M8.D Algebraic Concepts

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<th>Assessment Anchor</th>
<th>Eligible Content</th>
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<tr>
<td>M8.D.2</td>
<td>Represent and/or analyze mathematical situations using numbers, symbols, words, tables and/or graphs.</td>
<td>M8.D.2.1 Match a written situation to its numeric and/or algebraic expression, equation or inequality (up to two variables in equations or expressions – one variable with inequalities).</td>
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<tr>
<td>M8.D.2.2</td>
<td>Create and/or interpret expressions, equations, or inequalities that model problem situations.</td>
<td>M8.D.2.2 Write and/or solve an equation for a given problem situation (one variable only).</td>
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How *Robotics Engineering, Volume 1* Addresses the Assessment Anchor

Students will use a number of formulas to control their robot. For example, they will use a set of formulas to calculate the value fed into the robot's wheel encoder to ensure the robot moves an exact distance. The student will need to calculate the circumference of the wheel using:

\[
\text{Circumference} = \pi \times \text{Diameter} \quad \text{or} \quad C = \pi \times D
\]

And then apply a second formula to calculate distance:

\[
\text{DistanceTraveledPerTick} = \frac{\text{Circumference}}{360} \quad \text{or} \quad DtPt = \frac{C}{360}
\]

And then apply a third formula to calculate the number of ticks to set the encoder

\[
\text{EncoderValue} = \frac{\text{TotalDistance}}{\text{DistanceTraveledPerTick}} \quad \text{or} \quad EV = \frac{Td}{DtPt}
\]

Each of the formulas use relevant variables and students will be able to connect each variable to physical aspects of the robot and be able to manipulate them to control their robot's behavior.
M8.B Measurement

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<tr>
<td>M8.B.1</td>
<td>Demonstrate an understanding of measurable attributes of objects and figures, and the units, systems and processes of measurement.</td>
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<tr>
<td>M8.B.1.1</td>
<td>Convert measurements.</td>
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<tr>
<td>M8.B.1.1.1</td>
<td>Convert among metric measurements (milli, centi, kilo using meter, liter and gram) (table of equivalency provided on the reference sheet).</td>
<td>2.3.5.D Convert linear measurements within the same system.</td>
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<tr>
<td>M8.B.1.1.2</td>
<td>Convert customary measurements up to 2 units above or below the given unit (e.g., inches to yards, pints to gallons) (table of equivalency provided on the reference sheet).</td>
<td></td>
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</table>

How *Robotics Engineering, Volume 1* Addresses the Assessment Anchor

Students will convert between a number of different measurement systems while learning about their robot, such as:

1. Between systems (centimeters to inches)

   \[
   \frac{2.54cm}{1\text{in}} \cdot \frac{?cm}{5\text{in}}
   \]

2. Within systems (centimeters to meters), and

   \[
   \frac{100cm}{1\text{m}} = \frac{250cm}{?m}
   \]

3. Between units (rotations to degrees).

   \[
   \frac{360\text{degrees}}{1\text{rotation}} = \frac{540\text{degrees}}{?\text{rotations}}
   \]