Probability Distributions Solutions

The following probability distribution represents the number of children students have in a Math 227 course.

Let x represent the number of children.

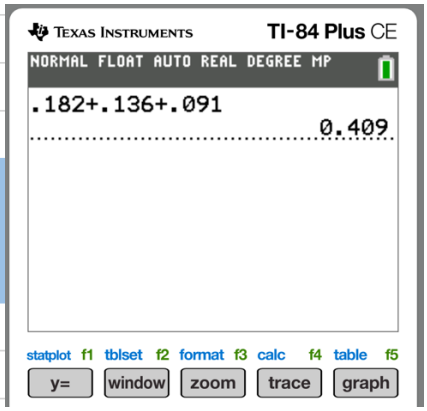
$$x = \#\ of\ children$$

x	p(x)
0	0.364
1	0.227
2	0.182
3	0.136
4	0.091
Total	**1**

If you select a person at random, what's the probability the person has:

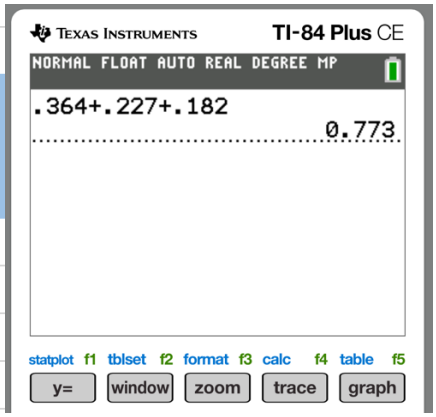
1. More than one child?

x	p(x)
0	0.364
1	0.227
2	0.182
3	0.136
4	0.091
Total	**1**



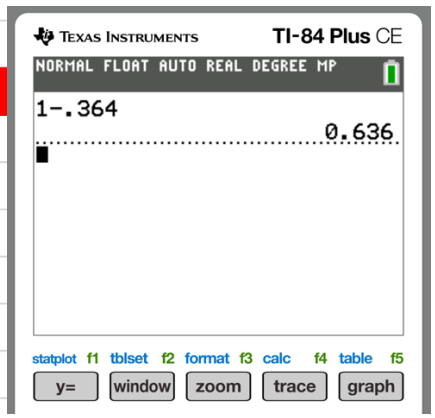
2. No more than two children?

x	p(x)
0	0.364
1	0.227
2	0.182
3	0.136
4	0.091
Total	**1**



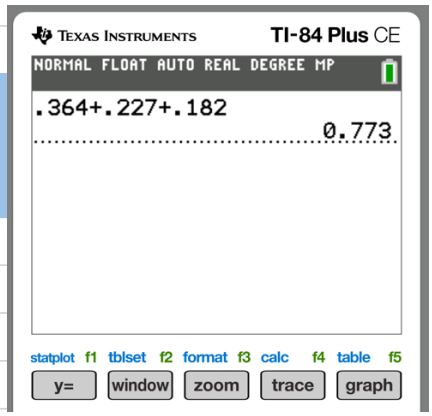
3. At least one child?

x	p(x)
0	0.364
1	0.227
2	0.182
3	0.136
4	0.091
Total	**1**



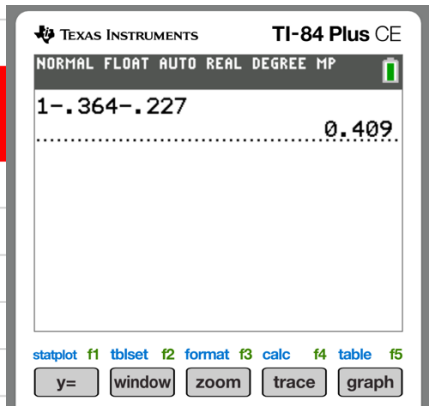
4. Less than three children?

