

Chart of Activities

Use this chart to locate appropriate activities for various lessons in your curriculum.

| Activity | Pre-algebra | Algebra 1 | Algebra 2 | Precalculus | Statistics | Sketchpad Level | Average Time | Paired/Individual | Small Groups | Whole-Class | Short Demo | Presenter Notes | Description |
|---|-------------|-----------|-----------|-------------|------------|-----------------|--------------|-------------------|--------------|-------------|------------|-----------------|---|
| 1: Functions | | | | | | | | | | | | | |
| Introducing Dynagraphs | | ○ | ○ | | | E | 35 | ○ | ○ | ○ | ○ | ○ | Students explore dynagraphs to develop a feel for functional relationships. |
| From Dynagraphs to Cartesian Graphs | | ○ | ○ | | | E | 45 | ○ | ○ | | | | Students make connections between symbolic, Cartesian, and dynagraph representations of functions. |
| Domain and Range | | ○ | ○ | | | E | 35 | ○ | ○ | ○ | ○ | | Students explore the domain and range of functions, including those with restricted domain or range, using dynagraphs and Cartesian graphs. |
| Function Composition with Dynagraphs | | | ○ | ○ | | E | 40 | ○ | ○ | ○ | ○ | ○ | Students use dynagraphs to model composite functions. |
| Odd and Even Functions | | | ○ | ○ | | E | 35 | ○ | ○ | ○ | ○ | | Students explore odd and even functions using dynagraphs and transformations. |
| Inverse Functions | | ○ | ○ | | | E | 30 | ○ | ○ | ○ | ○ | ○ | Students use linked dynagraphs to investigate inverse functions. |
| Functions Again and Again | | ○ | ○ | | | I | 35 | ○ | ○ | | | ○ | Students define an iterated coordinate transformation on a point, and observe and draw conclusions from the orbit. |
| 2: Functions and Relations | | | | | | | | | | | | | |
| Relations and Functions | | ○ | ○ | | | E | 35 | ○ | ○ | ○ | ○ | ○ | Students explore the definitions of relation and function, and develop a vertical line test for functions. |
| The Circumference Function | ○ | ○ | ○ | | | I | 35 | ○ | ○ | | | | Students measure, graph, and analyze the function that connects a circle's diameter and circumference. |
| Radius and Arc Length | | ○ | ○ | | | E/ I | 35 | ○ | ○ | ○ | ○ | ○ | Students explore the relationship between the radius of a circle and the arc length of a semicircle. |
| Functions in a Triangle | ○ | ○ | ○ | | | I | 30 | ○ | ○ | | | | Students measure constructions in a triangle and investigate the relations and their graphs. |
| Functional Geometry | | ○ | ○ | | | I | 30 | ○ | ○ | | | | Students explore relations defined by geometric measurements and create graphs, explaining how they decided on the independent variable. |
| 3: Systems | | | | | | | | | | | | | |
| Solving Systems of Equations | | ○ | ○ | | | I | 35 | ○ | ○ | ○ | ○ | | Students use rate information from two companies to find out which is cheaper for various moves. |
| Graphing Inequalities in Two Variables | | ○ | ○ | | | E | 45 | ○ | ○ | | | | Students use a prepared sketch to graph various inequalities in x and y . |
| Legend: E = Easy; I = Intermediate; C = Challenging | | | | | | | | | | | | | |

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| 3: Systems continued | | | | | | | | | | | | | |
| Graphing Systems of Inequalities | | | ○ | | | I | 40 | ○ | ○ | ○ | ○ | | Students use a prepared sketch to solve systems of two and three inequalities. |
| Linear Programming: Swans and Giraffes | | | ○ | | | E | 45 | ○ | ○ | | | | Students explore a linear programming problem, by writing constraint equations, defining the feasible region, and maximizing a quantity. |
| 4: Quadratic Functions | | | | | | | | | | | | | |
| Parabolas in Vertex Form | | ○ | ○ | | | E | 45 | ○ | ○ | ○ | ○ | ○ | Students graph parabolas using the vertex form. |
