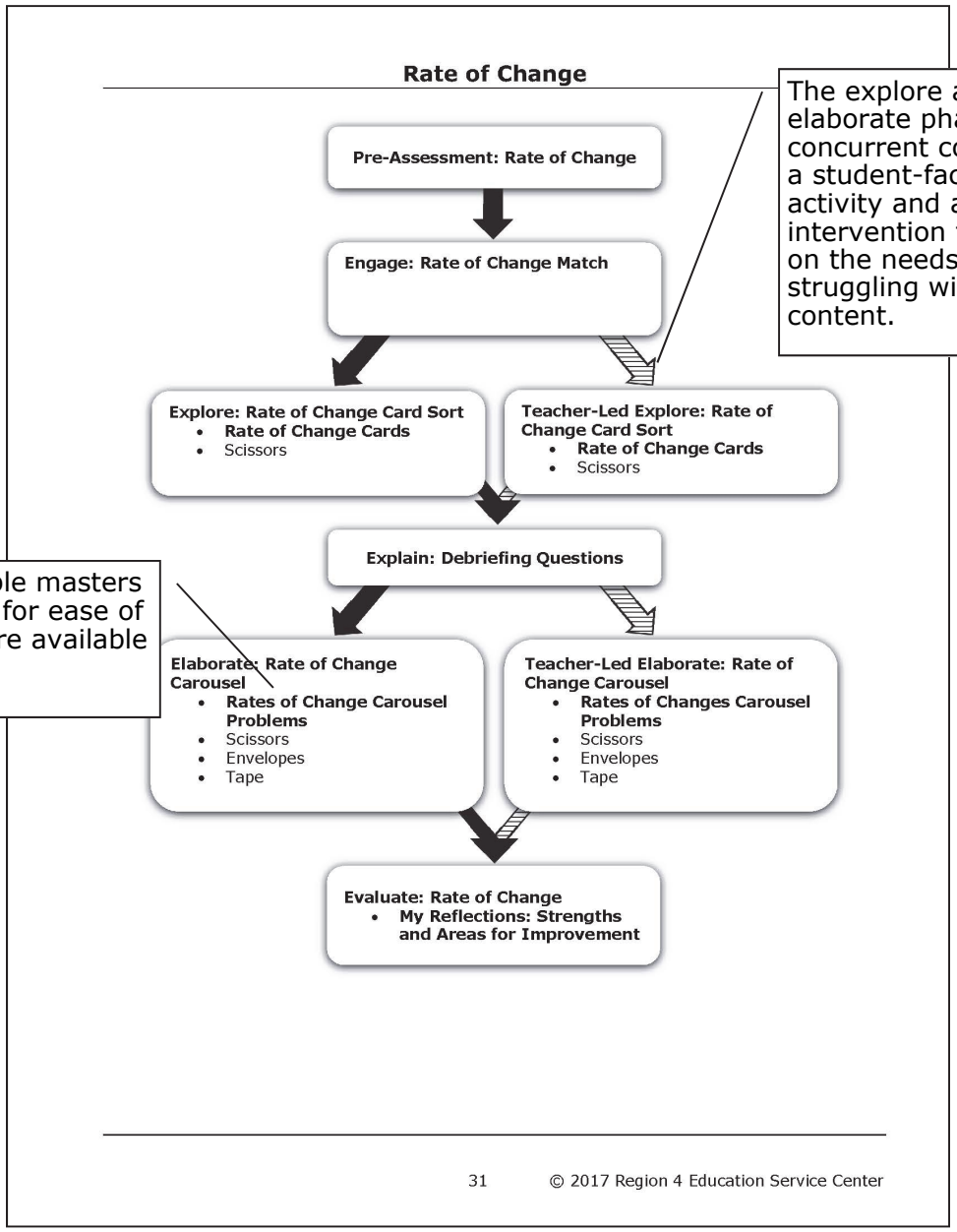

The explore and the elaborate phase have two concurrent components: a student-facilitated activity and a teacher-led intervention that focuses on the needs of students struggling with the content.

