

**Multiplication  
& Division:  
Bridge over Troubled  
Waters**

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## Multiplication and Division

- Multiplication and division is often the mathematical downfall for so many children.
- Attempts have been made to solve this by focusing on sheer memorization.
- They struggle to apply the knowledge to new situations and are frequently overwhelmed.
- This results in frustration, confusion, and an aversion to math.

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## Multiplication and Division

- We know that a deep understanding of concepts removes anxiety.
- Understanding lessens the burden of memorizing.
- Understanding makes advanced math easier to grasp.
- Math becomes more enjoyable!
- We need to focus on understanding!

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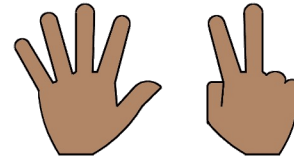
## Solution for Success

- Foundation of subitizing
- Strategies to visualize the facts
- Practice and apply with games

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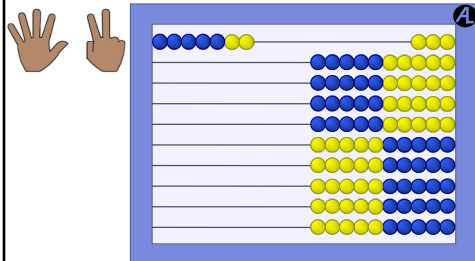
## Subitizing

- Subitizing is quick recognition of quantity without counting.



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## Subitizing



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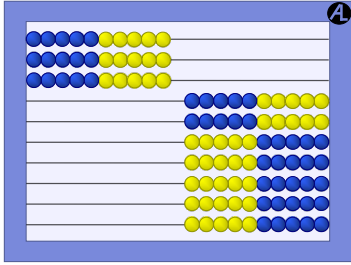
## Subitizing

- Subitizing is quick recognition of quantity without counting.
- Subitizing allows quantities over five to be seen in groups of fives.
- Subitizing beyond ten is also done by grouping.
- Subitizing eliminates counting!

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## Subitizing Tens

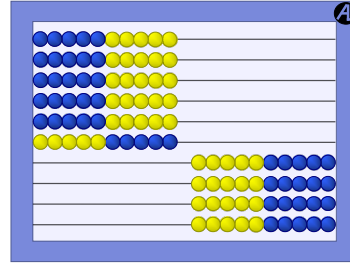
3-ten



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## Subitizing Tens

6-ten



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## Strategies

- A strategy is a way to learn a new fact or recall a forgotten fact.
- A visual representation is a powerful strategy.

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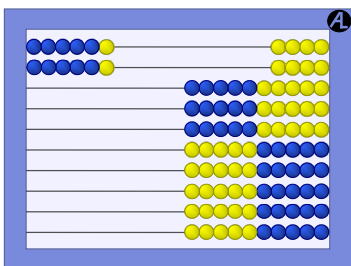
## Visualizing

- It is well known that most of us learn best with visualizable images.
  - visual: seen with our eyes.
  - visualizable: seen in our mind's eye.
- Important part of math is visualizing – seeing it in your mind.

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## Multiples of Two

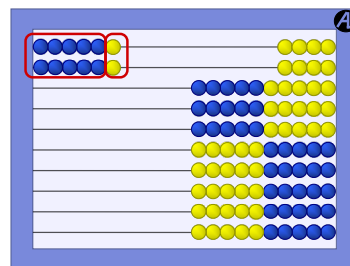
$$6 \times 2 =$$



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## Multiples of Two

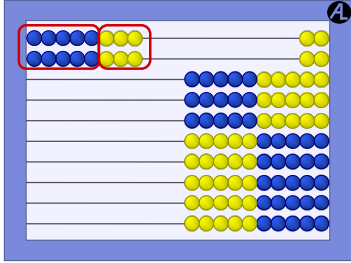
$$6 \times 2 = 12$$



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## Multiples of Two

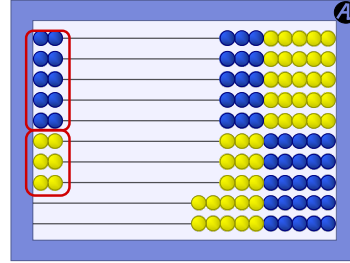
$$8 \times 2 = 16$$



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## Multiples of Two

$$2 \times 8 = 16$$



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## Multiplication Memory Game

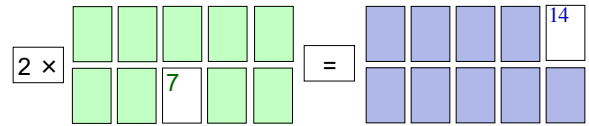
Objective: To help the players master the multiplication facts.

