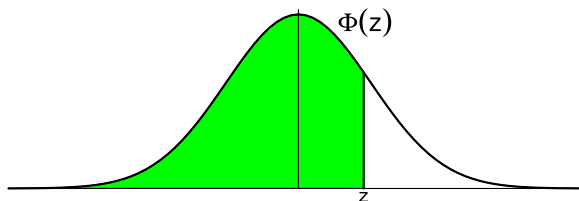


## Exercise Sheet 6

1. Extensive studies over time have shown that the lead content  $X$  of lettuces is approximately normally distributed. Moreover, it is known that the expectation of this distribution is 32 ppb and its standard deviation 6 ppb.
  - a) Sketch the density of  $X$ . In this sketch, mark the probability of a lead concentration between 26 und 38 ppb.
  - b) What is the probability of a lettuce containing no more than 40 ppb of lead.  
Hint: Transform into the standardized random variable  $Z$  and use the table given over-leaf.
  - c) What is the probability of a lettuce containing no more than 27 ppb of lead?
  - d) Which level of lead content is not exceeded at a probability of 97.5%? That is, find the level  $c$ , for which the probability of the lead content being no greater than  $c$  is exactly 97.5%.
  - e) Which lead content is not exceeded at a probability of 10%?
  - f) Compute the probability marked in question a).
  
2. The manager of a bookshop knows from experience that people entering the shop have probability  $p = 0.3$  of buying something.
  - a) At one time, 10 people were in the shop. What is the distribution of the number of people making purchases?
  - b) What is the probability than none of these 10 people buy anything? What is the probability that at least 2 of them buy something?
  - c) On one particular day, 200 people entered the shop. We are interested in the distribution of the number of people making purchases. This number can be assumed to approximately follow a normal distribution  $\mathcal{N}(\mu, \sigma^2)$  with  $\mu = \mathbf{E}[X]$  and  $\sigma^2 = \text{Var}(X)$ , where  $X \sim \text{Bin}(200, 0.3)$ .  
Use this distribution to compute the probability that the number of people making purchases is between 50 and 60.

Tabulated values of the cumulative normal distribution  $\Phi(z) = P[Z \leq z]$ ,  $Z \sim \mathcal{N}(0, 1)$



Example:  $P[Z \leq 1.96] = 0.975$

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767