GRADE 3 MATH: WILD TURKEYS

UNIT OVERVIEW

The Wild Turkeys task is embedded in a 15-20 day unit focused on operations and algebraic thinking. Students demonstrate mastery by solving the Wild Turkeys task in one class period.

TASK DETAILS

Task Name: Wild Turkeys

Grade: 3

Subject: Math

Task Description: Students use a pattern to demonstrate number sense to 112, as well as knowledge of the days of the week and multiplication/addition.

Standards Assessed:
3.OA.1 Interpret products of whole numbers, e.g., interpret 5×7 as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as 5×7.
3.OA.2 Interpret whole-number quotients of whole numbers, e.g., interpret $56 \div 8$ as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. For example, describe a context in which a number of shares or a number of groups can be expressed as $56 \div 8$.
3.OA.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
3.OA.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.

Standards for Mathematical Practice:
MP.1 Make sense of problems and persevere in solving them.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.

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The task and instructional supports in the following pages are designed to help educators understand and implement tasks that are embedded in Common Core-aligned curricula. While the focus for the 2011-2012 Instructional Expectations is on engaging students in Common Core-aligned culminating tasks, it is imperative that the tasks are embedded in units of study that are also aligned to the new standards. Rather than asking teachers to introduce a task into the semester without context, this work is intended to encourage analysis of student and teacher work to understand what alignment looks like. We have learned through this year's Common Core pilots that beginning with rigorous assessments drives significant shifts in curriculum and pedagogy. Universal Design for Learning (UDL) support is included to ensure multiple entry points for all learners, including students with disabilities and English language learners.

Acknowledgements: The unit outline was developed by Shenaz Hashim (CFN 109) and Haydee Santino with input from Curriculum Designers Alignment Review Team. The tasks were developed by the schools in the 2010-2011 NYC DOE Elementary School Performance Based Assessment Pilot, in collaboration with Exemplars, Inc. and Center for Assessment.

GRADE 3 MATH: WILD TURKEYS PERFORMANCE TASK

Name_____

Wild Turkeys

Colin and Ryan see four wild turkeys on Sunday. Colin and Ryan see eight wild turkeys on Monday. Colin and Ryan see twelve wild turkeys on Tuesday. Colin and Ryan see sixteen wild turkeys on Wednesday. If this pattern continues how many wild turkeys do Colin and Ryan see on the seventh day? How many wild turkeys do Colin and Ryan see in all? Show all your mathematical thinking.

Preliminary Planning Sheet for a Mathematics Portfolio Piece/Task

(3)

Title of Task Wild Turkeys

Content Strand(s) Addressed Operations and Algebraic Thinking

State Standard(s) Addressed

Program Link

Common Core Standard(s) 3.OA 1, 2, 3, 9

Underlying Mathematical Concepts

number sense to 112
days of the week
multiplication/addition

Problem Solving Strategies/Representation

diagram/key
table
graph
numberline

Mathematical Language

diagram
key
table
graph
numberline
pattern
multiple
total
odd/even
amount
per
day, week, month
Mon., Tues, Wed....
dozen

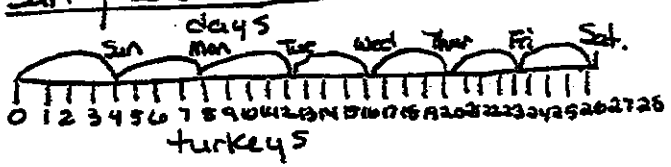
5

Possible Solution(s)

Answer
Sat - 28 turkeys
112 total turkeys

Wild Turkeys

day	Turkeys	total turkeys
Sun.	4	4
Mon.	8	12
Tues.	12	24
Wed.	16	40
Thurs.	20	60
Fri.	24	84
Sat.	28	112



Connections

- pattern turkey + 4 - even multiples
- Saw a dozen turkeys on Tuesday
- Continue for 2 weeks
- Relate to a similar problem and state math
- Verify by solving more than one way

Related Tasks

See Resource Binder

GRADE 3 MATH: WILD TURKEYS
UNIVERSAL DESIGN FOR LEARNING (UDL) PRINCIPLES

Wild Turkeys– Math Grade 3
Common Core Learning Standards/
Universal Design for Learning

The goal of using Common Core Learning Standards (CCLS) is to provide the highest academic standards to all of our students. Universal Design for Learning (UDL) is a set of principles that provides teachers with a structure to develop their instruction to meet the needs of a diversity of learners. UDL is a research-based framework that suggests each student learns in a unique manner. A one-size-fits-all approach is not effective to meet the diverse range of learners in our schools. By creating options for how instruction is presented, how students express their ideas, and how teachers can engage students in their learning, instruction can be customized and adjusted to meet individual student needs. In this manner, we can support our students to succeed in the CCLS.

Below are some ideas of how this Common Core Task is aligned with the three principles of UDL; providing options in representation, action/expression, and engagement. As UDL calls for multiple options, the possible list is endless. Please use this as a starting point. Think about your own group of students and assess whether these are options you can use.

REPRESENTATION: *The "what" of learning.* How does the task present information and content in different ways? How do students gather facts and categorize what they see, hear, and read? How are they identifying letters, words, or an author's style?

In this task, teachers can…

- ü **Embed visual, non-linguistic supports for vocabulary clarification (pictures, videos, etc)** by including print and/or online photographs or illustrations of turkeys.
- ü **Provide visual diagrams or charts,** such as a tally chart and/or graph, to record "day" and "number of turkeys."

ACTION/EXPRESSION: *The "how" of learning.* How does the task differentiate the ways that students can express what they know? How do they plan and perform tasks? How do students organize and express their ideas?

In this task, teachers can…

- ü **Use cues and prompts to draw attention to critical tasks** by assisting students with the organization of directions and task.
- ü **Provide checklists and project planning templates for understanding the problem, setting up prioritization, sequences, and schedule of steps** by reviewing ordinal numbers and developing steps to solve for the number of turkeys.

ENGAGEMENT: *The "why" of learning.* How does the task stimulate interest and motivation for learning? How do students get engaged? How are they challenged, excited, or interested?

In this task, teachers can…

- ü **Provide prompts, reminders, guides, rubrics, checklists that focus on elevating the frequency of self-reflection and self-reinforcements** by providing an assessment rubric that clearly delineates expectations of the task.

Visit http://schools.nyc.gov/Academics/CommonCoreLibrary/default.htm to learn more information about UDL.

