

Minting Quarters: Is the manufacturing process of minting quarters out of control?

Congress created the United States Mint when it passed the Coinage Act in 1792, so the Mint has been manufacturing coins for well over 200 years. When the Thomas Adams Gum Company brought vending machines to the United States in 1888, a perfect marriage was formed between coins and various consumer products. Vending machines are designed to reject coins that vary too much from the Mint's target weight of 5.670 g for quarters. This is one of many reasons why it is important to maintain good quality control in the manufacture of quarters.

Principles of statistical process control are routinely used by the Mint and other businesses to monitor the quality of the goods they produce and the services they provide. This Chapter Problem involves the current process of manufacturing quarters. Table 14-1 lists the weight (grams) of quarters selected during each of the first 5 hours of production on each of 20 consecutive days. These quarters are from a new, streamlined production process that is being tested, and we need to determine whether this new process is functioning as it should.

Table 14-1 Weights (grams) of Minted Quarters

Day	Hour 1	Hour 2	Hour 3	Hour 4	Hour 5	\bar{x}	s	Range
1	5.543	5.698	5.605	5.653	5.668	5.6334	0.0607	0.155
2	5.585	5.692	5.771	5.718	5.720	5.6972	0.0689	0.186
3	5.752	5.636	5.660	5.680	5.565	5.6586	0.0679	0.187
4	5.697	5.613	5.575	5.615	5.646	5.6292	0.0455	0.122
5	5.630	5.770	5.713	5.649	5.650	5.6824	0.0581	0.140
6	5.807	5.647	5.756	5.677	5.761	5.7296	0.0657	0.160
7	5.686	5.691	5.715	5.748	5.688	5.7056	0.0264	0.062
8	5.681	5.699	5.767	5.736	5.752	5.7270	0.0361	0.086
9	5.552	5.659	5.770	5.594	5.607	5.6364	0.0839	0.218
10	5.818	5.655	5.660	5.662	5.700	5.6990	0.0689	0.163
11	5.693	5.692	5.625	5.750	5.757	5.7034	0.0535	0.132
12	5.637	5.628	5.646	5.667	5.603	5.6362	0.0235	0.064
13	5.634	5.778	5.638	5.689	5.702	5.6882	0.0586	0.144
14	5.664	5.655	5.727	5.637	5.667	5.6700	0.0339	0.090
15	5.664	5.695	5.677	5.689	5.757	5.6964	0.0359	0.093
16	5.707	5.890	5.598	5.724	5.635	5.7108	0.1127	0.292
17	5.697	5.593	5.780	5.745	5.470	5.6570	0.1260	0.310
18	6.002	5.898	5.669	5.957	5.583	5.8218	0.1850	0.419
19	6.017	5.613	5.596	5.534	5.795	5.7110	0.1968	0.483
20	5.671	6.223	5.621	5.783	5.787	5.8170	0.2380	0.602

14-1 Review and Preview

14-2 Control Charts for Variation and Mean

14-3 Control Charts for Attributes