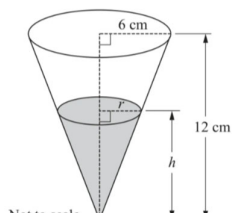
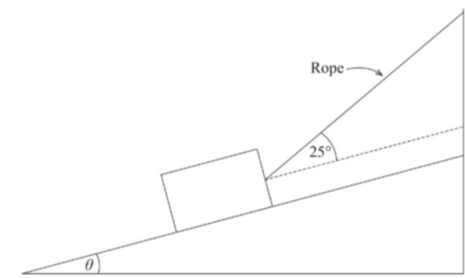


<b>Question 1</b>	
<p><b>QUESTION 4</b></p> <p>The time taken for students to answer questions in a class is assumed to be a random variable <math>X</math> with an exponential distribution that has the probability density function</p> $f(x) = \begin{cases} \lambda e^{-\lambda x}, & x \geq 0 \\ 0, & \text{otherwise} \end{cases}$ <p>The mean of <math>X</math> is <math>\frac{1}{\lambda}</math>.</p> <p>The mean length of time taken for students to answer questions in this class is 15 seconds.</p> <p>The probability that the next question in this class is answered between 8 seconds and 17 seconds is</p> <p>(A) 0.05 (B) 0.12 (C) 0.22 (D) 0.26</p>	<p>Simple Familiar Technology Active 2022</p>
<b>Question 2</b>	
<p><b>QUESTION 10</b></p> <p>In a town, the mean number of residents per household is 3.79 people with a standard deviation of 1.47 people. Using a random sample of 45 households from the town, determine the probability that the mean number of residents per household will be more than 4.</p> <p>(A) 0.17 (B) 0.33 (C) 0.83 (D) 0.96</p>	<p>Simple Familiar Technology Active 2022</p>
<b>Question 3</b>	
<p><b>QUESTION 15 (8 marks)</b></p> <p>Water is poured into a cone-shaped cup at a rate of <math>2 \text{ cm}^3 \text{ s}^{-1}</math>. The cup has a height of 12 cm and a radius of 6 cm, as shown.</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>As the cup fills, the ratio of the height of the water <math>h</math> to the surface radius of the water <math>r</math> remains constant.</p> <p>a) Given that <math>h = 2r</math>, determine a function for the volume of water in the cup, <math>V</math>, in terms of <math>h</math>. Express your answer in simplified form. <span style="float: right;">[1 mark]</span></p> <p>b) Use the results from Question 15a) to show that the rate at which the height of water in the cup is increasing with respect to time is given by <math>\frac{8}{\pi h^2}</math>. <span style="float: right;">[3 marks]</span></p> <p>c) Determine the rate at which the height of water in the cup is increasing with respect to time when the volume of water in the cup reaches half of the total capacity of the cup. <span style="float: right;">[4 marks]</span></p>	<p>Simple Familiar Technology Active 2021</p>

<b>Question 4</b>													
<p><b>QUESTION 13 (4 marks)</b></p> <p>The wait time for customers put on hold when calling complaint departments is assumed to be normally distributed. A company claims that the mean wait time for their customers is 7.6 minutes.</p> <p>The following data represents the wait time (minutes) from a random sample of 12 customers who called the complaint department of this company.</p> <table border="1" style="margin: 10px auto; border-collapse: collapse; text-align: center;"> <tr> <td>8.3</td><td>12.7</td><td>9.1</td><td>7.3</td><td>10.3</td><td>5.4</td><td>8.5</td><td>10.7</td><td>6.9</td><td>12.5</td><td>7.2</td><td>11.9</td> </tr> </table> <p>a) Determine the mean of this data. <span style="float: right;">[1 mark]</span></p> <p>The standard deviation of this data is calculated to be 2.384 minutes.</p> <p>b) Use an approximate 95% confidence interval for the mean to evaluate the reasonableness of the company's claim. Justify your decision using mathematical reasoning. <span style="float: right;">[3 marks]</span></p>	8.3	12.7	9.1	7.3	10.3	5.4	8.5	10.7	6.9	12.5	7.2	11.9	<p>Simple Familiar Technology Active 2023</p>
8.3	12.7	9.1	7.3	10.3	5.4	8.5	10.7	6.9	12.5	7.2	11.9		
<b>Question 5</b>													
<p><b>QUESTION 16 (6 marks)</b></p> <p>An object with a mass of 12 kg lies on a frictionless inclined plane. A rope is attached to the object at an angle of <math>25^\circ</math> above the plane, as shown.</p> <div style="text-align: center; margin: 10px 0;">  </div> <p>Not to scale</p> <p>The force of the rope, <math>T \text{ N}</math>, prevents the object from moving. When the rope is detached, the object moves down the plane with an acceleration of <math>5.6 \text{ m s}^{-2}</math>.</p> <p>Determine the magnitude of <math>T</math>.</p>	<p>Complex Familiar Technology Active 2022</p>												
<b>Question 6</b>													
<p><b>QUESTION 19 (7 marks)</b></p> <p>The height of Year 9 students at a school is assumed to be normally distributed with a population mean height of <math>\mu \text{ cm}</math>.</p> <p>A teacher at the school measured the height of all the students in her Year 9 class. This data was used to calculate an approximate 95% confidence interval for <math>\mu</math> of (163.7, 166.9) cm.</p> <p>The teacher repeated the procedure using data from another Year 9 class. Although this class had the same number of students, its data produced an approximate 95% confidence interval for <math>\mu</math> of (167.8, 172.4) cm.</p> <p>Using the same data, the teacher recalculated the approximate confidence intervals for <math>\mu</math> for each class using a confidence level of <math>x\%</math>. She observed that the upper bound of the confidence interval from her Year 9 class now equalled the lower bound of the confidence interval from the other Year 9 class.</p> <p>Determine the value of <math>x</math>. Give your answer rounded to one decimal place.</p>	<p>Complex Unfamiliar Technology Active 2023</p>												