Baking a tray of corn muffins takes 4 cups of milk, 3 cups of flour, and 1 cup of sugar. Baking a tray of bran muffins takes 2 cups of milk, 3 cups of flour, and 1/2 cup of sugar. A baker has 16 cups of milk, 15 cups of flour, and 6 cups of sugar. He makes $3 profit per tray of corn muffins and $2 profit per tray of bran muffins. How many trays of each type of muffin should the baker make to maximize his profit?

To maximize profit, the baker should make 3 trays of corn muffins, 2 trays of bran muffins.

Unit 3.1 Vertex Form of Quadratic Functions

Given the quadratic parent function, graph numbers 2 and 3 without a calculator by transforming the indicated points on the parent function. Answer the questions for each graph given the following vocabulary.

- **Axis of symmetry** – a line of symmetry for a quadratic function. The two sides of a graph on either side of the axis of symmetry look like mirror images of each other. It is an equation of a vertical line.
- **Maximum value of a parabola** – the largest y-value on the parabola.
- **Minimum value of a parabola** – the smallest y-value on the parabola.
- **Vertex** – a point on the parabola that intersects the axis of symmetry. It is either the maximum or minimum value of a parabola.

Find the domain, range and y-intercept of the following graphs.

**Domain:**
- Graph 1: (-∞, ∞)
- Graph 2: (-∞, ∞)

**Range:**
- Graph 1: (-∞, ∞)
- Graph 2: (-∞, ∞)

**y-intercept:**
- Graph 1: (0, 0)
- Graph 2: (0, 0)

When you finish, grab a WS off the table—make number 6

y = 5(x + 3)^2 + 6

End behavior:
- $f(x) \to -\infty$ as $x \to -\infty$, $f(x) \to \infty$ as $x \to \infty$
2. \( f(x) = -2(x + 2)^2 + 3 \)

- Axis of symmetry: \( x = -2 \)
- Vertex: \((-2, 3)\)
- Opens up or down? Down
- Maximum or minimum? Maximum
- At \( y = 3 \)
- \( y \)-intercept: \((0, -5)\)
- End behavior:
  - \( x \to -\infty, f(x) \to -\infty \)
  - \( x \to \infty, f(x) \to -\infty \)

How can you quickly determine if a quadratic function will open up or down based on the equation?

How can you determine the vertex of a quadratic function based only on the equation?

Vertex form of a quadratic equation:
Based only on the equations determine the different characteristics for each quadratic.

4. \( y = \frac{1}{2}x^2 + 4 \)
   - axis of symmetry: \( x = 0 \)
   - vertex: \((0, 4)\)
   - opens up or down? up
   - maximum or minimum? maximum at \(y = 4\)
   - \(y\)-intercept: \((0, 4)\)
   - End behavior:
     \(-\infty \rightarrow f(x) \rightarrow -\infty\)
     \(+\infty \rightarrow f(x) \rightarrow +\infty\)

5. \( y = (-x)^2 - 3 \)
   - axis of symmetry: \( x = 0 \)
   - vertex: \((0, -3)\)
   - opens up or down? up
   - maximum or minimum? minimum at \(y = -3\)
   - \(y\)-intercept: \((0, -3)\)
   - End behavior:
     \(-\infty \rightarrow f(x) \rightarrow -\infty\)
     \(+\infty \rightarrow f(x) \rightarrow +\infty\)

6. \( y = 5(x + 3)^2 + 6 \)
   - axis of symmetry: \( x = -3 \)
   - vertex: \((-3, 6)\)
   - opens up or down? up
   - maximum or minimum? minimum at \(y = 6\)
   - \(y\)-intercept: \((0, -3)\)
   - \(y\)-intercept: \((0, -39)\)
   - End behavior:
     \(-\infty \rightarrow f(x) \rightarrow -\infty\)
     \(+\infty \rightarrow f(x) \rightarrow +\infty\)

Write the equation of a quadratic in vertex form given the following.

7. Vertex \((-4, -24)\), Point on graph \((-5, -25)\)
   \[
   f(x) = a(x + 4)^2 - 24 \\
   f(x) = a(x - 5)^2 + 24 \\
   f(x) = a(x + 4)^2 - 24 \\
   -25 = a(-5 + 4)^2 - 24 \\
   -25 = a - 24 \\
   -1 = a
   \]

Write the equation of a quadratic in vertex form given the following.

8. \[
   \begin{array}{c}
   \includegraphics[width=2cm]{graph1.png}
   \end{array}
   \]

9. \[
   \begin{array}{c}
   \includegraphics[width=2cm]{graph2.png}
   \end{array}
   \]