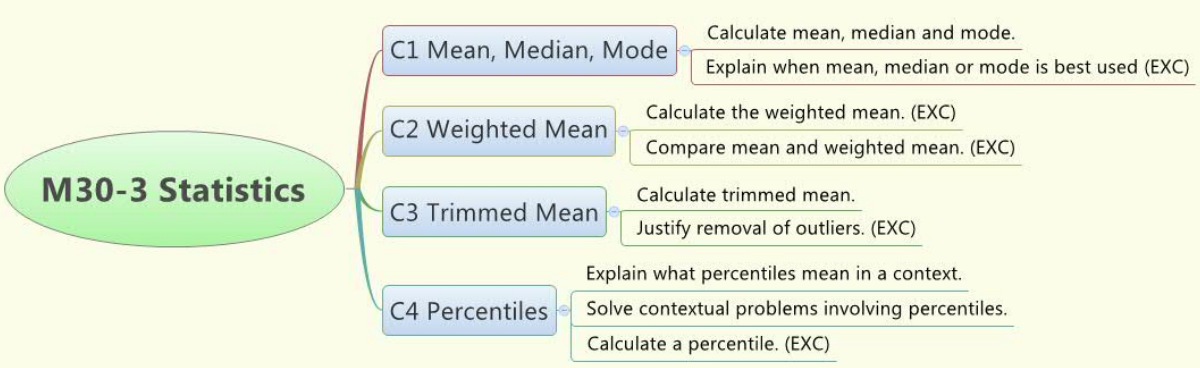
M30-3 Statistics Notes



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C1 MEAN, MEDIAN, MODE

Statistics: collecting and analyzing numerical data.

Data is often stored in tables. The following are two types of tables that are commonly used to store larger amounts of data. For each table, write the data stored in the table as a list.

Stem & Leaf

"Golf Scores"

Stem (tens)	Leaf (ones)
7	4 5 5 6
8	0 6 8
9	1 4 7
10	2

74, 75, 75, 76, 80, 86, 88, 91, 94, 97, 102

Frequency

"Shoe Sales"

Shoe Size	Frequency
7	3
8	4
9	6
10	3
11	2

7, 7, 7, 8, 8, 8, 9, 9, 9, 9, 9, 9, 10, 10, 10, 11, 11

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Mean

Mean: -the average of the data values.

-add the data values and divide the total by the number of data values.

Example: A student earned the following marks on various quizzes.
What was the average quiz mark?

"Quiz Marks"

Stem (tens)	Leaf (ones)
7	2 4 8
8	3 6
9	0 5

$$\frac{72+74+78+83+86+90+95}{7}$$

$$= \frac{578}{7}$$

$$= 82.6\%$$

Practice: pg. 76: 1ace, 3

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Median

Median: -the middle number in a set of the data values arranged in order.

-when there is an even number of data, average the two middle values to find the median.

Example: Determine the median of 7, 12, 8, 6, 23,14, 21.

6, 7, 8, (12), 14, 21, 23

Median = 12

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Median

Example: A fish and wildlife officer records the weights of trout caught in a lake. Their weights to the nearest tenth of a pound are 2.9, 1.5, 2.8, 1.1, 1.0, 2.7, 3.0, 1.6, 1.9, 2.9. (MathAtWork12 pg. 70)

a) Determine the median weight.

1.0, 1.1, 1.5, 1.6, 1.9, 2.7, 2.8, 2.9, 2.9, 3.0

Median = $\frac{1.9+2.7}{2}$

= 2.3

Practice: pg. 71: 1ac, 2, 3bc

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Mode

Mode: -the number that occurs most frequently in a set of data.

-a data set can have no mode, one mode or more than one mode.

Example: Determine the mode of the golf scores below.

"Golf Scores"

Stem (tens)	Leaf (ones)
7	4 5 5 6
8	0 6 8
9	1 4 7
10	2

Mode = 75

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Mode

Example: Determine the mode of the shoe sales below.

"Shoe Sales"

Shoe Size	Frequency
7	3
8	4
9	6
10	3
11	2

Mode = 9

Practice: pg. 68: 1b, 2, 4, 6

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What's Best: Mean, Median or Mode

Determine the mean, median and mode for the following data.
Which measure of central tendency is the best? Why?

