Robotics Links to ACARA

MATHEMATICS GRADE 7

Strand	Content Descriptions	Elaborations	LEGO Education	Teacher notes
Numbers and Algebra	**Patterns and algebra** Introduce the concept of variables as a way of representing numbers using letters. (ACMNA175)	Understanding that arithmetic laws are powerful ways of describing and simplifying calculations and that using these laws leads to the generality of algebra.	**For a robot car - draw up a table for a series of trials.** **Distance (d) travelled and a uniform increase in Duration Time (t).**	Identify a relationship between d and t. Express algebraically. Use relationship to predict (and trial) time required to stop robot in front of LEGO minifig (teacher specified distance). Use relationship to predict time to travel 1m, 1km, 1000km (from Sydney to Melbourne).
	Patterns and algebra Create algebraic expressions and evaluate them by substituting a given value for each variable. (ACMNA176)			
	Real Numbers Recognise and solve problems involving simple ratios. (ACMNA173)	Understanding that rate and ratio problems can be solved using fractions or percentages and choosing the most efficient form to solve a particular problem.		
	Real Numbers Round decimals to a specified number of decimal places. (ACMNA156)	Using rounding to estimate the results of calculations with whole numbers and decimals, and understanding the conventions for rounding.		

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MATHEMATICS GRADE 8

Strand	Content Descriptions	Elaborations	LEGO Education	Teacher notes
Measurement and Geometry	**Using units of measurement** Investigate the relationship between features of circles such as circumference, area, radius and diameter. Use formulas to solve problems involving circumference and area. (ACMMG197)	Investigating the circumference and area of circles with materials or by measuring, to establish an understanding of formulas.	**Robot car course prediction, using diameter and Circumference. Course given, but no trial and error.**	Students can be given a straight line distance. By measuring wheel diameter and calculating circumference - hence distance for one rotation, they can use a ratio calculation to program Number of rotations for desired distance. Extension - add some right angle turns. Measure diameter of wheel base of robot car. If only one motor (one wheel) moves, how many rotations to complete 90deg (right angle) turn. Further extension: Use 3 or 4 different wheels sizes. Graph Diameter (x) and Circumference (distance travelled by one rotation) (y). Gradient = ??
			Variation on above: Students construct a measuring wheel using diameter and circumference.	Using the Simple and Powered machines equipment and Activity Pack #2009686 Students can work through Trundle wheel activity.

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MATHEMATICS GRADE 9

Strand	Content Descriptions	Elaborations	LEGO Education	Teacher notes
Number and Algebra	**Real Numbers** Solve problems involving direct proportion. Explore the relationship between graphs and equations corresponding to simple rate problems. (ACMNA208)	Identifying direct proportion in real-life contexts.	**Using a robot car students can graph the following:** **Time (i) vs Distance (d) (Power constant)** **Power (i) vs Distance (d) (Time constant)**	**i=Independent** (deliberately change) variable **d = dependent** (changes as a result) variable Graph data (independent variable on x axis) Find Gradient and equation of the lines (Gradient of first graph = Velocity) Interpolate from graph (and/or equation) to prevent car hitting a LEGO minifigurine from a certain distance. Extrapolate to find time for 1km
	Linear and Non-Linear relationships Sketch linear graphs using the coordinates of two points and solve linear equations.	Determining linear rules from suitable diagrams, tables of values and graphs and describing them using both words and algebra.		
Measurement and Geometry	**Pythagoras and Trigonometry** Investigate Pythagoras' Theorem and its application to solving simple problems involving right angled triangles. (ACMMG222)	Understanding that Pythagoras' Theorem is a useful tool in determining unknown lengths in right-angled triangles and has widespread applications.	**Given a large circle on card and a robot car, students can measure (using dist. of a wheel rotation = circumference) intersecting chord lengths that make 90 deg angle with the edge of a circle. Using Pythagoras' Theorem, diameter of the circle can be calculated.**	

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MATHEMATICS GRADE 10

Strand	Content Descriptions	Elaborations	LEGO Education	Teacher notes
Number and Algebra	**Linear and Non Linear Relationships** Explore the connection between algebraic and graphical representations of relations such as simple quadratics, circles and exponentials using digital technology as appropriate. (ACMNA239)	Sketching graphs of parabolas, and circles.	**Create a robot dropper:** **'On' Touch Sensor on top (release selected), 'Off' Toucher Senor (press selected) connected to rigid protective structure.** **Timer on screen activated.** **Drop from measured heights - independent variable (less than 15cm)**	1st Graph: distance (d) vs time (t) - should give a parabola 2nd Graph: distance (d) on x-axis and time squared (t^2) on y - axis. Gradient x 2 = acceleration due to gravity

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