Problem # 01

The following data give the age at inauguration of all 44 presidents of the United States.

President	Age at inauguration	President	Age at inauguration
1. Washington	57	23. B. Harrison	55
2. J. Adams	61	24. Cleveland	55
3. Jefferson	57	25. McKinley	54
4. Madison	57	26. T. Roosevelt	42
5. Monroe	58	27. Taft	51
6. J.Q. Adams	57	28. Wilson	56
7. Jackson	61	29. Harding	55
8. Van Buren	54	30. Coolidge	51
9. W. Harrison	68	31. Hoover	54
10. Tyler	51	32. F. Roosevelt	51
11. Polk	49	33. Truman	60
12. Taylor	64	34. Eisenhower	62
13. Fillmore	50	35. Kennedy	43
14. Pierce	48	36. L. Johnson	55
15. Buchanan	65	37. Nixon	56
16. Lincoln	52	38. Ford	61
17. A. Johnson	56	39. Carter	52
18. Grant	46	40. Reagan	69
19. Hayes	54	41. G. H. W. Bush	64
20. Garfield	49	42. Clinton	46
21. Arthur	50	43. G. W. Bush	54
22. Cleveland	47	44. Obama	47

(a) Find the sample mean and sample standard deviation of this data set.

(b) Draw a histogram for the given data.

(c) Do the data appear to be approximately normal?

(d) If the answer to (c) is yes, give an interval that you would expect to contain approximately 95 percent of the data observations.

(e) What percentage of the data lies in the interval given in part (d)?

Solution

(a) $\bar{x} = 54.6364$ and the sample standard deviation $s = 6.273$.

(b) The histogram for the age at inauguration of all 44 presidents of the United States is shown below.

(c) From the histogram, the data appears to be approximately normal.

(d) Since the data is approximately normal, then approximately 95% of the data values will lie within two standard deviations of the mean. That is, approximately 95% of the data will lie between $54.6364 \pm 2(6.273)$ or from 42.0904 to 67.1824.

(e) When the data set is arranged in ascending order, 41 out of the 44 values will lie in the interval of 42.0904 to 67.1824. Thus, the percentage of values that actually lie in the interval is 93.2 %.

Problem # 02

The following data represent the IQ scores of 10 mothers and their eldest daughters.

Mother's IQ	Daughter's IQ
135	121
127	131
124	112
120	115
115	99
112	118
104	106
96	89
94	92
85	90

(a) Draw a scatter diagram.

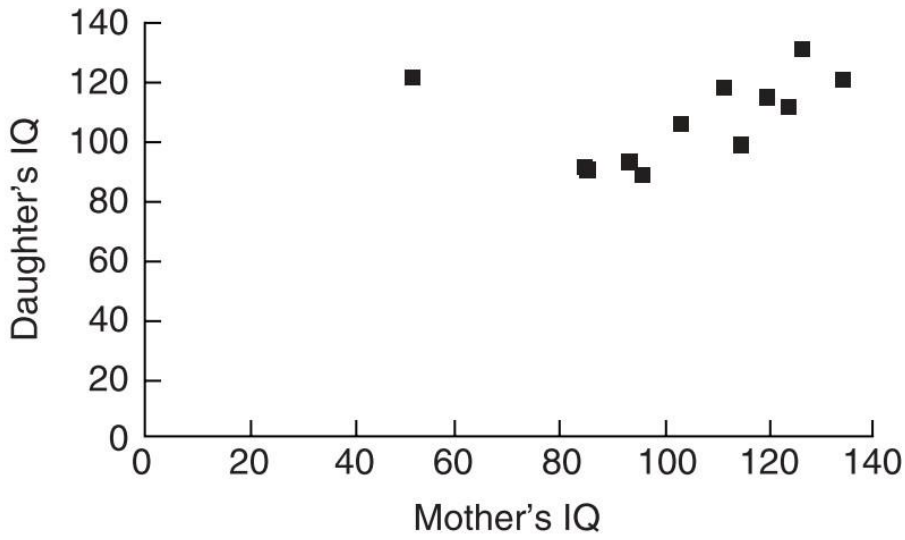
(b) Guess at the value of the sample correlation coefficient *r*.

(c) Compute *r*.

(d) What conclusions can you draw about the relationship between the mother's & daughter's IQs?

Solution

(a)



(b) Almost 1

(c) 0.86

(d) There is a relatively strong linear relationship between them.

Detail of part (c)….

Part c detail

Mother's IQ x_i	Daughter's IQ y_i
135	121
127	131
124	112
120	115
115	99
112	118
104	106
96	89
94	92
85	90

$\bar{x} = 111.2$

$\bar{y} = 107.3$

$\bar{x}\bar{y} = 11931.76$

$\sum_{i=1}^{10} x_i^2 = 125992$

$\sum_{i=1}^{10} y_i^2 = 117017$

$\sum_{i=1}^{10} x_i y_i = 121127$

Thus $$r = \frac{\sum_{i=1}^{10} x_i y_i - 10\bar{x}\bar{y}}{\sqrt{\left(\sum_{i=1}^{10} x_i^2 - 10\bar{x}^2\right)\left(\sum_{i=1}^{10} y_i^2 - 10\bar{y}^2\right)}}$$

$$= \frac{121127 - 10(111.2)(107.3)}{\sqrt{\left[125992 - 10(111.2^2)\right]\left[117017 - 10(107.3^2)\right]}}$$

$r = 0.86$

Note

There is one another formula in slides which also give the same result

Problem # 03

How many different 7-place license plates are possible when 3 of the entries are letters and 4 are digits? Assume that repetition of letters and numbers is allowed and that there is no restriction on where the letters or numbers can be placed.

Solution

There are $\binom{7}{3} = 35$ choices of the three places for the letters. For each choice, there are $(26)^3(10)^4$ different license plates. Hence, altogether there are $35 \cdot (26)^3 \cdot (10)^4$ different plates.

The End