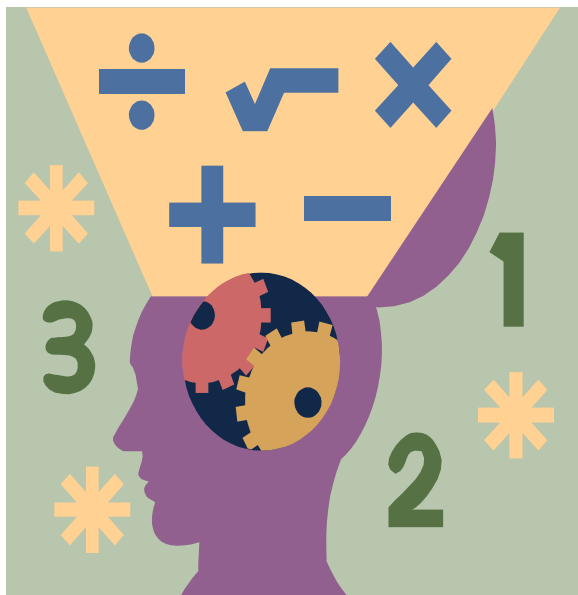


Strategies to Make Facts Stick



Addition Facts

Doubles
Doubles + 1
Doubles + 2 or Sharing
Adding 0 & 1
Adding 9 & 10
Using What You Know

Subtraction Facts

Subtract Nothing, One
or Everything
Counting Up
Ride the Express

Multiplication Facts

$\times 2$
 $\times 5$
 $\times 0$ & $\times 1$
 $\times 9$
Squares
 $\times 3$ & $\times 4$
 $\times 6$ $\times 7$ & $\times 8$

For Younger Learners

Combinations Making 5 & 10
and Other Numbers

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The following pages are selections from the **Strategies to Make Facts Stick Presentation** given by Nancy Nutting in your district or region that may be useful to teachers who want to adapt pages for use on the Smart Board or customize materials for their students.

Enjoy!
Nancy

Grid of How Basic Fact Knowledge Grows

Addition Facts: Strategies Built on Number Relationships

	0	1	2	3	4	5	6	7	8	9	D O U B L E S		0	1	2	3	4	5	6	7	8	9	D O U B L E S + 1		
0	0												0	0	1										
1		2											1	1	2	3									
2			4										2		3	4	5								
3				6									3			5	6	7							
4					8								4				7	8	9						
5						10							5					9	10	11					
6							12						6						11	12	13				
7								14					7							13	14	15			
8									16				8								15	16		17	
9										18		9									17	18			

	0	1	2	3	4	5	6	7	8	9	D O U B L E S + 2		0	1	2	3	4	5	6	7	8	9	A D D I N G 0 & 1	
0	0	1	2										0	0	1	2	3	4	5	6	7	8		9
1	1	2	3	4									1	1	2	3	4	5	6	7	8	9		10
2	2	3	4	5	6								2	2	3	4	5	6						
3		4	5	6	7	8							3	3	4	5	6	7	8					
4			6	7	8	9	10						4	4	5	6	7	8	9	10				
5				8	9	10	11	12					5	5	6		8	9	10	11	12			
6					10	11	12	13	14				6	6	7			10	11	12	13	14		
7						12	13	14	15	16			7	7	8				12	13	14	15		16
8							14	15	16	17			8	8	9					14	15	16		17
9								16	17	18		9	9	10						16	17	18		

	0	1	2	3	4	5	6	7	8	9	A D D I N G 9		0	1	2	3	4	5	6	7	8	9	U W Y K	
0	0	1	2	3	4	5	6	7	8	9			0	0	1	2	3	4	5	6	7	8		9
1	1	2	3	4	5	6	7	8	9	10			1	1	2	3	4	5	6	7	8	9		10
2	2	3	4	5	6					11			2	2	3	4	5	6	7	8	9	10		11
3	3	4	5	6	7	8				12			3	3	4	5	6	7	8	9	10	11		12
4	4	5	6	7	8	9	10			13			4	4	5	6	7	8	9	10	11	12		13
5	5	6		8	9	10	11	12		14			5	5	6	7	8	9	10	11	12	13		14
6	6	7			10	11	12	13	14	15			6	6	7	8	9	10	11	12	13	14		15
7	7	8				12	13	14	15	16			7	7	8	9	10	11	12	13	14	15		16
8	8	9					14	15	16	17			8	8	9	10	11	12	13	14	15	16		17
9	9	10	11	12	13	14	15	16	17	18		9	9	10	11	12	13	14	15	16	17	18		

Grid of How Basic Fact Knowledge Grows

Multiplication Facts: Strategies Built on Number Relationships and a Better Sequence for Learning

	0	1	2	3	4	5	6	7	8	9	T W O S		0	1	2	3	4	5	6	7	8	9	F I V E S		
0			0										0			0									
1			2										1			2									
2	0	2	4	6	8	10	12	14	16	18			2	0	2	4	6	8	10	12	14	16		18	
3			6										3			6									
4			8										4			8									
5			10										5	0	5	10	15	20	25	30	35	40		45	
6			12										6			12									
7			14										7			14									
8			16										8			16									
9			18									9			18										

