

Sign Test

1. In 2003 the *Los Angeles Times* carried the headline “GAS FINALLY DROPS BELOW \$2” and said that the average price in southern California was now below \$2 a gallon. (Unfortunately, since then prices in L.A. have risen to as much as \$5.) At the time some gas prices observed around the Los Angeles area for the cheapest grade of unleaded were:

\$1.94 ⁹	\$2.39 ⁹	\$1.89 ⁹	\$1.99 ⁹	\$2.09 ⁹	\$1.97 ⁹
\$2.29 ⁹	\$2.07 ⁹	\$1.95 ⁹	\$1.97 ⁹	\$2.01 ⁹	\$1.99 ⁹
\$1.91 ⁹	\$1.98 ⁹	\$2.09 ⁹	\$1.96 ⁹	\$2.55 ⁹	\$1.97 ⁹

Use the .05 level of significance to do a sign test to see if the average price is significantly below \$2 per gallon.

2. A pen company has developed a new tip for its felt-tip pens. Twelve pens are filled with ink and fitted with the old tip. Each pen is attached to one of 12 motor-driven paper-covered drums, and the writing life of each pen is determined (in hours). Then each pen is refilled with ink and fitted with a new tuype tip. Again the writing life of each pen is determined. The results follow:

Pen	New Tip	Old Tip	Pen	New Tip	Old Tip
1	52	50	7	47	46
2	47	55	8	57	53
3	56	51	9	56	52
4	48	45	10	46	40
5	51	57	11	56	49
6	59	54	12	47	51

Do a sign test with $\alpha = .10$ to see if the new tip gives significantly longer pen life than the old tip does.

3. While working one morning as a waitress, Madge keeps track of whether her customers order regular or decaffeinated coffee. In the time she keeps track of, eleven people order regular coffee, while five order decaf. At the .01 level of significance, did significantly more people order regular than decaf?
4. In the first film we saw, Domino’s Pizza asked people whether they preferred thick crust or thin crust pizza. Supposed they found that 40% preferred thin crust, 35% preferred thick crust, and 25% liked both equally. Do a sign test at the .01 level of significance to see if there is a significant difference in preference among the groups.
5. A university says that a “typical” full-time student there takes 15 hours of credit each semester. Suppose the credits of several students are examined, and the numbers were:

17	12	15	14	18	16
21	19	13	20	18	12
16	15	14	16	17	19
18	12	21	18	20	18
13	15	20	19	18	16

Do a sign test with $\alpha = .05$ to see if there are significantly more students with over 15 hours than under 15 hours of credit.

Runs Test

1. You roll a die repeatedly, and the following numbers come up:

5	3	6	2	4	2	6
1	5	3	1	3	5	3
3	2	6	6	6	4	2
4	4	4	2	6	6	1

Use the characteristic of “odd” or “even” (reading across the rows) to do a runs test to see if this data is random.

2. You roll a die repeatedly, and the following numbers come up:

5	3	6	2	4	2	6
1	5	3	1	3	5	3
3	2	6	6	6	4	2
4	4	4	2	6	6	1

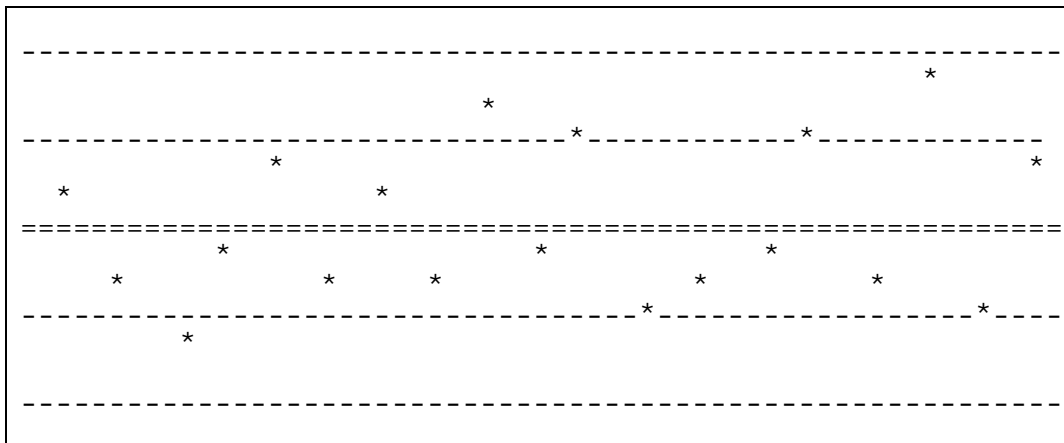
Use the characteristic of “1, 2, or 3” or “4, 5, or 6” (reading across the rows) to do a runs test to see if this data is random.

3. You flip a coin and record whether the coin comes up “heads” (H) or “tails” (T):

H	H	H	H	H	H	T	T
T	T	T	T	T	T	T	T
H	H	H	H	H	H	T	T

Is this data random?

4. A machine in a factory is filling boxes of cereal. A worker samples a box each minute and records how the actual weight of the box compares to the target weight. This is recorded on the control chart below:



Use the characteristic of above or below the target weight to see if this data is random.