Measuring and Graphing -> Statistics

Kindergarten

Measuring
NY-K.MD.1 Describe measurable attributes of an object(s), such as length or weight, using appropriate vocabulary. e.g., small, big, short, tall, empty, full, heavy, and light.

NY-K.MD.2 Directly compare two objects with a common measurable attribute and describe the difference.

Graphing
NY-K.MD.3 Classify objects into given categories; count the objects in each category and sort the categories by count. Note: Limit category counts to be less than or equal to 10.

First Grade

Measuring
NY-1.MD.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

NY-1.MD.2 Measure the length of an object using same size "length units" placed end to end with no gaps or overlaps. Express the length of an object as a whole number of "length units." Note: "Length units" could include cubes, paper clips, etc.

NY-2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters.

Graphing
NY-1.MD.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

2nd Grade

Measuring
NY-2.MD.1 Measure the length of an object to the nearest whole by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes

NY-2.MD.2 Measure the length of an object twice, using different "length units" for the two measurements; describe how the two measurements relate to the size of the unit chosen.

NY-2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard "length unit."

NY-2.MD.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Present the measurement data in a line plot, where the horizontal scale is marked off in whole-number units

Graphing
NY-2.MD.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a picture graph or a bar graph.

3rd Grade

Measuring
NY-3.MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters

Graphing
NY-3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step "how many more" and "how many less" problems using information presented in a scaled picture graph or a scaled bar graph. e.g., Draw a bar graph in which each square in the bar graph might represent 5 pets.

4th Grade

NY-4.MD.4 Make a line plot to display a data set of measurements in fractions of a unit (½, ¼, ⅛). Solve problems involving addition and subtraction of fractions by using information presented in line plots. e.g., Given measurement data on a line plot, find and interpret the difference in length between the longest and shortest specimens in an insect collection.

5th Grade

NY-5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit (½, ¼, ⅛). Use operations on fractions for this grade to solve problems involving information presented in line plots. e.g., Given different measurements of liquid in identical beakers, make a line plot to display the data and find the total amount of liquid in all of the beakers.

6th Grade

NY-6. SP.1a Recognize that a statistical question is one that anticipates variability in the data related to the question and accounts for it in the answers. e.g., "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.
NY-6. SP.1b Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Note: Students need to understand that data are generated with respect to particular contexts or situations and can be used to answer questions about those contexts or situations.
NY-6. SP.1c Understand that the method and sample size used to collect data for a particular question is intended to reduce the difference between a population and a sample taken from the population so valid inferences can be drawn about the population. Generate multiple samples (or simulated samples) of the same size to recognize the variation in estimates or predictions. Note: Examples of acceptable methods to obtain a representative sample from a population include, but are not limited to, a simple random sample for a given population or a systematic random sample for an unknown population. Examples of unacceptable methods of sampling include, but are not limited to, online polls and convenience sampling because they introduce bias and are not representative of the population.

NY-6. SP.2 Understand that a set of quantitative data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. Notes:
- Students need to determine and justify the most appropriate graph to display a given set of data (histogram, dot plot).
- Students extend their knowledge of symmetric shapes, to describe data displayed in dot plots and histograms in terms of symmetry. They identify clusters, peaks and gaps, recognizing common shapes and patterns in these displays of data distributions, and ask why a distribution takes on a particular shape for the context of the variable being considered.

NY-6.SP.3 Recognize that a measure of center for a quantitative data set summarizes all of its values with a single number while a measure of variation describes how its values vary with a single number. Note: Measures of center are mean, median, and mode. The measure of variation is the range.

NY-6.SP.4 Display quantitative data in plots on a number line, including dot plots and histograms

NY-6.SP.5 Summarize quantitative data sets in relation to their context
NY-6.SP.5a Report the number of observations.
NY-6.SP.5b Describe the nature of the attribute under investigation, including how it was measured and its units of measurement.
NY-6.SP.5c Calculate range and measures of center, as well as describe any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. Note: Measures of center are mean, median, and mode. The measure of variation is the range. Role of outliers should be discussed, but no formula required.
NY-6.SP.5d Relate the range and the choice of measures of center to the shape of the data distribution and the context in which the data were gathered. Note: Measures of center are mean, median, and mode. The measure of variation is

7th Grade

NY-7.SP.1 Construct and interpret box-plots, find the interquartile range, and determine if a data point is an outlier. Note: Students in grade 7 are not expected to construct box-plots that include outliers in the data, but students are expected to interpret box-plots that may contain outliers

NY-7.SP.3 Informally assess the degree of visual overlap of two quantitative data distributions.