Play: Turn over a basic card, state the fact, then try to find the matching product card.

Goal: To collect the most cards by matching the multiplier with the product.

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## Multiplication Memory Game



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## Why Games

$$\frac{\text{Games}}{\text{Math}} = \frac{\text{Books}}{\text{Reading}}$$

Games provide interesting repetition needed for automatic responses.

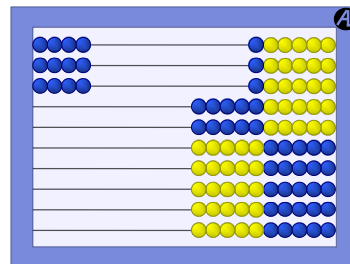
Games are worksheets, albeit with cards.

Most importantly, games provide an application for the new information!

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## Multiples of Four

$$4 \times 3$$



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### Multiples of Four

$4 \times 3 = 2 \times 3$  doubled

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### Multiples of Four

$4 \times 5 = 2 \times 5$  doubled

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### Multiplication Memory Game

$4 \times$  [ ] [ ] [ ] [ ] [ ] [ ] = [ ] [ ] [ ] [ ] [ ] [ ]

6 = 20

It's a worksheet!

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### Multiplication Memory: Level Up

$2 \times$  [1] [2] [3] [4] [5] = [ ] [ ] [16] [ ] [ ]

$4 \times$  [6] [7] [8] [9] [10] = [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ] [32]

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### Multiples of Eight

$8 \times 3$

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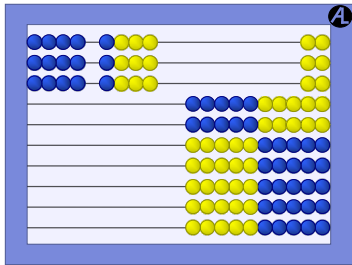
### Multiples of Eight

$8 \times 3 = 15 + 9 = 24$

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## Multiples of Eight

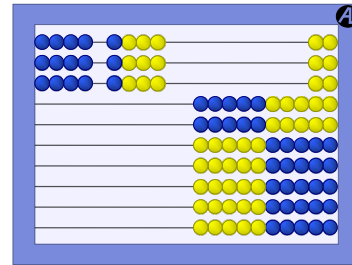
$$8 \times 3 = 4 \times 3 \text{ doubled}$$



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## Multiples of Eight

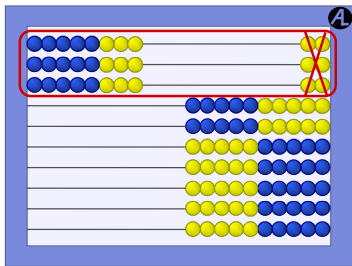
$$8 \times 3 = 12 \text{ doubled} = 24$$



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## Multiples of Eight

$$8 \times 3 = 30 - 6 = 24$$



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## *Eights on Top Game*

Objective: To help the players associate the correct multiplier and product.

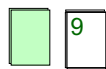
Play: Turn over a multiplier card, state the fact, then mark the matching product card.

If another's marker is already there, put the marker on top of the previous marker.

Goal: To have the most markers on top.

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## *Eights on Top Game*

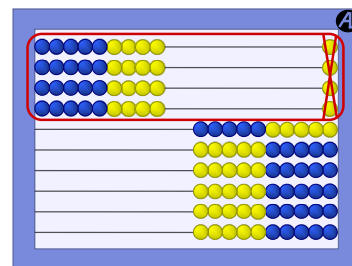


8	16	24	32	40
48	56	64	72	80

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## Multiples of Nine

$$9 \times 4 = 40 - 4 = 36$$



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## Multiples of Nine

$9 \times 1 = 9$     $9 \times 2 = 18$     $9 \times 3 = 27$     $9 \times 4 = 36$     $9 \times 5 = 45$   
 $9 \times 6 = 54$     $9 \times 7 = 63$     $9 \times 8 = 72$     $9 \times 9 = 81$     $9 \times 10 = 90$

- A pattern: look at the **digits** of the products. They all add up to **9**.

