

$$0.2 + 0.02$$

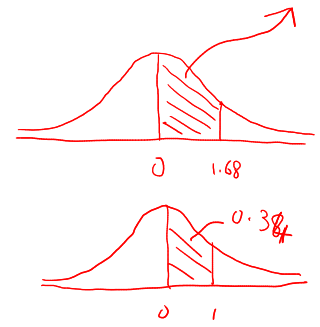
$$0.22$$

$$0.22$$

$$0 \leq z \leq 0.54$$

<https://www.mathsisfun.com/data/standard-normal-distribution-table.html>

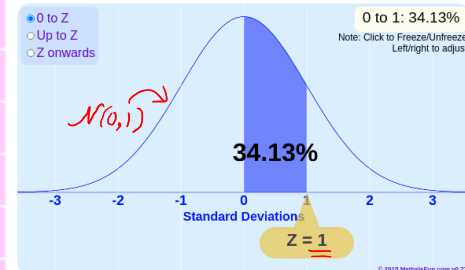
$$P(0 \leq z \leq 1.68) = 0.4535$$



$$P(0 \leq z \leq 0.3)$$

$$P(0 \leq z \leq 1)$$

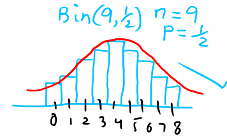
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990



$$34.13\% = \frac{34.13}{100} = 0.3413$$

Coin $P(H) = 0.6$ $X \sim \text{Bin}(100, 0.6)$

① n large
OR ② $P \approx \frac{1}{2}$



0	1	2	3	...	9
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① $P(45 \leq X \leq 50 \text{ heads in } 100 \text{ tosses})$

$= P(45 \leq X \leq 50)$

$= \binom{100}{45} p^{45} (1-p)^{55} + \binom{100}{46} p^{46} (1-p)^{54}$

$8.29 \times 10^{-4} + \binom{100}{47} 0.6^{47} (0.4)^{53} + \dots + \binom{100}{50} 0.6^{50} 0.4^{50}$

② $P(45 \leq X \leq 60) = \dots$

③ $P(6050 \leq X \leq 6070)$ where $X \sim \text{Bin}(10000, 0.6)$

$= \binom{10000}{6050} 0.6^{6050} 0.4^{3950} + \dots + \binom{10000}{6070} 0.6^{6070} 0.4^{3930}$
answer not available

Normal Approximation
 ≥ 0.5 < 0.5

If $X \sim \text{Bin}(n, p)$ and n is large
or p is close to $\frac{1}{2}$, then
 X is closely approximated by
 $N(np, np(1-p))$

$X \sim \text{Bin}(100, 0.6)$

$N(60, 24) \leftarrow N(\mu, \sigma^2)$

① $P(45 \leq X \leq 50)$

Apply continuity correction

$P(44.5 \leq X \leq 50.5)$

z -transformation
(standardization)

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

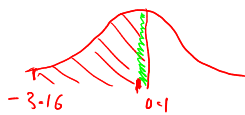
$P\left(\frac{44.5 - 60}{\sqrt{24}} \leq \frac{X - \mu}{\sigma} \leq \frac{50.5 - 60}{\sqrt{24}}\right)$

$P(-3.2639 \leq Z \leq -1.939)$

Look-up in the standard normal table

Table is for +ve z .
Table is for 2 decimal places

$P(-3.16 \leq Z \leq -1.94)$

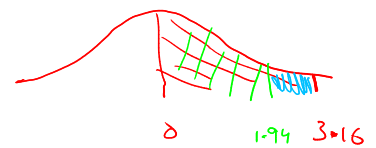
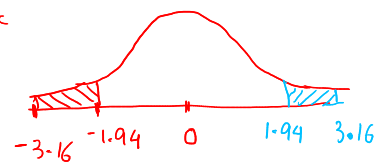


$P(0 \leq Z \leq 3.16) + P(0 \leq Z \leq 0.1)$

$0.4994 + 0.0398$

$= 0.539$

Symmetric around μ .



$P(0 \leq Z \leq 3.16) - P(0 \leq Z \leq 1.94)$

$= 0.4994 - 0.4738$

$= 0.0256$

③ $P(6050 \leq X \leq 6070)$ where $n = 10,000$

$N(10000 \times 0.6, 10000 \times 0.6 \times 0.4)$

$N(6000, 2400)$

$P(6049.5 \leq X \leq 6070.5)$

$P\left(\frac{6049.5 - 6000}{\sqrt{2400}} \leq Z \leq \frac{6070.5 - 6000}{\sqrt{2400}}\right)$

$P(1.01 \leq Z \leq 1.44)$

$P(0 \leq Z \leq 1.44) - P(0 \leq Z \leq 1.01)$

$= 0.4251 - 0.3438 = 0.0813$



$P(0 \leq Z \leq 1.44) = 0.4251$

$P(0 \leq Z \leq 1.01) = 0.3438$

Poisson(λ)