x	p(x)
0	0.364
1	0.227
2	0.182
3	0.136
4	0.091
Total	**1**



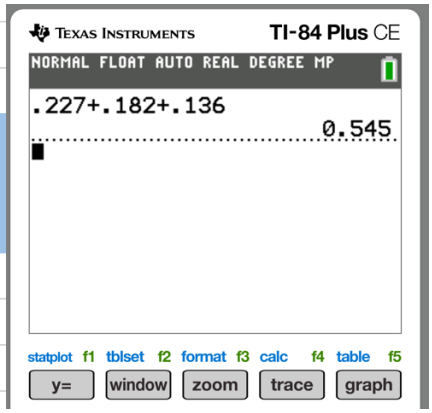
5. At least two children?

x	p(x)
0	0.364
1	0.227
2	0.182
3	0.136
4	0.091
Total	**1**



6. Between one and three children?

x	p(x)
0	0.364
1	0.227
2	0.182
3	0.136
4	0.091
Total	**1**



7. What is the mean for this distribution?

Approximate to the nearest tenths

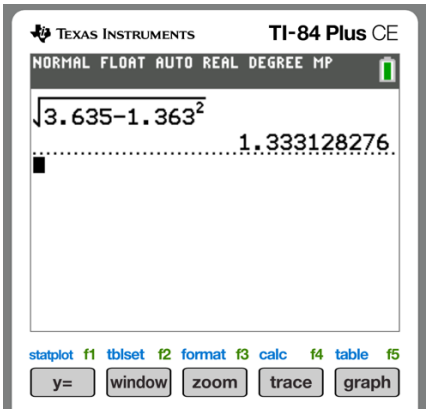
x	p(x)	xp(x)
0	0.364	0.000
1	0.227	0.227
2	0.182	0.364
3	0.136	0.408
4	0.091	0.364
Total	**1**	1.363

$$\mu \approx 1.4$$

8. What is the standard deviation for this distribution?

Approximate to the nearest tenths

	x	p(x)	xp(x)	x^2p(x)
	0	0.364	0.000	0.000
	1	0.227	0.227	0.227
	2	0.182	0.364	0.728
	3	0.136	0.408	1.224
	4	0.091	0.364	1.456
Total		**1**	1.363	3.635



$$\sigma = \sqrt{3.635 - 1.363^2} \approx 1.3$$

The following probability distribution represents the hours of sleep students get the night before an exam.

Let x represent the hours of sleep

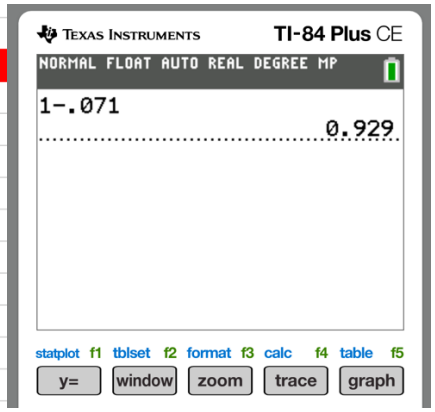
$$x = \#\ of\ hours\ of\ sleep$$

x	p(x)
0	0.071
1	0.048
2	0.024
3	0.024
4	0.119
5	0.143
6	0.190
7	0.286
8	0.095
Total	**1.000**

If you select a person from this table, What's the probability the person slept for:

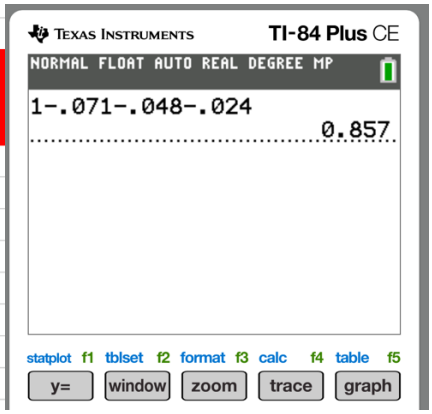
9. At least one hour?

	x	p(x)
	0	0.071
	1	0.048
	2	0.024
	3	0.024
	4	0.119
	5	0.143
	6	0.190
	7	0.286
	8	0.095
Total		**1.000**



