Mathematics Calculator Guidance

Geometry

TN Standard	Standards Scope and Clarification	Calculator Tested Subpart	Non-Calculator Tested Subpart	Big Ideas Lesson(s)	Notes
Link to Calculator Step Guide					
G.N.Q.A.1 Use units as a way to understand real-world problems. **a.** Use appropriate quantities in formulas, converting units as necessary. **b.** Define and justify appropriate quantities within a context for the purpose of modeling. **c.** Choose an appropriate level of accuracy when reporting quantities.	*Apply this standard to any real-world problems studied within the scope of this course.*			10.3, 10.4, 10.5, 11.2, 11.3, 11.7	Historically, this standard has not appeared on the TCAP practice assessment. Instruction should prepare students to demonstrate mastery with and without the aid of the calculator.
G.CO.A.1 Describe transformations as functions that take points in the plane (pre-image) as inputs and give other points (image) as outputs. Compare transformations that preserve distance and angle measure to those that do not, by hand for basic transformations and using technology for more complex cases.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*	✓		4.1, 4.2, 4.3, 4.5	Graphing calculators can be used to perform a given transformation and identify the effects of transformation(s) on a figure.«

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G.CO.A.2 Given a rectangle, parallelogram, trapezoid, or regular polygon, determine the transformations that carry the shape onto itself and describe them in terms of the symmetry of the figure.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*		✓	4.2, 4.3	Calculator not needed.
G.CO.A.3 Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*	-	-	1.1, 1.6, 3.1, 4.1, 4.2, 4.3	Historically, no items appeared on practice assessments, therefore, instruction should prepare students for mastery with or without the aid of a calculator. Graphing calculators can be utilized to support students in their development of definitions through explorations. ★
G.CO.A.4 Given a geometric figure, draw the image of the figure after a sequence of one or more rigid motions, by hand and using technology. Identify a sequence of rigid motions that will carry a given figure onto another.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*	✓	✓	4.1, 4.2, 4.3, 4.4, 4.6	Graphing calculators can be utilized to draw the image of a figure to support rigid motions carrying a given figure onto another.«

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G.CO.B.5 Given two figures, use the definition of congruence in terms of rigid motions to determine informally if they are congruent.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*	✓	✓	4.1, 4.2, 4.3, 4.4	Graphing calculators can be utilized to create transformations based on previously created definition and support measuring distances and angles. «
G.CO.B.6 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*	✓	✓	5.2	Graphing calculators can support students when measuring sides and angles of triangle on the coordinate plane.«
G.CO.B.7 Explain how the criteria for triangle congruence (ASA, SAS, AAS, SSS, and HL) follow from the definition of congruence in terms of rigid motions.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*		✓	5.3, 5.5, 5.6	Calculator Not Needed
G.CO.C.8 Use definitions and theorems about lines and angles to solve problems and to justify relationships in geometric figures.	*"Justification" may take a variety of forms. Theorems include but are not limited to: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a*	✓	✓	2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 3.2, 3.3, 3.4, 6.1	Graphing calculators can be used to perform calculations with determining angle measurements.

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	perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.				
G.CO.C.9 Use definitions and theorems about triangles to solve problems and to justify relationships in geometric figures.	*"Justification" may take a variety of forms. Theorems include but are not limited to: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.*	✓	✓	2.1, 2.2, 2.3, 2.4, 5.1, 5.4, 6.2, 6.3, 6.4, 6.5, 6.6	Calculator Not Needed
G.CO.C.10 Use definitions and theorems about parallelograms to solve problems and to justify relationships in geometric figures.	*"Justification" may take a variety of forms. Theorems include but are not limited to: opposite sides of a parallelogram are congruent, opposite angles of a parallelogram are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.*	✓		2.1, 2.2, 2.3, 2.4, 7.2, 7.3, 7.4	Calculator Not Needed

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G.CO.D.11 Perform formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).	*Constructions are limited to: bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.*		✓	1.2, 1.3, 1.5, 3.3, 3.4	Graphing calculators can be utilized by students to create precise constructions.«
G.CO.D.12 Use geometric constructions to solve geometric problems in context, by hand and using technology.	*For example, find the point equidistant from three given points by constructing two perpendicular bisectors and locating their point of intersection.*		✓	6.1, 6.2	Historically, this standard has not appeared on the TCAP practice assessment. Instruction should prepare students to demonstrate mastery with and without the aid of the calculator.
G.SRT.A.1 Use properties of dilations given by a center and a scale factor to solve problems and to justify relationships in geometric figures.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*	✓		4.5	Graphing calculators can be utilized to perform dilations in the coordinate plane given a scale factor and a center. «
G.SRT.A.2 Define similarity in terms of transformations. Use transformations to determine whether two figures are similar.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*	✓		4.6, 7.1, 8.1	Graphing calculators can be utilized to explore sequences of transformations to visually conceptualize the relationship between the angles and sides of similar figures. «

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G.SRT.B.3 Use congruence and similarity criteria for triangles to solve problems and to justify relationships in geometric figures.	*"Justification" may take a variety of forms. For example, tasks could include, but are not limited to: a line parallel to one side of a triangle divides the other two proportionally, and conversely; finding the area of a kite by partitioning it into two congruent triangles and finding the area of one triangle.*	✓		2.1, 2.2, 2.3, 2.4, 5.7, 8.1, 8.2, 8.3, 8.4, 9.1, 9.2, 9.3, 10.4	Graphing calculators can be used to perform transformations to support in determining relationships among geometric figures. «
G.SRT.C.4 Use side ratios in right triangles to define trigonometric ratios. **a.** Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles. **b.** Explain and use the relationship between the sine and cosine of complementary angles.	*There are no assessment limits for this standard. The entire standard is assessed in this course.*	✓		9.4, 9.5	Graphing calculators can be utilized when finding the values of angles and/or legs in a right triangle using trigonometry.
G.SRT.C.5 Solve triangles. ★ **a.** Know and use the Pythagorean Theorem and trigonometric ratios (sine, cosine, tangent, and their inverses) to solve right triangles in a real-world context. **b.** Know and use relationships	*For part c, exclude ambiguous cases.*	✓		9.1, 9.4, 9.5, 9.6	Graphing calculators can be utilized when finding the values of angles and/or legs in a right triangle using trigonometry and the Pythagorean theorem. Additionally, it can be utilized to perform calculations related to the Law of Sines and Cosines.

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within special right triangles to solve problems in a real-world context. **c.** Use the Law of Sines and Law of Cosines to solve non-right triangles in a real-world context.*					
G.C.A.1 Use proportional relationships between the area of a circle and the area of a sector within the circle to solve problems in a real-world context.*	*Angles are measured in degrees.*	✓		10.2, 10.3	Graphing calculators can be used to perform calculations related to find arc lengths and central angles measured in both degrees and radians. It can also be utilized to find the area of fractional portions of a circle.
G.GPE.A.1 Use coordinates to justify geometric relationships algebraically and to solve problems.	*Examples include but are not limited to: determine whether four points in the coordinate plane are the vertices of a rectangle, trapezoid, rhombus, square, or parallelogram; determine whether three points in the coordinate plane are the vertices of a scalene, isosceles, equilateral, or right triangle; determine the median of a triangle using the midpoint formula; given the coordinates of the center of a circle and a point on the circle, find the area and/or circumference of the circle.*	✓		3.5, 5.1, 5.8, 6.3, 7.3, 7.4, 7.5, 10.1, 10.3	Calculator not needed.

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G.GPE.A.2 Use the slope criteria for parallel and perpendicular lines to solve problems and to justify relationships in geometric figures.	*For example, justify why two lines are parallel, perpendicular, or neither. Create parallel and perpendicular lines to solve problems in context (e.g., given three noncollinear points in the plane, find the coordinates of a fourth point so that the four points are the vertices of a rectangle).*	✓		3.5, 8.3	Graphing calculators can be used to explore constructions and transformations of parallel and perpendicular lines.
G.GPE.A.3 Understand the relationship between the Pythagorean Theorem and the distance formula and use an efficient method to solve problems on the coordinate plane.	*For example, compute the radius of a circle given a center and a point on the circle, perimeters of polygons, and areas of triangles and quadrilaterals. Finding the area of a triangle is limited to cases when the triangle is either right or contains a side that is horizontal or vertical.*			1.3, 1.4, 10.1, 10.3	Graphing calculators can be utilized to perform calculations related to solving problems involving the Pythagorean Theorem and the distance formula.
G.GMD.A.1 Understand and explain the formulas for the volume and surface area of a cylinder, cone, prism, and pyramid.	*Informal arguments are limited to dissection. Memorizing formulas is not required.*	✓		11.1, 11.2, 11.3, 11.4, 11.5	Calculator not needed.

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G.GMD.A.2 Use volume and surface area formulas for cylinders, cones, prisms, pyramids, and spheres to solve problems in a real-world context.★	*There are no assessment limits for this standard. The entire standard is assessed in this course.*	✓		11.2, 11.3, 11.4, 11.5, 11.6, 11.8	Graphing calculators can be utilized to perform calculations related to the volume and surface area of cylinders, cones, prisms, pyramids, and spheres.
G.MG.A.1 Use geometric shapes, their measures, and their properties to model objects found in a real-world context for the purpose of approximating solutions to problems.★	*For example, determine which geometric shape best approximates a real-world object.*		✓	1.4, 10.5, 11.7	Graphing calculators can be utilized to perform calculations related to solving real-world problems involving various geometric shapes.
G.S.CP.A.1 Use set notation to represent contextual situations.★ **a.** 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").* **b.** Flexibly move between visual models (Venn diagrams, frequency tables, etc.) and set notation.*	*There are no assessment limits for this standard. The entire standard is assessed in this course.*			12.1, 12.3	Calculator not needed.

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G.S.CP.B.2 Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A and interpret the answer in terms of the given context.*	*Calculating conditional probability may be performed via use of a visual model (Venn diagrams, frequency tables, etc.).*			12.2	Graphing calculators can be utilized to calculate conditional probability.
G.S.CP.B.3 Understand and apply the Addition Rule.* **a.** Explain the Addition Rule, *P(A or B) = P(A) + P(B) – P(A and B)* in terms of visual models (Venn diagrams, frequency tables, etc.).* **b.** Apply the Addition Rule to solve problems and interpret the answer in terms of the given context.*	*There are no assessment limits for this standard.* *The entire standard is assessed in this course.*			12.3	Graphing calculators can be utilized to perform calculations related to the Addition Rule.
G.S.CP.C.4 Calculate probabilities using geometric figures.*	*Geometric figures include line segments, two-dimensional shapes, and three-dimensional solids.*			12.1	Graphing calculators can be utilized to calculate conditional probability.

(Note: Some standards may have been previously tested on the calculator and non-calculator subparts of the TCAP.)

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