P1

Normalization

$$x_{new} = \frac{x_i - \min(x)}{\max(x) - \min(x)}$$

$$x_1 = \frac{110 - 100}{150 - 100}$$

$$= \frac{10}{50}$$

$$= \frac{1}{5}$$

$$= 0.2$$

$$x_2 = \frac{105 - 100}{150 - 100}$$

$$= \frac{5}{50}$$

$$= \frac{1}{10}$$

$$= 0.1$$

$$x_3 = \frac{115 - 100}{150 - 100}$$

$$= \frac{15}{50}$$

$$= 0.3$$

$$x_4 = \frac{120 - 100}{150 - 100}$$

$$= \frac{20}{50}$$

$$= 0.4$$

$$x_5 = \frac{110 - 100}{150 - 100}$$

$$= \frac{10}{50}$$

$$= 0.2$$

$$x_6 = \frac{130 - 100}{150 - 100}$$

$$= \frac{30}{50}$$

$$= 0.6$$

$$x_7 = \frac{150 - 100}{150 - 100}$$

$$= \frac{50}{50}$$

$$= 1$$

$$x_8 = \frac{100 - 100}{150 - 100}$$

$$= 0$$

$$x_9 = \frac{105 - 100}{150 - 100}$$

$$= \frac{5}{50}$$

$$= 0.1$$

Price	Normalized Price
110	0.2
105	0.1
115	0.3
120	0.4
110	0.2
130	0.6
150	1
100	0
105	0.1

Standardization

$$X_{new} = \frac{x_i - X_{mean}}{\text{Standard Deviation}}$$

Mean, $\mu = ?$

$N = 9$

Standard Deviation:

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{N}}$$

$$\text{Mean} = \frac{110 + 105 + 115 + 120 + 110 + 130 + 150 + 100 + 105}{9}$$

$$= 116.111$$

$$(x_1 - \mu)^2 = (110 - 116.111)^2 = 37.3443$$

$$(x_2 - \mu)^2 = (105 - 116.111)^2 = 123.4543$$

$$(x_3 - \mu)^2 = (115 - 116.111)^2 = 1.2343$$

$$(x_4 - \mu)^2 = (120 - 116.111)^2 = 15.124321$$

$$(x_5 - \mu)^2 = (110 - 116.111)^2 = 37.344321$$

$$(x_6 - \mu)^2 = (130 - 116.111)^2 = 192.904321$$

$(x_7 - \mu)^2 = (150 - 116.111)^2 = 1148.46432$

$(x_8 - \mu)^2 = (100 - 116.111)^2 = 259.564321$

$(x_9 - \mu)^2 = (105 - 116.111)^2 = 123.454321$

$\sum (x_i - \mu)^2 = 37.3443 + 123.4543 + 1.2343$
$+ 15.124321 + 37.344321 + 192.90432$
$+ 1148.46432 + 259.564321 + 123.454321$

$= 1938.88883$

$$\sigma = \sqrt{\frac{\sum (x_i - \mu)^2}{N}} = \sqrt{\frac{1938.88883}{9}}$$

$= \sqrt{215.432092}$

$= 14.6776051$

$$x_{new} = \frac{x_i - \mu}{\text{Standard deviation}}$$

$$x_{new} = \frac{110 - 116.111}{14.6776051}$$

$$x_1 = +0.416314857$$

$$x_2 = \frac{105 - 116.111}{14.6776051}$$

$$= -0.757003607$$

$$x_3 = \frac{115 - 116.111}{14.6776051}$$

$$= -0.075693547 6$$

$$x_4 = \frac{120 - 116.111}{14.6776051}$$

$$= 0.264961$$

$$x_5 = \frac{110 - 116.111}{14.677\,6051}$$

$$= -0.416348577$$

$$x_6 = \frac{130 - 116.111}{14.6776051}$$

$$= 0.946271541$$

$$x_7 = \frac{150 - 116.111}{14.6776051}$$

$$= 2.30889166$$

$$x_8 = \frac{100 - 116.111}{14.67760\,51}$$

$$= -1.097\,65864$$

$$x_9 = \frac{105 - 116.111}{14.6776051}$$

$$= -0.757003607$$

Price	Standardized Prize
110	-0.4163 48577
105	-0.757003607
115	-0.07569354 76
120	0.264961
110	-0.416348577
130	0.94627 1541
150	2.30889166
100	-1.09765864
105	-0.757003607

