Confidence Interval.

1. Population = 1,000,000 men

Sample = 1000 men

$\mu = 180$

$\sigma = 30$

$C.I = \mu \pm Z \times \sigma$

$= 180 \pm 2 \times SE$ (at 95%)

$= 180 \pm 2 \times \frac{30}{\sqrt{1000}}$

$= 180 \pm 1.89 \Rightarrow (178.11, 181.89)$

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2. $\sigma = 3.6$

$n = 120$

$\mu = 16.2$

a) CI (at 92%) $= \mu \pm 1.75\ SE$

$= 16.2 \pm 1.75 \times \frac{3.6}{\sqrt{120}}$

$= 16.2 \pm 0.576 \Rightarrow (15.624, 16.776)$

b) $Z \times SE = 15$ seconds.

$= 0.25$ min

$1.75 \times \frac{3.6}{\sqrt{n}} = 0.25$

$\boxed{n = 635}$

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3. a) 2% margin of error and 90% confidence interval.

$ME = Z \times SE$

$0.02 = 1.64 \times \sqrt{\frac{pq}{n}}$

assume $p = 0.5$; $\sqrt{n} = 1.64 \times \frac{\sqrt{(0.5)(0.5)}}{0.02} = 1681$

b) 95% CI for P, when out of 1000 sample 400 are happy.

$$\Rightarrow \frac{400}{1000} \pm 2\sqrt{\frac{0.4 \times 0.6}{1000}}$$

$$\Rightarrow 0.40 \pm 0.030 \Rightarrow (0.37, 0.43)$$

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4. Mean for 0.95, 1.02, 1.01, 0.98

Mean for $\bar{x} = 0.99$

$$S.D = \sqrt{\frac{\Sigma (x - \bar{x})^2}{n}} = 0.027$$

a) C.I at 95% $\Rightarrow 0.99 \pm 2 \times \frac{0.027}{\sqrt{4}}$

$= (0.963, 1.017)$

b) Consider hypothesis testing.

Null hypothesis $\mu = 0.99$ H_0

Alternate hypothesis $\mu \neq 0.99$ H_1

Since μ lies between C.I, we fail to reject null hypothesis.

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5. Null hypothesis ; $\mu = 45$ H_0

Alternate hypothesis ; $\mu \neq 45$ H_1

$n = 9$

Standard Error $= \frac{3.5}{\sqrt{9}}$; d.f = 8

at 5% Significance; $T = \frac{\bar{x} - \mu_0}{\frac{\sigma}{\sqrt{n}}} = \frac{49.2 - 45}{\frac{3.5}{\sqrt{9}}} = 3.6$

t-score at dfs and 5% Significance $\Rightarrow$ 2.306

Hence it is evident that mean time has changed after exercise, hence accept alternate hypothesis.

6. Standard Deviation = 5 min

$\mu = 42$ mins

95% CI $\Rightarrow$ $\mu \pm 2SE$

$n = 64$

$\Rightarrow 42 \pm 2 \frac{5}{\sqrt{64}}$

$\Rightarrow 42 \pm 1.25 \Rightarrow (40.75, 43.25)$

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7. Sum of value $= -3.50$

$n = 17$

$\therefore \mu = \frac{-3.50}{17} = -0.205$

$\sigma^2 = \frac{\text{Sum squared}}{17} - (\mu)^2$

$= \frac{19.13}{17} - (-0.205)^2$

$= 1.125 - 0.0420$

$\sigma^2 = 1.083$

$\therefore \sigma = \sqrt{1.083} = 1.040$

at 90% CI, $\Rightarrow -0.205 \pm \frac{1.040 \times 1.64}{\sqrt{17}}$

$C.I = -0.205 \pm 0.413$

$\Rightarrow (-0.618, 0.208)$

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8. ME = 1 cm

$\sigma^2 = 9 cm^2$

$\sigma = 3 cm$

$n = \left(\frac{z\sigma}{ME}\right)^2 = \left(\frac{z \times 3}{z \times 1}\right)^2$

~~$n = 36$~~ $\quad n = 36$

9. $\mu = 141$ 95% C.I $\Rightarrow$ $\mu \pm 2SE$

$n = 16$

$\sigma = 4$

$= 141 \pm 2\frac{4}{\sqrt{16}}$

$\boxed{C.I = 141 \pm 2}$

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10. $n = 17,096$

need ~~to~~ determine proportion of binge-drinkers.

∴ there are known 3314 binge-drinkers.

$\therefore p = \frac{3314}{17,096} = 0.1938$

$q = 0.806$

∴ at 90% C.I ; $\hat{p} \pm 1.64\,SE \Rightarrow \sqrt{\frac{pq}{n}}$

$\Rightarrow \frac{3314}{17096} \pm 1.64\sqrt{\frac{(0.1938)(0.806)}{17096}}$

$\Rightarrow 0.1938 \pm 0.0049$

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11. $n = 100$ S.D $= 4.49$

$\mu = 49$ C.I at 90%.

$\Rightarrow$ ~~49 ± 1.64~~ $49 \pm 1.64\left(\frac{4.49}{\sqrt{100}}\right)$

$\Rightarrow 49 \pm 0.736$

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12. 95% C.I proportion of fraudulent clicks.

$p = \frac{175}{1200} = 0.145$; $q = 0.855$

$\Rightarrow 0.145 \pm 2\sqrt{\left(\frac{0.145 \times 0.855}{1200}\right)}$

$\Rightarrow 0.145 \pm 0.064$

13. $n = 59$

proportion of left-hand players at 95% CI

$p = \frac{15}{59} = 0.254 \; ; q = 0.746$

$\Rightarrow \quad 0.254 \pm 2\sqrt{\frac{0.254 \times 0.746}{59}}$

$\Rightarrow 0.254 \pm 0.1133$

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14. $n = \left(\frac{Z\sigma}{ME}\right)^2$

at 90%. $z = 1.64$

$n = \left(\frac{1.64 \times 475}{100}\right)^2$

$\boxed{n = 61}$

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15. $\mu = 55.3 \qquad n = 10$

$\sigma^2 = 227.61$

$\sigma = 15.08$

C.I at 95%

$\Rightarrow \quad 55.3 \pm 2 \; \frac{15.08}{\sqrt{10}}$

$\Rightarrow \quad 55.3 \pm 9.53$
