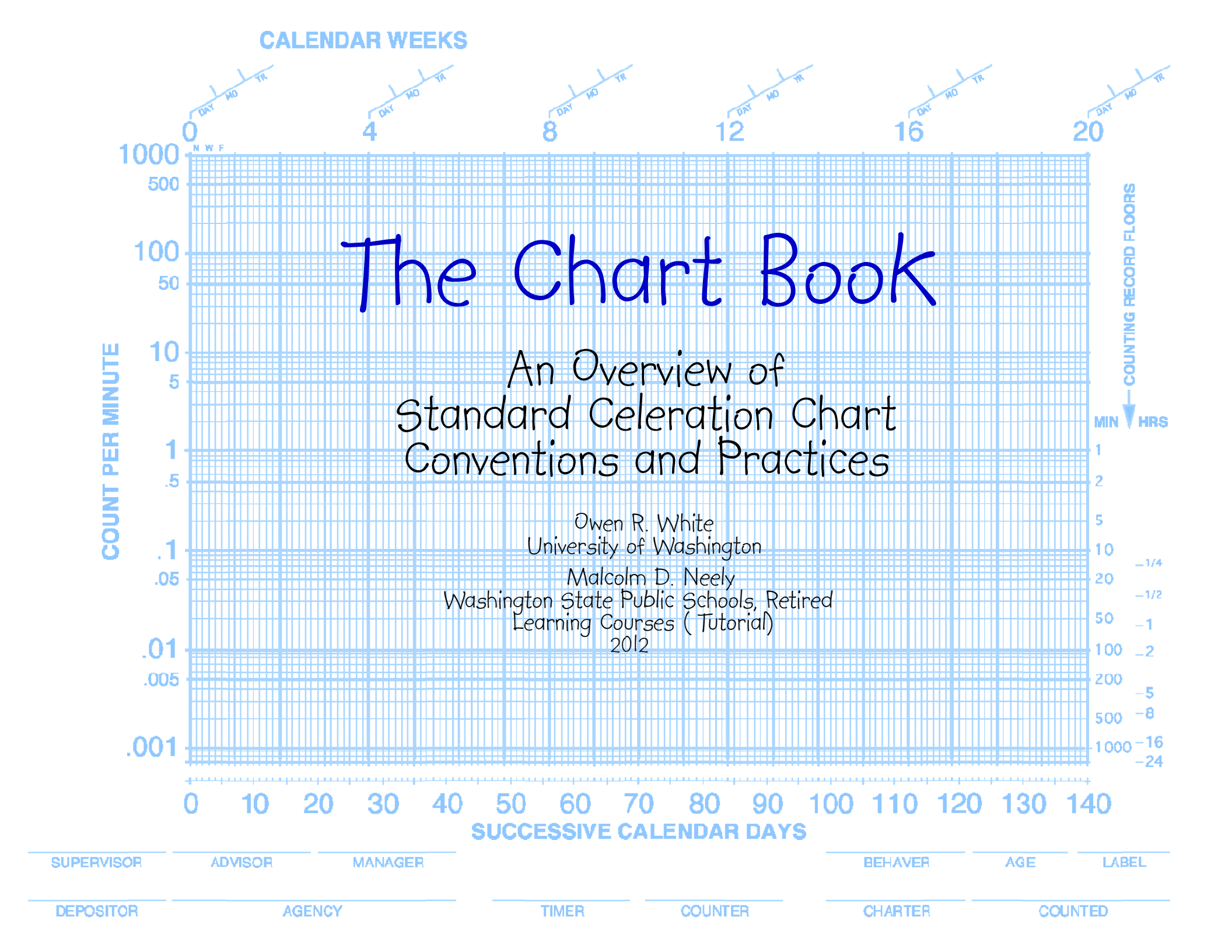

The Chart Book

An Overview of Standard Celeration Chart Conventions and Practices

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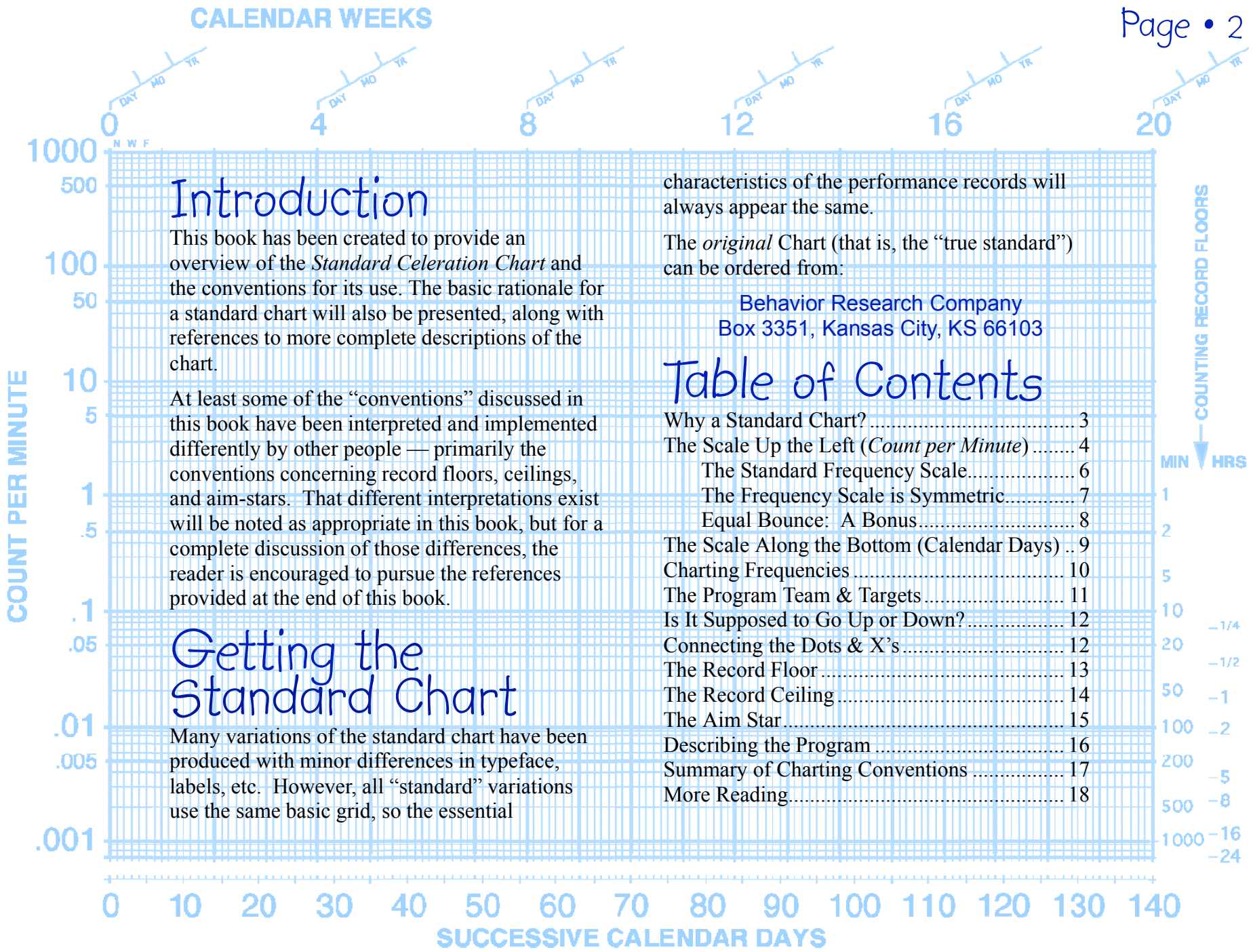
2012



Introduction

This book has been created to provide an overview of the *Standard Celeration Chart* and the conventions for its use. The basic rationale for a standard chart will also be presented, along with references to more complete descriptions of the chart.

At least some of the "conventions" discussed in this book have been interpreted and implemented differently by other people — primarily the conventions concerning record floors, ceilings, and aim-stars. That different interpretations exist will be noted as appropriate in this book, but for a complete discussion of those differences, the reader is encouraged to pursue the references provided at the end of this book.

