A Closer Look at Grade Level Curriculum Focal Points for Math

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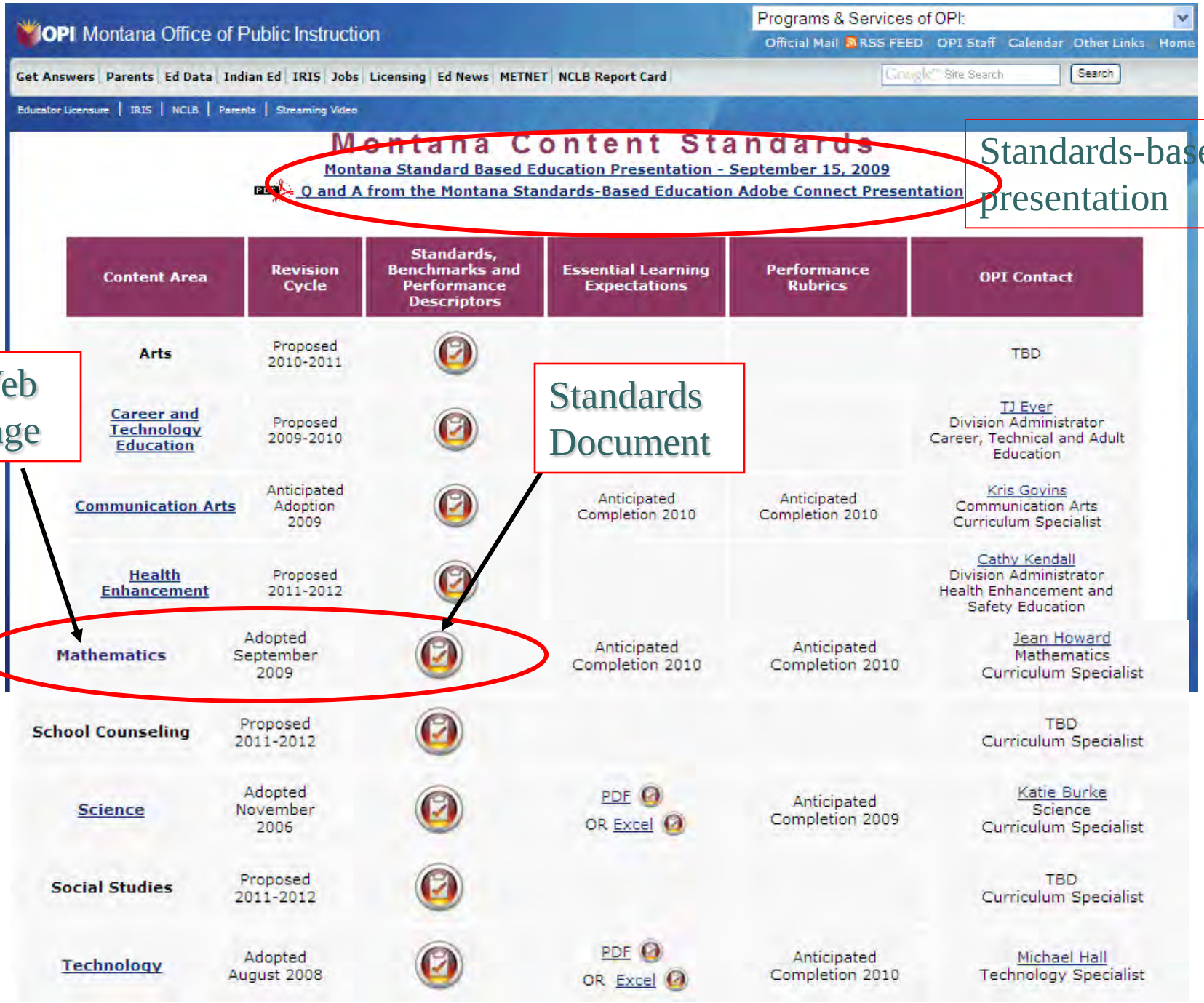
Montana Mathematics Content and Performance Descriptors

- Number Sense and Operation
- Data Analysis
- Geometric Reasoning
- Algebraic and Functional Reasoning

