I. In November DCdesserts.com produced 3,000 multilayer fancy cakes and incurred the following actual costs for direct materials and direct labor:
   - Purchased 16,500 pounds of ingredients at $1.44 per pounds.
   - Used 15,500 pounds of ingredients at $1.44 per pounds.
   - Used 1,520 hours of direct labor at $22 per hour.

   The standard costs for production of multilayer fancy cakes were the same in November as those given for September as follows:
   **Standard quantity:**
   - Direct Materials:
     - Ingredients in finished product: 4.75 pounds
     - Allowance for normal waste: .25 pound
     - Total standard quantity required per multilayer fancy cake: 5.00 pounds
   - Direct Labor:
     - Direct labor required per multilayer fancy cake: .50 hours
   **Standard price / rate:**
   - Direct Materials:
     - Purchase price per pound of ingredients (net of discounts): $1.30
     - Transportation cost per pound: .10
     - Total standard price per pound of ingredients: $1.40
   - Direct Labor:
     - Hourly wage rate: $16
     - Fringe benefits (25% of wages): 4
     - Total standard rate per hour: $20

   **Required:** Compute DCdesserts.com’s direct-material and direct-labor variances for November using the format shown in our textbook. (40%)

II. List five phases in a product’s life cycle, and explain why it is important to budget the costs in each of these phases. (15%)

III. Brad’s Bicycle Shop sells 21-speed bicycles. For purpose of a cost-volume-profit analysis, the shop owner has divided sales into two categories, as follows:

<table>
<thead>
<tr>
<th>Product type</th>
<th>Sales price</th>
<th>Invoice Cost</th>
<th>Sales Commission</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-quality</td>
<td>$1,000</td>
<td>$550</td>
<td>$50</td>
</tr>
<tr>
<td>Medium-quality</td>
<td>600</td>
<td>270</td>
<td>30</td>
</tr>
</tbody>
</table>

   Seventy percent of the shop’s sales are medium-quality bikes. The shop’s annual fixed expenses are $148,500. (In the following requirements, ignore income taxes.)

   **Required:**
   1. Compute the unit contribution margin for each product type.
   2. What is the shop’s sales mix?
   3. Compute the weighted-average unit contribution margin, assuming a constant sales mix.
   4. What is the shop’s break even-sales volume in dollars? Assume a constant sales mix.
   5. How many bicycles of each type must be sold to earn a target net income pf $99,000? Assume a constant sales mix.
Solution:

I. **Answer:**

Direct-material purchase price variance = \((1.44 - 1.40) \times 16,500 = \$660\) Unfavorable

(Direct-material price usage variance = \((1.44 - 1.40) \times 15,500 = \$620\) Unfavorable)

Direct-material quantity variance = \(1.40 \times (15,500 - 3,000 \times 5) = \$700\) Unfavorable

Direct-labor rate variance = \((22 - 20) \times 1,520 = \$3,040\) Unfavorable

Direct-labor efficiency variance = \(20 \times (1,520 - 3,000 \times 0.5) = \$400\) Unfavorable

II. 9-21 The five phases in a product's life cycle are as follows:
(a) Product planning and concept design  
(b) Preliminary design  
(c) Detailed design and testing  
(d) Production  
(e) Distribution and customer service

It is important to budget these costs as early as possible in order to ensure that the revenue a product generates over its life cycle will cover all of the costs to be incurred. A large portion of a product's life-cycle costs will be committed well before they are actually incurred.

III. Exercise 8-30 (30 minutes)

1. 

<table>
<thead>
<tr>
<th>Bicycle Type</th>
<th>Sales Price</th>
<th>Unit Variable Cost</th>
<th>Unit Contribution Margin</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-quality</td>
<td>$1,000</td>
<td>$600 ($550 + $50)</td>
<td>$400</td>
</tr>
<tr>
<td>Medium-quality</td>
<td>600</td>
<td>300 ($270 + $30)</td>
<td>300</td>
</tr>
</tbody>
</table>

2. Sales mix:

High-quality bicycles .................................................................................................................... 30%

Medium-quality bicycles.................................................................................................................. 70%

3. Weighted-average unit contribution margin = \((\$400 \times 30\%) + (\$300 \times 70\%)\)

= \$330

4. **Break-even point (in units) =** \[\frac{\text{fixed expenses}}{\text{weighted-average unit contribution margin}}\]

\[
= \frac{\$148,500}{\$330} = 450 \text{ bicycles}
\]

<table>
<thead>
<tr>
<th>Bicycle Type</th>
<th>Break-Even Sales Volume</th>
<th>Sales Price</th>
<th>Sales Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-quality bicycles</td>
<td>135 ((450 \times .30))</td>
<td>$1,000</td>
<td>$135,000</td>
</tr>
<tr>
<td>Medium-quality bicycles</td>
<td>315 ((450 \times .70))</td>
<td>600</td>
<td>189,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>324,000</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Target net income:

Sales volume required to earn target net income of \(\$99,000\) = \[
\frac{\$148,500 + \$99,000}{\$330} = 750 \text{ bicycles}
\]

This means that the shop will need to sell the following volume of each type of bicycle to earn the target net income:

High-quality ................................................................................................................................. 225 \((750 \times .30)\)

Medium-quality ............................................................................................................................. 525 \((750 \times .70)\)