

Worksheet 11/1/2023

Normal distribution: a special symmetric, bell-shaped distribution, with a single peak. The normal distribution is completely identified by its mean and standard deviation.

68-95-99.7 rule: about 68%, 95%, 99.7% of data points fall within 1, 2, 3 standard deviations of the mean, respectively

Standard score (z-score) of a data value = the number of standard deviations from the mean

$$z = \frac{\text{data value} - \text{mean}}{\text{standard deviation}}$$

Percentile of a data value = the percentage of all data points that are less than or equal to it.

1) State whether and why you would expect each of the following data sets to be normally distributed.

a) Scores awarded to a large class on an easy exam

b) The weights of bags of flour labeled “25 pounds”

c) The last digit of the Social Security number of 1000 randomly selected people

2) A set of test scores is normally distributed with a mean of 100 and a standard deviation of 20. Use the 68-95-99.7 rule to find the percentage of scores in each of the following categories.

(a) Greater than 100

(b) Less than 80

(c) Between 80 and 120

3) The SAT exams are designed so that their scores are normally distributed with a mean of 500 and a standard deviation of 100.

(a) Find the standard score and percentile of a score of 525. Explain the meaning of the percentile.

(b) Find the standard score and percentile of a score of 443. Explain the meaning of the percentile.

(c) Find the standard score and percentile of a score of 287. Explain the meaning of the percentile.

z-score	Percentile	z-score	Percentile	z-score	Percentile	z-score	Percentile
-3.5	0.02	-1.0	15.87	0.0	50.00	1.1	86.43
-3.0	0.13	-0.95	17.11	0.05	51.99	1.2	88.49
-2.9	0.19	-0.90	18.41	0.10	53.98	1.3	90.32
-2.8	0.26	-0.85	19.77	0.15	55.96	1.4	91.92
-2.7	0.35	-0.80	21.19	0.20	57.93	1.5	93.32
-2.6	0.47	-0.75	22.66	0.25	59.87	1.6	94.52
-2.5	0.62	-0.70	24.20	0.30	61.79	1.7	95.54
-2.4	0.82	-0.65	25.78	0.35	63.68	1.8	96.41
-2.3	1.07	-0.60	27.43	0.40	65.54	1.9	97.13
-2.2	1.39	-0.55	29.12	0.45	67.36	2.0	97.72
-2.1	1.79	-0.50	30.85	0.50	69.15	2.1	98.21
-2.0	2.28	-0.45	32.64	0.55	70.88	2.2	98.61
-1.9	2.87	-0.40	34.46	0.60	72.57	2.3	98.93
-1.8	3.59	-0.35	36.32	0.65	74.22	2.4	99.18
-1.7	4.46	-0.30	38.21	0.70	75.80	2.5	99.38
-1.6	5.48	-0.25	40.13	0.75	77.34	2.6	99.53
-1.5	6.68	-0.20	42.07	0.80	78.81	2.7	99.65
-1.4	8.08	-0.15	44.04	0.85	80.23	2.8	99.74
-1.3	9.68	-0.10	46.02	0.90	81.59	2.9	99.81
-1.2	11.51	-0.05	48.01	0.95	82.89	3.0	99.87
-1.1	13.57	0.0	50.00	1.0	84.13	3.5	99.98