Introductory Statistics Tutorial
Chapter 6 – Continuous Random Variables

Section A: Probability Density Function Quiz

The probability distribution function of a continuous random variable is represented by a *density curve*. The following quiz is about the density curve.

1. How are probabilities represented?

2. What is the total area under the density curve?

3. When we calculate probabilities for a continuous random variable, does it matter whether interval endpoints are included or excluded?

4. What are the parameters of the Normal distribution?

Section B: Normal Distribution

1. The natural gestation period for human births, *X*, has a mean of about 266 days and a standard deviation of about 16 days. Assume that *X* is Normally distributed with a mean of 266 days and a standard deviation of 16 days.

Cumulative Distribution Function

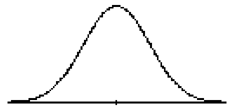
Normal with mean = 266.000 and standard deviation = 16.0000

x	P(X <= x)	x	P(X <= x)
244.0000	0.0846	279.0000	0.7917
245.0000	0.0947	280.0000	0.8092
246.0000	0.1056	281.0000	0.8257
254.0000	0.2266	286.0000	0.8944
255.0000	0.2459	287.0000	0.9053
256.0000	0.2660	288.0000	0.9154

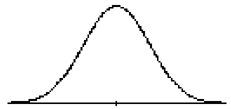
Use the MINITAB output above to answer the following questions.

Calculate the proportion of women who carry their babies for:

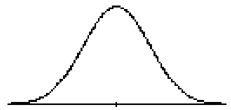
(a) less than 245 days (ie, deliver at least 3 weeks early).



(b) between 255 and 280 days.



(c) longer than 287 days (ie, the baby is more than 3 weeks overdue).



2. A medical trial was conducted to investigate whether a new drug extended the life of a patient who had lung cancer. Assume that the survival time (in months) for patients on this drug is Normally distributed with a mean of 31.1 months and a standard deviation of 16.0 months.

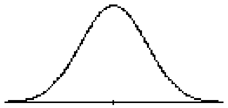
Use the following MINITAB output to answer the questions below.

Inverse Cumulative Distribution Function

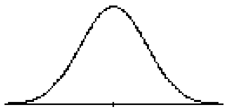
Normal with mean = 31.1000 and standard deviation = 16.0000

P(X <= x)	x
0.1000	10.5952
0.2000	17.6341
0.4000	27.0464
0.6000	35.1536
0.8000	44.5659
0.9000	51.6048

(a) Calculate the number of months beyond which 80% of the patients survive.



(b) Calculate the range of the central 80% of survival times.



3. The designer of a new aircraft's cockpit wants to position a switch so that most pilots can reach it without having to change positions. Suppose that among airline pilots the distribution of the maximum distance (measured from the back of the seat) that can be reached without moving the seat is approximately Normally distributed with mean $\mu = 125$cm and standard deviation $\sigma = 10$cm.

Cumulative Distribution Function

Normal with mean = 125.000 and standard deviation = 10.0000

x	P(X<= x)
95.0000	0.0013
115.0000	0.1587
120.0000	0.3085
125.0000	0.5000
135.0000	0.8413

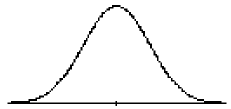
Inverse Cumulative Distribution Function

Normal with mean = 125.000 and standard deviation = 10.0000

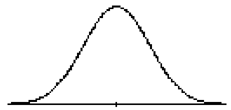
P(X <= x)	x
0.0250	105.4004
0.0500	108.5515
0.9500	141.4485
0.9750	144.5996

Use the MINITAB output above to answer the following questions.

(a) If the switch is placed 120cm from the back of the seat, what proportion of pilots will be able to reach it without moving the seat?



(b) What is the maximum distance from the back of the seat that the switch could be placed if it is required that 95% of pilots be able to reach it without moving the seat?



(c) **(i)** If the pilot has a *z*-score of 1.5, what does this mean in this context?

(ii) To what maximum reach does a *z*-score of 1.5 correspond?