Vision for Montana Mathematics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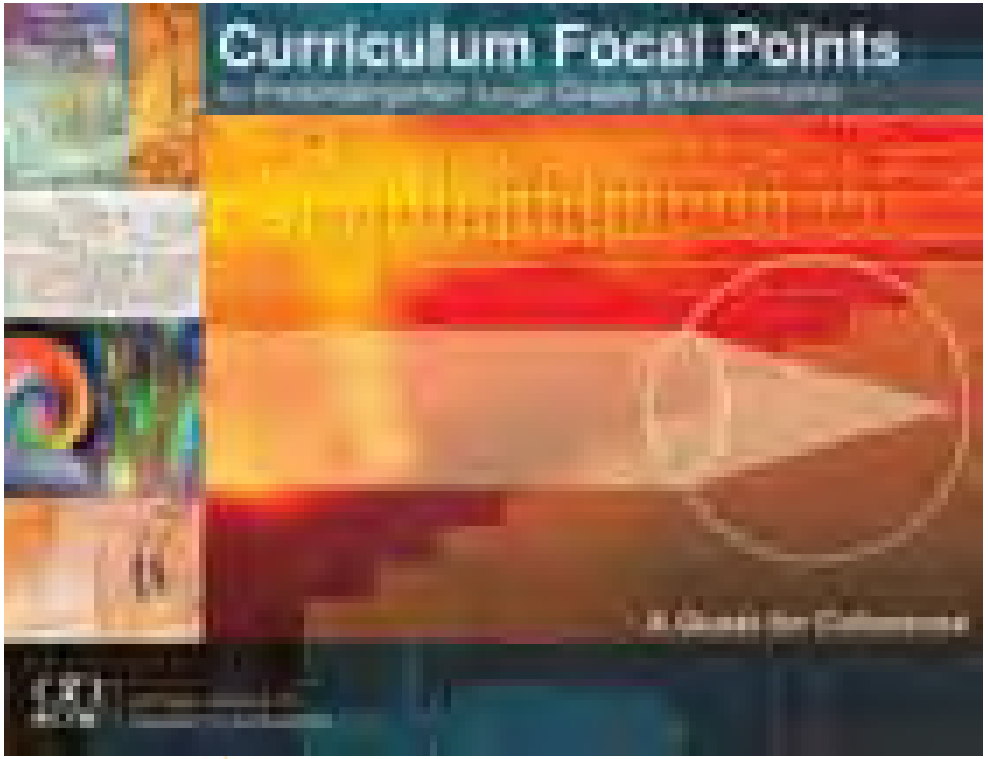
Montana Content Standards
Montana Standard Based Education Presentation - September 15, 2009
Q and A from the Montana Standards-Based Education Adobe Connect Presentation
Standards-based presentation
Content Area
Revision Cycle
Standards, Benchmarks and Performance Descriptors
Essential Learning Expectations
Performance Rubrics
OPI Contact
Web page
Standards Document
Arts
Proposed 2010-2011
TBD
Career and Technology Education
Proposed 2009-2010
TJ Ever
Division Administrator
Career, Technical and Adult Education
Communication Arts
Anticipated Adoption 2009
Anticipated Completion 2010
Anticipated Completion 2010
Kris Goyins
Communication Arts Curriculum Specialist
Health Enhancement
Proposed 2011-2012
Cathy Kendall
Division Administrator
Health Enhancement and Safety Education
Mathematics
Adopted September 2009
Anticipated Completion 2010
Anticipated Completion 2010
Jean Howard
Mathematics Curriculum Specialist
School Counseling
Proposed 2011-2012
TBD
Curriculum Specialist
Science
Adopted November 2006
PDF
OR Excel
Anticipated Completion 2009
Katie Burke
Science Curriculum Specialist
Social Studies
Proposed 2011-2012
TBD
Curriculum Specialist
Technology
Adopted August 2008
PDF
OR Excel
Anticipated Completion 2010
Michael Hall
Technology Specialist

Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics:

A Quest for Coherence



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Focus in Grades PK-2 or 3-5 or 6-8:

- Use of Process standards
- Facilitating Classroom Discourse
- Use of Questioning
- Sample Student Assignments
- Mathematical Knowledge Needed by Teachers
- School Culture and Professional Development
- Assessment
- Resources, samples

Teaching with Curriculum Focal Points

- What does it mean to progress rather than "spiral" in learning?
- What are some of the major learning progressions that occur in grades 3-5?
- How are basic facts and algorithms addressed in a focused curriculum?
- How does the topic of fractions develop as students progress from grade 3 through grade 5?