A local "Dollar Store" sells items for $1.00, $1.50, $2.00, $2.50 and $3.00. The owner wants to know which pricing category is the most popular and collects the data below.

Item Price	Frequency
$1.00	6
$1.50	4
$2.00	7
$2.50	2
$3.00	1

Mode is best used for categorical data and when looking for the typical or most popular data.

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What's Best: Mean, Median or Mode

Determine the mean, median and mode for the following data.
Which measure of central tendency is the best? Why?

The house prices in a neighbourhood are as follows:

- $325,000
- $350,000
- $290,000
- $365,000
- $345,000
- $370,000
- $650,000
- $800,000

Median is best used for continuous data that has extreme values that do not reflect the typical data.

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What's Best: Mean, Median or Mode

Determine the mean, median and mode for the following data.
Which measure of central tendency is the best? Why?

The table shows the number of hours per week that Sam has worked at his part-time job.

Week	# of Hours
1	12
2	14
3	9
4	11
5	13

Mean is best used for continuous data that does not have extreme values.

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What's Best: Mean, Median or Mode

Summary:

Mean is best used for continuous data that does not have extreme values.

Median is best used for continuous data that has extreme values that do not reflect the typical data.

Mode is best used for categorical data and when looking for the typical or most popular data.

Practice: pg. 77: 1
pg. 78:3
pg. 79:4,6

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C2 WEIGHTED MEAN

A student achieves the following marks in each of the units of her math course.
Determine the average mark for the student.

Probability & Statistics	80%
Linear Relations	70%
Number	65%
Geometry	78%
Measurement & Trig	84%

$$\text{Average} = \frac{80+70+65+78+84}{5}$$

$$= 75.4\%$$

What is the weighted mean, if each unit has the following weightings?

- Probability & Statistics counts for 10%
- Linear Relations counts for 30%
- Number counts for 35%
- Geometry counts for 15%
- Measurement & Trig counts for 10%

Unit	Weight	Mark	Weight × Mark
Prob. + Stats	10%	80%	800
Lin. Rel.	30%	70%	2100
Number	35%	65%	2275
Geometry	15%	78%	1170
Meas. + Trig	10%	84%	840
Totals	100%		7185

$$\text{Weighted Mean} = \frac{\text{Total Weight} \times \text{Mark}}{\text{Total Weight}}$$

$$= \frac{7185}{100} = 71.85\%$$

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Your Turn

The table shows Janelle's history marks: (MathAtWork12 pg. 75)

Course Work	Mark (%)
Homework	80
Quizzes	77
Projects	75
Oral Presentations	82
Exams	72

a) What is the average of Janelle's marks?

b) What is the weighted mean, if each area has the following weightings?

- homework counts for 20%
- quizzes count for 20%
- projects count for 10%
- oral presentations count for 10%
- exams count for 40%

Practice: Case Studies pg. 75: 2,5

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C3 TRIMMED MEAN

Range: the difference between the largest value and the smallest value of a data set.

= largest value - smallest value

Outlier: a value that is much smaller or larger than the other data values. May be none, one, or more than one outlier.

Example: Determine the range and outliers for each data set.

a) Points per Game: 16, 14, 18, 20, 44, 15, 18, 5, 16

Range = 44 - 5 = 39 Outliers = 5, 44

b) Annual Snowfall (cm): 120, 115, 123, 118, 122, 115

Range = 123 - 115 = 8 Outliers: None

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Trimmed Mean

Trimmed Mean: -a calculation of the mean after removing the highest and lowest values.

-you must remove the same # of values from the top and bottom of the data set.

-removal of outliers may result in a more accurate mean.

Example: Determine the mean and trimmed mean for the # of points per game.

Points per Game: 16, 14, 18, 20, ~~44~~, 15, 18, ~~5~~, 16

Mean $= \frac{16+14+18+20+44+15+18+5+16}{9}$ $= 18.4$

Trimmed Mean $= \frac{16+14+18+20+15+18+16}{7}$ $= 16.7$

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Practice (Mini-Boards)

Judges in a gymnastics competition gave the following scores, in points, to 14 competitors: 8.5, 9.0, 6.9, 7.5, 7.0, 9.5, 10.0, 5.0, 8.0, 8.0, 7.5, 7.5, 6.8, 6.8.

