Student Learning Outline: Year 9 Mathematics

Year Level: 9 **Subject:** Mathematics **Investigation:** Building a Fantasy League Team

Overview:
Students will create a squad of 21 of the highest statistically rated Rugby League Players. The squad stay within a 9.4-million-dollar salary cap. Data and statistics must be the only decision-making tool in player selection. Students will need to consider player statistical data as well as the cost to the 9.4 million Salary Cap. Player data will be presented in a variety of tables and statistical representations.

Australian Curriculum Achievement Standard:

By the end of Year 9,

- Students compare techniques for collecting data from primary and secondary sources. They make sense of the position of the mean and median in skewed, symmetric and bi-modal displays to describe and interpret data.
- They construct histograms and back-to-back stem-and-leaf plots.

Australian Curriculum Statistics and Probability:

Data representation and interpretation – Year 9

- Identify everyday questions and issues involving at least one numerical and at least one categorical variable, and collect data directly and from secondary sources (ACMSP228)
- back-to-back stem-and-leaf plots and histograms and describe data, using terms including ‘skewed’, ‘symmetric’ and ‘bi modal’ (ACMSP282)
- Compare data displays using mean, median and range to describe and interpret numerical data sets in terms of location (centre) and spread (ACMSP283)

Driving Question:	Could selectors who utilise analytics, create the statistically strongest Rugby League team?
Real World Context:	Analytics in sport is amongst the fastest growth areas within elite sporting organisations and teams right now. The ever-increasing collection of data on athletes is part of nearly every elite sporting teams' practices. Rugby League is amongst the leading sports in data collection of player's statistics. Data gathered by teams informs weekly team selections and most importantly, player acquisition. It has been said that mathematics is taking over the selection and recruitment of players in Rugby League teams. Online, fan managed teams within 'Fantasy Leagues' utilise data and statistics almost more than traditional coaches as they are not concerned with winning games, their focus is on player statistical performances. **Using secondary statistical data, students will research and create their own 'Fantasy League Team' taking into account Rugby League positional requirements.**
Established Goals: • What relevant goals (e.g. ACARA content descriptors, work program objectives, learning outcomes) will be addressed?	**Data representation and interpretation** • Identify everyday questions and issues involving at least one numerical and at least one categorical variable, and collect data directly and from secondary sources (ACMSP228) • back-to-back stem-and-leaf plots and histograms and describe data, using terms including 'skewed', 'symmetric' and 'bi modal' (ACMSP282) • Compare data displays using mean, median and range to describe and interpret numerical data sets in terms of location (centre) and spread (ACMSP283)
Understandings: • What are the SIGNIFICANT concepts of this topic?	Students identify and collect specific data associated with positions in a Rugby League team. They will describe the relationship between the median and mean in data displays. Students will apply statistical data to Back to Back Stem and Leaf Plots.
• What knowledge is ESSENTIAL?	• Collecting data directly and from secondary sources • Mean, Median, Mode and Range • Data collection • Back to Back Stem and Leaf plots
• What specific skills must be taught in this unit?	Data collection techniques Comparing mean and median Using digital programs to generate graphs Retrieving information from digital data sets in excel Back to Back Stem and Leaf plots with specific terminology

21st Century skills	*Communication, Collaboration, Technology Skills, Citizenship* **Creativity and Innovation** • Creating new and worthwhile ideas and products **Critical Thinking and Problem Solving** • Critically evaluating information and arguments • Seeing patterns and connections • Seeking problems and developing solutions to real-world problems **Information, Media and Technology Skills** • Accessing information efficiently and effectively • Evaluating information critically and competently • Using and managing information accurately • Using technology as a tool to research, organize, evaluate, create and communicate information **Communication** • Communicating effectively with a variety of styles, modes and tools (including digital tools), tailored for a range of audiences **Collaboration** • Working effectively and respectfully with diverse teams • Making substantive decisions together • Learning from and contributing to the learning of others **Citizenship** • Developing a desire and ability to solve complex real-world problems that impact human and environmental sustainability **Character** • Developing self-directed learners with a growth mindset and a passion for learning

Differentiation	**Content** •Online Resources •Real world relevance •Using multiple media sources •Scaffolding •Links to the game of Rugby League •Bloom's Taxonomy •Tiered online activities	**Process** •Flexible Grouping Practices •Tiered Inquiry based activities •Cooperative Learning •Teacher mentoring and pedagogy maintained •Pacing •Problem Based Learning •Working in small groups
Evidence of Student Learning	Whilst the NRL's Inquiry based questions and investigation are not designed as assessment tasks, they have the scope to be modified to align with each school's individual assessment planning and practices. All attempts have been made to align activities and investigations to Australian Curriculum.	
Reflection	Students will complete a Student Reflection sheet designed to gather insight into their own learning processes throughout the unit and to help identify successful practices for future learning. The reflective tool will also assist educators to make informed decisions about student centred learning in future tasks.	

