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Problem solving set A

Bronze

a) $\sigma = \sqrt{\frac{\Sigma t^2}{n} - \left(\frac{\Sigma t}{n}\right)^2}$

$\sigma = \sqrt{\frac{216.4}{10} - \left(\frac{42}{10}\right)^2}$

$\sigma = 2$ (1 s.f)

$\overline{X} = \frac{42}{10}$

$\overline{X} = 4.2$

Upper Boundary $= 4.2 + 2(2) = 8.2$ (s)

$8.3 > 8.2$ ∴ This piece of data is an outlier

b) This is a reasonable amount of time to eat the bisquit, so it could be a legitimate data value.

Silver

$\sigma = \sqrt{\frac{\Sigma m^2}{n} - \left(\frac{\Sigma m}{n}\right)^2}$

$\sigma = \sqrt{\frac{530276}{20} - \left(\frac{3218}{20}\right)^2}$

$\sigma = 25.0$ (3. sf)

$$\overline{X} = \frac{3218}{20}$$

$$\overline{X} = 160.9$$

Upper Boundary $= 160.9 + 2(25) = 210.9\ (g)$

both values are outliers but 223 is a reasonable mass for a graipefruit, while 845 g is a much more extreme value so is lilely to be an error. Only remove the 845g value

Gold

Definition A:

$$\sigma = \sqrt{\frac{\Sigma x^2}{n} - \left(\frac{\Sigma x}{n}\right)^2}$$

$$\Sigma X = 351$$

$$\Sigma X^2 = 16439$$

$$n = 9$$

$$\overline{X} = 39$$

$$\sigma = \sqrt{\frac{16439}{9} - \left(\frac{351}{9}\right)^2}$$

$\sigma = 17.5$ (3 s.d)

Upper Boundary $= 39 + 2(17.5) = 74$

Lower Boundary $= 39 - 2(17.5) = 4$

$75 > 74$ ∴ It's an outlier.

Definition B:

Med = 36

$Q_1 = 27$

$Q_3 = 51$

IQR $= 51 - 27 = 24$

Lower bound $= 27 - 1.5 \times 24 = -9$

Upper bound $= 51 + 1.5 \times 24 = 87$

Definition A is a more useful method of identifying extreme data values because it sets a lower and upper bound for acceptable data values.

Definition B only sets an upper bound; $27 - 1.5 \times 24 = -9$, so even a value 0 would not be regarded as an extreme value under this definition