**“Next-Generation” Competency Portfolio Requirements in Each Subject**

**MATHEMATICS**

Carefully review the mathematics competency portfolio requirements listed below, since these have been updated to incorporate the content standards contained in the [*2017 Massachusetts Curriculum Framework for Mathematics*](http://www.doe.mass.edu/frameworks/math/2017-06.pdf). Beginning with the spring 2019 administration of next-generation MCAS tests to students in grade 10, those students must now meet new requirements to earn a competency determination based on those standards.

**Mathematics high school competency portfolios must include the following evidence, at minimum, to be considered for the Competency Determination:**

* + at least **four examples or problems solved correctly** by the student that demonstrate **each aspect** of all required standards, as described in the tables below. Submission of additional work samples in each standard is encouraged. Submission of multiple-choice, matching, and fill-in-the-blank worksheets is discouraged.
	+ an overall score (percent accuracy) given by the teacher for each work sample, with incorrect answers clearly marked; the score for each work sample must exceed 75% accuracy
	+ work samples produced as independently as possible by the student; the overall score for each work sample must exceed 75% independence on each work sample

(**Note:** corrections made by the teacher may not be submitted as the student's own work)

* + include a completed **“Next-Generation”** **High School Mathematics Competency Portfolio Work Description** attached to each work sample
	+ a clear indication on the Work Description of the type(s) and frequency of assistance and accommodations provided to the student (i.e., percent independence and any accommodations used by the student)
	+ original student work, rather than photocopies
	+ work samples must be submitted *without* model or solved sample problems with the submitted work

Mathematics portfolios may include evidence produced over a period of **more than one school year**, beginning as early as grade 9. Evidence may be added to an existing portfolio and resubmitted annually beyond grade 10.

**Number and Quantity**

Submit **at least four examples,** solved correctly by the student, for **each** aspect of **all** **three** clusters identified in the table below.

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| Clusters | ***Mathematics*** *“next-generation” high school competency portfolios must include the following:* (from the 2017 Mathematics Curriculum Framework) |
| N-RN.A | [ ]  Evaluate numerical exponential expressions. *For example,* $10^{4}=10,000$; $2^{7}∙3^{3}=3456$[ ]  Evaluate numerical expressions involving rational numbers (using order of operations).  *For example,* $\frac{8-4^{2}·5}{3-3^{3}}=3$[ ]  Rewrite exponential expressions with variables using the properties of exponents.  *For example,* $\frac{x^{4}}{x^{3}}=x$; $\frac{a^{5}b^{3}c^{2}}{a^{2}b^{7}c^{-1}}=\frac{a^{3}c^{3}}{b^{4}} $ |
| N-RN.B | [ ]  Perform operations (add, multiply, etc.) on rational and irrational numbers using approximations of irrational numbers. *For example,* $2\sqrt{6}+7≈2\left(2.45\right)=4.9+7=11.9$; $\sqrt{3}·19≈1.7∙19≈33$ |
| N-Q.A | [ ]  Identify appropriate quantities for descriptive modeling. *For example, A city has* $25,068 $*registered voters. For an election,* $15,943$ *ballots were cast. About what percentage of the city’s registered voters cast a ballot in the election? A woman drove on a trip across the country. She drove for about 10 hours each day for 5 days, for a total of 3022 miles. What was the approximate average rate of speed, in miles per hour, that she drove during her trip?*[ ]  Solve word problems involving rounding and dimensional analysis. *For example, A traveler drove a distance of 36 miles in 50 minutes. Approximate the travelers average speed, in miles per hour.* |

**Algebra**

Submit **at least four examples,** solved correctly by the student, for **each** aspect of **any** **four** of the five clusters or groups of clusters identified in the tablebelow. (Note: Submit at least four examples of each of the tasks shown in **bold**.)

