The New HP Prime Graphing Calculator

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If you are an educator and would like to receive the FREE HP Prime emulator for use on your PC and in the classroom, please visit https://ssl.www8.hp.com/h41268/live/index.aspx?qid=20709 and select the "Prime Graphing" calculator.
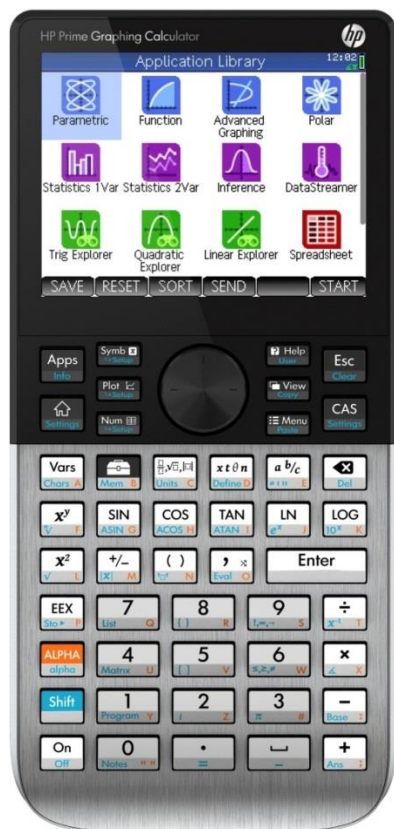

Fig. 1 – HP Prime showing Apps view.

Imagine a handheld math machine with a high-resolution multi-touch color screen. Imagine that you could plug a small dongle into that machine for wireless connectivity to the teacher's class computer allowing instant polling and the sharing of students' screens, teacher files and settings. Imagine a machine with a spreadsheet, dynamic geometry, a full computer algebra system (CAS) and high powered programming tools, which is so easily and clearly configurable with its exam mode that it will be allowed for use in exams. No need to imagine further, the HP Prime graphing calculator has arrived.

HP Prime looks very sophisticated, with a brushed aluminum finish and 3.5" sharp color display. The touch screen is smooth and very accurate, allowing the user to drag and move objects and navigate drop down menus. But looks are just the beginning; HP Prime boasts a comprehensive set of Apps, an integrated Exam Mode, data streaming capabilities[1] and a Connectivity Kit that together provide revolutionary functionality for teachers and students alike. According to Gizmodo, a top tech blog, HP Prime "appears to be one of the most advanced color touchscreen calculators the scientific world has ever seen." (http://bit.ly/146moqr)

HP Apps

HP Apps are designed to explore mathematical topics and solve problems. They make it easy to view numeric, graphic and symbolic representations of mathematical concepts. Customize your HP Apps by filling any one of them with data while you work, and then save it with a name you'll remember. Then reset the app and use it for something else. You can come back to your saved app anytime and even send it to your colleagues or students with a PC or the Wireless Connectivity Kit. HP Apps have app functions as well as app variables; use them while in the app, or from the CAS view, Home view, or in programs.

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[1] *Data streamer sold separately, expected availability near the end of 2013.*

