



TECHNOLOGY CORNER

14. Geometric probability on the HP Prime

In this Technology Corner, we will program the HP Prime with two new commands. Then we will use these commands to confirm our answers in the previous example. The inputs for both commands are the success probability p and the value(s) of interest for the geometric random variable Y :

$\text{GEO_PDF}(p, k)$ computes $p \cdot (1 - p)^{k-1}$ or $P(Y = k)$

$\text{GEO_CDF}(p, k)$ computes $P(Y \leq k)$

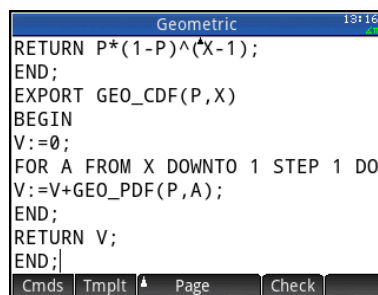
This Technology Corner assumes that you have installed the HP Prime Virtual Graphing Calculator on your PC. If you have not done so, install the HP Prime Virtual Calculator from your product CD onto your PC.

- Here is the short program that contains our two commands:

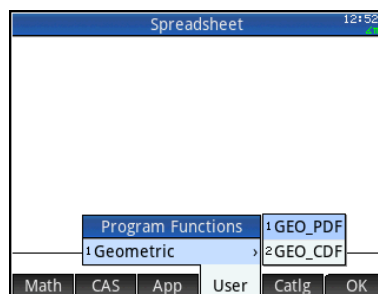
```
Geometric()
BEGIN
END;
EXPORT GEO_PDF(P,X)
BEGIN
RETURN P*(1-P)^(X-1);
END;
EXPORT GEO_CDF(P,X)
BEGIN
V:=0;
FOR A FROM X DOWNT0 1 STEP 1 DO
V:=V+GEO_PDF(P,A);
END;
RETURN V;
END;
```

- Launch the HP Prime Virtual Calculator
- Click **Shift** **1** **Program** **Y** to enter the Program Catalog. Click **New** and enter the program name: *Geometric*. Click **Enter** twice to open the program.
- The first three lines are created for you, but we will not need them. Delete them now so that the program is empty.
- Using your PC clipboard and Copy command, copy the program listed above.

- In the HP Prime Virtual Calculator, paste the program you just copied into the program editor.



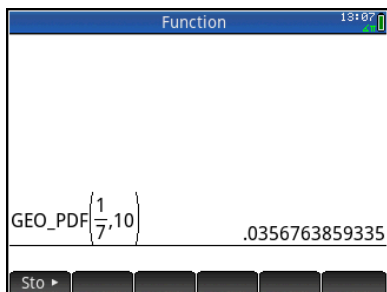
- The new commands show up in the Toolbox User menu. Click **Settings** for the Home view. Click **Mem** and click **USER** to open the User menu. Tap *Geometric* to see your two new commands.



- To send the new program to your physical HP Prime, connect your HP Prime to your PC using the USB cable that came in the box with your HP Prime.
- On the HP Prime Virtual Calculator menu bar, click *Calculator*, then click *Connect To*, and select your HP Prime
- On the HP Prime Virtual Calculator, click **Shift** **1** **Y** to enter the Program Catalog. Click **▼** (if needed) to select the program *Geometric* and click **Send**. You will see the transmit icon momentarily.

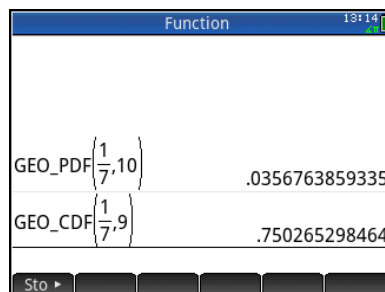
The new program is now on your physical HP Prime and ready to use. Let's test our new commands using the Lucky Day example.

- (a) Find the probability that the class receives exactly 10 homework problems as a result of playing the Luck Day game.
- Press **Settings** for the Home view
 - Press **Mem B** and tap **USER** to open the User menu. Tap *Geometric* and select **GEO_PDF**
 - Complete the command **GEO_PDF(1/7, 10)** and press **Enter**.



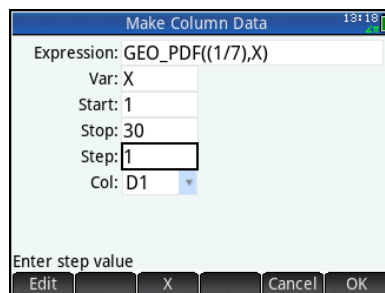
This result agrees with our previous answer using the geometric probability formula: 0.0357.

- (b) Find $P(Y < 10)$ and interpret this value in context.
- Press **Mem B** and tap **USER** to open the User menu. Tap *Geometric* and select **GEO_CDF**
 - Complete the command **GEO_CDF(1/7, 9)** and press **Enter**.




These results agree with our previous answer using the geometric probability formula: 0.7503.

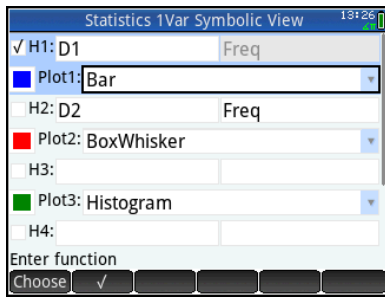
- (c) Use our new **GEO_PDF** command to plot the geometric probability distribution with $p = 1/7$
- Open the Statistics 1Var app and tap **Make**
 - Edit the following fields:
 - Expression:** **GEO_PDF(1/7,X)**
 - Stop:** **30**




- Tap **OK** to see the first 30 probabilities in D1

The screenshot shows the HP Prime Statistics 1Var Numeric View screen. The first 30 probabilities are listed in column D1. The values are: 1.4285714, 1.2244898, 1.0495627, 8.9962516, 7.7110728, 6.6094909, 5.6652780, 4.8550526, 4.1428571, 3.5714286, 3.0952381, 2.7142857, 2.3809524, 2.0952381, 1.8571429, 1.6666667, 1.5192308, 1.3793103, 1.2468879, 1.1209877, 1.0000000, 0.8888889, 0.7857143, 0.6952381, 0.6173810, 0.5519231, 0.4960317, 0.4489796, 0.4090909, 0.3763441, 0.3478261, 0.3235294, 0.3023023, 0.2830928, 0.2657143, 0.2500000, 0.2357143, 0.2227273, 0.2109375, 0.1996032, 0.1896447, 0.1809524, 0.1733333, 0.1666667, 0.1609524, 0.1561738, 0.1521739, 0.1488889, 0.1461538, 0.1439286, 0.1421053, 0.1405769, 0.1393226, 0.1382243, 0.1372714, 0.1364545, 0.1357634, 0.1351881, 0.1347206, 0.1343529, 0.1340752, 0.1338776, 0.1337500, 0.1336815, 0.1336714, 0.1337188, 0.1337206, 0.1337764, 0.1337905, 0.1338529, 0.1339219, 0.1340000, 0.1340873, 0.1341838, 0.1342895, 0.1344045, 0.1345288, 0.1346625, 0.1348056, 0.1349581, 0.1351200, 0.1352914, 0.1354723, 0.1356627, 0.1358627, 0.1360723, 0.1362915, 0.1365203, 0.1367587, 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- Press  to enter the Symbolic view and set H1 as shown below



- Press  and select *Autoscale* to see the plot of the first 30 terms of the distribution.

