

Exercise 1:

Midterm Examination Scores									
44	35	20	40	38	52	29	36	38	38
38	38	41	35	42	50	31	43	30	37
32	47	43	41	47	32	38	29	41	26
41	51	48	49	37	26	34	48	23	29
38	47	41	33	39	48	38	20	48	34
29	44	29	33	35	50	41	38	35	35
32	26	24	38	38	56	56	48	41	29
26	26	38	37	44	24	44	47	32	41

Using the data in MidtermPercentiles.xlsx fill in the following in the table below:

- 10th, 50th and 90th percentiles;
- 1st and 3rd quartiles
- The rank of scores 42 and 27

Measure	Value
10 th percentile	26
1 st quartile	32
50 th percentile	38
3 rd quartile	43.25
90 th percentile	48
Percentile rank of score 27	0.443 (44.3%)
Percentile rank of score 42	0.721 (72.1%)

$$= \text{PERCENTILE}(A2:A81, 0.1)$$

$$= \text{QUARTILE}(A2:A81, 1)$$

$$= \text{PERCENTILE}(A2:A81, 0.5)$$

$$\text{#PERCENTILE} = \text{QUARTILE}(A2:A81, 3)$$

$$= \text{PERCENTILE}(A2:A81, 0.9)$$

$$= \text{PERCENTRANK}(A2:A81, 38)$$

$$= \text{PERCENTRANK}(A2:A81, 42)$$

Exercise 2:

Suppose that an exam is taken by a large number of people and the scores are assumed to be from a normally distributed population with a mean of 50 and a standard deviation of 10.

Approximately what percentage of people earned scores

1. Below 50?
2. Above 60?
3. Between 40 and 60?

1. 50%, because the mean is the mid-point of the distribution.
2. About 16%. 60 is one standard deviation above the mean, which means that approximately 84% of scores are below that figure.
3. About 68%. 40 to 60 is -1σ to $+1\sigma$, so it is $84\% - 16\% = 68\%$

Exercise 3

A test was administered to 16 people, with the resulting scores

20, 19, 19, 18, 18, 18, 17, 17, 17, 16, 16, 16, 15, 15, 14

Eve was one of the two people who scored 19. What is her Z score?

Frank was the person who scored 14. What is his Z score?

$$Z = \frac{X - \bar{X}}{SD} \quad \bar{X} = \frac{272}{16} = 17 \quad SD = 1.6$$

$$Z_{\text{Eve}} = \frac{\text{Eve's score} - \bar{X}}{SD} = \frac{19 - 17}{1.6} = \frac{2}{1.6} = 1.25$$

$$Z_{\text{Frank}} = \frac{\text{Frank's score} - \bar{X}}{SD} = \frac{14 - 17}{1.6} = \frac{-3}{1.6} = -1.875$$

Exercise 4

Using the dataset in the MidtermPercentiles.xlsx datafile calculate the following:

1. The Z score of the raw score 42
2. The Z score of the raw score 27
3. The raw score that produces a Z score of -0.5
4. The raw score that produces a Z score of 1.2
5. The percentile rank of the raw score producing a Z score of -0.5
6. The percentile rank of the raw score producing a Z score of 1.2

$$\text{Mean} = 37.7 \quad (\text{from} = \text{AVERAGE}(A2:A81))$$

$$\text{SD} = 8.3 \quad (\text{from} = \text{STDEV}(A2:A81))$$

$$1. \quad Z = \frac{X - \bar{X}}{\text{SD}} = \frac{42 - 37.7}{8.3} = \frac{4.3}{8.3} = 0.5$$

$$2. \quad Z = \frac{X - \bar{X}}{\text{SD}} = \frac{27 - 37.7}{8.3} = \frac{-10.7}{8.3} = -1.3$$

$$3. \quad Z = \frac{X - \bar{X}}{\text{SD}} \quad \text{therefore} \quad X = (\text{SD} \cdot Z) + \bar{X}$$

$$X = (8.3 \times -0.5) + 37.7 = -4.15 + 37.7 = 33.6$$

$$4. \quad Z = \frac{X - \bar{X}}{\text{SD}} \quad \text{therefore} \quad X = (\text{SD} \cdot Z) + \bar{X}$$

$$X = (8.3 \times 1.2) + 37.7 = 10.0 + 37.7 = 47.7$$

$$5. \quad = \text{PERCENTRANK}(A2:A81, 33.6) = 0.298 = 29.8\% \text{ile}$$

$$6. \quad = \text{PERCENTRANK}(A2:A81, 47.7) = 0.856 = 85.6\% \text{ile}$$