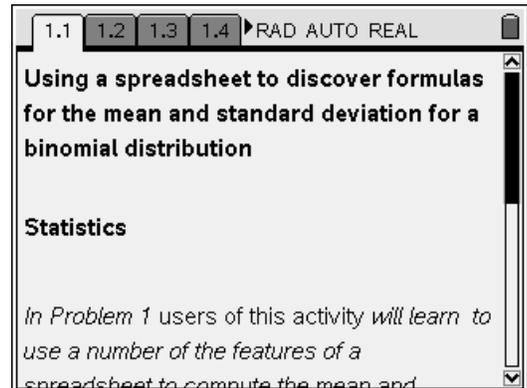


You will work with your teacher on this activity. To begin open the activity and you will be greeted with the opening page. To read the entire introduction you will need to scroll down the page.



Problem #1

A discrete probability distribution is given below:

x	0	1	2	3	4	5
p(x)	.04	.16	.26	.38	.12	.04

On Page 1.2

- Use the NavPad to scroll about the spreadsheet to see that each of these values are entered in columns C and D
- On the command line for column E (in the gray area above cell E1) enter the expression $= c * d$
- In cell B1 sum the resulting column E by entering $= sum(e1 : e6)$. The calculated number that appears is the mean of the distribution. Place the value of the mean in the space provided below:

Mean = _____

Advance to Page 1.3 which should be identical to your recalculated Page 1.2

- Enter on the command line for column F enter $= (c - b1)^2 * d$
- In cell B3 enter the command: $= sum(f1 : f6)$. The calculated number that appears is the variance of the distribution.
- In cell B4 enter the command: $= sqrt(b3)$. The number that appears is the standard deviation of the distribution. Place the value for the standard deviation in the space below:

Standard Deviation = _____

- In cells A1, A3, and A4 enter the words mean, variance and stand dev respectively by enclosing these words in double quotes. This will help to remember what cells B1, B3 and B4 denote.
- In the title lines (above the command line) for columns C and D enter column names `num_val` and `prob_val` respectively which will be used to create a scatter plot of the distribution

Advance to Page 1.4 which should be identical to your recalculated Page 1.3. This Page is provided simply to check that your recalculated Page 1.3 is correct

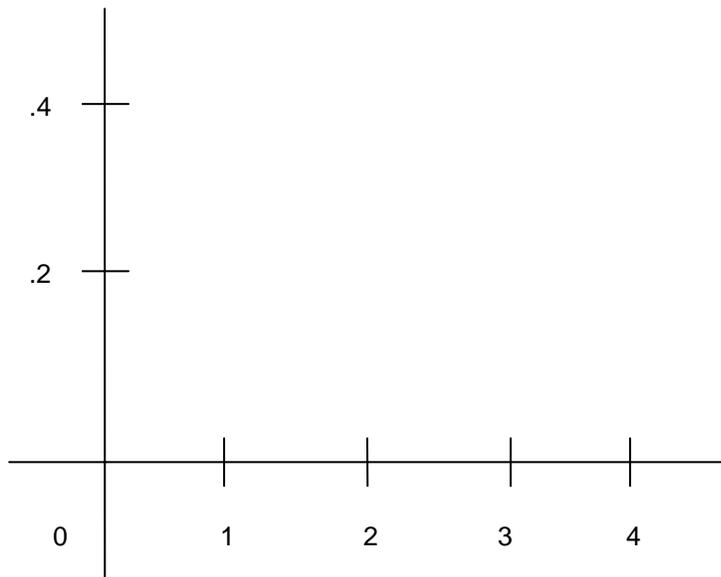
Advance to Page 1.5

This Page is a scatter plot of the given probability distribution and on geometry Page 1.6 you will replicate Page 1.5

Advance to Page 1.6 which is a blank graph which you will use to generate the graph on Page 1.5 by following the steps below:

- From the Graph Type menu select Scatter Plot. (menu,3:Graph Type,4:Scatter Plot)
- In the Entry Line at the bottom that appears enter *num_val* in the box for *x* and *prob_val* in the box for *y* (click on boxes to view variables)
- In the Window menu select Zoom-Data (menu,4:Window,9:Zoom-Data)
- In the View menu, select the Hide Entry Line (menu,2:View,6:Hide Entry Line)
- In the Points & Lines menu, select Point On (menu,6:Points&Lines,2:Point On) and click on each point to enter coordinates (place pointer over point and hit the Enter button)

Finally for this problem, sketch the scatter plot showing on Page 1.6 in the space provided below:



Problem #2

A number is selected randomly from the set $\{1,2,3,4,5,6,7,8\}$. Then a second number from the same set, then a third, and a fourth, all from the same given set. Let x denote the number of even numbers drawn in the 4 selections. The discrete probability distribution for x is given below:

x	0	1	2	3	4
$p(x)$.0625	.25	.375	.25	.0625

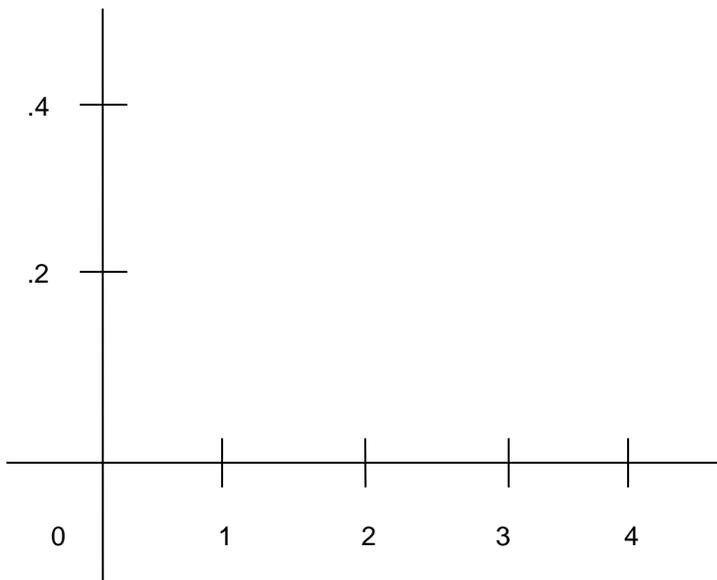
Using the process from Problem #1:

- a. On blank Spreadsheet Page 2.1 compute the mean and the standard deviation of the distribution. Enter the values on this worksheet below in the space provided

Mean _____ Standard Deviation _____

- b. On the blank Graphs & Geometry Page 2.2 construct the graph of the scatter plot. Sketch the graph on this worksheet below in the space provided

Sketch of Scatter Plot



Problem #3

A number is selected randomly from the set {1,2,3,4,5,6,7,8,9,10}. Then a second number then a third, a fourth, a fifth and a sixth. Each time a number is selected it is replaced back into the original set before the next number is selected. Let x denote the number of primes drawn in the 6 selections. Your teacher will assist you in completing the entire probability distribution of x (probabilities need only be correct to 3 decimal places at this point). Then as in the preceding problems, determine the mean, variance, standard deviation and scatter plot for the distribution

x	0	1	2	3	4	5	6
$p(x)$.047	.187	.311	.276			

On Page 3.1

- a. Compute the probabilities for $x = 0,1,2,3,4,5,6$ using the formula

$p(x) = nCr(6, x) * p^x (1 - p)^{n-x}$ for the probability of x . Again note that n denotes the number of trials and p denotes the probability of success. The first 4 values of x are computed for you. Then complete the table above (note: the built-in function $nCr()$ is found in the probability submenu, but can also be typed directly)

- b. Next compute the command $seq(n,n,0,6,1)$ (again this command can be typed directly or accessed from menu, 6:Statistics,4:List Operations,5:Sequence).
- c. Finally compute $binomPdf(6,0.4)$ (again this command can be typed directly or accessed from menu, 6:Statistics,5:Distributions,D:BinomialPdf). Observe that the values generated by this command provides the values of $p(x)$ in the table.

We conclude these last two commands give us a quick way to produce the probability distribution for this problem and are accurate to more decimal places.

On spreadsheet Page 3.2 observe that these last two commands appear on the command line for columns C and D and that the mean and variance are computed via columns E and F as before. Enter the mean and standard deviation in the space provided below:

A. Mean _____ Standard Deviation _____

Now go back to Page 3.1 and define $n = 6$ (use command $n := 6$) and $p := 0.4$ on separate lines and then calculate the commands $n * p$ and $sqrt(n * p * (1 - p))$ separately and enter the results in the space provided below:

B. $n * p$ _____ $sqrt(n * p * (1 - p))$ _____

Compare the numbers you entered in lines A and B. What do you observe? Write your response below:

Advance to **Page 3.3** which is a scatter plot of the distribution and then advance to **Page 3.4** where the values for n and p are entered in cells B1 and B2 respectively and that the mean and standard deviation are now computed by their respective formulas $n * p$ and $sqrt(n * p * (1 - p))$ in cells B4 and B5 and again in B7 and B8 by definition via columns E and F. The current values of n and p are set respectively as 6 and 0.4

Complete the table below by entering the values of n and p given below into cells B1 and B2 of the spreadsheet page

n (cell B1)	p (cell B2)	Mean (by formula) (cell B4)	Mean (by definition) (cell B7)	Stand Dev (by formula) (cell B5)	Stand Dev (by definition) (cell B8)
20	0.6				
10	0.45				
15	0.5				
24	.75				

After observing table, write your observation and any conclusions you reach below:

Problem #4

The spreadsheet on Page 4.1 simplifies the process of finding the mean and standard deviation of any binomial distribution for any value of n less than or equal to 100 and for any value of p . The current Page has an $n = 20$ and $p = 0.6$. The value for n has been entered in cell B1 and the value for p in cell B2. Complete the table below by entering the values of n and p given into cells B1 and B2 respectively.

Page 4.2 provides a scatter plot for the current values of n and p and **Page 4.3** extends our understanding of the binomial distribution as it overlays the normal curve with the mean and standard deviation for the binomial distribution defined by the current values of n and p stored in cells B1 and B2 respectively. Note that every time the values of n and p change, the scatter plot needs to be resized by re-selecting Zoom-Data in the Window submenu.

n	p	mean	standard deviation
30	0.4	_____	_____
20	0.6	_____	_____
15	0.45	_____	_____
24	0.75	_____	_____

Once again, write your observation about the comparison between the normal curve and the binomial distribution scatter plot below:
