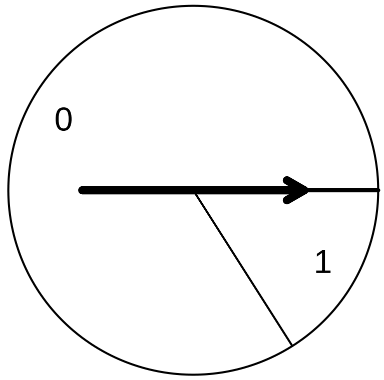
1. **Problem:**
   Determine the probabilities when adding up 5 Bernoulli trials if each trial has chance 0.84. Each trial could be thought of as a spin of the spinner below.

   Then, use $\mu = \sum x \cdot \Pr(x)$ to find the mean and $\sigma = \sqrt{\sum (x-\mu)^2 \cdot \Pr(x)}$ to determine the standard deviation.

Solution: We can use the Binomial formula.

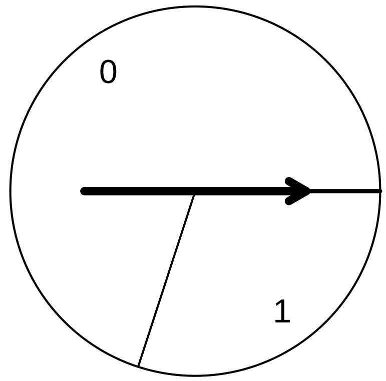
$$\Pr(x) = {}_nC_x(p)^x(1-p)^{n-x}$$

We want 6 probabilities, letting x vary from 0 to 5. For each probability, $n = 5$ and $p = 0.84$. A table is useful.

x	${}_nC_x p^x(1-p)^{n-x}$	$\Pr(x)$
0	$({}_5C_0)(0.84)^0(1-0.84)^{5-0}$	0.000105
1	$({}_5C_1)(0.84)^1(1-0.84)^{5-1}$	0.00275
2	$({}_5C_2)(0.84)^2(1-0.84)^{5-2}$	0.0289
3	$({}_5C_3)(0.84)^3(1-0.84)^{5-3}$	0.152
4	$({}_5C_4)(0.84)^4(1-0.84)^{5-4}$	0.398
5	$({}_5C_5)(0.84)^5(1-0.84)^{5-5}$	0.418

| x_i | Pr(x) | $x \cdot$ Pr(x) | $x-\mu$ | $(x-\mu)^2$ | $(x_i-\mu)^2 \cdot$ Pr(x) | |:—:|:—:|:—:|:—:|:—:|:—:| | 0 | 0.000105 | 0 | -4.2 | 17.6 | 0.00185 | | 1 | 0.00275 | 0.00275 | -3.2 | 10.2 | 0.0281 | | 2 | 0.0289 | 0.0578 | -2.2 | 4.84 | 0.14 | | 3 | 0.152 | 0.456 | -1.2 | 1.44 | 0.219 | | 4 | 0.398 | 1.59 | -0.199 | 0.0396 | 0.0158 | | 5 | 0.418 | 2.09 | 0.801 | 0.642 | 0.268 | |=========|=========|=========|=========|=========|=========| | | | $\sum x \cdot \Pr(x) = 4.199$ | | | $\sum(x_i-\mu)^2 \cdot \Pr(x) = 0.673$ | | | | | $\mu = 4.199$ | | | $\sigma = \sqrt{\sum(x_i-\mu)^2 \cdot \Pr(x)} = 0.82$ |

2. **Problem:**
   Determine the probabilities when adding up 4 Bernoulli trials if each trial has chance 0.7. Each trial could be thought of as a spin of the spinner below.



Then, use $\mu = \sum x \cdot \Pr(x)$ to find the mean and $\sigma = \sqrt{\sum (x - \mu)^2 \cdot \Pr(x)}$ to determine the standard deviation.

Solution: We can use the Binomial formula.

