

STA2023 TI-84 Skills

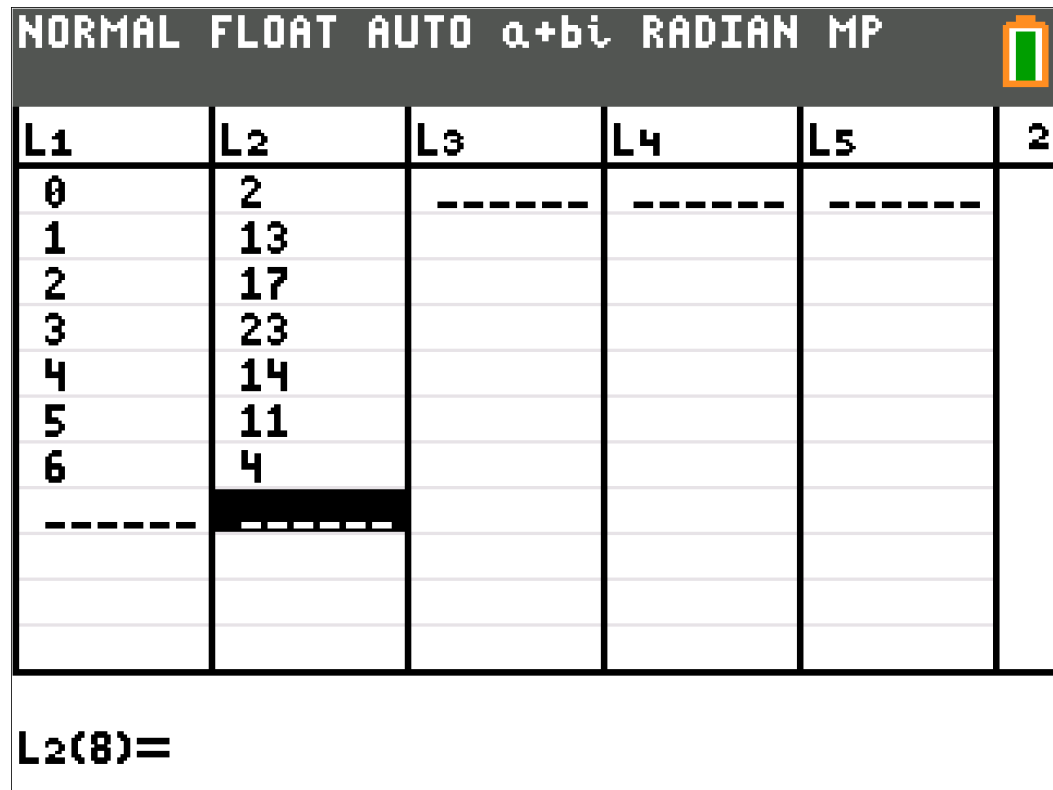
CH 4&5

The Plan

- ▶ Probability distribution in the List Menu
- ▶ Variance and Standard Deviation (in Probability) in the List Menu
- ▶ nCx , factorials, entering information correctly in BinomProb formula
- ▶ calculating z-scores
- ▶ CLT/StDev of sample means
- ▶ normalCDF with z, normalCDF with x
- ▶ invNorm
- ▶ binomPDF

Probability Distribution in the List Menu

- ▶ When you're given x and frequency and you need to find the probability and the mean.
- ▶ $x \rightarrow L_1 \{0, 1, 2, 3, 4, 5, 6\}$
- ▶ $f \rightarrow L_2 \{2, 13, 17, 23, 14, 11, 4\}$



