

# Unit 5 Introduction

The Excursions in this unit reintroduce KenKen along with a new type of number puzzle. Students also solve word problems that require them to grapple with two different interpretations of division as they manage time and share food. The Excursions conclude with a problem involving the area of rectangles. Students will continue solving puzzles as part of the Adventures in this unit, along with extending their work with division. The final Adventure of the unit brings together the reasoning involved in solving puzzles and basic mathematical operations.

Excursions		
Task		Targeted Concepts
<b>A</b>	KenKen Again	Logic; basic facts with addition, subtraction, multiplication, and division
<b>B</b>	3-by-3 Addition Magic Square	Adding and subtracting multidigit numbers
<b>C</b>	Meatballs	“Sharing” or partition division
<b>D</b>	Time Management 1	“Sharing” or partition division; elapsed time
<b>E</b>	Ranking Remainders	“Grouping” or measurement division
<b>F</b>	Comparing Rectangles	Area of rectangles

Adventures		
Task		Targeted Concepts
<b>A</b>	KenKen AgainAgain	Logic; basic facts with addition, subtraction, multiplication, and division
<b>B</b>	3-by-3 Product Magic Square	Multiplication and division
<b>C</b>	Lasagna	“Sharing” or partition division with fractional results
<b>D</b>	Time Management 2	“Sharing” or partition division; elapsed time
<b>E</b>	Dog Years	Multiplication by 7; “grouping” or measurement division
<b>F</b>	Alphabet Soup	Logic; addition, multiplication, and division with basic facts

# Unit 5

## Excursions

	Task	Task Complete	Teacher Initials
<b>A</b>	KenKen Again <i>Required before Adv. A</i>		
<b>B</b>	3-by-3 Addition Magic Square <i>Required before Adv. B</i>		
<b>C</b>	Meatballs		
<b>D</b>	Time Management 1 <i>Required before Adv. D</i>		
<b>E</b>	Ranking Remainders		
<b>F</b>	Comparing Rectangles		

## Adventures

	Task	Task Complete	Teacher Initials
<b>A</b>	KenKen AgainAgain		
<b>B</b>	3-by-3 Product Magic Square		
<b>C</b>	Lasagna		
<b>D</b>	Time Management 2		
<b>E</b>	Dog Years		
<b>F</b>	Alphabet Soup		

## KenKen Again

Do you remember KenKens from a previous Concept Quest? In the KenKen puzzles provided for this task, the numbers 1, 2, 3, and 4 only appear once in each row and each column. The bold, outlined sections indicate how numbers add, subtract, multiply, or divide to the number provided.

Complete the three KenKen puzzles on the supplement page.

2	2-		3-
8×		7+	
2-			5+
	2÷		

# KenKen Again

2	2-		3-
8×		7+	
2-			5+
	2÷		

24×		3-	
	8+		9+
2-		2	
	2÷		

6×	3-	2÷	1
			7+
	1-		
1-		2÷	

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## 3-by-3 Addition Magic Square

In a 3-by-3 magic square, the numbers in each row, column, and two diagonals have the same sum. In the magic square below, some numbers are filled in already. Fill in the missing numbers for this magic square on the supplement page.

393		511
	334	
157		

## 3-by-3 Addition Magic Square

393		511
	334	
157		

## Meatballs

For this task, you need to assume that you like meatballs and would like as many meatballs as possible! For each of the “Would you rather ...?” scenarios below, justify your reasoning with equations, pictures, or both.

Would you rather:

- a. share 20 meatballs between 4 people, or share 18 meatballs between 3 people?
  
  
  
  
  
  
  
  
  
  
- b. share 56 meatballs between 7 people, or share 49 meatballs between 7 people?
  
  
  
  
  
  
  
  
  
  
- c. share 64 meatballs between 8 people, or share 32 meatballs between 4 people?
  
  
  
  
  
  
  
  
  
  
- d. share 47 meatballs between 9 people, or share 56 meatballs between 11 people?

## Time Management 1

It is 6:38 p.m. and Lakota gets ready for bed at 7:50 p.m. He plans to do these things before going to bed:

- practice piano
  - play with Legos
  - clean his desk
- a. He plans to spend the same amount of time doing each. How much time will he spend doing each task?
- b. Lakota's mother adds one more item to the list: talking to his grandparents. He will still spend the same amount of time on all tasks. How much time will he spend on each?

