Y11 Maths Knowledge Organiser – Half Term 3

Statistics - Key vocabulary		ıry	Examples
1	Qualitative data	Non-numerical data (also known as	Hair colour, type of pet
2	Quantitative data	Numerical data – data which is counted or measured	Age, length, frequency
3	Primary data	Data which you collect yourself	Survey, questionnaire, data collection sheet
4	Secondary data	Data which someone else has collected	Database, newspaper, internet
5	Discrete data	Quantitative data that can be counted. It has a finite number of possible values	Shoe size, number of people
6	Continuous data	Quantitative data which can be measured. It has an infinite number of possible values within a selected range	Length, weight, time
7	Bivariate data	Data which contains 2 variables	Often represented by a scatter graph
8	Population	The whole group from which data may be collected	Population of interest
9 10	Census Sample	Data collected from the whole population Data collected from a subset (section) of the whole population.	
11	Bias	When a sample or probability is not fair – every member does not have an equal chance of being selected	
12	Random sample	Each member of the population has an equal chance of being selected.	Number each person. Use a random number generator to select the sample.
13	Strata	The name given to groups that a population has been divided into.	Year groups in a school, gender, age
14	Stratified Sample	The population is divided into different groups (strata) and each group is sampled in proportion.	The population contains twice as many males as females, so the sample must be in the same proportion
15	Hypothesis	An idea or theory, which can be tested.	'Large dogs are better at catching tennis balls than small dogs'. We can test this hypothesis by having hundreds of different sized dogs try to catch tennis balls.
Ave	rages - Key concept,	/skill	Examples
16	Average	The central or typical value in a data set → mode, median or mean.	Annual Average Temperature in Israel
17	Mode	The most common/frequent value from a set of data.	Mode of 3, 3, 6, <u>7</u> , <u>7</u> , <u>7</u> , 8, 9, 10 = 7
18	Median	The middle value when the data is in order.	Median of 9, 5, 15, 6, 8 → 5, 6, 8 , 9, 15 = 8
19	Mean	Add up all the numbers and divide the total by how many numbers there are.	Mean of 7, 8, 9: $\frac{7+8+9}{3} = \frac{24}{3} = 8$
20	Range	A measure of the spread of the data, = largest value – smallest value.	Range of 14 , 16, 16, 17, 19 = 19 – 14 = 5

21	Quartiles	Divide a data set into quarters. After	2, 2, 3, 3, 3, 4, 5, 5, 6, 6, 7	
		finding the median, find the median of the	Upper quartile = 6	
		lower and upper halves of the data	Lower quartile = 3	
22	Inter-Quartile	A measure of spread of the middle 50% of	2, 2, 3, 3, 3, 4, 5, 5, 6, 6, 7	
	Range	the data,	IQR = 6 - 3 = 3	
	0	IQR = Upper Quartile – Lower Quartile		
23	Frequency Table	A table showing how often (frequent)	score tally frequency (f)	
		something occurs. Can include tally		
		charts.	2 1111 9	
			3 1111 6	
			5 3	
			6 2	
24	Grouped data	Data that has been organised into	Discrete	
24	Gioupeu uata	categories		
		categories.	(Marks) Frequency Weight of box (w kg) Frequency	
			$0 < w \le 4$ 11 11 - 15 2	
			<u>4 < w ≤ 8</u> 16	
			21 - 25 3 $8 < w \le 12$ 29	
			26 - 30 5 $12 < w \le 16$ 26	
			31 - 35 6 $16 < w \le 20$ 20	
25	Class interval			
25	Class Interval	One of the groups into which data has	Class interval frequency	
		been divided.	16-20 100	
			21-25 122 26-30 900	
			31-35 207	
			36-40 795	
			41-45 568 46-50 322	
26	Linner class			
20	Opper class		For the class interval $20 \le h \le 30$, 30 is the upper	
20	boundary	The highest possible value in each class.	For the class interval $20 < h \le 30$, 30 is the upper class boundary	
20	boundary Model class	The highest possible value in each class.	For the class interval 20 < h ≤ 30, 30 is the upper class boundary	
20	boundary Modal class	The highest possible value in each class. The class (group) which has the highest	For the class interval 20 < h ≤ 30, 30 is the upper class boundary Height, h cm Frequency, f $5 \le h \le 10$ 5 The modal class = $20 \le h \le 30$ as it is the	
20	boundary Modal class	The highest possible value in each class. The class (group) which has the highest frequency.	For the class interval 20 < h ≤ 30, 30 is the upper class boundary Height, h cm Frequency, f $5 \le h < 10$ 5 $10 \le h < 20$ 7 The modal class = $20 \le h < 30$ as it is the group with the highest	