App Views

App Functions
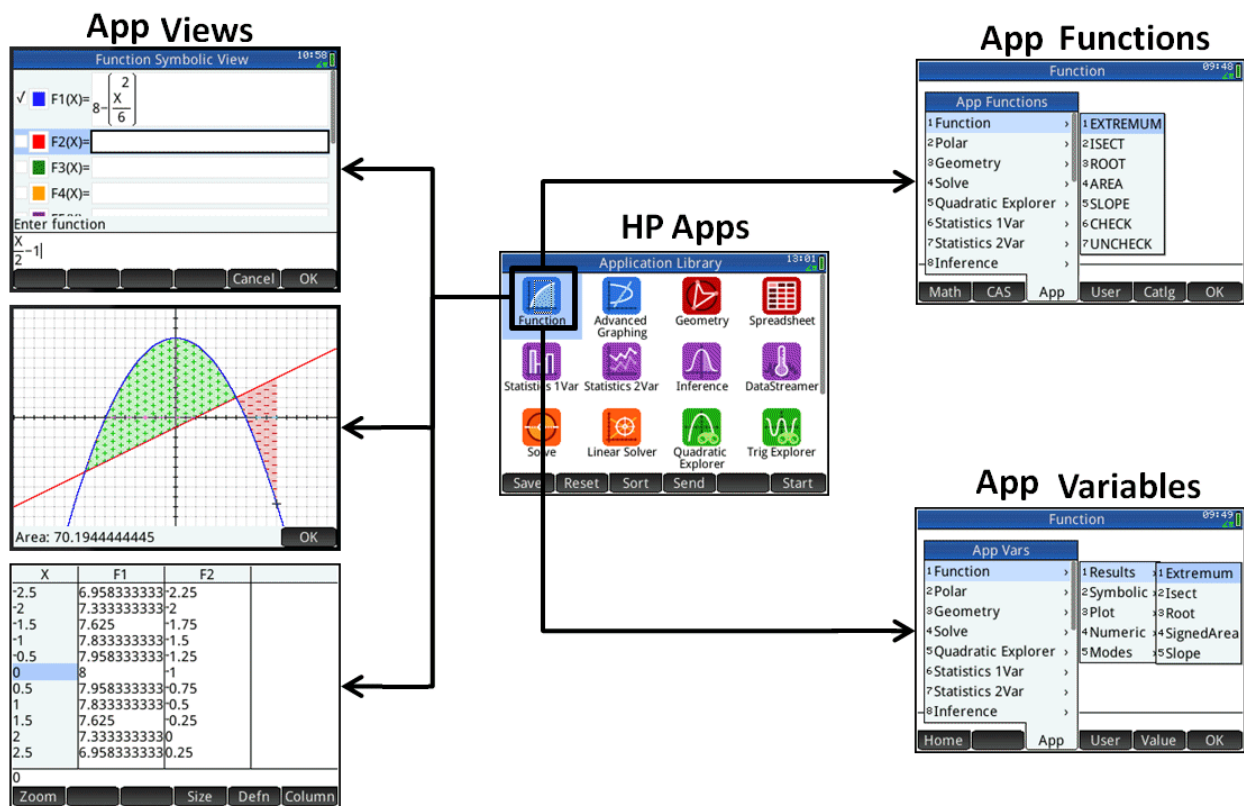
HP Apps

App Variables

Fig. 2 – Organizational layout showing the integration of Prime's Applications.

HP Apps are color-coded for easy identification:

- **5 graphing apps (blue)** to explore graphs –including the new Advanced Graphing App
- **2 Special apps (red):** the Geometry app and the Spreadsheet app
- **4 Statistics Apps (purple)** for descriptive and inferential statistics and data collection
- **4 Solver Apps (orange)** for solving specific types of problems (triangles finance, etc.)
- **3 Explorer Apps (green)** for investigating a function's equation and its graph.

Advanced Graphing App

The **Advanced Graphing App** is a major advance in Prime. This App will graph almost anything including any equation or inequality in *x* and *y*. Below is just one of the example with its equation included.

Additionally, the Advanced Graphing App can handle all of the following with ease:

- Conic sections (rotated ones, too)
- Polynomials in standard or general form
- Inequalities (not just linear) Functions
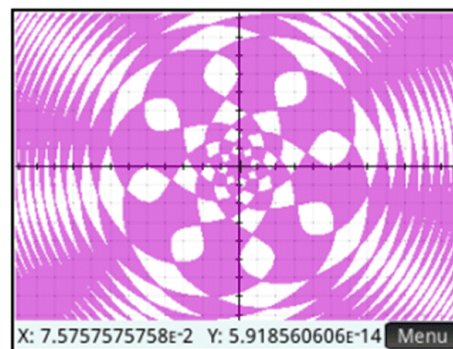
$$Sin\left(\left(\sqrt{x^2+y^2}-5\right)^2\right) > Sin\left(8*Tan^{-1}\left(\frac{y}{x}\right)\right)$$

Fig. 3 – Graphing application example.

