



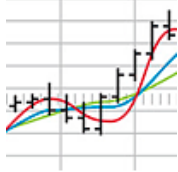
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Your articles



» [Let's extrapolate the population growth in the US!](#)

Build upon what you have learned from the HP calculator e-newsletter in this month's exercise. With sequences and statistics and a little help from your HP calculator you can learn to extrapolate the US population growth.



» [The HP 12c: the industry standard for finance professionals and the world's first horizontal financial calculator](#)

This oldie-but-goodie calculator revolutionized calculating and became a staple to millions of users. Read the stories of the lives the HP 12c has touched and learn how to get your own.



» [HP calculator sales promotions – buy in bulk and save!](#)

A new promotion was recently launched to create special discounts and savings for financial institutions using HP calculators. Get the promotion details and sneak-peaks into upcoming promotions!



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As a reward for all the loyal readers out there, you can now save 10% on the HP 17bII+ Financial Calculator! Stay tuned next month for more great savings!

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» [The Technical Corner](#)

Learn how your HP calculator finds the square root of a number in this month's technical corner.



» [RPN Tip #5](#)

This month's RPN tip teaches you to calculate the number of attendees at a sporting event and can be translated to other like mathematical equations. Learn more with this month's RPN tip.

Volume 5
June 2008

Welcome to the fifth edition of the HP Solve newsletter. Learn calculation concepts, get advice to help you succeed in the office or the classroom, and be the first to find out about new HP calculating solutions and special offers.

Featured Calculator



» [HP 17bII+ Financial Calculator](#)

Trust the HP 17bII+ financial calculator with even your heaviest work loads. This handy calculator is preferred in business, real estate and other financial endeavors and happens to be the HP calculator of the month!

[Learn more »](#)

HP Calculator Blog

Check out Wing Kin Cheung's blog, "The Calculating World with Wing and You."

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Upcoming HP Calculator events

Event	Dates - Location
ASEE	June 22-25 - Pittsburgh, PA
NECC	June 29-July 2 - San Antonio, TX
AP Annual	July 16-20 - Seattle, WA
WIPTE	October 15-16 - Westville, IN
Educause	October 28-31 - Orlando, FL

The gift that keeps on giving for Dad's and Grads!

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Are you looking for the perfect gift for the Dad or Grad in your life? Finding the right gift can be very difficult. We know you want to give something fun, but also something memorable, practical and something that will keep on giving for years to come. That perfect gift they will remember, it came from you! HP calculating solutions might be the perfect gift for your special Dad or Grad. HP recommends our most powerful calculators:

- HP 17bII+ Financial Calculator
- HP 35s Scientific Calculator
- HP 50g Graphing Calculator

Whether your special family member is or aspires to be a real estate tycoon, financial markets wizard, Nobel Prize winning scientist, world renowned mathematician, or professor emeritus in engineering at MIT, HP calculating solutions is the tool of choice for these intelligent leaders and many thought leaders around the world. Give them the gift that speaks to them, supports them, and enables them to be efficient, effective, and successful. Celebrate their achievements with HP calculating solutions.

Save 10% on an HP 17bII+ Financial Calculator right now. Ideal for real estate, finance and business professionals, the HP 17bII+ features a simple keyboard, 250 menu-driven functions, RPN1 and algebraic entry-system logic. And now, for this month only, it is 10% off for newsletter readers only. After adding your calculator to your shopping cart, insert coupon code CL1414 at checkout. Expires June 30th, 2008. Restrictions apply*.

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Feature calculator of the month: HP 17bII+ Financial Calculator

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New! HP 17bII+ Financial Calculator industrial design (silver). The simple-to-use HP 17bII+ Financial Calculator is built for the heaviest workloads of real estate, finance, and business professionals WW. Quickly calculate loan payments, interest rates and conversions, standard deviation, percent, TVM, NPV, IRR, cash flows, bonds and more. Features 28KB of user memory, over 250 menu-driven functions, RPN1

and algebraic entry-system logic, clock, calendar, HP solve application2, menus prompts and messages. Permitted for use on Certified Financial Planner® (CFP) Certification Exam3

Fun facts about the new HP 17bII+ Financial Calculator (silver):

- Born: January 8, 2008
- The 17bII+ (classic) replaced the 17BII, which was introduced in January of 1990 and it replaced the original HP17B, which was released on January 4th, 1988.
- The current HP17BII+ keyboard represents a return to the double-wide INPUT key which was present in the original HP17B (Jan 1988) and the HP17BII (Jan 1990).
- HP has used the model number 10 five times for scientific, printing, and business machines – the original HP-10, HP-10C, HP-10B, HP-10BII, & HP10s. The model number 17 has been used for the "same" business machine with variations – HP17B, HP17BII, HP17BII+ (gold) & HP17BII+ (silver).

