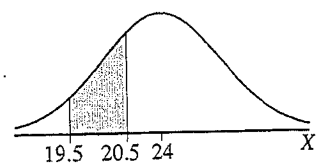
HW 15 — 7.5: 5, 7, 15, 29

5. Approximate $P(X \geq 40)$ by computing the area under the normal curve to the right of $X = 39.5$.

7. Approximate $P(X = 8)$ by computing the area under the normal curve between $X = 7.5$ and $X = 8.5$.

15. Using $P(x) = {}_nC_x p^x (1-p)^{n-x}$, with the parameters $n = 60$ and $p = 0.4$, we get $P(20) = {}_{60}C_{20}(0.4)^{20}(0.6)^{40} \approx 0.0616$. Now $np(1-p) = 60 \cdot 0.4 \cdot (1-0.4) = 14.4 \geq 10$, so the normal approximation can be used, with $\mu_X = np = 60(0.4) = 24$ and $\sigma_X = \sqrt{np(1-p)} = \sqrt{14.4} \approx 3.795$. With continuity correction we calculate:



$$P(20) \approx P(19.5 < X < 20.5) = P\left(\frac{19.5-24}{3.795} < Z < \frac{20.5-24}{3.795}\right) = P(-1.19 < Z < -0.92)$$

$= 0.1788 - 0.1170 = 0.0618$.

29. From the parameters $n = 150$ and $p = 0.42$, we get $\mu_X = np = 150 \cdot 0.42 = 63$ and $\sigma_X = \sqrt{np \cdot (1-p)} = \sqrt{150 \cdot 0.42 \cdot (1-0.42)} = \sqrt{36.54} \approx 6.045$. Note that $np(1-p) = 36.54 \geq 10$, so the normal approximation to the binomial can be used.

(a) $P(X \geq 80) \approx P(X \geq 79.5) = P\left(Z \geq \frac{79.5-63}{6.045}\right) = P(Z \geq 2.73) = 1 - 0.9968 = 0.0032$

(b) Since the result is very unusual, it contradicts the results of the Gallup poll. Explanations will vary. One possibility follows: The result suggests that the preference for boys is higher among the students of this college than among the population sampled by the Gallup poll.