Problem Set 2, Problem 1, 9, 12, 13, 15, 16, 17.

Wednesday Quiz: Problem 17 or before

Problem 1.

$x = 2cm$ (individual, observation).

$\mu = 2.3cm$ (mean)

$s = 0.6cm$ (standard deviation)

The formula of standardized value is

$$z = \frac{x-\mu}{s}$$ (z-score), always used under Normal assumptions.

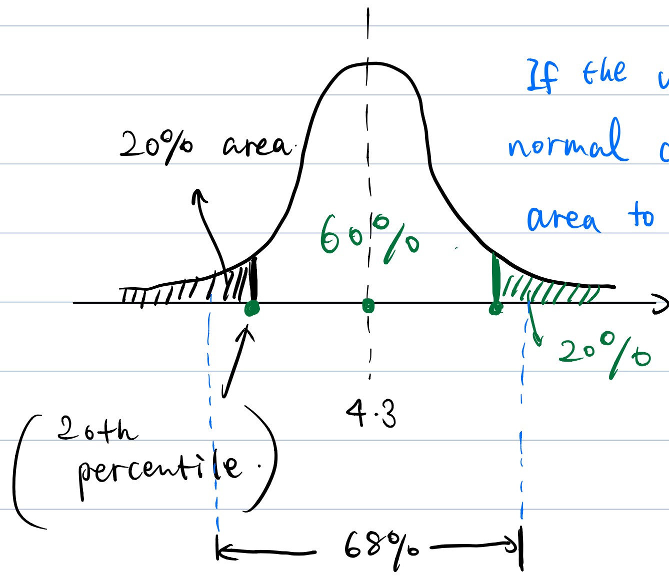
1. subtracted by mean
2. divided by sd.

$$= \frac{2\cancel{cm} - 2.3\cancel{cm}}{0.6\cancel{cm}}$$

$$= \frac{-0.3}{0.6} = -0.5$$

Problem 9. $\mu = 4.3\,m/s$

$s = 2.5\,m/s$.



If the whole area under the normal curve is A, then the area to the left of 20th percentile is 20% · A.

$(\mu - s \quad , \quad \mu + s)$. → this interval contains 68% area.

"empirical law"

$(\mu - s, \mu + s) \rightarrow 68\%$

$(\mu - 2s, \mu + 2s) \rightarrow 95\%$

$(\mu - 3s, \mu + 3s) \rightarrow 99.7\%$.

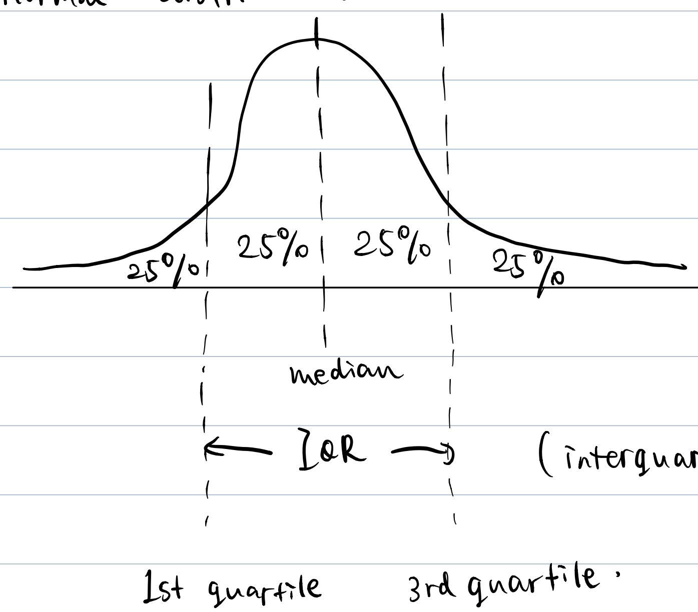
R code: qnorm (0.20) * 2.5 + 4.3. (2.196)

or: qnorm (0.20, mean = 4.3, sd = 2.5) (2.196)

Problem 12 & 13.

		(median)	
Special case of quantile { Quartiles :	1st quartile	2nd quartile	3rd quartile.
Percentiles:	25th perc.	50th perc.	75th perc.
Quantile : (Most general)	0.25 quantile	0.50 quantile	0.75 quantile

For normal distributions :



(interquartile range).

R code: qnorm(0.75) − qnorm(0.25)

or using symmetricity:

2 * qnorm(0.75)

} (1.349). IQR.

qnorm(0.75) (0.674)

qnorm(0.25) (−0.674).

Problem 15.

Outcome : of a probability model

For this model, the outcomes are $\{1,2,3,4,5,6\}$

(a) is a event, $\{2,4,6\}$. X

The result could be divided by 5 — event $\{5\}$

The " " " " 7 — event ϕ.

The "2" — outcome 2.

(b) (c) not related to the prob. model X.

(d) ✓

Problem 16. We want an outcome.

Outcome set = { · , · , ... } (names of 20 participants).

(a) (b) (c) all describe a group of individuals.

So they are events. ✗

(d) presumes that there should be only one participant named Wilhelmina.

belongs to the outcome set.

It refers to this participant. ✓

Problem 17. outcomes = $\{1,2,3,4,5,6\}$.

(a) $\{3,4\}$. ✓

(b) This a situation could happen when we are really rolling a die.
But, it is not contained in the prob. model.
⇒ Not an event ✗.

(c) Not related ✗.

Appendix: problem 7.

x = velocities. $E[x] = \mu$, $sd(x) = s$.

$$z = \frac{x-\mu}{s}, \quad E[z] = \frac{E[x]-\mu}{s} = \frac{\mu-\mu}{s} = 0.$$

$$sd(z) = sd\left(\frac{x-\mu}{s}\right) = \frac{1}{s} sd(x-\mu) = \frac{1}{s} sd(x) = \frac{s}{s} = 1.$$

$\Rightarrow$ Standardized random variables / samples always have mean 0, sd 1.