Getting the Standard Chart

Many variations of the standard chart have been produced with minor differences in typeface, labels, etc. However, all "standard" variations use the same basic grid, so the essential characteristics of the performance records will always appear the same.

The *original* Chart (that is, the "true standard") can be ordered from:

Behavior Research Company
Box 3351, Kansas City, KS 66103

Table of Contents

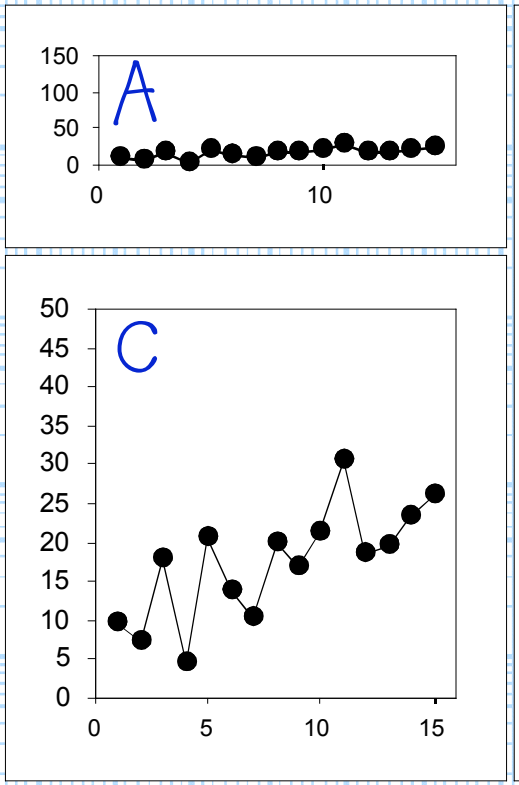
CALENDAR WEEKS

Why a Standard Chart?

To Save Time. The main reason we use a standard chart is to save time. In the late 1960's, when Ogden Lindsley began helping teachers track their pupils' progress so they could make timely and precise instructional decisions, he discovered that evaluating and communicating information about progress could be a very time consuming business:

> The teachers shared their progress on these behavior change projects by showing charts in class each week. It took 20 to 30 minutes to share one behavior project because most of this time was spent describing each teacher's unique charting and recording system. (p. 11, Lindsley, O. R., 1990, Precision teaching: By teachers for children. *Teaching Exceptional Children*, 22(3), 10-15)

For example, a quick examination of the three charts shown at the right suggests projects with three very different outcomes. Chart "A" shows hardly any progress at all; Chart "B" shows terrific progress, and chart "C" shows progress that's somewhere in-between.



Actually, all three charts show the *same performance record*, they just use different scales and proportions. To realize they all present the

COUNT PER MINUTE: 1000, 500, 100, 50, 10, 5, 1, .5, .1, .05, .01, .005, .001

COUNTING RECORD FLOORS: MIN 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 — HRS ¼, ½, 1, 2, 5, 8, 16, 24

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

SUCCESSIVE CALENDAR DAYS

SUPERVISOR | ADVISOR | MANAGER | BEHAVER | AGE | LABEL

DEPOSITOR | AGENCY | TIMER | COUNTER | CHARTER | COUNTED

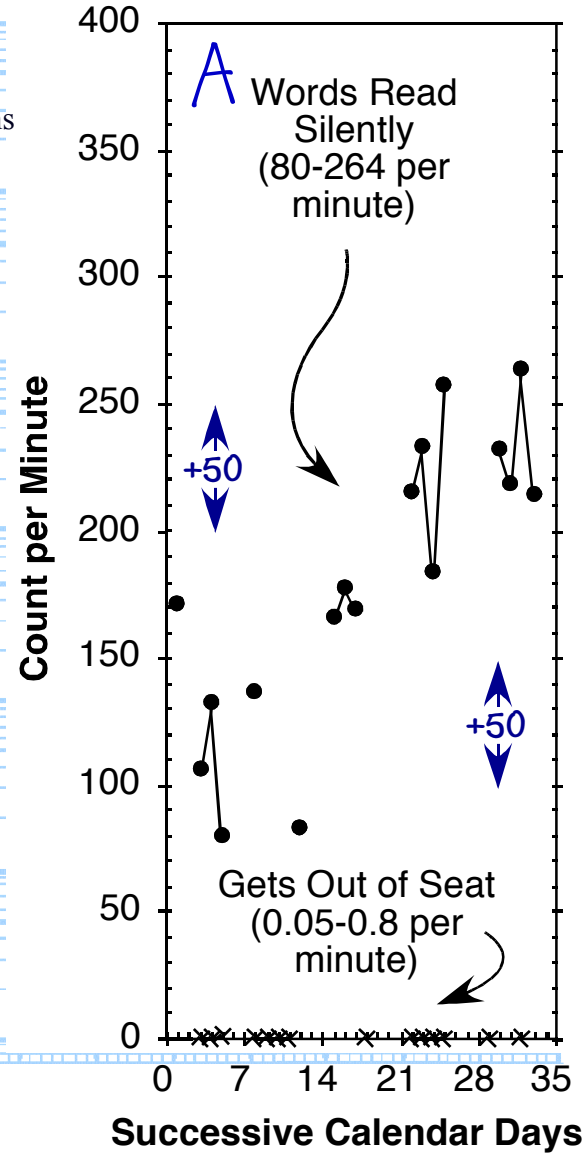
same data, though, we need to read the numbers on the scales *very* carefully, then compare the scales from one chart to the next. If we always use the same chart, we can get used to the scales & proportions of the chart and interpret them much more quickly. Indeed, after Lindsley's teachers got used to their standard chart, they spent practically no time at all discussing the chart, and all their time evaluating their pupils' progress.

The Scale Up the Left (Count per Minute)

We need to be very careful in selecting a chart to use as a standard. The most *common* type of chart uses what Lindsley calls "*add-subtract*" or "*equal-interval*" scales. An example is shown on the right.

It's called an "add-subtract" chart because adding or subtracting the same number anywhere on the vertical ("count per minute") scale shows a change that looks the same size. For example, a change from a count of 200 to 250 per minute (a "plus 50" change) looks the same size as a change from 50 to 100 (also a "plus 50") change.

The scale up the left of the chart shown here goes from zero to a frequency of 400 per minute — a nice range for showing the progress of a learner's "words read silently." Unfortunately, that same scale cramps all of the learner's "out of seat" frequencies into a space so low on the chart that we can't see any of the changes that are occurring in *that* behavior.



CALENDAR WEEKS

0 4 8 12 16 20

If we adjust the size of the scale up the left of the chart so we can clarly see changes in "out of seat," it would take a *very* big chart to show "silent reading" behavior on the same scale (see chart "B"). A standard chart with this sort of scale simply won't work for a wide range of behaviors.

Fortunately, there's another type of scale that works quite well.

COUNT PER MINUTE

1000 500 100 50 10 5 1 .5 .1 .05 .01 .005 .001

Count per Minute

0.8 0.7 0.6 0.5 0.4 0.3 0.2 0.1 0

B

Words Read Silently (80-264 per minute) would not show on this scale unless the chart was extended an additional 123 feet!

Gets Out of Seat (0.05-0.8 per minute)

0 7 14 21 28 35

Successive Calendar Days

0 10 20 80 90

SUCCESSIVE CALENDAR DAYS

Figure "C" uses a "ratio" or "times-divide" scale.

On this type of scale, multplying or dividing by the same factor will produce changes that look the same size. For example, going from 10 to 50 (a "times-5" or "x5" change) looks the same as going from 1 to 5 (also a x5 change).

A times-divide scale allows us to see the patterns of change in both behaviors — high frequency reading and low frequency out-of-seat — very clearly.

This is the scale used on the Standard Celeration Chart.