Dynamic Geometry and Spreadsheet Mode

The **Geometry App** is a dynamic geometry application that allows you to create geometric constructions and explore their properties interactively.

With an array of menu buttons at your disposal, you have limitless possibilities to create geometric objects:

- **Zoom**: zoom in or out, etc.
- **Point**: midpoints, intersections, points on objects, etc.
- **Line**: segments, lines, tangents, perpendiculars, etc.
- **Polygon**: triangles, quadrilaterals, and special polygons
- **Curve**: circles and other conic sections, locus of points, graphs of functions, etc.
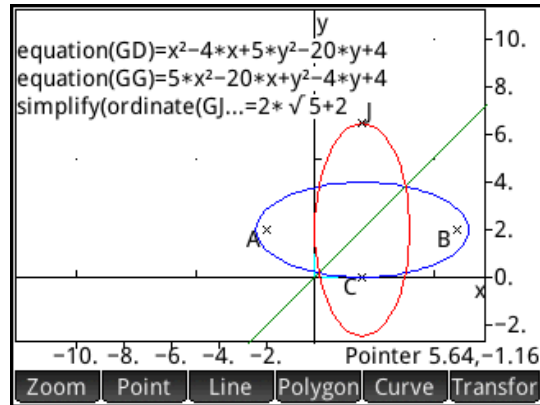- **Transfor(m)**: translation, reflection, dilation, etc.

Fig. 4 – Geometry application example.

The **Spreadsheet App** allows for a textbook style view of spreadsheets. And with HP Prime, you also get the power of a CAS integrated with the spreadsheet. The Spreadsheet app can return numerical approximations for a formula, or it can use the CAS to return exact numeric or symbolic results.

CAS and Exam Mode

HP Prime features two home screens - a **CAS** screen which deals with exact objects and the traditional home screen which deals with approximate objects. This recognition of the fundamental pure/applied,

Fig. 5 – Spreadsheet application example.

exact/approximate distinctions is central to an underlying philosophy which has the potential to transform the way we think about exploring mathematics. Using CAS together with HP Apps represents a major advance in providing a space to explore mathematical ideas.
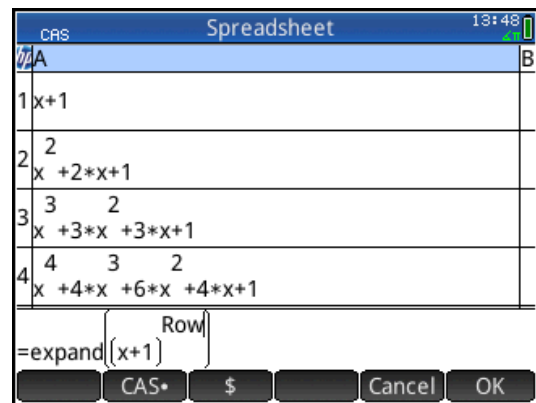
Even though HP Prime is enabled with CAS, the calculator also includes a comprehensive and secure **Exam Mode** that can be adjusted by teachers depending on their needs. The menu system allows for a vast range of features like CAS to be turned on or off. Specific apps can also be turned off for specific exams or subjects. The system is password protected so the user is unable to use blocked features. For school use, teachers can select the settings they want, disable any features, create a password and then beam this setting to all of the connected student Prime units, wirelessly. A series of bright LEDs light up in the same sequence while exam mode is engaged, and every setting has a unique configuration of lights.