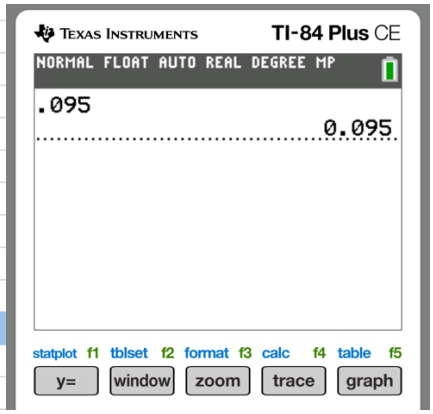
10. At least three hours?

x	p(x)
0	0.071
1	0.048
2	0.024
3	0.024
4	0.119
5	0.143
6	0.190
7	0.286
8	0.095
Total	**1.000**



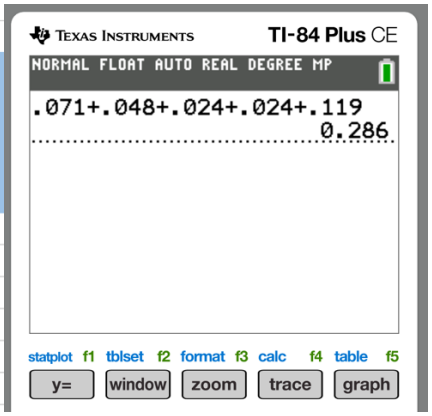
11. More than seven hours?

x	p(x)
0	0.071
1	0.048
2	0.024
3	0.024
4	0.119
5	0.143
6	0.190
7	0.286
8	0.095
Total	**1.000**



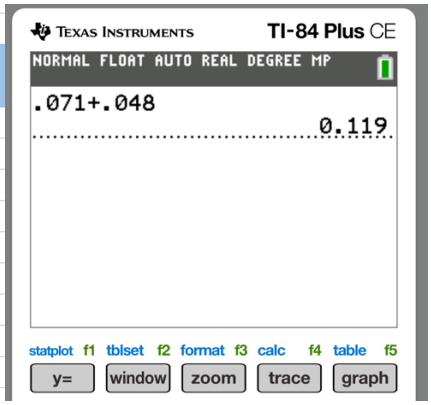
12. No more than four hours?

x	p(x)
0	0.071
1	0.048
2	0.024
3	0.024
4	0.119
5	0.143
6	0.190
7	0.286
8	0.095
Total	**1.000**



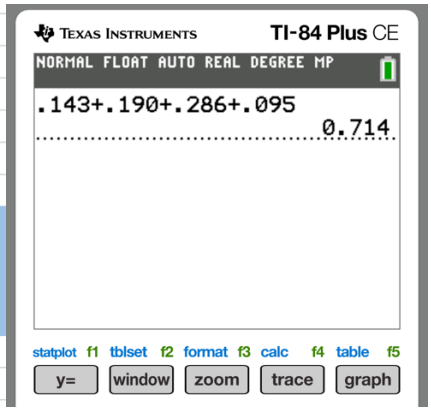
13. Less than two hours?

x	p(x)
0	0.071
1	0.048
2	0.024
3	0.024
4	0.119
5	0.143
6	0.190
7	0.286
8	0.095
Total	**1.000**



14. Between five and eight hours?

x	p(x)
0	0.071
1	0.048
2	0.024
3	0.024
4	0.119
5	0.143
6	0.190
7	0.286
8	0.095
Total	**1.000**



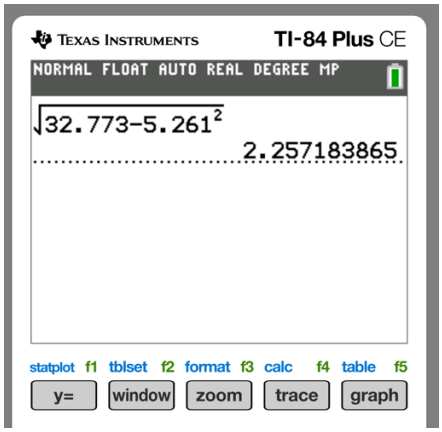
15. What is the mean for this distribution?
Approximate to the nearest tenths

	x	p(x)	xp(x)
	0	0.071	0
	1	0.048	0.048
	2	0.024	0.048
	3	0.024	0.072
	4	0.119	0.476
	5	0.143	0.715
	6	0.190	1.14
	7	0.286	2.002
	8	0.095	0.76
Total		**1.000**	5.261