	0	1	2	3	4	5	6	7	8	9	Z E R O S & O N E S		0	1	2	3	4	5	6	7	8	9	N I N E S		
0	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0		0	
1	0	1	2	3	4	5	6	7	8	9			1	0	1	2	3	4	5	6	7	8		9	
2	0	2	4	6	8	10	12	14	16	18			2	0	2	4	6	8	10	12	14	16		18	
3	0	3	6			15							3	0	3	6			15						27
4	0	4	8			20							4	0	4	8			20						36
5	0	5	10	15	20	25	30	35	40	45			5	0	5	10	15	20	25	30	35	40		45	
6	0	6	12			30							6	0	6	12			30						54
7	0	7	14			35							7	0	7	14			35						63
8	0	8	16			40							8	0	8	16			40						72
9	0	9	18			45						9	0	9	18	27	36	45	54	63	72	81			

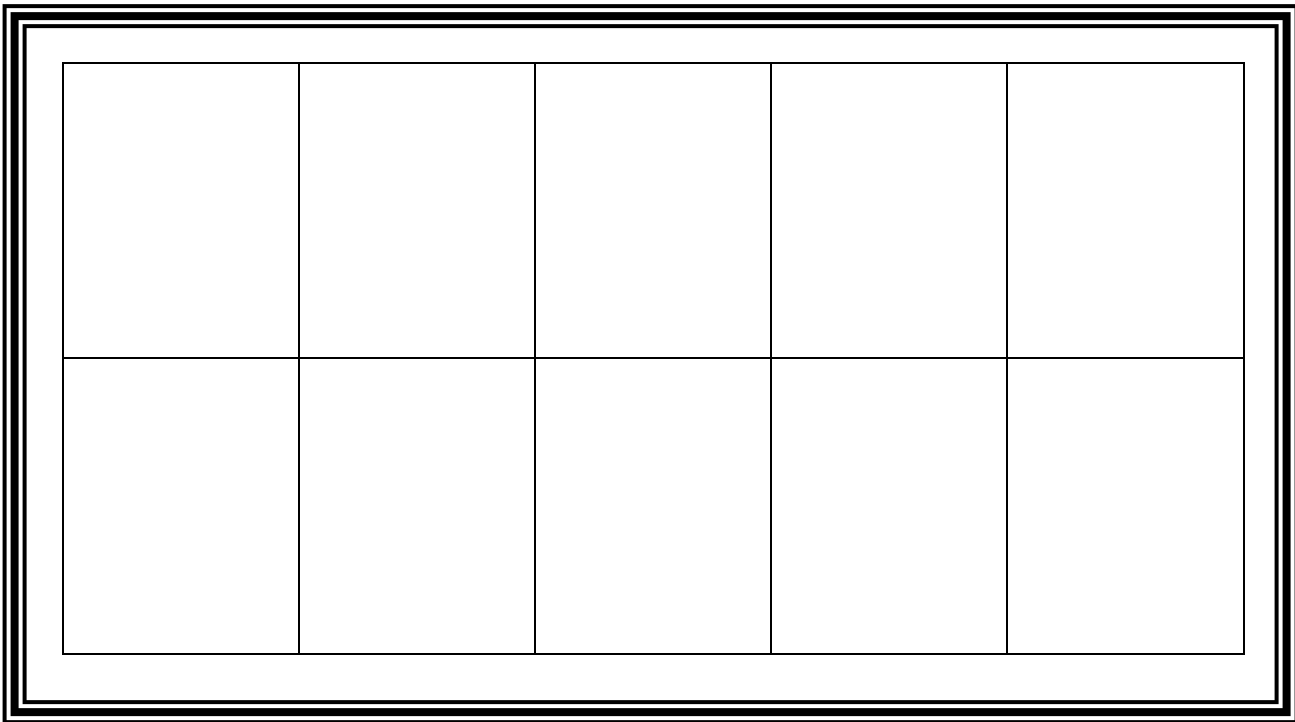
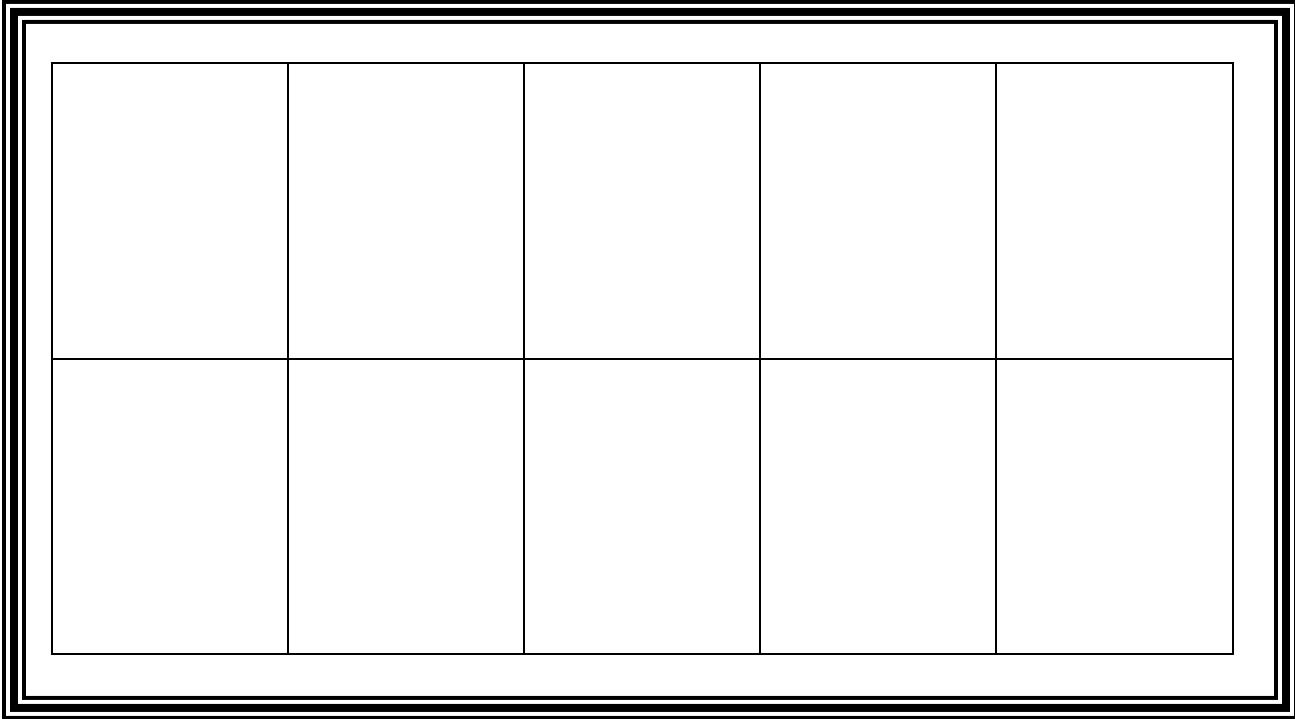
	0	1	2	3	4	5	6	7	8	9	S Q U A R E S		0	1	2	3	4	5	6	7	8	9	3's & 4's		
0	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0		0	
1	0	1	2	3	4	5	6	7	8	9			1	0	1	2	3	4	5	6	7	8		9	
2	0	2	4	6	8	10	12	14	16	18			2	0	2	4	6	8	10	12	14	16		18	
3	0	3	6	9		15				27			3	0	3	6	9	12	15	18	21	24		27	
4	0	4	8		16	20				36			4	0	4	8	12	16	20	24	28	32		36	
5	0	5	10	15	20	25	30	35	40	45			5	0	5	10	15	20	25	30	35	40		45	
6	0	6	12			30	36			54			6	0	6	12	18	24	30	36				54	
7	0	7	14			35		49		63			7	0	7	14	21	28	35		49			63	
8	0	8	16			40			64	72			8	0	8	16	24	32	40			64		72	
9	0	9	18	27	36	45	54	63	72	81		9	0	9	18	27	36	45	54	63	72	81			

