Time Frame: 50 minutes

Subject Matter: Standard Error of the Estimate

TELL ME

Objective: TSWBAT compute the standard error of the estimate.

Standards: DA – 3.8

 Materials: TI 83 Calculator and Worksheets

SHOW ME

Presentation of Information

The teacher will discuss the meaning of standard error of the estimate, denoted by *Sest* and its formula.

Formula: $S\_{est}=\sqrt{\frac{∑y^{2}-a∑xy-b∑y}{n-2}}$ The smaller the value of $S\_{est}$ the lesser the error of the estimate.

Example 1

A researcher collects the following data and determines that there is a significant relationship between the age of a copy machine and its monthly maintenance cost. Find the standard error of the estimate.

|  |  |  |
| --- | --- | --- |
| Machine | Age (in years)(x) | Monthly cost(y) |
| A | 1 | $62 |
| B | 2 | $78 |
| C | 3 | $70 |
| D | 4 | $90 |
| E | 4 | $93 |
| F | 6 | $103 |

Classwork in standard error of the estimate

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: April 7, 2011

1. A manager finds that there is a relationship between the number of radio ads aired per week and the amount of sales (in thousands) of a product. Compute the standard error of the estimate.

|  |  |
| --- | --- |
| No. of ads (x) | Sales (y) |
|  2 | 2 |
| 5 | 4 |
| 8 | 7 |
| 8 | 6 |
| 10 | 9 |
| 12 | 10 |

1. A researcher found that a person’s age is related to the number of hours he or she exercises per week. The data of the sample is shown here. Compute the standard error of the estimate.

|  |  |
| --- | --- |
| Age (x) | Hours (y) |
| 18 | 10 |
| 26 | 5 |
| 32 | 2 |
| 38 | 3 |
| 52 | 1.5 |
| 59 | 1 |

1. A study found that there is a relationship between a person’s monthly income in dollars and the number of meals that a person eats away from home per month. The data from the sample is shown here. Compute the standard error of the estimate.

|  |  |
| --- | --- |
| Income (x) | Meals (y) |
| 500 | 8 |
| 1200 | 12 |
| 1500 | 16 |
| 945 | 10 |
| 850 | 9 |
| 400 | 3 |
| 540 | 7 |

1. A store manager wishes to found that there is a relationship between the age of her employees and the number of sick days they take each year. The data for the sample are shown. Compute the standard error of the estimate.

|  |  |
| --- | --- |
| Age (x) | Days (y) |
| 18 | 16 |
| 26 | 12 |
| 39 | 9 |
| 48 | 5 |
| 53 | 6 |
| 58 | 2 |

Classwork in standard error of the estimate

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: April 7, 2011

1. A manager finds that there is a relationship between the number of radio ads aired per week and the amount of sales (in thousands) of a product. Compute the standard error of the estimate.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No. of ads (x) | Sales (y)$$S\_{est}=\sqrt{\frac{∑y^{2}-a∑xy-b∑y}{n-2}}$$$$S\_{est}=\sqrt{\frac{286-.83\*338-.07\*38}{6-2}}$$$$S\_{est}=\sqrt{\frac{286-280.54-2.66}{4}}$$$$S\_{est}=\sqrt{\frac{2.8}{4}}$$$$S\_{est}=\sqrt{.7}$$$$S\_{est}=.84 Answer$$Solution:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **x** | **y** |  | **y2** |  | **xy** |
| **2** | **2** |  | **4** |  | **4** |
| **5** | **4** |  | **16** |  | **20** |
| **8** | **7** |  | **49** |  | **56** |
| **8** | **6** |  | **36** |  | **48** |
| **10** | **9** |  | **81** |  | **90** |
| **12** | **10** |  | **100** |  | **120** |
| **y=** | **38** | **y2 =** | **286** | **xy =** | **338** |

 |
|  2 | 2 |
| 5 | 4 |
| 8 | 7 |
| 8 | 6 |
| 10 | 9 |
| 12 | 10 |

1. A researcher found that a person’s age is related to the number of hours he or she exercises per week. The data of the sample is shown here. Compute the standard error of the estimate.