Click here for more information about the [HP 17bII+ Financial Calculator](#).

1. Reverse Polish Notation (RPN) is an efficient data-entry system that can significantly reduce keystrokes. More information is available at [HP.com](#).
2. HP Solve is a time-saving application that allows you to solve for any variable without rewriting your equation.
3. CFP® is a registered trademark of the Certified Financial Planner Board of Standards, Inc.

RPN Tip #5

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You are assigned the task of counting the people who attend a high school foot ball game by standing at the door. You don't have a mechanical push button counter, but you have your trusty RPN calculator.

You prepare the machine to act as an electronic counter by pressing 1, ENTER, ENTER, ENTER, CHS, +.

In place of CHS + you may save a keystroke if your machine has a correction key (such as the HP35s) by pressing it (□). This also allows you to start a new count at any time.

In place of CHS + you may also save a keystroke if you press zero. This method, however, will not terminate digit entry so the next keystroke should be your first "count".

You now have zero in the display (X register) and 1's in the Y, Z, & T registers. Every time you press the + key you will add 1 to the X register. This "counter" action occurs because of the RPN feature of replicating the T register every time the stack drops (as when you perform an addition).

If you need to subtract a count press 1, - or -, CHS.

Click here to learn more about [RPN](#).

Let's extrapolate the population growth in the US!

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The previous activity looked at population data (overall and Hispanic) for both Texas and the United States. For this activity, we will focus on the Hispanic and overall population for the US.

Examine the data. Does the US Hispanic population appear to be roughly linear? What about the total US?

This activity will tie together two previous ideas you have worked with: sequences and statistics. First, you will explore the data using the ideas of common difference and common ratio from your work with sequences. You will then use the statistics applet to see how accurate your sequence representations are by making predictions. You will also work with an applet that has to be put on your calculator.

Year	US Hispanic Population	US Total Population
1970	9,589,216	203,210,158
1980	14,608,673	226,545,805
1990	22,354,059	248,709,873
2000	35,305,818	281,421,906

Exercise 1:

Use the Sequence applet to enter information about the US Total Population.

1. What should $U_1(1)$ and $U_1(2)$ be?
2. When you enter an expression for the data, will you use a common difference or a common ratio? How did you make that determination?
3. How did you come up with that number you used in your symbolic formula?
4. Create the table for your sequence on the calculator. How does the table shown on the calculator compare to the data in the table given in this problem? If there are differences, how do you explain them?

Now look at the US Hispanic Population.

5. What should $U_2(1)$ and $U_2(2)$ be?
6. When you enter an expression for the data, will you use a common difference or a common ratio? How did you make that determination?
7. How did you come up with that number you used in your symbolic formula?
8. Create the table for your sequence on the calculator. How does the table shown on the calculator compare to the data in the table given in this problem? If there are differences, how do you explain them.

Exercise 2:

Let's now examine the data using the applet TXY2K. [Click here to download the TXY2K applet.](#) Be sure to save the TXY2K applet to your desktop. Then connect your 39gs to your computer and be sure to

download the applet to calculator as a folder. Before you can answer any questions, you have to complete the downloading process of the applet on your calculator. Once you have the applet, make sure you can see the data for this problem in the NUM view.

1. Use the data for the total US population and find a model to fit the data. Which model did you choose? Why?
2. Explain any similarities and differences between the model found using statistics and the formula you used in the sequence applet.
3. Use the data for the US Hispanic population and find a model to fit the data. Which model did you choose? Why?
4. Explain any similarities and differences between the model found using statistics and the formula you used in the sequence applet.

Exercise 3:

In this exercise, rather than exploring the Hispanic population separate from the total US population, you will look at the ratio of the two populations.