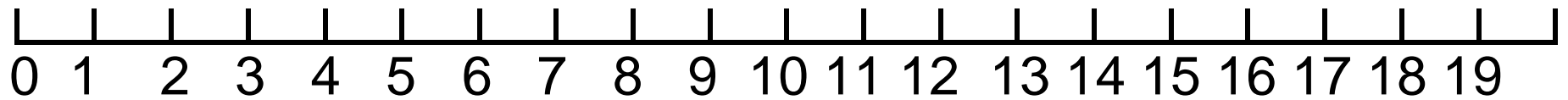
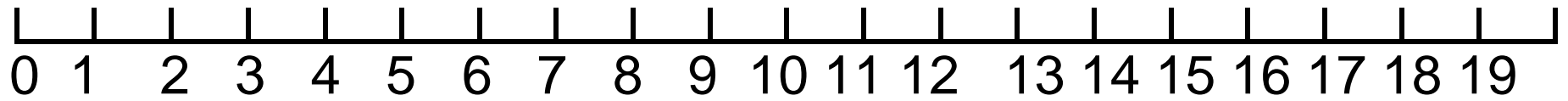
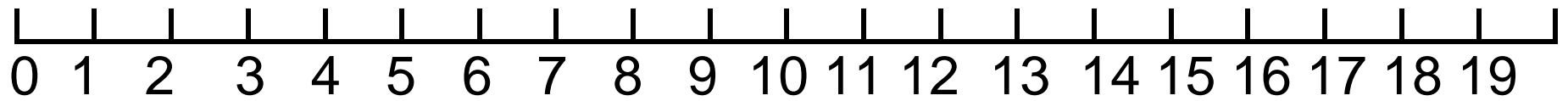
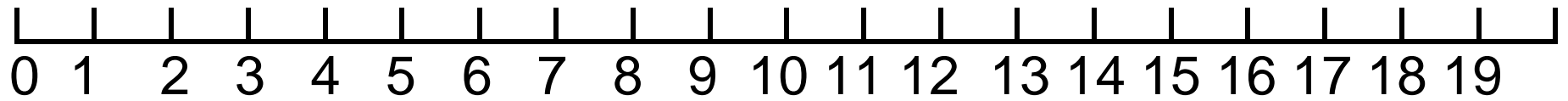
	0	1	2	3	4	5	6	7	8	9	6's 7's & 8's
0	0	0	0	0	0	0	0	0	0	0	
1	0	1	2	3	4	5	6	7	8	9	
2	0	2	4	6	8	10	12	14	16	18	
3	0	3	6	9	12	15	18	21	24	27	
4	0	4	8	12	16	20	24	28	32	36	
5	0	5	10	15	20	25	30	35	40	45	
6	0	6	12	18	24	30	36	42	48	54	
7	0	7	14	21	28	35	42	49	56	63	
8	0	8	16	24	32	40	48	56	64	72	
9	0	9	18	27	36	45	54	63	72	81	