Log Transformation

Price	Loganithm	
110	log 110	2.041393
105	log 105	2.021189
115	log 115	2.060698
120	log 120	2.079181
110	log 110	2.041393
130	log 130	2.113943
150	log 150	2.176091
100	log 100	2.000000
105	log 105	2.021189

Robust Scaler:

$$x_{scale} = \frac{x_i - x_{med}}{x_{75} - x_{25}}$$

100, 105, 105, 110, 110, 115, 120, 130, 150

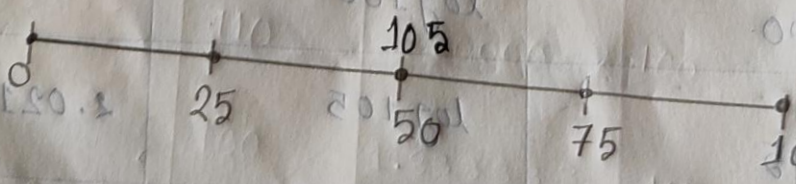
even, number of data, hence median is 110

100, 105, 105, 110, 110, 115, 120, 130, 150

↓ Median

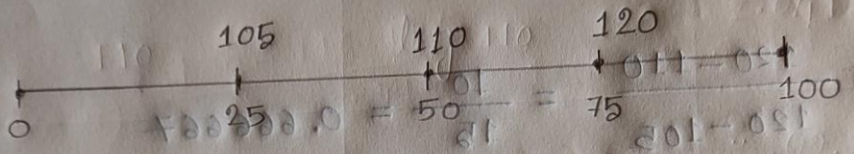
1st half: 100, 105, 105, 110, 110

↓ Median



2nd half: 110, 115, 120, 130, 150

↓ Median



$x_{med} = 110$

$x_{25} = 105$

$x_{75} = 120$

$$x_1 = \frac{100 - 110}{120 - 105} = -\frac{10}{15} = -0.666667$$

$$x_2 = \frac{105 - 110}{120 - 105} = \frac{-5}{15} = -0.333333$$

$$x_3 = \frac{105 - 110}{120 - 105} = -\frac{5}{15} = -0.333333$$

$$x_4 = \frac{110 - 110}{120 - 105} = 0$$

$$x_5 = \frac{110-110}{120-105} = 0$$

$$x_6 = \frac{115-110}{120-105} = \frac{5}{15} = 0.333333$$

$$x_7 = \frac{120-110}{120-105} = \frac{10}{15} = 0.666667$$

$$x_8 = \frac{130-110}{120-105} = \frac{20}{15} = 1.333333$$

$$x_9 = \frac{150-110}{120-105} = \frac{40}{15} = 2.666667$$

X_i	Robust scaler	X_i	Robust scaler	X_i	Robust scaler
110	0.000000	120	0.666667	150	2.666667
105	−0.333333	110	0.000000	100	−0.666667
115	0.333333	130	1.333333	105	−0.333333

Max Absolute scaler :

$$x_{scaled} = \frac{x}{max(x)}$$

Max (X) = 150

$$x_1 = \frac{110}{150} = 0.733333$$

$$x_2 = \frac{105}{150} = 0.7$$

$$x_3 = \frac{115}{150} = 0.766667$$

$$x_4 = \frac{120}{150} = 0.8$$

$$x_5 = \frac{110}{150} = 0.733333$$

$$x_6 = \frac{130}{150} = 0.866667$$

$$x_7 = \frac{150}{150} = 1$$

$$x_8 = \frac{100}{150} = 0.666667$$

$$x_9 = \frac{105}{150} = 0.7$$

price	Max Absolute scaler
110	0.733333
105	0.7
115	0.766667
120	0.8
110	0.733333
130	0.866667
150	1.0
100	0.666667
105	0.7