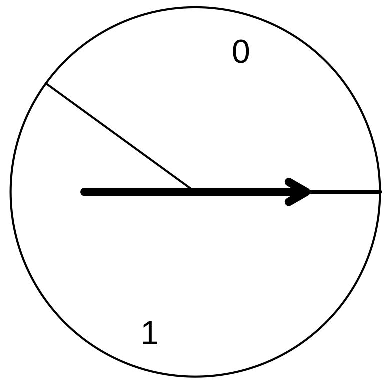
$$\Pr(x) = {}_nC_x(p)^x(1-p)^{n-x}$$

We want 5 probabilities, letting x vary from 0 to 4. For each probability, $n = 4$ and $p = 0.7$. A table is useful.

x	${}_nC_x p^x(1-p)^{n-x}$	$\Pr(x)$
0	$({}_4C_0)(0.7)^0(1-0.7)^{4-0}$	0.0081
1	$({}_4C_1)(0.7)^1(1-0.7)^{4-1}$	0.0756
2	$({}_4C_2)(0.7)^2(1-0.7)^{4-2}$	0.265
3	$({}_4C_3)(0.7)^3(1-0.7)^{4-3}$	0.412
4	$({}_4C_4)(0.7)^4(1-0.7)^{4-4}$	0.24

| x_i | Pr(x) | $x \cdot$ Pr(x) | $x-\mu$ | $(x-\mu)^2$ | $(x_i-\mu)^2 \cdot$ Pr(x) | |:—:|:—:|:—:|:—:|:—:|:—:| | 0 | 0.0081 | 0 | -2.8 | 7.85 | 0.0636 | | 1 | 0.0756 | 0.0756 | -1.8 | 3.25 | 0.245 | | 2 | 0.265 | 0.53 | -0.802 | 0.643 | 0.17 | | 3 | 0.412 | 1.24 | 0.198 | 0.0392 | 0.0162 | | 4 | 0.24 | 0.96 | 1.2 | 1.44 | 0.344 | |=========|=========|=========|=========|=========|=========| | | | $\sum x \cdot \Pr(x) = 2.802$ | | | $\sum(x_i-\mu)^2 \cdot \Pr(x) = 0.839$ | | | | $\mu = 2.802$ | | | $\sigma = \sqrt{\sum(x_i-\mu)^2 \cdot \Pr(x)} = 0.92$ |

3. **Problem:**
   Determine the probabilities when adding up 2 Bernoulli trials if each trial has chance 0.4. Each trial could be thought of as a spin of the spinner below.



Then, use $\mu = \sum x \cdot \Pr(x)$ to find the mean and $\sigma = \sqrt{\sum (x-\mu)^2 \cdot \Pr(x)}$ to determine the standard deviation.

Solution: We can use the Binomial formula.

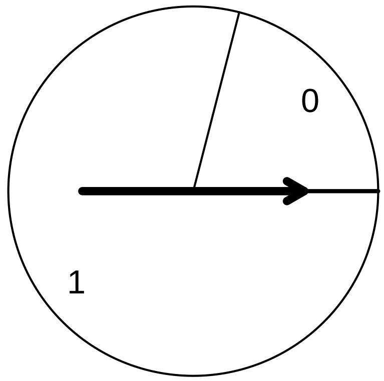
$$\Pr(x) = {}_nC_x(p)^x(1-p)^{n-x}$$

We want 3 probabilities, letting x vary from 0 to 2. For each probability, $n = 2$ and $p = 0.4$. A table is useful.

x	${}_nC_x p^x(1-p)^{n-x}$	$\Pr(x)$
0	$({}_2C_0)(0.4)^0(1-0.4)^{2-0}$	0.36
1	$({}_2C_1)(0.4)^1(1-0.4)^{2-1}$	0.48
2	$({}_2C_2)(0.4)^2(1-0.4)^{2-2}$	0.16

| x_i | Pr(x) | $x \cdot$ Pr(x) | $x - \mu$ | $(x-\mu)^2$ | $(x_i-\mu)^2 \cdot$ Pr(x) | |:—:|:—:|:—:|:—:|:—:|:—:| | 0 | 0.36 | 0 | -0.8 | 0.64 | 0.23 | | 1 | 0.48 | 0.48 | 0.2 | 0.04 | 0.0192 | | 2 | 0.16 | 0.32 | 1.2 | 1.44 | 0.23 | |=========|=========|=========|=========|=========|=========| | | | $\sum x \cdot \Pr(x) = 0.8$ | | | $\sum(x_i-\mu)^2 \cdot \Pr(x) = 0.479$ | | | | $\mu = 0.8$ | | | $\sigma = \sqrt{\sum(x_i-\mu)^2 \cdot \Pr(x)} = 0.69$ |

4. **Problem:**
Determine the probabilities when adding up 4 Bernoulli trials if each trial has chance 0.21. Each trial could be thought of as a spin of the spinner below.