1000 100 10 1 0.1 0.01 0.001

C

x5

Words Read Silently (80-264 per minute)

x5

Gets Out of Seat (0.05-0.8 per minute)

COUNTING RECORD FLOORS

MIN HRS

1 2 5 10 20 50 100 200 500 1000

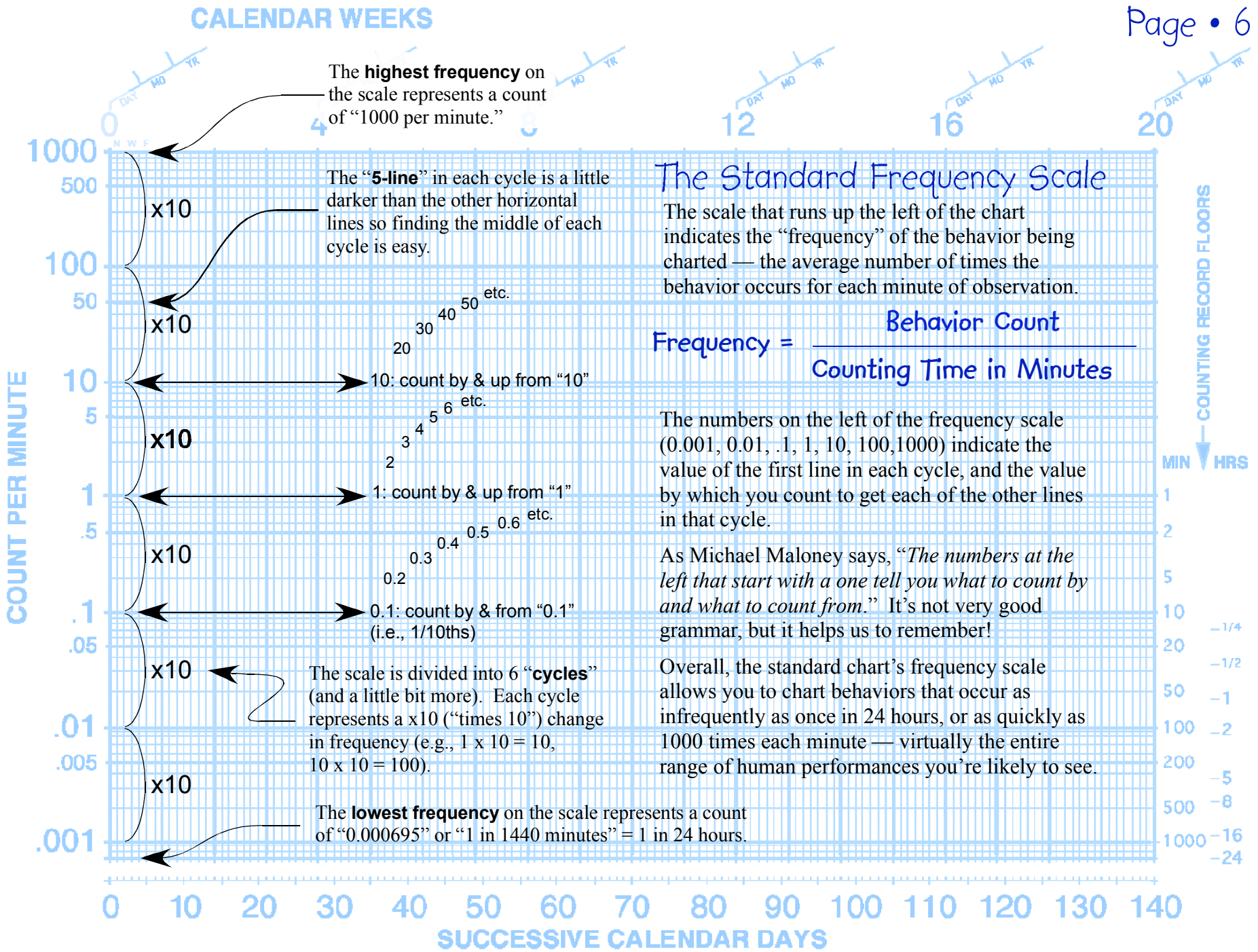
1/4 1/2 1 2 5 8 16 24

0 7 14 21 28 35

Successive Calendar Days

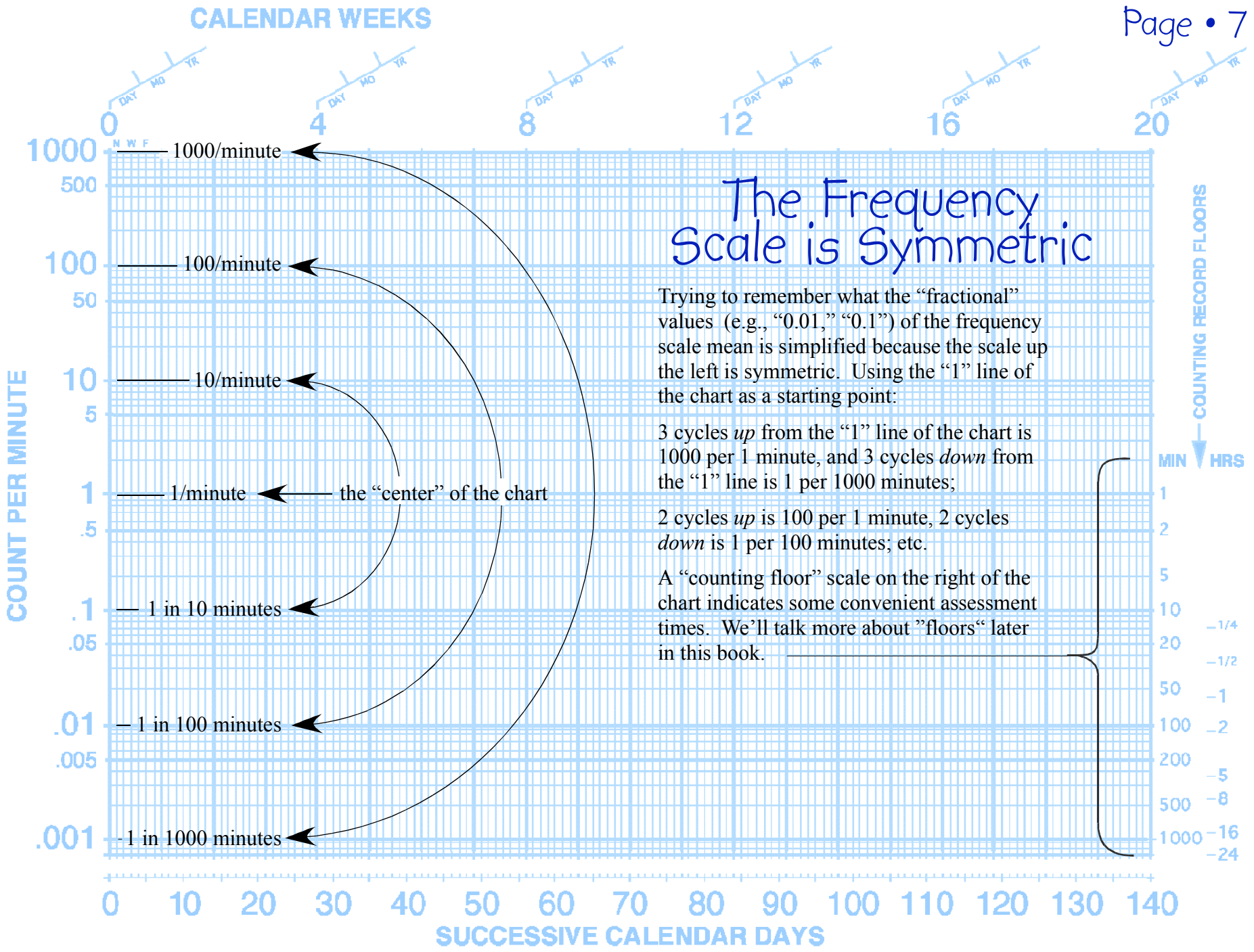
SUPERVISOR ADVISOR MANAGER BEHAVER AGE LABEL

DEPOSITOR AGENCY TIMER COUNTER CHARTER COUNTED



SUPERVISOR | ADVISOR | MANAGER | BEHAVER | AGE | LABEL

DEPOSITOR | AGENCY | TIMER | COUNTER | CHARTER | COUNTED



The Frequency Scale is Symmetric

Trying to remember what the "fractional" values (e.g., "0.01," "0.1") of the frequency scale mean is simplified because the scale up the left is symmetric. Using the "1" line of the chart as a starting point:

3 cycles *up* from the "1" line of the chart is 1000 per 1 minute, and 3 cycles *down* from the "1" line is 1 per 1000 minutes;

2 cycles *up* is 100 per 1 minute, 2 cycles *down* is 1 per 100 minutes; etc.