NY-7.SP.4 Use measures of center and measures of variability for quantitative data from random samples or populations to draw informal comparative inferences about the populations. Note: Measures of center are mean, median, and mode. The measures of variation include range and the interquartile range.

8th Grade

NY-8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

NY-8.SP.2 Understand that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.

NY-8.SP.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. e.g., In a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.

Algebra I: Interpreting Categorical and Quantitative Data

AI-S.ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots)

AI-S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, sample standard deviation) of two or more different data sets. Note: Values in the given data sets will represent samples of larger populations. The calculation of standard deviation will be based on the sample standard deviation formula . The sample standard deviation calculation will be used to make a statement about the population standard deviation from which the sample was drawn.

AI-S.ID.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

AI-S.ID.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

AI-S.ID.6 Represent bivariate data on a scatter plot, and describe how the variables' values are related. Note: It's important to keep in mind that the data must be linked to the same "subjects," not just two unrelated quantitative variables; being careful not to assume a relationship between the actual variables (correlation/causation issue).
AI-S.ID.6a Fit a function to real-world data; use functions fitted to data to solve problems in the context of the data. (Shared standard with Algebra II) Note: Algebra I emphasis is on linear models and includes the regression capabilities of the calculator.

AI-S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

AI-S.ID.8 Calculate (using technology) and interpret the correlation coefficient of a linear fit.

AI-S.ID.9 Distinguish between correlation and causation

Algebra II: Interpreting Categorical and Quantitative Data

AII-S.ID.4a. Recognize whether or not a normal curve is appropriate for a given data set.
AII-S.ID.4b If appropriate, determine population percentages using a graphing calculator for an appropriate normal curve.

AII-S.ID.6 Represent bivariate data on a scatter plot, and describe how the variables' values are related. Note: It's important to keep in mind that the data must be linked to the same "subjects", not just two unrelated quantitative variables. Do not assume that an association between two variables implies that one causes another to change.
AII-S.ID.6a Fit a function to real-world data; use functions fitted to data to solve problems in the context of the data. (Shared standard with Algebra I) Note: Algebra II emphasis is on quadratic, exponential, and power models, including the regression capabilities of the calculator

Algebra II: Making Inferences and Justifying Conclusions

AII-S.IC.2 Determine if a value for a sample proportion or sample mean is likely to occur based on a given simulation. Note: For the purposes of this course, if the statistic falls within two standard deviations of the mean (95% interval centered on the population parameter), then the statistic is considered likely (plausible, usual).

AII-S.IC.3 Recognize the purposes of and differences among surveys, experiments, and observational studies. Explain how randomization relates to each.

AII-S.IC.4 Given a simulation model based on a sample proportion or mean, construct the 95% interval centered on the statistic (+/- two standard deviations) and determine if a suggested parameter is plausible.

AII-S.IC.6a Use the tools of statistics to draw conclusions from numerical summaries.
AII-S.IC.6b Use the language of statistics to critique claims from informational texts. For example, causation vs correlation, bias, measures of center and spread.

Probability

NY-6. SP.6 Understand that the probability of a chance event is a number between 0 and 1 inclusive, that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

NY-6. SP.7 Approximate the probability of a simple event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. e.g., When rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times. Note: Compound events are introduced in grade 7.

NY-6.SP.8 Develop a probability model and use it to find probabilities of simple events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
NY-6.SP.8a Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of simple events. e.g., The probability of rolling a six-sided fair number cube and landing on a 2 is 1/6 . The probability of landing on an even number is 3/6
NY-6.SP.8b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. e.g., Find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?

7th Grade

NY-7.SP.8 Find probabilities of compound events using organized list, sample space tables, tree diagrams, and simulation.
NY-7.SP.8a Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
NY-7.SP.8b Represent sample spaces for compound events using methods such as organized lists, sample space tables, and tree diagrams. For an event described in everyday language, identify the outcomes in the sample space which compose the event. e.g., "rolling double sixes"
NY-7.SP.8c Design and use a simulation to generate frequencies for compound events. e.g., Use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?

Algebra II: Conditional Probability and Rules of Probability

AII-S.CP.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").

AII-S.CP.4 Interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and calculate conditional probabilities.