$$\mu \approx 5.3$$

16. What is the standard deviation for this distribution?
Approximate to the nearest tenths

	x	p(x)	xp(x)	x^2p(x)
	0	0.071	0	0
	1	0.048	0.048	0.048
	2	0.024	0.048	0.096
	3	0.024	0.072	0.216
	4	0.119	0.476	1.904
	5	0.143	0.715	3.575
	6	0.190	1.14	6.84
	7	0.286	2.002	14.014
	8	0.095	0.76	6.08
Total		**1.000**	5.261	32.773



$$\sigma = \sqrt{32.773 - 5.261^2} \approx 1.3$$

The following probability distribution represents the number of boys a couple has when having **5 children**.

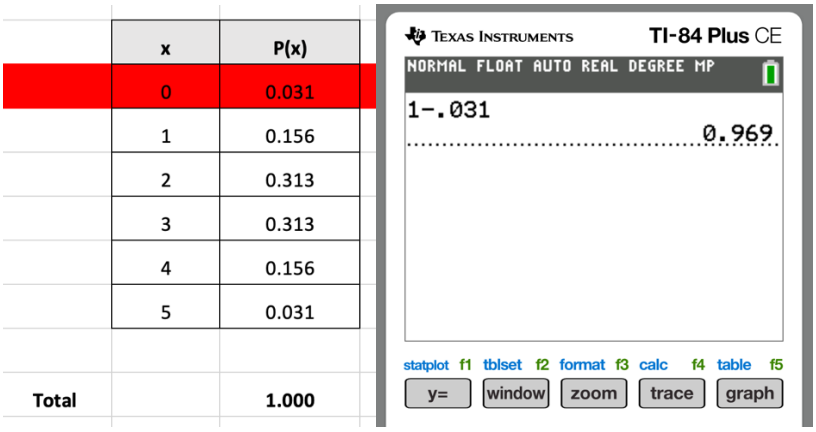
Let x represent the number of boys

$$x = \#\ of\ boys$$

x	P(x)
0	0.031
1	0.156
2	0.313
3	0.313
4	0.156
5	0.031
Total	**1.000**

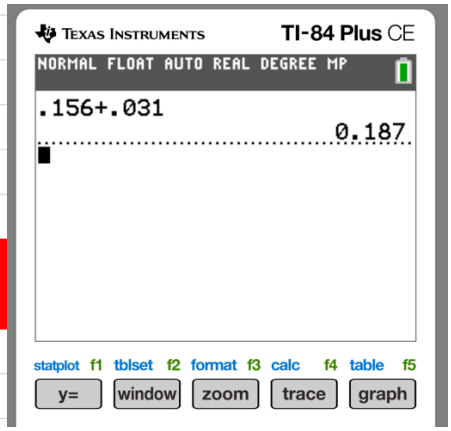
If you select a couple at random, what's the probability the couple has:

17. At least one boy?



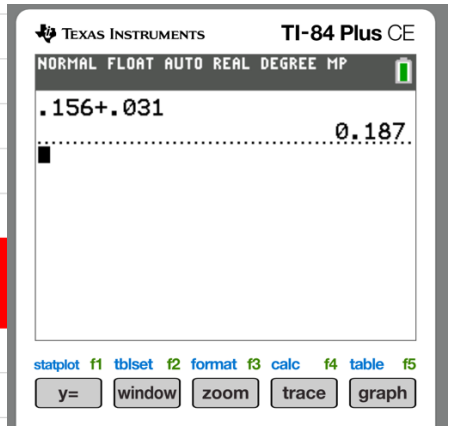
18. At least four boys?

