

EPPro8 Challenge

Engineer Problem Solve Innovate

Crane

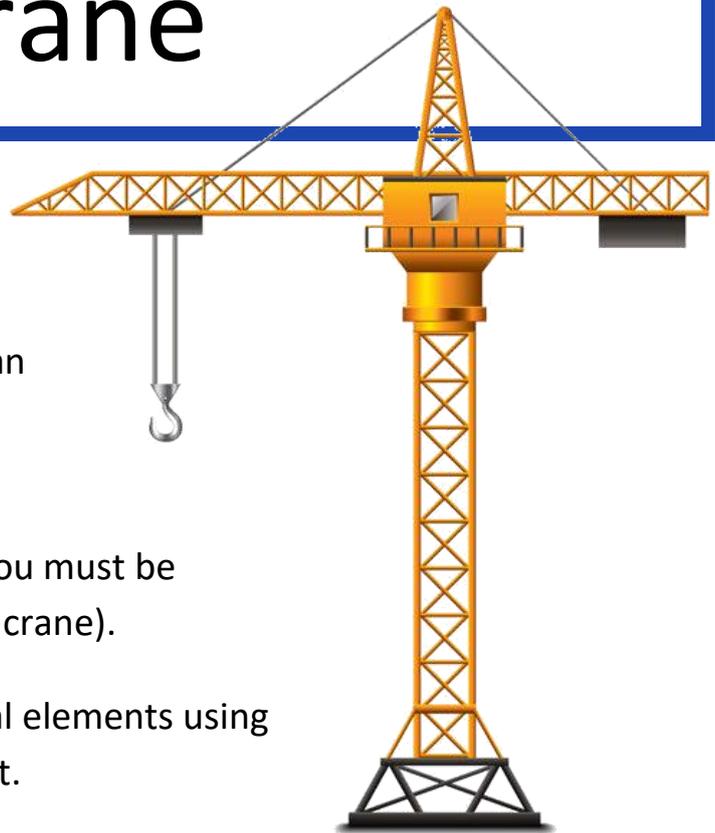
You work at a construction site building a skyscraper.

You need to construct a crane that can lift objects from the ground, rotate, and lower them to another location.

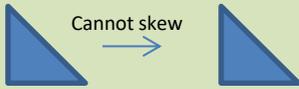
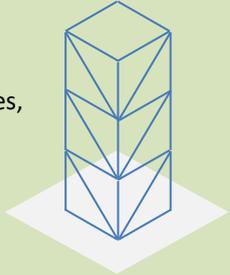
The crane must be self-supporting (you must be able to stand back and not touch the crane).



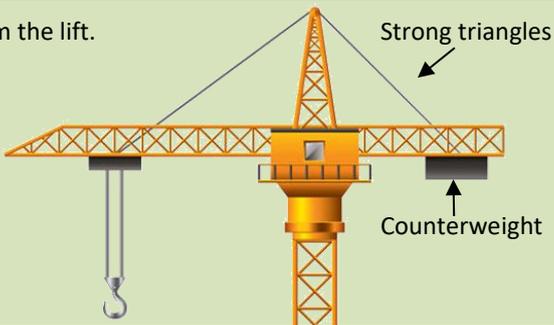
This challenge contains optional elements using the EPro8 Electronics Starter Kit.



Crane Construction

Criteria	Build a free standing tower or structure at least 1.8m The tower must be rigid. It must need bend when pushed from the side	
Hint	<p>Squares or cubes can skew, so they are weak:</p>  <p>Collapses when pushed</p> <p>Triangles cannot skew so they are strong and rigid:</p>  <p>Cannot skew</p>	<p>A diagonal brace will turn a square into two strong rigid triangles.</p> <p>Many cranes and towers are built with lots of strong triangles, like in this diagram:</p> 

Boom Arm

Criteria	<p>An arm extends horizontally from the top of the crane by at least 400mm.</p> <p>A 2kg weight is attached to the end of the arm.</p> <p>The arm does not bend and the structure remains stable.</p>	
Hint	<p>Cranes have counterweights on the opposite side from the lift. This balances the crane and stops it tipping over. Build the boom arm in both directions and attach a 1kg weight on the other side.</p> <p>Use triangles again so the boom doesn't bend.</p>	 <p>The diagram shows a yellow crane boom arm extending horizontally from a central tower. On the left side, a hook is attached. On the right side, a counterweight is attached. The boom is supported by a central pivot point. The structure is reinforced with 'strong triangles' (truss structures) to prevent bending. Labels include 'Strong triangles' with an arrow pointing to the truss structure and 'Counterweight' with an arrow pointing to the weight on the right.</p>

Manual 2kg Lift

Criteria	<p>A rope is attached from the 2kg weight through the end of the boom to the centre of the crane.</p> <p>Pulling down on the rope in the centre of the crane lifts the 2kg weight.</p>	
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Crank Handle Operated

Criteria	<p>The weight is attached to the end of the boom.</p> <p>A crank handle in the middle of the tower raises and lowers the weight.</p>	
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Motorised Crane

Criteria	<p>The motor and two push buttons are mounted near the base of the crane.</p> <p>Pushing one button causes the weight to raise.</p> <p>Pushing the other button causes the weight to lower.</p>	
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Rotating Boom

Criteria	The boom is attached to an axle so that it can rotate around the crane. The 2kg weight can be lifted, the boom rotated, and then the weight lowered in a different location.
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Motorised Crane (Simulator)

Criteria	Use the online electronics simulator, code CRAN . The crane must be electrically operated. An operating panel must have 4 buttons: <ul style="list-style-type: none">• Two that raise and lower the weight.• Two that rotate the boom from side-to-side.
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Warning Siren and Auto Stop

Criteria	Before starting to lift, a warning buzzer will automatically sound for 5 seconds. The crane will automatically stop when it reaches the top.
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Hint	Experiment with the Time Delay, On/Off, and Direction boxes.
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After you have attempted this challenge watch the tutorial to see our solution at www.EPro8Challenge.co.nz/Tutorial and enter the Challenge Code **CRAN**.