Due: Thursday, October 19th, 2016

1. Let $X \sim$ Normal $(3, 4)$. Find the below probabilities
   (a) $P(-1 < X \leq 7)$
   (b) $P(-5 < X \leq 11)$
   (c) $P(-9 < X \leq 15)$

2. The height(s) of boys from Punjab are normally distributed with a mean of 70 inches and a standard deviation of 2.5 inches. Draw a normal density curve with the mean and plus or minus one, two, and three standard deviation s marked. On your picture, label 71 on the horizontal axis and shade the area that represents the percentage of men who are less than 71 inches. Then find the percentage of men who are less than 71 inches.

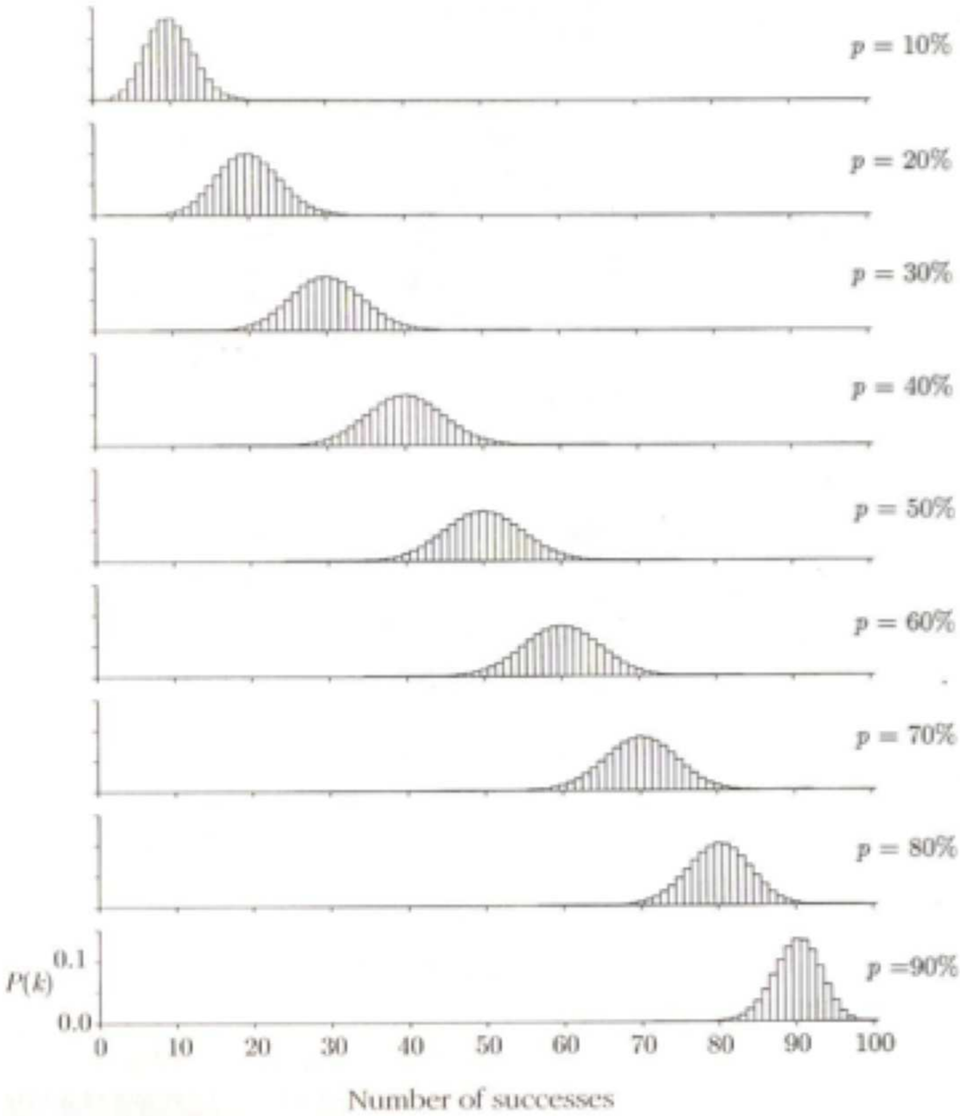
3. In 1999, the scores of students taking the B.Cool entrance test were approximately normally distributed with a mean of 1017 and a standard deviation of 209. Draw a normal density curve with the mean and plus or minus one, two, and three standard deviations marked. On your picture, label 1200 on the horizontal axis and shade the area that represents the percentage of students who scored more than 1200 on their exam. Find this percentage.

