



Indiana Department of Education

Dr. Katie Jenner, Secretary of Education

ILEARN Mathematics Formulas

February 2019

Indiana educators reviewed the Indiana standards to classify which Indiana standards have an emphasis on applying a formula as intended in the standard language. For identified standards, the related formulas are included as part of the item rather than utilizing a reference sheet. Students should be prepared to apply other concepts, such as perimeter or conversion within a system, without being provided the formulas.

The determination about embedding the formula was contingent upon the construct of the Indiana standard being assessed. This document serves as insight for the ILEARN assessment. This document does not define how to best teach these skills, nor whether memorization and identification of these provided formulas is an appropriate classroom instructional practice.

The following formulas are provided within ILEARN corresponding to the noted Indiana Academic Standards. In general, if the mathematical content in higher grade level items involves these formulas, such as a performance task or while assessing algebraic, computational, or process skills, the formula will be provided in those items as well. Geometry items in higher grades may not explicitly provide basic formulas from earlier grades, such as the area of triangles and parallelograms in MA.6.GM.4 and MA.6.GM.6.

MA.5.M.3: Develop and use formulas for the area of triangles, parallelograms, and trapezoids. Solve real-world and other mathematical problems that involve perimeter and area of triangles, parallelograms, and trapezoids, using appropriate units for measures.

- Area of a triangle = $\frac{1}{2}bh$
- Area of a parallelogram = bh
- Area of a trapezoid = $\frac{1}{2}h(b_1 + b_2)$

MA.6.GM.1: Convert between measurement systems (English to metric and metric to English) given conversion factors, and use these conversions in solving real-world problems.

Length

- 1 kilometer \approx 0.62 mile
- 1 meter \approx 3.28 feet
- 1 meter \approx 1.09 yards
- 1 meter \approx 39.37 inches
- 1 centimeter \approx 0.39 inch
- 1 mile \approx 1.61 kilometers
- 1 foot \approx 0.30 meter
- 1 yard \approx 0.91 meter
- 1 inch \approx 2.54 centimeters

Volume

- 1 liter \approx 1.06 quarts
- 1 liter \approx 0.26 gallon
- 1 gallon \approx 3.79 liters
- 1 quart \approx 0.95 liter
- 1 fluid ounce \approx 29.57 milliliters

Mass

- 1 kilogram \approx 2.20 pounds
- 1 gram \approx 0.04 ounce
- 1 pound \approx 0.45 kilogram
- 1 ounce \approx 28.35 grams



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MA.7.GM.5: Understand the formulas for area and circumference of a circle and use them to solve real-world and other mathematical problems; give an informal derivation of the relationship between circumference and area of a circle.

- Area of a circle = πr^2
- Circumference of a circle = πd or $2\pi r$

MA.7.GM.6: Solve real-world and other mathematical problems involving volume of cylinders and three-dimensional objects composed of right rectangular prisms.

- Volume of a cylinder = $\pi r^2 h$
- Volume of a right rectangular prism = lwh

MA.7.GM.7: Construct nets for right rectangular prisms and cylinders and use the nets to compute the surface area; apply this technique to solve real-world and other mathematical problems.

- Surface area of a cylinder = $2\pi r h + 2\pi r^2$
- Surface area of a right rectangular prism = $2(lw + lh + wh)$

MA.8.GM.2: Solve real-world and other mathematical problems involving volume of cones, spheres, and pyramids and surface area of spheres.

- Volume of a cone = $\frac{1}{3}\pi r^2 h$
- Volume of a sphere = $\frac{4}{3}\pi r^3$
- Volume of a pyramid = $\frac{1}{3}Bh$
- Surface area of sphere = $4\pi r^2$

MA.8.GM.7: Use inductive reasoning to explain the Pythagorean relationship.

MA.8.GM.8: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and other mathematical problems in two dimensions.

MA.8.GM.9: Apply the Pythagorean Theorem to find the distance between two points in a coordinate plane.

- $a^2 + b^2 = c^2$

The full item specifications and other test design documentation are available at:
<https://www.doe.in.gov/assessment/ilearn-test-design>



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Change History

Version	Page	Note
2/25/19	1	"November 2018" changed to "February 2019"
	1	In third paragraph, added the phrase "In general" to the second sentence and added the following sentence: "Geometry items in higher grades may not explicitly provide basic formulas from earlier grades, such as the area of triangles and parallelograms in MA.6.GM.4 and MA.6.GM.6."
	1	Removed MA.6.GM.4 from list of standards that will have formulas provided.