Then, use $\mu = \sum x \cdot \Pr(x)$ to find the mean and $\sigma = \sqrt{\sum (x - \mu)^2 \cdot \Pr(x)}$ to determine the standard deviation.

Solution: We can use the Binomial formula.

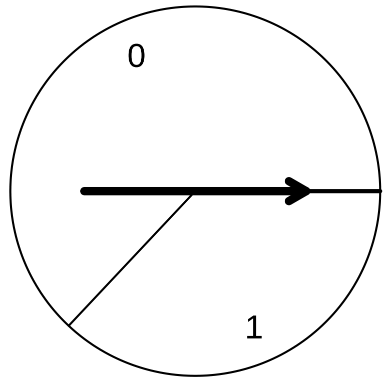
$$\Pr(x) = {}_nC_x(p)^x(1-p)^{n-x}$$

We want 5 probabilities, letting x vary from 0 to 4. For each probability, $n = 4$ and $p = 0.21$. A table is useful.

x	${}_nC_x p^x(1-p)^{n-x}$	$\Pr(x)$
0	$({}_4C_0)(0.21)^0(1-0.21)^{4-0}$	0.39
1	$({}_4C_1)(0.21)^1(1-0.21)^{4-1}$	0.414
2	$({}_4C_2)(0.21)^2(1-0.21)^{4-2}$	0.165
3	$({}_4C_3)(0.21)^3(1-0.21)^{4-3}$	0.0293
4	$({}_4C_4)(0.21)^4(1-0.21)^{4-4}$	0.00194

| x_i | Pr(x) | $x \cdot$ Pr(x) | $x - \mu$ | $(x-\mu)^2$ | $(x_i-\mu)^2 \cdot$ Pr(x) | |:—:|:—:|:—:|:—:|:—:|:—:| | 0 | 0.39 | 0 | -0.84 | 0.705 | 0.275 | | 1 | 0.414 | 0.414 | 0.16 | 0.0257 | 0.0106 | | 2 | 0.165 | 0.33 | 1.16 | 1.35 | 0.222 | | 3 | 0.0293 | 0.0879 | 2.16 | 4.67 | 0.137 | | 4 | 0.00194 | 0.00776 | 3.16 | 9.99 | 0.0194 | |=========|=========|=========|=========|=========|=========| | | | $\sum x \cdot \Pr(x) = 0.8397$ | | | $\sum(x_i-\mu)^2 \cdot \Pr(x) = 0.664$ | | | | $\mu = 0.8397$ | | | $\sigma = \sqrt{\sum(x_i-\mu)^2 \cdot \Pr(x)} = 0.81$ |

5. **Problem:**
   Determine the probabilities when adding up 5 Bernoulli trials if each trial has chance 0.63. Each trial could be thought of as a spin of the spinner below.



   Then, use $\mu = \sum x \cdot \Pr(x)$ to find the mean and $\sigma = \sqrt{\sum (x-\mu)^2 \cdot \Pr(x)}$ to determine the standard deviation.

Solution: We can use the Binomial formula.

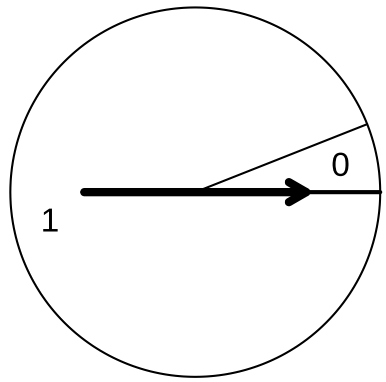
$$\Pr(x) = {}_nC_x(p)^x(1-p)^{n-x}$$

We want 6 probabilities, letting x vary from 0 to 5. For each probability, $n = 5$ and $p = 0.63$. A table is useful.

x	${}_nC_xp^x(1-p)^{n-x}$	$\Pr(x)$
0	$({}_5C_0)(0.63)^0(1-0.63)^{5-0}$	0.00693
1	$({}_5C_1)(0.63)^1(1-0.63)^{5-1}$	0.059
2	$({}_5C_2)(0.63)^2(1-0.63)^{5-2}$	0.201
3	$({}_5C_3)(0.63)^3(1-0.63)^{5-3}$	0.342
4	$({}_5C_4)(0.63)^4(1-0.63)^{5-4}$	0.291
5	$({}_5C_5)(0.63)^5(1-0.63)^{5-5}$	0.0992

