

## Week 3- Standard Normal Distribution

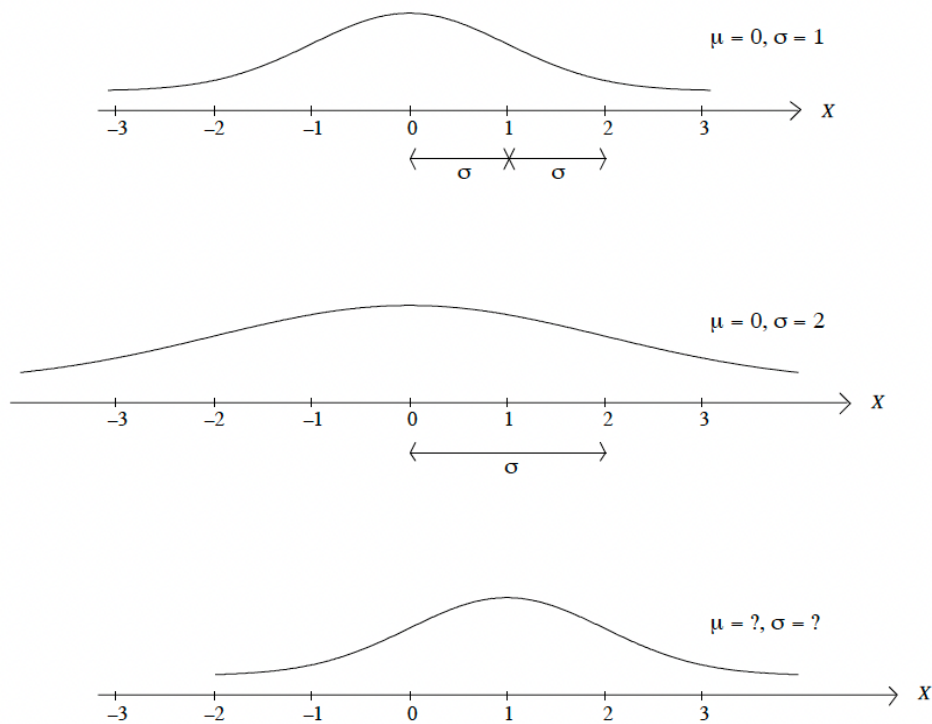
Answer the following questions

Q1. In the given figures, we have three normal curves.

In the first curve the mean is 0 and the standard deviation is 1.

The second curve has the same mean, 0, but a standard deviation of 2.

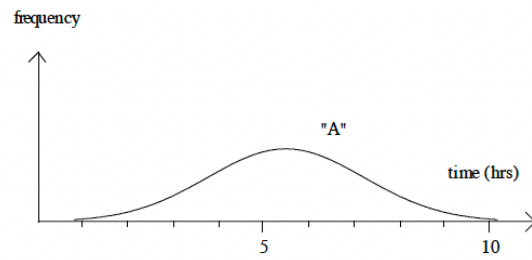
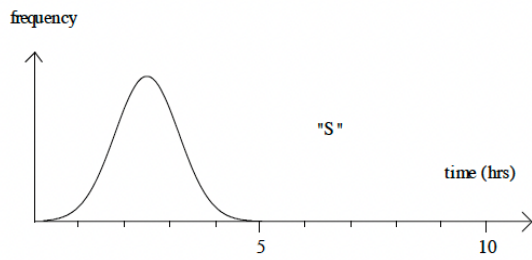
Can you see what the mean and standard deviation are for the third curve?



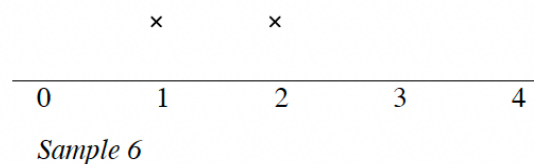
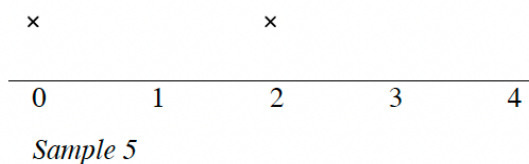
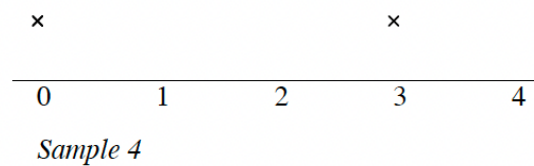
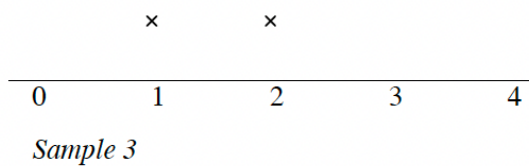
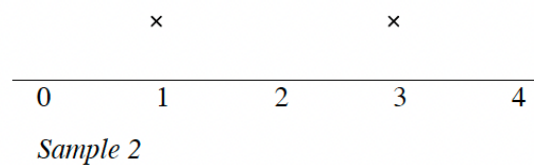
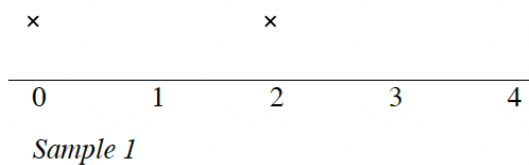
Q2. The figure given below shows two normal distribution curves representing the time taken to prepare personal ("S") and business ("A") income tax returns:

(a) Which has the larger mean?