4. The annual rate o f return on stock indexes (which combine many individual stocks) is roughly normal. Since 1945, the Standard & Poors 500 index has had a mean yearly return of 12% with a standard deviation of 16.5%. Take this normal distribution to be the distribution of yearly returns over a long period. Find the percent of returns that yield more than 30%.

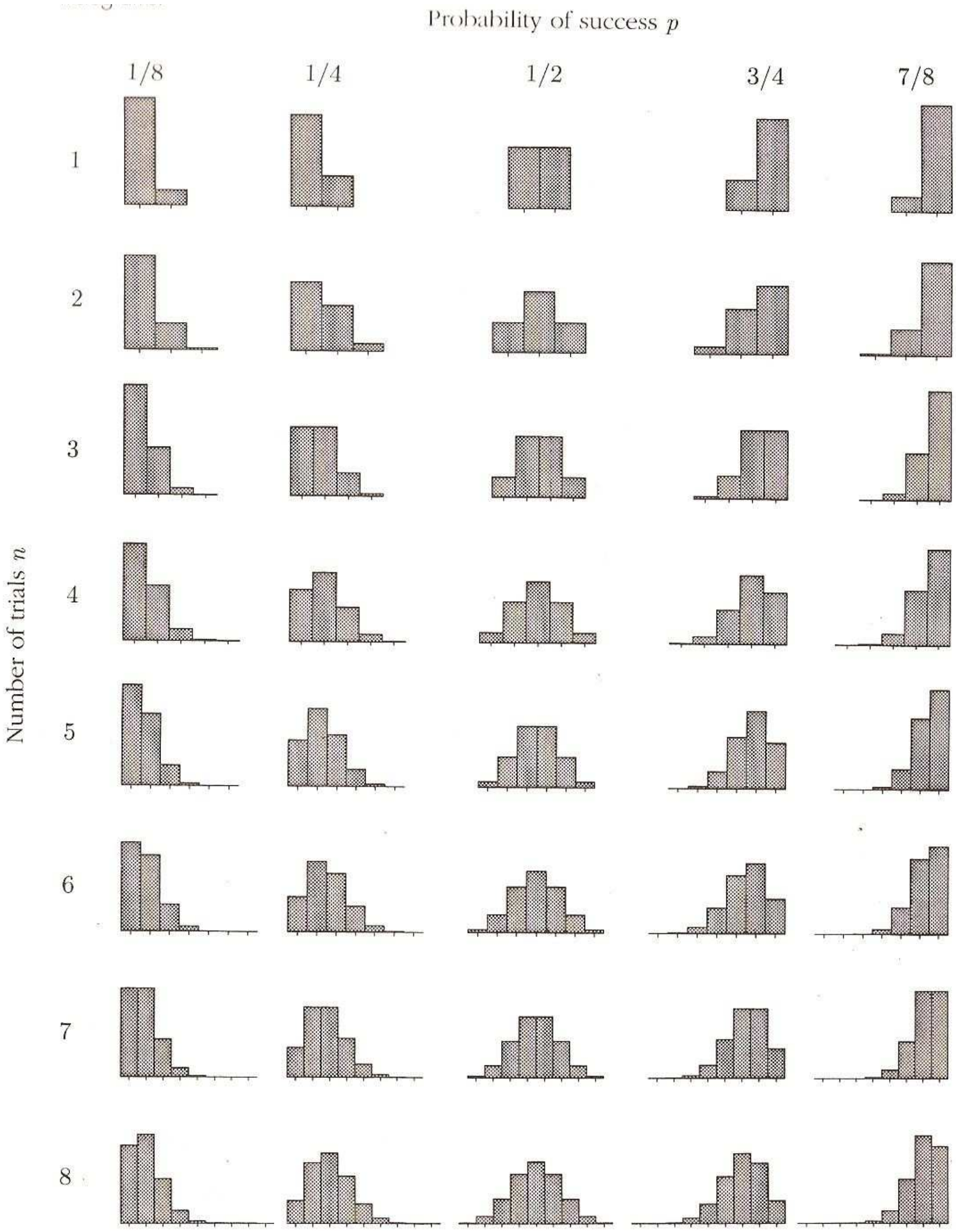
5. For a certain year, the B.S. scores were roughly normal with a mean of 500 and a standard deviation of 110. If I scored 350 on my B.S. that year, wha t percentile am I in? (In other words, what percent of the test takers scored less than me?)

