Some Normal Example Problems

1) Let Z be the standard normal random variable.
   a) Find the probability P(-1.1 < Z < 2.5).
      > pnorm(2.5)-pnorm(-1.1)
      [1] 0.8581243
   b) Find the probability P(Z < -2.1).
      > pnorm(-2.1)
      [1] 0.01786442
   c) Find the probability P(1.5 < Z).
      > 1-pnorm(1.5)
      [1] 0.0668072

2) Let X be a normal random variable with mean $\mu = 3$ and standard deviation $\sigma = 1.5$.

   a) Find the probability P(-1.1 < X < 2.5).
      > pnorm(2.5,3,1.5)-pnorm(-1.1,3,1.5)
      [1] 0.3663065
   b) Find the probability P(X < -2.1).
      > pnorm(-2.1,3,1.5)
      [1] 0.0003369293

3) The length of life of some light bulbs produced in a factory is normally distributed with mean 8640 hours and standard deviation 1440 hours. Find the probability that a bulb will last

   a) less than 5040 hours.
      > pnorm(5040,8640,1440)
      [1] 0.006209665

   b) between 5040 hours and 8640 hours.
      > pnorm(8640,8640,1440)-pnorm(5040,8640,1440)
      [1] 0.4937903

4) The length X of a fish in a lake has normal distribution with mean 67 cm and standard deviation 21 cm. On a fishing trip to the lake, you are instructed to keep only those in the upper 33 percent in length. What is the cut-off length, above which you are permitted keep?

Find z so that P(Z>z)=0.33 or equivalently P(Z<z)=1-.33

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> qnorm(1-.33)
[1] 0.4399132
> 1-pnorm(.44)
[1] 0.3299686
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X=sigma*z+mu

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> 21*.44+67
[1] 76.24
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Or directly in R [same answer]

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> qnorm(1-.33,67,21)
[1] 76.23818
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