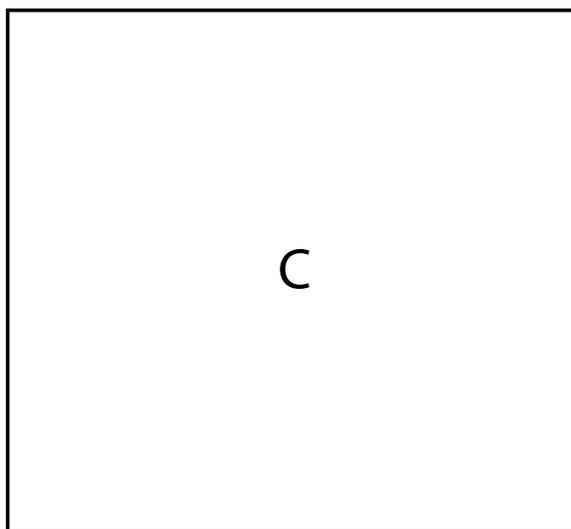
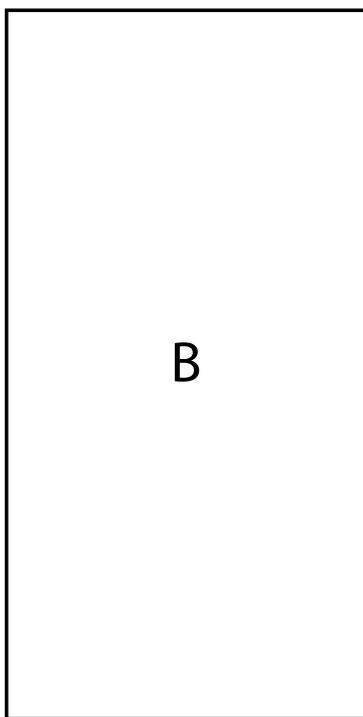
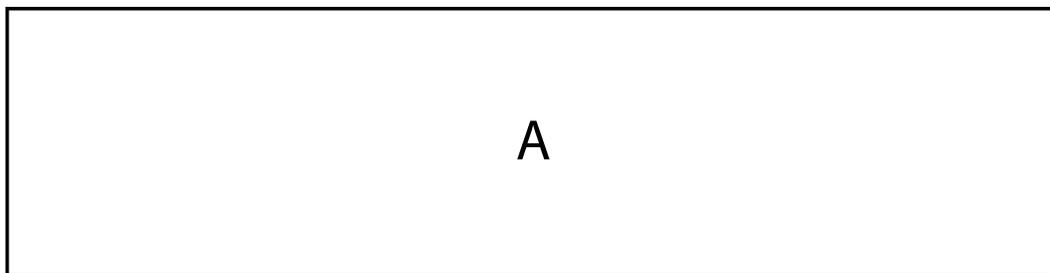
## Ranking Remainders

Solve the following problems. Then, decide what the remainder represents.