| Exploring Parabolas in Vertex Form | | ○ | ○ | | | E | 30 | ○ | ○ | | | | Students graph parabolas using the vertex form (open-ended). |
| Parabolas in Factored Form | | ○ | ○ | | | I | 45 | ○ | ○ | ○ | ○ | | Students investigate the relationship between the factored form of a quadratic function and its graph. |
| Parabolas in Standard Form | | ○ | ○ | | | I | 40 | ○ | ○ | ○ | ○ | | Students use the standard form to identify the behavior of the graph when a , b , and c are changed. |
| Changing Quadratic Function Forms | | | ○ | ○ | | C | 50 | ○ | ○ | | | | Students change quadratic functions between standard, vertex, and factored forms. |
| The Discriminant | | | ○ | ○ | | I | 35 | ○ | ○ | ○ | ○ | ○ | Students calculate and explore the discriminant of a quadratic function. |
| Parabolas: A Geometric Approach | | ○ | ○ | | | I | 40 | ○ | ○ | | | | Students construct a parabola geometrically. |
| Parabolas in Headlights and Satellite Dishes | | ○ | ○ | | | C | 45 | ○ | ○ | | | | Students construct and explore a two-dimensional model of a parabolic reflector. |
| Conic Reflections | | | ○ | ○ | | C | 45 | ○ | ○ | ○ | ○ | ○ | Students explore reflective properties of ellipses and hyperbolas. |
| Modeling Projectile Motion | | ○ | ○ | | | I | 40 | ○ | ○ | ○ | ○ | | Students make a Sketchpad model of a basketball's flight, and make the ball go through a basket. |
| 5: Algebraic Transformations | | | | | | | | | | | | | |
| Translating Coordinates | | ○ | ○ | | | I | 40 | ○ | ○ | ○ | ○ | ○ | Students translate points in and make connections between the coordinates of a point and its translated image. |
| Rotating Coordinates | | ○ | ○ | | | I | 35 | ○ | ○ | | | ○ | Students explore coordinate rotation of figures about the origin by multiples of 90° . |
| Reflecting in Geometry and Algebra | | ○ | ○ | | | E/ I | 35 | ○ | ○ | ○ | ○ | ○ | Students explore algebraic associations between the coordinates of a point and its reflected image. |
| Stretching and Shrinking Coordinates | | | ○ | | | I | 30 | ○ | ○ | ○ | ○ | ○ | Students investigate the behavior of polygons when the x - or y -values of the vertices are multiplied by various constants. |
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| 5: Algebraic Transformations continued | | | | | | | | | | | | | |
| Transforming Coordinates | | ○ | ○ | | | I | 35 | ○ | ○ | | | ○ | Students perform elementary transformations in the coordinate plane. |
| Translating Functions | | | ○ | | | I | 25 | ○ | ○ | ○ | ○ | ○ | Students translate function graphs vertically and horizontally by adding constants to x - and y -values. |
| Reflecting Functions | | ○ | ○ | | | I | 23 | ○ | ○ | ○ | ○ | ○ | Students reflect function plots across the axes and explore connections between algebraic and geometric transformations. |
| Stretching and Shrinking Functions | | | ○ | | | I | 25 | ○ | ○ | ○ | ○ | ○ | Students stretch and shrink function graphs vertically and horizontally. |
| Transforming Odd and Even Functions | | | ○ | | | C | 30 | ○ | ○ | ○ | ○ | | Students explore the symmetry in odd and even functions. |
| 6: Other Functions | | | | | | | | | | | | | |
| Absolute Value Functions | | ○ | ○ | | | E | 25 | ○ | ○ | ○ | ○ | ○ | Students graph and explore the absolute value function, reviewing the point-slope form of linear functions. |
| Exponential Functions | | | ○ | ○ | | I | 35 | ○ | ○ | ○ | ○ | ○ | Students graph exponential functions, examine their properties, and use them to model real-world applications. |
| Logarithmic Functions | | | ○ | | | I/ C | 45 | ○ | ○ | ○ | ○ | ○ | Students explore the relationships between exponential and logarithmic functions. |