- NCTM 3-5 page 3, 7

Instructional Progression

Focusing on Multiplication and Division

Focusing on Fractions

Focusing on Two-Dimensional Shapes

Learning Progression Grades 3-5

- Concepts and skills for multiplication and division
  - Grade 3 – understanding multiplication and division; developing strategies
  - Grade 4 – quick recall of facts & begin whole number multiplication and division
  - Grade 5 – fluency with multi-digit division
- Understanding of Fractions
  - Grade 3 – meaning of fractions and equivalence
  - Grade 4- connect fractions with decimals
  - Grade 5 – fluency with addition & subtraction of fractions and decimals
- Geometric shapes – measurement constructs

Algebraic readiness developed …

NCTM Focus in Grade 3:Teaching with Curriculum Focal Points, 2009

An Important Grade 3 Issue: Developing Fluency in Basic Multiplication and Division Facts

- Solid understanding of multiplication gives students a foundation to learn, retain, and apply whole-number multiplication and division facts
- By end of Grade 4 students fluent in using those facts

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Strategies to learn basic facts in meaningful contexts

- Memorizing multiplication and division facts as isolated entities **without being supported by meaningful constructs**, their ability to develop fluency with those facts and apply them **will be limited**.
- Dedication to teaching, practicing, and discussing a **wide variety of strategies** for **understanding** the basic multiplication and division facts, with the eventual goal being the **automatic recall** of those facts **requires much attention**

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Multiplication
Joining Equal Groups

2nd Grade - Skip counting

- Count by 2: 2 more than the number before
- Count by 5: 5 more than the number before

3rd Grade - Skip counting

- totals for different number of groups of (number counting by) i.e. one group of 2, two groups of 2, three groups of 2 … or
- Different multiples of 2

Patterns on Hundreds Chart

2nd Grade

- results of joining groups of 10 or skip counting by 10

- Pattern; zero in ones place

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Fig. 2.1. Pattern for tens on a hundreds grid

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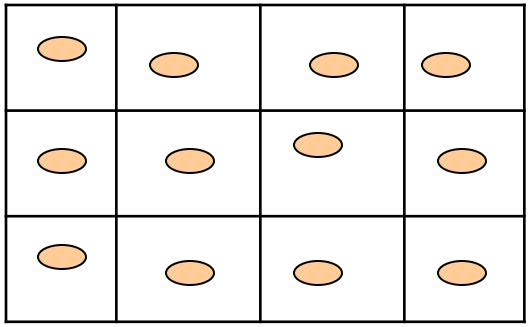
Concrete Model

- 1 person rolls a die and places the number of cards to represent “group” on the table
- 1 person rolls a die and places the number of beans to represent “item” on each card
- Say: I have ___ groups with __ items for a total of ___