| x_i | Pr(x) | $x \cdot$ Pr(x) | $x - \mu$ | $(x-\mu)^2$ | $(x_i-\mu)^2 \cdot$ Pr(x) | |:—:|:—:|:—:|:—:|:—:|:—:| | 0 | 0.00693 | 0 | -3.15 | 9.9 | 0.0686 | | 1 | 0.059 | 0.059 | -2.15 | 4.61 | 0.272 | | 2 | 0.201 | 0.402 | -1.15 | 1.32 | 0.264 | | 3 | 0.342 | 1.03 | -0.147 | 0.0216 | 0.00739 | | 4 | 0.291 | 1.16 | 0.853 | 0.728 | 0.212 | | 5 | 0.0992 | 0.496 | 1.85 | 3.43 | 0.341 | |=========|=========|=========|=========|=========|=========| | | | $\sum x \cdot \Pr(x) = 3.147$ | | | $\sum(x_i-\mu)^2 \cdot \Pr(x) = 1.16$ | | | | | $\mu = 3.147$ | | | $\sigma = \sqrt{\sum(x_i-\mu)^2 \cdot \Pr(x)} = 1.1$ |

6. **Problem:**
   Determine the probabilities when adding up 5 Bernoulli trials if each trial has chance 0.06. Each trial could be thought of as a spin of the spinner below.



   Then, use $\mu = \sum x \cdot \Pr(x)$ to find the mean and $\sigma = \sqrt{\sum (x-\mu)^2 \cdot \Pr(x)}$ to determine the standard deviation.

Solution: We can use the Binomial formula.

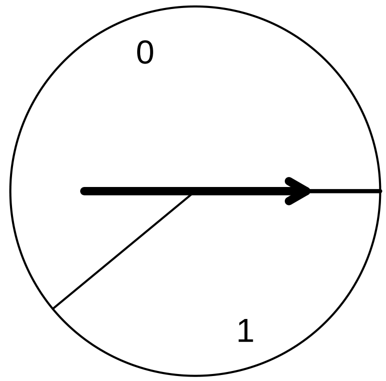
$$\Pr(x) = {}_nC_x(p)^x(1-p)^{n-x}$$

We want 6 probabilities, letting x vary from 0 to 5. For each probability, $n = 5$ and $p = 0.06$. A table is useful.

x	${}_nC_x p^x (1-p)^{n-x}$	$\Pr(x)$
0	$({}_5C_0)(0.06)^0(1-0.06)^{5-0}$	0.734
1	$({}_5C_1)(0.06)^1(1-0.06)^{5-1}$	0.234
2	$({}_5C_2)(0.06)^2(1-0.06)^{5-2}$	0.0299
3	$({}_5C_3)(0.06)^3(1-0.06)^{5-3}$	0.00191
4	$({}_5C_4)(0.06)^4(1-0.06)^{5-4}$	6.09e-05
5	$({}_5C_5)(0.06)^5(1-0.06)^{5-5}$	7.78e-07

| x_i | Pr(x) | $x \cdot$ Pr(x) | $x - \mu$ | $(x-\mu)^2$ | $(x_i-\mu)^2 \cdot$ Pr(x) | |:—:|:—:|:—:|:—:|:—:|:—:| | 0 | 0.734 | 0 | -0.3 | 0.0899 | 0.066 | | 1 | 0.234 | 0.234 | 0.7 | 0.49 | 0.115 | | 2 | 0.0299 | 0.0598 | 1.7 | 2.89 | 0.0864 | | 3 | 0.00191 | 0.00573 | 2.7 | 7.29 | 0.0139 | | 4 | 6.09e-05 | 0.000244 | 3.7 | 13.7 | 0.000834 | | 5 | 7.78e-07 | 3.89e-06 | 4.7 | 22.1 | 1.72e-05 | |=========|=========|=========|=========|=========|=========| | | | $\sum x \cdot \Pr(x) = 0.2998$ | | | $\sum (x_i-\mu)^2 \cdot \Pr(x) = 0.282$ | | | | $\mu = 0.2998$ | | | $\sigma = \sqrt{\sum (x_i-\mu)^2 \cdot \Pr(x)} = 0.53$ |

7. **Problem:**
   Determine the probabilities when adding up 6 Bernoulli trials if each trial has chance 0.61. Each trial could be thought of as a spin of the spinner below.



Then, use $\mu = \sum x \cdot \Pr(x)$ to find the mean and $\sigma = \sqrt{\sum (x - \mu)^2 \cdot \Pr(x)}$ to determine the standard deviation.