A "counting floor" scale on the right of the chart indicates some convenient assessment times. We'll talk more about "floors" later in this book.

SUPERVISOR ADVISOR MANAGER BEHAVER AGE LABEL

DEPOSITOR AGENCY TIMER COUNTER CHARTER COUNTED

CALENDAR WEEKS

0 4 8 12 16 20

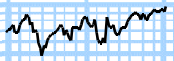
DAY MO YR

Equal Bounce: A Bonus

The *main* reason for the use of a times-divide scale is to allow us to see the ups-and-downs of all sorts of behaviors clearly — behaviors that happen hundreds of times each minute or only a few times each day — without having to change our chart.

As it turns out, though, there's a *bonus* with a times-divide scale. Most "natural" phenomena *change* by constant *ratios*, not by adding or subtracting some constant value. Looking back at the add/subtract charts on pages 4 & 5, for example, it's not only difficult to see both behaviors at once, the "bounce" or daily variability of the behaviors also looks very different as we move up or down that scale. On the ratio chart shown on page 5, the daily ups-and-downs of the two behaviors look very much alike, even though one has a high overall frequency and the other has a low frequency. Other examples are shown at the right.

Consistency in how the "bounce" in behavior is shown is a very important feature of the standard chart.



Dow Jones Average
1965 - 1972

John — steps taken on a balance beam

Patsy — see/say c-(short vowel)-c words

Paul — points politely for food at lunch

Behaviors of greatly different frequencies can all be seen clearly; and their daily bounce looks roughly the same, regardless of how or low they are on the chart — even the Dow Jones Average!

