

===== **Quick Reference Guide** =====

Please read the **Introduction**, immediately following this Guide, before selecting Lessons.

[Page] **Introduction Topics**

- [I-1] **Mac's Abacus Construction and Functions.**
- [I-2] **Owner's Notes Page.**
- [I-3] **How to use Mac's Abacus Basic workbook.**
 - Making Bead Patterns using Memory Beads.
 - Learning to Count using the numbered Lessons.
- [I-4] Each Row as a Problem. Using the Legends.
- [I-5] Teaching Strategy.
- [I-6] Grouping. Lesson Keys.
- [I-7] The Trade Concept - Carry and Borrow.
- [I-8] Special Forms. Developing Creativity.

KEY to the Teaching Guide and Lessons: [L #] [PT #] [PL #] [section title] Description ...

- [L #] = Lesson Number Range.
- [PT #] = Teaching Guide Page Number Range.
- [PL #] = Lesson Sheets Page Number Range.

<< Special Teaching Aids >>

[x] [x] [**In back of Workbook immediately after the Lessons**] [**Tape-on Legend Strips**]

Legend Strips are intended to be cut out and taped over the standard Legend, engraved into the Abacus. Each Legend corresponds to a particular Lesson Set. The range of applicable Lesson numbers is printed above each column. Additional Legend Strips on the last page, labeled "Games" are for use when keeping scores of two players, using the top 2 Abacus Rows as *separate* from the bottom 2 Rows. Each *Row pair* can hold score counts up to 110.

[x] [x] [**On the back of the last Legend page**] [**Practice Printing Numbers**]

This sheet is meant to be copied and used by children that are not yet adept at making numerical digits. These digits (0 through 9) are *hollow*, to encourage children to write towards the middle. The top set is very large, for beginners. Once the top set is mastered, your child should try writing on the lower set, which is a size that fits on the lines of the Lessons.

[x] [x] [**Outside back cover**] [**Poster: First Counts**]

"**First Counts**" has a column of numerical Counts from 1 to 10, alongside their equivalent representations as *objects*, *Finger Counts* and *Abacus Bead Counts*. This page should often be shown to your child as he/she works out the Lessons, especially in the beginning.

[x] [x] [Inside back cover] [Poster: Subtracting]

A columnar list of “Subtracting” equations, starting from a Count of 6, and going down to **Zero**. The *objects* (a string of **Stars**), their *equivalent numerical values* and their *Abacus Bead* representations are shown for each item. *This is also a good way to show your child the Concept of Zero.*

<< Beginning with Mac's Abacus >>

[L A-P] [PT 1] [PL 1] [Making Bead Patterns] Demonstrates the workings of the Abacus. Teaches *Bead Manipulation*. Also makes Rows of *Bead Groups* of 1's, 2's, 3's and 5's. Great place to start, especially for children who have never counted before.

<< Begin Counting with Mac's Abacus >> *Always start with all Beads moved fully to the left (= Zero).*

[L 1-14] [PT 1-4] [PL 3-17] [First Counts 1 to 5 - Full Page Lessons] Slide Beads to “+” side of the Abacus, using 1 **Bead** for each object counted. Each Abacus Row is assigned to a different object (Hearts, Stars, Balls, Cheerios and Fruits) per the tape-on Legends.
Lessons are *full-size* so your child can lay **Mac's Abacus** over the Abacus picture.

[L 15-32] [PT 4-7] [PL 18-23] [Counts 1 to 10 - Begin 3 Lessons per page] Objects arranged in geometric patterns by 2's, 3's and 4's, or scattered about for an interesting challenge.

<< Introducing Numbers >>

[L 33-42] [PT 7-9] [PL 24-27] [Introducing Numbers - Printing the Numbers] Ordinary Playing Cards are used to associate *numbers* with *object Counts*. Later, objects are presented inside circles, along with their corresponding numerical Count. Lines are provided for writing the numbers (see the worksheet “Practice Printing Numbers”).

[L 43-47] [PT 9-10] [PL 28-29] [Finger Counting] All Finger Counts, using one and two hands, are presented along with their corresponding numbers. Set Beads to the number of fingers shown, then write down their number (total Bead Counts).