Algebraic Connections to Strategies

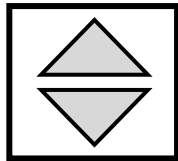
Doubles $x + x = y$ $2x = y$	Doubles + 1 $x + (x + 1) = y$ $x + x + 1 = y$ $2x + 1 = y$
Doubles + 2 $x + (x + 2) = y$ $x + x + 2 = y$ $2x + 2 = y$	Sharing $x + (x + 2) = y$ $x + (x + 1 + 1) = y$ $(x + 1) + (x + 1) = y$
Adding 9 $9 + x = y$ $(10 - 1) + x = y$ $(10 + x) - 1 = y$	Adding 0 $0 + x = x$ $x + 0 = x$

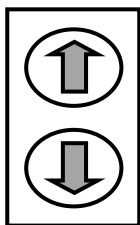
Ten-Frames





Ride the Express





10

9

8

18

7

17

6

16

5

15

4

14

3

13

2

12

1

11

Name _____ Date _____

15	14	17	13	16
<u>-7</u>	<u>-8</u>	<u>-9</u>	<u>-6</u>	<u>-7</u>

12	18	13	15	16
<u>-7</u>	<u>-9</u>	<u>-5</u>	<u>-8</u>	<u>-9</u>

Name _____ Date _____

15	14	17	13	16
<u>-7</u>	<u>-8</u>	<u>-9</u>	<u>-6</u>	<u>-7</u>

12	18	13	15	16
<u>-7</u>	<u>-9</u>	<u>-5</u>	<u>-8</u>	<u>-9</u>

Make a Problem



To give your child more practice with facts you can use sheets like this over and over.

Think of the paper as 3 sections - 2 rows per section.

In the first two rows do a warm up having your child generate the kind of facts he or she knows well (e.g. doubles). In the next two rows, work on the group where your child needs practice.

For doubles in addition just have your child put the same number below all the given numbers and then add up all the problems.

For doubles + 1 (or doubles + 2), have your child write numbers that are 1 (or 2) away from the given numbers. Usually make the bottom number larger but sometimes encourage your child to make it 1 (or 2) smaller. (Watch out for 0 and 1. You can say that -1 is one away from 0 (or -2 is two away from 0) if you know about negative numbers.)

For adding 0 & adding 1 (adding 10 & adding 9), have your child put 0s in one section and 1s in the next (10s in one section and 9s in the next). When they know these facts really well they can put 0s and 1s (10s and 9s) randomly beneath the given numbers.

For UWYK put any number, 0-9, beneath the given numbers.

For multiplication put the number of the group you are practicing beneath the given numbers and multiply the problems. For the x3 x4 group or x6 x7 x8 you can start by putting 3s in one section and 4s in another and then putting either number down randomly when your child knows the facts better. Do the same for 6s 7s 8s.

For squares in multiplication just put the same number under each given number and then multiply.

Name				Date		
8 —	7 —	6 —	3 —	2 —	<p style="text-align: center;">Make a Problem</p>	
4 —	9 —	0 —	1 —	5 —		
8 —	1 —	3 —	7 —	4 —	6 —	8 —
2 —	9 —	0 —	10 —	5 —	7 —	9 —
7 —	3 —	9 —	4 —	5 —	6 —	8 —
0 —	10 —	1 —	8 —	7 —	2 —	6 —



Pig Game or Safety Zone Game



Number of Players: 2 - 6

What you need: number cubes for each strategy

(see "Cubes Needed," p. 38 and "Labeling Cubes," p. 39)

game sheet (4 turns/player) and pencils, calculator (optional)

How to play for **DOUBLES** in **ADDITION**

1. Shake all 4 number cubes at once. If you shake any doubles write their sums in the big box below "1st turn". You can shake as many times as you want as long as you keep shaking doubles. Put all the sums for each doubles shake in the big box. (Use your brain for these sums.) BUT if you shake and don't get any doubles you lose all your points for that turn! Put a big X on all your points and a 0 in the "safe points" box. Pass cubes to next player.
2. Whenever you decide to stop shaking, add all your points for that turn together and put them in the "safe points" box at the top. (You can add these points on a calculator. Younger students can just get 1 point for every sum in their box.) These points are protected until the end of the game even if you lose points on a future turn.
3. After 4 rounds for each player add all your "safe points" together to get your final score.
4. Watch out for super shakes like 4 4 4 9. You can add the first and second four together, the second and third four together and the first and third four together and write the sum of 8 down 3 times!

Variations for Other Addition, Subtraction and Multiplication Groups:

For doubles + 1 or doubles + 2 (sharing facts), play the same way. Just look for numbers that form doubles + 1 facts if you are playing that version; look for numbers that form doubles + 2 if you are working on those facts. Watch for super shakes like 4 5 6 9. For doubles + 1 you can add 4+5, 5+4, 5+6 and 6+5 so you get 9, 9, 11, and 11 points!