x	P(x)
0	0.031
1	0.156
2	0.313
3	0.313
4	0.156
5	0.031
Total	1.000



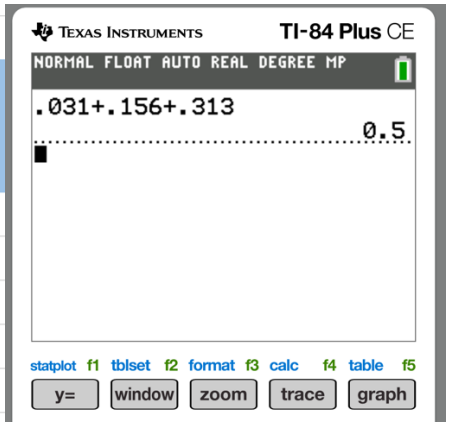
19. More than three boys?

x	P(x)
0	0.031
1	0.156
2	0.313
3	0.313
4	0.156
5	0.031
Total	1.000



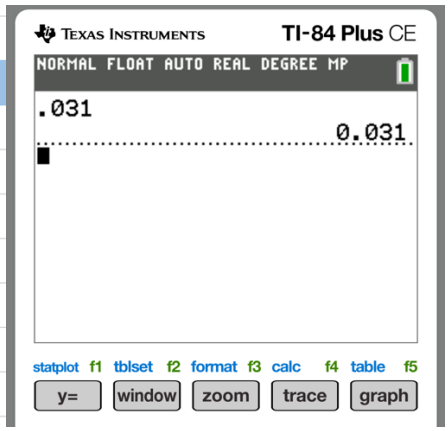
20. No more than two boys?

x	P(x)
0	0.031
1	0.156
2	0.313
3	0.313
4	0.156
5	0.031
Total	1.000



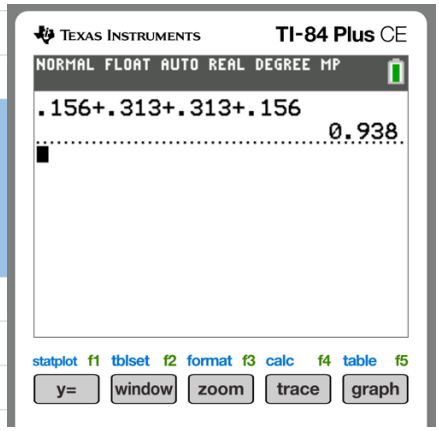
21. Less than one boy?

x	P(x)
0	0.031
1	0.156
2	0.313
3	0.313
4	0.156
5	0.031
Total	**1.000**



22. Between one and four boys?

x	P(x)
0	0.031
1	0.156
2	0.313
3	0.313
4	0.156
5	0.031
Total	**1.000**



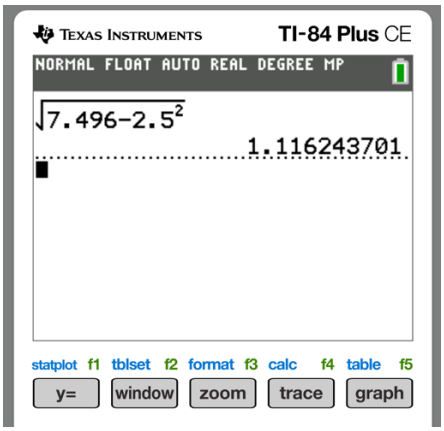
23. What is the mean for this distribution?
Approximate to the nearest tenths

	x	P(x)	xp(x)
	0	0.031	0
	1	0.156	0.156
	2	0.313	0.626
	3	0.313	0.939
	4	0.156	0.624
	5	0.031	0.155
Total		**1.000**	2.5

$$\mu \approx 2.5$$

24. What is the standard deviation for this distribution?
Approximate to the nearest tenths

	x	P(x)	xp(x)	x^2p(x)
	0	0.031	0	0
	1	0.156	0.156	0.156
	2	0.313	0.626	1.252
	3	0.313	0.939	2.817
	4	0.156	0.624	2.496
	5	0.031	0.155	0.775
Total		**1.000**	2.5	7.496



$$\sigma = \sqrt{7.496 - 2.5^2} \approx 1.1$$

The following probability distribution represents the number of boys a couple has when having **4 children**.