Titles of reproducible masters are printed in bold for ease of reference. These are available in digital format.

Each lesson supports multiple student expectations with a focus on the STAAR® readiness standards. Student expectations are listed at the beginning of each lesson.

Materials for each phase are summarized on one page for ease in preparation.

Rate of Change

Phase	Activity Title	TEKS	Additional Materials	Instructional Grouping
Pre-Assessment	**Pre-Assessment: Rate of Change**	A(3)(B)		Individual
Engage	**Rate of Change Match**	A(3)(B)		Groups of 2
Explore Explain	**Rate of Change Card Sort**	A(3)(B)	• **Rate of Change Cards** • Scissors	Groups of 2 Whole Group
Elaborate	**Rate of Change Carousel**	A(3)(B)	• ***Rates of Change Carousel Problems*** • Scissors • Envelopes • Tape	Groups of 2
Evaluate	**Evaluate: Rate of Change**	A(3)(B)	• **My Reflections: Strengths and Areas for Improvement**	Individual

Grouping strategies for each phase are summarized to assist in the arrangement of the classroom.

Bold items are reproducible masters.
Italicized items require advanced preparation.

Students should have continuous access to the graphing technology and STAAR® Reference Materials that will be made available for the assessment.

Pre-Assessment: Rate of Change
The purpose of this activity is to formatively assess students' understanding of how to calculate the rate of change of a linear function represented tabularly, graphically, or algebraically.

The identified activities are recommended for small-group, teacher-led interventions for students who may struggle with the specific content in **Pre-Assessment: Rate of Change**.

Content	Teacher-Led Intervention
Calculate the rate of change from graphs, tables, equations, and non-contextual mathematical descriptions	**Rate of Change Card Sort**
Calculate the rate of change in real-world contexts	**Rate of Change Carousel**

A focused pre-assessment is provided for each lesson. Tier I intervention activities are identified for use with students who may struggle with the identified content.

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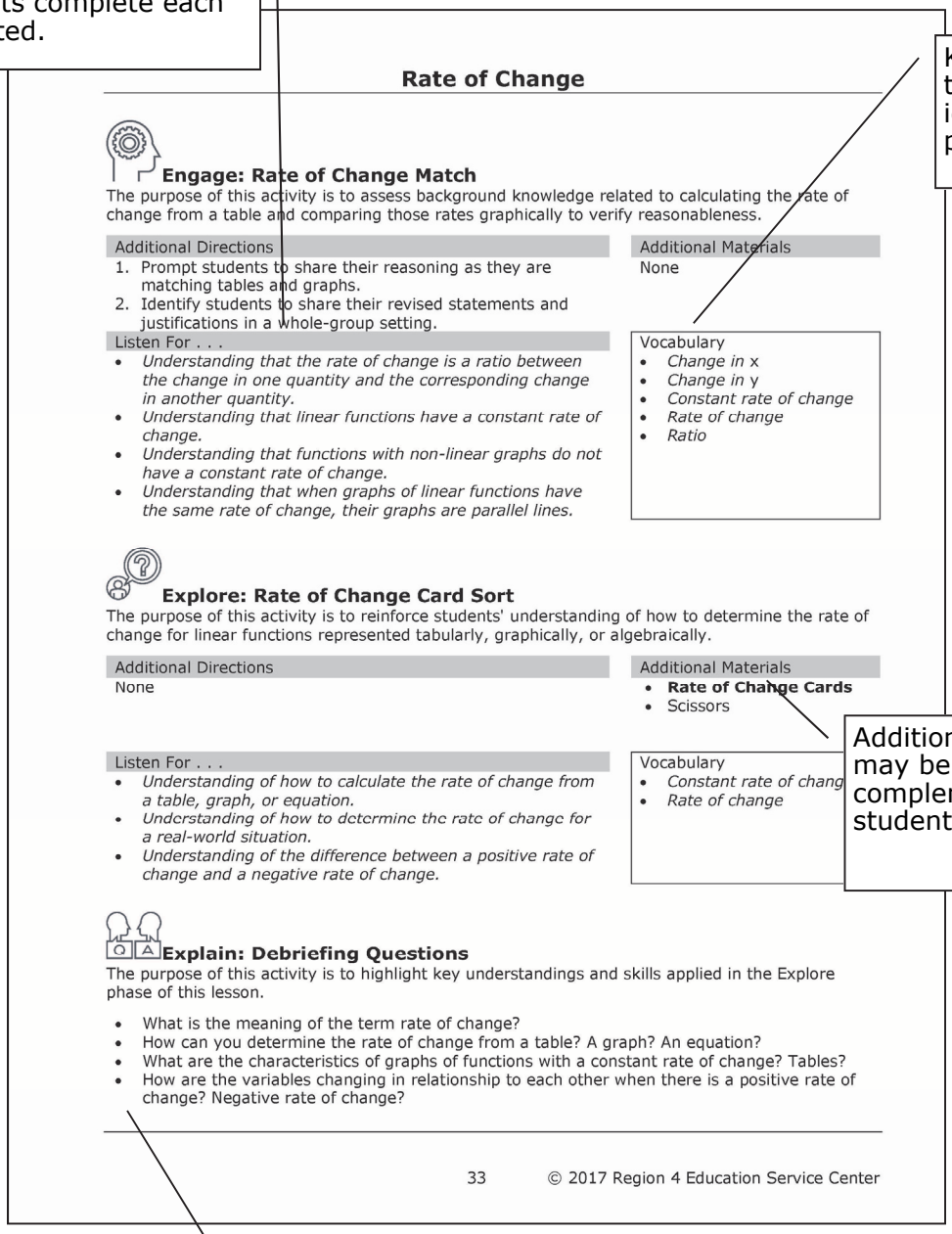
What is in a lesson found in *Closing the Distance*?