27	boundary Modal class	The highest possible value in each class. The class (group) which has the highest frequency.	For the class interval 20 < h ≤ 30, 30 is the upper class boundary Height, h cm Frequency, f $5 \le h < 10$ 5 $10 \le h < 20$ 7 $20 \le h < 30$ 12 The modal class = $20 \le h < 30$ as it is the group with the highest frequency	
27	Modal class	The highest possible value in each class. The class (group) which has the highest frequency.	For the class interval 20 < h ≤ 30, 30 is the upper class boundary Height, h cm Frequency, f $5 \le h < 10$ 5 $10 \le h < 20$ 7 $20 \le h < 30$ as it is the group with the highest frequency	
27	Modal class	The highest possible value in each class. The class (group) which has the highest frequency.	For the class interval 20 < h \leq 30, 30 is the upper class boundary Height, h cm Frequency, f 5 \leq h < 10 5 10 \leq h < 20 7 20 \leq h < 30 as it is the group with the highest frequency	
27	Modal class Modal class	The highest possible value in each class. The class (group) which has the highest frequency. Total of (Value × Frequency)	For the class interval 20 < h ≤ 30, 30 is the upper class boundaryHeight, h cm Frequency, f $5 \le h < 10$ 5 $10 \le h < 20$ 7 $20 \le h < 30$ 12 $30 \le h < 50$ 9	
27	Mean from a frequency table	The highest possible value in each class. The class (group) which has the highest frequency. $\frac{Total \ of \ (Value \times Frequency)}{Total \ Frequency}$	For the class interval 20 < h ≤ 30, 30 is the upper class boundary Height, h cm Frequency, f $5 \le h < 10$ 5 $10 \le h < 20$ 7 $20 \le h < 30$ as it is the group with the highest frequency $10 \le h < 50$ 9 $10 \le h < 50$ 9	
27	Mean from a frequency table	The highest possible value in each class. The class (group) which has the highest frequency. $\frac{Total \ of \ (Value \ \times \ Frequency)}{Total \ Frequency}$	For the class interval 20 < h ≤ 30, 30 is the upper class boundary $\begin{array}{r llllllllllllllllllllllllllllllllllll$	
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27 27 28 28	Mean from a frequency table	The highest possible value in each class. The class (group) which has the highest frequency. <u>Total of (Value × Frequency)</u> Total of (Midpoint × Frequency) Total of (Midpoint × Frequency)	For the class interval 20 < h ≤ 30, 30 is the upper class boundary	
20 27 28 29	Mean from a frequency table Mean from a	The highest possible value in each class. The class (group) which has the highest frequency. <u>Total of (Value × Frequency)</u> Total Frequency <u>Total of (Midpoint × Frequency)</u> Total Frequency	For the class interval 20 < h ≤ 30, 30 is the upper class boundary $ \frac{Height, h cm}{5 \le h < 10} \frac{Frequency, f}{5} $ The modal class = $20 \le h < 30$ as it is the group with the highest frequency $ \frac{10 \le h < 50}{20 \le h < 50} \frac{12}{9} $ The modal class = $20 \le h < 30$ as it is the group with the highest frequency $43 \div 30 =$ 1.43333 $ \frac{Class}{1 - 50} \frac{Frequency, f}{30 - 43} $ Class centre, $fr = \frac{fr}{30}$ $\frac{Class}{1 - 50} \frac{Frequency, f}{30 - 43}$	
20	Mean from a frequency table Mean from a	The highest possible value in each class. The class (group) which has the highest frequency. <u>Total of (Value × Frequency)</u> Total of (Midpoint × Frequency) Total of (Midpoint × Frequency) Total Frequency	For the class interval 20 < h ≤ 30, 30 is the upper class boundary $\begin{array}{r rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	
27	Mean from a frequency table Mean from a frequency table (Estimated Mean)	The highest possible value in each class. The class (group) which has the highest frequency. <u>Total of (Value × Frequency)</u> Total Frequency <u>Total of (Midpoint × Frequency)</u> Total Frequency	For the class interval 20 < h ≤ 30, 30 is the upper class boundary	
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27 27 28 29 30	Mean from a frequency table Mean from a frequency table (Estimated Mean) Median from a	The highest possible value in each class. The class (group) which has the highest frequency. <u>Total of (Value × Frequency)</u> Total of (Midpoint × Frequency) Total of (Midpoint × Frequency) Total Frequency Find the middle value when the data is	For the class interval 20 < h ≤ 30, 30 is the upper class boundary	
20 27 28 29 30	Mean from a frequency table Mean from a frequency table (Estimated Mean) Median from a frequency table	The highest possible value in each class. The class (group) which has the highest frequency. <u>Total of (Value × Frequency)</u> Total of (Midpoint × Frequency) Total of (Midpoint × Frequency) Total Frequency Find the middle value when the data is represented in a frequency table.	For the class interval 20 < h ≤ 30, 30 is the upper class boundary $\frac{ \text{Height, h cm} \text{Frequency, f}}{5 \le h < 10 5 10 \le h < 20 7 7 20 \le h < 30 12 30 \le h < 50 9 7 10 10 10 10 10 10 10 $	
