Form B

2. Option (d)

3. (a) Option (iii)

 (b) In relation to a 96% CI, a 95% CI has a smaller margin of error (when both are constructed from the same data).

 (c) False, since 0 is inside the 96% CI.

4. Option (b) displays independent samples.

5. Use formula

$$n \geq \left(\frac{z^*}{ME}\right)^2 \tilde{p}(1-\tilde{p}) = \left(\frac{1.96}{0.022}\right)^2 (0.5)^2 = 1984.298$$

Sample sizes must be integers, so a minimal size is $n = 1985$.

6. (a) $E(Y) = E(2.5X - 2) = 2.5E(X) - 2 = (2.5)(12) - 2 = 28.$

 (b) $Var(Y) = Var(2.5X - 2) = Var(2.5X) = (2.5)^2(3.2) = 20.$

7.
$$E(X) = \int_{-\infty}^{\infty} x f(x)\,dx = \int_0^3 x\left(\frac{1}{36}x^2 + \frac{1}{6}x\right)dx = \int_0^3 \left(\frac{1}{36}x^3 + \frac{1}{6}x^2\right)dx$$
$$= \frac{1}{144}x^4 + \frac{1}{18}x^3 \Big|_0^3 = \frac{1}{144}\cdot 81 + \frac{1}{18}\cdot 27 = \frac{9}{16} + \frac{3}{2}$$
$$= \frac{33}{16} = 2.0625$$

8. The critical value for a 90% CI for a mean with 18 dfs is

$$qt(0.95, 18) = 1.734.$$

So, our 90% CI is

$$\bar{x} \pm t^* \frac{s}{\sqrt{n}} = 23.14 \pm (1.734)\frac{3.41}{\sqrt{19}}, \quad \text{or} \quad (21.783, 24.497).$$

9. (a) When p_1 represents the proportion of 25-30 yr. olds who limit spending, and p_2 represents the proportion of 45-50 yr. olds who limit spending, our hypotheses are $H_0: p_1 - p_2 = 0$ vs. $H_a: p_1 - p_2 \neq 0$.

 (b) The pooled proportion is $\hat{p} = \dfrac{23+17}{51+43} = \dfrac{40}{94} = \dfrac{20}{47}$

So, our standardized test statistic is

$$Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} = \frac{23/51 - 17/43}{\sqrt{\left(\frac{20}{47}\right)\left(\frac{27}{47}\right)\left(\frac{1}{51} + \frac{1}{43}\right)}} \doteq 0.5435$$

(c) The P-value corresponding to a 2-sided H_a comes from

$$2 * (1 - \text{pnorm}(0.5435))$$

(d) We are using a normal approximation to the sampling distribution of $\hat{p}_1 - \hat{p}_2$, and this should be done only if there are at least 10 successes and 10 failures in the two independent samples — i.e.,

$$n_1\hat{p}_1, \quad n_1(1-\hat{p}_1), \quad n_2\hat{p}_2, \quad \text{and} \quad n_2(1-\hat{p}_2)$$

are all at least 10. It is the case here, so we have no concerns.