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| Clusters | ***Mathematics*** *“next-generation” high school competency portfolios must include the following:* (from the 2017 Mathematics Curriculum Framework) |
| A-SSE.AA-SSE.B | [ ]  Create expressions that describe a variety of contexts. *For example, a truck rental that costs* $\$12$ *per hour plus a flat fee of* $\$30$ *can be represented by the expression* $12h+30$*.*[ ]  Interpret parts of mathematical expressions. *For example, for the expression* $2p^{4}-11$*,* $2$ *is the coefficient,* $4$ *is the exponent, and* $–11$ *is the constant.*[ ]  Interpret parts of linear expressions. *For example, for the linear expression* $-3x+100$*, interpret* $-3$ *as the rate of change (slope) and* $100$ *as the initial value (y-intercept).*[ ]  Translate between standard and slope-intercept forms of linear equations to reveal slope and *y*-intercept. *For example, the equation* $3x-2y=4$ *is equivalent to* $y=\frac{3}{2}x-2$ *and thus the line it represents has a slope of* $\frac{3}{2}$ *and a y-intercept of* $-2$*. Create an equation, in standard form, of a line that has a slope of* $-6$ *and a y-intercept of* $3$*.* |
| A-APR.A | [ ]  **Add**, **subtract** and **multiply** polynomials (including monomials and binomials). *For example,* $2t^{2}\left(1-t\right)=2t^{2}-2t^{3}$*;* $\left(2a+3b+c\right)-\left(-7a+3b\right)=9a+c$*;* $\left(x-3\right)\left(x+3\right)=x^{2}-9$[ ]  Factor polynomial expressions using Greatest Common Factor. *For example,* $2x^{5}-8x^{2}-10x=2x\left(x^{4}-4x-5\right)$ |
| A-CED.A | [ ]  Create equations and/or inequalities in one variable from a context. *For example, Jo has saved* $\$40$ *and needs a total of* $\$300$ *to buy a laptop. She will save* $\$20$ *per week. How many weeks will it take to have enough money to buy the laptop?* $\left(300=20n+40\right)$*. Student may create equations, inequalities, or some of each.*[ ]  Create equations in two variables from a context. *For example, Grant needs* $2$ *pounds of apples and raspberries for a pie* $\left(r+a=2\right)$*. He has* $\$6$ *to spend, and apples cost* $\$2.50$ *per pound and raspberries cost* $\$5$ *per pound* $\left(2.5a+5r=6\right)$*.*[ ]  Graph linear equations on a coordinate plane. *For example, graph* $y=-\frac{2}{3}x+6$[ ]  Rearrange formulas to highlight a quantity of interest. *For example, given the formula for the volume of a cylinder, solve for the height.* |

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| A-REI.AA-REI.B | [ ]  Explain each step in the solutions of equations (with or without the formal property name). *For example, “Addition property of equality” or “I added the same number to both sides of the equation” are equally acceptable as justification.*[ ]  Show when equations have no solution and explain why. *For example,* $2x+11=2x-12$ *has no solution because* $11\ne -12$*.*[ ]  Solve linear equations in one variable. *For example,* $4n-11=25$[ ]  Solve inequalities in one variable. *For example,* $2x-5<-3$*;* $4y+11\geq 9y-9$*;* $-2x\leq 6$ |
| A-REI.CA-REI.D | [ ]  Solve systems of linear equations algebraically and/or graphically. *For example, find the solution of* $y=2x+4$*,* $y=-\frac{3}{4}x+15$ *by using substitution or elimination.; Given two lines graphed on a coordinate plane, estimate the coordinates of the point of their intersection.*[ ]  Show whether ordered pairs are solutions of a graphed linear equation. *For example, show whether the points*$ (1, 7)$*,* $(3, 13)$*, or* $\left(6, 16\right)$ *lie on the graph of* $y=3x+4$*.*[ ]  Graph the solutions of inequalities in two variables on a coordinate plane. *For example, graph the solution of the inequality* $y\geq \frac{1}{2}x-4$*.*[ ]  Determine inequalities in two variables from their graphs. *For example, given a half-plane and its boundary line on a coordinate plane, determine the inequality that describes it.* |

**Functions**

Submit **at least four examples,** solved correctly by the student, for **each** aspect of **any** **two** of the three clusters or groups of clusters identified in the tablebelow.