[L 48-55] [PT 10-11] [PL 30-32] [Assortments and Bracelet arrangements - Numbers not shown] Assorted Fruit scattered about. Patterned objects in Bracelets (to Count *sequentially*). Corresponding numbers are no longer shown, but your child is encouraged to write down the correct number of Counts

<< The Concept of Zero >>

[L 56-59] [PT 12] [PL 33-34] [Count Toy Parts - Presenting Concept of Zero] Cars and Cubic structures are shown ...Count their parts. Sometimes, not all parts are used (= Zero Counts).

[L 60-64] [PT 13] [PL 35-36] [Count Dots on Dice - Concept of Zero] Each Die is assigned to a single Bead Row. A Die with *no dots* is sometimes present (= Zero).

[L 65-71] [PT 14-15] [PL 37-39] [9 Objects inside a 3x3 Grid - Concept of Zero] Subtly building the orderly Concept of a *geometric* array in your child's mind, while practicing small Counts.

[L 72-75] [PT 15] [PL 39-40] [Scattered Objects - Concept of Zero] Small assortments are missing some objects (= Zero). Kids like to “find” the objects.

[L 76-81] [PT 16] [PL 41-42] [16 Objects inside a 4x4 Grid - Concept of Zero] Continuing to subtly build the Concept of a *geometric* array, while practicing slightly larger Counts.

[L 82-84] [[PT 17](#)] [[PL 43](#)] [**Grouped Objects - Concept of Zero**] Objects are grouped by 2's and by 3's, to teach the efficiency of *pattern recognition* in counting them all.

[L 85-92] [[PT 17-18](#)] [[PL 44-46](#)] [**Counting Alphabet Letters**] Find and Count *just* the letters **A, B, C** and **D** within various arrangements of letters. Some words may be familiar here.

<< Formal Addition: The “+” and “=” Signs >>

[L 93-107] [[PT 19-21](#)] [[PL 47-52](#)] [**Introducing Formal Addition and the “+” and “=” Signs**] Starting with **Dice** joined by the “+” sign, then moving to patterned **Dots** (joined by the “+” sign) and finally expanding to various now-familiar objects similarly patterned and joined by the “+” sign. Counts go up to 10.

[L 108-112] [[PT 22](#)] [[PL 53-54](#)] [**Addition using Playing Cards and the “+” and “=” Signs**] Ordinary *Playing Cards* are used to automatically associate *numbers* with *object Counts*.

[L 113-117] [[PT 23](#)] [[PL 55-56](#)] [**Adding just Numbers with the “+” and “=” Signs**] Sets of single *numerical digits* are joined by the “+” sign and followed by the “=” sign, forming simple *equations*.

<< The Concept of Length >>

[L 118-121] [[PT 24](#)] [[PL 57-58](#)] [**Reading and Stacking Rulers**] Various length Rulers and *stacks* of Rulers are presented and their *Lengths* are translated to Bead Counts on the corresponding Abacus Rows. (Note that the *numbers* on the Rulers can represent *any* preferred units: inches, centimeters ...)

[L 122-126] [[PT 25](#)] [[PL 59-60](#)] [**Stacks of Measured Rods**] Various *colored Rods* of Lengths (defined by a Ruler) are stacked end-to-end with corresponding *numerical equations* written below them.

[L 127-128] [[PT 26](#)] [[PL 61](#)] [**Triangles and Rectangles built with Measured Rods**] *Perimeters* of objects are measured by *adding up* the Lengths of sticks used to build them.

[L 129-130] [[PT 26](#)] [[PL 62](#)] [**Measuring Heights of Stacks of Blocks**] Sets of Blocks of *unit length* (unit = 1) are stacked alongside a Ruler. Set the Bead Rows to the *measured* heights.

<< Clocks: Telling Time >>

[L 131-135] [[PT 27](#)] [[PL 63-64](#)] [**Dial and Digital Clocks - Reading Hours**] Just the Hours are presented. Use the Rows of **Mac's Abacus** to compare the *Lengths of various Times* and to show the *equivalence of times* on Dial and Digital Clocks.

