General Information

Lesson Title: Graphing Quadratic Functions in Factored Form

Subject(s): Algebra 1

Grade/Level/Setting: 9th Grade Algebra 1 – Whole class instruction in a high school classroom using collaborative group activities and visual learning strategies.

Prerequisite Skills/Prior Knowledge:

Students previously learned how to graph quadratic functions using:

- *Basic form:* $y = ax^2$
- *Vertical shift form:* $y = ax^2 + c$
- *Standard form:* $y = ax^2 + bx + c$
- *Vertex form:* $y = a(x - h)^2 + k$

Students also know how to:

- *Identify the vertex*
- *Determine the axis of symmetry*
- *Identify whether a parabola opens up or down*
- *Sketch a quadratic graph from key features*

Standards and Objectives

State/National Academic Standard(s):

F.IF.C.7a - Graph linear and quadratic functions and show intercepts, maxima, and minima.

F.IF.C.8a - Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

F.BF.B.3-1 - Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x + k) for specific values of k (both positive and negative) and find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include linear, exponential, quadratic, and absolute value functions.

Learning Objective(s):

Students will be able to:

1. Identify zeros of quadratic functions written in factored form.
2. Apply the Zero Product Property to solve for x-intercepts.
3. Determine the axis of symmetry using the midpoint of zeros.
4. Sketch a parabola using intercepts and direction of opening.
5. Explain how factored form relates to vertex form and standard form.

Assessment

Summative

Students complete an exit ticket where they must:

- Identify zeros of a quadratic written in factored form
- Determine the axis of symmetry
- Identify direction of opening
- Sketch the graph

This task demonstrates whether students understand how to extract key features from factored form and graph the parabola.

Formative

Formative assessment occurs during:

- Do Now station rotation reviewing previous quadratic forms
- Guided practice solving a quadratic in factored form
- Group activity ("Intercept Heist") where students identify zeros and graph quadratics

Teacher circulates during these activities to monitor understanding and provide feedback.

Materials

- Student worksheet
- Station cards for Do Now rotation
- Factored Form reference infographic
- Activity cards for the "Intercept Heist" activity

Technology

- Projector or interactive board to display lesson slides
- Timer to manage station rotations
- Optional graphing software or Desmos for visualization

Instructional Strategies and Learning Tasks *Consider the teacher and student actions in the planning for instructional strategies and learner tasks.*	**High Leverage Practices for Supporting All Learners** *Consider how the selected instructional strategy and/or learning task would support the specific needs of the following groups:* • *Gifted and Talented Learners* • *English Learners/ Emergent Bilinguals*

	• *Students with Other Exceptionalities* *Identify **at least one** opportunity to support each of the 3 types of learners.*
Do Now Station Rotation (12 minutes) Students rotate through four stations reviewing previously learned quadratic forms. The stations include vertex form and standard form review problems, as well as pattern observation tasks that introduce factored expressions.	**Gifted and Talented Learners** Advanced learners are challenged to convert quadratic functions between factored form, vertex form, and standard form. They may also analyze how the value of $a$affects the width of the parabola. **English Learners / Emergent Bilinguals** Visual supports such as graphs, diagrams, and the reference infographic help students connect vocabulary to mathematical representations. Key terms (vertex, zeros, axis of symmetry) are explicitly defined and reinforced during instruction. **Students with Other Exceptionalities** Students receive structured step-by-step graphing instructions and may work with peers during the collaborative activity. Graphic organizers and guided notes help scaffold the process of identifying key features of quadratic functions.
Mini Lesson (10 minutes) Teacher introduces factored form of quadratics: $$y = a(x - r_1)(x - r_2)$$ Students learn that $r_1$and $r_2$represent the zeros of the function. The Zero Product Property is	

introduced to show how each factor can equal zero.	
Guided Practice (8 minutes) Students work through an example with teacher guidance to identify zeros, determine intercepts, and sketch the graph.	
Collaborative Activity – "Intercept Heist" (30 minutes) Students work in groups to analyze quadratic functions written in factored form. For each function they: • Identify zeros • Determine axis of symmetry • Identify direction of opening • Sketch the graph Groups present their reasoning to the teacher for verification before moving on to the next problem.	
Vertical Connection Discussion (7 minutes) Teacher presents a quadratic in standard form. Students factor the expression and connect it to factored form, reinforcing relationships between the different representations of quadratic functions.	
Exit Ticket (7 minutes) Students independently complete a problem requiring them to analyze and graph a quadratic written in factored form.	