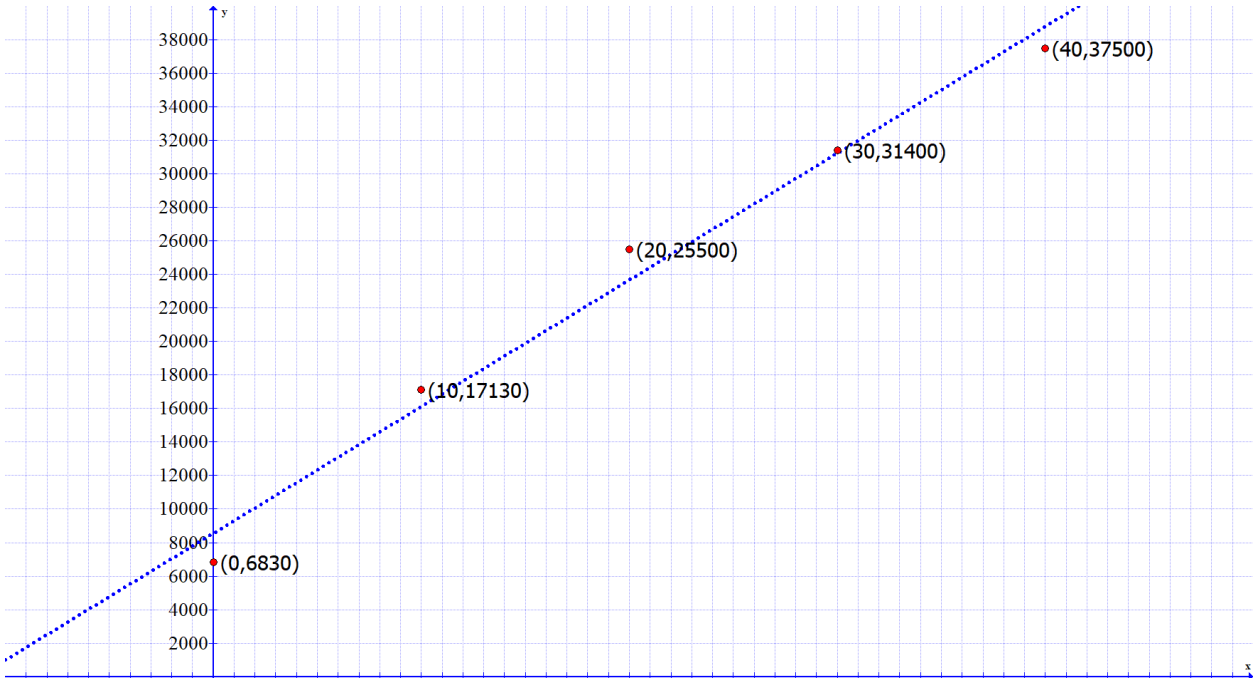
c) Is there a linear relationship between the year and the amount of plastic waste? yes

d) Graph the function of best fit with the scatterplot of the data. See next page

e) Predict the average tons of plastic waste in the USA 2030.

$P(50) = 756.1(50) + 8560$

46,365 Thousand Tons


y
38000
36000
34000
32000
30000
28000
26000
24000
22000
20000
18000
16000
14000
12000
10000
8000
6000
4000
2000
x
(40,37500)
(30,31400)
(20,25500)
(10,17130)
(0,6830)

9) The table below shows the monthly rainfall and number of umbrellas sold at a large retail store in Miami, Florida.

Month	Rainfall in inches	Number of umbrellas sold
January	1.6	150
February	2.3	250
March	3	300
April	3.1	325
May	5.3	700
June	9.7	1100
July	6.5	800
August	8.9	900
September	9.9	1150
October	6.3	750
November	3.3	320
December	2	175

a) Make a scatterplot of the data, (L1 should be the rainfall, L2 umbrellas sold) See next page

b) Use a graphing calculator to fit a linear function to the data. (round to 2 decimals) $y = 117.35x - 28.67$ or $U(r) = 117.35r - 2867$

c) Is there a linear relationship between rainfall and the number of umbrellas sold? Very Strong

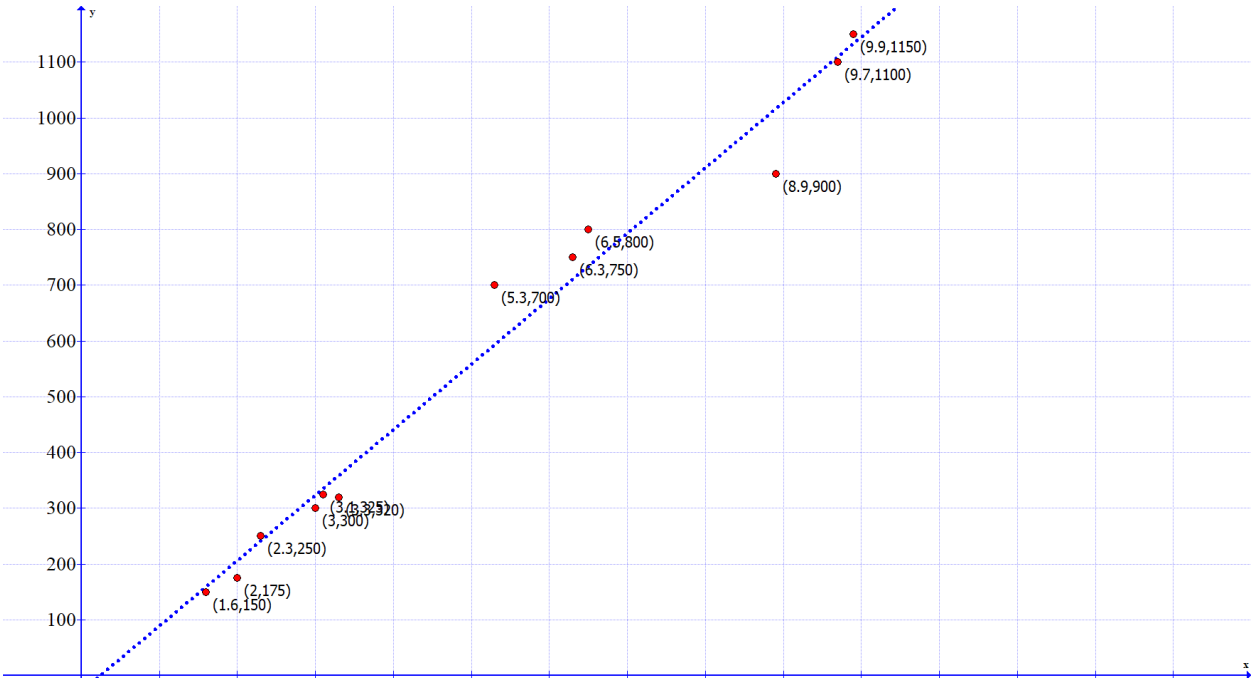
d) Graph the function of best fit with the scatterplot of the data. See next

e) Predict the number of umbrellas that will be sold in a month where it rains 8 inches. (round to nearest umbrella)

$U(8) = 117.35(8) - 28.67$

$= 910.13$

910 umbrellas


y
x
1100
1000
900
800
700
600
500
400
300
200
100
(9.9,1150)
(9.7,1100)
(8.9,900)
(6.3,750)
(5.3,700)
(3,300)
(2.3,250)
(2,175)
(1.6,150)