Pictorial Model - Abstract

- Place the beans “items” from each card “group” onto graph paper

4 items



3 groups

4

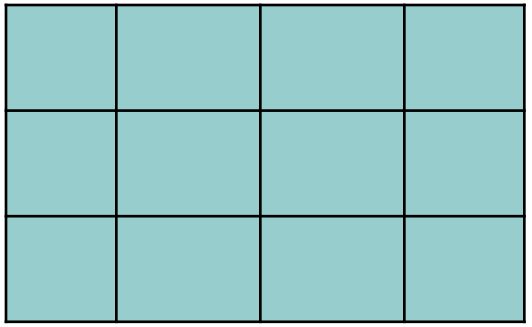
8

12

3 groups of 4 items is a total of 12

ARRAY

4 items



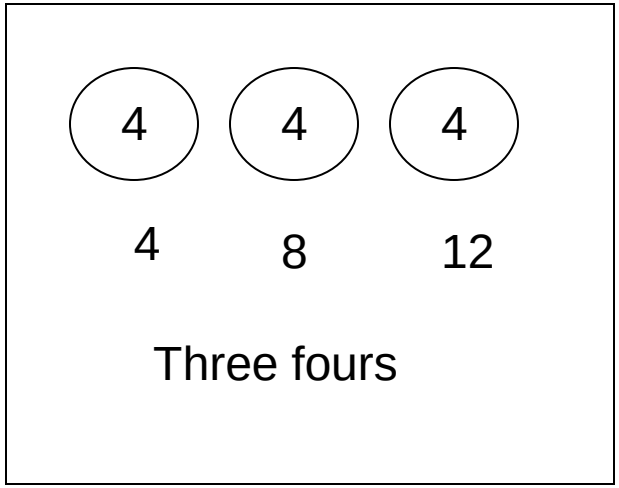
3 groups

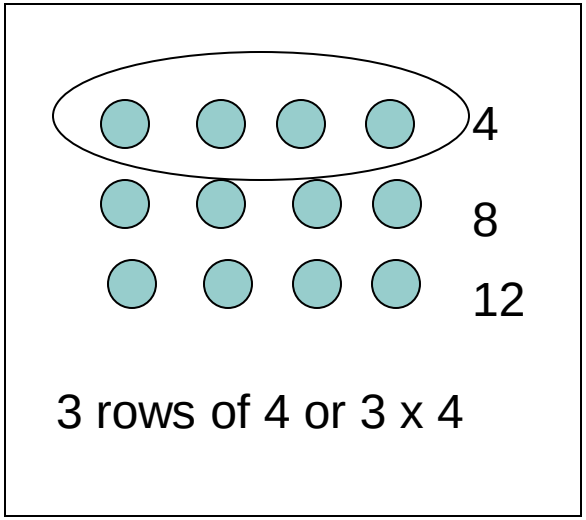
AREA of RECTANGLE

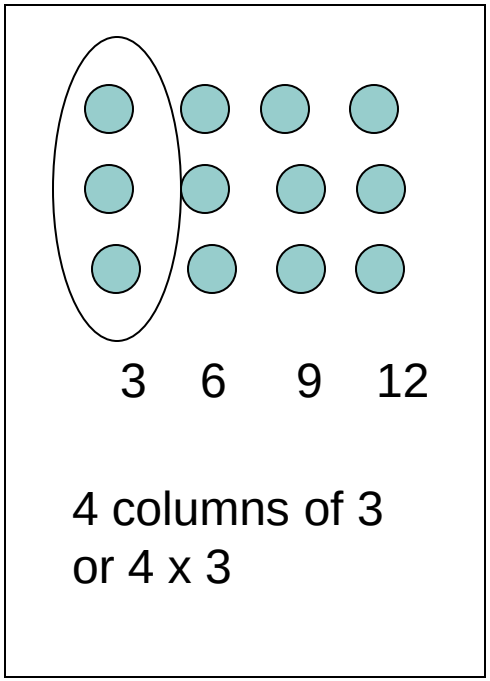
3 x 4 = 12

EQUATION

Variety Of Models Facilitate Learning Of Basic Multiplication Facts







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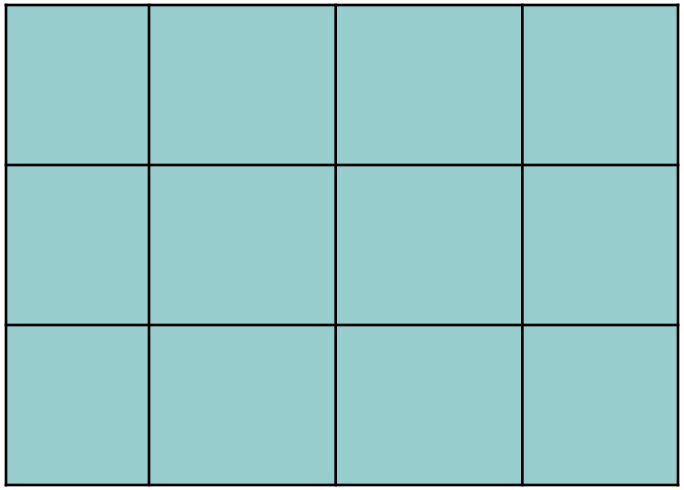
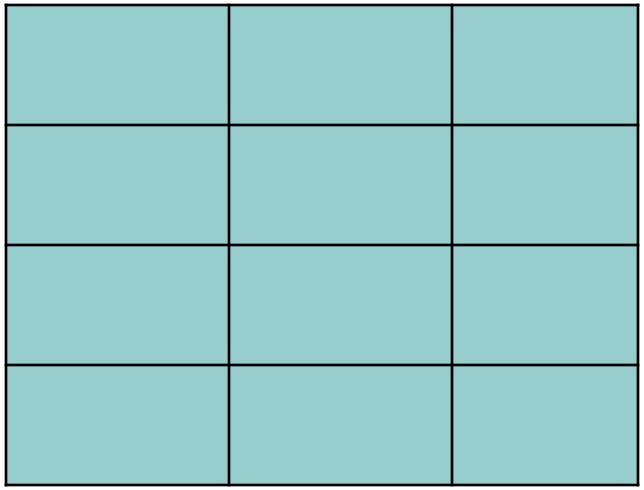
Connect Multiplication and Division