Let x represent the number of girls

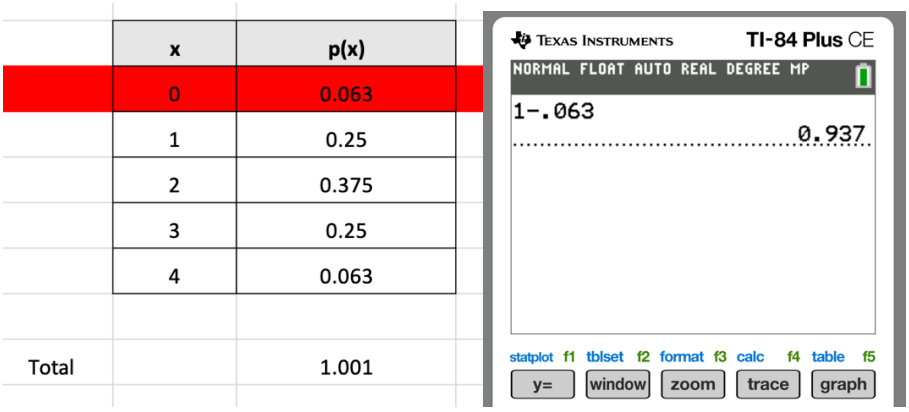
$$x = \#\ of\ girls$$

x	p(x)
0	0.063
1	0.25
2	0.375
3	0.25
4	0.063

Total 1.001

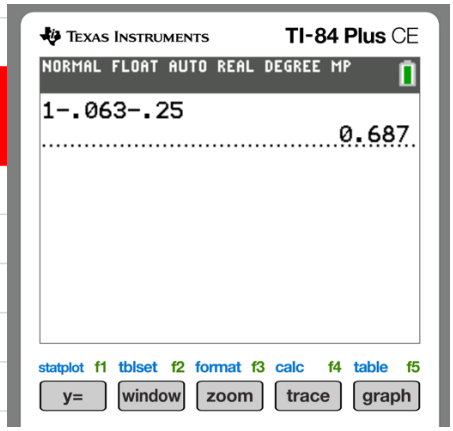
If you select a couple at random, what's the probability the couple has:

25. At least one girl?



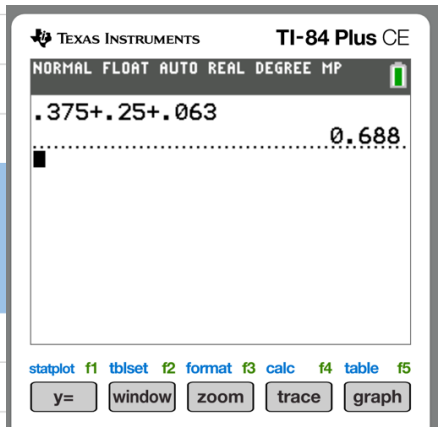
26. At least two girls?

x	p(x)
0	0.063
1	0.25
2	0.375
3	0.25
4	0.063
Total	1.001



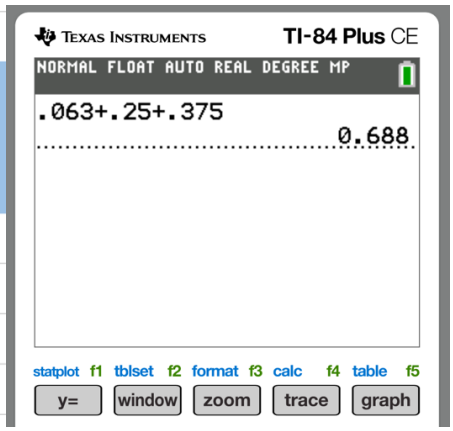
27. More than one girl?

x	p(x)
0	0.063
1	0.25
2	0.375
3	0.25
4	0.063
Total	1.001



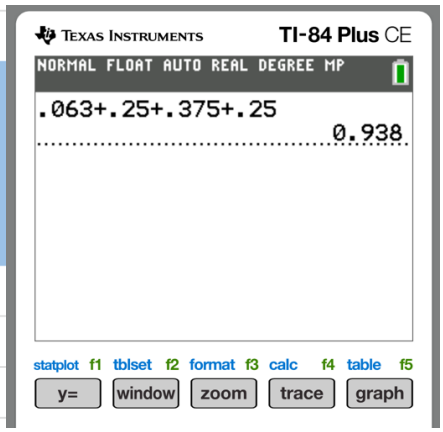
28. No more than two girls?