GRADE 3 MATH: WILD TURKEYS
RUBRIC

Grade 3 Math: Wild Turkeys
Rubric

Grades 3 & 4: Progress-Monitoring Focus: Multiplication & Division; Fractions

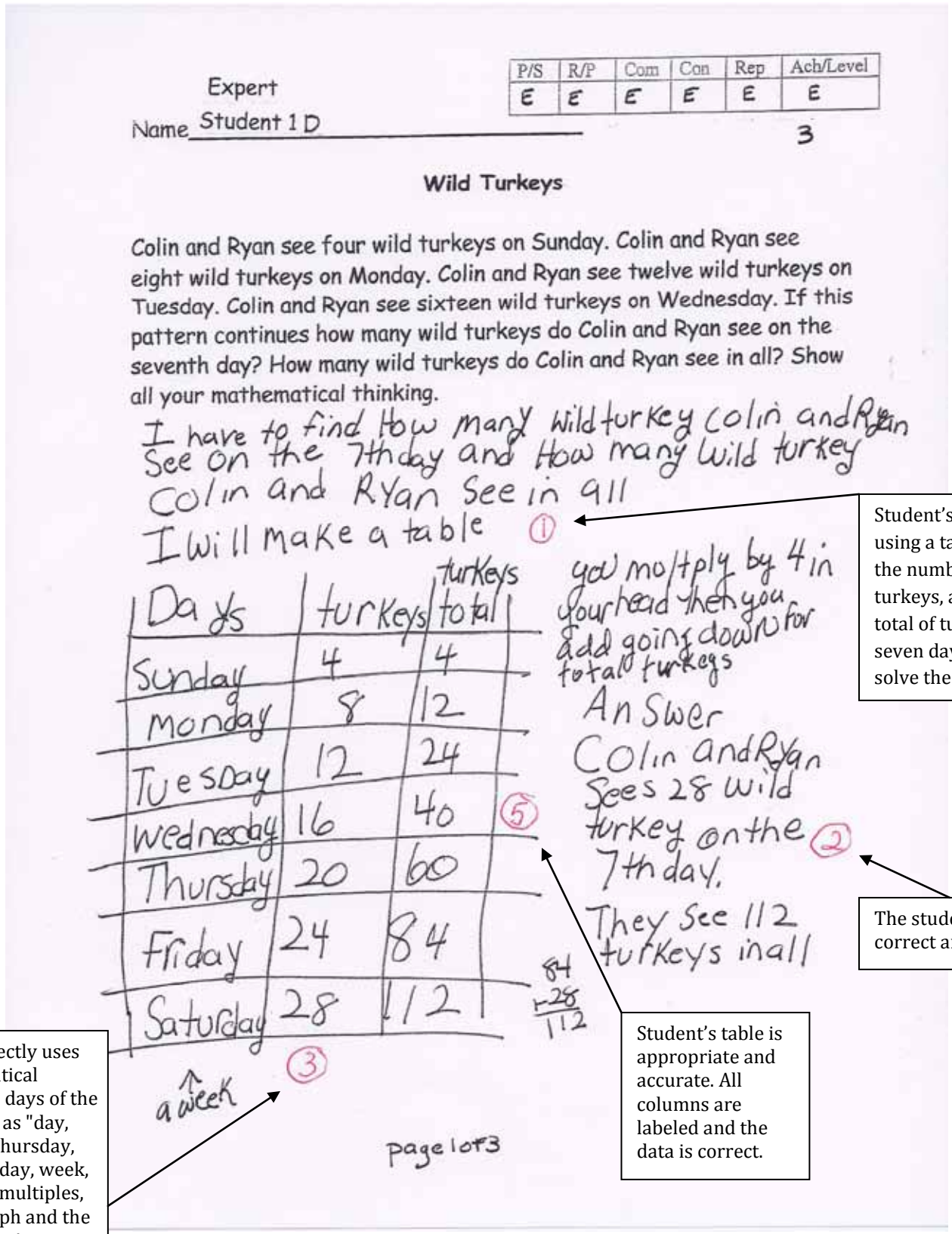
Gr. 3 & 4 Math CCSS Criteria/Clusters	Novice	Apprentice	Practitioner	Expert
Number & Operations in Base Ten **And** **Number & Operations - Fractions** **And** **Operations & Algebraic Thinking**	Applies flawed strategies (e.g., attempts to form groups when multiplying, but does not use equal sized groups) Selects the incorrect operation to perform or major inaccuracies in computation lead to an incorrect solution Still demonstrates limited knowledge of place value or number sense (e.g., difficulty estimating, representing part-whole relationships; cannot determine the reasonableness of an answer; does not see relationship between multiplication-division) A correct answer may be stated, but is not supported by student work or explanations	Some parts of problem correct and those parts are supported by student work Uses additive reasoning to solve or interpret most problems May include limited/ partial explanations Uses visual models (number line, area, sets) to represent parts of a whole but stops short of applying concepts in problem solving	***Expresses whole numbers as fractions*** **3.NF-3** ***Expresses fractions and equivalent fractions (gr 3-4) and decimal-fraction equivalents (gr 4); explains/ illustrates why they are equivalent (e.g., using visual models- number line, area, sets; compare to benchmarks)*** **3.NF-1, 2, 3** **4.NF-1, 2, 5, 6, 7** ***Uses addition, subtraction, and multiplication to solve problems with whole numbers, fractions (gr 3-4) and mixed numbers (gr 4)*** **3.NF-1, 2, 3** **4.NF-3, 4** ***Uses 4 operations in solving problems (e.g., using equations, explaining patterns using whole numbers, following a rule)*** **3.OA-3, 4, 5, 6, 7, 8, 9** **3.NBT-2, 3** **4.OA-2, 3, 5** ***Solves multi-step problems*** **3.OA-8** **4.OA-3** *Minor computation flaws do not affect outcome*	All parts of problem correct, precise, and supported by student work Extends understanding of equivalence of fractions by identifying proper and improper fractions Interprets meaning of the products when multiplying (gr 3-4) and remainder s when dividing (gr 4) Uses a variety of representations (e.g., concrete models, diagrams, equations), strategies, and operations to solve problems or represent solutions in multiple ways

NOTE: Anchor papers will illustrate how descriptors for each performance level are evidenced at each grade.

GRADE 3 MATH: WILD TURKEYS
ANNOTATED STUDENT WORK

This section contains annotated student work at a range of score points. The student work shows examples of student understandings and misunderstandings of the task.

Grade 3 Math: Wild Turkeys
Annotated Student Work



P/S	R/P	Com	Con	Rep	Ach/Level
E	E	E	E	E	E

Expert

Name Student 1 D

3

Wild Turkeys

Colin and Ryan see four wild turkeys on Sunday. Colin and Ryan see eight wild turkeys on Monday. Colin and Ryan see twelve wild turkeys on Tuesday. Colin and Ryan see sixteen wild turkeys on Wednesday. If this pattern continues how many wild turkeys do Colin and Ryan see on the seventh day? How many wild turkeys do Colin and Ryan see in all? Show all your mathematical thinking.

I have to find How many wild turkey colin and Ryan See on the 7th day and How many wild turkey Colin and Ryan See in all

I will make a table (1)

Days	turkeys	turkeys total
Sunday	4	4
monday	8	12
Tuesday	12	24
Wednesday	16	40 (5)
Thursday	20	60
Friday	24	84
Saturday	28	112

you multply by 4 in your head then you add going down for total turkeys

84 + 28 = 112

Answer

Colin and Ryan Sees 28 wild turkey on the 7th day. (2)

They See 112 turkeys in all

(3)

a week

page 1 of 3

Student's strategy of using a table to show the number of days, turkeys, and running total of turkeys for seven days works to solve the problem.

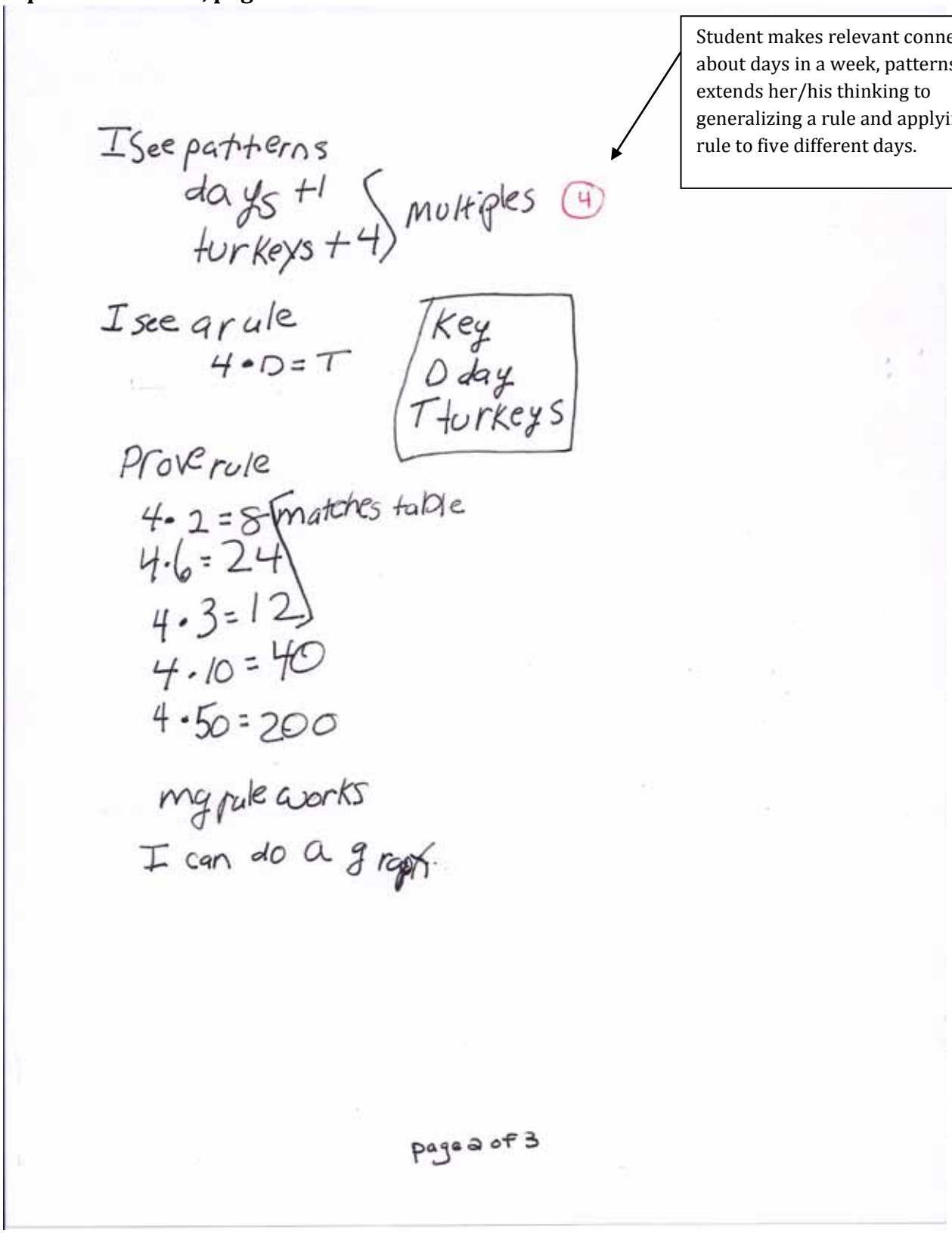
The student states correct answers.

Student's table is appropriate and accurate. All columns are labeled and the data is correct.

Student correctly uses the mathematical terms for the days of the week as well as "day, table, total, Thursday, Friday, Saturday, week, 7th, pattern, multiples, rule, key, graph and the symbolic notation $4 * D = T$."