20 27 28 29 30	Mean from a frequency table Mean from a frequency table (Estimated Mean) Median from a frequency table	The highest possible value in each class. The class (group) which has the highest frequency. <u>Total of (Value × Frequency)</u> Total of (Midpoint × Frequency) Total of (Midpoint × Frequency) Total Frequency Find the middle value when the data is represented in a frequency table.	For the class interval $20 < h \le 30, 30$ is the upper class boundary $\frac{ \text{Height}, h \text{ cm} Frequency, f}{5 \le h < 10 5 10 \le h < 20 7 7 10 \le h < 30 12 30 \le h < 50 9 9 10 10 10 10 10 10 $	
20 27 28 29 30	Mean from a frequency table Mean from a frequency table (Estimated Mean) Median from a frequency table	The highest possible value in each class. The class (group) which has the highest frequency. <u>Total of (Value × Frequency)</u> Total Frequency <u>Total of (Midpoint × Frequency)</u> Total Frequency Find the middle value when the data is represented in a frequency table.	For the class interval $20 < h \le 30$, 30 is the upper class boundary The modal class = $20 \le h < 30$ as it is the group with the highest frequency $30 \le h < 30$ The modal class = $20 \le h < 30$ as it is the group with the highest frequency $30 \le h < 50$ 9 $43 \div 30$ = $30 \le h < 50$ 9 $43 \div 30$ = $30 \le h < 50$ 9 $43 \div 30$ = $30 \le h < 50$ 9 $30 \le h < 50$ 9 $30 \le h < 50$ 9 12 8 $43 \div 30$ 12 8 $43 \div 30$ $143 \div 30$ 143333 $143 \div 30$ $143 \div 30$ 143333 $143 \div 30$ $143 \div 30$ $143 \div 30$ <th co<="" th=""></th>	
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Representing Data			Examples
31	Bar chart / graph	A way of displaying data, using horizontal or vertical bars which are the same width and have gaps between them.	mangoes apples grapes bananas oranges
32	Dual / comparable bar chart	A type of graph which has at least two bars in each category to show a comparison.	
33	Composite bar chart	A type of graph with more than one set of information shown on the same bar.	Vergint (gm)
34	Line graph	Uses lines to join points on a graph to represent a data set.	Temperatures in New York City degrees 60 50 50 50 50 50 50 50 50 50 50 50 50 50
35	Stem & leaf diagram	A diagram where numbers are split and displayed partly in the stem and partly in the leaf.	stemleaves037Multiply the1545931440229tensones
36	Back-to-back stem & leaf diagram	A form of stem and leaf diagrams sharing the same stem used to compare the distribution of two data sets.	$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$
37	Pie Chart	Method of displaying proportional information by dividing a circle up into different-sized sectors.	5% 4% Cats Cats Fish Rabbits Rodents
38	Pictogram	A pictorial way of presenting data, in which a symbol is used to show a specific quantity of items.	Black \bigcirc \bigcirc \bigcirc \bigcirc Red \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc $=$ 4 cars Others \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc
39	Time-series graph	Data that is collected over a period of time. When plotted in a graph the time is represented on the horizontal x-axis.	

40	Two-way table	A table that organises data from 2 categories.	Soda Water No Drink Total Hot Dog 50 62 46 158 Pizza 120 58 4 182
			No Food 30 20 10 60 Total 200 140 60 400
41	Frequency Polygon	A straight line graph plotting frequencies, using the mid-point of each group.	180 100 100 100 100 100 100 100
42	Box plot / Box & whisker diagram	Diagram showing 5 values from a data set: minimum, LQ, median, UQ and maximum.	Lower Upper quartile quartile Minimum Median Maximum
Hist	ograms & Cumulativ	ve Frequency – Higher Tier	Examples
43	Histogram	A chart where the area (not the height) of the bar represents the frequency . The bars can be unequal in width	Height(cm)FrequencyFrequency $0 < h \le 10$ 8 $10 < h \le 30$ 6
		Histograms show frequency density on the y axis , not frequency	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
44	Frequency	$Frequency Density = \frac{Frequency}{Frequency}$	
	density	Class Width	
45	Interpreting Histograms	The area of the bar is proportional to the frequency of each class interval. Frequency = Freq Density × Class Width	A histogram shows information about the heights of a number of plants. 4 plants were less than 5cm tall. Find the number of plants more than 5cm tall.
