Problem Set 1.1 - What Statistics Is

Wackerly SS1.1-1.2 - 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 20260909

A bank has **4550** retail deposit accounts at one branch. To estimate the average balance across all of them, an analyst interviews the holders of **145** accounts chosen at random.

Give the proportion and percentage to at least four significant figures.

(a) How many of the branch's accounts are **not** in the sample? _____

(b) What proportion of the population was sampled? _____

(c) Express that as a percentage. _____ %

Problem 2

seed 20260909

A commercial bank classifies its corporate loans by days past due.

Frequency distribution of the loan book

Days past due	Loans
0 (current)	20
1 to 30	22
31 to 60	31
61 to 90	16
more than 90	29

Give the proportions to at least four significant figures.

(a) How many loans are in the book altogether? _____

(b) The relative frequency of the 31-to-60-day class is _____

(c) The cumulative relative frequency of the first three classes is _____

(d) The relative frequency of loans more than 60 days past due is _____

Problem 3

seed 20260909

A fund's monthly returns over several years are summarised in the relative frequency distribution below. The five classes have equal width and one relative frequency has been lost.

Relative frequency distribution of monthly fund returns

Monthly return (%)	Relative frequency
-6 up to -3	0.1
-3 up to 0	0.18
0 up to 3	0.29
3 up to 6	0.16
6 up to 9	?

Give each answer to at least four significant figures.

(a) The missing relative frequency for the top class is _____

(b) A month is selected at random from this record. The probability that its return falls between -3% and 6% is _____

(c) The probability that it falls **outside** that range is _____

(d) The probability that the return is above 3% is _____

Problem 4

seed 20260909

An analyst has the credit spreads of a portfolio of bonds, in basis points. The smallest is 24 and the largest is 142. She decides on classes of equal width 16 basis points, and — following the book's advice that no measurement should fall on a point of subdivision — starts the first class at 23.5.

(a) What is the range of the data? _____

(b) How many classes of width 16 are needed to span the range? _____

(c) What is the upper boundary of the first class? _____

(d) What is the upper boundary of the last class? _____

Problem 5

seed 20260909

A manufacturer has completed 360 custom contracts. On 93 of them the profit margin exceeded 8%. The firm treats these as a sample from a **conceptual** population: all contracts it might complete, now and in future, at similar settings of contract size and competition.

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

(a) What is the relative frequency of contracts with a margin above 8%? _____

(b) Taking that relative frequency as the probability, what is the probability that the **next** contract has a margin of 8% or less? _____

(c) The firm expects 75 contracts next quarter. If they behave like the historical record, about how many will have a margin above 8%? _____

Problem 6

seed 20260909

Two branches are audited. At branch A, 28 of 74 sampled files contain a documentation error; at branch B, 18 of 79.

Give each proportion to at least four significant figures.

(a) The sample proportion with an error at branch A is _____

(b) At branch B it is _____

(c) Treating the two samples as one sample from the combined population of both branches, the pooled proportion is _____

Problem 7

seed 20260909

A histogram of daily trade counts at a brokerage uses six classes of equal width, with these frequencies:

class 1: 17 class 2: 19 class 3: 24 class 4: 15 class 5: 23 class 6: 29

The analyst decides the picture is too choppy and merges classes into pairs, so classes 3 and 4 become one class of double width.

Give the proportions to at least four significant figures.

(a) The total number of days recorded is _____

(b) The frequency of the merged class (old classes 3 and 4) is _____

(c) Its relative frequency is _____

(d) The relative frequency of the top two classes, 5 and 6, is _____

Problem 8

seed 20260909

Two funds are compared over their whole histories. Fund X has 330 daily returns on record, of which 31 fall in the two worst classes of its histogram. Fund Y has 340 daily returns, of which 18 fall in the two worst classes of its own histogram. The two histograms use the same class boundaries.

Give each answer to at least four significant figures.

(a) The relative frequency in the lower tail for fund X is _____

(b) For fund Y it is _____

(c) The difference, X minus Y, is _____

(d) The ratio of X’s tail proportion to Y’s is _____

Problem 9

seed 20260909

Five equal-width classes of client portfolio values have relative frequencies 9%, 15%, 40%, 13% and one unknown, in order from lowest to highest.

Give each answer as a proportion to at least four significant figures.

(a) The relative frequency of the top class is _____

(b) The cumulative relative frequency through class 2 is _____

(c) The cumulative relative frequency through class 3 is _____

(d) The median lies in class 3. Having passed through class 2, what further proportion of the data must be crossed to reach the median? _____

Problem 10

seed 20260909

Daily settlement volumes at a clearing house run from a low of 37 to a high of 293 thousand instructions.

Give each answer to at least four significant figures; the count in (c) is a whole number.

(a) The range of the data is _____ thousand.

(b) An analyst wants exactly 13 classes of equal width spanning that range. What width must each class have? _____ thousand.

