

$$1. \text{ Mean, } \bar{X} = \frac{20 + 35 + 14 + 10 + 48 + 55 + 14 + 28 + 42 + 35 + 41 + 59 + 19 + 5}{15}$$

$$\bar{X} = 30.6667$$

2. ~~Mean~~ Median

$$5 \quad 10 \quad 14 \quad \overset{Q_1}{14} \quad 19 \quad 20 \quad 28 \quad | \quad 35 \quad 35 \quad 35 \quad 41 \quad \overset{Q_3}{42} \quad 48 \quad 55 \quad 59$$

$$\text{Median} = 35$$

3. Mode = 35

$$4. \quad s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n-1}} = \sqrt{\frac{3885.3333}{15-1}}$$

$$= 16.659$$

$$5. \quad Q_1 = 14, \quad Q_3 = 42$$

$$IQR = Q_3 - Q_1 = 42 - 14 = 28$$

$$6. \quad \text{Rank} = \frac{x}{100} (n+1) = \frac{40}{100} (15+1) = 6.4$$

$$= \frac{20 + 28}{2} = 24$$

$$7. \quad \text{Percentile rank} = \frac{L + \frac{s}{2}}{N} \times 100$$

$$L (\text{numbers less than } 42) = 11 \quad s = 1$$

$$= \frac{11 + \frac{1}{2}}{15} \times 100$$

$$= 76.67\%$$

$$8. \quad 5, 14, 35, 42, 59$$

|       | On-time | Late | Total |
|-------|---------|------|-------|
| S.A   | 33      | 6    | 39    |
| L.A   | 43      | 5    | 48    |
| Total | 76      | 11   | 87    |

$$9. P(L.A) = \frac{48}{87}$$

$$10. P(S.A \text{ and late}) = \frac{6}{87}$$

$$11. P(\text{Late} | S.A) = \frac{P(\text{Late and S.A})}{P(S.A)}$$

$$= \frac{6}{39} = \frac{2}{13}$$

$$12. \text{Total marbles} = 9.$$

$$P(B \text{ or } R) = \frac{3}{9} + \frac{5}{9} = \frac{8}{9}$$

$$13. P(A) = 0.56$$

$$P(B) = 0.81$$

$$P(B|A) = \frac{P(B \cap A)}{P(A)} = \frac{P(A) \times P(B)}{P(A)} = P(B) = 0.81.$$

$$14. P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0.37}{0.8} = \frac{37}{80}.$$

$$15. P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{0}{0.6} = 0$$

|    |   |      |
|----|---|------|
| 16 | X | P(x) |
|    | 0 | 0.12 |
|    | 1 | 0.18 |
|    | 2 | 0.3  |
|    | 3 | 0.15 |
|    | 4 | 0.1  |
|    | 5 | 0.1  |
|    | 6 | 0.05 |

$$17. P(X \geq 3) = 0.15 + 0.1 + 0.1 + 0.05 \\ = 0.4$$

$$p = 0.85, n = 22$$

$$18. \text{Mean} = np = 0.85 \times 22 = 18.7$$

$$19. \text{Standard deviation} = \sqrt{np(1-p)} \\ = \sqrt{22 \times 0.85(1-0.85)} \\ = 1.675$$

$$20. P(X \geq 12)$$

$$P(X=x) = \binom{n}{x} p^x (1-p)^{n-x}$$

$$P(X \geq 12) = 0.9999$$

$$21. a = 6 \\ b = 15$$

$$f(x) = \frac{1}{b-a} = \frac{1}{15-6} = \frac{1}{9}$$

$$P(8 < X < 12) = (12-8) \frac{1}{9} = \frac{4}{9}$$

$$22. a = 8 \\ b = 24$$

$$u = \frac{a+b}{2} = \frac{8+24}{2} = \frac{32}{2} = 16$$

$$23. z = 2, \mu = 76, \sigma = 2$$

$$z = \frac{X - \mu}{\sigma} \quad 2 = \frac{X - 76}{2}$$

$$X = 4 + 76 = 80$$

$$24. \mu = 36, \sigma = 10, X = 40$$

$$P(X > 40) = P\left(X > \frac{40-36}{10}\right) = P(X > 0.4) \\ = 0.3446$$

$$25. \quad n = 60 \\ x = 38$$

$$p = 0.74$$

$$\hat{p} = \frac{x}{n} = \frac{38}{60} = 0.6333$$

$$PZ \quad z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{0.6333 - 0.74}{\sqrt{\frac{0.74(1-0.74)}{60}}} = -1.884$$