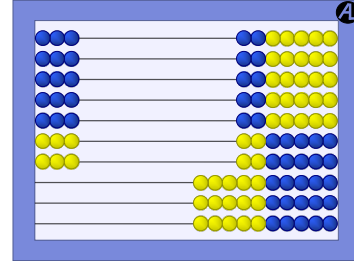
$9 \times 1 = 9$     $9 \times 2 = 18$     $9 \times 3 = 27$     $9 \times 4 = 36$     $9 \times 5 = 45$  →  
 $9 \times 10 = 90$     $9 \times 9 = 81$     $9 \times 8 = 72$     $9 \times 7 = 63$     $9 \times 6 = 54$  ←

- Another pattern: The digits of the product are reversed using this layout.

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## Multiples of Three

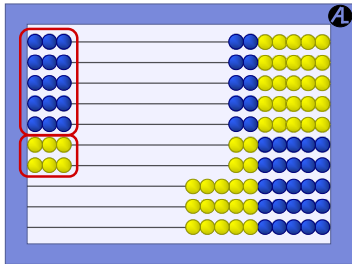
$$3 \times 7$$



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## Multiples of Three

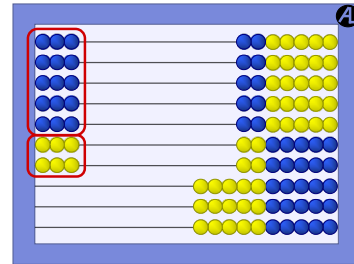
$$3 \times 7 = 3 \times 5 + 3 \times 2$$



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## Multiples of Three

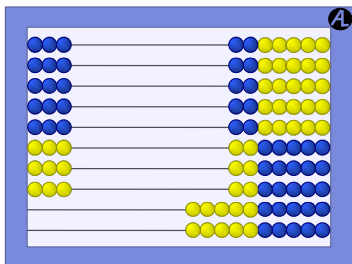
$$3 \times 7 = 15 + 6 = 21$$



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## Multiples of Three

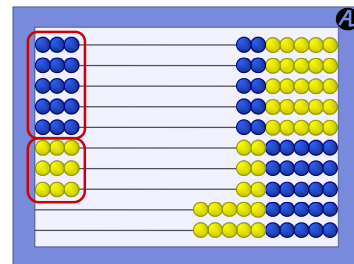
$$3 \times 8$$



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## Multiples of Three

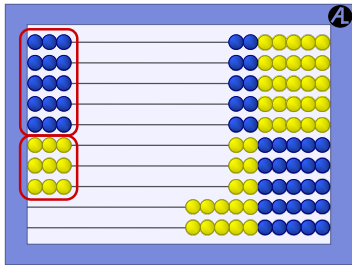
$$3 \times 8 = 3 \times 5 + 3 \times 3$$



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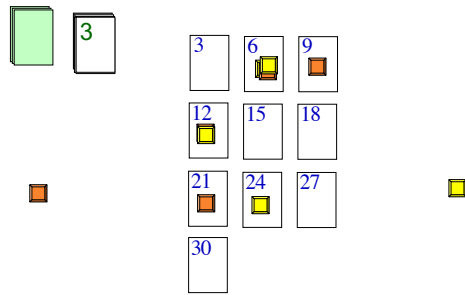
### Multiples of Three

$$3 \times 8 = 15 + 9 = 24$$



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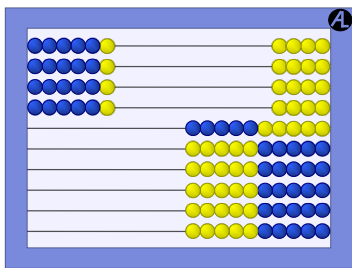
### Threes on Top Game



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### Multiples of Six

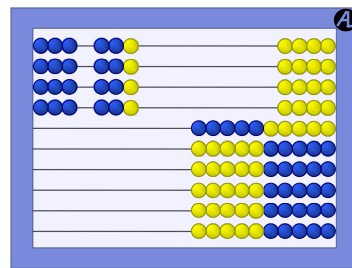
$$6 \times 4$$



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### Multiples of Six

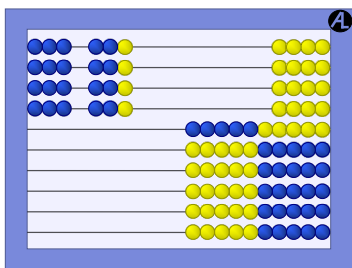
$$6 \times 4 = 3 \times 4 \text{ doubled}$$