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| Clusters | ***Mathematics*** *“next-generation” high school competency portfolios must include the following:* (from the 2017 Mathematics Curriculum Framework) |
| F-IF.A | [ ]  Distinguish between functional and non-functional relationships. *For example, given a relation shown in a table, a mapping, a set of ordered pairs, a graph or an equation, determine whether the relation is a function.*[ ]  Extend a linear sequence given a rule or numbers in the sequence. *For example, The first three numbers in a linear sequence are 4, 11, 18... what is the 6th number in the sequence?; The rule for a linear sequence is “subtract 4” and the first number in the sequence is 124. What are the first 5 numbers in the sequence?*[ ]  Evaluate functions for inputs in their domains. *For example, if* $f\left(x\right)=-2x-14$*, evaluate* $f\left(2\right)$*,* $f\left(20\right)$*, and* $f\left(200\right)$*.*[ ]  Evaluate functions for inputs in their domains in terms of a context. *For example, the relationship between degrees Celsius and degrees Fahrenheit can be represented by the function* $C\left(F\right)=\frac{5}{9}\left(F-32\right)$*. Find* $℃$ *for* $50℉$*,* $77℉$*, and* $86℉$*.* |
| F-IF.BF-IF.C | [ ]  Determine the domain and the range of functions. *For example, given a relation shown in a table, a mapping, a set of ordered pairs, a graph, an equation, or a verbal description, determine both the domain and the range of the relation.*[ ]  Calculate (or estimate from a graph) the average rates of change of functions over specific intervals. *For example, determine the average change in temperature from* $10$ *a.m. and* $5$ *p.m., given the temperatures at those times; determine the average change in the population of a town from 1980 to 2010, given a table of populations and years.*[ ]  Graph linear functions and interpret the slope and the rate of change. *For example, profit earned from a car wash can be represented by the function* $P(c)=11c-55$*. Graph the function, and interpret the slope as the price charged per car, the y-intercept as the cost of the supplies, and the* *x-intercept as the number of cars needed to wash to break even.*[ ]  Compare properties and/or key features of two linear functions presented in different ways. *For example, given a graph of a company’s profits over time, and a table of values of the yearly profits of another company, show which company exhibits greater growth.* |
| F-LE.A | [ ]  Distinguish between situations that are modeled by linear and exponential functions (or neither). *For example, the total amount of money deposited in a bank account as a function of a constant weekly deposit is linear, while the current balance in the account as a function of time is exponential.*[ ]  Recognize situations in which a quantity changes at a constant rate. *For example, from a graph or a table of values.*[ ]  Construct linear functions from graphs, descriptions, or tables of values (including ordered pairs). *For example, given the weight of a boy at age* $3$ *was* $38$ *lbs. and his weight at age* $15$ *was* $170$ *lbs., a function that models the boy’s weight as a function of his age from* $3$ *years old to* $15$ *years old is* $w\left(a\right)=11a+5$*.*[ ]  Compare the values of a linear function and an exponential function as the value of the independent variable increases by showing that eventually, for the same input, the output of an exponential function will exceed the output of the linear function. *For example, if* $f\left(x\right)=600x$ *and* $g\left(x\right)=6^{x}$*, then* $f\left(2\right)>g\left(2\right)$*, but* $g\left(5\right)>f\left(5\right)$*.* |

**Geometry**

Submit **at least four examples,** solved correctly by the student, for **each** aspect of **any** **four** of the five clusters or groups of clusters identified in the tablebelow. (Note: Submit at least four examples of each of the tasks shown in **bold**.)

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| Clusters | ***Mathematics*** *“next-generation” high school competency portfolios must include the following:* (from the 2017 Mathematics Curriculum Framework) |
| G-CO.A | [ ]  Determine the coordinates of points on a grid after a transformation or a series of transformations. *For example, give the coordinates of point B after* $⊿ABC$*, graphed on a coordinate plane, is reflected across the x-axis.*[ ]  Perform transformations on figures on a coordinate plane. *For example, given a triangle on a coordinate plane, draw the triangle after rotating it* $90°$ *counterclockwise.*[ ]  Distinguish between transformations or series of transformations, that yield congruent figures and those that do not. *For example, a translation of* $5$ *units left followed by a* $180°$ *clockwise rotation yields a congruent figure, while a reflection across the y-axis followed by a dilation with scale factor* $2$*, with respect to the origin, does not.* |
| G-CO.C | [ ]  Solve problems that involve **vertical** angles, **corresponding** angles, and **alternate interior** angles. *For example, in a diagram with parallel lines and one or more transversals, solve for a missing angle measure or missing angle measures.*[ ]  Solve problems using the triangle sum theorem (including isosceles triangles). *For example, determine a missing angle measure in a triangle with angle measures of* $63° and 108°$ *or with algebraic expressions for angle measures; determine the measures of the angles in a triangle if they are in the ratio* $7:11:12$*.* |