Dale — turning & talking w/o permission

Don — cigarettes smoked

COUNT PER MINUTE

1000 500 100 50 10 5 1 .5 .1 .05 .01 .005 .001

COUNTING RECORD FLOORS

MIN HRS

1 2 5 10 20 50 100 200 500 1000

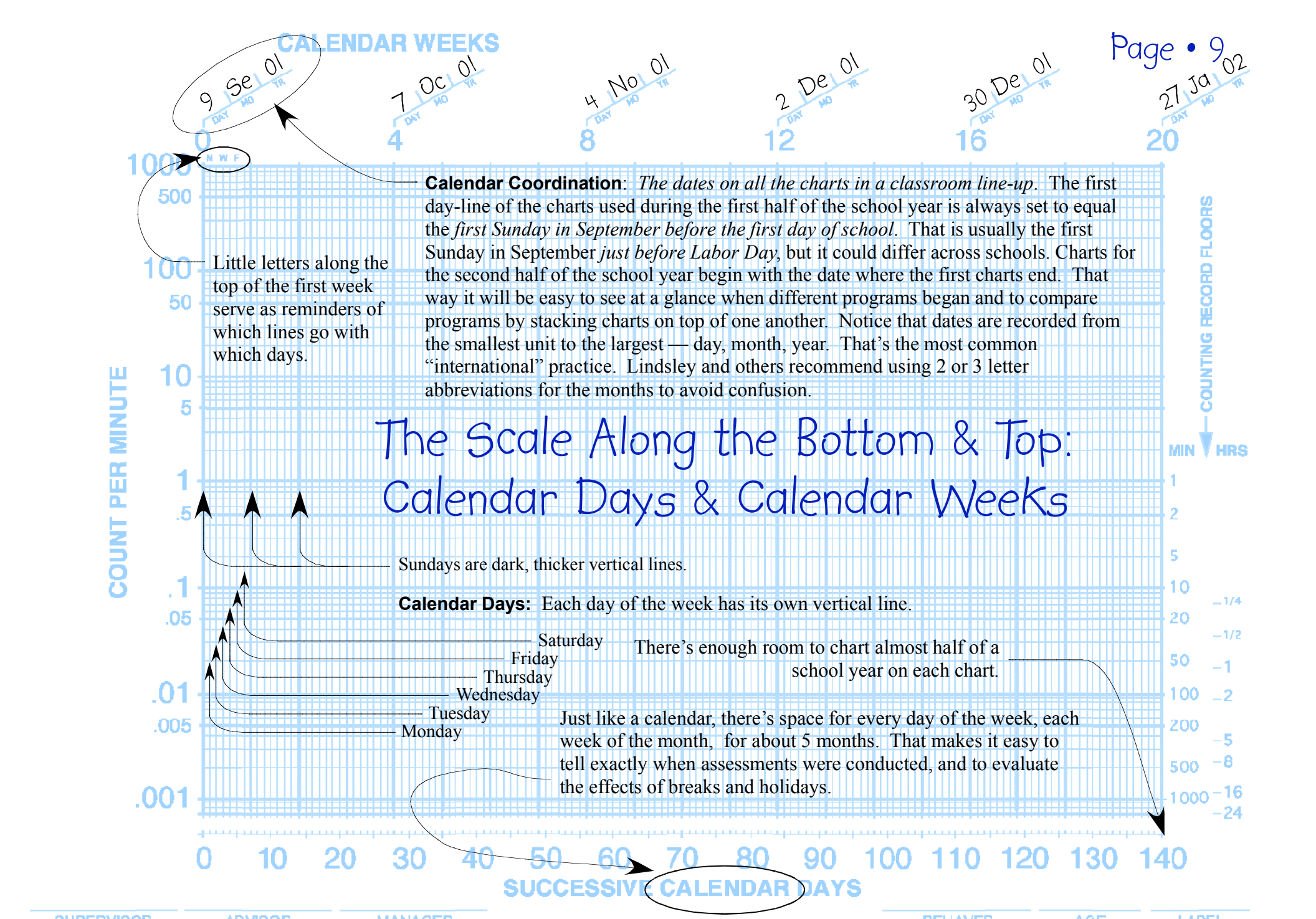
1/4 1/2 1 2 5 8 16 24

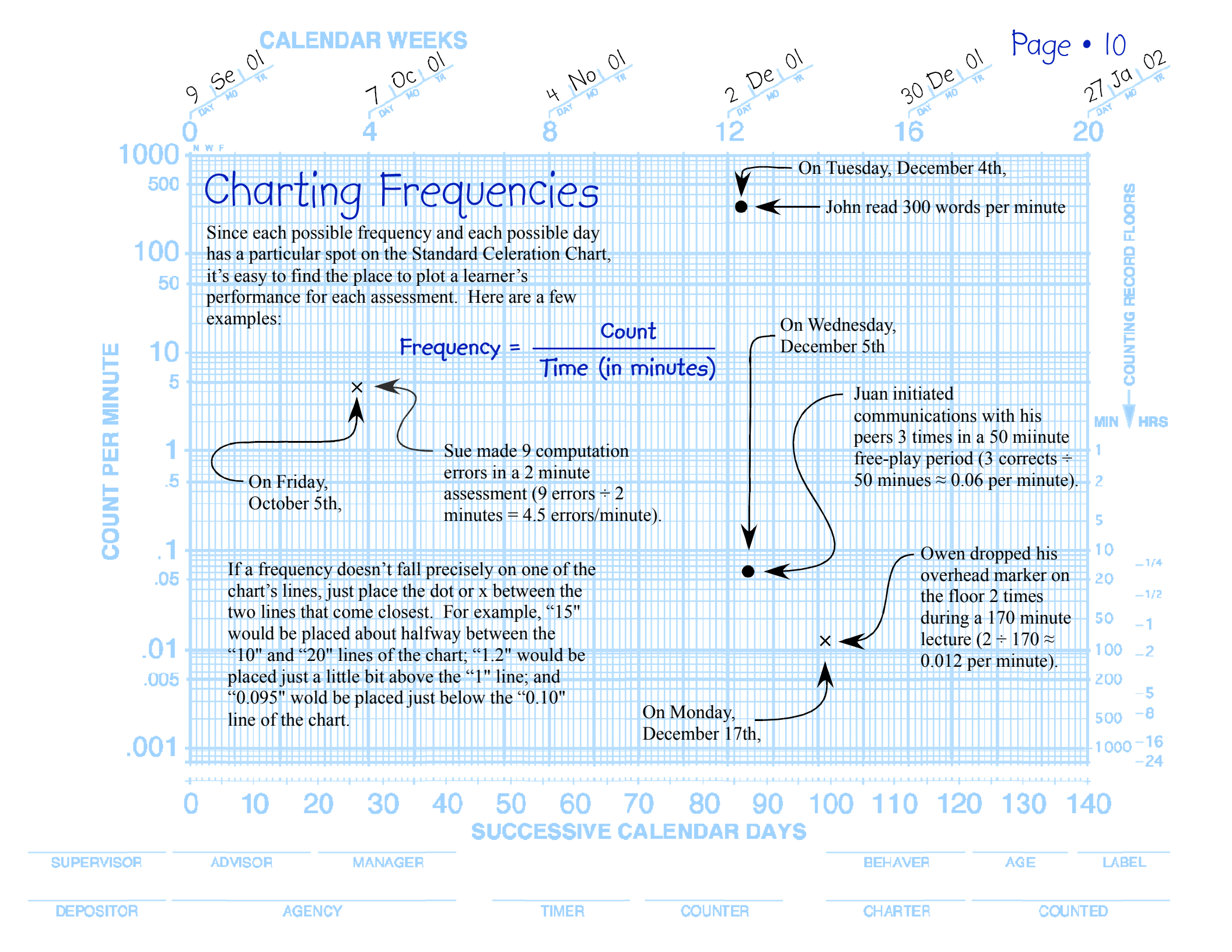
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

SUCCESSIVE CALENDAR DAYS

SUPERVISOR ADVISOR MANAGER BEHAVER AGE LABEL

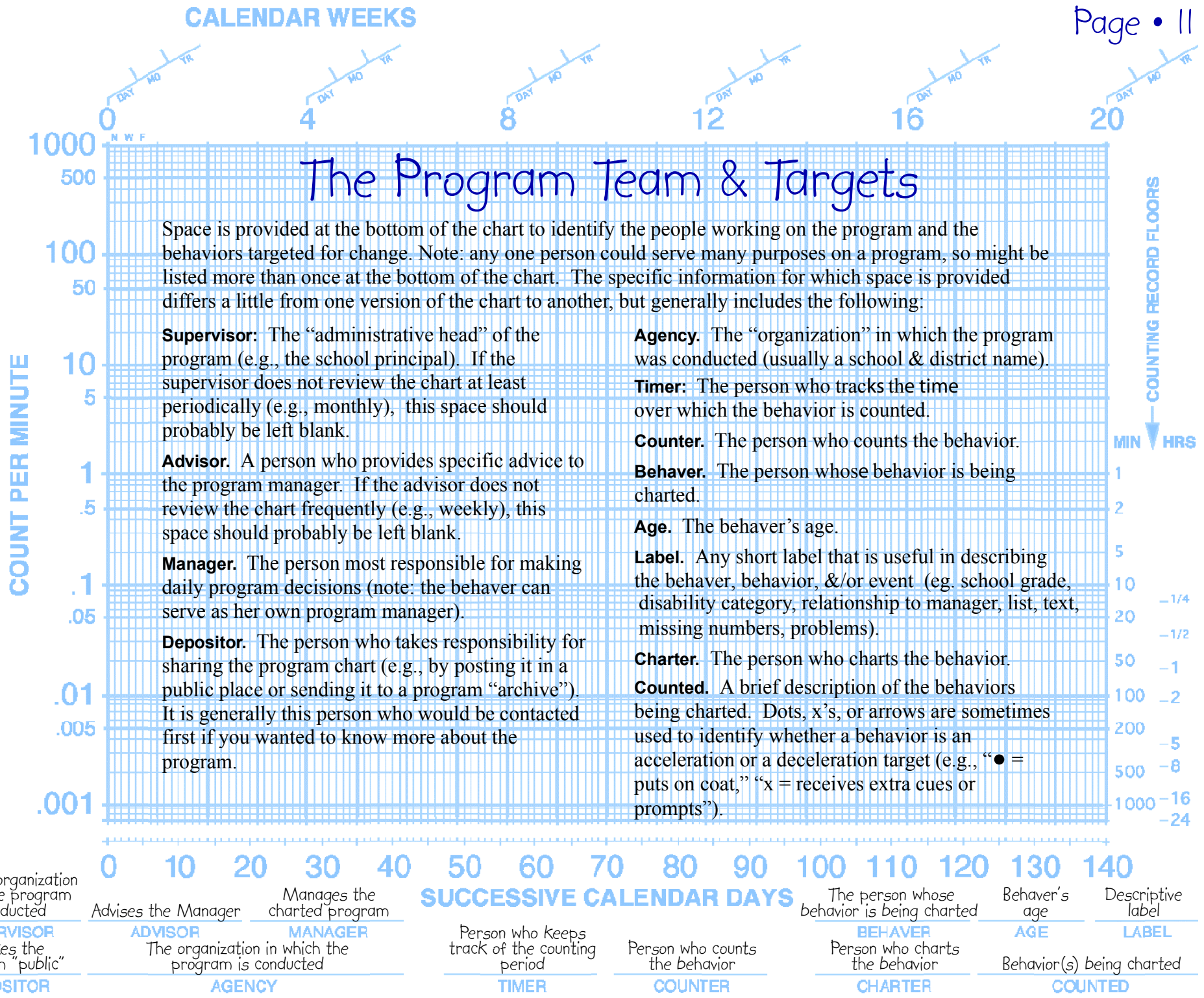
DEPOSITOR AGENCY TIMER COUNTER CHARTER COUNTED


CALENDAR WEEKS
9 Se 01
7 Oc 01
4 No 01
2 De 01
30 De 01
27 Ja 02
0
4
8
12
16
20
Little letters along the top of the first week serve as reminders of which lines go with which days.
Calendar Coordination: The dates on all the charts in a classroom line-up. The first day-line of the charts used during the first half of the school year is always set to equal the first Sunday in September before the first day of school. That is usually the first Sunday in September just before Labor Day, but it could differ across schools. Charts for the second half of the school year begin with the date where the first charts end. That way it will be easy to see at a glance when different programs began and to compare programs by stacking charts on top of one another. Notice that dates are recorded from the smallest unit to the largest — day, month, year. That's the most common "international" practice. Lindsley and others recommend using 2 or 3 letter abbreviations for the months to avoid confusion.
COUNT PER MINUTE
1000
500
100
50
10
5
1
.5
.1
.05
.01
.005
.001
COUNTING RECORD FLOORS
MIN
HRS
1
2
5
10
20
50
100
200
500
1000
1/4
1/2
1
2
5
8
16
24
The Scale Along the Bottom & Top:
Calendar Days & Calendar Weeks
Sundays are dark, thicker vertical lines.
Calendar Days: Each day of the week has its own vertical line.
Saturday
Friday
Thursday
Wednesday
Tuesday
Monday
There's enough room to chart almost half of a school year on each chart.
Just like a calendar, there's space for every day of the week, each week of the month, for about 5 months. That makes it easy to tell exactly when assessments were conducted, and to evaluate the effects of breaks and holidays.
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140
SUCCESSIVE CALENDAR DAYS
SUPERVISOR
ADVISOR
MANAGER
BEHAVER
AGE
LABEL
DEPOSITOR
AGENCY
TIMER
COUNTER
CHARTER
COUNTED



SUPERVISOR | ADVISOR | MANAGER | BEHAVER | AGE | LABEL

DEPOSITOR | AGENCY | TIMER | COUNTER | CHARTER | COUNTED



The Program Team & Targets

Space is provided at the bottom of the chart to identify the people working on the program and the behaviors targeted for change. Note: any one person could serve many purposes on a program, so might be listed more than once at the bottom of the chart. The specific information for which space is provided differs a little from one version of the chart to another, but generally includes the following:

Supervisor: The "administrative head" of the program (e.g., the school principal). If the supervisor does not review the chart at least periodically (e.g., monthly), this space should probably be left blank.

