Pg. 240

1\. (a) Distribution of sample means: probability distribution of a statistic obtained from a large number of samples drawn from a specific population

(b) Central limit theorem: If you have a population with mean μ and standard deviation σ and take sufficiently large random samples from the population with replacement, then the distribution of the sample means will be approximately normally distributed.

(c) Expected value of M is the average value attained by the random variable.

(d) Standard error of M is a statistical term that measures the accuracy with which a sample distribution represents a population by using standard deviation.

2\. $n = 50$ samples

All possible samples $= 100$ samples

⇒ The mean is more centrally located when more samples are used

⇒ Standard deviation is smaller when more samples are used

⇒ With more samples, the graph of distribution is more flattened than when fewer samples are used

3\. Measures of variability

S is the sample ~~variance~~ standard deviation

σ is the population standard deviation

σ_M is the standard error of the mean

M is the sample mean, μ is the population mean and μ_M refers to the mean of the sampling distribution of the mean.

4. a) $\mu = 100$, $\sigma = 20$

$n = 16$

$E(x) = \mu = 100$

Standard error of $\bar{x}$ $= \frac{\sigma}{\sqrt{n}} = \frac{20}{\sqrt{16}} = 5$

b) $n = 100$

$E(x) = \mu = 100$

Standard error $= \sigma/\sqrt{n} = \frac{20}{\sqrt{100}} = 2$

5. $n = 64$

$\mu = 90$

$\sigma = 32.$

mean $= 90$

99.75 of the data is distribution within 3 standard deviations of the mean

Standard error $= \sigma/\sqrt{n} = \frac{32}{\sqrt{64}} = 4$

6. Sample mean is normally distributed

number of samples should be greater than 30.

7. a) $\sigma = 18$

$\sigma_m = \sigma/\sqrt{n} = 18/\sqrt{4} = 9$

b) $\sigma_m = \sigma/\sqrt{n} = 18/\sqrt{9} = 6$

c) $\sigma_m = \sigma/\sqrt{n} = 18/\sqrt{36} = 3$

8. $n = 36$

$\sigma_m = \sigma/\sqrt{n}$

$\sigma = \sigma_m \times \sqrt{n} =$

a) $\sigma = 12 \times \sqrt{36} = 72.$

b) $\sigma = 3 \times \sqrt{36} = 18$

c) $\sigma = 2 \times \sqrt{36} = 12.$

9. $n = 4$

$\mu = 75$

$\sigma = 10$

$E(\bar{x}) = \mu = 75$

$\sigma_m = \sigma/\sqrt{n} = 10/\sqrt{4} = 5$

10. $\mu = 40$, $\sigma = 12$

a) $x = 52$, $n = 1$

$$z = \frac{x - \mu}{\sigma/\sqrt{n}} = \frac{52 - 40}{12/\sqrt{1}} = +1$$

(b) $\bar{x} = 52$, $n = 9$

$$z = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}} = \frac{52 - 40}{12/\sqrt{9}} = 3$$

c) $\bar{x} = 52$, $n = 16$

$$z = \frac{52 - 40}{12/\sqrt{16}} = 4$$

11. $\mu = 200$ $\sigma = 9$ (missing info)

$n = 25$, $M = 220$

$$z = \frac{M - \mu}{\sigma/\sqrt{n}} = \frac{220 - 200}{9/\sqrt{25}} = 11.11$$

12. $n = 64$ $M = 68$

$\mu = 60$

a) $\sigma = 2.$

$$z = \frac{68 - 60}{2/\sqrt{64}} = \frac{8}{1/4} = 32$$

b) $\sigma = 3$

$$z = \frac{68 - 60}{3/\sqrt{64}} = \frac{8}{3/8} = 21.33$$

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c) $\sigma = 4$

$$z = \frac{68-66}{4/\sqrt{64}} = \frac{8}{\frac{1}{2}} = 16$$

13. $\mu = 85$, $\sigma = 24$

a) $M = 91$, $n = 4$

$$z = \frac{M-\mu}{\sigma/\sqrt{n}} = \frac{91-85}{24/\sqrt{4}} = \frac{6}{12} = 0.5$$

b) $M = 91$, $n = 9$

$$z = \frac{91-85}{24/\sqrt{9}} = \frac{6}{8} = 0.75$$

c) $M = 91$, $n = 16$

$$z = \frac{91-85}{24/\sqrt{16}} = \frac{6}{6} = 1$$

d) $M = 91$, $n = 36$

$$z = \frac{91-85}{24/\sqrt{36}} = \frac{6}{4} = 1.5$$

14. $\sigma = 24$, $\mu = \cancel{63}$ 71 $\quad M = 63$

a) $n = 9$

$$z = \frac{M-\mu}{\sigma/\sqrt{9}} = \frac{63-71}{24/\sqrt{9}} = \frac{-8}{8} = -1$$

$$p(z > -1) = 0.84134$$

(b) $n = 36$

$$z = \frac{63-71}{24/\sqrt{36}} = \frac{-8}{4} = -2$$

$P(z > -2) = 0.97725$

(c) $n = 64$

$$z = \frac{63-71}{24/\sqrt{64}} = \frac{-8}{3} = -2.667.$$

$P(z > -2.667) = 0.99617.$

15 $\mu = 52$

$\sigma = 10$

$M = 50$

$$z = \frac{50-52}{10} = \frac{-2}{10} = -0.2$$

$P(z > -0.2) = 0.57926$

16. $\mu = 58, \sigma = 12$

a) $x < 52.$

$$z = \frac{x-\mu}{\sigma} = \frac{52-58}{12.} = -0.5$$

$P(x < -0.5) = 0.30854$

b) $n = 9$

$$z = \frac{x-\mu}{\sigma/\sqrt{n}} = \frac{52-58}{12/\sqrt{9}} = \frac{-6}{4} = -1.5$$

$P(x < -1.5) = 0.06681$

(c) $n = 16$

$$Z = \frac{x - \mu}{\sigma/\sqrt{n}} = \frac{52 - 58}{12/\sqrt{16}} = \frac{-6}{3} = -2$$

$$P(x < -2) = 0.02275$$

17. $\mu = 30$

a) $\sigma = 8$

$M = 32$, $n = 4$

$$z = \frac{M - \mu}{\sigma/\sqrt{n}} = \frac{32 - 30}{8/\sqrt{4}} = \frac{2}{4} = 0.5$$

$$P(x > 0.5) = 0.30854$$

(b)