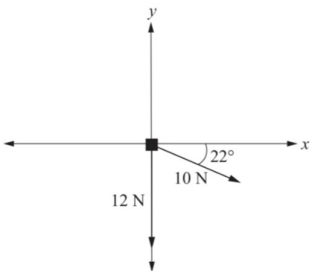


Question 1	
<p>QUESTION 1</p> <p>The acceleration (ms^{-2}) of an object moving with simple harmonic motion is modelled by $a = -2.95x$, where x is its displacement (m) from the origin.</p> <p>Determine the period of the motion in seconds.</p> <p>(A) 1.72 (B) 2.13 (C) 2.95 (D) 3.66</p>	Simple Familiar Technology Active 2023
Question 2	
<p>QUESTION 8</p> <p>Given $f(x) = \tan^{-1}(2x)$, determine $f'(3)$.</p> <p>(A) 0.05 (B) 0.15 (C) 2.17 (D) 3.10</p>	Simple Familiar Technology Active 2023
Question 3	
<p>QUESTION 6</p> <p>Two coplanar forces of magnitudes 12 N and 10 N act on an object in the directions shown.</p> <div style="text-align: center; margin: 10px 0;"> <p>Not to scale</p>  </div> <p>Determine the magnitude of the resultant force acting on the object.</p> <p>(A) 12.41 N (B) 15.55 N (C) 15.69 N (D) 18.27 N</p>	Simple Familiar Technology Active 2023

Question 4																	
<p>QUESTION 13 (5 marks)</p> <p>An article claims that the mean starting salary of graduates in Australia is currently \$64 800 with a standard deviation of \$4500.</p> <p>To check the validity of this claim, an employment agent intends to collect data on the starting salaries of a random sample of 360 graduates.</p> <p>a) Determine the probability that the sample mean starting salary will be between \$64 000 and \$65 000. [2 marks]</p> <p>From the data, the agent calculates a confidence interval for the population mean starting salary of (\$64 589, \$65 811).</p> <p>b) Determine the sample mean. [1 mark]</p> <p>c) Comment on the reasonableness of the article's claim based on this confidence interval. [2 marks]</p>	Simple Familiar Technology Active 2022																
Question 5																	
<p>QUESTION 14 (4 marks)</p> <p>At a certain location, a biologist measures the width of a river to be 12 m. She also records the depth of the river at regular 2 m interval widths as shown.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <tr> <th style="padding: 2px 5px;">Width (m)</th> <td>0</td><td>2</td><td>4</td><td>6</td><td>8</td><td>10</td><td>12</td> </tr> <tr> <th style="padding: 2px 5px;">Depth (m)</th> <td>0.52</td><td>2.15</td><td>3.70</td><td>4.27</td><td>3.32</td><td>1.28</td><td>0.59</td> </tr> </table> <p>The biologist estimates the cross-sectional area of the river at this location to be 15 m^2.</p> <p>Use Simpson's rule to evaluate the reasonableness of this estimation. Justify your area calculation and decision regarding reasonableness using mathematical reasoning.</p>	Width (m)	0	2	4	6	8	10	12	Depth (m)	0.52	2.15	3.70	4.27	3.32	1.28	0.59	Simple Familiar Technology Active 2023
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Depth (m)	0.52	2.15	3.70	4.27	3.32	1.28	0.59										
Question 6																	
<p>QUESTION 16 (6 marks)</p> <p>Let $\mathbf{A} = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 1 \\ 2 & 2 & 1 \end{bmatrix}$</p> <p>Given $\mathbf{A}^4 = p\mathbf{A}^3 + q\mathbf{A}^2 + r\mathbf{A} + 3\mathbf{I}$, use matrix algebra to determine the value of the scalars p, q and r.</p>	Complex Familiar Technology Active 2021																
Question 7																	
<p>QUESTION 18 (5 marks)</p> <p>Consider the polynomials $P(z) = z^3 + (i - a)z^2 - 2biz + 3i$ and $Q(z) = z - 2i$, where $a, b \in \mathbb{R}$.</p> <p>Given $\frac{P(z)}{Q(z)}$ has a remainder of $a - bi$, evaluate the reasonableness that $(z - (a - bi))$ is a factor of $P(z)$.</p>	Complex Unfamiliar Technology Active 2022																