Advisor. A person who provides specific advice to the program manager. If the advisor does not review the chart frequently (e.g., weekly), this space should probably be left blank.

Manager. The person most responsible for making daily program decisions (note: the behaver can serve as her own program manager).

Depositor. The person who takes responsibility for sharing the program chart (e.g., by posting it in a public place or sending it to a program "archive"). It is generally this person who would be contacted first if you wanted to know more about the program.

Agency. The "organization" in which the program was conducted (usually a school & district name).

Timer: The person who tracks the time over which the behavior is counted.

Counter. The person who counts the behavior.

Behaver. The person whose behavior is being charted.

Age. The behaver's age.

Label. Any short label that is useful in describing the behaver, behavior, &/or event (eg. school grade, disability category, relationship to manager, list, text, missing numbers, problems).

Charter. The person who charts the behavior.

Counted. A brief description of the behaviors being charted. Dots, x's, or arrows are sometimes used to identify whether a behavior is an acceleration or a deceleration target (e.g., "● = puts on coat," "x = receives extra cues or prompts").

CALENDAR WEEKS

0 4 8 12 16 20

1000 500 100 50 10 5 1 .5 .1 .05 .01 .005 .001

COUNT PER MINUTE

Is It Supposed to Go Up or Down?

Standard symbols are used to chart behavior frequencies so we can tell at a glance how we *want* the behavior frequency to change.

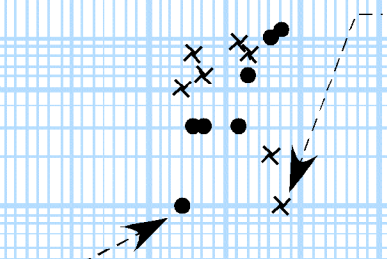


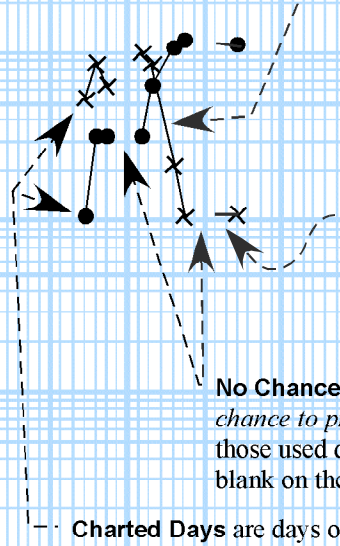
Chart **deceleration targets** (behaviors that *should decrease* in frequency) with x's. If two or more deceleration targets are put on the same chart, try to chart them all with "sharp" symbols (e.g., x's and triangles Δ).

Chart **acceleration targets** (behaviors that should *increase* in frequency) with dots. If two or more acceleration targets are put on the same chart, try to make the symbols for all the acceleration targets "round" (e.g., solid dots • and open dots ○).

A dot or an x doesn't necessarily indicate how a behavior *is* changing, only how we *want* the behavior to change. In the program shown above, for example, the correct frequencies generally changed in the desired direction; the deceleration target was going in the wrong direction at the beginning of the program, but then turned the way we wanted.

Connecting the Dots & X's

Lines are drawn from one dot or x to the next across successive practices; gaps are left in the line whenever there was a break in regular practices.



Ignore Days are days on which the skill might have been practiced under conditions similar to those used during assessment, but for some reason was *not assessed* or the *assessment data were lost. Connecting lines are drawn across ignore days* from the last charted frequency to the next charted frequency.

If there are one or more no chance days (see below) and one or more ignore days between the last charted frequency and the next charted frequency, the connecting line is broken when it crosses the no chance days.

No Chance Days are days on which the *behaver had no chance to practice the skill* under conditions resembling those used during regular assessments. Those days are left blank on the chart — *no line is drawn across no chance days.*

Charted Days are days on which the *behaver was assessed in the usual fashion and the results are recorded on the standard chart. Successive charted days* (i.e., series of charted days without intervening no chance days) *are connected with one another by lines.*

Breaks in the connecting lines allows us to see at a glance whether breaks in practice effect learning. Here, for example, the learner fails to improve over the no-chance days, but does improve over the ignore day (i.e., a day when practice might have occurred but for some reason wasn't assessed or charted).

RECORD FLOORS

MIN HRS

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

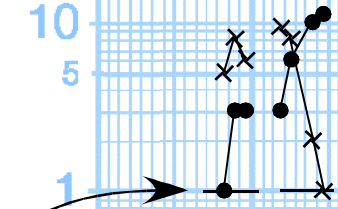
SUCCESSIVE CALENDAR DAYS

SUPERVISOR	ADVISOR	MANAGER		BEHAVER	AGE	LABEL
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER	COUNTED	

The Record Floor

The Record Floor on a chart represents the **lowest possible non-zero result of an assessment**. It serves as a reminder of what results are possible, and what results are impossible, given the way we measure the behaver's performance — we can see performances that fall on or above the record floor, but if actual performances fall below the record floor, they're too low for us to detect with our assessments.

$$\text{Record Floor} = \frac{1}{\text{Counting Time in Minutes}}$$

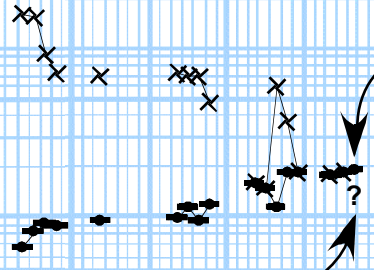


The record floor also tells us the **least amount of change** we can measure in performance. If the record floor is "1," for example, we can measure changes in frequencies as small as ±1; if the record floor were "0.1," we could measure changes as small as ±0.1

If the record floor remains constant from day-to-day, just chart it as a long line across the chart, broken across days when assessments weren't conducted. (Others use the convention of a "time-bar" drawn from the Tuesday line to the Thursday line to represent a constant floor.)

Here, a constant record floor is based on an assessment time of 1-minute, so the floor is (1/1min=) 1, and a line is drawn at that level across the chart.

To calculate the value of the record floor, simply apply the usual formula for frequency, but use a count of "1" (that is, the lowest possible non-zero behavior count):



Frequencies based on a count of zero are often charted as little question marks below the floor. That reminds us that we really don't know what the frequency might be, only that it's less than what we can measure. Don't worry about discriminating between correct and error frequencies. If both are below the floor, just chart two question-marks; if only one is below the floor, chart one question mark, and it's got to be whichever frequency is not charted on or above the floor. In this case, the errors slipped below the floor; the correct frequency of "1" is noted as a dot on the record floor.

If the record floor changes from day-to-day, chart each floor separately as a short dashed-line (time-bar) for each day.

In the performance record shown on the left, the assessment time is determined by how long the behaver takes to put on his coat. At first it takes more than a minute to finish that task; by the end of the program, it takes about 30 seconds, so the record floor for the last day is (1/30 seconds = 1/.5 minutes =) 2.

With this sort of "**single movement frequency**" (that is, a frequency based on how long it takes to complete a single task), changes in the record floor reflect learner progress.