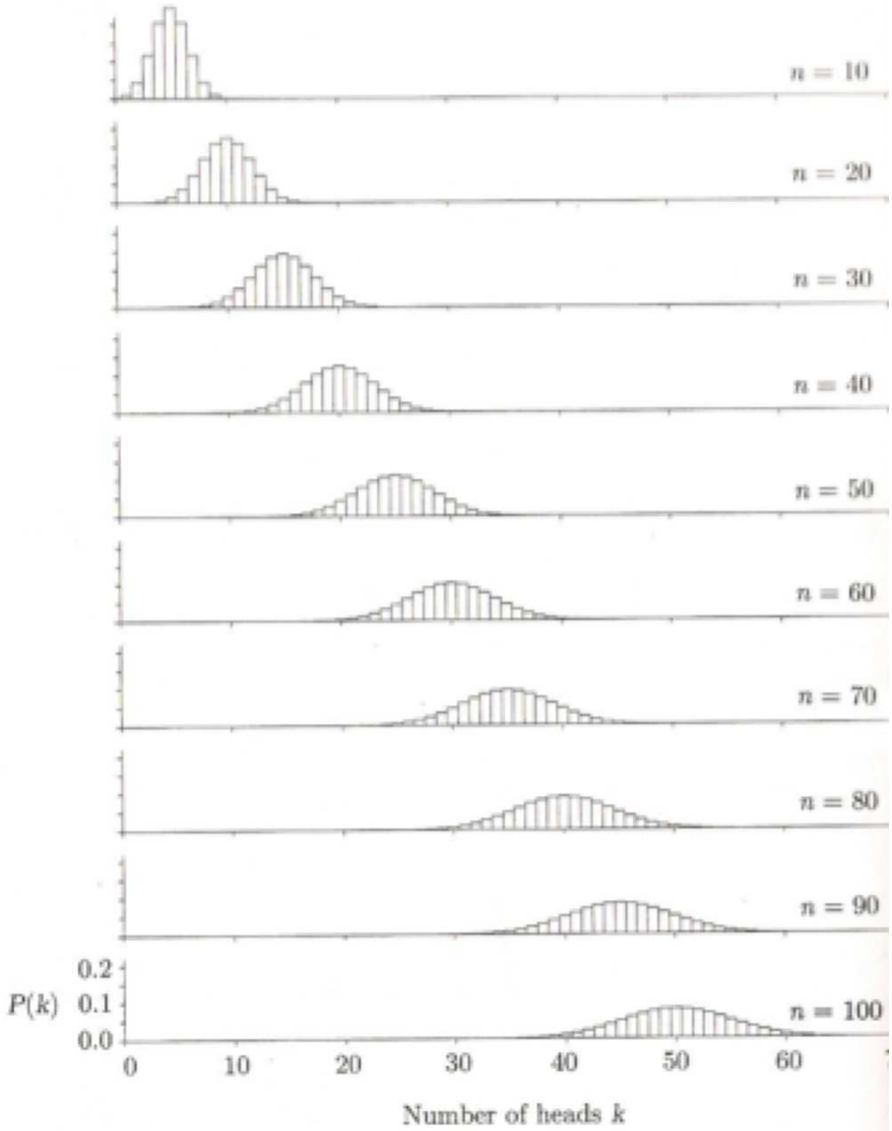
6. The heights of women are normally distributed with a mean of 65 inches and a standard deviation of 2.5 inches. My daughter is 56 (or 66 inches). Find the percentage of women that are shorter than my daughter.