- *This Lesson Set may be attempted any time out of the normal sequence.* -

<< Subtraction >>

[L 136-146] [[PT 28-29](#)] [[PL 65-68](#)] [**Introducing Subtraction**] Starting with the Abacus set to match *Lesson 16*, various objects are now masked-out. Slide a Bead to the “-” side of the Row for each masked object and read the remainders as Bead Counts. Then following, there are six similar Lessons (using rows of 10    ), which start with each Bead Row pre-set to 10 Beads.

[L 147-151] [[PT 30](#)] [[PL 69-70](#)] [**Subtracting Dice**] Starting with *known* Dice counts of previous Lessons (**L 95, 96 & 97**), subtract the Dice with the **X** on them.

[L 152-160] [[PT 31-32](#)] [[PL 71-74](#)] [**Subtracting Dice and Dots using “+”, “-” and “=” signs**] First Dice and then similarly patterned Dots are joined in “equations” by the “+”, “-” and “=” signs. The *starting*

count setups for each Lesson are shown in the **Key** above the Abacus.

[L 161-165] [PT 33] [PL 75-76] [**Subtracting just Numbers with the “+”, “-” and “=” Signs**]
Single numerical digits are joined by “+” and “-” signs and followed by an “=” sign, forming *equations*.
Beads are slid toward the Left (+) or Right (-) to *add* or *subtract*, according to the preceding sign.

<< The Concept of a Token >>

[L 166-175] [PT 34-35] [PL 77-80] [**Introducing the Token**] A Token is an object or symbol that “stands for” a certain value (The *Joker* in a card game can be set to some card, a *Store Coupon* can have a specific monetary value, etc.). Starting with a **Token = 2 Balls**, as defined in the **Key** above the Abacus, various kinds of *Balls* are counted. Then these *same sets* of *Balls* are counted using the **Token = 5 Balls**. Next the **Token** is set = 5 **Pennies** and *Pennies* are counted. Finally, the **Nickel** is used as the **Token** and also set = 5 **Pennies**. Thus, the diversity of the Token Concept is demonstrated.

[L 176-185] [PT 36-37] [PL 81-84] [**Row 2 Beads as a Token - Counting in the Teens**] A **single Blue Bead** of Row 2 is set equal to the **10 Green Beads** of Row 1. Sets of **Green** and **Blue** Beads are then counted together, forming all Counts from 11 to 20. The “exchange” (Trade) of **10 Green Beads** for 1 **Blue Bead** is demonstrated (commonly called a Carry). Lines are provided next to the Abacus for children to write the values in *2-Digit columnar form*, corresponding to the *value* of the Beads in that Row (Beads at “+” side).

[L 186-200] [PT 38-40] [PL 85-90] [**Row 2 Beads as a Token - Counting Familiar Objects**] Various now-familiar objects are counted, including clusters of Dice. Counts range from the **Teens** to the 30's.

[L 201-205] [PT 41] [PL 91-92] [**Row 2 Beads as a Token - Counting Large Arrays**] Square arrays of 5x5, 6x6, 7x7, 8x8 and 9x9, along with an 8x6 array are counted, using an *exchange* of **10 Green Beads** for 1 **Blue Bead** (a Carry) each time the bottom Bead Row gets filled (reaches 10 Counts).

<< Split Mac's Abacus into two Double-Row Abaci >>

[L 206-210] [PT 42] [PL 93-94] [**Using 2 Tokens - Counting 2 Sets of Dice**] In addition to the **Blue Bead** Token, *another* Token is assigned: 1 **Purple Bead** of the top Row is set equal to the **10 Red Beads** of Row 3. It is defined in a *new Key* above the **Key** for the **Blue Bead**. A special “**Split-Row**” Legend is provided to tape over the standard Legend. This allows **Mac's Abacus** to become *two Double-Row Abaci*, each capable of holding Counts up to 110. Two sets of Dice are counted at once, allowing their Counts to be instantly compared. This is used to demonstrate such things as “a set of all (5+5)'s being equal to a set of all (6+4)'s”.