1. To look at the US Hispanic population compared to the total US population, graph the year and the ratio of Hispanic to total. Describe the pattern you see.
2. Use the statistics applet to develop a model for the ratio of Hispanic to total. Use this model to predict when the Hispanic population will be at least 50% of the US population.
3. Go back to your sequence applet and look at the tables you created for the Hispanic population and total US population. According to this table, when is the Hispanic population at least 50% of the total US population?
4. Does this match your answer from the statistics model? Explain any differences that may occur.

Teacher Notes

The following TEKS can be found in this activity. The TEKS are listed in grade-level order, not the order in which they appear in the activity. Also, some of the TEKS statements are abbreviated or paraphrased here.

- 6.2D: estimate and round to approximate reasonable results and to solve problems where exact answers are not required
- 6.3A: use ratios to describe proportional situations
- 6.3C: use ratios to make predictions in proportional situations
- 6.7: use coordinate geometry to identify location in two dimensions
- 7.5B: formulate problem situations when given a simple equation and formulate an equation when given a problem situation
- 7.7A: locate and name points on a coordinate plane using ordered pairs of integers
- 8.3A: compare and contrast proportional and non-proportional linear relationships
- 8.4: make connections among various representations of a numerical relationship
- 8.5A: predict, find, and justify solutions to application problems using appropriate tables, graphs, and algebraic equations

Table 1: TEKS Covered, by Activity

Activity	TEKS Covered
Exercise 1	6.2D, 6.3A, 6.3C, 7.5B, 8.3A, 8.4, 8.5A
Exercise 2	6.7, 7.5B, 7.7A, 8.4, 8.5A
Exercise 3	6.2D, 6.3A, 6.3C, 6.7, 7.5B, 7.7A, 8.3A, 8.4, 8.5A

Answer Key

Exercise 1:

1. $U1(1) = 203,210,158$ and $U1(2) = 226,545,805$
2. Students should realize they are looking at a common difference situation. Even though the differences are not exact, you are adding close to the same amount each time.
3. Answers will vary. Students may just guess or base it on the approximate difference in the population in 1970 and 1980. Some student may add all the differences and divide by three to get the mean. For the answers shown here, we are using a common difference of 13,000,000

```
SEQUENCE SYMBOLIC VIEW
✓U1(1)=203210158
✓U1(2)=226545805
✓U1(N)=U1(N-1)+13000000
U2(1)=
U2(2)=
EDIT ✓CHK N U1 SHOW EVAL
```

4. Below is the table based on the symbolic input shown in the previous problem.

N	U1		
1	2.0321E8		
2	2.2655E8		
3	2.3955E8		
4	2.5255E8		
5	2.6555E8		
6	2.7855E8		

203210158

ZOOM | BIG | DEFN

There are two main differences. The values in the table appear in scientific notation and students will not be able to see the precise numbers. However, they should be able to see enough of the values to notice that these numbers are different than what was provided in the problem.

5. $U2(1) = 9,589,216$ and $U2(2) = 14,608,673$
6. Students should realize that they are not dealing with a common difference in this problem. While they may not be able to immediately recognize a common ratio, it should be clear that if it is not a common difference, they should be checking for a common ratio.
7. As with the common difference with the previous data, student answers will vary for the common ratio. They can use a guess and check method, choose only one of the ratios, or average the three. For the answers shown here, a common ratio of .15 is used.

- 8.

```
SEQUENCE SYMBOLIC VIEW
✓U2(1)=9589216
✓U2(2)=14608673
✓U2(N)=U2(N-1)*1.5
U3(1)=
U3(2)=
EDIT ✓CHK N U2 SHOW EVAL
```

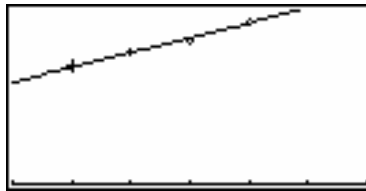
N	U1	U2	
1	2.0321E8	9589216	
2	2.2655E8	14608673	
3	2.3955E8	21913010	
4	2.5255E8	32869514	
5	2.6555E8	49304271	
6	2.7855E8	73456407	