Key ideas and concepts to listen for as students complete each phase are listed.

Key vocabulary terms are identified for each phase.



Rate of Change

Engage: Rate of Change Match

The purpose of this activity is to assess background knowledge related to calculating the rate of change from a table and comparing those rates graphically to verify reasonableness.

Additional Directions

1. Prompt students to share their reasoning as they are matching tables and graphs.
2. Identify students to share their revised statements and justifications in a whole-group setting.

Additional Materials

None

Listen For . . .

- *Understanding that the rate of change is a ratio between the change in one quantity and the corresponding change in another quantity.*
- *Understanding that linear functions have a constant rate of change.*
- *Understanding that functions with non-linear graphs do not have a constant rate of change.*
- *Understanding that when graphs of linear functions have the same rate of change, their graphs are parallel lines.*

Vocabulary

- *Change in x*
- *Change in y*
- *Constant rate of change*
- *Rate of change*
- *Ratio*

Explore: Rate of Change Card Sort

The purpose of this activity is to reinforce students' understanding of how to determine the rate of change for linear functions represented tabularly, graphically, or algebraically.

Additional Directions

None

Additional Materials

- **Rate of Change Cards**
- Scissors

Listen For . . .

- *Understanding of how to calculate the rate of change from a table, graph, or equation.*
- *Understanding of how to determine the rate of change for a real-world situation.*
- *Understanding of the difference between a positive rate of change and a negative rate of change.*

Vocabulary

- *Constant rate of chang*
- *Rate of change*

Additional materials may be needed to complement the student pages.

Explain: Debriefing Questions

The purpose of this activity is to highlight key understandings and skills applied in the Explore phase of this lesson.

- What is the meaning of the term rate of change?
- How can you determine the rate of change from a table? A graph? An equation?
- What are the characteristics of graphs of functions with a constant rate of change? Tables?
- How are the variables changing in relationship to each other when there is a positive rate of change? Negative rate of change?