Grade 3 Math: Wild Turkeys
Annotated Student Work

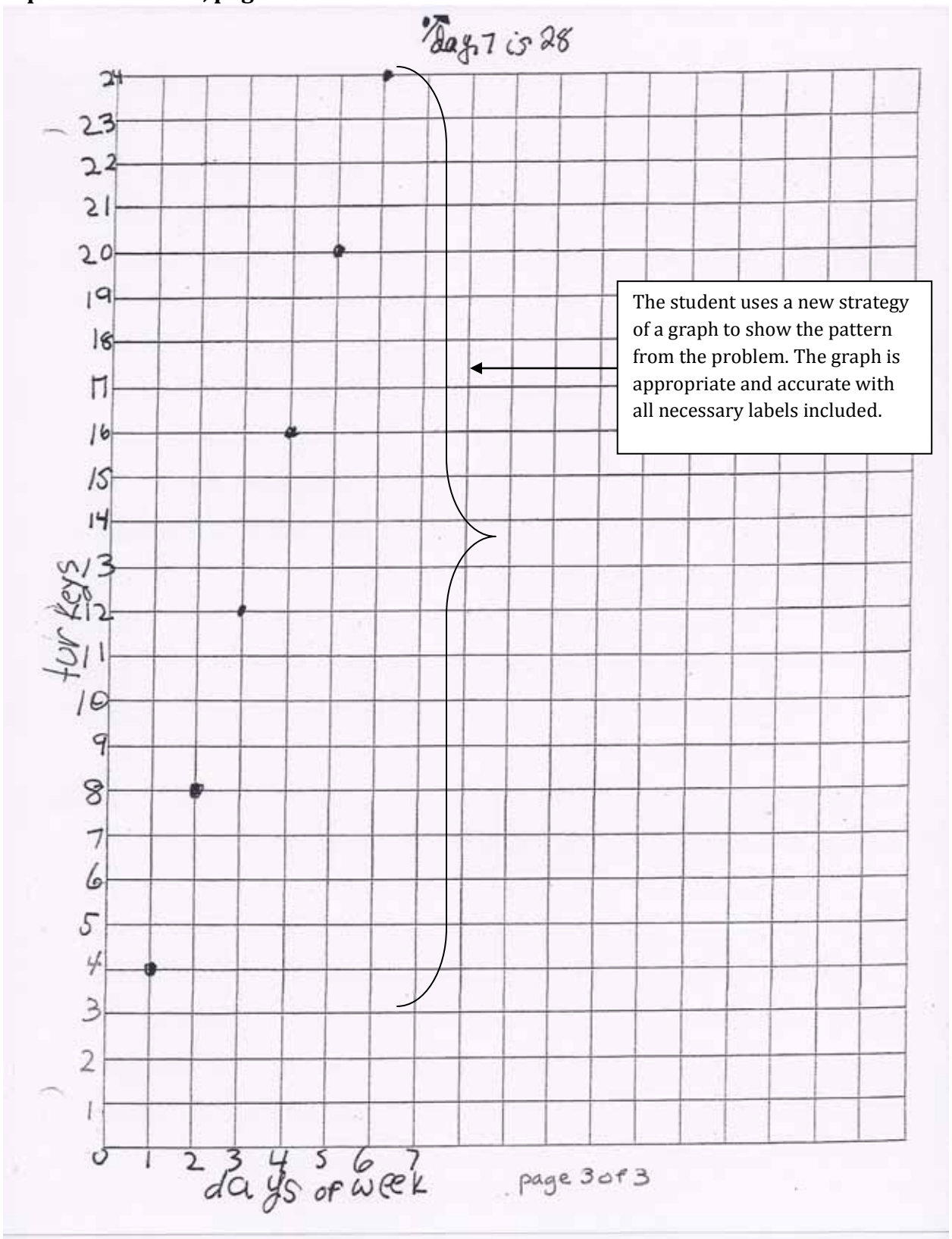
Expert Student 1D, page 2



Student makes relevant connections about days in a week, patterns, and extends her/his thinking to generalizing a rule and applying the rule to five different days.

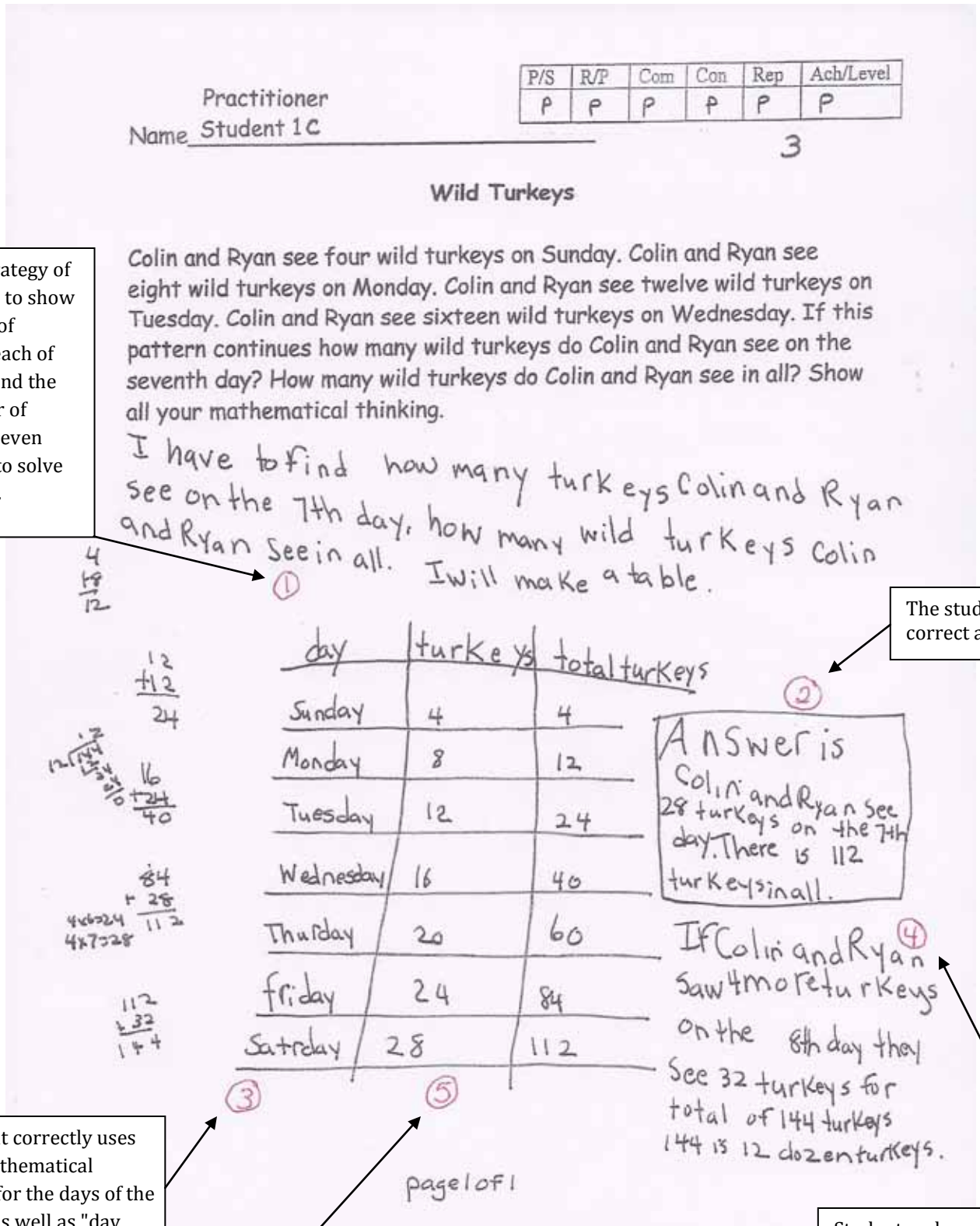
Grade 3 Math: Wild Turkeys
Annotated Student Work

Expert Student 1D, page 3



The student uses a new strategy of a graph to show the pattern from the problem. The graph is appropriate and accurate with all necessary labels included.

Grade 3 Math: Wild Turkeys
Annotated Student Work



P/S	R/P	Com	Con	Rep	Ach/Level
P	P	P	P	P	P

Practitioner

Name Student 1C

3

Wild Turkeys

Colin and Ryan see four wild turkeys on Sunday. Colin and Ryan see eight wild turkeys on Monday. Colin and Ryan see twelve wild turkeys on Tuesday. Colin and Ryan see sixteen wild turkeys on Wednesday. If this pattern continues how many wild turkeys do Colin and Ryan see on the seventh day? How many wild turkeys do Colin and Ryan see in all? Show all your mathematical thinking.

I have to find how many turkeys Colin and Ryan see on the 7th day. how many wild turkeys Colin and Ryan See in all. I will make a table.

day	turkeys	total turkeys
Sunday	4	4
Monday	8	12
Tuesday	12	24
Wednesday	16	40
Thursday	20	60
friday	24	84
Saturday	28	112

Answer is Colin and Ryan see 28 turkeys on the 7th day. There is 112 turkeys in all.

If Colin and Ryan saw 4 more turkeys on the 8th day they See 32 turkeys for total of 144 turkeys 144 is 12 dozen turkeys.

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Student's strategy of using a table to show the number of turkeys for each of seven days and the total number of turkeys for seven days works to solve the problem.

The student states correct answers.

Student correctly uses the mathematical terms for the days of the week as well as "day, table, total, more, 7th, 8th."

Student's table is appropriate and accurate. All columns are labeled and the data is correct.

Student makes a relevant connection by finding the number of turkeys for the 8th day as well as the running total of turkeys.

Grade 3 Math: Wild Turkeys
Annotated Student Work

P/S	R/P	Com	Con	Rep	Ach/Level
P	P	P	P	P	P

Practitioner
Name Student 2C 3

Wild Turkeys

Colin and Ryan see four wild turkeys on Sunday. Colin and Ryan see eight wild turkeys on Monday. Colin and Ryan see twelve wild turkeys on Tuesday. Colin and Ryan see sixteen wild turkeys on Wednesday. If this pattern continues how many wild turkeys do Colin and Ryan see on the seventh day? How many wild turkeys do Colin and Ryan see in all? Show all your mathematical thinking.