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### Multiples of Six

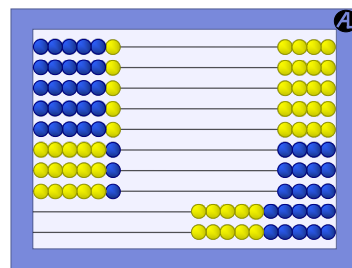
$$6 \times 4 = 12 \text{ doubled} = 24$$



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### Multiples of Six

$$6 \times 8$$

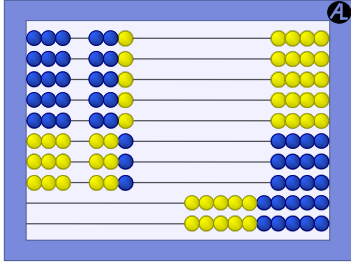


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### Multiples of Six

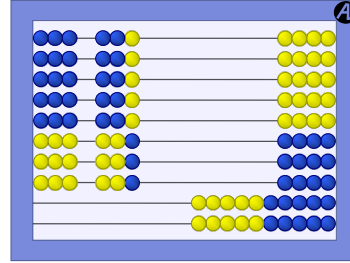
$$6 \times 8 = 3 \times 8 \text{ doubled}$$



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### Multiples of Six

$$6 \times 8 = 24 \text{ doubled} = 48$$



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### Multiplication Chart

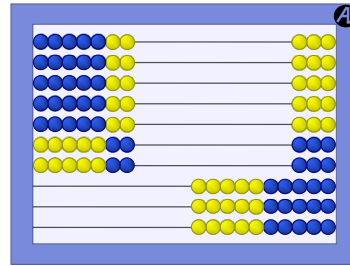
7s

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	63	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	63	72	81	90
10	20	30	40	50	60	70	80	90	100

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### Multiples of Seven

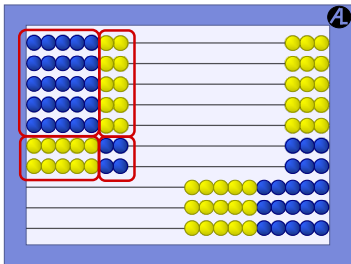
$$7 \times 7$$



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### Multiples of Seven

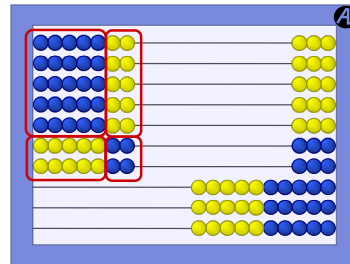
$$7 \times 7 = 25 + 10 + 10 + 4$$



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### Multiples of Seven

$$7 \times 7 = 49$$



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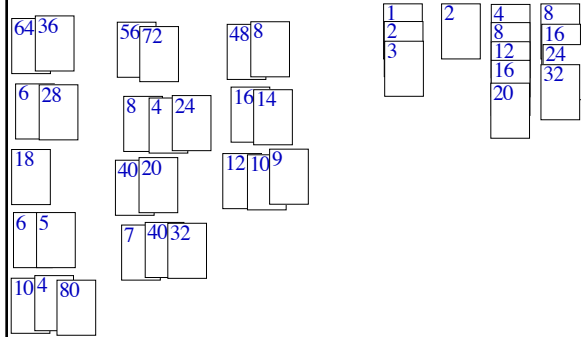
## Multiples Solitaire

### Rules:

- Choose four sets of multiples. Shuffle together.
  - Only the top card of a fan may be played.
  - Columns start with lowest number of a set.
  - Cards in a fan can be moved to another location if they immediately precede the card in a set that they are being moved to.
- This example game: sets of 1s, 2s, 4s, and 8s.

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## Multiples Solitaire



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## Introducing Division

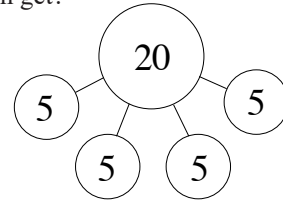
Maria picks 20 oranges with three friends. If the four friends share the oranges equally, how many oranges does each person get?

$$\underline{5} \times 4 = 20$$

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## Introducing Division

Maria picks 20 oranges with three friends. If the four friends share the oranges equally, how many oranges does each person get?