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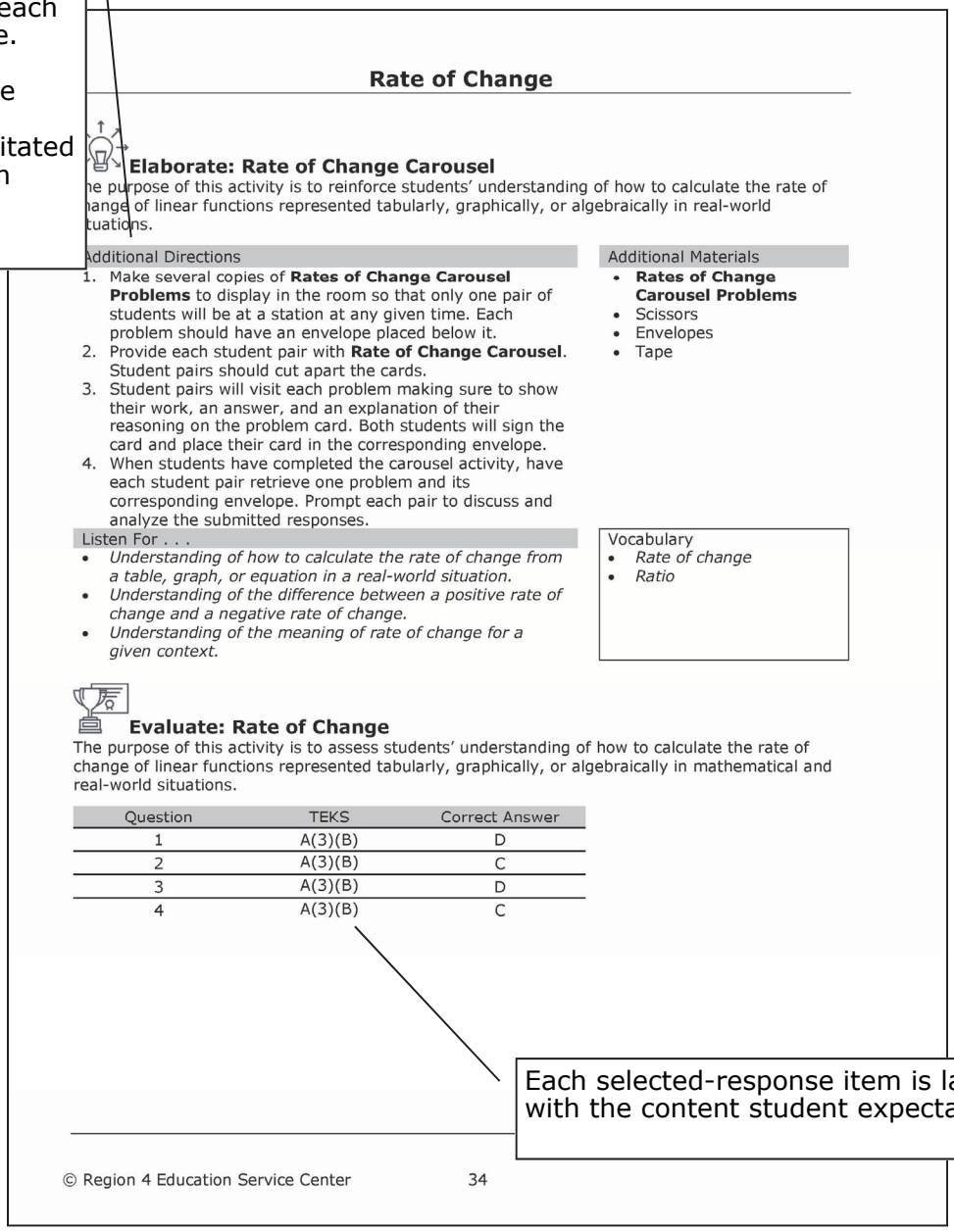
The explain phase includes debriefing questions to guide class discussion for key understandings and skills found in the activities.

Complete directions are included on each student page. Additional directions are provided for teacher-facilitated aspects of an activity.



Rate of Change

Elaborate: Rate of Change Carousel

he purpose of this activity is to reinforce students' understanding of how to calculate the rate of hange of linear functions represented tabularly, graphically, or algebraically in real-world tuations.

Additional Directions

1. Make several copies of **Rates of Change Carousel Problems** to display in the room so that only one pair of students will be at a station at any given time. Each problem should have an envelope placed below it.
2. Provide each student pair with **Rate of Change Carousel**. Student pairs should cut apart the cards.
3. Student pairs will visit each problem making sure to show their work, an answer, and an explanation of their reasoning on the problem card. Both students will sign the card and place their card in the corresponding envelope.
4. When students have completed the carousel activity, have each student pair retrieve one problem and its corresponding envelope. Prompt each pair to discuss and analyze the submitted responses.

Additional Materials

- **Rates of Change Carousel Problems**
- Scissors
- Envelopes
- Tape

Listen For . . .

- *Understanding of how to calculate the rate of change from a table, graph, or equation in a real-world situation.*
- *Understanding of the difference between a positive rate of change and a negative rate of change.*
- *Understanding of the meaning of rate of change for a given context.*

Vocabulary

- *Rate of change*
- *Ratio*

Evaluate: Rate of Change

The purpose of this activity is to assess students' understanding of how to calculate the rate of change of linear functions represented tabularly, graphically, or algebraically in mathematical and real-world situations.

Question	TEKS	Correct Answer
1	A(3)(B)	D
2	A(3)(B)	C
3	A(3)(B)	D
4	A(3)(B)	C

Each selected-response item is labeled with the content student expectation.

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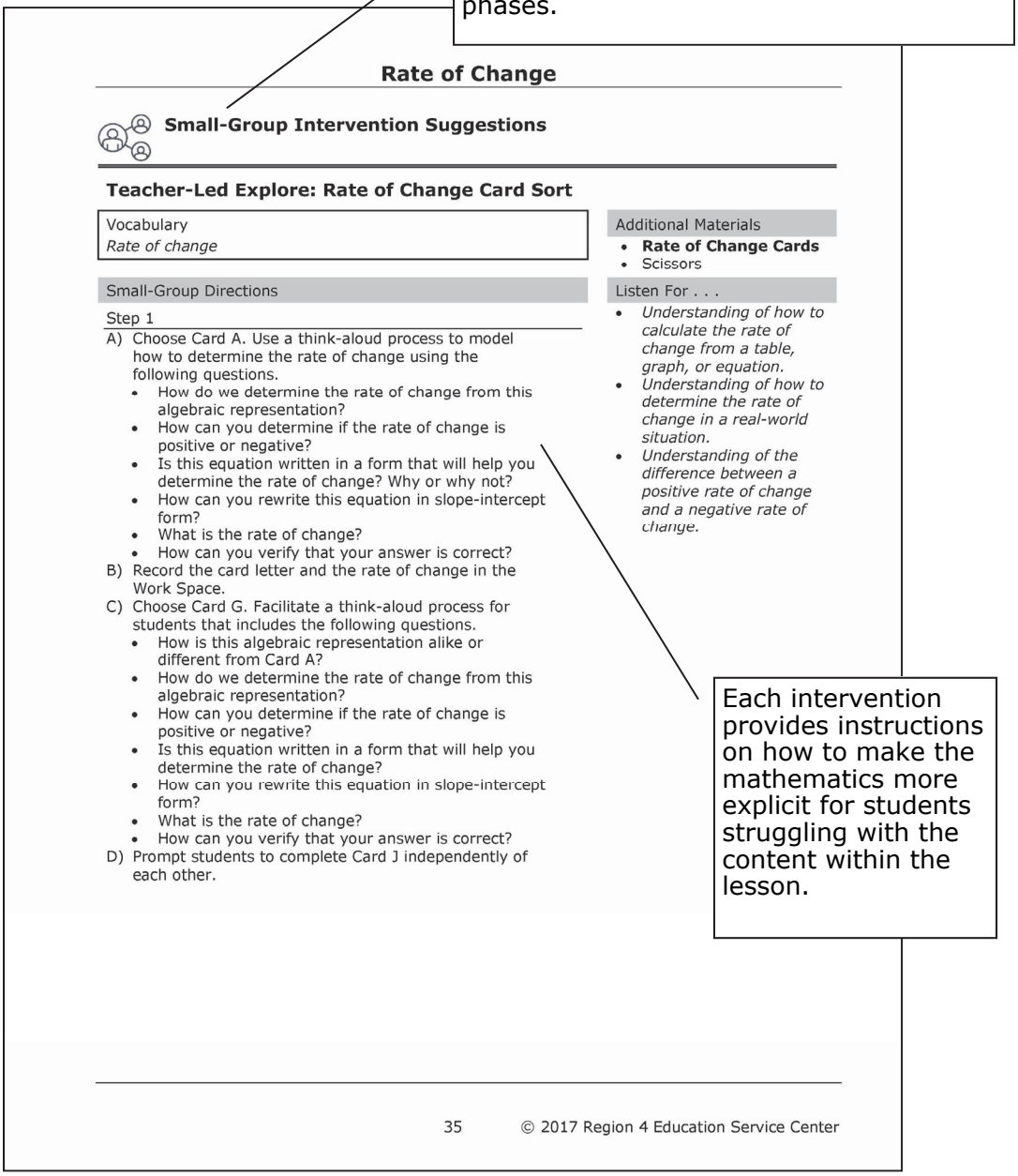
What is in a lesson found in *Closing the Distance*?