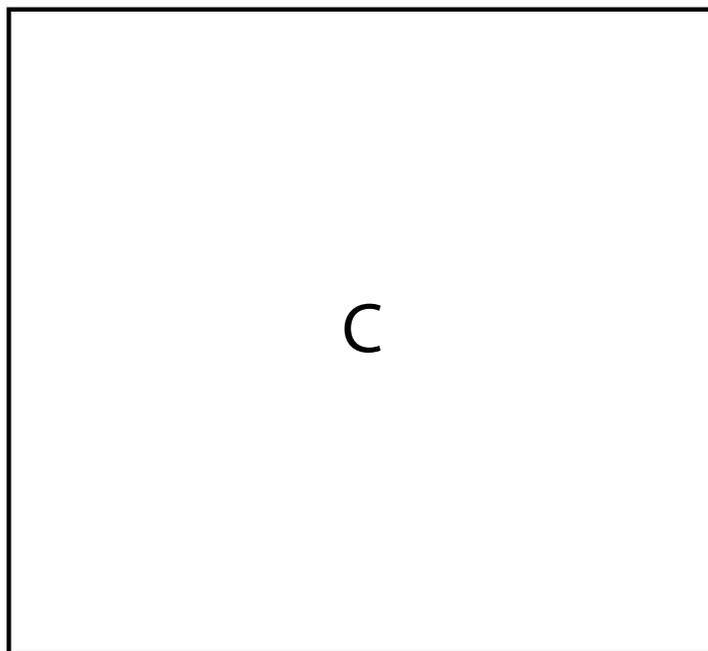
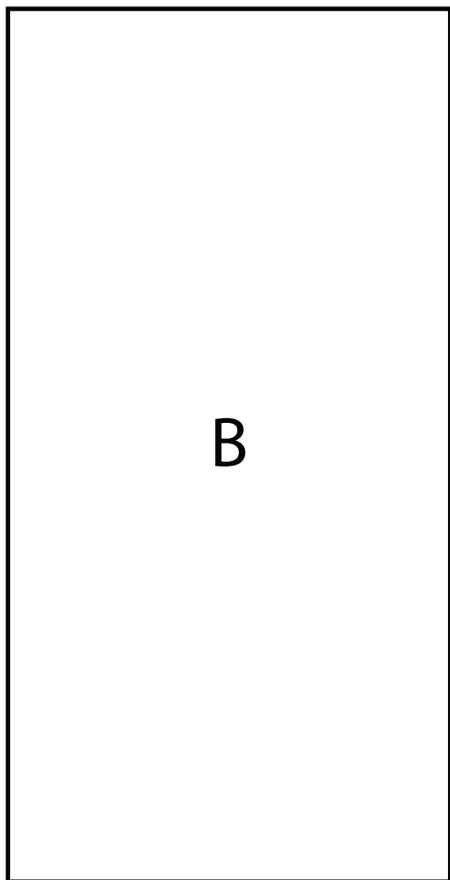
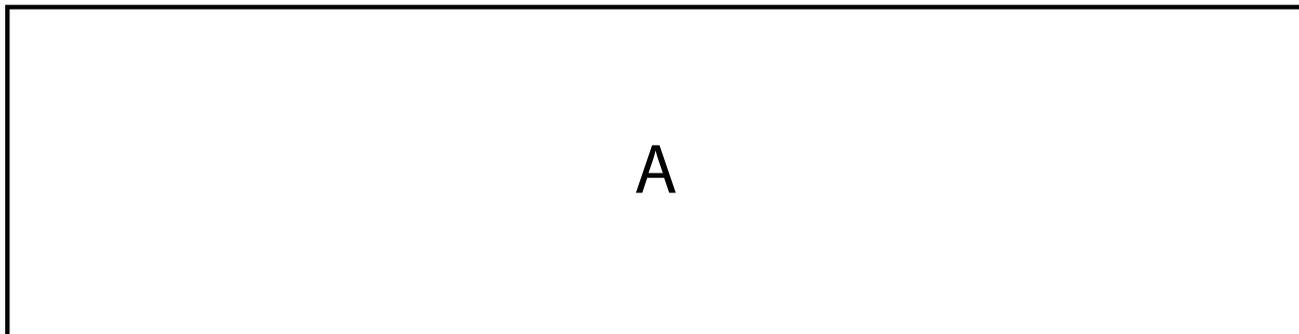
- a. The Regional Food Bank of Oklahoma has 32 cans of beans to share equally between 6 families. How many cans of beans will each family get?
  
- b. Families will receive 3 loaves of bread on their next visit to the Regional Food Bank of Oklahoma. If there are 19 loaves of bread, how many families can receive their 3 loaves?
  
- c. At the Regional Food Bank of Oklahoma, there are 49 boxes of macaroni and cheese. If each family will receive 5 boxes, how many families can receive macaroni and cheese?
  
- d. The Regional Food Bank of Oklahoma will distribute clementines to 8 families. If there are 75 clementines, and each family will receive the same amount, how many clementines will each family get?

## Comparing Rectangles

Order these rectangles by area, from smallest to largest. On the supplement page, explain or show how you know.



# Comparing Rectangles



## KenKen AgainAgain

Let's try some bigger KenKens. In the first two KenKen puzzles provided on the first supplement page, the numbers 1, 2, 3, 4, and 5 appear once in each row and each column. In the third KenKen puzzle provided on the second supplement page, the numbers 1–7 appear once in each row and each column. The bold, outlined sections indicate how numbers add, subtract, multiply, or divide to the number provided. Solve the puzzles!

18×		4−	9+	
	2		12+	2÷
20×		10+		
	8+		2÷	

# KenKen AgainAgain

18×		4-	9+	
	2		12+	2÷
20×		10+		
	8+		2÷	

2÷		60×		3
6×	4-		5	8×
		4		
16+		1-		4-
		3+		

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# KenKen AgainAgain

2÷		56×			4-	
7+	28×	9+			2÷	13+
		3+		24×		
56×			2-			9+
6-	150×			3+		
	6		13+	1-		
8+				70×		

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## 3-by-3 Product Magic Square

This magic square is a bit different. In this 3-by-3 magic square, the numbers in each row, column, and two diagonals have the same product. Some numbers are filled in already. On the supplement page, fill in the missing numbers for this magic square.

9	6	4
		3

# 3-by-3 Product Magic Square

9	6	4
		3



## Time Management 2

It is 6:47 p.m., and Emma needs to start getting ready for bed at 8:05 p.m. She will spend half as much time playing with the dog as she needs to clean her room. She also needs to finish her homework, which will take 10 minutes less than she will spend playing with the dog. How much time does she need to do each task if she uses all the time she has left before she gets ready for bed?