$$P(z \leq -1.884) = 0.0298$$

$$26. \quad s_x = \frac{s}{\sqrt{n}} = \frac{50}{\sqrt{49}} = 7.1429$$

$$z = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

$$27. \quad P(220 < \bar{x} < 240)$$

$$P\left(\frac{220 - 250}{\frac{50}{\sqrt{49}}} < z < \frac{240 - 250}{\frac{50}{\sqrt{49}}}\right)$$

$$P(-4.2 < z < -1.4)$$

$$P(z < -1.4) - P(z < -4.2)$$

$$= 0.0808 - 0 = 0.0808$$

$$28. \quad \mu = 11, \quad \sigma = 2, \quad n = 39$$

$$\mu_{\Sigma x} = 11(39) = 429$$

$$\sigma_{\Sigma x} = \sigma \sqrt{n} = 2\sqrt{39} = 12.49$$

$$29. \quad P(430 \leq \Sigma x \leq 436)$$

$$P\left(\frac{430 - 429}{12.49} \leq z \leq \frac{436 - 429}{12.49}\right)$$

$$P(0.08 \leq z \leq 0.56) = P(z \leq 0.56) - P(z \leq 0.08)$$

$$= 0.7123 - 0.5319 \\ = 0.1804$$

$$30. \quad \sigma = 14, n = 15 \quad Z_{\alpha/2} = 2.576$$

$$\bar{x} = 58.26667,$$

$$CI = \bar{x} \pm Z_{\alpha/2} \left( \frac{\sigma}{\sqrt{n}} \right)$$

$$= 58.2667 \pm 2.576 \left( \frac{14}{\sqrt{15}} \right)$$

$$= (48.955, 67.578)$$

$$31. \quad n = 45 \quad Z_{\alpha/2} = 2.968$$

$$x = 30$$

$$\hat{p} = \frac{x}{n} = \frac{30}{45} = 0.6667$$

$$\tilde{p} = \frac{x+2}{n+4} = \frac{32}{49} = 0.6531$$

$$CI = \tilde{p} \pm Z_{\alpha/2} \sqrt{\frac{\tilde{p}(1-\tilde{p})}{n+4}}$$

$$= 0.6531 \pm 2.968 \sqrt{\frac{0.6531(1-0.6531)}{49}}$$

$$= (0.4513, 0.8549)$$

$$32. \quad n = 100, \bar{x} = 650, \sigma = 25 \quad \alpha = 0.05$$

$$H_0: \mu = 700$$

$$H_1: \mu < 700$$

$$Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{650 - 700}{\frac{25}{\sqrt{100}}} = -20$$

$$P(Z < -20) = 0$$

Reject  $H_0$  since  $p\text{-value} < 0$ . There is sufficient evidence to conclude that the mean number of meals eaten at home is less than 700 per year.

$$33. \bar{x} = 174.8, s = 8.2306, n = 15$$

$$H_0: \mu = 170$$

$$H_1: \mu < 170$$

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}} = \frac{174.8 - 170}{\frac{8.2306}{\sqrt{15}}} = 2.259$$

$$P\text{-value} = 0.0202$$

Reject  $H_0$  since  $p\text{-value} < 0.05$ . There is sufficient evidence to conclude that the mean Brinell hardness of all such ductile iron pieces is greater than 170.

$$34. x_1 = 18$$

$$n_1 = 200$$

$$x_2 = 25$$

$$n_2 = 600$$

$$\alpha = 0.05$$

$$H_0: p_1 = p_2$$

$$H_1: p_1 \neq p_2$$

$$\hat{p}_1 = \frac{18}{200} = 0.09$$

$$\hat{p}_2 = \frac{25}{600} = 0.042$$

$$\hat{p} = \frac{18 + 25}{200 + 600} = 0.05375$$

$$z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$= \frac{0.09 - 0.042}{\sqrt{0.05375(1-0.05375)\left(\frac{1}{200} + \frac{1}{600}\right)}} = 2.62$$

$$P\text{-value} = 0.0087$$

The differences between two assembly procedures are significant.

35. Two independent population proportions

$$\alpha = 0.001$$

Check if the normality conditions are met