[L 211-215] [PT 43] [PL 95-96] [**Adding 2-Digit Numbers with the “+” and “=” Signs**] Using the same **Split-Row Abacus** allows two sets of numbers to be independently added at once and compared.

<< Using a Three-Row Abacus >>

[L 216-220] [PT 44] [PL 97-98] [**Counting Objects into the Hundreds**] Now the **Red Bead** of Row 3 is redefined as being equal to the **10 Blue Beads** of Row 2 (which are still a Token for **10 Green Beads** of Row 1). This makes 1 **Red Bead** = 10 **Blue Beads** = 100 **Counts** (**Green Beads** are each worth 1 Count). Sets of colored **Dots** are counted, (most which are conveniently arranged into *groups of 10*).

[L 221-225] [PT 45] [PL 99-100] [**Adding 2 and 3-Digit Numbers**] Large numbers are added by selecting Beads from each *Row* corresponding to the *value* of each digit. *When a Row gets filled (=10 Beads) it is reset (=0) and traded for 1 Bead in the next-higher Row*. When all numbers in the Set have been counted, **Mac's Abacus** holds the answer.

<< Using a Four-Row Abacus >>

[L 226-230] [PT 46] [PL 101-102] [Adding 4-Digit Numbers] In similar fashion, the **Purple Bead** of the top Row is set equal to the **10 Red Beads** of Row 3 (which are now *each* worth 100). The **Lesson Key** now shows the 3 *Bead Tokens*. This allows for Counts up to 11,110 *using all Beads*, because $11,110 = (10 \times 1000) + (10 \times 100) + (10 \times 10) + (10)$, assuming that all Carries are postponed. (If all Carries are executed when a Bead Row gets filled, **Mac's Abacus** then has a capacity of 10,999).

[Special Add] [PT 47] [PL 103] [Adding Sequences step-by-step]

Example A shows **Mac's Abacus** at each step in the operation of *adding 148 to 365*.

Example B shows each step in the *cascading Carries* needed to complete the *addition of 5 to 2996*. This pair of examples may be presented to your child anytime during *Lessons 216 to 225* in the Addition Section. It is also recommended that the teacher actually perform the sequences shown, to gain a feel for the process.

<< Counting Money >>

[L 231-235] [PT 48] [PL 104-105] [Counting Coins using the Split-Rows Abacus format again] Values of each coin (Nickels, Dimes and Quarters) are defined using the Penny as the *basic unit* of Count. The coins are assigned values as *Tokens* in the **Key**. The Abacus is split into *two Double-Row Abaci*, using the same tape-on Legends as previous. Bead values (1 **Blue** = 10 **Green**, 1 **Purple** = 10 **Red**) are assumed.

[L 236-239] [PT 49] [PL 106-107] [Coin Sums exceed \$1.00 - Introducing the Decimal Point] Using the *Full-Row Abacus*, coin sums that reach \$1.00 are shown as a *Carry* into the *third Row* (\$1.00 = 1 **Red Bead**). The *Decimal Point* is used to separate *Dollars* from *Cents*. For the first time, the *Decimal Point* is included in the lines for writing answers. (The "\$" sign is omitted for now).

[L 240-251] [PT 50-51] [PL 108-111] [Assorted Coin Sums] Assortment of coins for practice. *Lessons 240, 242 and 242* each add up to exactly \$1.00. Coins are scattered or arranged in interesting patterns. *Lessons 249 to 251* present square arrays of: just *Quarters*, just *Dimes* and just *Nickels*.

[L 252-258] [PT 52-53] [PL 112-115] [Paper Bills are presented along with Coins] *Lesson 252* introduce the \$1 **Bill** (\$1's are shown as being *equivalent* to a set of Coins worth 1.00). Assorted coins and \$1's are counted together. *Lessons (253-254)* introduce the \$5 **Bill** as *equivalent* to 5 \$1's and also carry some Counts into the top Bead Row (**Purple Bead** = \$10). *Lessons (255-256)* introduce the \$10 **Bill** as being *equivalent* to 1 **Purple Bead** (1,000 pennies or 10.00). *Lessons (257-258)* introduce the \$20 **Bill** as being *equivalent* to 2 **Purple Beads** (20.00).

