The Sutton Academy

# Knowledge Rich Curriculum Plan

Course/Unit

<table>
<tr><th>Lesson/Learning Sequence</th><th>Intended Knowledge:<br>Students will know that…</th><th>Tiered Vocabulary</th><th>Prior Knowledge:<br>In order to know this students, need to already know that…</th><th>Assessment</th></tr>
<tr><td>LO: To learn how to construct a mechanical model.</td><td>• Students will know how to construct a model,<br>• Students will know how sketch a model<br>• Students will how to construct a simple model</td><td></td><td>Students will need to know how to use formula<br>Students will need to substitute</td><td></td></tr>
<tr><td>LO: To learn how to use assumptions and units in mechanical models.</td><td>• Students will know what assumptions to make depending on the model.
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<tr><th>Model</th><th>Modelling assumptions</th></tr>
<tr><td>Particle – Dimensions of the object are negligible.</td><td>• mass of the object is concentrated at a single point<br>• rotational forces and air resistance can be ignored</td></tr>
<tr><td>Rod – All dimensions but one are negligible, like a pole or a beam.</td><td>• mass is concentrated along a line<br>• no thickness<br>• rigid (does not bend or buckle)</td></tr>
<tr><td>Lamina – Object with area but negligible thickness, like a sheet of paper.</td><td>• mass is distributed across a flat surface</td></tr>
<tr><td>Uniform body – Mass is distributed evenly.</td><td>• mass of the object is concentrated at a single point at the geometrical centre of the body – the centre of mass</td></tr>
<tr><td>Light object – Mass of the object is small compared to other masses, like a string or a pulley.</td><td>• treat object as having zero mass<br>• tension the same at both ends of a light string</td></tr>
<tr><td>Inextensible string – A string that does not stretch under load.</td><td>• acceleration is the same in objects connected by a taut inextensible string</td></tr>
<tr><td>Smooth surface</td><td>• assume that there is no friction between the surface and any object on it</td></tr>
<tr><td>Rough surface – If a surface is not smooth, it is rough.</td><td>• objects in contact with the surface experience a frictional force if they are moving or are acted on by a force</td></tr>
<tr><td>Wire – Rigid thin length of metal.</td><td>• treated as one-dimensional</td></tr>
<tr><td>Smooth and light pulley – all pulleys you consider will be smooth and light.</td><td>• pulley has no mass<br>• tension is the same on either side of the pulley</td></tr>
<tr><td>Bead – Particle with a hole in it for threading on a wire or string.</td><td>• moves freely along a wire or string<br>• tension is the same on either side of the bead</td></tr>
<tr><td>Peg – A support from which a body can be suspended or rested.</td><td>• dimensionless and fixed<br>• can be rough or smooth as specified in question</td></tr>
<tr><td>Air resistance – Resistance experienced as an object moves through the air.</td><td>• usually modelled as being negligible</td></tr>
<tr><td>Gravity – Force of attraction between all objects. Acceleration due to gravity is denoted by $g$.<br>  <br></td><td>• assume that all objects with mass are attracted towards the Earth<br>• Earth's gravity is uniform and acts vertically downwards<br>• $g$ is constant and is taken as $9.8\ \text{m s}^{-2}$, unless otherwise stated in the question</td></tr>
</table>
• Students will know the SI units.<br>• Students will know that KG measures mass and not weight.<br>• Students will know how to convert between units.</td><td></td><td>Students will need to know basic physics.</td><td></td></tr>
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| Lesson/Learning Sequence | Intended Knowledge:<br>*Students will know that…* | Tiered Vocabulary | Prior Knowledge:<br>*In order to know this students, need to already know that…* | Assessment |
|---|---|---|---|---|
| **To learn how to use vectors in mechanics.** | • *Students will know that vector quantities are displacement, velocity, acceleration and force/weight.*<br>• *Students will know how to fully describe motion using vectors.*<br>• *Students will know you can describe vectors using i,j notation, where I and j are the unit vectors in the positive x and y directions*<br>• *Students will know that the magnitude of the displacement vector.*<br>• *Students will know that speed is the magnitude of the velocity vector.*<br>. | | Students will need to know how to find the magnitude of a vector.<br>Students will need to know ow to find an angle of a vector. | |

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| **Students will know how to use the trapezium rule to approximate integration.** | • Students will know that if you cannot integrate a function algebraically, you can use a numerical method to approximate the area beneath a curve.<br>• Students will know that to approximate the area given by $\int_a^b ydx$ you can divide the area into n equal strips. Each strip will be of width $h$ where $h = \frac{b-a}{n}$<br>• Students will know that $\int_a^b ydx \approx \frac{1}{2}h(y_0 + 2(y_1 + y_2 \dots + y_{n-1}) + y_n)$ where $h = \frac{b-a}{n}$ and $y_i = f(a + ih)$<br>• Students will know if there answer is an overestimate (convex) or underestimate. | | Students will need to know the area of a trapezium.<br>Students will need to know how to substitute into a formula<br>Students will need to know how to use radians. | |