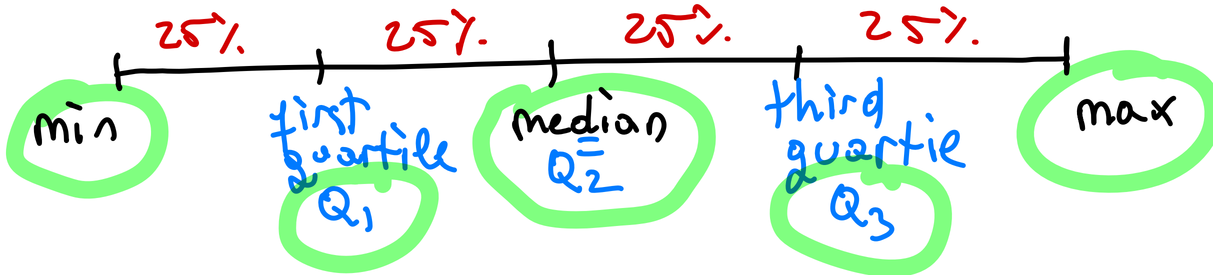
Measures of relative position are used to describe data values relative to other data values.

Quartiles separate the data into 4 equal parts.



Example 3. Consider the following data set.

1; 1; 2; 2; 4; 6; 6.8; 7.2; 8; 8.3; 9; 10; 10; 11.5

Five number summary is a list of the following values

$\min = 1$

$Q_1 = 2$

$Q_2 = \text{median} = (6.8 + 7.2)/2 = 7$

$Q_3 = 9$

$\max = 11.5$

Example 4. Listed the ages of the 46 US Presidents when entered office in order from smallest to largest.

42; 43; 46; 46; 47; 47; 48; 49; 49; 50; 51; 51; 51; 51; 51; 52; 52; 54; 54; 54; 54; 54; 55; 55; 55; 55; 56; 56; 56; 57; 57; 57; 57; 58; 60; 61; 61; 61; 62; 64; 64; 65; 68; 69; 70; 78

$\min = 42$

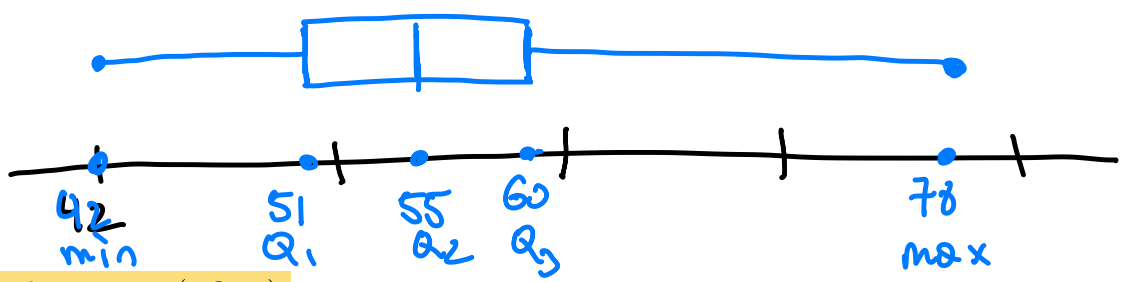
$Q_1 = 51$

$Q_2 = 55$

$Q_3 = 60$

$\max = 78$

Boxplot is a visual representation of the 5 number summary. (box and whiskers plot)



InterQuartileRange(IQR)

$IQR = Q_3 - Q_1$

middle 50% of data

$IQR = Q_3 - Q_1 = 60 - 51 = 9$ years

Outlier value outside the norm.

A data value is a (low) outlier if it's less than $\boxed{Q_1 - 1.5(IQR)}$. *

A data value is a (high) outlier if it is more than $\boxed{Q_3 + 1.5(IQR)}$ *

Example 5. Use age of presidents example to determine if there are any outliers.

Calculate: $Q_1 - 1.5(IQR) = 51 - 1.5(9)$
$= 37.5$ years

$Q_3 + 1.5(IQR) = 60 + 1.5(9) = 73.5$ years

78 is an outlier

Math 142: Wednesday, September 25th, Day 12 Notes

Agenda for Wednesday, Sep 25th 2024

Coming up

- ! HW 8 due Monday, Sept 30th
- ! Second **Excel Homework** posted and it is due Wednesday, Oct 2nd
- Student Hours today from 3:45pm-5pm and Thursday, 1-2:15pm
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Section 4.1 Terminology Probability

Experiment: is an action where the results are random

Example 1. Examples of experiments:

· rolling a die
- tossing a coin

Outcome: a single result from performing the experiment once.

Sample Space: of an experiment is a list of all the possible outcomes.
we denoted with S.

$$S = \underbrace{\{1,2,3,4,5,6\}}_{\text{all possible outcomes when rolling a die}}$$

the number of all possible outcomes is called the size of the sample space

$n(S) = 6$

Example 2. What is the sample space for Rolling a 6-sided die and flipping a coin?

$S =$ {1T, 1H, 2T, 2H, 3T, 3H, 4T, 4H, 5T, 5H, 6T, 6H}

$n(S) =$ 12

Event is a subset (smaller lis) of the sample space.

ex: rolling a 1 when tossing a coin and rolling a die.

Example 3. Rolling a number less than three and tails

$E =$ {1T, 2T} $n(E) =$ 2

There are two basic ways to calculate probabilities: theoretical probability and empirical probability.

Classical (Theoretical) Probability is used when all the outcomes in the sample space are equally likely.

$$\underbrace{P(E)}_{\text{the probability of event } E \text{ happening}} = \frac{n(E)}{n(S)}$$

E → rolling even number die

ex: $P(E) = \frac{3}{6} = \frac{1}{2}$

ex: $P(E) = \frac{2}{12} = \frac{1}{6}$

E:

Rounding Rule for probability:

Always round to 3 significant digits!

ex: .000030680

.0000307

Example 4. Classical probability Experiment: Rolling a fair 12 sided die.

S = {1, 2, ... , 12}   n(S) = 12

Event A: rolling a prime number   A = {2, 3, 5, 7, 11}

Event B: rolling a number divisible by 5   B =

Event C: rolling a number greater than 4 which is divisible by 3

C =

Find the following probabilities.

P(A) = $\frac{5}{12}$

P(B) =

P(C) =

Empirical (Experimental) Probability

Example 5. Julia made a die for a game. It had 5 faces, labeled 1-5. Because of the shape of the die, it was biased in favor of rolling a 3. She experimented to estimate how likely it was for a 3 to be rolled. Julia rolled the die 100 times, and the number of times she rolled a 3 was 45.

Example 6. Empirical Probability: Choosing a student from a survey

	Accounting	Non Accounting
Freshman	20	50
Soph	14	56

1. What is the probability of choosing a student who is majoring in accounting?

2. What is the probability of choosing a student who is a sophmore?

3. What is the probability of choosing a student who is not majoring in accounting?

Properties of Probability

1. For any event A, $\mathbf{0 \leq P(}A\mathbf{) \leq 1}$. That is, the probability of any event is always a number between 0 and 1.
2. The probability of any event A is equal to the sum of the probabilities of the individual outcomes in A.
3. The sum of the probabilities of all outcomes in S must equal 1. This is true whether S consists of equally likely outcomes.