I will make a table to find out the pattern and multiply to the 7th day and find the total turkeys. (1)

(5)

Turkeys	Days	Days of the week	running total turkeys
4	1	Sunday	4
8	2	Monday	12
12	3	Tuesday	24
16	4	Wednesday	40
20	5	Thursday	60
24	6	Friday	84
28	7	Saturday	112

4x1=4
4x2=8
4x3=12
4x4=16
4x5=20
4x6=24
4x7=28

24 16 40

84 28 112

(2)

Answer
28 turkeys seen on the 7th day

You multiply like input 1 day output 4 turkeys input 2 days output 8 turkeys

Answer
112 turkeys are seen in all

(3)

(4) Patterns are multiples of 4 so all are even numbers 7 days is 1 week

page 1 of 1

Student's table is appropriate and accurate. All columns are labeled and the data is correct.

Student's strategy of using a table to show the number of turkeys, days, days of the week, and running total of turkeys for seven days works to solve the problem.

The student states correct answers.

Student correctly uses the mathematical terms for the days of the week as well as "day, table, total, Thursday, Friday, Saturday, input, output, pattern, multiple, even numbers."

Student makes relevant connections about using input/output, discovering the multiple even patterns of +4 and that all totals are even.

Grade 3 Math: Wild Turkeys
Annotated Student Work

Apprentice

Name Student 1 B

P/S	R/P	Com	Con	Rep	Ach/Level
A	P	P	N	A	A

3

Wild Turkeys

Colin and Ryan see four wild turkeys on Sunday. Colin and Ryan see eight wild turkeys on Monday. Colin and Ryan see twelve wild turkeys on Tuesday. Colin and Ryan see sixteen wild turkeys on Wednesday. If this pattern continues how many wild turkeys do Colin and Ryan see on the seventh day? How many wild turkeys do Colin and Ryan see in all? Show all your mathematical thinking.

I have to find how many wild turkeys Colin and Ryan see on the 7th day and how many wild turkeys they see in all

I will make a table (1)

	day	turkey	total
1	Sun	4	4
2	Mon	8	12
3	Tue	12	24
4	Wed	16	40
5	Thurs	20	60
6	Fri	24	84
7	Sat.	26	110

(5)

Answer

Colin and Ryan See 26 Wild turKeys Colin and Ryan See 110 in all turKeys

(2)

(3)

(4)

page 1 of 1

Student's strategy of using a table to show the number of turkeys for each of seven days and the total number of turkeys for seven days would work to solve the problem but the student has computational errors which lead to an incorrect answer.

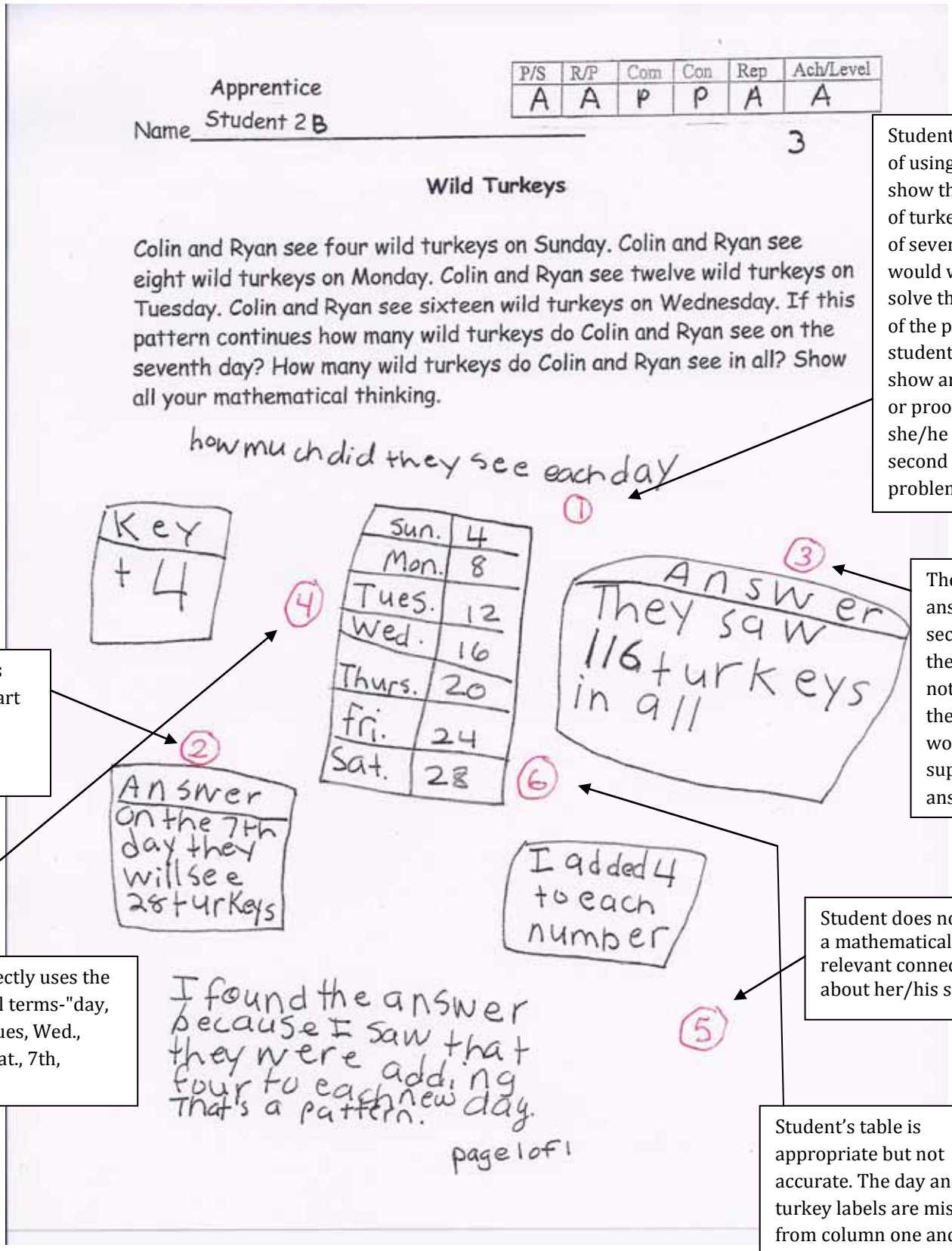
Student's table is appropriate but not accurate. There is no label for the first column and the turkey and total data for Saturday is not correct.

Both answers are incorrect due to incorrect calculation.

Student correctly uses the mathematical terms for the days of the week as well as "day, table, total.

Student does not make a mathematically relevant connection about her/his solution.

Grade 3 Math: Wild Turkeys
Annotated Student Work



Apprentice

Name Student 2 B

P/S	R/P	Com	Con	Rep	Ach/Level
A	A	P	P	A	A

3

Wild Turkeys

Colin and Ryan see four wild turkeys on Sunday. Colin and Ryan see eight wild turkeys on Monday. Colin and Ryan see twelve wild turkeys on Tuesday. Colin and Ryan see sixteen wild turkeys on Wednesday. If this pattern continues how many wild turkeys do Colin and Ryan see on the seventh day? How many wild turkeys do Colin and Ryan see in all? Show all your mathematical thinking.

how much did they see each day

(1)

Key
+4

(4)

Sun.	4
Mon.	8
Tues.	12
Wed.	16
Thurs.	20
fri.	24
Sat.	28

(3)

Answer
They saw 116 turkeys in all

(2)

Answer
On the 7th day they will see 28 turkeys

(6)

I added 4 to each number

I found the answer because I saw that they were adding four to each new day. That's a pattern.

(5)

page 1 of 1

Student's strategy of using a table to show the number of turkeys for each of seven days would work to solve the first part of the problem. The student does not show any reasoning or proof of how she/he solved the second part of the problem.

The student's answer for the second part of the problem is not correct and there is no work to support that answer.

The student's answer for part one of the problems is correct.

Student correctly uses the mathematical terms-"day, Sun,. Mon., Tues, Wed., Thurs., Fri., Sat., 7th, number."

Student does not make a mathematically relevant connection about her/his solution.

Student's table is appropriate but not accurate. The day and turkey labels are missing from column one and column two.