CALENDAR WEEKS · COUNT PER MINUTE · COUNTING RECORD FLOORS · SUCCESSIVE CALENDAR DAYS

SUPERVISOR · ADVISOR · MANAGER · BEHAVER · AGE · LABEL

DEPOSITOR · AGENCY · TIMER · COUNTER · CHARTER · COUNTED

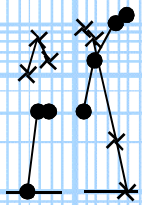
CALENDAR WEEKS

0 4 8 12 16 20

The Record Ceiling

The Record Ceiling on a chart represents the **highest possible result of an assessment**. Like the record floor, it serves as a reminder of what results are possible, and what results are impossible, given the way we measure the behaver's performance — we can see performances that fall on or below the record ceiling, but if actual performances fall above the record ceiling, we can't tell how high they might be, and can only record them as being at least as high as the ceiling.

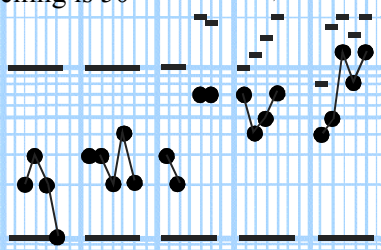
$$\text{Record Ceiling} = \frac{\text{Highest Possible Count}}{\text{Assessment Time}}$$



If the record ceiling remains constant from day-to-day, just chart it as a long line across the chart, broken every so often across days when assessments weren't conducted. In this example, a maximum of 50 opportunities to demonstrate the skill are provided, so over a 1-minute assessment, the record ceiling is 50 movements per minute.

Whenever possible, **try to avoid record ceilings** by providing more opportunities to demonstrate a behavior, or "time to completion" and stop the assessment time when all opportunities have been exhausted. Note, however, that while "timing to completion" eliminates the record ceiling, it also results in a variable record ceiling, which can make the interpretation of the performance record more difficult.

NOTE: some people have suggested alternative methods for charting ceilings and floors. Consult the references in the back for details.



If the record ceiling changes from day-to-day, chart each ceiling separately as a short dashed-line for each day.

In the performance record shown here, Karin is counting the number of times Ilene complies with simple requests (e.g., go to the table," "take out your crayons") over the course of a 100 minute period. At first, she only tries to make 10 requests during each period, so she has a constant record ceiling of (10/100 =) 0.1/minute. Later she decides to make as many requests as seem reasonable during any given period, so she begins to have a variable record ceiling. On most days that results in more than 10 requests, so the record ceiling is higher than before, but on Monday of the last week she only made 8 requests, so the record ceiling is lower.

Generally, it seems that higher record ceilings have helped Ilene to become more compliant, or at least *reveal* higher levels of compliance.

COUNT PER MINUTE: 1000 500 100 50 10 5 1 .5 .1 .05 .01 .005 .001

COUNTING RECORD FLOORS

MIN	HRS
1	
2	
5	
10	
20	–1/4
50	–1/2
100	–1
200	–2
500	–5
1000	–8
	–16
	–24

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

SUCCESSIVE CALENDAR DAYS

SUPERVISOR | ADVISOR | MANAGER | BEHAVER | AGE | LABEL

DEPOSITOR | AGENCY | TIMER | COUNTER | CHARTER | COUNTED

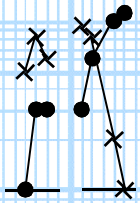
CALENDAR WEEKS

0 4 8 12 16 20

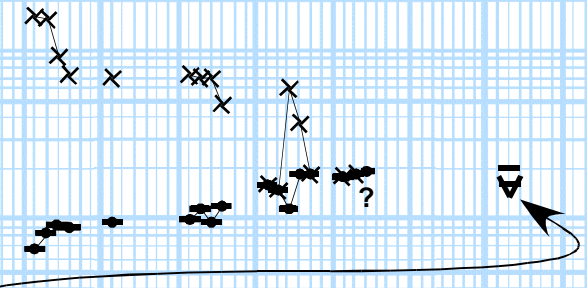
The Aim Star

The **performance aim** for your project is indicated by a little **aim star** drawn at the intersection of the **aim-date** (the date by which you want to reach your aim) and the **aim-frequency** (the frequency you want to achieve for the behavior).

The Aim-Frequency is indicated by the cross-bar of the aim-star, in this case, 40 correct movements per minute.



The Aim-Date is indicated by the day on which the "point" of the aim-star is placed, in this case, on the Friday 5 weeks after the beginning of the program.



Aim-Stars for Acceleration Targets Point Up, like the aim-star for these data.

Aim-Stars for Deceleration Targets Point Down, like the aim-star for these data. In this case, the performance aim is to decelerate errors to a point below the record floor (indicated by the dashed line); where the record floor is set at a value of "2." In other words, we want no errors.

If performance aims are set for both correct and error frequencies, two aim stars will be required — one pointing "up" and the other pointing "down." Both aim stars can be put on the same day (indicating that you want to reach both aims at the same time), or they can be placed on different days (indicating you want to reach one of the aims before the other). **If you don't know *when* you should reach the aim**, you can place the aim-star on a day *before* the project actually begins. Folks will then be able to determine what frequency you want to reach, but not the specific date by which you want to reach it.
NOTE: some people have suggested different conventions for the placement of aim-stars. Consult the references at the back of this book for details.

COUNT PER MINUTE: 1000, 500, 100, 50, 10, 5, 1, .5, .1, .05, .01, .005, .001

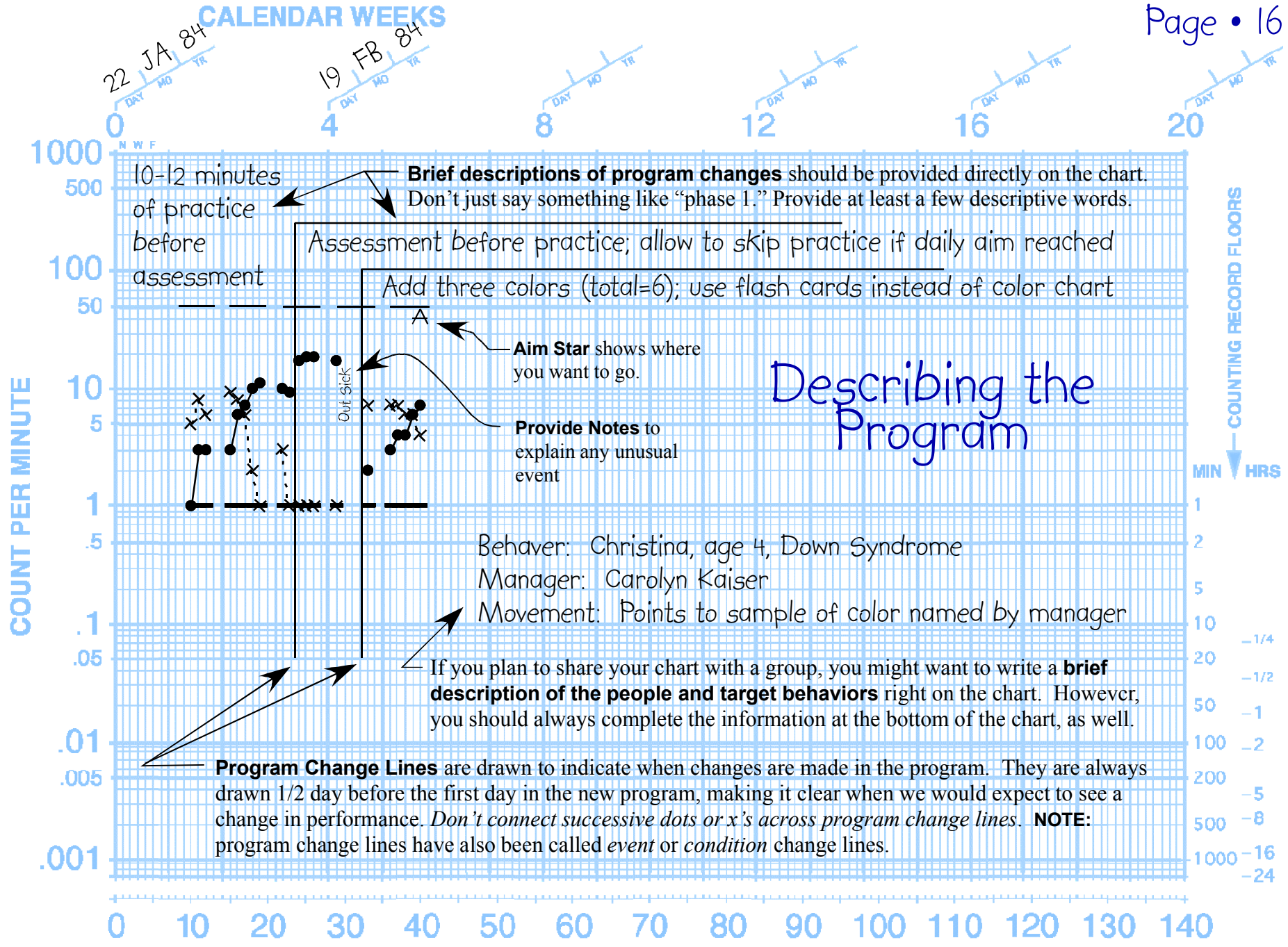
COUNTING RECORD FLOORS — MIN: 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000 — HRS: –1/4, –1/2, –1, –2, –5, –8, –16, –24