9589216

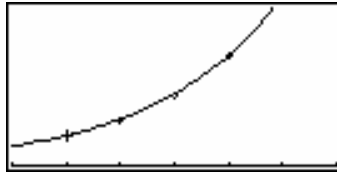
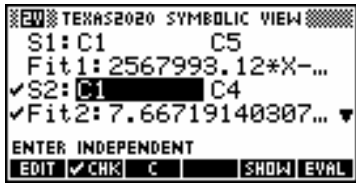
ZOOM | BIG | DEFN

Exercise 2:

1. A linear model since we used a common difference to set up an arithmetic sequence.



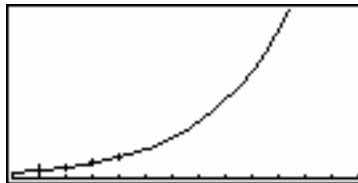
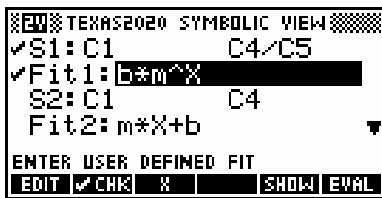
2. A linear model best represents an arithmetic sequence. However, the common difference used is not the same as the slope of our statistical model.
3. An exponential model because we used a common ratio to define our sequence.
4. An exponent model best represents a geometric sequence. However, the statistical fit is not the same as our sequence definition.



Exercise 3:

In this exercise, rather than exploring the Hispanic population separate from the total US population, you will look at the ratio of the two populations.

1. The pattern appears to be exponential.



2. According to the statistical model, the US Hispanic population will be at least 50% between 2040 and 2050. A better approximation is between 2042 and 2043.
- 3.

N	U1	U2	U3
4	2.5255E8	32869514	.1301527
5	2.6555E8	44304271	.1856714
6	2.7855E8	73456407	.265509
7	2.9155E8	1.1093E8	.3805048
8	3.0455E8	1.664E8	.5463437
9	3.1755E8	2.446E8	.7860374
.380504911034			

According to the table, the population will reach 50% sometime between 70 and 80 years past the original starting point of 1970, so between 2040 and 2050.

4. The data for the ratio in the table of sequences indicates that the choice of an exponential model is best. Differences in prediction values occur because of our choice of model. This is why predictions for population and other things will vary in different newspaper or magazine articles. When different mathematical models are used, different results can occur.

Click here for more information about the [HP 39gs Graphing Calculator](#).

The industry standard for finance professionals and the world's first horizontal financial calculator

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Some things just don't go out of style – the original HP 12c hits 27 years in 2008. HP introduced a \$150 pocket-sized device that revolutionized financial calculations for people on the move. Its innovative design and breakthrough Reverse Polish Notation (RPN) entry forever changed the way students and professionals reach their goals. Instantly recognized for its unique horizontal layout, the HP 12c financial calculator has sold in the millions to investors, real estate professionals, accountants, loan officers, business students and teachers. It is an iconic consumer electronics product that is still sold virtually unchanged under its original name and model number 27 years after it was introduced. The HP 12c that's sold today acts and looks just like it did when it was first snapped up by thousands of financial and real estate students and professionals at its worldwide debut. Few other products of industrial design have achieved such a classic distinction.

HP still offers the HP 12c and it is still one of our most popular financial calculators today. It has touched many lives and you can see the story winners here:

[Tales of the AMAZING 12C story contest](#)

The HP 12c is approved for many courses and exams including the GARP FRM, CFP, CFA, AFP, CIIA, and MFA. Easily calculate loan payments, interest rates and conversions, standard deviation, percent, TVM, NPV, IRR, cash flows, bonds and more. Now you can solve all your financial calculations with the industry standard financial calculator.

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In May, HP officially launched our first external calculator sales promotion of the year. This program is aimed at providing additional discounts and benefits for financial institutions throughout the Western United States. The program, entitled Banking and Insurance Promotion, was launched through a direct mail campaign targeting specific financial institutions. With this promotion we are looking to create awareness of our high-end financial calculator line by informing customers of the many benefits of our calculators. We hope to illustrate how our 17bill+ financial calculator is a "finance-savvy tool" that can help people easily answer some of the toughest financial questions, such as: What will my new ARM payment be? Should I choose a car loan or a lease? Which APR will cost me the least? How much life insurance do I need? What will my savings be worth in 40 years?