Topic	TimeLine	Skill	Student Worksheet	Additional Activities and Resources
Primary Vs Secondary data		• Obtaining secondary Data • Obtaining Primary Data	Worksheet – questions of identification between the two	NRL website https://www.nrl.com/ Fox Sports website https://www.foxsports.com.au/nrl total footy stats website https://www.totalfootystats.com.au/ Newspapers
Primary and Secondary data		• Investigating Secondary data – making lists of statistical information available on the internet • Insight from a performance coach on how primary and secondary information impacts on professional teams	Worksheet – Primary and Secondary data	Web searches for secondary data Research how data is collected in sports – GPS trackers etc.
Stem and Leaf plots		• Displaying secondary data in a Back to Back Stem and Leaf plot	Worksheet – Back to back Stem and Leaf Plots - TBC	Stem and Leaf plots of data worksheet Resources that show how clubs record their data
Mean, Median and Mode		• Calculating Mean • Calculating Median • Calculating Range • Investigating how the NRL uses Mean, Median and Mode in their statistics • Identifying trends in Mean and Median	Mean, Median and Mode overview sheet Mean specific sheet Mode specific sheet Median specific sheet	NRL website https://www.nrl.com/ Fox Sports website https://www.foxsports.com.au/nrl total footy stats website https://www.totalfootystats.com.au/
Box and Whisker Plot		• Using a Box and Whisker plot to group data • Using correct terminology to describe trends in data	Worksheet – Box and Whisker - TBC	Utilising online resources and data sets and creating their own Using online digital creators

New South Wales Curriculum:

Mathematics / Statistics and Probability

DATA: Data Collection and Representation

A student:

Stage 4: MA4-19SP collects, represents and interprets single sets of data, using appropriate statistical displays

DATA: Single Variable Data Analysis

A student:

Stage 4: MA4-20SP analyses single sets of data using measures of location, and range

Stage 5.1: ***MA5.1-12SP*** uses statistical displays to compare sets of data, and evaluates statistical claims made in the media

Stage 5.2: ***MA5.2-15SP*** uses quartiles and box plots to compare sets of data, and evaluates sources of data

Stage 5.3: ***MA5.3-18SP*** uses standard deviation to analyse data

Bivariate Data Analysis:

Stage 5.2: ***MA5.2-16SP*** investigates relationships between two statistical variables, including their relationship over time

Stage 5.3: ***MA5.3-19SP*** investigates the relationship between numerical variables using lines of best fit, and explores how data is used to inform decision-making processes

Relevant NSW Stage Statements:

Stage 4:

By the end of Stage 4, students use mathematical terminology, algebraic notation, diagrams, text and tables to communicate mathematical ideas, and link concepts and processes within and between mathematical contexts. They apply their mathematical knowledge, skills and understanding in analysing real-life situations and in systematically exploring and solving problems using technology where appropriate. In solving particular problems, they compare the strengths and weaknesses of different strategies and solutions.

Students construct, interpret and compare data displays, including dot plots, stem-and-leaf plots, sector graphs, divided bar graphs, and frequency tables and histograms. In analysing data, they consider both categorical and numerical (discrete and continuous) variables, sampling versus census, and possible misrepresentation of data, and calculate the mean, mode, median and range.

Stage 5.1:

By the end of Stage 5.1, students explain and verify mathematical relationships, select and use appropriate strategies to solve problems, and link mathematical ideas to existing knowledge and understanding. They use mathematical language and notation to explain mathematical ideas, and interpret tables, diagrams and text in mathematical situations.

Students' statistical skills are extended to include considering shape and skewness of distributions, comparing data and data displays, and evaluating the reliability of statistical claims.

Stage 5.2:

By the end of Stage 5.2, students use mathematical arguments to reach and justify conclusions. When communicating mathematical ideas, they use appropriate mathematical language and algebraic, statistical and other notations and conventions in written, oral or graphical form. Students use suitable problem-solving strategies, which include selecting and organising key information, and they extend their inquiries by identifying and working on related problems.

Statistical skills are extended to include the construction of box-and-whisker plots and the calculation of interquartile range to analyse and compare data sets in appropriate data displays. Students investigate bivariate data sets and use scatter plots to describe relationships between variables. They evaluate the sources of data in statistical reports.

Stage 5.3:

By the end of Stage 5.3, students use deductive reasoning in problem solving and in presenting arguments and formal proofs. They interpret and apply formal definitions and generalisations and connect and apply mathematical ideas within and across substrands. They demonstrate fluency in selecting, combining and applying relevant knowledge, skills and understanding in the solution of familiar and unfamiliar problems.

Students use standard deviation to analyse data, and interpolate and extrapolate from bivariate data using lines of best fit. They investigate statistical reports and explore how data is used to inform decision-making processes.