Quiz # 4 **Stat 3445, Due Feb 22**

Use a proper correction for continuity in both problems.

1. The daily water demands for a city pumping station exceed 500,000 gallons with probability only 0.15. Over a 30-day period, find the approximate probability that demand for over 500,000 gallons per day occurs no more than twice.

Solution:

If $X \sim bin(30, .15)$ and $W \sim \mathcal{N}(4.5, 3.825)$ then

$$\begin{aligned} P(X \leq 2) &= P(W < 2.5) \\ &= P(Z < (2.5 - 4.5)/\sqrt{3.825}) = P(Z < -1.02) = .1539. \end{aligned}$$

At a specific intersection, vehicles entering from the east are equally likely to turn left, turn right, or proceed straight ahead. If 500 vehicles enter this intersection from the east tomorrow, what is the approximate probability that

(a) 150 or fewer turn right?

(b) at least 350 turn?

Solution:

(a) If $X \sim bin(500, 1/3)$ and $W \sim \mathcal{N}(500 \times 1/3, 500 \times 1/3 \times 2/3)$ then

$$\begin{aligned} P(X \leq 150) &= P(W < 150.5) \\ &= P(Z < (150.5 - 500 \times 1/3)/\sqrt{500 \times 1/3 \times 2/3}) = P(Z < -1.53) = .0630. \end{aligned}$$

(b) If $X \sim bin(500, 2/3)$ and $W \sim \mathcal{N}(500 \times 2/3, 500 \times 1/3 \times 2/3)$ then

$$\begin{aligned} P(X \geq 350) &= P(W > 349.5) \\ &= P(Z > (349.5 - 500 \times 2/3)/\sqrt{500 \times 1/3 \times 2/3}) = P(Z > 1.53) = .0630. \end{aligned}$$