

Problem Set 1.2 - Numerical Descriptive Measures

Wackerly SS1.3 - practice copy, Mathematical Statistics I, Fall 2026

This is one randomly generated version of the set. Every student receives different numbers, so the values here will not match your own copy — follow the method, not the arithmetic.

Problem 1

seed 20260912

A junior analyst records the monthly excess returns (%) of a small-cap stock over 6 months:

10, 2, 15, 3, 7, 1

Using the computational formula $s^2 = \frac{1}{n-1} \left[\sum y_i^2 - \frac{(\sum y_i)^2}{n} \right]$, find:

- (a) the sample mean _____
- (b) the sample variance _____
- (c) the sample standard deviation _____

Problem 2

seed 20260912

A quant records the absolute day-over-day price change (in cents) of a small-cap stock over 10 trading days:

51, 38, 59, 39, 46, 36, 46, 41, 24, 28

- (a) Use the range (range $\div$ 4) to approximate the standard deviation _____
- (b) Calculate the actual sample standard deviation _____

Problem 3

seed 20260912

An insurer records seven claims on a small book, in thousands of manat:

32, 20, 39, 21, 27, 19, 300

Give each answer to at least four significant figures.

- (a) The sample mean is _____ thousand.
- (b) The sample median is _____ thousand.
- (c) The mean minus the median is _____ thousand.

Problem 4

seed 20260912

A fund's **270** daily percentage returns have sample mean $\bar{y} = 0.16\%$ and sample standard deviation $s = 1.9\%$. Nothing is known about the shape of the distribution, so the empirical rule is not available.

Apply Tchebysheff's theorem with $k = 4$. Give each answer to at least four significant figures; the count in part (d) need not be a whole number.

(a) At least what **proportion** of the days must lie within k standard deviations of the mean? _____

(b) The lower endpoint of that interval is _____ %.

(c) The upper endpoint is _____ %.

(d) At least how many of the **270** days must lie inside the interval? _____

Problem 5

seed 20260912

A bank times **880** loan applications through its processing system. The times are mound-shaped and roughly symmetric, with mean **424** seconds and standard deviation **33** seconds.

Give each answer to at least four significant figures; the count need not be a whole number.

(a) About 68% of the times lie between _____ and _____ seconds.

(b) The lower endpoint of the interval holding about 95% is _____ seconds.

(c) About how many of the **880** applications fall within two standard deviations of the mean? _____

Problem 6

seed 20260912

Daily settlement values at a custodian are mound-shaped and roughly symmetric, with mean **122** million manat and standard deviation **14** million. The record covers **590** days.

Give each answer to at least four significant figures; the count need not be a whole number.

(a) Two standard deviations above the mean is _____ million.

(b) By the empirical rule, what proportion of days lie **outside** $\bar{y} \pm 2s$ altogether? _____

(c) What proportion lie above $\bar{y} + 2s$? _____

(d) On about how many of the **590** days did settlement exceed **150** million? _____

Problem 7

seed 20260912

An analyst holds **400** daily percentage returns with mean $\bar{y} = 0.16\%$ and standard deviation $s = 1.9\%$. She is interested in the interval $\bar{y} \pm 2s$.

Give each answer to at least four significant figures; the counts need not be whole numbers.

(a) How many of the **400** days does **Tchebysheff's theorem** guarantee lie inside that interval? _____

(b) If the returns were mound-shaped and roughly symmetric, how many would the **empirical rule** put inside it?

(c) By how many days do the two figures differ? _____

Problem 8

seed 20260912

A colleague has already summarised a sample of $n = 10$ monthly fee revenues (in thousands of manat) and gives you only the two sums:

$$\sum_{i=1}^{10} y_i = 563, \quad \sum_{i=1}^{10} y_i^2 = 34599$$

The individual figures have been lost. Give each answer to at least four significant figures.

(a) The sample mean is _____

(b) The sample variance is _____

(c) The sample standard deviation is _____

Problem 9

seed 20260912

A risk report gives the daily profit and loss of a desk as having mean **65** thousand manat and **variance 184** thousand manat squared.

Give each answer to at least four significant figures.

(a) The standard deviation is _____ thousand manat.

(b) The lower endpoint of $\bar{y} - 2s$ is _____ thousand.

(c) The upper endpoint $\bar{y} + 2s$ is _____ thousand.

Problem 10

seed 20260912

Six monthly returns have been converted to deviations from their own sample mean, $y_i - \bar{y}$. Five of the six are

$$-3, \quad -5, \quad 7, \quad 5, \quad 6$$

and the sixth has been lost. Give each answer to at least four significant figures.

(a) What must the sixth deviation be? _____

(b) The sample variance s^2 is _____

(c) The sample standard deviation is _____

(d) What value would you have got in (b) by dividing by n instead of $n - 1$? _____

Problem 11

seed 20260912

Monthly gross fees across a bank's accounts have mean **101** manat and standard deviation **16** manat. Every account is then charged the **same** fixed maintenance fee of **25** manat, and the results are finally reported in a foreign currency at **2.7** manat per unit.