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| G-SRT.AG-SRT.BG-SRT.C | [ ]  Determine the coordinates of dilated figures. *For example, give the coordinates of point R, graphed on a coordinate plane, after* $▭PQRS$ *is dilated by scale factor of* $\frac{1}{2}$ *with respect to the origin. Use scale factors that produce similar, but not congruent, figures.*[ ]  Determine missing **side lengths** and **angle measures** in similar figures. *For example, given a diagram with similar triangles, solve for a missing side length by using proportions.*[ ]  Use the Pythagorean Theorem to solve word problems. *For example, find the height of a building, given the distance from the top of the building to a point a given distance from the base of the building.* |
| G-GPE.B | [ ]  Determine the coordinates of the midpoints of line segments graphed on a coordinate plane. *For example, find the midpoint of the line segment with endpoints* $\left(8,0\right)$ *and* $\left(2,-2\right)$*.*[ ]  Using the coordinates of their vertices, calculate the **perimeter** and the **area** of figures on a coordinate plane. *For example, given a triangle, graphed on a plane, with vertices at* $\left(-1, 7\right)$*,* $\left(5, 7\right)$*, and* $\left(1, -2\right)$*, calculate its perimeter, in units, and its area, in square units.* |
| G-GMD.A | [ ]  Use volume formulas for **cylinders**, **cones**, and **spheres** to solve problems. *For example, given a cone with a radius of 14 cm and a height of* $27$ *cm, calculate its volume, in cm³; Given a sphere with a volume of* $4200$ *in³, calculate its diameter, in inches.* |

**Statistics and Probability**

Submit **at least four examples,** solved correctly by the student, for **each** aspect of **any** **two** of the three clusters or groups of clusters identified in the tablebelow, unless indicated otherwise. (Note: Submit at least four examples of each of the tasks shown in **bold**.)

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| Clusters | Competency Portfolio Requirements (from the 2017 Mathematics Curriculum Framework) |
| S-ID.A | [ ]  Create and analyze **dot plots**, **histograms**, and **box plots**. *For example, given a set of data, create a histogram and determine the interval that includes the median; given a set of data, create a dot plot and describe its distribution. At least one analysis must be shown for each display created.*[ ]  Compare centers and spreads of two or more data sets. *For example, given two box plots, compare the medians and interquartile ranges; add an additional value to a set of data and compare the measures of center and spread of the data sets before and after the value was added.* |
| S-ID.BS-ID.C | [ ]  Calculate relative frequencies (joint, marginal, and/or conditional) from two-way tables. *For example, from a table showing spring sports played by student athletes, determine the percentage of senior athletes who play golf (joint), the percentage of the athletes that are juniors (marginal), or the percentage of sophomore athletes who play softball (conditional). All examples may be drawn from the same table.*[ ]  Create scatter plots from data, fit trend lines to the scatter plots, and determine equations for the linear functions described by the data. ***Only two of these are required*.**[ ]  Describe the intensity and nature of the correlation of data from scatter plots. *For example, the correlation is strong and it is negative; the data indicates that there is no correlation. These examples may be drawn from the scatter plots created by the student.*[ ]  Interpret the slope and *y*-intercept of a line of best fit, shown in a scatter plot, in terms of a context. *For example, identify the slope of a line of best fit as a rate of change, and its y-intercept as an initial value, based on a context.* |
| S-CP.AS-CP.B | [ ]  Describe events as subsets of a sample space as unions, intersections, or complements of events. *For example, for the sample space of rolling two number cubes, the event “rolling a sum of four” is the subset* $\{\left(1,3\right), \left(2,2\right), \left(3,1\right)\}$*, the event “rolling exactly one two AND an even total” is the subset* $\{\left(2,4\right), \left(2,6\right), \left(4,2\right), \left(6,2\right)\}$*, and the event “rolling doubles OR a sum of eleven” is the subset* $\{\left(1,1\right), \left(2,2\right), \left(3,3\right), \left(4,4\right), \left(5,5\right), \left(5,6\right), \left(6,5\right), \left(6,6\right)\}$*. The event “rolling an even sum” is the complement of the event “rolling an odd sum”.*[ ]  Construct and interpret two-way frequency tables using two associated variables. *For example, construct a table comparing seniors and juniors who have roles in the school’s musicals and dramatic shows and indicate whether there is any association between the students’ grade level and the type of show in which they appear.*[ ]  Compute probabilities of compound events. *For example, calculate the probability of rolling two number cubes and getting a sum of seven or eight.* |