For adding +0 or +1 or for adding +9 or +10 or for x2, x5, x0x1, x9, x3x4,

x6x7x8 use just the two cubes (a mixed-number cube and a special-number cube) indicated on the "Number Cubes" chart, p. 38. Figure your answers and put the points in the big box. BUT if the PIG or sad face ☹ comes up you lose your points and have to put 0 in the "safe points" box.

For squares in multiplication, play the game with 4 of the same mixed number cubes (4,5,6,7,8,9) or (0,1,2,3,4,5). You can multiply any number by itself if it appears at least twice on your roll.

For subtraction, play the game with one mixed number cube that has 17, 16, 15, 14, 13 and a pig or sad face on it and the 4,5,6,7,8 mixed number cube. Shake two cubes and subtract the lesser number from the greater number. BUT if the PIG or sad face ☹ comes up you lose your points and have to put 0 in the "safe points" box.

Number Cubes Needed for Pig or Safety Zone Game and Shake, Rattle & Roll

(See also "Recommendations for Labeling Cubes," p. 39 and cube patterns on p. 40)

Addition Facts	For older learners	For younger learners
Doubles Doubles + 1 Doubles + 2 or Sharing	Use four mixed-number cubes like this for each player or pair of players: 4 5 6 7 8 9	Use four mixed-number cubes like this for each player or pair of players: 0 1 2 3 4 5
Adding 0 & 1 Cube 1 Cube 2	Use two cubes like this: 0 0 1 1 1 ☹️ 4 5 6 7 8 9	Use two cubes like this: 0 0 1 1 1 ☹️ 0 1 2 3 4 5
Adding 10 & 9 Cube 1 Cube 2	Use two cubes like this: 9 9 9 9 9 ☹️ 4 5 6 7 8 9	Use two cubes like this: 10 10 10 10 10 ☹️ 0 1 2 3 4 5

Multiplication Facts	Use 2 cubes for each player or pair of players: Cube 1-special number cube & Cube 2-mixed number cube												
x 2	2	2	2	2	2	☹️	&	4	5	6	7	8	9
x 5	5	5	5	5	5	☹️	&	4	5	6	7	8	9
x 0 x 1	0	0	1	1	1	☹️	&	4	5	6	7	8	9
x 9	9	9	9	9	9	☹️	&	4	5	6	7	8	9
x 3 x 4	3	3	4	4	4	☹️	&	4	5	6	7	8	9
x6 x7 x8	6	7	7	8	8	☹️	&	4	5	6	7	8	9
Squares	Use 4 cubes like this: 4 5 6 7 8 9												

For Pig or Safety Zone it often works best for players to use one set of cubes. One player will check out the other player while he or she is shaking the cubes and also practice facts without even knowing it. In Shake, Rattle and Roll, if each person does not have his/her own cubes, one person can shake the cubes and the other record the number sentences.

Recommendations for Labeling Cubes for Basic Fact Games

(see also “Cubes Needed” chart, p.38 or “Cube Pattern Diagrams,” p.40)

Basic Cube Set for Addition

Requires 6-10 cubes for each student or pair of students

Make 4 mixed number cubes (4,5,6,7,8,9)

Make 1 special number cube for 9s (9,9,9,9,9,pig/sad face)

Make 1 special number cube for 0s & 1s (0,0,1,1,1, pig/sad face)

Option: make 4 lower level mixed number cubes (0,1,2,3,4,5) for students who are just beginning fact work or who have struggled with learning facts

Basic Cube Set for Multiplication

Requires 10-14 cubes for each student or pair of students

If students also have cubes from addition facts (see above) then they will only need 4 new cubes

Make 4 mixed number cubes (4,5,6,7,8,9) (can reuse from addition cubes)

Make 1 special number cube for 2s (2,2,2,2,2, pig/sad face)

Make 1 special number cube for 5s (5,5,5,5,5, pig/sad face)

Make 1 special number cube for 9s (9,9,9,9,9, pig/sad face) (can reuse from addition cubes)

Make 1 special number cube for 0s & 1s (0,0,1,1,1, pig/sad face) (can reuse from addition)

Make 1 special number cube for 3s & 4s (3,3,4,4,4, pig/sad face)

Make 1 special number cube for 6s, 7s & 8s (6,7,7,8,8, pig/sad face)

Option: make 4 lower level mixed number cubes (0,1,2,3,4,5) for students who are just beginning fact work or who have struggled with learning facts

Color Coding (optional but helpful – makes finding or sorting cubes easier)

For color coding use different colors of Sharpie® pens.

BLACK	mixed number cubes (4,5,6,7,8,9, or 0,1,2,3,4,5)
PURPLE	2s special number cube (2,2,2,2,2,pig/sad face)
ORANGE	5s special number cube (5,5,5,5,5 pig/sad face)
GREEN	9s special number cube (9,9,9,9,9 pig/sad face)
RED	0s & 1s special number cube (0,0,1,1,1, pig/sad face)
BROWN	3s & 4s special number cube (3,3,4,4,4, pig/sad face)
BLUE	6s, 7s & 8s special number cube (6,7,7,8,8 pig/sad face)



Share the Pig or Safety Zone game with parents at Open House, Curriculum Night, Family Math Night or Conferences. Send home a basic cube set, game directions and chart of cubes to use.

