Chapter 7

Excises 3/

The closing price of Schnur Sporting Goods, Inc,. Common stock is uniformly distributed between \$20 and \$30 per share. What is the probability that the stock price will be:

a/ More than \$27?

P(x > 27) = (height)(base) = $\frac{1}{30-20}$ (30 - 27) = 0.3

b/ less than or equal to \$24?

P(x ≤ 24) = (height)(base) = $\frac{1}{30-20}$ (24 - 20) = 0.4

Exercise 5/

The April rainfall in Flagstaff, Arizona, follows a uniform distribution between 0.5 and 3 inches.

a/ what are the values for a and b?

a = 0.5 b= 3

b/ what is the mean amount of rainfall for the month? What is the standard deviation?

$\mu = \frac{a+b}{2} = \frac{0.5+3}{2}$ = 1.75 inches

$\sigma = \sqrt{\frac{(3-0.5)^2}{12}}$ = 0.72 inches

c/ what is the probability of less than an inch of rain for the month?

P(x < 1) = (height)(base) = $\frac{1}{3-0.5}$ (1 – 0.5) = 0.2

d/ what is the probability of exactly 1 inch of rain?

P(x = 1) = (height)(base) = $\frac{1}{3-0.5}$ (1 – 1) = 0

e/ what is the probability of more than 1.5 inches of rain for the month?

P(x > 1.5) = (height)(base) = $\frac{1}{3-0.5}$ (3 – 1.5) = 0.6

Exercise 7/

Explain what is meant by this statement: “there is not one normal probability distribution but a family of them”

The actual shape of a normal distribution depends on its mean and standard deviation. Thus, there is a normal distribution, and accompanying normal curve, for a mean of 7 and a standard deviation of 2. There is another normal curve for a mean of \$25000 and a standard deviation of \$1742 and so on.

Exercise 11/

The Kamp family has twins, Rob and Rachel graduated from college 2 years ago, and each is now earning $50000 per year. Rachel works in the retail industry, where the mean salary for executives with less than 5 years of experience is $35000 with a standard deviation of $8000. Rob is an engineer. The mean salary for engineers with less than 5 years of experience is $60000 with a standard deviation of $5000. Compute the Z values for both Rob and Rachel and comment on your findings.

$Z_{ROB} = \frac{50000 - 60000}{5000} = \frac{-10000}{5000} = -2$

$Z_{Rachel} = \frac{50000 - 35000}{8000} = \frac{15000}{8000} = 1.875$

Adjusting for their industries, Rob is well below average and Rachel well above.

Finding area under the normal curve:

Exercise 15/

A recent study of the wages of maintainace crew members for major airlines showed that the mean hourly salary was $20.50 with a standard deviation of $3.50. Assume the distribution of hourly wages follows the normal probability distribution. If we select a crew member at random, what is the probability the crew member earns:

a/ Between $20.50 and $24.00 per hour?

$Z = \frac{24 - 20.5}{3.5} = \frac{3.5}{3.5} = 1$

$P(0 \le Z \le 1) = 0.3413$

$P(\$20.5 \le wage \le \$24.00) = 0.3413$

b/ More than 24.00 per hour?

$Z = \frac{24 - 20.5}{3.5} = \frac{3.5}{3.5} = 1$

$P(Z > 1) = 0.5 – 0.3413 = 0.1587$

$P(wage > \$24.00) = 0.5 – 0.3413 = 0.1587$

c/ Less than $19.00 per hour?

$Z = \frac{19 - 20.5}{3.5} = \frac{-1.5}{3.5} = -0.43$

$P(Z < -0.43) = 0.5 – 0.1664 = 0.3336$

$P(wage < \$19.00) = 0.5 – 0.1664 = 0.3336$

Exercise 19/

According to internal Revenues service, the mean tax refund for the year 2007 was \$2708. Assume the standard deviation is \$650 and that the amounts refunded follow a normal probability distribution.

a/ what percent of refunds are more than \$3000?

Z = $\frac{3000-2708}{650} = \frac{292}{650}$ = 0.45

P(Z > 0.45) = 0.5 – 0.1736 = 0.3264

P(Tax refund > \$3000) = 0.5 – 0.1736 = 0.3264

b/ what percent of tax refunds are more than \$3000 but less than \$3500?

Z = $\frac{3500-2708}{650} = \frac{792}{650}$ = 1.22

P(0 < Z < 1.22) = 0.3888

P(2708 < Tax refund < \$3500) = 0.3888

Z = $\frac{3000-2708}{650} = \frac{292}{650}$ = 0.45

P(0 < Z < 0.45) =0.1736

P(2708 < Tax refund < \$3000) = 0.1736

P (\$3000 < Tax refund < \$3500) = 0.3888 – 0.1736 = 0.2152

c/ what percent of refunds are more than \$2500 but less than \$3500?

Z = $\frac{3500-2708}{650} = \frac{792}{650}$ = 1.22

P(0 < Z < 1.22) = 0.3888

P(2708 < Tax refund < \$3500) = 0.3888

Z = $\frac{2500-2708}{650} = \frac{-208}{650}$ = - 0.32

P(-0.32 < Z < 0) = 0.1255

P(\$2500 < Tax refund <2708) = 0.1255

P (\$2500 < Tax refund < \$3500) = 0.3888 + 0.1255 = 0.5143

Exercise 25/

Assume that the mean hourly cost to operate a commercial airline follows the normal distribution with a mean of \$2100 per hour and a standard deviation of \$250. What is the operating cost for the lowest 3 percent of the airlines?