Grade 3 Math: Wild Turkeys
Annotated Student Work

P/S	R/P	Com	Con	Rep	Ach/Level
A	A	N	N	A	N

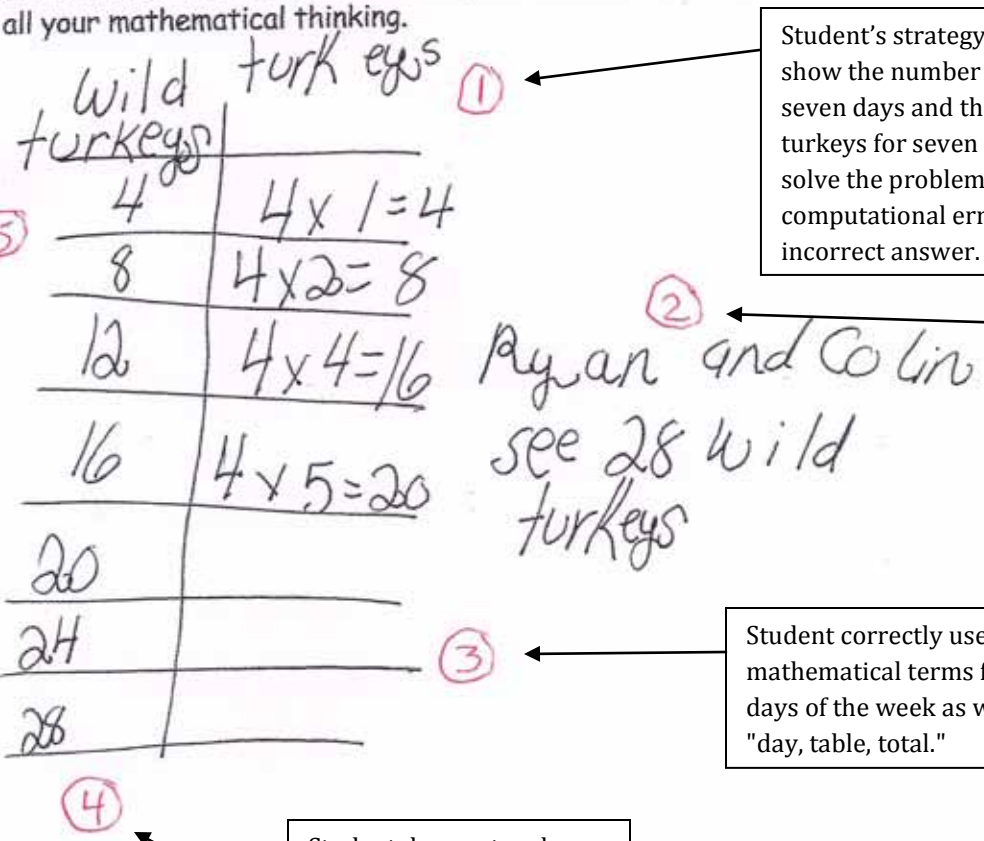
Novice

Name Student 1 A

3

Wild Turkeys

Colin and Ryan see four wild turkeys on Sunday. Colin and Ryan see eight wild turkeys on Monday. Colin and Ryan see twelve wild turkeys on Tuesday. Colin and Ryan see sixteen wild turkeys on Wednesday. If this pattern continues how many wild turkeys do Colin and Ryan see on the seventh day? How many wild turkeys do Colin and Ryan see in all? Show all your mathematical thinking.



Student's strategy of using a table to show the number of turkeys for each of seven days and the total number of turkeys for seven days would work to solve the problem but the student has computational errors which lead to an incorrect answer.

Both answers are incorrect due to incorrect calculation.

Student's table is appropriate but not accurate. There is no label for the first column and the turkey and total data for Saturday is not correct.

Student correctly uses the mathematical terms for the days of the week as well as "day, table, total."

Student does not make mathematically relevant connections about her/his solution.

GRADE 3 MATH: WILD TURKEYS
INSTRUCTIONAL SUPPORTS

The instructional supports on the following pages include a unit outline with formative assessments and suggested learning activities. Teachers may use this unit outline as it is described, integrate parts of it into a currently existing curriculum unit, or use it as a model or checklist for a currently existing unit on a different topic.

Unit Outline –Grade 3 Math

INTRODUCTION: This unit outline provides an example of how teachers may integrate performance tasks into a unit. *Teachers may (a) use this unit outline as it is described below; (b) integrate parts of it into a currently existing curriculum unit; or (c) use it as a model or checklist for a currently existing unit on a different topic.*

Grade 3 Math: Developing Algebraic Thinking

UNIT TOPIC AND LENGTH:

- Concepts and skills that build algebraic thinking-exploring growing patterns
- 15-20 days

COMMON CORE LEARNING STANDARDS:

- 3. OA.1 Interpret products of whole numbers, e.g., interpret 5 X 7 as the total number of objects in 5 groups of 7 objects each. For example, describe a context in which a total number of objects can be expressed as 5 × 7.
- 3. OA.3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
- 3. OA.9 Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.
- 3. NBT.2 Fluently adds and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
- 4. OA.5 Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. For example, given the rule "Add 3" and the starting number 1 generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.
- MP.1 Make sense of problems and persevere in solving them.
- MP.3 Construct viable arguments and critique the reasoning of others.
- MP.6 Attend to precision.
- MP.7 Look for and make use of structure.

Unit Outline –Grade 3 Math

BIG IDEAS/ENDURING UNDERSTANDINGS:

- Mathematicians use arithmetic patterns including addition and multiplication patterns to make connections between various ways to make a pattern
- Mathematicians use patterns involving properties of operations
- Mathematicians apply algebraic relationships involving patterns including functions, variables, and the use of patterns in tables, equations, and graphs using manipulatives or other visual models
- Mathematicians solve word problems involving patterns, properties of operations, use of tables, equations, and graphs including two-step problems

ESSENTIAL QUESTIONS:

- What ways can I show patterns?
- How do I know what method to use to solve problems?
- How do I know what strategy to use when solving word problems?
- What will I share to justify and defend my answer when solving any problem?

CONTENT:

Patterns

- In addition and multiplication
- Repeating patterns
- Growing patterns
- Numerical and geometric patterns

Representations

- Variables and unknowns
- Graphing functions
- Input and output tables (T-charts)
- Dependent and independent variables

Problem Solving

- Strategies/Method
- Real life context

SKILLS:

- **Recognize, create** and verbally **describe** different types of patterns
- **Represent** patterns using different types of geometric models and tools
- **Extend** numerical and geometric patterns in input and output tables
- **Interpret** patterns and rules from input and output tables
- **Build** on the concept of patterns utilizing various visual tools
- **Identify, describe,** and **explain** the concepts of the 4 operations to understand the rules of a pattern: adding, multiplication, division and subtraction
- **Describe** patterns and rules using key algebraic words or phrases

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- **Create** generalizations about rules

	from input and output tables ➢ **Formulate** predictions from input and output tables ➢ **Solve** for unknown values in input/output tables ➢ **Write** an equation to represent the rule from an input and output table ➢ **Plot** points in a coordinate grid ➢ **Graph** the linear function of a pattern in a coordinate plane ➢ **Identify** patterns among relationships of input and output tables _____ ➢ **Construct** different types of tables to represent given and missing information from a word problem ➢ **Apply** the concepts of patterns to solve word problems in real life context

KEY TERMS/ VOCABULARY:

Increasing, decreasing, twice, half, double, addition, subtraction, multiplication, term, sequence, vertical, horizontal, intersect, diagonal

ASSESSMENT EVIDENCE AND ACTIVITIES:

INITIAL ASSESSMENT : PICKING TOMATOES

After the teachers have activated students' prior knowledge of "repeating patterns" and completed initial tasks in problem solving using different strategies – number lines, tables – to represent and solve word problems, students will be given the initial assignment of "Picking Tomatoes". This task will give teachers an insight into students' level of conceptual understanding of number sense and operations and the concept of growing patterns. In addition students will be given several word problems in which they will be asked to organize the given and missing information using tables. *See the task "Picking Tomatoes" and the associated planning sheet for full details.*

FORMATIVE ASSESSMENT:

After students have completed tasks involving the 4 operations up to the place value in the 1000's; have been introduced to the concept of "growing patterns" , and have deepened their knowledge of solving word problems using a variety of representations, students will be asked to create their own problems using an input and output table.

In addition, students will be asked to analyze and interpret given and missing information from a word problem into visual representations.

Unit Outline –Grade 3 Math

FINAL PERFORMANCE TASK: WILD TURKEYS

At the end of the unit the teacher will give the class the final assessment to see how students have improved their thinking and mathematical skills over the course of the instructional unit. This task – "Wild Turkey"—assesses students' skills in and knowledge of recognizing geometric patterns, visualizing and extending the pattern, generating a linear function , developing an algebraic generalization verbally, visually or in an equation format, plotting points in coordinate grid, having the knowledge of working with input and output values which are the foundational concepts of a function. *See the task "Wild Turkeys" and the associated planning sheet for full details.*

LEARNING PLAN & ACTIVITIES:

Please see the Resources section for the information on the books referenced below.