(b) Which has the larger standard deviation?

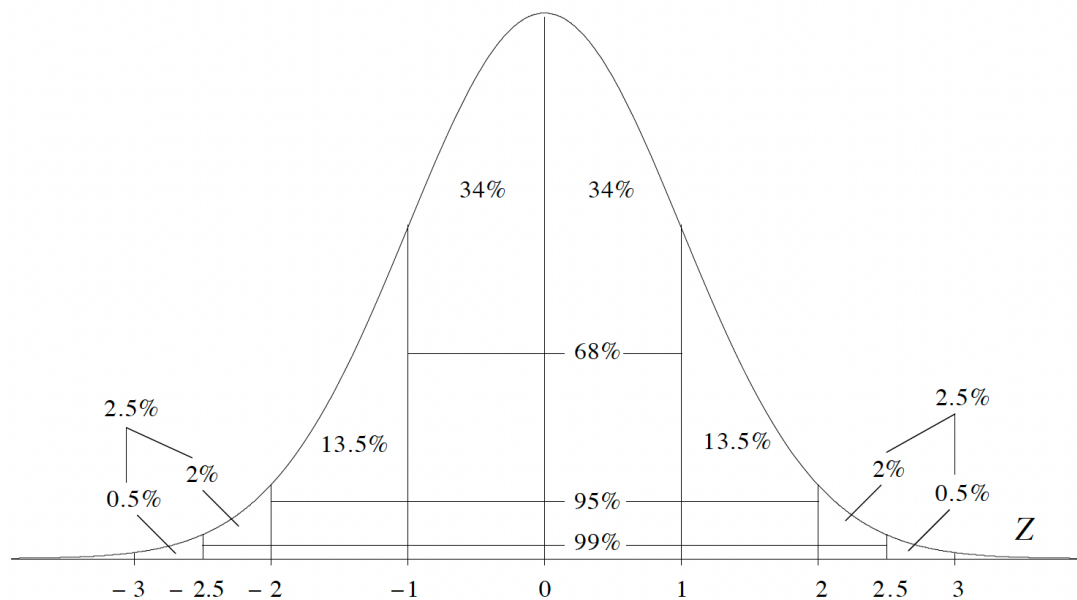


Q3. Let  $X$  = number of children in a household in Sydney. Suppose we take random samples of size 2 from the above parent population, that is we randomly select 2 households at a time and count the number of children in each household. The diagrams in Figure 14 represent the outcomes from six samples. So, for example, in sample 1, one household had no children the other had 2 children.



- Find the sample mean in each case and mark it on the diagram.
- Draw the distribution of  $X$  for these six samples. Use the same scale on the axis as above.

c. Based on your data above what do you guess is the mean number of children in an Australian household? That is, estimate  $\mu_X$  from the data. What could you do to improve your estimate?



These are all standard deviations away from the mean centred at 0.

Q4.

Study carefully the diagram of the normal curve given in Figure 16 and then complete the table using the percentages given.

Interval	Percentage of area under the curve	Proportion of area under the curve expressed as a decimal	Probability of selecting a score in this interval
Between 0 and +1	34%	0.34	0.34
Between -3 and +3	100%	1	1
a) Less than 0			
b) Greater than 0			
c) Between 0 and +2			
d) Between 0 and -2			
e) Between -2 and +2			
f) Outside (beyond) -2 and +2			
g) Between +1 and $+2\frac{1}{2}$			
h) Between -3 and -2			
i) Greater than $2\frac{1}{2}$			
j) Outside (beyond) $-2\frac{1}{2}$ and $+2\frac{1}{2}$			

Q5. What is the area between the mean and 0.85 standard deviations below the mean (ie between z scores of  $-0.85$  and  $0$ )?

Q6. What is the area between z scores of  $0.33$  and  $1.33$ ?

Q7. Find the areas corresponding to the following intervals, expressing your answers as decimals and then percentages. Show each result on a diagram of the normal curve.

Area for z scores:

- a. below a z score of  $+0.85$ ;
- b. above a z score of  $+2.75$ ;
- c. below a z score of  $-1.03$ ;
- d. between z scores of  $+1.58$  and  $+2.35$ ;
- e. between z scores of  $-2.80$  and  $-2.50$ ;
- f. between z scores of  $-1.55$  and  $+1.55$ ;
- g. between the mean and  $z = +2.33$ ;
- h. between the mean and  $1.47$  standard deviations above the mean;
- i. between  $z = -0.58$  and  $z = 0$ ;
- j. between the mean and  $2.55$  standard deviations below the mean

Q8. Let  $X$  be scores on a computer skills test with  $\mu_X = 100$  and  $\sigma_X = 10$ .

Assume the

scores follow a normal distribution.

- a. Find the number of standard deviations above or below the mean of each of the following scores on the computer test:  $95$ ,  $110$ ,  $130$ .
- b. Use a diagram to find the raw scores equivalent to the following z scores:  $0$ ,  $-1$ ,  $-2$ ,  $1$ ,  $2$ .
- c. What is the z score for a raw score of  $118.4$ ?