46	Cumulative frequency	A running total of frequencies.	Age Frequency Cumulative Frequency $0 < a \le 10$ 15 15 $10 < a \le 40$ 35 15 + 35 = 50 $40 < a \le 50$ 10 50 + 10 = 60

47	Cumulative	Cumulative frequency is plotted against	40-
	frequency graph	the upper class boundary for each group.	30
		Join the points with a smooth curve	CF
			20 -
			10 -
			0
			10 20 30 40 50 Height
48	Median and	Use the total frequency to work out which	40-
	quartiles from a	values (cumulative frequencies) will	Value of UQ taken from 33rd = 37
	cumulative	represent the median, upper quartile and	CF Value of Medidan taken from 22nd = 30
	frequency graph	lower quartile.	20 - Value of LO taken from 11th = 18
		Read these values from the graph	10 Value of LQ taken from 11th - 18
			0
			10 20 30 40 50 Height
49	Box plot / Box &	The minimum, lower quartile, median.	Students sit a maths test. The highest score is 19.
	whisker diagram	upper quartile and maximum are shown	the lowest score is 8, the median is 14, the lower
	-	on a box plot.	quartile is 10 and the upper quartile is 17. Draw a
			box plot to represent this information.
		A box plot can be drawn independently or	
		from a cumulative frequency diagram.	
			8 10 12 14 16 18 20
50	Inter-quartile	Inter quartile range -	Q1 Q2 Q3
	range (IQR)	Inter-quartile – Lower Quartile	25% 25% 25% 25%
		opper Quartite – Lower Quartite	25% 25% 25% 25%
		IOR = UO - LO	\sim
			Interquartile Range $= 03 - 01$
			4. 4.
51	Comparing Box	Write two sentences.	'On average, students in class A were more
_	Plots	1. Compare the averages using the	successful on the test than class B because their
		medians for two sets of data.	median score was higher.'
		2. Compare the spread of the data using	
		the range or IQR for two sets of data.	'Students in class B were more consistent than
			class A in their test scores as their IQR was
		The <u>smaller</u> the range/IQR, the <u>more</u>	smaller.'
		<u>consistent</u> the data.	
		You must compare box plots in the	
		context of the problem.	
~			E sus star
Sca	tter Graphs		Examples
Sca [®] 52	tter Graphs Scatter graph	A diagram whose purpose is to establish	Examples
Sca 52	tter Graphs Scatter graph	A diagram whose purpose is to establish the relationship between two variables.	Examples
Sca ⁻ 52	tter Graphs Scatter graph	A diagram whose purpose is to establish the relationship between two variables.	Examples
Sca 52 53	tter Graphs Scatter graph Line of best fit	A diagram whose purpose is to establish the relationship between two variables. A straight line drawn through a scatter	Examples

shown on a scatter graph. 55 Positive correlation As one variable increases, the other also increases 56 Negative correlation A domward trend in the line of best fit. As one variable increases, the other decreases 57 No correlation No linear relationship between the two variables shown on a scatter graph. 58 Strong correlation A close relationship between the two variables shown on a scatter graph. 59 Weak correlation A general relationship between two variables shown on a scatter graph. 50 Outlier A value that lies outside most of the other values in a set of data. Examples 61 Probability - Key Concepts & Skills Examples 62 Probability scale Is expressed as a fraction or decimal between 0 (mpossible) and 1 (certain). (Can also be a percentage). P(head)=0.5 and P(tail)=0.5 . P(head)+tail) = 1 63 Total Probability Probability Number of Successful Outcomes Total Number of Possible Outcomes Total Number of Successful Outcomes 64 Theoretical Probability Number of Successful Outcomes Total Number of Totals Turning left and right; Heads and Tails on a coil the possible outcomes. 65 Relative frequency Events that cannot happen at the same exclusive time i.e. P(A and B) = 0 Not replacing a counter in a bag after picking it	shown on a scatter graph. Positive An upward trend in the line of best fit. correlation As one variable increases, the other also increases Negative A downward trend in the line of best fit.	
