When will we ever use this?
From **Percentages to Algebra**

Deborah Ferry  
[dferry@misd.net](mailto:dferry@misd.net)  
Macomb ISD, Michigan

Marianne Srock  
[msrock@misd.net](mailto:msrock@misd.net)  
Macomb ISD, Michigan
To show this poll

1. Install the app from pollev.com/app
2. Start the presentation

Still not working? Get help at pollev.com/app/help
or
Open poll in your web browser
To show this poll

1. Install the app from pollev.com/app
2. Start the presentation

Still not working? Get help at pollev.com/app/help
or
Open poll in your web browser
To show this poll

1. Install the app from pollev.com/app
2. Start the presentation

Still not working? Get help at pollev.com/app/help
or
Open poll in your web browser
To show this poll

1. Install the app from pollev.com/app
2. Start the presentation

Still not working? Get help at pollev.com/app/help or Open poll in your web browser
To show this poll

1. Install the app from pollev.com/app
2. Start the presentation

Still not working? Get help at pollev.com/app/help
or
Open poll in your web browser
FROM PERCENTAGES TO ALGEBRA

Using Authentic Problem Contexts

Military operations  App growth  Fast food restaurants  Making the grade
Lawnmower business  Discount coupons  Free throws  T-shirt sales

Kenneth Chelst, Ph.D.  Thomas Edwards, Ph.D.  Debbie Ferry  Marianne Srock

www.appliedmathpractices.com
Equity, Authentic, Entrepreneur
Societal Consciousness
Today Specifically – Transition to Algebra

- Percentages everywhere
  - One of top 2000 words in use
- Algebra can flow naturally from meaningful examples in middle school math topics: percentages, rates, etc.
- First exposure to variables
Variables

What is $x$?

$50 + 15x$

What is $x$?

$50 + 15x = 65$

- Algebraic Expression $\Rightarrow$ Algebraic Equation
  (Really a variable – question is unknown)
- The value changes as the value of the variable changes.
Mathematics Practice # 1

1. Make sense of problems and persevere in solving them.
Mathematical Practice #3

Construct viable arguments and critique the reasoning of others.

Can we do that with questions that take students two minutes to read and solve?
TABLES & GRAPHS

Comparison of Two Marketing Plans

U.S. Department of Labor & Statistics – Unemployment Rates
Activity 6: Growing a business
Page 109
Open to page 111 – Walk through the Number Talk silently by yourself.

Turn and Talk - What do you think might be one of the math concepts illustrated in this scenario?
Open to page 112 – 113. Read through these two pages. You DO NOT have to answer the questions.

From a business sense, what’s the KEY POINT here?
Open to page 114 – 115. Read through these two pages up to the table. STOP.

Turn and Talk - One person explain Freddie’s Plan. One person explain Grace’s Plan.

Work problems 8, 9, 10, and 11.
Activity 6:  
Growing a business  
Pages 115-116

Continue reading on pages 115 – 116.

Work #12 on handout.

#13. If they use Freddie, how many customers will they have after 5 weeks?

#14. If they use Freddie, how many weeks will it take for them to at least double the number of customers?
<table>
<thead>
<tr>
<th>End of Week</th>
<th>Freddie – Using a List</th>
<th>Grace – Using Word of Mouth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Start of Week</td>
<td>Add 30% of 50</td>
</tr>
<tr>
<td>1</td>
<td>50</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>65</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
<td>15</td>
</tr>
<tr>
<td>4</td>
<td>95</td>
<td>15</td>
</tr>
<tr>
<td>5</td>
<td>110</td>
<td>15</td>
</tr>
<tr>
<td>6</td>
<td>125</td>
<td>15</td>
</tr>
<tr>
<td>In general “x”</td>
<td>50 + 15(1)</td>
<td>50 + 15(2)</td>
</tr>
</tbody>
</table>

In general “x”  

x stands for __Number of Weeks,  50 + 15x = total at end of week x

Vocabulary:
Activity 6: Growing a business
Pages 117

Open to page 117. Continue reading and answer question #15.

