Homework (Sign Test)
Biostatistics (STAT:3510; Bognar)

1. The cholesterol levels in (10 year old) children has a distribution that is skewed to the right with population median $\mathcal{Q}_2$. A random sample of 12 children yielded the following cholesterol levels.

   154 139 194 145 133 172 135 149 142 150 186 155

   (a) Test $H_0 : \mathcal{Q}_2 = 180$ versus $H_a : \mathcal{Q}_2 < 180$ at the $\alpha = 0.05$ significance level using the sign test. *You must find the test statistic and p−value, and state your decision and final conclusion.*

   $x^* = n_- = 10, X \sim Bin(n = 12, p = 0.5), p - value = P(X \geq 10) = 0.019$, *Reject* H_0, *evidence that* $Q_2 < 180$

   (b) Test $H_0 : \mathcal{Q}_2 = 140$ versus $H_a : \mathcal{Q}_2 > 140$ at the $\alpha = 0.05$ significance level using the sign test. *You must find the test statistic and p−value, and state your decision and final conclusion.*

   $x^* = n_+ = 10, X \sim Bin(n = 12, p = 0.5), p - value = P(X \geq 9) = 0.073$, *Do not reject* H_0, *no evidence that* $Q_2 > 140$

   (c) Test $H_0 : \mathcal{Q}_2 = 160$ versus $H_a : \mathcal{Q}_2 \neq 160$ at the $\alpha = 0.05$ significance level using the sign test. *You must find the test statistic and p−value, and state your decision and final conclusion.*

   $x^* = Max(n_-, n_+) = Max(9, 3) = 9, X \sim Bin(n = 12, p = 0.5), p - value = 2P(X \geq 9) = 0.146$, *Do not reject* H_0, *no evidence that* $Q_2 \neq 160$