x	p(x)
0	0.063
1	0.25
2	0.375
3	0.25
4	0.063
Total	1.001



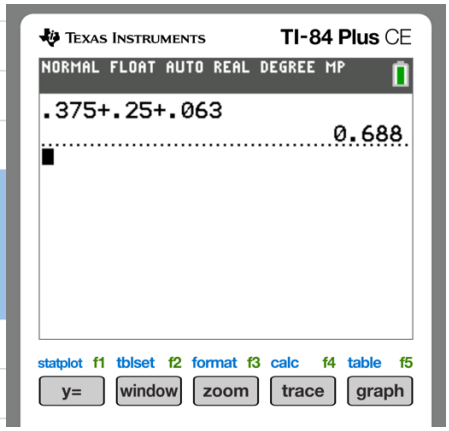
29. Less than four girls?

	x	p(x)
	0	0.063
	1	0.25
	2	0.375
	3	0.25
	4	0.063
Total		1.001



30. Between two and four girls?

	x	p(x)
	0	0.063
	1	0.25
	2	0.375
	3	0.25
	4	0.063
Total		1.001



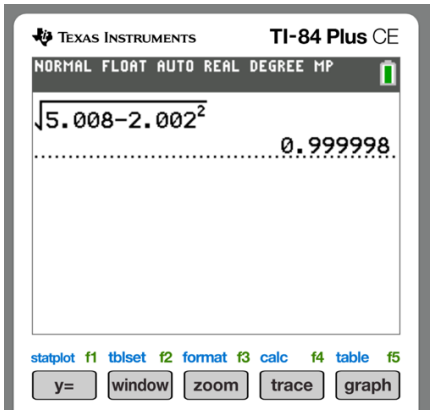
31. What is the mean for this distribution?
Approximate to the nearest tenths

	x	p(x)	xp(x)
	0	0.063	0
	1	0.25	0.25
	2	0.375	0.75
	3	0.25	0.75
	4	0.063	0.252
Total		1.001	2.002

$$\mu \approx 2.0$$

32. What is the standard deviation for this distribution?
Approximate to the nearest tenths

	x	p(x)	xp(x)	x^2p(x)
	0	0.063	0	0
	1	0.25	0.25	0.25
	2	0.375	0.75	1.5
	3	0.25	0.75	2.25
	4	0.063	0.252	1.008
Total		1.001	2.002	5.008

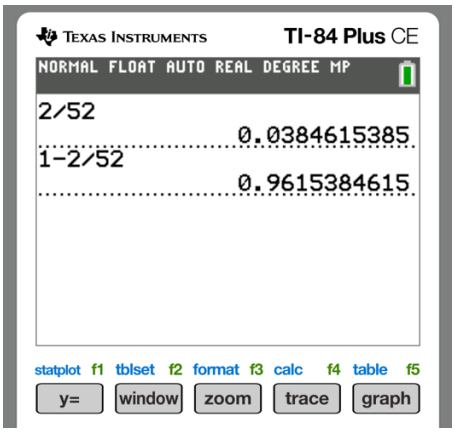


$$\sigma = \sqrt{5.008 - 2.002^2} \approx 1.0$$

Red Aces Game

It costs $5.00 for a chance to win $50.00 in the red aces game. All you must do is select a red ace when picking a card at random.

Approximate your answer to the nearest hundredths



	x		p(x)	
	Amount	Outcome	Probability	xp(x)
	45	win	0.038	1.71
	-5	Lose	0.962	-4.81
Total				-3.1

33. What is the cost of losing for this game?

$$-5.00$$

34. What is the net amount for winning this game?

$$45.00$$

35. What's the probability of winning this game?

$$\frac{2}{52} \approx 0.038$$

36. What's the probability of losing this game?

$$1 - \frac{2}{52} \approx 0.962$$

37. What is the expected value for this game?

$$\mu \approx 1.71 - 4.81 \approx 3.10$$