Develop this formula with your students.
Activity 6: Growing a business

Pages 117

\[ 50 + 0.2(50) = 60 \]

\[ 50(1 + 0.2) = 60 \]

\[ 50(1.2) = 60 \]

Week 1 \[ 50(1.2) = 50(1.2)^1 \]

Week 2 \[ [50(1.2)](1.2) = 50(1.2)^2 \]

Week 3 \[ [50(1.2)(1.2)](1.2) = 50(1.2)^3 \]
### Freddie – Using a List

<table>
<thead>
<tr>
<th>End of Week</th>
<th>Start of Week</th>
<th>Add 30% of 50</th>
<th>End of Week</th>
<th>Start of Week</th>
<th>Add 20% of previous total</th>
<th>End of Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>50</td>
<td>15</td>
<td>65</td>
<td>50</td>
<td>10</td>
<td>60</td>
</tr>
<tr>
<td>2</td>
<td>65</td>
<td>15</td>
<td>80</td>
<td>60</td>
<td>12</td>
<td>72</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
<td>15</td>
<td>95</td>
<td>72</td>
<td>14.4</td>
<td>86.4</td>
</tr>
<tr>
<td>4</td>
<td>95</td>
<td>15</td>
<td>110</td>
<td>86.4</td>
<td>17.28</td>
<td>103.68</td>
</tr>
<tr>
<td>5</td>
<td>110</td>
<td>15</td>
<td>125</td>
<td>103.68</td>
<td>20.736</td>
<td>124.416</td>
</tr>
<tr>
<td>6</td>
<td>125</td>
<td>15</td>
<td>140</td>
<td>124.416</td>
<td>24.8832</td>
<td>149.2992</td>
</tr>
</tbody>
</table>

### Grace – Using Word of Mouth

<table>
<thead>
<tr>
<th>End of Week</th>
<th>Start of Week</th>
<th>Add 20% of previous total</th>
<th>End of Week</th>
</tr>
</thead>
</table>

In general, 

\[ 50 + 15x = \text{total at end of week } x, \quad 50(1.2)^x = \text{total at end of week } x \]
Comparison of Two Marketing Plans

End of Week

Customers

Freddie
Grace
Activity 6:
Teachers’ guide
Page 125
Teachers’ Guide

• Thinking Through a Lesson Protocol
  ◦ Launch
  ◦ Explore
  ◦ Summarize

• Practice Problems

• Project Idea
Classroom Video – Growing a Business

- Dr. Yamamah Sawalha – A big THANKS
- Dearborn, Michigan
- 8th grade students in Algebra 1

LOOK FOR IN VIDEO CLIPS

- How does the context play a role in student understanding?
- Is there productive struggle?
- Are students supporting and helping each other to understand the mathematics?
# From Percentages to Algebra

**Using Authentic Problem Contexts**

<table>
<thead>
<tr>
<th></th>
<th>Introduction</th>
<th>Concepts</th>
<th>Table</th>
<th>Algebra</th>
<th>Graph Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Better deal</td>
<td>Compare percent and fixed value of coupons</td>
<td>Y</td>
<td>Solve Equation</td>
<td>N</td>
</tr>
<tr>
<td>2</td>
<td>Making the grade</td>
<td>Best is 100% - weighted scores</td>
<td>Y</td>
<td>Solve Equation</td>
<td>N</td>
</tr>
<tr>
<td>3</td>
<td>Free throw percentages</td>
<td>Best is only 90%</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>4</td>
<td>Dropping out of high school</td>
<td>Best is 0 %</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>5</td>
<td>Special operations</td>
<td>Order of percent change no impact</td>
<td>Y</td>
<td>Solve Equation</td>
<td>N</td>
</tr>
<tr>
<td>6</td>
<td>Growing lawn service</td>
<td>Compare percent and fixed value</td>
<td>Y</td>
<td>Solve Equation</td>
<td>N</td>
</tr>
<tr>
<td>7</td>
<td>McFadden restaurant</td>
<td>Fallacy of equal + and – percentage change</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>8</td>
<td>Managing by percentage</td>
<td>More than two percentages and non-whole number answers</td>
<td>Y</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>9</td>
<td>Ice cream</td>
<td>More than two percentages and non-whole number answers</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>10</td>
<td>Clothing sizes</td>
<td>Multiply two percentages and non-whole number answers</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>11</td>
<td>App growth</td>
<td>Compound percentages and financial analysis</td>
<td>Y</td>
<td>Set up Formula</td>
<td>Y</td>
</tr>
<tr>
<td>12</td>
<td>Homeless veterans</td>
<td>Compound percent vs fixed</td>
<td>Y</td>
<td>Set up Formula</td>
<td>Y</td>
</tr>
<tr>
<td>13</td>
<td>Grades</td>
<td>Weighted Scores - 3 values</td>
<td>Y</td>
<td>Solve Equation</td>
<td>N</td>
</tr>
<tr>
<td>14</td>
<td>Different sized Slushies</td>
<td>Weighted sum of percentages</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>15</td>
<td>Congressional districts</td>
<td>Combine geographies and their percentages</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
</tbody>
</table>
To show this poll

1. Install the app from pollev.com/app
2. Start the presentation

Still not working? Get help at pollev.com/app/help
or
Open poll in your web browser