| Square Root Functions | | | ○ | | | I | 35 | ○ | ○ | ○ | ○ | ○ | Students explore the square root function and think about the conditions under which inverse relations are also inverse functions. |
| Rational Functions | | | ○ | | | I | 35 | ○ | ○ | ○ | ○ | ○ | Students explore rational functions as transformations of $y = 1/x$. |
| Modeling Linear Motion: An Ant's Progress | | | ○ | | | E | 25 | ○ | ○ | ○ | ○ | ○ | Students model linear motion using parametric equations. |
| 7: Trigonometric Functions | | | | | | | | | | | | | |
| Right Triangle Functions | | | ○ | | | I | 25 | | | ○ | ○ | ○ | Students calculate ratios for right triangles, plotting the values to reveal the graphs of the trigonometric functions. |
| Radian Measure | | | ○ | ○ | | I | 25 | ○ | ○ | ○ | ○ | ○ | Students explore the relationship between the length, radius, and central angle of an arc. |
| Unit Circle Functions | | | ○ | ○ | | I | 40 | ○ | ○ | ○ | ○ | ○ | Students use a unit circle to define the trigonometric functions. |
| Unit Circle and Right Triangle Functions | | | ○ | ○ | | I | 25 | ○ | ○ | ○ | ○ | ○ | Students compare the unit circle definitions and right triangle definitions of trigonometric functions. |
| Trigonometric Identities | | | ○ | ○ | | E | 35 | ○ | ○ | ○ | ○ | ○ | Students use geometric relationships to justify trigonometric identities. |
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| 7: Trigonometric Functions <small>continued</small> | | | | | | | | | | | | | |
| Law of Sines | | | ○ | ○ | | I | 20 | ○ | ○ | ○ | ○ | | Students explore the Law of Sines and develop a proof. |
| Law of Cosines | | | ○ | ○ | | I | 35 | ○ | ○ | ○ | ○ | ○ | Students develop the Law of Cosines by exploring how the Pythagorean theorem fails for triangles without a right angle. |
| 8: Probability and Data | | | | | | | | | | | | | |
| Normal Distribution | | | ○ | ○ | ○ | E | 35 | ○ | ○ | | | | Students use a random distribution to explore the normal density curve. |
| Permutation and Combination | | | ○ | | ○ | E | 45 | ○ | ○ | | | | Students explore permutations and combinations of a given set of objects. |
| Box and Whiskers | | ○ | ○ | ○ | ○ | E | 45 | ○ | ○ | | | ○ | Students change data and explore the effects on a box-and-whiskers plot. |
| Fitting Functions to Data | | | ○ | ○ | ○ | I | 40 | ○ | ○ | ○ | ○ | ○ | Students transform functions to fit data and use a least-squares calculation to judge how good the fit is. |
| 9: Vectors and Matrices | | | | | | | | | | | | | |
| Introduction to Vectors: Walking Rex | | ○ | ○ | | | E | 25 | ○ | ○ | ○ | ○ | ○ | Students explore vectors, learning the connection between two ways to describe vectors. |
| Vector Addition and Subtraction | | ○ | ○ | | | E | 25 | ○ | ○ | ○ | ○ | ○ | Students add and subtract vectors, and explore the commutativity of these operations. |
| Solving Systems Using Matrices | | | ○ | ○ | | I | 25 | ○ | ○ | ○ | ○ | ○ | Students solve a system of equations expressed as a single matrix equation. |
| Supplemental Activities (on CD-ROM) | | | | | | | | | | | | | |
| Quadratic Intercepts | | ○ | ○ | | | I | 30 | ○ | ○ | ○ | ○ | ○ | Students derive a quadratic function from the y -intercept and the two x -intercepts. |
| Function Transformation Game | | | ○ | ○ | | E | | ○ | ○ | | | | Students match the graph of a mystery function by choosing a parent function and applying transformations to it. |
| Point Field | | ○ | ○ | | | E | 35 | ○ | ○ | ○ | ○ | ○ | Students use a point field to investigate linear combinations in the form $ax + by$. |
| Build Your Own Dynagraph | | ○ | ○ | ○ | | C | 35 | ○ | ○ | | | | Students or teachers build their own dynagraphs from scratch. |
| Legend: E = Easy; I = Intermediate; C = Challenging | | | | | | | | | | | | | |