Lessons and Activities

1. Introduce or revisit the problem solving strategy of using a table and a number line to solve a word problem: understand, represent , analyze and organize information from a world problem (**2 days)**
2. Activate prior knowledge by revisiting the concept of pattern students have seen already in grades K-2: Repeating-Pattern Activities and Frames and Arrows Lessons from Grades K-2 Elementary and Middle School Mathematics , pages 392-407 **(2 days)**
3. Introduce students to the concept of growing patterns, recording and extending the pattern, representing the pattern algebraically with an equation "Two of Everything"-A First Experience with Growing Patterns. It introduces students to the idea of a function, which is the relationship between two variables: the input and output. Students describe the patterns in words and with an equation. Students create also their own rules. (Chapter 1, Lessons for Algebraic Thinking, pages 3-26) (**3 days)**
4. Introduce students to learn to write equations using one variable-open sentences
5. (x +3 =7) and 2 X = 12 (Chapter 2, - True, False and Open Sentences, Lessons for Algebraic Thinking, pages 27- 42) (**1 day)**
6. Introduce students to the concept of coordinate graphing (chapter 3, Lessons for Algebraic Thinking, pages 43-54) (**1 day)**
7. Student practice plotting points in a coordinate grid by playing a game: Tic- Tac –Toe (chapter 4, Lessons for Algebraic Thinking, pages 55-70) (**1 day)**
8. Students apply their skills of plotting points to represent patterns graphically (Chapter 5, Lessons for Algebraic Thinking, pages 71-90) (**2 days)**

Evidence of Students' Learning

1. **Journal Writing**
   a. Students may be directed to reflect on the answers to the essential questions as they are used throughout the lessons

2. **Students may be exposed to different types of activities as listed below during the mathematics blocks , as extensions for homework, and quizzes**
   a. Solving a word problem using a table and a number line
   b. Identifying appropriate tables to represent information from a word problem

c. Completing input and output tables problems
d. Identifying and writing the rules from input and output tables
e. Applying the strategy of using a table to solve a word problem
f. Creating their own patterns, recognizing patterns, writing rules
g. Representing patterns using different models

Suggested Order of Tasks
Initial Activities

1. Activities with repeating patterns
2. "Picking Tomatoes" – After the first lesson of "Two of Everything"
3. "Books on the Shelves" – After lesson on problem solving strategy-using a table
4. "Soccer Cards"
5. "Sport Cards"
6. "Making Bracelets" – Organizing information in a more complicated table. Later on can be revisited again to write the rule or other representations-middle assessment

Middle Assessments – *use as needed to build and reinforce concepts*

1. "Saving Nickels"
2. "Helping the Library"
3. "Animal Pictures"
4. "Pictures in the Hallway"

Final Task

1. "Wild Turkeys"

Extension Activities – *use as needed to build and reinforce concepts and challenge students*

1. "Counting Cats"
2. "Collecting Stamps"

Unit Outline –Grade 3 Math

RESOURCES:

Texts

- Elementary and Middle School Mathematics, John A. Van de Walle, Third Edition; chapter 18 pages 392-407
- Fostering Algebraic Thinking, Mark Driscoll; Chapter 1 pages 2-5
- Lessons for Algebraic Thinking, Maryann Wickett, Katherine Kharas and Marylyn Burns; pages xi-xx and pages 3-90
- Lessons on Frames and Arrows From Everyday Mathematics – second edition, grades 1- 3

Field Trips

- Botanical Garden – Identifying Patterns in Nature
- MOMA (October – Math Exhibit)

Interdisciplinary Connections

- Science and Art Connections – Patterns in the Body and Collage
- Literacy Connection – Students explain their logical reasoning by using appropriate math vocabulary

Name_____

Picking Tomatoes

Nick has many tomato plants in his garden. The tomatoes are turning red in the sunshine. The first day Nick picks 3 tomatoes. The second day Nick picks 6 tomatoes. The third day Nick picks 9 tomatoes. The fourth day Nick picks 12 tomatoes. If this pattern continues, how many tomatoes does Nick pick on the tenth day? Show all your mathematical thinking.

Preliminary Planning Sheet for a Mathematics Portfolio Piece/Task ③

Title of Task Picking Tomatoes
Content Strand(s) Addressed Operations & Algebraic Thinking
State Standard(s) Addressed
Program Link
Common Core Standard(s) 3.OA. 1, 2, 3, 9

Underlying Mathematical Concepts

Number sense to 30
ordinal numbers
multiplication/addition

Problem Solving Strategies/Representation

model (manipulatives)
table
diagram/key
graph
number line

Mathematical Language

model
table
graph
diagram
key
day
week
month
pattern
rule
variable
3·d=T
multiples
odd/even
per
1st, 2nd, 3rd...
ordinal numbers
number line

Answer
30 tomatoes

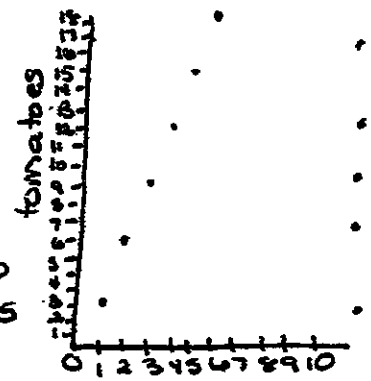
Possible Solution(s)

Picking Tomatoes

day	tomatoes
1	3
2	6
3	9
4	12
5	15
6	18
7	21
8	24
9	27
10	30

rule
3·d=T
3·5=15
3·10=30
3·15=45

Key
d is day
T is tomatoes



(use grid paper)

Connections

- Patterns day + 1 tomatoes + 3 - odd/even
- rule 3·d=T verify rule
- continue table to 2 weeks...
- verify by solving more than one way
- relate to a similar problem and state math
- picks a total of 165 tomatoes
- +3 multiples
- graph input/output

Related Tasks

See the Resource Binder

P/S	R/P	Com	Con	Rep	Ach/Level

Name_____

Animal Pictures

Ken is collecting animal pictures to cover a large bulletin board. The first day Ken collects 4 animal pictures. The second day Ken collects 8 animal pictures. The third day Ken collects 12 animal pictures The fourth day Ken collects 16 animal pictures. If this pattern continues, how many animal pictures does Ken collect on the thirty-fifth day? Show all your mathematical thinking.

Preliminary Planning Sheet for a Mathematics Portfolio Piece/Task

③

Title of Task Animal Pictures *

Content Strand(s) Addressed Operations + Algebraic Thinking

State Standard(s) Addressed

Program Link

Common Core Standard(s) 3.OA 1, 2, 3, 9

Underlying Mathematical Concepts

number sense to 40/140
ordinial numbers
multiplication/addition

Problem Solving Strategies/Representation

diagram/key
table
graph
numberline

Mathematical Language

diagram
key
table
graph
axis
per
pattern
multiples
day
week
rule
variable
4·d=p
odd/even
input/output
total
numberline

Possible Solution(s)

Answer
140 pictures

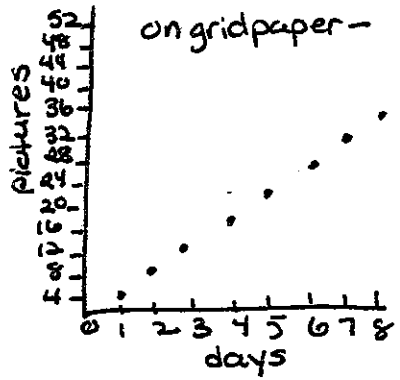
Animal Pictures

day	pictures
1	4
2	8
3	12
4	16
5	20
6	24
7	28
8	32
9	36
10	40

rule
4·d=p
4·4=16
4·6=24
4·10=40
4·35=140

Key
d day
p pictures

on grid paper –



Connections

- pattern: day +1, pictures +4 – all even multiples
- ten days is a total of 220 pictures
- Relate to a similar problem and state math
- generalize rule and verify for a number of days
- graph input/output
- verify by solving more than 1 way

Related Tasks

* do not use unless student can generalize rule

P/S	R/P	Com	Con	Rep	Ach/Level

Name_____

Collecting Stamps

Leslie and Jordan are beginning to collect stamps. Leslie has 9 stamps. Leslie's mom brings Leslie 2 new stamps from her office each week. Jordan has 5 stamps. Jordan's mom bring 3 stamps from her office each week. Leslie says that Jordan will never have more stamps. Is Leslie correct? Show all your mathematical thinking.

Preliminary Planning Sheet for a Mathematics Portfolio Piece/Task (3)

Title of Task Collecting Stamps

Content Strand(s) Addressed Operations + Algebraic Thinking

State Standard(s) Addressed

Program Link

Common Core Standard(s) 3.OA 1, 2, 3, 9

Underlying Mathematical Concepts

patterns starts from 9 and 5, not 0
number sense to 20
addition / multiplication
comparison

Problem Solving Strategies/Representation

manipulatives/model
diagram / key
table
tally chart
number line
graph

Mathematical Language

model
diagram
key
table
tally chart
number line
graph
pattern
fair share
~~total~~
amount
product
axis
rule
variable
per
more/less/than
week, day, month
odd/even

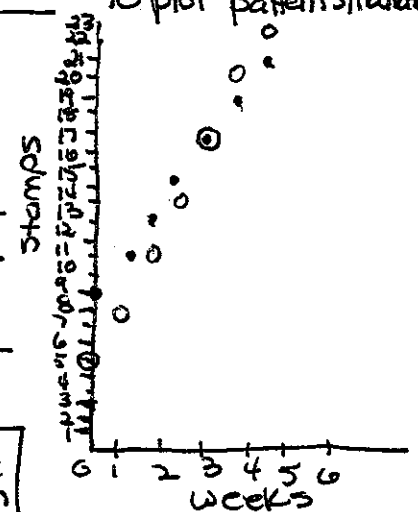
Possible Solution(s)

Collecting Stamps

Answer: Leslie is incorrect

week	Leslie's Stamps	Jordan's Stamps
0	9	5
1	11	8
2	13	11
3	15	14
4	17	17
5	19	20
6	21	23
7	23	26
8	25	29

(use graph paper to plot patterns/findings)



Key
• Leslie
o Jordan

Connections

- patterns weeks + 1
  Leslie's stamps + 2 from 9
  Jordan's stamp + 3 from 5
- Leslie always has odd total stamps
- Jordan has odd/even stamp total
- Relate to a similar problem and state math
- Solve more than 1 way to verify
- Had a fair share of stamps on week 4
- If you continue table you see that each week from 5 on, Jordan has 1 more stamp than the week before when comparing to Leslie
  20-19=1 23-21=2 26-23=3
  29-25=4

Related Tasks

See Resource Binder

- Four weeks is 1 month (approx) when the tied -28 days
- at 1 month, 1 week (approx) Jordan starts to have more stamps.

