6E Mathematics – 3 Periods
Part A – Without Calculator

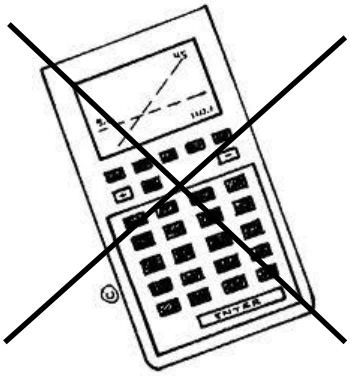
DATE: 15th June 2022

DURATION OF THE EXAMINATION:

45 Minutes

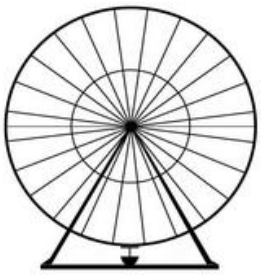
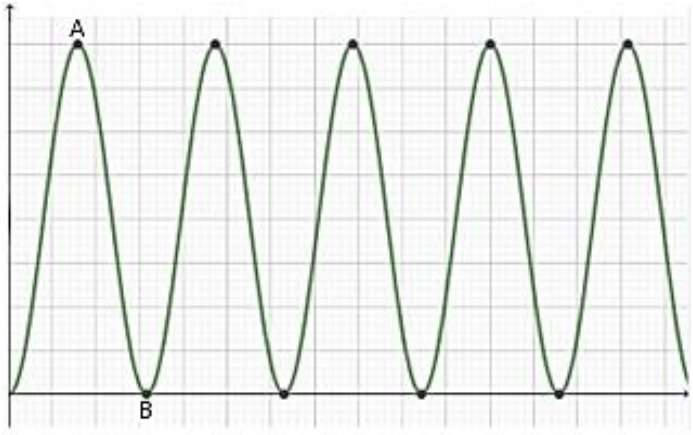
AUTHORISED MATERIAL:

Formula Booklet



SPECIAL INSTRUCTIONS:

- **No calculator allowed**
- Answer all questions
- Do not spend too long on one question
- Poorly presented work may result in marks being deducted
- The total mark is 35
- Answers must be supported by explanations, showing the reasoning for the results or solutions given.
- If graphs are used to find a solution, they must be sketched as part of the answer
- Unless indicated otherwise, full marks will not be awarded if a correct answer is not accompanied by supporting evidence or explanations of how the results or the solutions have been achieved
- If the answer provided is incorrect, some marks may still be awarded if it is shown that an appropriate method and/or a correct approach has been used

PART A		
	Page 3/5	**Marks**
A1	A tetrahedral dice is labelled with four numbers: 1, 2, 3 and 4. The dice is thrown three times. Let X represent the number of times a 1 is obtained. Determine the probability distribution of the variable X and calculate its expected value.	**6**
A2	In a family of 4 people (two parents and their two children), each has a smartphone of the same make and model. The probability that this 'basic' model will fail during the year is 20%. Calculate the probability that exactly two of the members of this family will have their smartphone fail during the year.	**6**
A3	The graph below shows the height above the ground of a cabin on a Ferris wheel as a function of time. The Ferris wheel takes 5 minutes to complete one full rotation. The cabin follows a circular path between the heights of 0m and 65m above the ground.   a) Determine the coordinates of points A and B on the graph above. b) Explain how the graph would change if the Ferris wheel were to take 10 minutes to complete a circuit. c) Describe any limitations of this model when applied to the practical situation.	**2** **2** **2**

		Page 4/5	Marks
A4	For each of the situations A to E described below, state whether the model involves: a) (i) Growth (ii) Decay (iii) Neither and whether the model is: b) (i) Linear (ii) Exponential (iii) Quadratic (iv) Sinusoidal A: A population of 100 mice increases by 20% each week under favourable conditions B: A tree which is 1.2m tall when planted grows 30cm each month during the growing season C: The height, *h*, of a stone *t* seconds after being dropped from the top of a tower is modelled by the function $h(t) = 130 - 5t^2$ D: The number of daylight hours in Blankenloch varies periodically each year between 16 hrs 12 mins and 8 hrs 13 mins E: The temperature, *T*, of a liquid, *t* minutes after being placed in a refrigerator, is given by the function $T(t) = 98 \times 2^{-\frac{t}{50}}$		**10**

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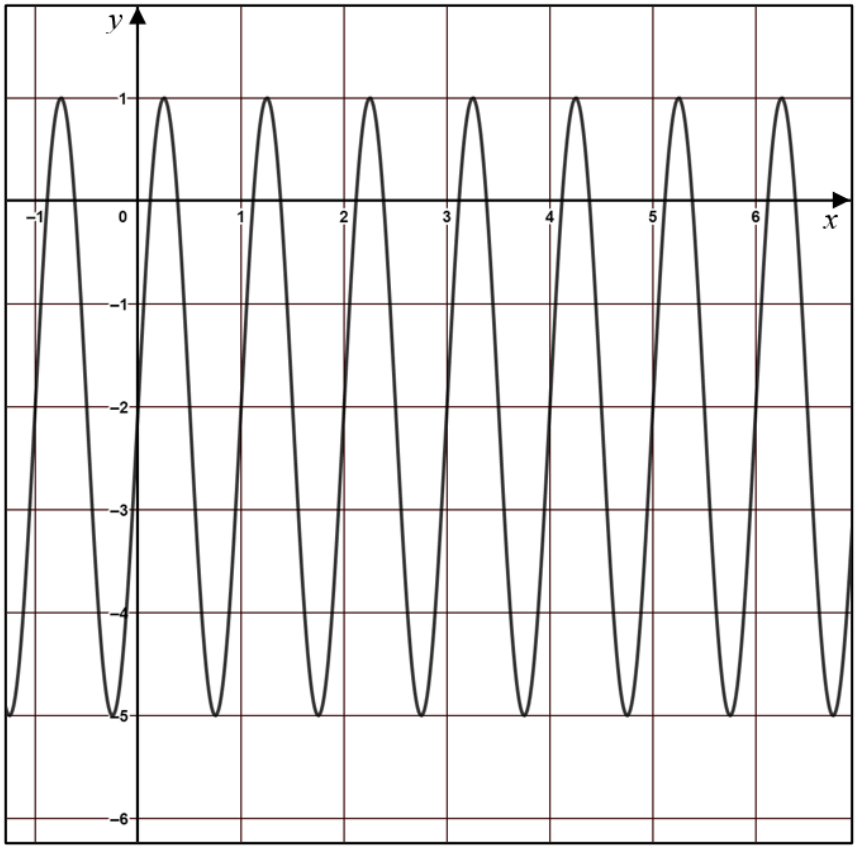
		Page 5/5	Marks
A5	The diagram shows the graphical representation of a sine function, *f*.  Determine the Amplitude (a), the Period (p), the Horizontal Translation (c) and the mean value (d) of the function *f*. Use these values to deduce the equation of the function, *f*(*x*).		**7**
		Total	**35**

The end