## Dog Years

Dr. Kim has two dogs, Bridger and Cody. Bridger is 4 years old, and Cody is half Bridger's age.

- a. How old will Cody be when Bridger is 16 years old?

A popular calculation (although not accurate) for comparing dog years to human years is that a dog ages 7 dog years for each human year that it has lived. That is, when a dog is 1 human year old, it is 7 dog years old.

- b. How many dog years old is Bridger when he is 4 human years old? How many dog years old is Cody if he is half Bridger's age?
- c. How many dog years old will Bridger be when he is 16 human years old? How old will Cody be then in dog years?
- d. If Cody is 91 dog years old, how many human years old is he? How old is Bridger at that time in human years?

# Alphabet Soup

The letters used below stand for the digits 1 through 9. Each letter is a different digit. Can you work out what digits each letter represents using the ten equations below? Do your work on the supplement page.

$$\mathbf{D + D = H}$$

$$\mathbf{K \times K = HK}$$

$$\mathbf{E + E = DF}$$

$$\mathbf{G \div H = A}$$

$$\mathbf{A \times F = DH}$$

$$\mathbf{C \div A = A}$$

$$\mathbf{D \times D = D}$$

$$\mathbf{DB \div C = H}$$

$$\mathbf{E \times K = AK}$$

$$\mathbf{DG \div B = H}$$

# Alphabet Soup

$$\mathbf{D + D = H}$$

$$\mathbf{K \times K = HK}$$

$$\mathbf{E + E = DF}$$

$$\mathbf{G \div H = A}$$

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$$\mathbf{C \div A = A}$$

$$\mathbf{D \times D = D}$$

$$\mathbf{DB \div C = H}$$

$$\mathbf{E \times K = AK}$$

$$\mathbf{DG \div B = H}$$



# Concept Quests

## Grade 3, Unit 5 – Answer Key

### Excursion 5A: KenKen Again

<sup>2</sup> 2	<sup>2-</sup> 3	1	<sup>3-</sup> 4
<sup>8×</sup> 4	2	<sup>7+</sup> 3	1
<sup>2-</sup> 3	1	4	<sup>5+</sup> 2
1	<sup>2÷</sup> 4	2	3

<sup>24×</sup> 2	3	<sup>3-</sup> 4	1
4	<sup>8+</sup> 1	3	<sup>9+</sup> 2
<sup>2-</sup> 1	4	<sup>2</sup> 2	3
3	<sup>2÷</sup> 2	1	4

<sup>6×</sup> 3	<sup>3-</sup> 4	<sup>2÷</sup> 2	<sup>1</sup> 1
2	1	4	<sup>7+</sup> 3
1	<sup>1-</sup> 2	3	4
<sup>1-</sup> 4	3	<sup>2÷</sup> 1	2

### Excursion 5B: 3-by-3 Addition Magic Square

In this magic square, each row, column, and diagonal sums to 1,002.

393	98	511
452	334	216
157	570	275

### Excursion 5C: Meatballs

- 20 meatballs shared between 4 people is 5 meatballs per person; 18 meatballs shared between 3 people is 6 meatballs per person. The second (18 and 3) is the better meatball deal.
- 56 meatballs shared between 7 people is 8 meatballs per person; 49 meatballs shared between 7 people is 7 meatballs per person. The first (56 and 7) is a better meatball deal.
- 64 meatballs shared between 8 people is 8 meatballs per person; 32 meatballs shared between 4 people is also 8 meatballs per person. They are equally beneficial meatball deals.
- 47 meatballs shared between 9 people is 5 meatballs per person with 2 meatballs remaining; 56 meatballs shared between 11 people is 5 meatballs per person with 1 remaining; the first is a better meatball deal, because the remaining 2 meatballs split between 9 people is better than splitting 1 meatball between 11 people.

### Excursion 5D: Time Management 1

- a. If Lakota has 72 minutes to split equally between three tasks, each will get 24 minutes.
- b. If Lakota splits the same amount of time equally between four tasks, each will get 18 minutes.

### Excursion 5E: Ranking Remainders

- a.  $32 \div 6 = 5 \text{ R } 2$   
Each family will get 5 cans, and there will be 2 cans left over.
- b.  $19 \div 3 = 6 \text{ R } 1$   
Six families can receive loaves, and there will be 1 loaf left over.
- c.  $49 \div 5 = 9 \text{ R } 4$ ; Nine families can receive macaroni and cheese, and there will be 4 boxes left over.
- d.  $75 \div 8 = 9 \text{ R } 3$ ; Each family will get 9 clementines, and there will be 3 clementines left over.