Key
w week
stamps

rules $(2 \cdot w) + 9 = S$ Leslie
$(2 \cdot 5) + 9 = 19$
$(2 \cdot 8) + 9 = 25$
$(2 \cdot 10) + 9 = 29$
$(2 \cdot w) + 5 = S$ - Jordan
$(2 \cdot 3) + 5 = 11$ $(2 \cdot 10) + 5 = 25$

P/S	R/P	Com	Con	Rep	Ach/Level

Name_____

Counting Cats

Chris loves cats. Chris decides to count how many cats he sees each day. The first day Chris sees two cats. The second day Chris sees five cats. The third day Chris sees eight cats. The fourth day Chris sees eleven cats. Chris is keeping a running total of all the cats he sees on all the days. On which day is the running total more than twenty-seven cats? Show all your mathematical thinking.

Preliminary Planning Sheet for a Mathematics Portfolio Piece/Task

Title of Task Counting Cats

Content Strand(s) Addressed Operations & Algebraic Thinking

State Standard(s) Addressed

Program Link

Common Core Standard(s) 3.OA 1, 2, 3, 9

Underlying Mathematical Concepts

numbersense to 40
pattern
addition / multiplication
comparison

Problem Solving Strategies/Representation

model (manipulatives)
table
tally chart
number line
graph

Mathematical Language

model
table
tallychart
number line
key
graph
patterns
per
day week month
input output
more than
rule
(3 x d) - 1 = C
variable
odd / even

Answer
day 5

Possible Solution(s)

Counting Cats

day	cats	total cats
1	2	2
2	5	7
3	8	15
4	11	26
5	14	40

rule
(3 * d) - 1 = C
(3 * 2) - 1 = 5
(3 * 5) - 1 = 14
(3 * 10) - 1 = 29

day	1	2	3	4	5
cats	|	|||	|||||	||||||||	||||||||||||||

(use graph paper to show linear function)

2 + 5 + 8 + 11 + 14 = 40

Connections

- patterns day + 1 - odd/even
  cats + 3 even / odd
- found 40 cats - 4 tens an even number of cats
- continue table for a week
- generalize and apply rule for any day
- 27 cats is on day 5. He saw 40 - 27 = 13 extra cats. He had to work 1 more day for 1 cat
- Relate to a similar problem and state math

Related Tasks

See Resource Binder

- Verify by solving with a new strategy

P/S	R/P	Com	Con	Rep	AC/LV

Name_____

Helping the Library

A group of students want to raise ten dollars to buy a new book for the school library. The students decide to make some puppets, write a play, and put on ten shows for some friends. The students will charge ten cents for admission to the show. Two friends come to the first show. Four friends come to the second show. Six friends come to the third show. Eight friends come to the fourth show. If this pattern continues, how many friends come to the tenth show? Do the students raise enough money to buy the book? Show all your mathematical thinking.

Preliminary Planning Sheet for a Mathematics Portfolio Piece/Task (3)

Title of Task Helping the Library

Content Strand(s) Addressed Operations & Algebraic Thinking

State Standard(s) Addressed

Program Link

Common Core Standard(s) 3.OA 1, 2, 3, 9

Underlying Mathematical Concepts

number sense to $11.00
money notation
ordinal numbers

Problem Solving Strategies/Representation

model (manipulatives)
diagram/key
table
graph
number line

Mathematical Language

model
diagram
key
table
pattern
multiples
ordinal numbers
1st, 2nd, 3rd...
odd/even
money notation
$.
total
product
more/less than
rule
2 * S = F
variables
running total
input/output
graph
axis
number line

Answer
Yes

Possible Solution(s)

Raising Money

Show	Friends	total money
1	2	$.20
2	4	$.60
3	6	$1.20
4	8	$2.00
5	10	$3.00
6	12	$4.20
7	14	$5.60
8	16	$7.20
9	18	$9.00
10	20	$11.00

rule
2 · S = F
2 · 10 = 20
2 · 5 = 10
2 · 20 = 40
2 · 50 = 100

or

graph patterns to see linear line

Key
S show
F friends

Connections

- $1.00 extra is raised
- patterns show +1, friends +2 - all even multiples
- rule 2 · S = F - generalize and use for other days
- continue table for 2 weeks
- if more friends went to 10th show than 1st show
- Relate to another show and state math
- graph linear function
- Verify more than 1 way to prove answer is correct

Related Tasks

See Resource Binder

P/S	R/P	Com	Con	Rep	Ach/Level

Name_____

Saving Nickels

Molly loves pencils. Molly is saving nickels to buy three glitter pencils that cost one dollar and thirty-nine cents. The first day Molly saves two nickels. The second day Molly saves four nickels. The third day Molly saves six nickels. Does Molly have enough money to buy the pencils if this pattern continues to the seventh day? Show all your mathematical thinking.

Preliminary Planning Sheet for a Mathematics Portfolio Piece/Task

(3)

Title of Task Saving Nickels

Content Strand(s) Addressed Operations + Algebraic Thinking

State Standard(s) Addressed

Program Link

Common Core Standard(s) 3.OA 1,2,3,9

Underlying Mathematical Concepts

Number sense to $2.80
money notation
multiplication / addition

Problem Solving Strategies/Representation

diagram / key
table
graph
number line

Mathematical Language

diagram
key
table
graph
number line
pattern
multiples
per
running total
day, week
ordinal numbers
1st, 2nd, 3rd...
even / odd
nickel
dime
dollar
input
output
rule
variables
money notation $.

37

Possible Solution(s)

Answer: Yes

Buying Pencils

day	nickels	total money	running total money
1	2	$.10	$.10
2	4	$.20	$.30
3	6	$.30	$.60
4	8	$.40	$1.00
5	10	$.50	$1.50
6	12	$.60	$2.10
7	14	$.70	$2.80

rule
2*d = n d+d = n

Key
d day
n nickel

Connections

- $1.41 change from $2.80
- Has enough money left to buy 3 more pencils
- pencils cost about $.50 each
- patterns day +1
  nickels +2, + $.10 - multiples
- nickel pattern is even
- Relate to a similar problem and state math
- 7 days is a week
- continue for 2 weeks
- Solve more than 1 way to verify

Related Tasks

See Resource Binder

Name_____

P/S	R/P	Com	Con	Rep	AC/LV

Making Bracelets

Maria uses large and small beads to make different types of bracelets. The first bracelet has 2 large beads and 3 small beads. The second bracelet has 4 large beads and 6 small beads. The third bracelet has 6 large beads and 9 small beads. The fourth bracelet has 8 large beads and 12 small beads. If this pattern continues how many large and small beads does Maria use to make the tenth bracelet? How many large and small beads does Maria use to make the fiftieth bracelet?

Preliminary Planning Sheet for a Mathematics Portfolio Piece/Task (3)

Title of Task Making Bracelets

Content Strand(s) Addressed Operations and Algebraic Thinking

State Standard(s) Addressed

Program Link

Common Core Standard(s) 3.OA 1,3,8,9

Underlying Mathematical Concepts

number sense to 30/150*
multiplication/addition
ordinal numbers

Problem Solving Strategies/Representation

diagram/key
table
graph
numberline

Mathematical Language

diagram	axis
key	more/less/than
table	rule
graph	variable
numberline	2·b=L
pattern	3·b=S
per	input/output
multiple	total
odd/even	product

ordinal numbers
1st, 2nd, 3rd

Possible Solution(s)

Bracelets

bracelet	large beads	small beads
1	2	3
2	4	6
3	6	9
4	8	12
5	10	15
6	12	18
7	14	21
8	16	24
9	18	27
10	20	30

Answer
10th bracelet
30 small beads
20 large beads
50th bracelet
150 small beads
100 large beads

Rules
2·b=L
3·b=S
2·10=20
3·10=30
2·7=14
3·7=21
2·100=200
3·100=300

Key
b bracelet
L large beads
s small beads

graph
table
on grid paper

Connections

- Patterns bracelet+1
  large beads +2-even multiples
  small beads +3-odd/even multiples
- graph linear patterns
- relate to a similar problem and state math
- continue table to 2 weeks or more
- find rules 2·b=L 3·b=S
- add bracelet number to large bead number to get small bead number
- Total of 110 large beads
- Total of

Related Tasks

See Resource Binder

* do not solve to the 50th day unless student can generalize rule and apply to day 50.

P/S	R/P	Com	Con	Rep	AC/LV

Name_____

Soccer Cards

Kim has seventy-two soccer cards. Kim wants to put nine soccer cards on the front of each page in an album. Kim knows she needs eight pages for all the cards. Carmen says Kim needs seven pages. Kim says that she can show Carmen that she is correct in three different mathematical ways. What should Kim show Carmen? Show all your mathematical thinking.