(c) A colleague prefers a round width of 18 thousand instead. How many classes of that width are needed to span the range? _____

Problem 11

seed 20260909

An insurer has 10800 policies in force. An auditor examines 250 of them chosen at random and finds 47 to be mispriced.

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

(a) The sample proportion mispriced is _____

(b) Estimate how many of the 10800 policies in force are mispriced. _____

(c) Estimate how many are correctly priced. _____

Problem 12

seed 20260909

Two analysts, working independently, each draw a random sample from the **same** population of outstanding invoices and record how many are more than 30 days old. The first samples 130 invoices and finds 56; the second samples 140 and finds 34.

Give each answer to at least four significant figures.

(a) The first analyst’s sample proportion is _____

(b) The second analyst's sample proportion is _____

(c) The absolute difference between the two is _____

(d) Pooling both samples into one gives a proportion of _____

Problem 13

seed 20260909

A histogram of 1000 settled trades groups them into three bands by settlement delay. 16% fall in the same-day band and 35% in the one-to-two-day band.

The counts below are whole numbers; give the proportion to at least four significant figures.

(a) How many trades are in the same-day band? _____

(b) What percentage fall in the band of three days or more? _____ %

(c) How many trades is that? _____

(d) Express the one-to-two-day percentage as a relative frequency. _____

Problem 14

seed 20260909

A histogram of loan sizes uses **five classes of equal width**, with relative frequencies 6%, 17%, 42%, 15% and one unknown, in order from smallest loans to largest.

Consider the interval covered by the two lowest classes. Give each answer as a proportion to at least four significant figures; (c) may be negative.

(a) The relative frequency of the top class is _____

(b) What fraction of the **measurement axis** spanned by the histogram do the two lowest classes cover?

_____

(c) What fraction of the **area** under the histogram lies over them? _____

(d) By how much does the area share exceed the axis share? _____

Problem 15

seed 20260909

An insurer records claim sizes in six classes of equal width, from smallest to largest:

class 1: 56 class 2: 69 class 3: 49 class 4: 15 class 5: 9 class 6: 8

Give the proportions to at least four significant figures.

(a) How many claims are recorded? _____

(b) The relative frequency in the two lowest classes is _____

(c) The relative frequency in the two highest classes is _____

(d) The lower two exceed the upper two by _____

Problem 16

seed 20260909

A histogram of 580 daily trading volumes has one class running from 35 to 49 lots, containing 64 days. A further 48 days fall in classes entirely above 49.

The desk wants to know how often volume exceeded the midpoint of that class. Assume the 64 days are spread evenly across the class.

Give the proportion to at least four significant figures.

(a) What is the midpoint of the class? _____ lots.

(b) Under the even-spread assumption, how many of the 64 days lie above the midpoint? _____

(c) How many days in total had volume above the midpoint? _____

(d) What proportion of all 580 days is that? _____

Problem 17

seed 20260909

A histogram of corporate bond maturities has several classes. The three shortest classes contain 56, 59 and 56 bonds. The analyst reports that the remaining classes together hold 28% of the portfolio.

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

(a) How many bonds are in the portfolio altogether? _____

(b) How many bonds are in the remaining classes? _____

(c) What is the relative frequency of the shortest class? _____

Problem 18

seed 20260909

Five equal-width classes of customer waiting times at a bank branch, from shortest to longest, contain

class 1: 41 class 2: 59 class 3: 65 class 4: 22 class 5: 15

Give the proportions to at least four significant figures.

(a) How many customers were timed? _____

(b) What proportion waited long enough to fall in class 4 or class 5? _____

(c) What proportion fell below class 4? _____

(d) What proportion fell in class 3 or above? _____

Problem 19

seed 20260909

The daily returns of an equity fund are grouped into five classes of equal width:

Frequency distribution of daily returns

Daily return (%)	Days
-4.0 up to -2.0	18
-2.0 up to 0.0	42
0.0 up to 2.0	76
2.0 up to 4.0	36
4.0 up to 6.0	20

Give the proportions to at least four significant figures.

(a) How many trading days are in the record? _____

(b) The relative frequency of the class 0.0 up to 2.0 is _____

(c) A day is drawn at random from the record. The probability its return lies between -2.0% and 4.0% is _____

(d) The probability it lies outside that interval is _____

(e) The probability the return is at least 2.0% is _____

Problem 20

seed 20260909

A machining firm has completed 240 custom contracts. Of these, 19 lost money and a further 56 returned a margin below 5%; the rest returned 5% or more. The firm regards this record as a sample from the conceptual population of all contracts it might take on at similar settings of contract size and competition.

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

(a) The relative frequency of loss-making contracts is _____

(b) The relative frequency of contracts returning 5% or more is _____

(c) Taking the relative frequency as the probability, the probability that the **next** contract loses money is _____

(d) The firm plans 55 contracts next year. About how many would you expect to lose money? _____