Exam Mode allows the following:

- Give your configuration a name
- Set a time period
- Set a password
- Check a box to erase memory when examination mode starts

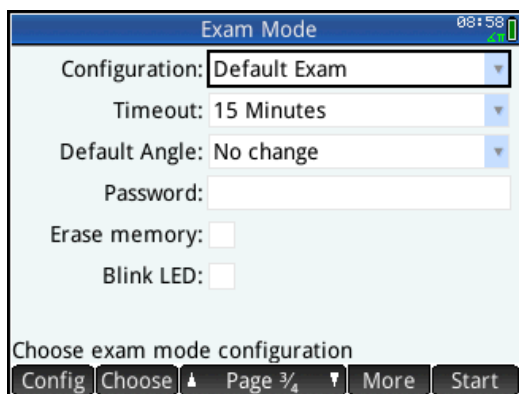Check a box to make the LED lights blink while in examination mode.

Fig. 6 – Exam mode options.

Wireless Connectivity for Formative Assessment

One of the most unique features of HP Prime is its ability to connect to PCs wirelessly. Transfer files via the included connectivity software or plug in a small USB dongle[2] into the top of the calculator. The teacher's computer will immediately recognize the dongle in class so files and settings can then be transferred wirelessly to the computer.

Additionally, HP Prime's screen can be shown on the teacher's screen. The class polling function allows the teacher to set a question from her computer for students to offer responses from their Prime units with the results shown in table and chart form. Many schools purchase individual polling systems but HP Prime has this as just one of its many features. Additionally, the **Wireless Connectivity Kit** is a plug-and-play system which works similarly to a Bluetooth pairing, which means no set up is required.

The Wireless Connectivity Kit has three panes:

- **Calculator Pane**: see the data on the connected calculator, edit apps, write programs, and synchronize the new data with the connected HP Prime calculator
- **Content Pane**: create and edit Exam Mode configurations, create polls and quizzes, etc.
- **Class Pane**: see all HP Prime displays in your classroom network, monitor students, send apps, data, polls, quizzes, share one student's display for discussion purposes, send and start an Exam Mode configuration to the entire class, etc.

Data Streaming

The **Data Streamer App** works with the HP StreamSmart 410 and up to four Fourier® sensors to collect data in real time. The final data set is sent to one of the two **Statistics Apps** (1-Var & 2 Var Statistics) for analysis. Just plug the microphone sensor into the StreamSmart 410 and start the Data Streamer App. The microphone is automatically identified. Tap to see your own voice in real time, and zoom in/out while data is still streaming.

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[2] *Wireless Connectivity Kit with included dongle sold separately, expected availability near the end of 2013.*

Fig. 7 is an example of the Data Streamer App in use. All this data you see was collected in 0.144 seconds-roughly 1/7 of a second!

HP Prime will be available in September around the new school year. This is only a fraction of what this calculator can do, for more information and to view the demo video please visit www.hp.com/go/calculators . If you want to play with HP Prime yourself, the virtual emulator is also available free to educators at https://ssl.www8.hp.com/h41268/live/index.aspx?qid=20709.
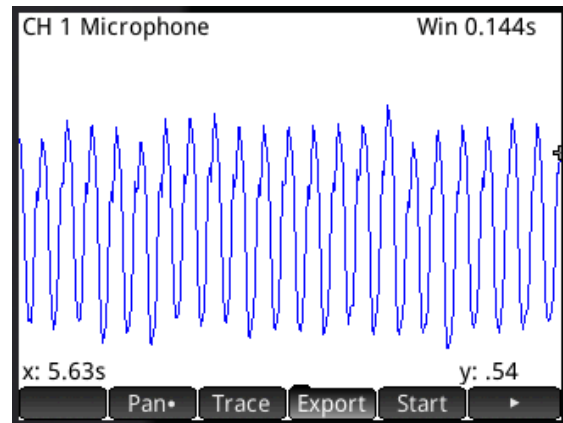

Fig. 7 – Captured sound waveform.