(MathAtWork12 pg. 84)

5.0, 6.8, 6.8, 6.9, 7.0, 7.5, 7.5, 7.5, 8.0, 8.0, 8.5, 9.0, 9.5, 10.0

a) Determine the range.

b) Determine the mode, median, and average, to one decimal place.

c) Identify any outlier(s). What might have caused the outlier(s)?

d) Remove the lowest and highest scores and calculate the trimmed mean.

a) Range $= 10 - 5 = 5$

b) mode $= 7.5$

median $= \frac{7.5+7.5}{2} = 7.5$

mean $= 7.7$

c) Outlier $= 5.0$

The gymnast tripped?

d) Trimmed Mean (Remove 5 and 10) $= 7.75$

Practice: pg. 85-86: 1-5

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C4 PERCENTILES

Percentile: a value below which a certain percent of the data falls.

e.g. The median is the 50th percentile because 50% of the values in the data set are below the median.

Practice: Explain what the following percentiles mean.

a) A baby born with a weight of 7 lbs is in the 75th percentile.

75% of babies weigh less than this baby.

b) A cross-country skier finished a race in the 90th percentile.

90% of the skiers finished after this skier.

c) On a test, a student scored in the 60th percentile.

The student scored better than 60% of the class.

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Solving Problems involving Percentiles

Many percentile problems involve using percentages to determine the number of data values below or above a certain value.

Examples: a) Martha is in the 75th percentile for height in her class. If her class has 700 students, how many students are shorter than Martha?

$0.75(700) = 525$

525 students are shorter than Martha.

b) 40 students wrote a Math exam. John got the same grade as 2 other students. If John is in the 60th percentile, how many students got a higher grade than John?

Below John → $0.60(40) = 24$

Same as John → John + 2 = 3

Above John → $40 - 24 - 3 = 13$

40

13 students got a higher grade than John.

Practice: Percentile Problems Handout

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Calculate Percentiles

$$Percentile = \frac{\#\ of\ data\ values\ below}{total\ \#\ of\ data\ values}\ x\ 100$$

Examples: a) On a math quiz, Susie had the 4th highest mark out of 40 students. What is the percentile for Susie's mark on this quiz?

Percentile = $\frac{36}{40} \times 100$ = 90th percentile

36 people scored less than Susie.

b) The students in a drama class earned the following grades on a presentation:

75%, 76%, 77%, 79%, 80%, 81%, 82%, 84%, 85%, 87%, 88%, 89%, 90%, 91%, 92%, 94%, 95%, 96%, 98%, 100%

Megan earned a grade of 80%. What is the percentile for her grade?

Percentile = $\frac{4}{20} \times 100$ = 20th percentile

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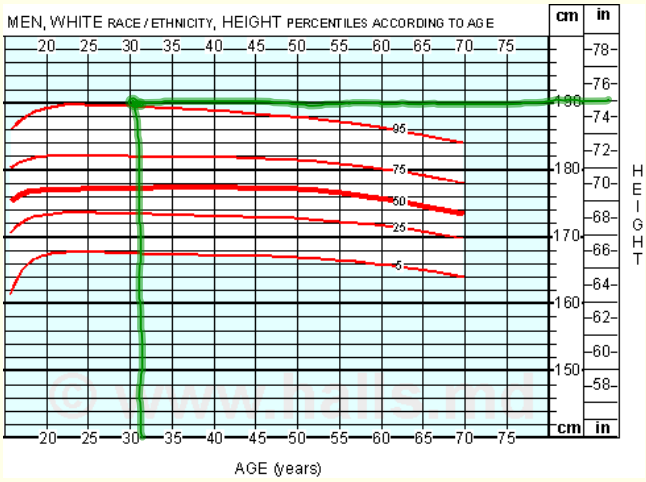
Percentile Charts

Discuss percentile charts.



A 6'3" (75") white male in his early 30's would be just above the 95th percentile.

Practice: Use growth chart handout to find your height and weight percentile. (Tape Measures)
Text pg. 90-91: 5,6

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