Lab #4

REPORT: Birth Weights

Exercises:

1. The distributions of birth weights for three gestation periods are shown. Match the curves with the gestation periods. Explain your reasoning.

<table>
<thead>
<tr>
<th>Gestation Period</th>
<th>Mean Birth Weight</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 28 Weeks</td>
<td>2.01 lb</td>
<td>1.32 lb</td>
</tr>
<tr>
<td>28 to 31 Weeks</td>
<td>4.29 lb</td>
<td>1.92 lb</td>
</tr>
<tr>
<td>32 to 35 Weeks</td>
<td>5.82 lb</td>
<td>1.51 lb</td>
</tr>
<tr>
<td>36 Weeks</td>
<td>6.45 lb</td>
<td>1.22 lb</td>
</tr>
<tr>
<td>37 to 39 Weeks</td>
<td>7.31 lb</td>
<td>1.11 lb</td>
</tr>
<tr>
<td>40 Weeks</td>
<td>7.74 lb</td>
<td>1.07 lb</td>
</tr>
<tr>
<td>41 Weeks</td>
<td>7.89 lb</td>
<td>1.09 lb</td>
</tr>
<tr>
<td>42 Weeks and over</td>
<td>7.75 lb</td>
<td>1.14 lb</td>
</tr>
</tbody>
</table>
a) This one is pretty easy, you just match up the mean $\mu = 7.31$ with the line on the chart that says Mean Birth Weight 7.31 lb and you get 37 to 39 weeks.

b) This one is the same, you just match up the mean $\mu = 7.75$ with the line on the chart that says 42 Weeks and over.

c) With this one you match up the mean $\mu = 4.29$ with the line on the chart that says 28 to 31 weeks.

2. What percent of the babies born with each gestation period have a low birth weight (under 5.5 pounds)? Explain your reasoning.

   a) Under 28 weeks: To find the percent of the babies born with each gestation period have a low birth weight you need to find the z scores using the formula: $z = (x - \mu) / \sigma = 5.5 - 2.01 / 1.32 \approx 2.644$ : Using Normsdist in Excel I come up with 0.996

   b) 32 to 35 weeks: To find the percent of the babies born with this gestation period we use the same formula $z = (x - \mu) / \sigma = (5.5 - 5.82) / 1.51 \approx -0.212$ : Using Normsdist in Excel I came up with $\approx 0.416$. So a baby in this group has less of a chance of having a lower birth than the group in part a).

   c) 37 to 39 weeks: To find the percent of the babies born with this gestation period we use the formula $z = (x - \mu) / \sigma = (5.5 - 7.31) / 1.11 \approx -1.631$ : Using Normsdist in Excel I came up with $\approx 0.051$. In this gestation group there is an even lower chance of having a baby with a low birth weight.

   d) 42 weeks and over : Same here $z = (x - \mu) / \sigma = (5.5 - 7.75) / 1.14 \approx -1.974$ : plug this into Excel and get .024. So a baby with a gestation period over 42 weeks has a very slim chance of having a low birth weight.

3. Describe the weights of the top 10% of the babies born with each gestation period. Explain your reasoning,

   a) 37 to 39 weeks : To find the answer we need to use the formulas: $x = \mu + z \sigma = 7.31 + z * 1.11$

   $z \approx 1.282$ using the Normsinv of .90 so $7.31 + 1.282 * 1.11 \approx 8.733$

   The lowest birth weight that you can have to be in the top 10% $\approx 8.733$ lbs.
b) 42 weeks and over: To find this answer we use the same formula: \( x = \mu + z \sigma = 7.75 + z \times 1.14 \)

\[ z \approx 1.282 \text{ using Normsinv of .90 so } 7.75 + 1.282 \times 1.14 \approx 9.211 \]

The lowest birth weight that you can have to be in the top 10% \( \approx 9.211 \) lbs.

4. For each gestation period, what is the probability that a baby will weigh between 6 and 9 pounds at birth?

a) 32 to 35 weeks:

\[ Z_1 = \frac{x - \mu}{\sigma} = \frac{6 - 5.82}{1.51} \approx 0.119 \]
\[ Z_2 = \frac{x - \mu}{\sigma} = \frac{9 - 5.82}{1.51} \approx 2.106 \]

So, the probability that a baby will weigh between 6 and 9 pounds equals:

\[ P(6 < x < 9) = P(0.119 < z < 2.106) = P(z < 2.106) - P(z < 0.119) = \text{using Normsdist} \]
\[ \approx 0.982 - 0.547 = 0.435 \]

So the probability that a baby will weigh between 6 and 9 pounds at birth with this gestation period is \( \approx 0.435 \)

b) 37 to 39 weeks:

\[ Z_1 = \frac{x - \mu}{\sigma} = \frac{6 - 7.31}{1.11} \approx -1.180 \]
\[ Z_2 = \frac{x - \mu}{\sigma} = \frac{9 - 7.31}{1.11} \approx 1.523 \]

So, the probability that a baby will weigh between 6 and 9 pounds equals:

\[ P(6 < x < 9) = P(-1.180 < z < 1.523) = P(z < 1.523) - P(z < -1.180) = \text{using Normsdist} \]
\[ \approx 0.936 - 0.119 = 0.817 \]

So the probability that a baby will weigh between 6 and 9 pounds at birth with this gestation period is \( \approx 0.817 \)

c) 42 weeks and over:

\[ Z_1 = \frac{x - \mu}{\sigma} = \frac{6 - 7.75}{1.14} \approx -1.535 \]
\[ Z_2 = \frac{x - \mu}{\sigma} = \frac{9 - 7.75}{1.14} \approx 1.096 \]

So, the probability that a baby will weigh between 6 and 9 pounds equals:

\[ P(6 < x < 9) = P(-1.535 < z < 1.096) = P(z < 1.096) - P(z < -1.535) = \text{using Normsdist} \]
\[ \approx 0.863 - 0.062 = 0.801 \]

So the probability that a baby will weigh between 6 and 9 pounds at birth with this gestation period is \( \approx 0.801 \)

5. A birth weight of less than 3.3 pounds is classified by NCHS as a “very low birth weight. “What is the probability that a baby has a very low birth weight for each gestation period?

a) Under 28 weeks: To find the percent of the babies born with each gestation period have a low birth weight you need to find the z scores using the formula: \( z = \frac{x - \mu}{\sigma} = (3.3 - 2.01) / 1.32 \approx 0.977 \): Using Normsdist in Excel I come up with \(.836\) have a very low birth weight.

b) 32 to 35 weeks: To find the percent of the babies born with this gestation period we use the same formula \( z = (x - \mu) / \sigma = (3.3 - 5.82) / 1.51 \approx -1.669 \): Using Normsdist in Excel I came up with \( \approx 0.048 \). So a baby in this group has a \( \approx 0.048 \) chance of having a very low birth weight.

c) 37 to 39 weeks: To find the percent of the babies born with this gestation period we use the formula \( z = (x - \mu) / \sigma = (3.3 - 7.31) / 1.11 \approx -3.613 \): Using Normsdist in Excel I came up with \( \approx 0.000151 \). In this gestation group there is \( \approx 0.000151 \) chance of having a baby with a very low birth weight.