Integrated Math II Performance Level Descriptors

Limited

A student performing at the **Limited Level** demonstrates a minimal command of Ohio's Learning Standards for Integrated Math II. A student at this level has an emerging ability to demonstrate reasoning with numbers, quantities, expressions, and equations to solve problems, to write and analyze functions to model and solve problems, to derive and prove geometric relationships in polygons and circles and use the relationships to solve problems, and to understand and use concepts involving conditional probability and rules of probability.

A student whose performance falls within the **Limited Level** typically can:

- Carry out some routine procedures to solve straight forward one-step problems;
- Recognize solutions to some simple computation, straight forward problems;
- Compute accurately a few grade level numbers and operations;
- Recognize a few grade level mathematical concepts, terms and properties, and,
- Use previous grade level mathematical concepts, terms and properties.

A student at the **Limited Level** can:

- Use algebra manipulatives or diagrams and the relationship of polynomials to whole numbers to add and subtract polynomials with like terms;
- Solve simple linear equations with integer coefficients and inequalities with whole number coefficients in one variable situations, with integer constants and whole number solutions;
- Solve linear equations in two variables to describe a familiar situation using whole numbers supported by algebra manipulatives or diagrams; Find square roots of perfect squares;
- Given a graph of a simple function modeling a linear relationship between two quantities, determine where the function is increasing, decreasing, positive, or negative;
- Given a line segment length and a scale factor, determine the dilated line segment measure**;**
- Recognize an equation of a circle;
- Identify central angles and find their measures given the measure of their intercepted arcs; Use volume formulas to find volumes of cylinders, pyramids, cones, and spheres, given all needed measurements, to solve simple problems;
- Identify the sample space (the set of outcomes) using characteristics of the outcomes;
- Complete two-way frequency tables of data when two categories are associated with each object being classified.

Integrated Math II Performance Level Descriptors

Basic

A student performing at the **Basic Level** demonstrates partial command of Ohio's Learning Standards for Integrated Math II. A student at this level has a general ability to demonstrate reasoning with numbers, quantities, expressions, and equations to solve problems, to write and analyze functions to model and solve problems, to derive and prove geometric relationships in polygons and circles and use the relationships to solve problems, and to understand and use concepts involving conditional probability and rules of probability.

A student whose performance falls within the **Basic Level** typically can:

- Carry out routine procedures;
- Solve simple problems using visual representations;
- Compute accurately some grade level numbers and operations;
- Recall and recognize some grade level mathematical concepts, terms and properties, and,
- Use more previous grade level mathematical concepts, terms and properties.

A student at the **Basic Level** can:

- Identify parts of simple linear expressions in terms of the context the quantity represents: terms, factors and coefficients;
- Create equations in two variables and inequalities in one variable and use them to solve simple routine problems;
- Solve simple linear equations and inequalities with integer coefficients in one variable situations;
- Solve one-step linear equations with coefficients represented by letters, including formulas;
- Add and subtract polynomials and multiply polynomials by constants, both supported by manipulatives or visual models;
- Solve routine quadratic equations with integer solutions;
- Given a graph of a function that models a linear relationship between two quantities, interpret key features: intercepts; intervals where the function is increasing, decreasing, positive, or negative;
- Use scale factors to reduce or enlarge drawings on grids to produce dilations**;**
- Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar**;**
- Use congruence criteria for triangles to solve mathematical problems**;**
- Complete a straight-forward proof of a theorem involving proportionality of lengths within a triangle or among triangles by identifying one or two statements or reasons missing from the proof;
- Solve problems involving the volumes of cylinders, pyramids, cones, and spheres, given all necessary measurements; Describe events as subsets of a sample space (the set of outcomes) using categories of the outcomes;
- Use two-way frequency tables of data when two categories are associated with each object being classified as a sample space to determine probabilities;
- Recognize independence of events in everyday language and everyday situations;

Integrated Math II Performance Level Descriptors

- Apply the addition rule for probability for events that are mutually exclusive.

Integrated Math II Performance Level Descriptors

Proficient

A student performing at the **Proficient Level** demonstrates an appropriate command of Ohio's Learning Standards for Integrated Math II. A student at this level has a consistent ability to demonstrate reasoning with numbers, quantities, expressions, and equations to solve problems, to write and analyze functions to model and solve problems, to derive and prove geometric relationships in polygons and circles and use the relationships to solve problems, and to understand and use concepts involving conditional probability and rules of probability.

A student whose performance falls within the **Proficient Level** typically can:

- Solve most routine and straight forward problems accurately;
- Compute accurately with most grade level numbers and operations;
- Apply most grade level mathematical concepts, terms and properties, and,
- Use informal (visual representation and language) and some formal reasoning.

A student at the **Proficient Level** can:

- Interpret parts of an expression, such as terms, factors, coefficients, bases, and exponents in terms of its context**;**
- Recognize the structure of a quadratic expression to identify ways to rewrite it to better represent the purpose**;**
- Factor a quadratic expression to reveal the zeros of the function it defines;
- Create exponential equations in one or two variables and use them to solve routine problems**;**
- Add and subtract polynomials and multiply monomials by polynomials;
- Multiply binomials;
- Solve quadratic equations with integer coefficients and constants by factoring or completing the square where $a = 1$**;**
- For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities; sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries**;**
- Graph quadratic functions and show intercepts, maxima, and minima;
- Relate the domain of a function to its graph;
- Given two functions represented in different ways, (algebraically, graphically, numerically in tables, or by verbal descriptions), compare the properties of the two functions;

Integrated Math II Performance Level Descriptors

- Complete a routine proof of a theorem involving proportionality of lengths within a triangle or among triangles;
- Use congruence and similarity criteria for triangles to solve routine problems;
- Explain the relationship between sine and cosine of complementary angles;
- Use trigonometric ratios, or the Pythagorean Theorem to solve routine real world problems;
- Use volume formulas to find a measurement (e.g. height or radius) of cylinders, pyramids, cones, and spheres, given the volume and other measurements, to solve problems;
- Describe events as unions, intersections, or complements of other events using the terminology "or," "and," "not";
- Determine the independence of two events in terms of the product of their probabilities;
- Understand the conditional probability of A given B as P(A and B)/P(B);
- Determine and interpret independence of two events using products of probabilities, conditional probabilities, and two-way frequency tables;
- Recognize conditional probability in everyday language and everyday situations;
- Apply the addition rule for probability for events that are not mutually exclusive.

Integrated Math II Performance Level Descriptors

Accelerated

A student performing at the **Accelerated Level** demonstrates a strong command of Ohio's Learning Standards for Integrated Math II. A student at this level has a superior ability to demonstrate reasoning with numbers, quantities, expressions, and equations to solve problems, to write and analyze functions to model and solve problems, to derive and prove geometric relationships in polygons and circles and use the relationships to solve problems, and to understand and use concepts involving conditional probability and rules of probability.

A student whose performance falls within the **Accelerated Level** typically can:

- Accurately solve routine and straight forward problems;
- Solve a variety of routine and multi-step problems;
- Compute accurately and efficiently with familiar numbers;
- Recognize connections between mathematical concepts, terms and properties, and,
- Use informal and some formal reasoning with symbolic representation.

A student at the **Accelerated Level** can:

- Interpret linear expressions by viewing one or more of their parts as a single entity in respect to the context**;**
- Use the structure of an exponential expression to identify ways to rewrite it;
- Multiply binomials by trinomials;
- Create quadratic equations and inequalities in one or two variables and use them to solve routine problems;
- Solve multi-step linear equations and inequalities with rational coefficients in one variable situations;
- Solve multistep linear equations with coefficients represented by letters, including formulas, which could include factoring or distributive property;
- Solve quadratic equations, with rational coefficients, that have real solutions, by factoring or completing the square;
- Solve a system consisting of a linear equation and a quadratic equation in two variables graphically, and algebraically in simpler cases;
- For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: end behavior;
- Relate the domain of a function to the quantitative relationship it describes;
- Interpret zeros, extreme values, and symmetry of the graph of a quadratic function in terms of a context;
- Use the process of completing the square in a quadratic function, where a = 1, to show extreme values and symmetry of the graph;

Integrated Math II Performance Level Descriptors

- Explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides;
- Use congruence and similarity criteria for triangles to prove relationships in geometric figures;
- Use trigonometric ratios and the Pythagorean Theorem to solve routine real-world problems involving complex figures;
- Use the formula for the area of a sector of a circle to solve routine problems;
- Use the properties of circles to solve routine problems related to the equation of a circle, its center and radius length;
- Give an informal argument for the formulas for the circumference and area of a circle;
- Solve routine problems based on the volumes of compositions or parts of cylinders, pyramids, cones, or spheres;
- Describe events involving unions, intersections, or complements of other events using set notation;
- Use a two-way relative frequency table as a sample space to decide if events are independent by approximating conditional probabilities;
- Explain the independence of events in everyday situations.

Integrated Math II Performance Level Descriptors

Advanced

A student performing at the **Advanced Level** demonstrates a distinguished command of Ohio's Learning Standards for Integrated Math II. A student at this level has a sophisticated ability to demonstrate reasoning with numbers, quantities, expressions, and equations to solve problems, to write and analyze functions to model and solve problems, to derive and prove geometric relationships in polygons and circles and use the relationships to solve problems, and to understand and use concepts involving conditional probability and rules of probability.

A student whose performance falls within the **Advanced Level** typically can:

- Solve routine and straight forward problems accurately and efficiently;
- Solve a variety of non-routine multi-step problems;
- Compute accurately and efficiently;
- Recognize, apply and justify mathematical concepts, terms and properties and their connections, and,
- Use more formal reasoning and symbolic representation (precise mathematical language).

A student at the **Advanced Level** can:

- Accurately multiply polynomials of any number of terms using rules of exponents;
- Interpret exponential expressions by viewing one or more of their parts as a single entity;
- Create quadratic and exponential equations and inequalities in one or two variables and use them to accurately solve routine and non-routine problems;
- Choose an appropriate method to solve a quadratic equation, according to the initial form of the equation which could include simplifying initial expressions and complex solutions;
- Accurately and efficiently solve a system consisting of a linear equation and a quadratic equation in two variables algebraically;
- Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in non-routine real world problems;
- Solve non-routine real world problems involving finding arc lengths and areas of sectors;
- Give an informal argument for the formulas for the volume of a cylinder, pyramid, and cone;
- Explain the concepts of conditional probability in everyday situations;
- Apply the addition rule for probability for events that are not mutually exclusive and interpret the answer in terms of the model.