

Mathematics Fundamentals Year 12 - Applied

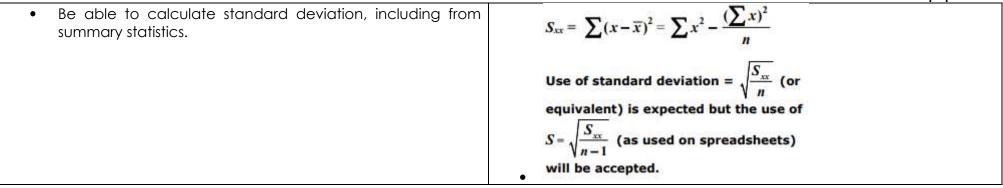
Statistics

Know	/ledge	Skills
Data	Collection	
•	Understand and use the terms 'population' and 'sample'. Use samples to make informal inferences about the population. Understand and use sampling techniques, including simple random sampling and opportunity sampling. Select or critique sampling techniques in the context of solving a statistical problem, including understanding that different samples can lead to different conclusions about the	 Students will be expected to comment on the advantages and disadvantages associated with a census and a sample. Students will be expected to be familiar with: simple random sampling, stratified sampling, systematic sampling, quota sampling and opportunity (or convenience) sampling.
	population.	

Knowledge	Skills	
Measures of location and spread		
 Interpret measures of central tendency and variation, extending to standard deviation. 	 Measures of central tendency: mean, median, mode. Measures of variation: variance, standard deviation, range and interpercentile ranges. Use of linear interpolation to calculate percentiles from grouped data is expected. 	



Mathematics Fundamentals Year 12 – Applied



Knowledge	Skills
Representations of data and correlation	
 Interpret diagrams for single-variable data, including understanding that area in a histogram represents frequency. Connect to probability distributions. Interpret scatter diagrams and regression lines for bivariate data, including recognition of scatter diagrams which include distinct sections of the population (calculations involving regression lines are excluded). Understand informal interpretation of correlation. Understand that correlation does not imply causation. Recognise and interpret possible outliers in data sets and statistical diagrams. Select or critique data presentation techniques in the context of a statistical problem. Be able to clean data, including dealing with missing data, errors and outliers. 	 Any rule needed to identify outliers will be specified in the question. For example, use of Q1 – 1.5 × IQR and Q3 + 1.5 × IQR or mean ± 3 × standard deviation. Students will be expected to draw simple inferences and give interpretations to measures of central tendency and variation



Mathematics Fundamentals Year 12 - Applied

Knowledge	Skills	
Probability		
 Understand and use mutually exclusive and independent events when calculating probabilities. Link to discrete and continuous distributions. 	 Venn diagrams or tree diagrams may be used. Set notation to describe events may be used. Use of P(B A) = P(B), P(A B) = P(A), P(A ∩ B) = P(A) P(B) in connection with independent events. students should understand that area under the curve represents probability in the case of a continuous distribution. 	

Knowledge	Skills	
Statistical Distributions		
 Understand and use simple, discrete probability distributions (calculation of mean and variance of discrete random variables is excluded), including the binomial distribution, as a model; calculate probabilities using the binomial distribution. 	 Students will be expected to use distributions to model a real- world situation and to comment critically on the appropriateness. Students should know and be able to identify the discrete uniform distribution. The notation X ~ B(n, p) may be used. Use of a calculator to find individual or cumulative binomial probabilities. 	

Knowledge	Skills	
Hypothesis Testing		
• Understand and apply the language of statistical hypothesis testing, developed through a binomial model: null hypothesis, alternative hypothesis, significance level, test statistic, 1-tail test, 2-tail test, critical value, critical region, acceptance	 Understand and apply to two tailed tests 	



Mathematics Fundamentals Year 12 – Applied

Mechanics

Knowledge	Skills
Modelling in Mechanics	
• Understand and use fundamental quantities and units in the S.I. system: length, time, mass. Understand and use derived quantities and units: velocity, acceleration, force, weight, moment.	 Students may be required to convert one unit into another e.g. km h-1 into m s-1

Knowledge	Skills
Constant and Variable Acceleration	
 Understand and use the language of kinematics: position; displacement; distance travelled; velocity; speed; acceleration. 	 Students should know that distance and speed must be positive.
• Understand, use and interpret graphs in kinematics for motion in a straight line: displacement against time and interpretation of gradient; velocity against time and interpretation of gradient and area under the graph.	Graphical solutions to problems may be required.
Understand, use and derive the formulae for constant acceleration for motion in a straight line.	
Use calculus in kinematics for motion in a straight line	



Mathematics Fundamentals Year 12 - Applied

$v = \frac{\mathrm{d}r}{\mathrm{d}t}, \ a = \frac{\mathrm{d}v}{\mathrm{d}t} = \frac{\mathrm{d}^2 r}{\mathrm{d}t^2}$	
$r = \int v \mathrm{d}t, v = \int a \mathrm{d}t$	

Knowledge	Skills
Forces and Motion	
 Understand the concept of a force; understand and use Newton's first law. 	 Normal reaction, tension, thrust or compression, resistance.
 Understand and use Newton's second law for motion in a straight line (restricted to forces in two perpendicular directions or simple cases of forces given as 2-D vectors); 	• Problems will involve motion in a straight line with constant acceleration in scalar form, where the forces act either parallel or perpendicular to the motion.
	 Problems may involve motion in a straight line with constant acceleration in vector form, where the forces are given in i – j form or as column vectors.
• Understand and use weight and motion in a straight line under gravity; gravitational acceleration, g, and its value in S.I. units to varying degrees of accuracy.	 The default value of g will be 9.8 m s-2 but some questions may specify another value, e.g. g = 10 m s-2
 Understand and use Newton's third law; equilibrium of forces on a particle and motion in a straight line (restricted to forces in two perpendicular directions or simple cases of forces given as 2-D vectors); application to problems involving smooth pulleys and connected particles; 	Connected particle problems could include problems with particles in contact e.g. lift problems