3 groups of 4 items is a total of 12



12 divided into 3 groups
gives 6 items in each group



12 divided into 6 groups
gives 3 items in each group

Properties - Help Learn Facts Faster

COMMUTATIVE PROPERTY

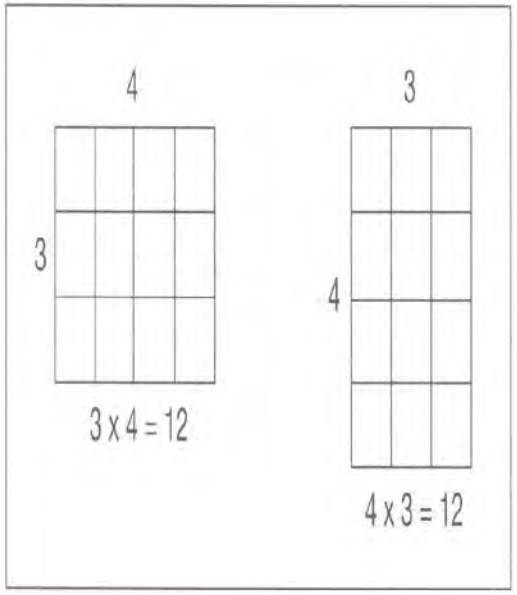


Fig. 2.5. Model of multiplication as area of a rectangle

3 groups of 4 = 12

4 groups of 3 = 12

3 x 4 = 12

4 x 3 = 12

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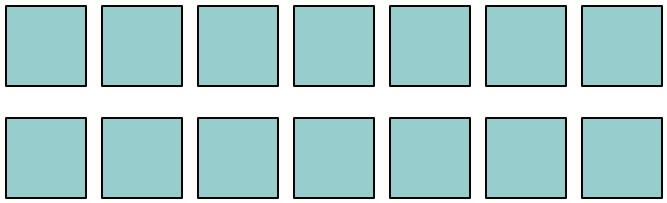
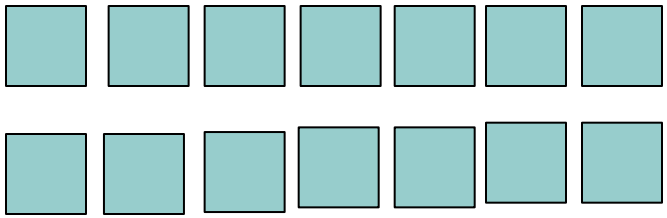
Properties – Learn New Facts

ASSOCIATIVE PROPERTY

2 x 7 = 14



2 x 7 = 14



4 x 7 = 28

2 x 7 = 14,
Doubling to find 4 x 7

4 is double 2 think of the product 4 x 7 as (2+2) x 7 or 2 x (2+7)

Since 2 x 7 = 14,
then 4 x 7 is two of the product, and 14 +14 = 28

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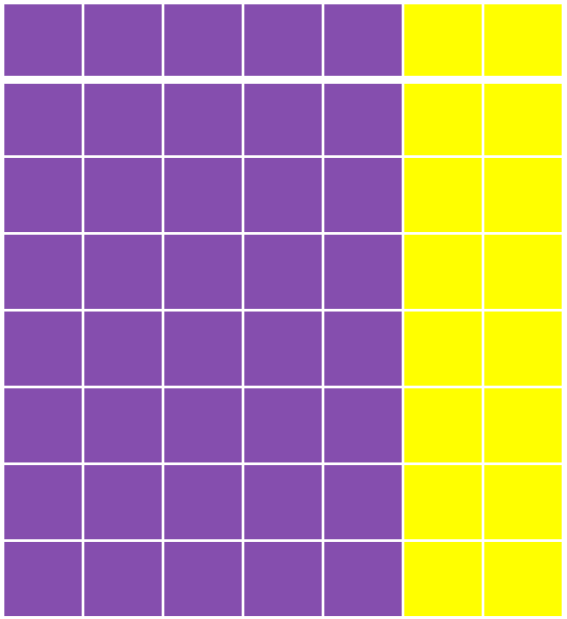
Properties - Use Products They Know To Find Products They Do Not Know

DISTRIBUTIVE PROPERTY OF MULTIPLICATION OVER ADDITION

8 x 5 = 40 8 x 2 = 16

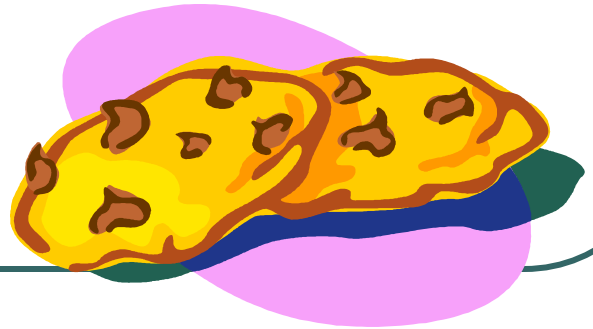


Factors can be taken apart
a x (b + c) = (a x b) + (a x c)