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## Introducing Division

Maria picks 20 oranges with three friends. If the four friends share the oranges equally, how many oranges does each person get?

$$20 \div 4 = \underline{5}$$

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## Find the Quotient

**Objective:** To see the relationship between multiplication and division.

**Play:** Pick up the top card, determine how many times the divisor is in that number, then place the card below that number in the row.

**Goal:** To match all the cards.

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### Find the Quotient

20	35	10	45	30	25	5	40	15	50
----	----	----	----	----	----	---	----	----	----

$\div 5 =$

7	5	3
---	---	---

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### Division Strategies

$48 \div 6$

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### Division Strategies

$48 \div 6$

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### Division Strategies

$48 \div 6$

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### Division Strategies

$48 \div 6$

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### Division Strategies

$48 \div 6 = 8 \text{ groups}$

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### Division Strategies

$48 \div 6$

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### Division Strategies

$48 \div 6$

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### Division Strategies

$48 \div 6 = 8$  in each group

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### Find the Quotient – Level Up

Objective: To practice division facts.

Play: Play cards so that the multiplication card divided by the first basic number card in the row equals the second basic number card in the row, the quotient.

Play a card that is a factor of the multiplication card. Up to six cards can be played during a turn.

Goal: To collect the most cards.

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### Find the Quotient – Level Up

	÷	=	
63		9	7
21		3	
8		2	

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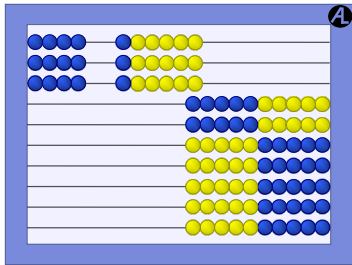
### Division and Remainders

$30 \div 4$

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### Division and Remainders

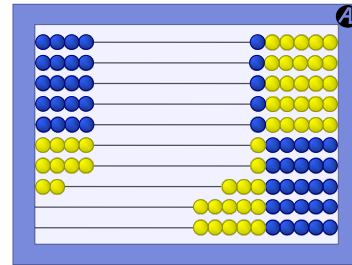
$$30 \div 4$$



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### Division and Remainders

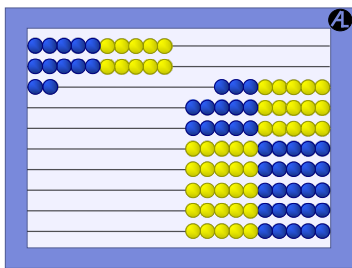
$$30 \div 4 = 7 \text{ with } 2 \text{ remaining}$$



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### Division and Remainders

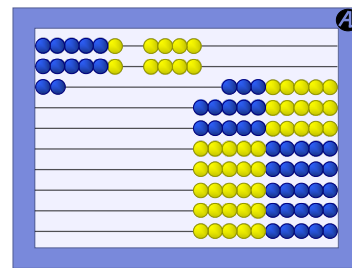
$$22 \div 6$$



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### Division and Remainders

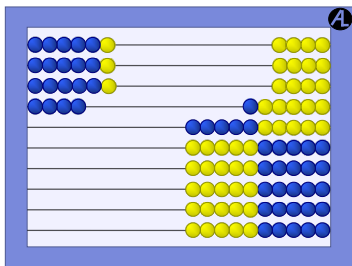
$$22 \div 6$$



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### Division and Remainders

$$22 \div 6 = 3 \text{ with } 4 \text{ remaining}$$



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### Find the Quotient and Remainder

	÷	=	r	
48		7	6	6
16		3		1
32		6	5	

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## Solution for Success

- Foundation of subitizing
- Strategies to visualize the facts
- Practice and apply with games

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## Multiplication and Division

- We know that a deep understanding of concepts removes anxiety.
- Understanding lessens the burden of memorizing.
- Understanding makes advanced math easier to grasp.
- Math becomes more enjoyable!

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## In Conclusion ...

Math needs to be taught so  
95 percent is understood and  
only 5 percent memorized.

– *Richard Skemp*  
major pioneer in  
mathematics education

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## In Conclusion ...

Our goal as a teacher of mathematics  
is to help our children transform,  
expand, and refine these beginning ideas  
into deeper mathematical thinking.

– *Dr. Joan A. Cotter*

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## In Conclusion ...

If a child can't learn the way we teach,  
maybe we should teach the way they learn.

– Ignacio Estrada,  
Gordon and Betty Moore Foundation

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