Cubes available at www.bayerwood.com

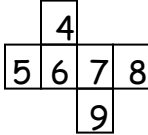
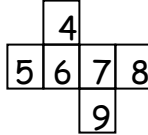
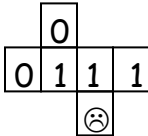
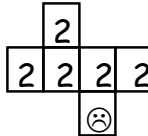
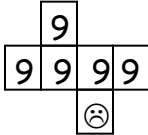
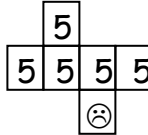
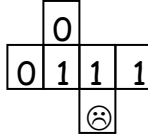
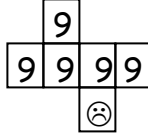
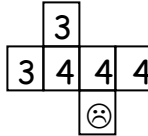
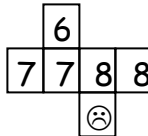
(go to “Balls, Beads and Cubes,” then to “Cubes” for price list)

Recommend 3/4”, 7/8” or 1” cubes.

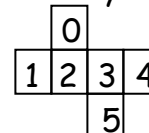
Cubes are usually 5¢-9¢ each – call company for price breaks on large orders.

You can also check a local craft store (may be pricey) or have parents make cubes for you.

Cube Pattern Diagrams

FOR ADDITION	FOR MULTIPLICATION
Make 4 mixed number cubes:  <i>ink color: black</i>	Make 4 mixed number cubes:  <i>ink color: black</i>
Make 1 special number cube:  <i>red</i>	Make 1 special number cube:  <i>purple</i>
Make 1 special number cube:  <i>green</i>	Make 1 special number cube:  <i>orange</i>
	Make 1 special number cube:  <i>red</i>
	Make 1 special number cube:  <i>green</i>
	Make 1 special number cube:  <i>brown</i>
	Make 1 special number cube:  <i>blue</i>
Total cubes needed per student or pair of students: 6 cubes	Total cubes needed per student or pair of students: 10 cubes (or only 4 cubes by reusing the 6 cubes from addition)

Option: for students just beginning fact work in addition or multiplication or for those struggling to learn facts you might want to make 4 easy number mixed cubes (use *black* ink or any other color not previously used):







Pig



Game

Final Score

1 st turn	2 nd turn	3 rd turn	4 th turn
 safe points	 safe points	 safe points	 safe points





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Pig



Game





Final Score

1 st turn	2 nd turn	3 rd turn	4 th turn
 safe points	 safe points	 safe points	 safe points

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Safety  Zone





Final Score

1 st turn	2 nd turn	3 rd turn	4 th turn
 safe points	 safe points	 safe points	 safe points

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Safety  Zone

Final Score

1 st turn	2 nd turn	3 rd turn	4 th turn
 safe points	 safe points	 safe points	 safe points

Shake Rattle Roll

This is a good activity while you are fixing dinner, taking a car trip or while waiting at a doctor's office.

Number of Players: just 1 or any number of children

Materials: 2-4 number cubes/person (see "Cubes Needed" sheet, p. 38)

Graph paper (or any paper) & pencils or pens

Recording of a favorite song

How to play:

1. Play a favorite song and shake cubes for as long as the song lasts.
2. For the doubles in addition game, write the equation for every doubles fact you shake (e.g. $8 + 8 = 16$). If you don't shake any doubles just shake again (there is no penalty).
3. At the end of the song, count how many facts you were able to write.

Hint: Parents can write the facts as child shakes and says the facts to speed things up. Knowing the facts is what's important. Or if you have two children practicing facts, one can shake and say the facts and the other write the facts. (Then play the song again and reverse who shakes and who writes). Graph paper helps but any scratch paper can be used.

Variations:

For doubles + 1, doubles + 2, adding 1 & adding zero, and adding 10 & adding 9 encourage your child to write equations both ways using the numbers that are being added. E.g. $6 + 7 = 13$ should instantly lead your child to also write $7 + 6 = 13$. (You might also want to write the related subtraction facts across from the addition facts.) Watch for super shakes like 4 5 6 9 - in doubles + 1 you can write:

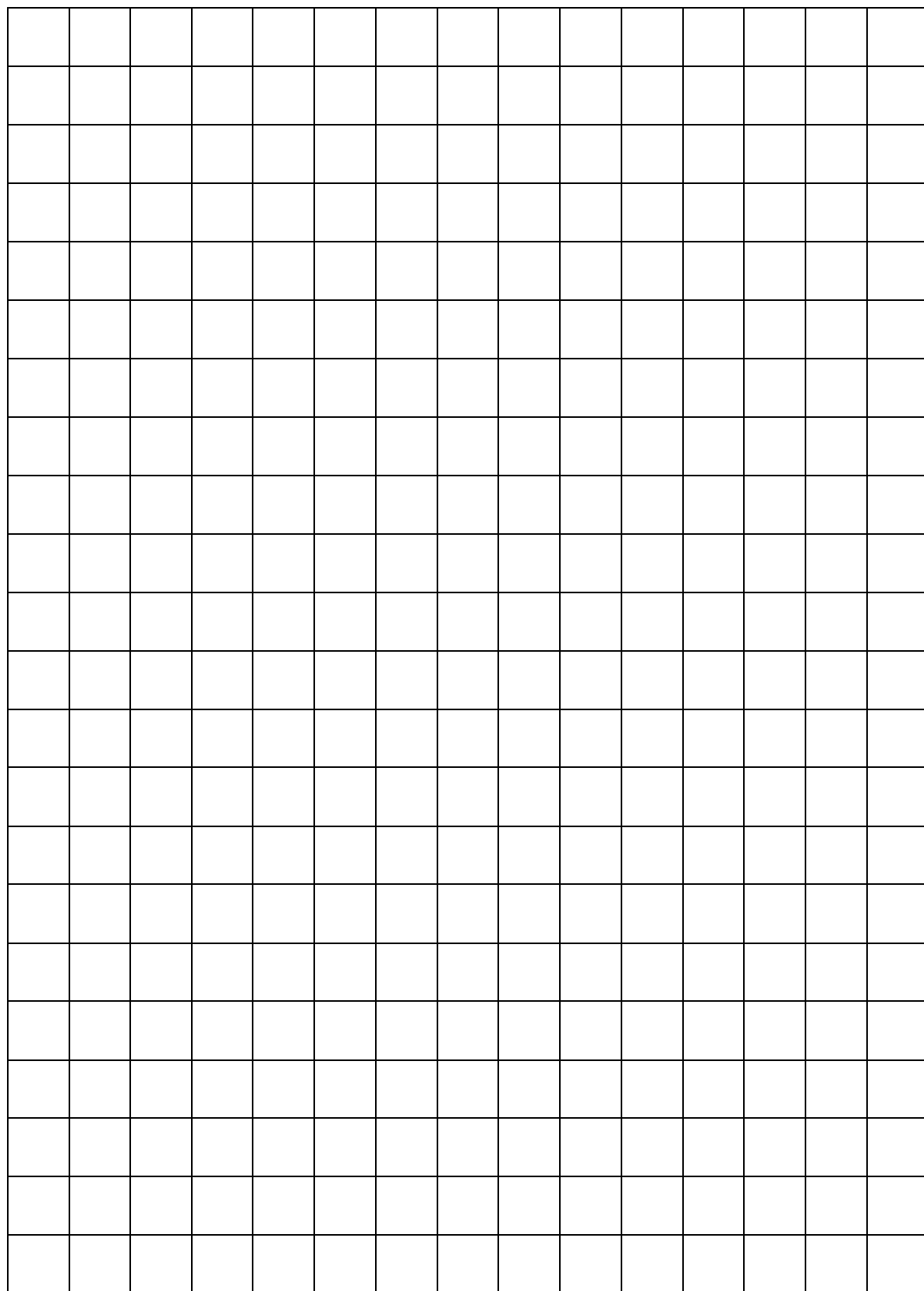
$$4 + 5 = 9 \qquad 9 - 5 = 4$$

$$5 + 4 = 9 \qquad 9 - 4 = 5$$

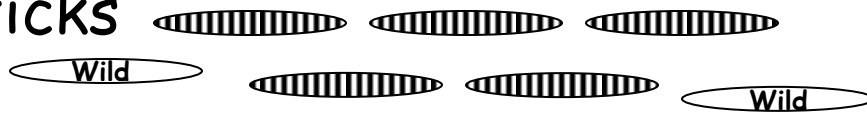
$$5 + 6 = 11 \qquad 11 - 5 = 6$$

$$6 + 5 = 11 \qquad 11 - 6 = 5$$

The same thing should be encouraged in multiplication. E.g. $5 \times 9 = 45$ should instantly lead to also writing $9 \times 5 = 45$. Related division facts, $45 \div 9 = 5$ and $45 \div 5 = 9$, can also be written.



Wild Sticks



How to make wild sticks:

- Save sticks from frozen treats like popsicles or buy craft sticks (or cut craft foam into stick-like strips or use pre-cut foam shapes).
- Write facts (just the addends or factors) for a given group on half of the sticks and the answers (sums or products) on the other half of the sticks. (Writing facts on file folder labels and then sticking to sticks is easy.)
- Make 2 sticks that say "WILD."
- Decorate the backs of the sticks to make the game interesting. Just be sure to use a design that it easy to make the same on all the sticks!

Game 1 - Concentration (2-4 players)

1. Lay all the sticks face down. Straight rows are best.
2. First player turns over 2 sticks. If they are a fact and its "answer" the player keeps the sticks and gets to keep playing. If they are not a match, turn them face down where they were and pass turn to next player.
3. WILD sticks match anything.
4. Play continues until all matches are made; player with most pairs wins.

Game 2 - Don't Get Stuck with the WILD Stick (2-4 players)

1. Use only one WILD stick. Lay sticks face down and mix them up.
2. Deal out all the sticks to players.
3. Players look for matches (a fact and its "answer") and lay them down.
4. Player on dealer's left draws a stick from the dealer and checks for a match. If he/she gets a match he/she can lay the match down and keeps drawing. If he/she gets the WILD stick or a stick that doesn't make a match his/her turn is over. The player on his/her left then draws from him/her, etc.
5. Keep playing until all the matches have been made and someone gets stuck with the WILD stick - not what you want to happen!

Game 3 - Drop in the Bucket (2-4 players)

1. Leave the WILD sticks out. Separate facts from "answers".
2. Dealer keeps the facts sticks and deals out all the "answers" (or keeps "answers", deals out facts).
3. Place a bucket or container within easy reach of all players.
4. Dealer draws a fact ("answer") stick and reads it; player with "answer" (fact) drops his/her stick in the bucket. Winner is first player out of sticks.