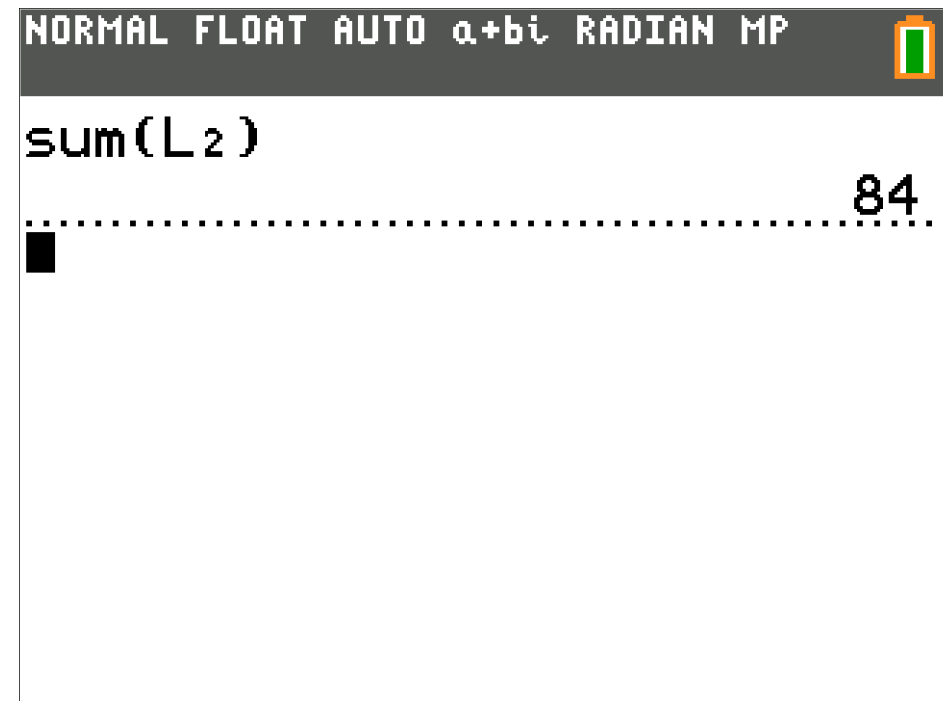
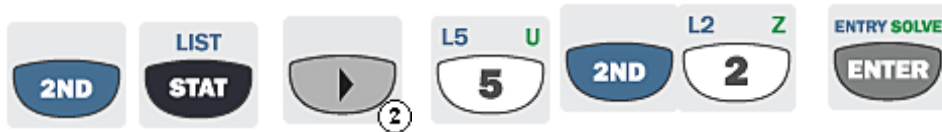
The image shows a TI-84 Plus calculator screen. At the top, the status bar displays "NORMAL FLOAT AUTO $\alpha+bi$ RADIAN MP" and a battery icon. Below this is a list menu with columns labeled L1 through L5 and a cursor icon. The data is as follows:

L1	L2	L3	L4	L5	2
0	2	-----	-----	-----	
1	13				
2	17				
3	23				
4	14				
5	11				
6	4				
-----	-----				

At the bottom of the screen, the text "L2(8)=" is displayed.

Probability Distribution in the List Menu


- ▶ What's the sum of L_2 ?
- ▶ $\text{sum}(L_2)$



Probability Distribution in the List Menu

► $L_3 = L_2 / \text{sum}(L_2)$

**Quick check!!
 $\text{sum}(L_3)$ should equal 1.

NORMAL FLOAT AUTO a+bi RADIAN MP 


L1	L2	L3	L4	L5	3
0	2	0.0238	-----	-----	
1	13	0.1548			
2	17	0.2024			
3	23	0.2738			
4	14	0.1667			
5	11	0.131			
6	4	0.0476			
-----	-----	-----			

$L_3(1) = 0.023809523809524$

Probability: Finding the Variance and Mean

- ▶ We have x and $P(x)$. We need μ , $(x - \mu)^2 \cdot P(x)$, σ^2 , and σ .
- ▶ $\mu = \sum x \cdot P(x)$
- ▶ $x \cdot P(x) = L_1 \cdot L_3 = L_4$

$\mu = 2.988$


```
NORMAL FLOAT AUTO a+bi DEGREE MP   
sum(L4)  
.....2.988095238  
■
```

Probability: Finding the Variance and Mean

- ▶ Now, we have μ . Let's put $(x - \mu)^2 \cdot P(x)$ in L_5 .


$$\sigma^2 = \sum (x - \mu)^2 \cdot P(x)$$

$$\sigma = \sqrt{\sigma^2}$$

```
NORMAL FLOAT AUTO a+bi DEGREE MP   
sum(L5)  
.....2.154718286  
√2.154718286  
.....1.46789587
```

nCx:



NORMAL FLOAT AUTO a+bi DEGREE MP 

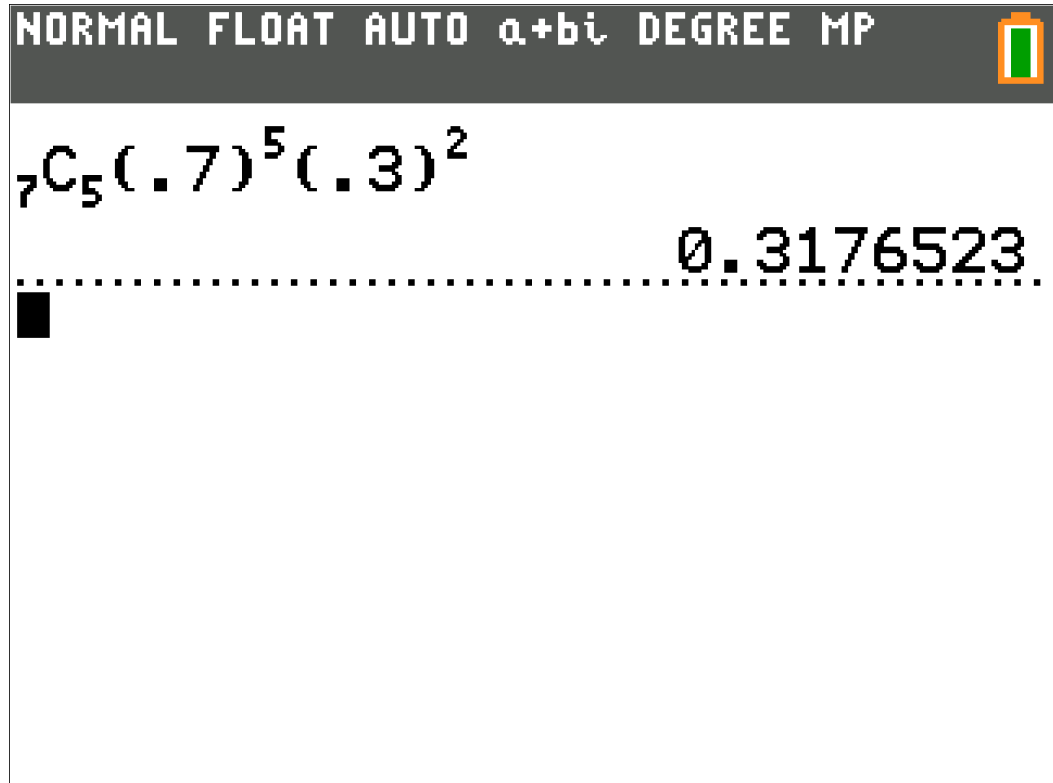
$10C_7$

120

■

Binomial Probability: ${}_n C_x p^x q^{n-x}$

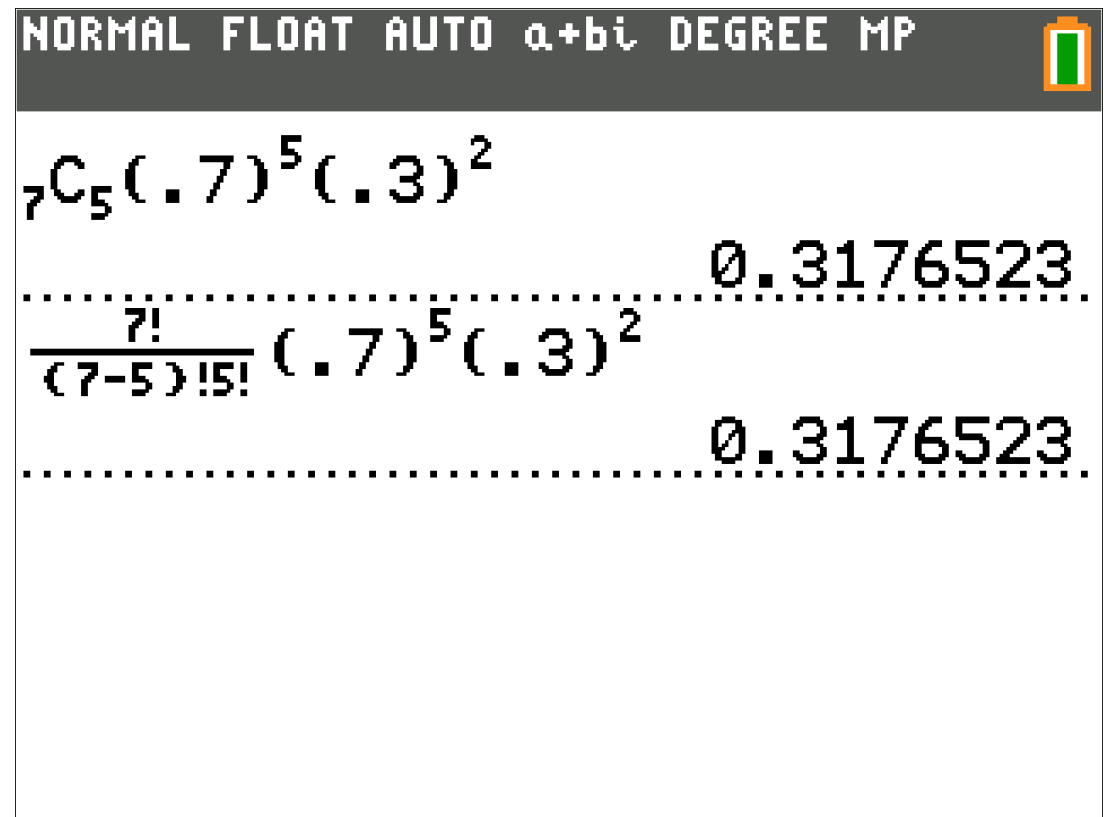
- ▶ With an expected 70% chance of success, what is the probability of getting exactly 5 successes in 7 trials?