### Excursion 5F: Comparing Rectangles

Some of the dimensions in these rectangles are not whole number inches. Therefore, students may choose to cut the rectangles to compare the area. The order from largest to smallest is C, A, B.

### Adventure 5A: KenKen AgainAgain

<sup>18x</sup> 2	3	<sup>4-</sup> 1	<sup>9+</sup> 4	5
3	<sup>2</sup> 2	5	<sup>12+</sup> 1	<sup>2÷</sup> 4
<sup>20x</sup> 5	1	<sup>10+</sup> 4	3	2
1	4	2	5	3
4	<sup>8+</sup> 5	3	<sup>2÷</sup> 2	1

<sup>2÷</sup> 1	2	<sup>60x</sup> 5	4	<sup>3</sup> 3
<sup>6x</sup> 2	<sup>4-</sup> 1	3	<sup>5</sup> 5	<sup>8x</sup> 4
3	5	<sup>4</sup> 4	1	2
<sup>16+</sup> 5	4	<sup>1-</sup> 2	3	<sup>4-</sup> 1
4	3	<sup>3+</sup> 1	2	5

<sup>2÷</sup> 6	3	<sup>56x</sup> 2	4	7	<sup>4-</sup> 5	1
<sup>7+</sup> 2	<sup>28x</sup> 4	<sup>9+</sup> 3	1	5	<sup>2÷</sup> 6	<sup>13+</sup> 7
5	7	<sup>3+</sup> 1	2	<sup>24x</sup> 4	3	6
<sup>56x</sup> 4	2	7	<sup>2-</sup> 5	6	1	<sup>9+</sup> 3
<sup>6-</sup> 7	<sup>150x</sup> 5	6	3	<sup>3+</sup> 1	2	4
1	<sup>6</sup> 6	5	<sup>13+</sup> 7	<sup>1-</sup> 3	4	2
<sup>8+</sup> 3	1	4	6	<sup>70x</sup> 2	7	5

## Adventure 5B: 3-by-3 Product Magic Square

The product of each row, column, and diagonal in this magic square is 216.

12	1	18
9	6	4
2	36	3

## Adventure 5C: Lasagna

- a. Sharing 3 lasagnas between 2 families yields  $1\frac{1}{2}$  lasagnas per family.  
Sharing 4 lasagnas between 3 families yields  $1\frac{1}{3}$  lasagnas per family.  
The first scenario is a better lasagna deal.
- b. Sharing 4 lasagnas between 6 families yields  $\frac{2}{3}$  of a lasagna per family.  
Sharing 3 lasagnas between 4 families yields  $\frac{3}{4}$  of a lasagna per family.  
The second scenario is a better lasagna deal.
- c. Sharing 5 lasagnas between 3 families yields  $1\frac{2}{3}$  lasagnas per family.  
Sharing 6 lasagnas between 4 families yields  $1\frac{1}{2}$  lasagnas per family.  
The first scenario is a better lasagna deal.

*Students may focus on the fact that not every family has the same number of people. For the purpose of this problem, though, students are asked to consider “lasagnas per family” as the unit, so family size is irrelevant. As an extension, however, you might ask students to determine how much lasagna each person in their family would get; how much lasagna each person would get in two families with different numbers of people; or, how much lasagna each person would get if the lasagna was divided among people, not families.*

## Adventure 5D: Time Management 2

Emma needs 12 minutes to finish her homework, 44 minutes to clean her room, and 22 minutes to play with the dog. This will account for the 78 minutes between the present time and the time she needs to start getting ready for bed.

## Adventure 5E: Dog Years

a. Right now, Bridger is 4 and Cody is 2.

Cody is 2 years younger than Bridger:

- Bridger: 16
- Cody:  $16 - 2 = 14$

*The first part is a riddle, and students may get caught in the trap of thinking that Cody is 8 years old (half of 16) when Bridger is 16. However, Cody will be 14 at that time.*

b. Bridger is 28 dog years when he is 4 human years old. Cody is 14 dog years old at the same point in time.

c. Bridger is 112 dog years when he is 16 human years old. Cody is 98 dog years at that time.

d. If Cody is 91 dog years old, he is 13 human years old. Bridger would be 15 human years at that time.

## Adventure 5F: Alphabet Soup

$$A = 3 \quad F = 4$$

$$B = 8 \quad G = 6$$

$$C = 9 \quad H = 2$$

$$D = 1 \quad K = 5$$

$$E = 7$$