**Chapter 4: An experiment on tomato plants**

Dr. Johanssen is interested in learning whether a new tomato food (Food E) will create larger tomato plants than the food currently used (food C). To test this theory, forty seedling tomato plants of similar size were planted in a garden. Each plant was numbered 1-40. Using a random number generator (on their calculator), Twenty different numbers from 1 to 40 were selected. The corresponding plants received food E, the “experimental” food. The other twenty were selected to receive food C. (This randomization process helps ensure that other conditions that could impact the growth of the plants were equalized across the two treatment groups). After eight weeks, the increase in height of each plant (in inches) was measured.

**treatment increase (in.)**

C 33.2

C 34.3

C 31.0

C 35.4

C 36.9

C 36.7

C 31.6

C 28.5

C 30.8

C 26.5

C 28.2

C 32.9

C 29.5

C 31.2

C 27.4

C 31.7

C 30.2

C 32.9

C 32.6

C 34.5

**treatment increase (in.)**

E 35.3

E 36.3

E 37.9

E 37.6

E 33.8

E 34.5

E 26.0

E 20.2

E 35.0

E 35.0

E 36.5

E 35.9

E 36.7

E 29.3

E 21.5

E 34.2

E 32.5

E 23.9

E 31.2

E 30.9

1. Compare the distribution of height increases for plants treated with food C and Food E with an appropriate visual display. Your comparison must include a discussion of shape, center, spread and outliers (if any).
2. Write a sentence interpreting how the standard deviation value for Food Group E summarizes spread, in context of this study.
3. In order to compare the centers and spreads of tomato plant growths between the two treatment groups, which choice of numerical summaries are most appropriate? Justify your decision with evidence from part a).
4. Dr. Johanssen compared the distributions, and saw one potential advantage to switching to food E in the future. Why would Dr. J consider switching to food E in the future? Explain your justification fully using numerical and graphical justifications.
5. Dr. Johanssen compared the distributions, and saw one potential disadvantage to switching to food E in the future. Why would Dr. J consider NOT switching to food E in the future? Explain your justification fully using numerical and graphical justifications.

Make sure you have all graphs and calculations labeled correctly and clearly on your paper.

**C**



**Quantiles**

|  |  |  |
| --- | --- | --- |
| 100.0% | maximum | 36.9 |
| 99.5% |  | 36.9 |
| 97.5% |  | 36.9 |
| 90.0% |  | 36.57 |
| 75.0% | quartile | 34.025 |
| 50.0% | median | 31.65 |
| 25.0% | quartile | 29.675 |
| 10.0% |  | 27.48 |
| 2.5% |  | 26.5 |
| 0.5% |  | 26.5 |
| 0.0% | minimum | 26.5 |

**Moments**

|  |  |
| --- | --- |
| Mean | 31.8 |
| Std Dev | 2.9266471 |
| Std Err Mean | 0.6544182 |
| Upper 95% Mean | 33.169713 |
| Lower 95% Mean | 30.430287 |
| N | 20 |

**E**



**Quantiles**

|  |  |  |
| --- | --- | --- |
| 100.0% | maximum | 37.9 |
| 99.5% |  | 37.9 |
| 97.5% |  | 37.9 |
| 90.0% |  | 37.51 |
| 75.0% | quartile | 36.2 |
| 50.0% | median | 34.35 |
| 25.0% | quartile | 29.7 |
| 10.0% |  | 21.74 |
| 2.5% |  | 20.2 |
| 0.5% |  | 20.2 |
| 0.0% | minimum | 20.2 |

**Moments**

|  |  |
| --- | --- |
| Mean | 32.21 |
| Std Dev | 5.3559509 |
| Std Err Mean | 1.197627 |
| Upper 95% Mean | 34.716662 |
| Lower 95% Mean | 29.703338 |
| N | 20 |