FAMAT State Convention 2000 Solutions
Probability & Statistics, Open level

1. [C] This is what the coefficient of determination (R^2) measures

2. [C] $\#10\left(\frac{4}{52}\right) - \#1\left(\frac{48}{52}\right) = -\#.15$

3. [E] $\frac{72}{1190} \pm 1.96\sqrt{\frac{\left(\frac{702}{1190}\right)\left(1-\frac{702}{1190}\right)}{1190}}$

$.59 \pm .0279$

4. [B] Def. of stratified random sample

5. [C] $ME = z^* \cdot \sigma_{\bar{x}}$

z^* for 99% CI = 2.576

95% CI = 1.96

6. [B] std. dev $= \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}} = 0$

means $\Sigma(x-\bar{x})^2 = 0$ and this only happens when all observations are same value.

7. [E] $\frac{\Sigma x}{n} = \frac{814}{22} = 37$

8. [B] $96 \overset{\text{Boys}}{/} (96+32+94) = .43$

↑ Personal Goals

9. [D] Expected $= \begin{bmatrix} 144.19 & 246.81 \\ 28.39 & 48.6 \\ 49.42 & 84.6 \end{bmatrix}$

$\chi^2 = \Sigma \frac{(obs-exp)^2}{exp} = 89.966$

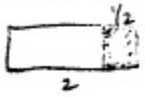
10. [B] $\sigma_{\hat{p}} = \sqrt{\frac{.75(.25)}{80}} = .0484$

11. [C] $(.64-.8) \pm 1.96\sqrt{\frac{.64(.36)}{100} + \frac{(.8)(.2)}{100}}$

$-.16 \pm 0.122$

12. [D] Power $= 1-\beta$; α & β are inversely proportional

13. [B] Area = Probability = 1/4



14. [B] Residual $= y - \hat{y}$ = Obs. − Predicted

15. [B] $P(\text{less than 2 heads}) = P(0) + P(1)$

$= \binom{6}{0}(.5)^0(.5)^6 + \binom{6}{1}(.5)^1(.5)^5$

$= .109$

16. [A] $b_1 = r\frac{s_x}{s_y} = .9\left(\frac{1.2}{3.6}\right) = .3$

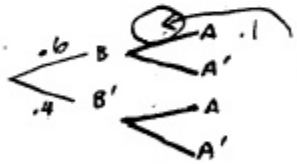
17. [A] $P(A \text{ and } B) = P(A)\cdot P(B)$ if A & B are independent

18. [B] $P(A \text{ or } B) = P(A) + P(B)$ if A & B are disjoint

19. [E] $\Sigma x \cdot P(x) = 3$

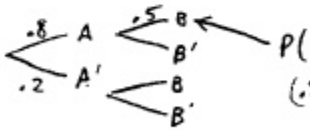
20. [A] $\sqrt{\Sigma(x-\bar{x})^2 \cdot P(x)} = 1.4$

21. [C]



$P(A|B) = \frac{.1}{.6}$

22. [B]



$P(A \text{ and } B) = (.8)(.5)$

23. [A] $\binom{20}{0}\left(\frac{1}{4}\right)^0\left(\frac{3}{4}\right)^{20} = .0032$

24. [D] $1 - P(\text{no boys}) = 1 - .5^3 = .875$

25. [A] $\frac{1}{3}\left(\frac{2}{3}\cdot\frac{3}{6} + \frac{3}{6}\cdot\frac{6}{8} + \frac{2}{3}\cdot\frac{6}{8}\right) = \frac{29}{72}$

26. [C] Answer is $= .25 + \frac{1}{3}\left(\frac{1}{3}\cdot\frac{3}{6} + \frac{3}{6}\cdot\frac{2}{8} + \frac{1}{3}\cdot\frac{2}{8}\right) = 19/36$

27. [E] $1 - P(\text{none solved})$

$1 - (4/5)(5/6)(1/2) = 2/3$

28. [B] 

$$\frac{\text{Area of } \Delta}{\text{Area of } O} = \frac{(\sqrt{3})^2(\sqrt{3})/4}{\pi} = 3\sqrt{3}/4\pi$$

29. [D]

320/600 Male — 160/320 Flex = 4/15; 160/320 No Flex

280/600 Female — 190/280 Flex; 90/280 No Flex

7/12 Flex — Male 4/15; Female

5/12 No Flex — Male; Female

$$\frac{4/15}{7/12} = .457$$

30. [A] $1 - P(\text{are seated side by side})$

$$1 - \frac{9!\cdot 2}{10!} = 4/5$$