[L 259-264] [PT 54] [PL 116-117] [Assorted Piles of Money] Bills and Coins together in various arrangements are provided for practice. Stacked patterns encourage your child to *sort money* before counting. Scattered sets provide a fun challenge.

<< Subtraction using Multiple Bead Rows >> Start with Abacus set to values shown in Lesson Key.

[L 265-269] [PT 55] [PL 118-119] [Two-Digit Subtractions -using Split-Row Abacus] (Resuming from Subtraction *Lessons 136 to 165*). Arrays of ♥ ♣ ♦ ♠ objects in **Rows of 10** are used again. Objects to be subtracted are *grayed-out*. No Borrowings are needed yet, as all subtractions have enough Beads in the Rows to hold the Counts. The equivalent *numbers* are shown in standard form alongside, each Problem. Encourage your child to *write-in* the subtracted value and then write the answer, as read off the Abacus. *A special Split-Row Legend is provided to tape over the standard Legend.*

[L 270-274] [PT 56] [PL 120-121] [**Two-Digit Subtractions requiring a Borrow**] Same arrays of 10 ♥ ♣ ♦ ♠ objects are used, but now there are more objects to subtract than there are Beads in those *Bead Rows*. This requires a *Borrow* (Trading 1 *Bead* from the 10's **Row** for 10 *Beads* in the 1's **Row**) before all Counts can be subtracted. A numerical equation placed below each set of objects describes the subtraction sequence. Values grouped in parentheses indicate the Counts, which may be subtracted before needing to Borrow.

[L 275-279] [PT 57] [PL 122-123] [**Subtracting Dice Values -using Split-Row Abacus**] The Lessons that were previously used in addition, *Lessons (206-210)*, are the starting point for subtracting those Dice that are X'ed out. The equivalent *numbers* are shown in standard form, alongside each Problem.

[L 280-284] [PT 58] [PL 124-125] [**Subtracting Two-Digit Numbers -using Split-Row Abacus**] Numerical equations in standard columnar form are presented alone (without showing corresponding objects). Since the subtraction procedure can start from any digit, a *Hint Cloud* is provided, showing two sequence possibilities for getting the answer.

[**Special Subtract**] [PT 59] [PL 126] [**Subtracting Sequences step-by-step**]

Example A shows **Mac's Abacus** at each step in the operation of *subtracting 257 from 855*.

Example B shows each step in the *cascading Borrows* needed to *subtract 4 from 5000*.

This pair of examples may be presented to your child anytime during this Subtraction Section. *It is also recommended that the teacher actually perform the sequences shown, to gain a feel for the process.*

[L 285-289] [PT 60] [PL 127-128] [**Subtracting Three-Digit Numbers**] Three-Digit numerical equations in standard columnar form are presented alone. A *Hint Cloud* is provided, showing three sequence possibilities, using *paired colored arrows* to indicate *Bead-Row Trades (Borrows)*. The subtraction process can proceed in any digit order, but sometimes one order is simpler than others when *Trades (Borrows)* are involved.

[L 290-295] [PT 61] [PL 129-130] [**Subtracting Four-Digit Numbers**] Four-Digit numerical equations in standard columnar form are presented alone. A *Hint Cloud* is provided, showing just one of many sequence possibilities, using *paired colored arrows* to indicate *Bead-Row Trades (Borrows)*. The subtraction process can proceed in any digit order.

<< Subtracting with Money >>

[L 296-300] [PT 62] [PL 131-132] [**Subtracting "Purchase Items"**] A starting amount of cash (Bills and Coins) is provided in the **Key** for each Lesson. An interesting object is shown, along with its sale price. Your child is to "buy" this object with the cash provided and compute the expected change (taxes are not involved). A place is provided for your child to write the *expected change* in standard columnar form.

{*Note: Prices shown are not intended to represent actual sales prices.* }