Preliminary Planning Sheet for a Mathematics Portfolio Piece/Task

(3)

Title of Task Soccer Cards

Content Strand(s) Addressed Operations + Algebraic Thinking

State Standard(s) Addressed

Program Link

Common Core Standard(s) 3.OA 1,2,3

Underlying Mathematical Concepts

number sense to 72
multiplication / addition
9 to 1 (9 cards to 1 page)

Problem Solving Strategies/Representation

model (manipulatives)
diagram / key
table
array
number line
graph

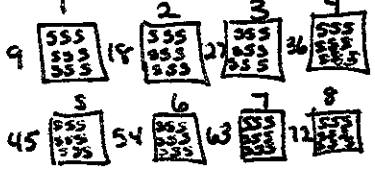
Mathematical Language

model
diagram
key
table
array
numberline
graph
axis
dozen
pattern
multiple
per
total
product
rule
variable
9 * p = c

Answer
See representation below - shows 3

Possible Solution(s)

Key: page / card



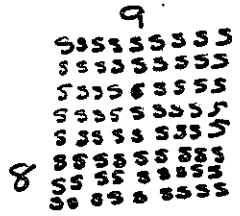
An Album

page	cards
1	9
2	18
3	27
4	36
5	45
6	54
7	63
8	72

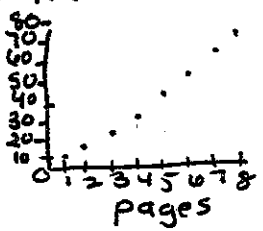
rule
9 * p = c
9 * 3 = 27
9 * 10 = 90
9 * 50 = 450

Key
p page
c cards

8 x 9 = 72
72 ÷ 9 = 8



9 + 9 + 9 + 9 + 9 + 9 + 9 + 9 = 72



Connections

- patterns page + 1
  cards + 9 - odd/even
  multiples
- no empty spaces on the 8th album page
- solve more than 3 ways
- Relate to a similar problem and state math
- 72 cards is 6 dozen
- connect strategies together to verify answer

Related Tasks

See Resource Binder

P/S	R/P	Com	Con	Rep	Ach/Level

Name_____

Sport Cards

Joseph collects sport cards. Joseph keeps his sport cards in a notebook. Joseph puts four cards on each page in his notebook. There are eight pages in the notebook. Joseph has twenty-nine sport cards. Is there enough room in the notebook for all twenty-nine sport cards? Show all your mathematical thinking.

Preliminary Planning Sheet for a Mathematics Portfolio Piece/Task ③

Title of Task Sport Cards

Content Strand(s) Addressed Operations & Algebraic Thinking

State Standard(s) Addressed

Program Link

Common Core Standard(s) 3.OA 1, 2, 3, 9

Underlying Mathematical Concepts

number sense to 29

4 sport cards per page

addition / multiplication / division / subtraction

Problem Solving Strategies/Representation

model (manipulatives)
diagram / key
Table
tally chart
graph
array

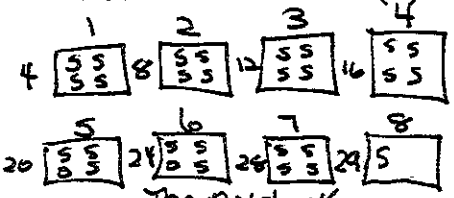
Mathematical Language

model
diagram
key
table
tally chart
graph
axis
input
output
pattern
odd
even
more/less/than
per
rule
$4 \cdot p = s$
variable
Multiples
array

43

Answer
Yes

Possible Solution(s)



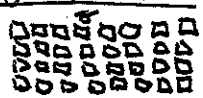
Key
page
5 sportcard

The Notebook ← total

page	sportcards
1	4
2	8
3	12
4	16
5	20
6	24
7	28
8	29

The Notebook ←

page	sportcards	totalcards
1	IIII	4
2	IIII	8
3	IIII	12
4	IIII	16
5	IIII	20
6	IIII	24
7	IIII	28
8	I	29



Key
card

4 cards × 8 pages = 32
32 − 29 = 3

4 × 8 = 32

Connections

- Patterns pages + 1 - odd/even sport cards + 4 - all even to pages 8
- Has room for 3 more cards
- Solve more than one way to verify
- Relate to a similar problem and state math
- graph the input/output page / cards on grid paper

- Find Rule $4 \cdot p = S$ Key p page s-sportcards $4 \cdot 1 = 4$ $4 \cdot 5 = 20$ $4 \cdot 9 = 36$ $4 \cdot 10 = 40$

Related Tasks

See Resource Binder

- The patterns are multiples of 1 and 4
- 29 is not a multiple of 4 so will be either too many or too few sport cards

P/S	R/P	Com	Con	Rep	Ach/Level

Name_____

Books on Shelves

Adam has six shelves. Adam puts four books on each shelf. How many total books does Adam have on his shelves? Show all your mathematical thinking.

Preliminary Planning Sheet for a Mathematics Portfolio Piece/Task

(3)

Title of Task Book on Shelves

Content Strand(s) Addressed Operations + Algebraic Thinking

State Standard(s) Addressed

Program Link

Common Core Standard(s) 3.OA 1, 2, 3, 9

Underlying Mathematical Concepts

number sense to 24
multiplication / addition
4 to 1 (4 books to 1 shelf)

Problem Solving Strategies/Representation

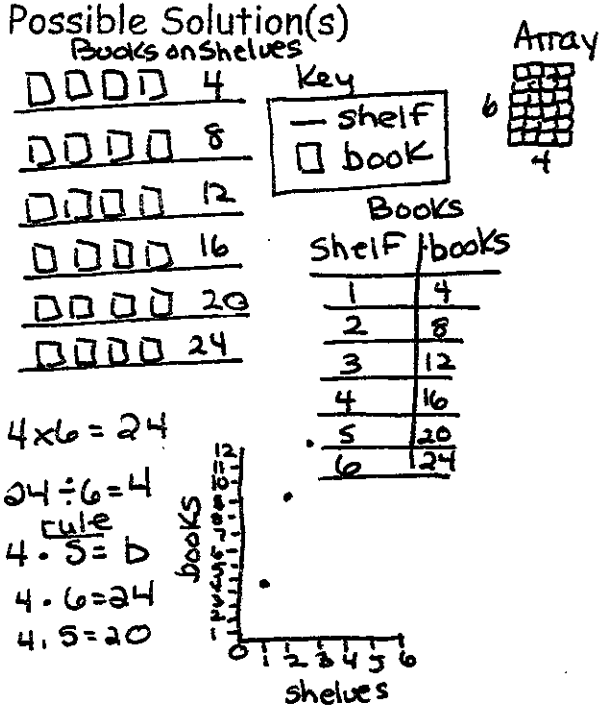
model (manipulatives)
diagram / key / arrays
table
graph
number line
array

Mathematical Language

model
diagram
key
table
graph
number line
rule
variable
4 • s = b
per
odd/even
multiples
arrays
row
column
dozen
per

Answer
24 books

Possible Solution(s)



Connections

- patterns shelves +1
  books +4 - even multiples
- Solve more than 1 way to verify
- Relate to a similar problem and state math
- a dozen books on 3 shelves
- 2 dozen books on the 6 shelves
- graph linear function
- generalize and apply rule

Related Tasks

See Resource Binder

P/S	R/P	Com	Con	Rep	Ach/Level

Name_____

Pictures in the Hallway

Mrs. Garcia has twenty-one students in her class. Each student made a drawing of themselves. Mrs. Garcia says she will put all the drawings in the hallway. Mrs. Garcia will put seven drawings in each of three rows. Will Mrs Garcia have enough room for all twenty-one drawings? Show and tell how you know.

Preliminary Planning Sheet for a Mathematics Portfolio Piece/Task (3)

Title of Task Pictures in the Hallway
Content Strand(s) Addressed Operations + Algebraic Thinking
State Standard(s) Addressed
Program Link
Common Core Standard(s) 3.OA 1, 2, 3

Underlying Mathematical Concepts

7 to 1 (7 pictures to 1 row)
addition / multiplication
number sense to 21

Problem Solving Strategies/Representation

model (manipulatives)
diagram / key (array)
table
tally chart
graph
number line

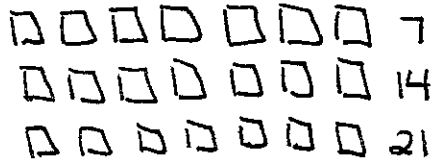
Mathematical Language

model	equation
diagram	total
key	sum
array	product
tally chart	equal
table	rule
number line	$7 \cdot r = p$
axis	row / column
odd / even	input / output
pattern	per
multiples	

47

Answer: Yes

Possible Solution(s)



3 x 7 = 21

Pictures

row	pictures
1	++++ ||
2	++++ ||
3	++++ ||

3 x 7 = 21

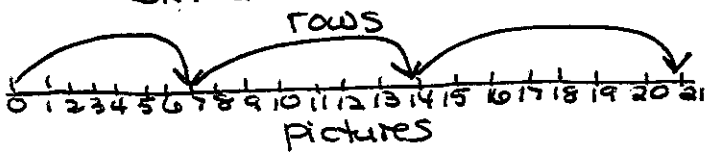
Key: 1 pictures

rule $7 \cdot r = p$ Key: r row, p pictures

row	total pictures
1	7
2	14
3	21

$7 \cdot 3 = 21$
$7 \cdot 5 = 35$
$7 \cdot 100 = 700$

$21 \div 7 = 3$
$3 \times 7 = 7 \times 3$



Connections

- patterns rows +1 odd/even pictures + 7 multiples odd/even
- rule $7 \cdot r = p$ - generalize and apply for any number of rows
- odd number of pictures in each row.
- Next equal amount per row would be 28 pictures
- Relate to a similar problem and state math
- Verify by solving more than 1 way
- graph rows and pictures

Related Tasks

See Resource Binder