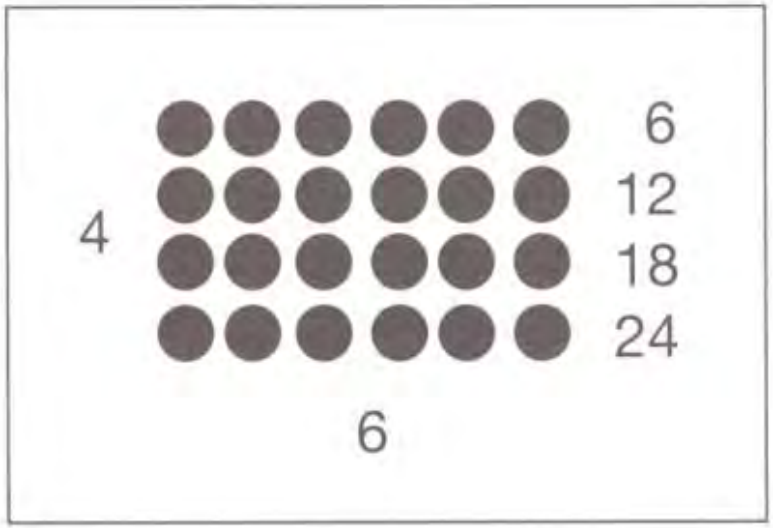
8 x 7 = (8 x 5) + (8 x 2) = 40 + 16 = 56

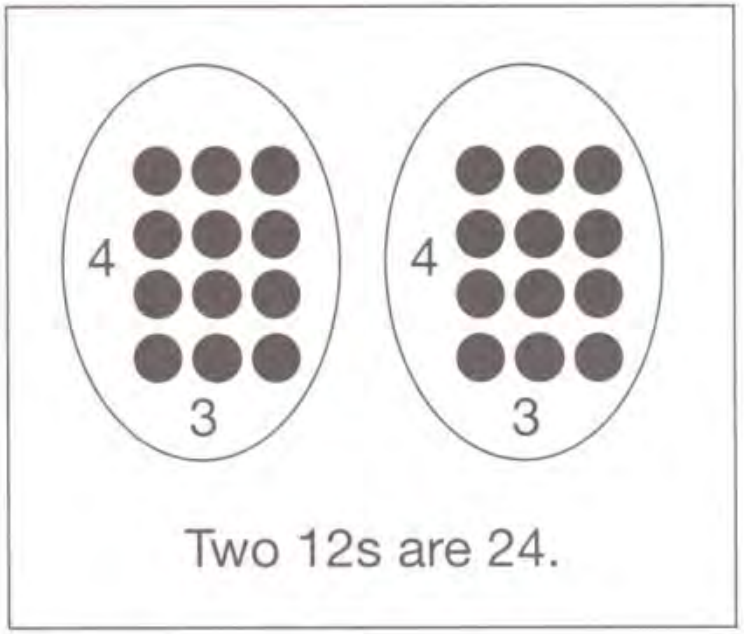
Problem Solving: To Deepen Understanding

- Lance needs to bring oatmeal cookies for the soccer game. The cookies come in packages of 6. If Lance, buys 4 packages, how many cookies will he have?
- Show three ways a third grader would solve the problem.



Possible Solutions to The Problem





Four packages of six cookies is 24

4 groups of 6 for a total of 24

$6 \times 4 = 24$

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Focusing on Fractions

- Grade 1 – Sequential Order
  - Number line – closer to 0 or 10, numbers between other numbers
- Grade 2 – Partitioning
  - Slicing length into equal-sized units
- Grade 3 – Equivalent Fractions
  - Use models including number line
- Grade 4 – Equivalent Fractions and Decimals
  - Comparing models with symbols to describe the same point on a number line

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Focus in ... Study Groups

- Small sections of the book at a time - lesson study, math circle, learning community
- Build understanding to help students
- Adapt to current teaching, learning, strategies, materials
- Share student insights, questions, work
- Teacher learning is also a continual process and can be very rewarding

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3-2-1

- What are **3** things you learned today?
- What are **2** things you need to know more about?
- What is the **1** thing you will tell your teaching colleagues about this presentation?

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