A screenshot of a calculator interface. The top status bar shows "NORMAL FLOAT AUTO a+bi DEGREE MP" and a battery icon. The main display area shows the expression ${}_7 C_5 (.7)^5 (.3)^2$ on the top line. A dotted horizontal line is drawn below the expression, and the result 0.3176523 is displayed on the line to the right. A small black square cursor is visible on the left side of the display area.

BinomProb Formula: factorials, entering information correctly


► $nC_x p^x q^{n-x} = \frac{n!}{(n-x)!x!} p^x q^{n-x}$



A screenshot of a calculator interface. The top status bar shows 'NORMAL FLOAT AUTO a+bi DEGREE MP' and a battery icon. The display shows the calculation of the binomial probability ${}^7C_5 (.7)^5 (.3)^2$. The result is 0.3176523. Below this, the formula is expanded to $\frac{7!}{(7-5)!5!} (.7)^5 (.3)^2$, which also results in 0.3176523.

Expression	Result
${}^7C_5 (.7)^5 (.3)^2$	0.3176523
$\frac{7!}{(7-5)!5!} (.7)^5 (.3)^2$	0.3176523

BinomPDF


```
NORMAL FLOAT AUTO a+bi DEGREE MP   
 ${}_7C_5 (.7)^5 (.3)^2$   
..... 0.3176523  
 $\frac{7!}{(7-5)!5!} (.7)^5 (.3)^2$   
..... 0.3176523  
binompdf(7,.7,5) ..... 0.3176523  
..... 0.3176523  
■
```

BinomPDF

What's the likelihood that the number of Avengers listed in purple blipped?

What is n?
What is p?
What is x?


- ▶ Captain America
- ▶ IronMan
- ▶ Thor
- ▶ Hulk
- ▶ **Black Panther**
- ▶ Captain Marvel
- ▶ **Spider Man**
- ▶ **Dr Strange**
- ▶ Black Widow
- ▶ **Scarlet Witch**
- ▶ **Star Lord**
- ▶ Hawkeye

```
NORMAL FLOAT AUTO a+bi DEGREE MP   
binompdf(12,.5,5)  
.....0.193359375  
█
```

calculating z-scores

- ▶ An average Japanese female is 158 cm tall with a standard deviation of 5.6 cm. Chisa is 164 cm tall. What is the z-score of Chisa's height?

$$z = \frac{x - \mu}{\sigma}$$


```
NORMAL FLOAT AUTO a+bi DEGREE MP   
164-158  
5.6  
.....1.071428571
```

Central Limit Theorem

- ▶ “What is the standard error?”

- ▶
$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$

- ▶ Standard deviation of 6.4 and a sample size of 40

```
NORMAL FLOAT AUTO REAL Radian MP   
6.4/√40  
.....1.011928851
```

When to use the z with \sqrt{n} (when to use CLT)

Z score (& normalCDF) of an **individual**

$$Z = \frac{x - \mu}{\sigma}$$

Z score (& normalCDF) of a **sample**

$$Z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

What two changes do you notice?

CLT/StDev of sample means

- ▶ You surveyed 47 college students who paid an average of \$435 for books this semester with a standard deviation of \$103. What is the probability that the true mean is greater than \$462?

```
NORMAL FLOAT AUTO a+bi DEGREE MP
-----
435-462
-----
103/√47
-----
-1.797113342
normalcdf(Ans, 1E99, 0, 1)
-----
0.9638412391
-----
```



normalCDF with z

- ▶ Given a $z < -.24$, what is the probability?

```
NORMAL FLOAT AUTO a+bi DEGREE MP
normalcdf(-1E99, -.24, 0, 1)
.....
0.405165175
█
```


normalCDF with x

- ▶ Given that $x < 47$, the mean is 32, and the standard deviation is 7, what is the probability?

```
NORMAL FLOAT AUTO a+bi DEGREE MP   
normalcdf(-1E99,47,32,7)  
.....0.9839377721  
■
```

invNorm

- ▶ What z score is associated with 87% probability?

```
NORMAL FLOAT AUTO a+bi DEGREE MP   
invNorm(.87,0,1,LEFT)  
.....1.126391128  
█
```

Have/Need

Have	Need	Do
Z	Area	normalCDF
Area	Z	invNorm