AII-S.CP.7 Apply the Addition Rule, P(A or B) = P(A) + P(B) - P(A and B), and interpret the answer in terms of the model.

Money, Time, Unit Conversions

Kindergarten
NY-K.MD.4 Explore coins (pennies, nickels, dimes, and quarters) and begin identifying pennies and dimes.
First Grade
NY-1.MD.3a Tell and write time in hours and half-hours using analog and digital clocks. Develop an understanding of common terms, such as, but not limited to, o'clock and half past. NY-1.MD.3b Recognize and identify coins (penny, nickel, dime, and quarter) and their value and use the cent symbol (¢) appropriately. NY-1.MD.3c Count a mixed collection of dimes and pennies and determine the cent value (total not to exceed 100 cents). e.g. 3 dimes and 4 pennies is the same as 3 tens and 4 ones, which is 34 cents (34 ¢)
2nd Grade
NY-2.MD.2 Measure the length of an object twice, using different "length units" for the two measurements; describe how the two measurements relate to the size of the unit chosen. NY-2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters. NY-2.MD.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units. e.g., using drawings and equations with a symbol for the unknown number to represent the problem. NY-2.MD.7 Tell and write time from analog and digital clocks in five minute increments, using a.m. and p.m. Develop an understanding of common terms, such as, but not limited to, quarter past, half past, and quarter to NY-2.MD.8a Count a mixed collection of coins whose sum is less than or equal to one dollar. e.g., If you have 2 quarters, 2 dimes and 3 pennies, how many cents do you have? NY-2.MD.8b Solve real world and mathematical problems within one dollar involving quarters, dimes, nickels, and pennies, using the ¢ (cent) symbol appropriately. Note: Students are not introduced to decimals, and therefore the dollar symbol, until Grade 4.
3rd Grade
NY-3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve one-step word problems involving addition and subtraction of time intervals in minutes. e.g., representing the problem on a number line or other visual model. Note: This includes one-step problems that cross into a new hour. NY-3.MD.2a Measure and estimate liquid volumes and masses of objects using grams (g), kilograms (kg), and liters (l). Note: Does not include compound units such as cm3 and finding the geometric volume of a container. NY-3.MD.2b Add, subtract, multiply, or divide to solve one-step word problems involving masses or liquid volumes that are given in the same units. e.g., using drawings (such as a beaker with a measurement scale) to represent the problem. Note: Does not include multiplicative comparison problems involving notions of "times as much."
4th Grade
NY-4.MD.1 Know relative sizes of measurement units: ft., in.; km, m, cm e.g., An inch is about the distance from the tip of your thumb to your first knuckle. A foot is the length of two-dollar bills. A meter is about the height of a kitchen counter. A kilometer is 2 ½ laps around most tracks. Know the conversion factor and use it to convert measurements in a larger unit in terms of a smaller unit: ft., in.; km, m, cm; hr., min., sec. e.g., Know that 1 ft. is 12 times as long as 1 in. and express the length of a 4 ft. snake as 48 in. Given the conversion factor, convert all other measurements within a single system of measurement from a larger unit to a smaller unit. e.g., Given the conversion factors, convert kilograms to grams, pounds to ounces, or liters to milliliters. Record measurement equivalents in a two-column table. e.g., Generate a conversion table for feet and inches. NY-4.MD.2 Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money. NY-4.MD.2a Solve problems involving fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. NY-4.MD.2b Represent measurement quantities using diagrams that feature a measurement scale, such as number lines. Note: Grade 4 expectations are limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.
5th Grade
NY-5.MD.1 Convert among different-sized standard measurement units within a given measurement system when the conversion factor is given. Use these conversions in solving multi-step, real world problems. Notes: • All conversion

factors will be given. • Grade 5 expectations for decimal operations are limited to work with decimals to hundredths.

6th Grade

NY-6.RP.3d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. Note: Conversion of units occur within a given measurement system, not

8th Grade

NY-8.EE.4 Perform multiplication and division with numbers expressed in scientific notation, including problems where both standard decimal form and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. Interpret scientific notation that has been generated by technology.

Algebra I: Number and Quantity

AI-N.Q.1 Select quantities and use units as a way to: i) interpret and guide the solution of multi-step problems; ii) choose and interpret units consistently in formulas; and iii) choose and interpret the scale and the origin in graphs and data displays.

AI-N.Q.3 Choose a level of accuracy appropriate to limitations on measurement and context when reporting quantities.