109-mid2-411-sol

1. $P(Z \geq 5.32) = 1 - P(Z < 5.32) = 1 - 1 = 0$
2. $P(Z < 0.19) = 0.57535$
3. $P(Z < -1.32) = 0.09342$
4. $P(k < Z < 0) = 0.09342$

$$P(Z < 0) - P(Z < k) = 0.27935$$
$$0.5 - P(Z < k) = 0.27935$$
$$P(Z < k) = 0.22065$$
$$k = -0.77$$

5. $P\left(T > t_{15,0.025}\right)$

$P\left(T < t_{15,0.975}\right)$

$t_{15,0.975} = 2.131$

6. $P\left(T < t_{15,0.005}\right)$

$P\left(T < -t_{15,0.995}\right)$

$-t_{15,0.995} = -2.947$

$$\boxed{p = 0.15 \ , \ \ n = 11}$$

7. Binomial (11,0.15)
8. $P(X \leq 1) = P(X \leq 0) + P(X \leq 1)$

$= \binom{11}{0}(0.15)^0(0.85)^{11} + \binom{11}{1}(0.15)^1(0.85)^{10} = 0.492$

9. $E(X) = np = 11 \times 0.15 = 1.65$
10. $\sqrt{Var(X)} = \sqrt{npq} = \sqrt{11 \times 0.15 \times 0.85} = 1.184$

$$\boxed{\mu = 20\ ,\sigma = 2.4\ ,n = 30}$$

11. The mean of the sample =20

12. The S.E of the sample $\frac{\sigma}{\sqrt{n}} = \frac{2.4}{\sqrt{30}} = 0.438$

13. $P(\bar{X} < 21) = P\left(Z < \frac{21-20}{0.438}\right) = P(Z < 2.28) = 0.9887$

14.

X	-1	0	1	2
$f(X)$	0.30	0.25	0.40	0.05

15. $P(X < 2) = 0.30 + 0.25 + 0.40 = 0.95$

16. $P(X > 0) = 0.40 + 0.05 = 0.45$

$$\boxed{\lambda_{one\ hour} = 7}$$

17. $P(X = 2) = \frac{e^{-7}7^2}{2!} = 0.022$

18. $P(X = 0) = \frac{e^{-7}7^0}{0!} = 0.0009$

19. $P(X = 1) = \frac{e^{-3.5}3.5^0}{0!} = 0.1057$ $\boxed{\lambda_{\frac{1}{2}\,hour} = 7}$

$$\boxed{\begin{array}{lll} n_1 = 45 & \bar{X}_1 = 52 & \sigma_1 = 4 \\ n_2 = 50 & \bar{X}_2 = 50 & \sigma_2 = 5 \end{array}}$$

20. The mean of the difference is 52-50=2

21. The S.E is $\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}} = \sqrt{\frac{16}{45} + \frac{25}{50}} = 0.925$

22. $P(1 < \bar{X}_1 - \bar{X}_2 < 3) = P\left(\frac{1-2}{0.925} < Z < \frac{3-2}{0.925}\right)$

$$= P(-1.08 < Z < 1.08)$$

$$= P(Z < 1.08) - P(Z < -1.08)$$

$$= 0.85993 - 0.14007 = 0.71956$$

23. $P(\bar{X}_1 - \bar{X}_2 > 4) = 1 - P\left(Z < \frac{4-2}{0.925}\right) = 1 - P(Z < 2.16) = 0.01539$

$$\boxed{p = 0.45 \ , \ n = 90}$$

24. The mean is 0.45
25. The S.E is $\sqrt{\frac{pq}{n}} = \sqrt{\frac{0.45 \times 0.55}{90}} = 0.052$
26. The sampling distribution is $\mu = 0.45$, $\sigma = 0.052$
27. $P(\hat{p} = 0.25) = 0$

$$\boxed{\begin{array}{ll} n_1 = 2000 & p_1 = 0.175 \\ n_2 = 2000 & p_2 = 0.15 \end{array}}$$

$$p_1 - p_2 = 0.175 - 0.15 = 0.025$$

28. $\sqrt{\frac{p_1 q_1}{n_1} + \frac{p_2 q_2}{n_2}} = \sqrt{\frac{0.175 \times 0.825}{2000} + \frac{0.15 \times 0.85}{2000}} = 0.012$

29. $P(\hat{p}_1 - \hat{p}_2 > 0.031) = 1 - P\left(Z < \frac{0.031 - 0.025}{0.012}\right)$
$= 1 - P(Z < 0.5)$
$= 1 - 0.69146 = 0.3085$

30. $P(\hat{p}_1 - \hat{p}_2 > k) = 0.00293 \Rightarrow 1 - P\left(Z < \frac{k - 0.025}{0.012}\right) = 0.00293$
$\Rightarrow \quad P\left(Z < \frac{k - 0.025}{0.012}\right) = 0.99702$
$\Rightarrow \quad \frac{k - 0.025}{0.012} = 2.75 \Rightarrow k = 0.058$