1-4: $K=8$, $n=5$, Thus: $D_3=0$, $D_4=2.114$, $A_2=0.577$

$$\bar{R} = \sum_{i=1}^{8} R_i / K = 30.8/8 = 3.85; \quad \bar{\bar{x}} = \sum_{i=1}^{8} \bar{x}_i / K = \frac{113.6}{8} = 14.2$$

R-chart: $UCL = \bar{R} * D_4 = 3.85 * 2.114 = 8.14$ 1A

$LCL = \bar{R} * D_3 = 3.85 * 0 = 0$ 2D

$\bar{x}$-chart: $UCL = \bar{\bar{x}} + A_2\bar{R} = 14.2 + 0.577 * 3.85 = 16.42$

$LCL = \bar{\bar{x}} - A_2\bar{R} = 14.2 - 0.577 * 3.85 = 11.98$ 3.B

For $\bar{x}$-chart: Largest: Day 7 (17.3) higer than the UCL

Smallest: Day 5 (11.8) lower than the LCL

At least one point is outside of the contrl limits 4.C

5-7. proportion $p = \frac{18+14+10+17+16+12}{6*100} = \frac{87}{600} = 0.145$ 5B

Thus $\sigma_{\bar{p}} = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{0.145(1-0.145)}{100}} = 0.0352$

$UCL = p + 3\sigma_{\bar{p}} = 0.145 + 3 * 0.0352 = 0.2506$ 6.A

$LCL = p - 3\sigma_{\bar{p}} = 0.145 - 3 * 0.0352 = 0.0394$

For p-chart: Largest: 0.18 lower than the UCL

smallest: 0.10 higher than the LCL

No pattern over time

the process is in contrl. 7.D

8. σ is known.

For $\bar{x}$-chart: $UCL = \mu + 3 * \frac{\sigma}{\sqrt{n}} = 64.5 + 3 * \frac{1.2}{\sqrt{4}} = 66.3$

$LCL = \mu - 3 * \frac{\sigma}{\sqrt{n}} = 64.5 - 3 * \frac{1.2}{\sqrt{4}} = 62.7$

8D

9. Either one 9C