Small-group intervention suggestions are provided for the Explore and the Elaborate phases.



Rate of Change

Small-Group Intervention Suggestions

Teacher-Led Explore: Rate of Change Card Sort

Vocabulary
Rate of change

Additional Materials
- **Rate of Change Cards**
- Scissors

Small-Group Directions

Step 1

A) Choose Card A. Use a think-aloud process to model how to determine the rate of change using the following questions.
   - How do we determine the rate of change from this algebraic representation?
   - How can you determine if the rate of change is positive or negative?
   - Is this equation written in a form that will help you determine the rate of change? Why or why not?
   - How can you rewrite this equation in slope-intercept form?
   - What is the rate of change?
   - How can you verify that your answer is correct?

B) Record the card letter and the rate of change in the Work Space.

C) Choose Card G. Facilitate a think-aloud process for students that includes the following questions.
   - How is this algebraic representation alike or different from Card A?
   - How do we determine the rate of change from this algebraic representation?
   - How can you determine if the rate of change is positive or negative?
   - Is this equation written in a form that will help you determine the rate of change?
   - How can you rewrite this equation in slope-intercept form?
   - What is the rate of change?
   - How can you verify that your answer is correct?

D) Prompt students to complete Card J independently of each other.

Listen For . . .
- *Understanding of how to calculate the rate of change from a table, graph, or equation.*
- *Understanding of how to determine the rate of change in a real-world situation.*
- *Understanding of the difference between a positive rate of change and a negative rate of change.*

Each intervention provides instructions on how to make the mathematics more explicit for students struggling with the content within the lesson.

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What is in a lesson found in *Closing the Distance*?

Each lesson provides an opportunity for student reflection as the student self-assesses strengths for each phase of the lesson. Following this self-assessment, students are prompted to note what they are most proud of and to set a goal to improve understanding.

Name: _____ Date:_____

My Reflections: Strengths and Areas for Improvement

Place a plus sign for each statement you feel is a strength after completing each lesson activity.

Lesson Activity	I can calculate the rate of change of a linear function in a mathematical problem using a table.	I can calculate the rate of change of a linear function in a mathematical problem using a graph.	I can calculate the rate of change of a linear function in a mathematical problem using an algebraic representation.	I can calculate the rate of change of a linear function in a real-world problem using a table.	I can calculate the rate of change of a linear function in a real-world problem using a graph.	I can calculate the rate of change of a linear function in a real-world problem using an algebraic representation.
Rate of Change Matching						
Rate of Change Card Sort						
Rate of Change Carousel						
Evaluate: Rate of Change						

I am most proud . . .

_____

_____

_____

To improve my understanding, I . . .

_____

_____

_____

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