In the upcoming months we expect to launch additional promotions aimed at our business customers throughout the world. These promotions will provide extra discounts, incentives, training, and programs for our biggest and best customers. Through these promotions our customers will receive extra discounts off our top-selling calculating solutions – the larger the purchase the bigger the discount. We also plan to incorporate a “buy 10 get one free” promotion. This program will greatly reward our customers that purchase our calculators in bulk. Also, unlike the previous promotions this one will use a two-pronged approach by providing incentives to our customers and internal HP sales folks.

It is clear our calculators are the perfect productivity tool for anyone involved in the financial industry. But, our calculators also make the perfect gift for your employees and your customers. So, next time you are thinking of a great gift consider purchasing HP calculators in bulk and at a discount for your customers and employees!

For more information or to obtain a quote on a bulk purchase please go to the [HP Calculator homepage](#), join the calculator club, and click on the link for ‘HP discounts & special offers’. On this page you will find the link to request discounted pricing for bulk purchases.

The Technical Corner

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Ever wonder how your HP Calculator finds the square root of a number?

HP calculators stores numbers as a set of 3 items: a sign, + or -, a 12 digit number called mantissa always greater or equal to 100000000000 and an exponent.

For example, 34.432 is stored as '+', 344320000000, 1.

To extract a square root of a number, the calculator makes use of the following mathematical fact:

$$\sum_{result=1}^n result - 0.5 = -0.5 * n + \frac{n^2 + n}{2} = \frac{n^2}{2}$$

Before calculating the square root, the calculator prepares the number by looking at the exponent.

Mathematically, the exponent of the square root of a number is ½ of the exponent of the original number (1e2=100 is the square root of 1e4=10000). But, there is an issue if the original exponent is odd, in this case, you can not divide it by 2, so if the exponent is even, the exponent is first decremented and the mantissa multiplied by 10 (which yield the same number).

The number is then divided by 2 (because the formula equates the sum with $n^2/2$).

Then comes the “real” work, calculating the square root digits. To do that, the calculator successively removes result +0.5 from the original number with result incrementing from 0 to 9 until it can not do it anymore. This gives us n, an approximation of the square root of $n^2/2$.

Then the calculator repeats the process for the next digit until it has done it for all digits of the mantissa.

Let us look at the algorithm in a “pseudo computer language” and try to apply it to the number 2 (sign:+ mantissa:200000000000 exponent:0)

```
// calculate exponent of the result and modify the mantissa as needed.
```

```

if exponent is odd then mantissa= mantissa/10 and exponent= exponent-1
exponent= exponent/2
// divide the mantissa by 2 as per the algorithm...
mantissa= mantissa/2

// initialize increment for the first digit.
// note that increment/2 is 0.5*increment!
increment= 100000000000
result= 0
for i=12 to 0 while decrement i each time           // for each of the 12 digits
{
  while mantissa >= result+increment/2 repeat      // see if we can remove result+0.5
                                                    // from mantissa
  {
    mantissa= mantissa-result-increment/2         // while we can do it, do it!
                                                    // number = number -
                                                    // result+increment*0.5
    result= result + increment                    // increment result
  }
  mantissa= mantissa*10                          // next digit!
  increment= increment/10                        // next increment
}

// and we are done. exponent is the result exponent.
// and result if the mantissa of the result!

```

The following table shows the content of the various variables during the execution of the algorithm and show how the square root of 2 “appears” during the process.

i	mantissa	result	increment
12	100,000,000,000	100,000,000,000	100,000,000,000
11	200,000,000,000	140,000,000,000	10,000,000,000
10	595,000,000,000	141,000,000,000	1,000,000,000
9	302,000,000,000	141,400,000,000	100,000,000
8	191,800,000,000	141,420,000,000	10,000,000
7	503,795,000,000	141,421,000,000	1,000,000
6	795,315,500,000	141,421,300,000	100,000
5	882,088,750,000	141,421,350,000	10,000
4	335,606,320,000	141,421,356,000	1,000
3	527,636,078,000	141,421,356,200	100
2	103,372,009,355	141,421,356,230	10
1	437,705,999,155	141,421,356,237	1

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