The Z-value that corresponds to 0.4700 or 0.4699 is 1.88

$2100 – (1.88 * $250) = $1630

In brief, there are four situations for finding the area under the standard normal probability distribution.

1/ to find the area between o and Z or –Z, look up the probability directly in the table.

2/ to find the area beyond Z or –Z, located the probability of Z in the table and subtract that probability from 0.5

3/ to find the area between two points on different sides of the mean, determine the Z values and add the corresponding probabilities.

4/ to find the area between two points on the same side of the mean, determine the Z values and subtract the smaller probability from the larger.

Exercise 31/

Assume a binomial distribution with n = 50 and π = 0.25. Compute the following:

a/ The mean and standard deviation of the random variable.

$\mu = 50*0.25 = 12.5$

$\sigma = \sqrt{50 * 0.25 * 0.75} = 3.06$

b/ the probability that X is 15 or more.

$Z = \frac{14.5 - 12.5}{3.06} = \frac{2}{3.06} = 0.65$

$P(Z > 0.65) = 0.5 - 0.2422 = 0.2578$

$P(X \geq 15) = 0.2578$

c/ the probability that X is 10 or less.

$Z = \frac{10.5 - 12.5}{3.06} = \frac{-2}{3.06} = -0.65$

$P(Z < -0.65) = 0.5 - 0.2422 = 0.2578$

$P(X \leq 10) = 0.2578$

Chapter 15

Exercise 1/

PNC Bank, Inc., which has its headquarters in Pittsburgh, Pennsylvania, reported in millions its commercial loans as follow:

| Year | commercial loans in millions $ |
|---|---|
| 1995 | 17446 |
| 1997 | 19989 |
| 1999 | 21468 |
| 2000 | 21685 |
| 2002 | 15922 |
| 2004 | 18375 |

Using 1995 as the base, develop a simple index for the change in the amount of commercial loans

| Year | commercial loans in millions $ | Index |
|---|---|---|
| 1995 | 17446 | 100.0 |
| 1997 | 19989 | 114.6 |
| 1999 | 21468 | 123.1 |
| 2000 | 21685 | 124.3 |
| 2002 | 15922 | 91.3 |
| 2004 | 18375 | 105.3 |

Exercise 7/

The prices and the number of various items produced by a small machine and stamping plant are reported below. Use 2000 as the base.

| | 2000 | | 2008 | |
|---|---|---|---|---|
| Item | Price | Quantity | Price | Quantity |
| Washer | 0.07 | 17000 | 0.10 | 20000 |
| Cotter pin | 0.04 | 125000 | 0.03 | 130000 |
| Stove bolt | 0.15 | 40000 | 0.15 | 42000 |
| Hex nut | 0.08 | 62000 | 0.10 | 65000 |

a/ Determine the simple average of the price index

$P_{Washer}$ = (0.10/0.07) * 100 = 142.9

$P_{Cotter\ pin}$ = (0.03/0.04) * 100 = 75.0

$P_{Stove\ blot}$ = (0.15/0.15) * 100 = 100.0

$P_{Hex\ nut}$ = (0.10/0.08) * 100 = 125.0

Simple average of the price index = (142.9 + 75.0 + 100.0 + 125.0)/4 = 110.7

b/ Determine the aggregate price index for the two years

Total prices of 2000 = (0.07 + 0.04 + 0.15 + 0.08) = 0.34

Total prices of 2008 = (0.10 + 0.03 + 0.15 + 0.10) = 0.38

The aggregate price index for the two years = (0.38/0.34) * 100 = 111.7

c/ Determine  Laspeyres price index

P = $\frac{(0.10*17000)+(0.03*125000)+(0.15*40000)+(0.10*62000)}{(0.07*17000)+(0.04*125000)+(0.15*40000)+(0.08*62000)} * 100$ = 102.9

d/ Determine the Paasche price index

P = $\frac{(0.10*20000)+(0.03*130000)+(0.15*42000)+(0.10*65000)}{(0.07*20000)+(0.04*130000)+(0.15*42000)+(0.08*65000)} * 100$ = 103.3

e/ Determine Fisher ideal index

P = $\sqrt{(102.9) * (103.3)}$ = 103.1

Excises 9/

The prices and production of gains for August 1995 and August 2008 are listed on the following table:

| Grain | Price 1995 | Quantity 1995 | Price 2008 | Quantity 2008 |
|---|---|---|---|---|
| Oats | 1.52 | 200 | 5.95 | 214 |
| Wheat | 2.10 | 565 | 9.80 | 489 |
| Corn | 1.48 | 291 | 6 | 203 |
| Barley | 3.05 | 87 | 3.29 | 106 |

Using 1995 as base period, find the value index of grains produced for August 2008.

V = $\frac{(5.95*214)+(9.8*489)+(6*203)+(3.29*106)}{(1.52*200)+(2.1*565)+(1.48*291)+(3.05*87)} * 100$ = 349.1