Give each answer to at least four significant figures.

- (a) The mean net fee, in manat, is _____
- (b) The standard deviation of the net fee, in manat, is _____
- (c) The mean net fee, in the foreign currency, is _____
- (d) Its standard deviation, in the foreign currency, is _____

Problem 12

seed 20260912

Days-to-settle for a portfolio of trades are recorded only in grouped form:

Days to settle, grouped		
Class	Midpoint	Frequency
[15] up to [$@ 15 + 14 @$]	22	24
[$@ 15 + 14 @$] up to [$@ 15 + 2*14 @$]	36	26
[$@ 15 + 2*14 @$] up to [$@ 15 + 3*14 @$]	50	31
[$@ 15 + 3*14 @$] up to [$@ 15 + 4*14 @$]	64	13

Treat every observation in a class as sitting at that class's midpoint. Give each answer to at least four significant figures.

- (a) How many trades are there? _____
- (b) The grouped-data mean is _____ days.
- (c) The grouped-data variance is _____
- (d) The grouped-data standard deviation is _____ days.

Problem 13

seed 20260912

Daily margin calls at a clearing member have mean **226** thousand manat and standard deviation **23** thousand. The distribution's shape is unknown, so only Tchebysheff's theorem is available.

The risk committee wants an interval, centred on the mean, that is guaranteed to contain at least **0.95** of the days. Give each answer to at least four significant figures.

- (a) What value of k is required? _____
- (b) The lower endpoint of the interval is _____ thousand.
- (c) The upper endpoint is _____ thousand.
- (d) How wide is the interval? _____ thousand.

Problem 14

seed 20260912

A fund has **344** daily returns with mean **56** basis points and standard deviation **18** basis points. Counting directly, **299** of the days fall inside $\bar{y} \pm 2s$.

Give each answer to at least four significant figures.

(a) The lower endpoint of $\bar{y} \pm 2s$ is _____ basis points.

(b) How many days fall **outside** the interval? _____

(c) What proportion of the days actually fall inside? _____

(d) By how much does the actual proportion exceed Tchebysheff's guarantee at $k = 2$? _____

Problem 15

seed 20260912

Two branches report average transaction sizes. Branch A: **49** transactions averaging **89** manat. Branch B: **35** transactions averaging **64** manat.

Give each answer to at least four significant figures; (d) may be negative.

(a) What is the total value of branch A's transactions? _____ manat.

(b) What is the average transaction size across both branches combined? _____ manat.

(c) What would you get by simply averaging the two branch averages? _____ manat.

(d) The correct figure minus that simple average is _____ manat.

Problem 16

seed 20260912

Weekly operating costs for a proprietary trading desk (in \$ thousands), adjusted for inflation, are approximately normally distributed with mean $\mu = 530$ and standard deviation $\sigma = 35$. Next week's budget is set exactly 2 standard deviation(s) above the mean.

(a) The budgeted figure is _____ (\$ thousands).

(b) Using the empirical rule, what is the approximate probability that actual cost exceeds this budgeted figure?
_____ %

Problem 17

seed 20260912

Credit default swap (CDS) spreads (in basis points) for 8 corporate bonds are:

220, 160, 255, 165, 195, 155, 200, 175

(a) Sample mean _____

(b) Sample standard deviation _____

(c) How many of the 8 spreads fall within 1 standard deviation of the mean? _____

(Compare this to the empirical rule's prediction of about 68% of 8, roughly 0.68×8 .)

Problem 18

seed 20260912

Risk scores for 500 advisory clients exhibit a bell-shaped (approximately normal) distribution with mean 59 and standard deviation 10.

(a) Approximately how many clients have a risk score within 1 standard deviation of the mean? _____

(b) Approximately how many clients have a risk score within 2 standard deviations of the mean?

Problem 19

seed 20260912

A volatile small-cap stock had the following daily returns (in basis points) over 15 trading days:

61, 23, 87, 27, 48, 19, 48, 33, -17, -6, 50, -25, 17, 16, -18

(a) Approximate the standard deviation using the range/4 rule. _____

(b) Calculate the actual sample mean _____ and standard deviation _____.

(c) Use Tchebysheff's theorem with $k = 2$ to find values a and b such that at least 75% of the returns lie between them: $a =$ _____, $b =$ _____

(d) What percentage of the 15 actual returns fall between a and b ? _____ % (Confirm that this actual percentage is at least 75%, as Tchebysheff's theorem guarantees.)

Problem 20

seed 20260912

A desk's daily returns over 12 trading days, in basis points, were

51, 19, 72, 23, 40, 16, 40, 28, -14, -5, 42, -21

Give each answer to at least four significant figures.

(a) The sample mean is _____ basis points.

(b) The sample standard deviation is _____ basis points.

(c) The range approximation **range/4** gives _____

(d) The lower endpoint of $\bar{y} \pm 2s$ is _____

(e) What proportion of the 12 returns actually fall inside $\bar{y} \pm 2s$? _____
