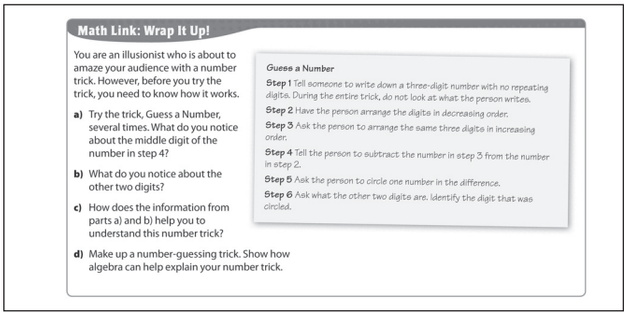
Math Link: Wrap It Up!


Math Link: Wrap It Up!

You are an illusionist who is about to amaze your audience with a number trick. However, before you try the trick, you need to know how it works.

a) Try the trick, Guess a Number, several times. What do you notice about the middle digit of the number in step 4?

b) What do you notice about the other two digits?

c) How does the information from parts a) and b) help you to understand this number trick?

d) Make up a number-guessing trick. Show how algebra can help explain your number trick.

Guess a Number

Step 1 Tell someone to write down a three-digit number with no repeating digits. During the entire trick, do not look at what the person writes.

Step 2 Have the person arrange the digits in decreasing order.

Step 3 Ask the person to arrange the same three digits in increasing order.

Step 4 Tell the person to subtract the number in step 3 from the number in step 2.

Step 5 Ask the person to circle one number in the difference.

Step 6 Ask what the other two digits are. Identify the digit that was circled.

***MathLinks 9*, page 207**

Suggested Timing
60–80 minutes

Blackline Masters
Master 1 Project Rubric
BLM 5–1 Chapter 5 Math Link Introduction
BLM 5–6 Section 5.1 Math Link
BLM 5–8 Section 5.2 Math Link
BLM 5–10 Section 5.3 Math Link
BLM 5–12 Chapter 5 Math Link: Wrap It Up!

Specific Outcomes
PR5 Demonstrate an understanding of polynomials (limited to polynomials of degree less than or equal to 2).
PR6 Model, record, and explain the operations of addition and subtraction of polynomial expressions, concretely, pictorially, and symbolically (limited to polynomials of degree less than or equal to 2).

Planning Notes

Introduce the problem and clarify the assessment criteria. Have students work through Guess a Number several times with different starting numbers. Encourage students to record their numbers at each step of the number puzzle and use the results to answer parts a) to c). Students should either find or make up a similar type of trick for part d). Ensure that multiple students do not select the same number trick.

Meeting Student Needs

- Encourage students to record their numbers for each step of Guess a Number.
- Have students try Guess a Number three or four times using different numbers. Ensure they record the middle digit and the other digits after Step 4. These numbers are the key to solving the problem.
- When students select or make up their Guess a Number trick in part d), encourage them to use a relatively short, simple trick because their main task is to explain how the trick works using polynomial algebra. At this point, students have only basic knowledge of algebraic operations. It is best if student number tricks are limited to addition and subtraction.
- A better option for your class may be to have a class discussion about parts a) to c) of the Wrap It Up! to help prepare them to complete part d) individually or in pairs.

Gifted and Enrichment

- In some card games, such as bridge, it is an advantage to keep track of cards that have been played in order to better predict upcoming cards. For example, knowing that all the spades in the deck have been played allows a player to expect no more to be available during a particular hand. Challenge students to create a polynomial that could be used to help a player remember cards that have been played. Have students test their method with real cards.

Common Errors

- Some students may have difficulty seeing the patterns in the Guess a Number trick.

R_x Remind students that their initial number should consist of three different digits (Step 1), and that they should follow the other steps exactly. After subtracting in Step 4, the middle digit must be 9. Ask students what the sum of the other two digits is (i.e., 9). Then, see if they can proceed on their own.

Answers

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a) The middle digit is 9.

b) The other two digits have a sum of 9.

c) Example: If the two numbers given add to 9, the other number is 9; if one of the numbers given is 9, the other two numbers must add to 9.

d) Example:

• Choose a number.	n
• Double it.	$2n$
• Add 9.	$2n + 9$
• Add the number you started with.	$3n + 9$
• Divide by 3.	$n + 3$
• Add 4.	$n + 7$
• Subtract the number you started with.	7

The result will always be 7.

Assessment	Supporting Learning
Assessment *of* Learning	
Math Link: Wrap It Up! This chapter problem wrap-up gives students an opportunity to demonstrate their understanding of how/why number tricks work. It is important for students to explain their reasoning and to use algebraic concepts and operations as part of their explanation for the number tricks. **Master 1 Project Rubric** provides a holistic descriptor that will assist you in assessing student work on this Wrap It Up! Page 207 in this TR provides notes on how to use this rubric for the Wrap It Up!	• You may wish to have students review the work they have completed in the Math Links in the introductions and in sections 5.1, 5.2, and 5.3 before they begin. • If students have not completed the Math Links, you may wish to provide them with **BLM 5–1 Chapter 5 Math Link Introduction, BLM 5–6 Section 5.1 Math Link, BLM 5–8 Section 5.2 Math Link, and BLM 5–10 Section 5.3 Math Link**. • You may wish to have students use **BLM 5–12, Chapter 5 Math Link: Wrap It Up!**, which provides scaffolding for the chapter problem wrap-up.

The chart below shows the **Master 1 Project Rubric** for tasks such as the Wrap It Up! and provides notes that specify how to identify the level of specific answers for the project.

Score/Level	Holistic Descriptor	Specific Question Notes
5 **(Standard of Excellence)**	❑ Applies/develops **thorough** strategies and mathematical processes making **significant** comparisons/connections that demonstrate a **comprehensive** understanding of how to develop a complete solution ❑ Procedures are **efficient and effective** and may contain a **minor mathematical error** that does not affect understanding ❑ Uses **significant** mathematical language to explain their understanding and provides **in-depth** support for their conclusion	• provides a correct and complete solution
4 **(Above Acceptable)**	❑ Applies/develops **thorough** strategies and mathematical processes for making **reasonable** comparisons/connections that demonstrate a **clear** understanding ❑ Procedures are **reasonable** and may contain a **minor mathematical error** that may hinder the understanding in one part of a complete solution ❑ Uses **appropriate** mathematical language to explain their understanding and provides **clear** support for their conclusion	Demonstrates one of the following: • provides a correct solution to all parts of the problem with weak or missing justification or communication in one part only • provides a correct and complete solution to parts a), b), and c), with part d) containing a minor error in either calculation or communication
3 **(Meets Acceptable)**	❑ Applies/develops **relevant** strategies and mathematical processes making **some** comparisons/connections that demonstrate a **basic** understanding ❑ Procedures are **basic** and may contain a **major error or omission** ❑ Uses **common** language to explain their understanding and provides **minimal** support for their conclusion	Demonstrates one of the following: • a correct solution for parts a), b), and c). Communication may be weak, but is attempted. • a correct and complete solution to part d)
2 **(Below Acceptable)**	❑ Applies/develops **some relevant** mathematical processes making **minimal** comparisons/connections that lead to a **partial solution** ❑ Procedures are **basic** and may contain **several major mathematical errors** ❑ Communication is **weak**	Demonstrates one of the following: • provides a correct solution to parts a) and b). Communication may be weak. • a correct significant start to part d)
1 **(Beginning)**	❑ Applies/develops an **initial start** that may be **partially correct** or could have led to a correct solution ❑ Communication is **weak or absent**	Demonstrates one of the following: • provides a correct initial attempt at part a) • provides a correct solution to part a)