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

SUCCESSIVE CALENDAR DAYS

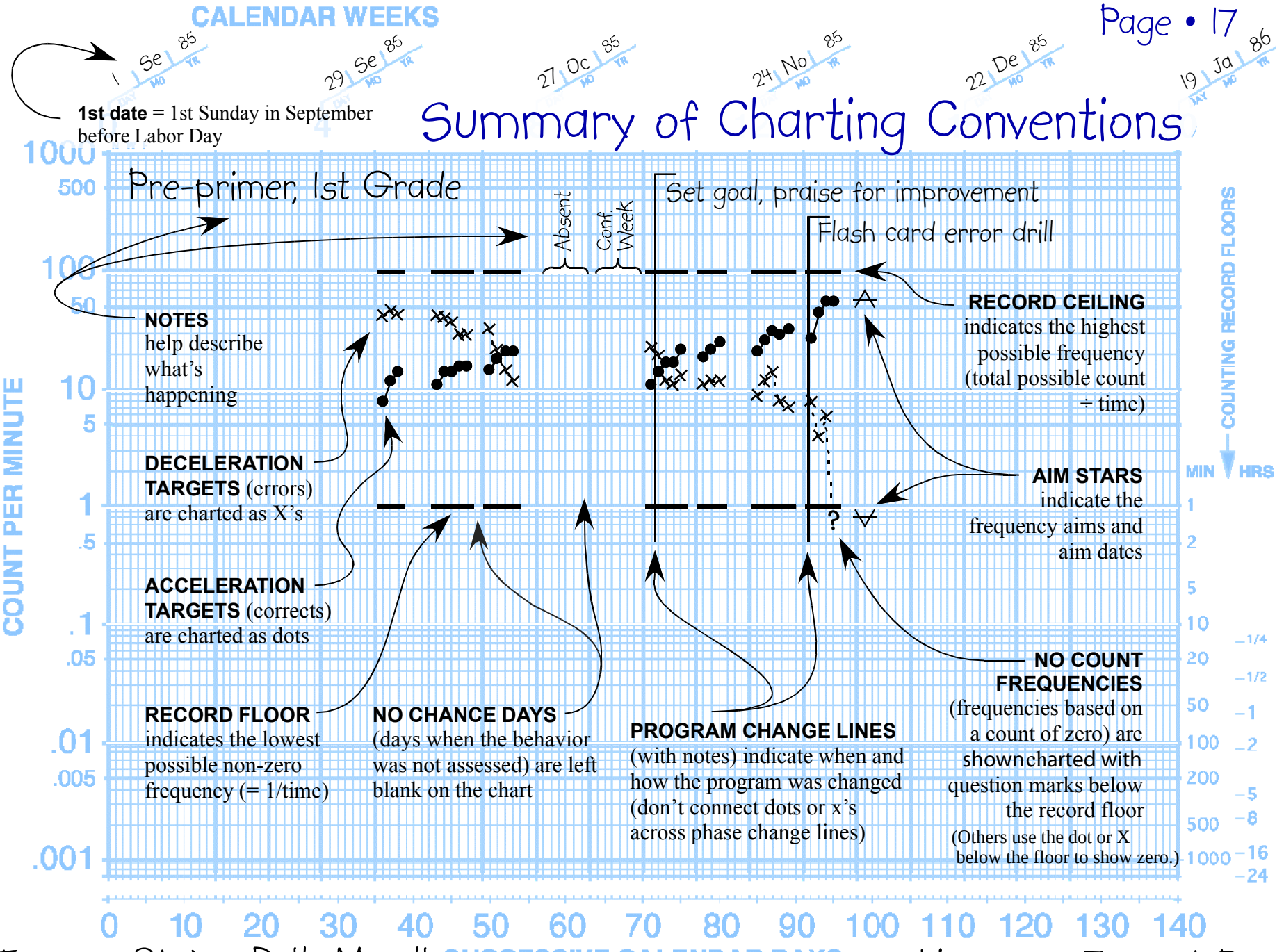
SUPERVISOR | ADVISOR | MANAGER | BEHAVER | AGE | LABEL

DEPOSITOR | AGENCY | TIMER | COUNTER | CHARTER | COUNTED



SUPERVISOR	ADVISOR	MANAGER		BEHAVER	AGE	LABEL
O.W.	O.W.	Carolyn Kaiser		Christina	4	Down Syn.
DEPOSITOR	**AGENCY**		**TIMER**	**COUNTER**	**CHARTER**	**COUNTED**
O.W.	Experimental Education Unit		C.K.	C.K.	C.K.	Points to Color Named

Summary of Charting Conventions



P.T.	O.W.	Ruth Mundt		Lisa	7	L.D.
SUPERVISOR	ADVISOR	MANAGER		BEHAVER	AGE	LABEL
S.S.	Lake Washington Schools	R.M.	R.M.	Lisa	Says Dolch Word	
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER	COUNTED	

More Reading

The following books provide additional information about the Standard Celeration Chart and charting techniques. They are only available through "nontraditional sources," but are well worth the effort to obtain.

Pennypacker, H.S., Gutierrez, A., & Lindsley, O.R. (2003) **Handbook of the Standard Celeration Chart.** Cambridge, MA: Cambridge Center for Behavioral Studies (www.behavior.org).

This is an updated version of the first **Standard Charting Book**. It presents all the basic conventions for charting in an easy-to-understand manner, including the use of a version of the frequency/celeration finder that is somewhat different in construction from the one discussed in the companion to this book (**The Finder Book** by Owen White see below).

Graf, S., & Lindsley, O.R. (2002) **Standard Celeration Charting 2002.** Poland, OH: Graf Implements (Order from Behavior Development Solutions at www.behaviordevelpmentsolutions.com/products/221-standard-celeration-charting-2002.aspx).

This book provides far more information about the details of the chart and related information. Several of the charting conventions suggested in *Standard Celeration Charting* differ slightly from those presented in this book, especially as pertaining to the record floor, record ceiling, and aim-star. Numerous "practice sheets" are provided for developing fluency in charting skills.

Kubina, R.M. and Yurich, K.L. (2012) **The Precision Teaching Book.** Lemont, PA: Greatness Achieved Publishing Company. (Order from www.theprecisionteachingbook.com)

This book blends the more formal language of Behavioral Analysis with the more common language of Precision Teaching. It is a guide for aspiring teachers and those who help others. It is a guide to make discoveries of human behavior and change, and an excellent teaching reference. (It includes a template for making a set of Dr. White's rate finders.)

White, O.R. (2012) **The Finder Book.** Available for downloading (pdf) from the UW College of Education web site: http://education.washington.edu/areas/edspe/white/precision/readings/finderbook.pdf

This book provides an overview of a simple "finder" useful for charting frequencies, floors, and ceilings; for determining the slopes of celeration lines; and more. Templates for reproducing the finder are also provided on the class web site.