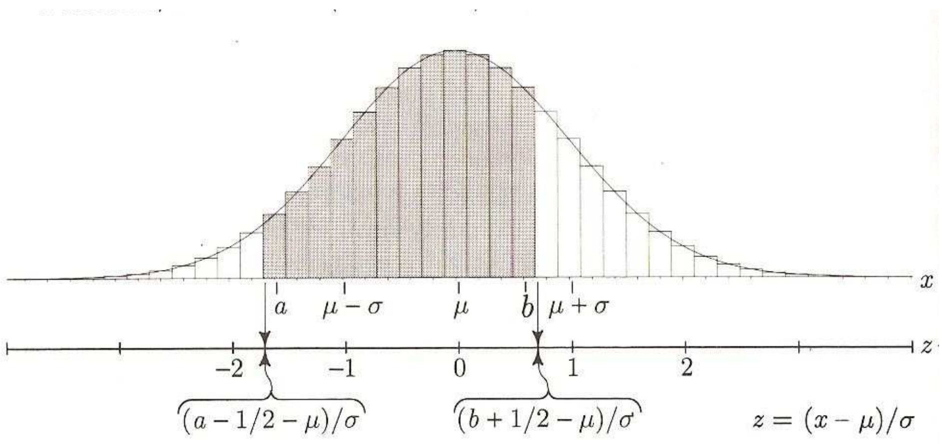
7. Joseph Maruthi Ali Service provides oil and lube service for cars. It is known that the mean time taken for oil and lube servic e at this garage is 15 minutes with a standard deviation of 2.4 minutes. The manager wants to promote the business by guaranteeing a maximum waiting time for its customers. If a customers car is not finished within this time, they will get a 50% discount. The manager wants to limit this discount to at most 5% of its customers. What should the guaranteed maximum waiting time be set at?



p = 10%
p = 20%
p = 30%
p = 40%
p = 50%
p = 60%
p = 70%
p = 80%
p =90%
P(k)
0.1
0.0
0
10
20
30
40
50
60
70
80
90
100
Number of successes


Probability of success p
1/8
1/4
1/2
3/4
7/8
Number of trials n
1
2
3
4
5
6
7
8


n = 10
n = 20
n = 30
n = 40
n = 50
n = 60
n = 70
n = 80
n = 90
n = 100
0.2
P(k) 0.1
0.0
0
10
20
30
40
50
60
Number of heads k



Binomial Histograms and Normal approximation, taken from Probability by Jim Pitman

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	0.2258	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2518	0.2549
0.7	0.2580	0.2612	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2882	0.2910	0.2939	0.2967	0.2996	0.3023	0.3051	0.3079	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3290	0.3315	0.3340	0.3365	0.3389
1.0	0.3414	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3622
1.1	0.3643	0.3665	0.3687	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	0.4083	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4193	0.4207	0.4222	0.4237	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4358	0.4370	0.4382	0.4394	0.4406	0.4418	0.4430	0.4441
1.6	0.4452	0.4463	0.4474	0.4485	0.4495	0.4505	0.4516	0.4526	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4600	0.4608	0.4617	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4679	0.4686	0.4693	0.4700	0.4706
1.9	0.4713	0.4720	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4762	0.4767
2.0	0.4773	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4813	0.4817
2.1	0.4822	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4858
2.2	0.4861	0.4865	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	0.4914	0.4916
2.4	0.4918	0.4920	0.4923	0.4925	0.4927	0.4929	0.4931	0.4933	0.4934	0.4936
2.5	0.4938	0.4940	0.4942	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4954	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4966	0.4967	0.4968	0.4969	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4975	0.4975	0.4976	0.4977	0.4978	0.4978	0.4979	0.4980	0.4980	0.4981
2.9	0.4982	0.4982	0.4983	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4988	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4991	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4993	0.4993	0.4993
3.2	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995	0.4995
3.3	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998	0.4998	0.4998

Table 1: Normal tables evaluating :$\frac{1}{\sqrt{2\pi}}\int_0^z e^{-\frac{x^2}{2}}dx$