Solution: We can use the Binomial formula.

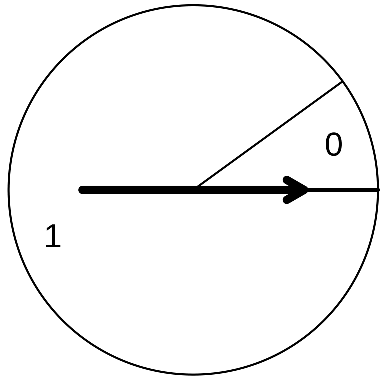
$$\Pr(x) = {}_nC_x(p)^x(1-p)^{n-x}$$

We want 7 probabilities, letting x vary from 0 to 6. For each probability, $n = 6$ and $p = 0.61$. A table is useful.

x	${}_nC_xp^x(1-p)^{n-x}$	$\Pr(x)$
0	$({}_6C_0)(0.61)^0(1-0.61)^{6-0}$	0.00352
1	$({}_6C_1)(0.61)^1(1-0.61)^{6-1}$	0.033
2	$({}_6C_2)(0.61)^2(1-0.61)^{6-2}$	0.129
3	$({}_6C_3)(0.61)^3(1-0.61)^{6-3}$	0.269
4	$({}_6C_4)(0.61)^4(1-0.61)^{6-4}$	0.316
5	$({}_6C_5)(0.61)^5(1-0.61)^{6-5}$	0.198
6	$({}_6C_6)(0.61)^6(1-0.61)^{6-6}$	0.0515

x_i	Pr(x)	$x \cdot$ Pr(x)	$x-\mu$	$(x-\mu)^2$	$(x_i-\mu)^2 \cdot$ Pr(x)
0	0.00352	0	-3.66	13.4	0.0472
1	0.033	0.033	-2.66	7.08	0.234
2	0.129	0.258	-1.66	2.76	0.356
3	0.269	0.807	-0.661	0.437	0.118
4	0.316	1.26	0.339	0.115	0.0363
5	0.198	0.99	1.34	1.79	0.355
6	0.0515	0.309	2.34	5.47	0.282
		$\sum x \cdot \Pr(x) = 3.661$			$\sum(x_i-\mu)^2 \cdot \Pr(x) = 1.43$
		$\mu = 3.661$			$\sigma = \sqrt{\sum(x_i-\mu)^2 \cdot \Pr(x)} = 1.2$

8. **Problem:**
Determine the probabilities when adding up 3 Bernoulli trials if each trial has chance 0.1. Each trial could be thought of as a spin of the spinner below.



Then, use $\mu = \sum x \cdot \Pr(x)$ to find the mean and $\sigma = \sqrt{\sum (x-\mu)^2 \cdot \Pr(x)}$ to determine the standard deviation.

Solution: We can use the Binomial formula.

$$\Pr(x) = {}_nC_x(p)^x(1-p)^{n-x}$$

We want 4 probabilities, letting x vary from 0 to 3. For each probability, $n = 3$ and $p = 0.1$. A table is useful.

x	${}_nC_x p^x(1-p)^{n-x}$	$\Pr(x)$
0	$({}_3C_0)(0.1)^0(1-0.1)^{3-0}$	0.729
1	$({}_3C_1)(0.1)^1(1-0.1)^{3-1}$	0.243
2	$({}_3C_2)(0.1)^2(1-0.1)^{3-2}$	0.027
3	$({}_3C_3)(0.1)^3(1-0.1)^{3-3}$	0.001

| x_i | Pr(x) | $x \cdot$ Pr(x) | $x - \mu$ | $(x-\mu)^2$ | $(x_i-\mu)^2 \cdot$ Pr(x) | |:—:|:—:|:—:|:—:|:—:|:—:| | 0 | 0.729 | 0 | -0.3 | 0.09 | 0.0656 | | 1 | 0.243 | 0.243 | 0.7 | 0.49 | 0.119 | | 2 | 0.027 | 0.054 | 1.7 | 2.89 | 0.078 | | 3 | 0.001 | 0.003 | 2.7 | 7.29 | 0.00729 | |=========|=========|=========|=========|=== | | | $\sum x \cdot \Pr(x) = 0.3$ | | | $\sum(x_i-\mu)^2 \cdot \Pr(x) = 0.27$ | | | | $\mu = 0.3$ | | | $\sigma = \sqrt{\sum(x_i-\mu)^2 \cdot \Pr(x)} = 0.52$ |