Solution:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **x** | **y** |  | **y2** |  | **xy** |
| **18** | **10** |  | **100** |  | **180** |
| **26** | **5** |  | **25** |  | **130** |
| **32** | **2** |  | **4** |  | **64** |
| **38** | **3** |  | **9** |  | **114** |
| **52** | **1.5** |  | **2.25** |  | **78** |
| **59** | **1** |  | **1** |  | **59** |
| **y=** | **23** | **y2 =** | **141.25** | **xy =** | **625** |

|  |  |
| --- | --- |
| Age (x) | Hours (y) |
| 18 | 10$$S\_{est}=\sqrt{\frac{∑y^{2}-a∑xy-b∑y}{n-2}}$$$$S\_{est}=\sqrt{\frac{141.25--.18\*625-10.50\*23}{6-2}}$$$$S\_{est}=\sqrt{\frac{141.25+112.5-241.5}{4}}$$$$S\_{est}=\sqrt{\frac{12.25}{4}}$$$$S\_{est}=\sqrt{3.06}$$$$S\_{est}=.92 Answer$$ |
| 26 | 5 |
| 32 | 2 |
| 38 | 3 |
| 52 | 1.5 |
| 59 | 1 |

1. A study found that there is a relationship between a person’s monthly income in dollars and the number of meals that a person eats away from home per month. The data from the sample is shown here. Compute the standard error of the estimate.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Income (x) | Meals Solution:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **x** | **y** |  | **y2** |  | **xy** |
| **500** | **8** |  | **64** |  | **4000** |
| **1200** | **12** |  | **144** |  | **14400** |
| **1500** | **16** |  | **256** |  | **24000** |
| **945** | **10** |  | **100** |  | **9450** |
| **850** | **9** |  | **81** |  | **7650** |
| **400** | **3** |  | **9** |  | **1200** |
| **540** | **7** |  | **49** |  | **3780** |
| **y=** | **65** | **y2 =** | **703** | **xy =** | **64480** |

(y)$$S\_{est}=\sqrt{\frac{∑y^{2}-a∑xy-b∑y}{n-2}}$$$$S\_{est}=\sqrt{\frac{703-.01\*64480-1.14\*65}{7-2}}$$$$S\_{est}=\sqrt{\frac{703-644.8-74.1}{5}}$$$$S\_{est}=\sqrt{\frac{-15.9}{5}}$$$$S\_{est}=\sqrt{-3.18 } disregard the negative$$$$S\_{est}=1.78 Answer$$ |
| 500 | 8 |
| 1200 | 12 |
| 1500 | 16 |
| 945 | 10 |
| 850 | 9 |
| 400 | 3 |
| 540 | 7 |

1. A store manager wishes to found that there is a relationship between the age of her employees and the number of sick days they take each year. The data for the sample are shown. Compute the standard error of the estimate.

Solution:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **x** | **y** |  | **y2** |  | **xy** |
| **18** | **16** |  | **256** |  | **288** |
| **26** | **12** |  | **144** |  | **312** |
| **39** | **9** |  | **81** |  | **351** |
| **48** | **5** |  | **25** |  | **240** |
| **53** | **6** |  | **36** |  | **318** |
| **58** | **2** |  | **4** |  | **116** |
| **y=** | **50** | **y2 =** | **546** | **xy =** | **1625** |

|  |  |
| --- | --- |
| Age (x) | Days (y)$$S\_{est}=\sqrt{\frac{∑y^{2}-a∑xy-b∑y}{n-2}}$$$$S\_{est}=\sqrt{\frac{546--.32\*1625-21.10\*50}{6-2}}$$$$S\_{est}=\sqrt{\frac{546+520-1055}{4}}$$$$S\_{est}=\sqrt{\frac{11}{4}}$$$$S\_{est}=\sqrt{2.75 }$$$$S\_{est}=1.66 Answer$$ |
| 18 | 16 |
| 26 | 12 |
| 39 | 9 |
| 48 | 5 |
| 53 | 6 |
| 58 | 2 |