APPLIED OVERVIEW

Topic	Objectives	☺	☺	☹	Comments
TOPIC 1 STATISTICAL SAMPLING	Understand the terms Population and Sample				
	Understand advantage/disadvantages of using census and sample				
	Use sampling techniques : Simple random sampling				
	Stratified sampling				
	Systematic sampling				
	Quota sampling				
	Opportunity sampling				
	Critique sampling techniques in context				
TOPIC 2: DATA PRESENTAION & INTERPRETAION	Draw and interpret Histograms				
	Draw and interpret frequency polygons				
	Draw and interpret Box and whisker plots (inc with outliers)				
	Draw and interpret Cumulative frequency graphs				
	Understand that in a Histogram, area is proportional to Frequency				
	Plot and interpret scatter graphs and regression lines for bivariate data				
	Understand the terms explanatory (independent) and response (dependent) variables				
	Use interpolation and be aware of dangers of extrapolation				
	Understand use of positive, negative, zero, strong and weak correlation				
	Know that correlation does not imply causation				
	Know how to calculate the mean, median and mode.				
	Know how to calculate Variance, standard deviation, range and interquartile $$S_{xx} = \sum (x - \bar{x})^2 = \sum x^2 - \frac{(\sum x)^2}{n}$$ range				

	Be able to calculate the above for Discrete, continuous, grouped and ungrouped data.				
	Use coding to find mean and standard deviation/variance				
	Use linear interpolation to calculate quartiles and percentiles				
	Calculate mean and standard deviation from summary statistics				
	Determine outliers (Rule needed will be specified in the question)				
	Critique data presentation techniques in context				
	Deal with missing data, errors and outliers				
	Compare 2 sets of data				
TOPIC 3: PROBABILITY	Understand set notation in probability				
	Identify Mutually exclusive events				
	Identify Independent events				
	Use of $P(B / A) = P(B)$ and $P(A / B) = P(A)$ and $P(A \cap B) = P(A)P(B)$ when A and B are independent				
	Draw and interpret Tree diagrams				
	Draw and interpret Venn diagrams				
	Using conditional probability inc with tree diagrams , Venn diagrams and two way tables				
	Use $P(A / B) = \dfrac{P(A \cap B)}{P(B)}$				
	$P(A') = 1 - P(A)$ $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ Know when to use				
	Critiquing assumptions made in modelling probability				
TOPIC 4: STATISTICAL DISTRIBUTIONS	Use discrete probability distributions				
	Complete probability distribution tables and use $\sum P(X = x) = 1$ to find unknowns				
	$f(x) = \begin{cases} 0 & \text{if } x < 0 \\ \frac{x}{1.3} & \text{if } 0 \le x \le 1.3 \\ \frac{2-x}{0.7} & \text{if } 1.3 < x \le 2 \\ 0 & \text{if } x > 2 \end{cases}$ Use piece wise functions of probability e.g.				
	Recognise and use the Discrete uniform distribution				
	Know when it is appropriate to use the Binomial distribution and what assumptions are made				

	Use $X \sim B(n,p)$ find probabilities and cumulative probabilities				
	Use calculator to find individual and cumulative binomial probabilities				
	Use Normal distribution as a model $X \sim N(\mu, \sigma^2)$				
	Knowledge of the shape and symmetry of Normal dist. Inc % for $\mu \pm \sigma \ and \ \mu \pm 2\sigma$ etc				
	Use calculator to find probabilities from normal dist.				
	Know the points of inflection on normal curve are at $x = \mu \pm \sigma$				
	Use calculator to find X values from a probability and normal dist.				
	Use simultaneous equations to find unknown $\mu \ and \ \sigma$				
	Use $Z = \frac{X - \mu}{\sigma}$ and have knowledge of the standardised Normal distribution				
	Know when B(n,p) can be approximated by N(np, np(1-p))				
	Use continuity corrections				
	Be able to select appropriate distribution for a context				
TOPIC 5: STSTISTICAL HYPOTHESIS TESTING	Complete Hypothesis test on Binomial distribution model				
	Null Hypothesis, Alternative hypothesis in terms of p, sig level, 1 tail, 2 tail tests, critical values, critical regions,				
	Know that the expected value of a binomial is np				
	Understand you are using a sample to make inference about the population				
	Significance level is the probability of incorrectly rejecting the null hypothesis				
	Use hypothesis testing on product moment correlation coefficient				
	Calculate r for the PMCC from calculator				
	Understand exponential models in bivariate data				
	Use a logs to estimate coefficients in an exponential.				
	Carry out a hypothesis test for zero correlation				
	Know that ρ is the population correlation coefficient				
	Conduct hypothesis test for the mean of a Normal distribution				
	If $X \sim N(\mu, \sigma^2)$ then $\overline{X} \sim N\left(\mu, \frac{\sigma^2}{n}\right)$				

TOPIC 6: **QUANTITIES AND UNITS IN MECHANICS**	Know the S.I units for length, time and mass				
	Use derived units for velocity, acceleration, force, weight and moments				
	Be able to convert from $km\ h^{-1}$ to ms^{-1}				
TOPIC 7: **KINEMATICS**	Understand language – kinematics, position, displacement, distance travelled, velocity, speed, acceleration				
	Sketch and interpret velocity-time graphs				
	Find Gradient (acceleration) and Area under (distance travelled) Velocity time graph				
	Sketch and interpret Displacement-time graphs				
	Derive and use suvat equations				
	Use suvats with vectors in 2 dimensions $$v = u + at\ ,\ r = ut + \tfrac{1}{2}at^2$$				
	Use calculus in to find displacement, velocity, acceleration $$v = \frac{dr}{dt}\ ,\ a = \frac{dv}{dt} = \frac{d^2r}{dt^2} \qquad r = \int v\ \ dt,\ v = \int a\ \ dt$$				
	Use calculus with s, v and a with vectors in 2 dimensions				
	Use suvats with projectiles				
	Use suvats with projectiles with vectors in 2 dimensions				
	Derive formula for time of flight, range, greatest height, and equation of path of projectile (p.122 year 2 textbook)				
TOPIC 8: **FORCES & NEWTONS LAWS**	Know forces – Normal reaction, tension, thrust, resistance				
	Draw force diagrams				
	Use Newtons 1st Law - an object will remain at rest or in uniform motion in a straight line unless acted upon by an external force				
	Use Newtons 2nd Law – F=ma in a straight line				
	Use F=ma where forces need to be resolved				
	Use F=ma where F and A are 2 dimensional vectors				
	Know that g is $9.8ms^{-2}$, and understand weight is mg				
	Use Newtons 3rd Law - For every action, there is an equal and opposite reaction				
	Complete problems with connected particles, smooth pulleys, lifts				
	Connected particles, pulleys and lifts moving on an inclined plane				

	Use addition of forces, resultant forces, magnitude-direction form.			
	Use the triangle law to find resultant force			
	Solve problems involving smooth or rough horizontal surfaces or inclined planes			
	μ is the coefficient of friction			
	Understand F = μR when particle is moving			
	Understand F ≤ μR in a situation of equilibrium			
	Frictional force opposes motion (or potential motion)			
TOPIC 9: MOMENTS	Solve problems involving uniform rods(rigid bodies) in equilibrium			
	Calculate the resultant moment of a set of forces acting on a rigid body			
	Solve problems involving non-uniform rods			
	Solve problems involving rods on the point of tilting			

LARGE DATA SET

Pearson have provided this large data set, which will support the assessment of Statistics in the A level Mathematics Paper 3 and AS Mathematics Paper 2. Students are required to become familiar with the data set in advance of the final assessment.