55 Positive correlation An upward trend in the line of best fit. correlation A downward trend in the line of best fit. decreases 56 Negative correlation A downward trend in the line of best fit. decreases Image: Constantion of the constantin the constene of the constene of the constantion of t	Positive correlation An upward trend in the line of best fit. As one variable increases, the other also increases Increases Negative A downward trend in the line of best fit.	•
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Increases 56 Negative Correlation 57 No correlation 58 Strong correlation 58 Strong correlation 59 Weak correlation 59 Weak correlation 59 Weak correlation 60 Outlier A value that lies outside most of the other variables shown on a scatter graph. 60 Outlier 61 Probability – Key Concepts & Skills 62 Probability – Key Concepts & Skills 63 Total Probability 64 Theoretical probability 7 Number of Successful Outcomes Total Number of Successful Outcomes Total Number of Possible Outcomes 65 Relative frequency Number of Successful Outcomes Total Number of Possible Outcomes 66 Exhaustive twents and ands on tails 29 times. The relative frequency of getting tails = 0 67 Mutually events are chaustive if they include all possible outcomes. 68 Independent the outcome of another 69 Pendability 61 Total Probability 7 Probability of Pleneth all ge 0 65 Relative frequency <	increases • • Negative A downward trend in the line of best fit. • • •	
56 Negative correlation A downward trend in the line of best fit. decreases, the other to decreases O Innear relationship between the two variables shown on a scatter graph. 58 Strong correlation A close relationship between the two variables shown on a scatter graph. A close relationship between two variables shown on a scatter graph. 59 Weak correlation A general relationship between two variables shown on a scatter graph. 60 Outlier A value that lies outside most of the other values in a set of data. 60 Outlier A value that lies outside most of the other values in a set of data. 61 Probability The chance that an event will happen. (Can also be a percentage). 62 Probability cale Is expressed as a fraction or decimal between 0 (impossible) and 1 (certain). (Can also be a percentage). 63 Total Probability Probability of rolling a 4 on a fair 6-sided die = 7 total Number of Successful Outcomes 64 Theoretical probability Number of Successful Outcomes 70 Mutually Events are exhaustive if they include all possible outcomes. 65 Relative frequency Events that cannot happen at the same 68 Independent the outcome of one event daes not affect the outcomes. Turning left and right, Heads and Tails on a coi the outcomes. <	Negative A downward trend in the line of best fit.	→X
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73	Frequency Tree	Used to represent the possible outcomes	Wears glasses
	diagram	and frequencies of 2 or more events	
			8015 Does not wear glass
			J. Cases
			Sin/s Wears gluss
			Does not wear glasses
74	Prohability tree	A diagram to show all the possible	
1 1	diagram	outcomes of 2 or more events. It is used	First toss Second toss Outcome Probability
		to calculate the associated probabilities	$\frac{1}{2}$ H HH $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
			$\frac{1}{2}$ H $\frac{1}{2}$ $\frac{1}{\sqrt{1-1}}$
			$O = \frac{1}{2}$ $\frac{1}{2}$ $H = \frac{T}{TH}$ $HT = \frac{2^{-2}}{4}$ $\frac{1}{1}$
			$\overline{2} \times \overline{2} = \overline{4}$
			2
			T TT $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$
75	Conditional	The probability of an event A happening,	1st Bead 2nd Bead
	probability	given that event B has already happened.	Red
			4
			9 Red 5 Green
			$\frac{4}{8}$ Red
			g Green
			4 Green
76	Sample space	Shows all of the possible outcomes for	
	Sumple space	one or more events	+ 1 2 3 4 5 6 7
			3 4 5 6 7 8 9
			4 5 6 7 8 9 10
			5 6 7 8 9 10 11
			6 7 8 9 10 11 12
77	Venn Diagram	Diagram used to represent the	E = everything Birds
		relationship between 2 or 3 sets of data	Cats Only Cats Birds Only Birds Only
70		(overlapping circles inside a rectangle).	Cats
/8	٤	The universal set – all the data	Cats Cats & Dogs Not Cats
			Dogs
79	AUB	Union of A and B (all the data contained in	$A \cup B$
		set A or B or both).	A B S
		,	
<u> </u>		· · · ·	The Union 'A or B or Both'
80	$\mathbf{A} \cap \mathbf{B}$	Intersection of A and B (only the data that	$\begin{bmatrix} A \cap B \\ A & B \end{bmatrix} \zeta$
		overlaps set A and B).	
			The Intersection 'A and B'
81	Α'	Data which is not in set A	A = people with blue eyes
			A' = peoplewho do not have blue eyes