Sample WILD STICKS Game for Doubles in Addition

$0 + 0$	0	$5 + 5$	10
$1 + 1$	2	$6 + 6$	12
$2 + 2$	4	$7 + 7$	14
$3 + 3$	6	$8 + 8$	16
$4 + 4$	8	$9 + 9$	18
	WILD	WILD	

Sample WILD STICKS Game for Nines in Multiplication

$9 \cdot 0$	0	$9 \cdot 5$	45
$9 \cdot 1$	9	$9 \cdot 6$	54
$9 \cdot 2$	18	$9 \cdot 7$	63
$9 \cdot 3$	27	$9 \cdot 8$	72
$9 \cdot 4$	36	$9 \cdot 9$	81
	WILD	WILD	

Using the Assessments of Strategies and Class Recording Sheets

Assessments of Strategies

Suggestion: Present the "tests" as "opportunities" for students to show what they know and for educators to determine which strategies will help students improve their fact knowledge.

Assess students one row at a time. To better show growth, time students in seconds. Going from 120 seconds to 60 or 30 seconds motivates students more than improving from 2 minutes to 1 minute! By the intermediate grades students should generally do a row in 30-50 seconds (NCTM: *Principles and Standards for School Mathematics*. 2000)

1. Assessing one student at a time is ideal. Have student do a row, record time in seconds, do next row, record time in seconds, etc.
2. Assess a small group. Students do a row and give their paper to the adult assessing the students. Adult records times as he/she gets the assessments. Pass papers back to students to do row 2, record seconds, pass papers back for row 3, etc.
3. Assess an entire class. Instruct students to do only one row at a time. They might even fold their paper to reveal just the row they need. While they work, record every 5 seconds on the board, listing 5, 10, 15, 20, etc. as time goes by. When a student finishes a row, he/she records the largest number on the board so far in the score box at the end of the row and waits for the signal to begin row 2. After 120 seconds, ask students who are not finished to put 120+ in their score box and move everyone to next row.

Reassess every 2-3 weeks IF students are able to practice at least 3 times a week for 10-20 minutes/day. When reassessing just let students do a row of their choice to warm up and then do the row for the facts they have worked on. The whole sheet does not need to be done again.

Key to Use on Recording Charts

O	Needs help
/	Close to mastery - might be a bit slow or has only a few (1-2) errors
X	Knows this group of facts; time is quick enough and accuracy is good

Name _____

Addition Facts
Assessment of Strategies

Date _____

											Score
Doubles	4 <u>+4</u>	7 <u>+7</u>	2 <u>+2</u>	9 <u>+9</u>	5 <u>+5</u>	0 <u>+0</u>	3 <u>+3</u>	6 <u>+6</u>	8 <u>+8</u>	1 <u>+1</u>	
Doubles + 1	8 <u>+9</u>	5 <u>+4</u>	3 <u>+2</u>	8 <u>+7</u>	3 <u>+4</u>	10 <u>+9</u>	5 <u>+6</u>	6 <u>+7</u>	1 <u>+2</u>	2 <u>+3</u>	
Adding 0 & 1	10 <u>+0</u>	0 <u>+3</u>	1 <u>+2</u>	9 <u>+0</u>	1 <u>+5</u>	5 <u>+0</u>	8 <u>+1</u>	1 <u>+6</u>	4 <u>+0</u>	7 <u>+1</u>	
Doubles + 2 (or Sharing)	5 <u>+7</u>	3 <u>+5</u>	7 <u>+9</u>	8 <u>+6</u>	2 <u>+4</u>	0 <u>+2</u>	9 <u>+7</u>	4 <u>+6</u>	1 <u>+3</u>	8 <u>+10</u>	
Adding 10	10 <u>+4</u>	9 <u>+10</u>	10 <u>+2</u>	10 <u>+0</u>	5 <u>+10</u>	7 <u>+10</u>	10 <u>+3</u>	10 <u>+6</u>	10 <u>+8</u>	1 <u>+10</u>	
Adding 9	9 <u>+2</u>	9 <u>+0</u>	5 <u>+9</u>	9 <u>+7</u>	9 <u>+3</u>	6 <u>+9</u>	9 <u>+8</u>	1 <u>+9</u>	4 <u>+9</u>	9 <u>+9</u>	
UWYK	3 <u>+6</u>	5 <u>+2</u>	7 <u>+4</u>	2 <u>+8</u>	7 <u>+2</u>	8 <u>+3</u>	3 <u>+7</u>	8 <u>+4</u>	5 <u>+8</u>	6 <u>+2</u>	

Name _____

Subtraction Facts
Assessment of Strategies

Date _____

											Score
Subtract nothing, one or everything	7 <u>-7</u>	6 <u>-1</u>	4 <u>-0</u>	3 <u>-3</u>	5 <u>-1</u>	9 <u>-1</u>	9 <u>-9</u>	8 <u>-0</u>	7 <u>-0</u>	8 <u>-1</u>	
Counting UP	9 <u>-8</u>	5 <u>-2</u>	7 <u>-6</u>	9 <u>-4</u>	6 <u>-5</u>	8 <u>-3</u>	9 <u>-5</u>	7 <u>-2</u>	7 <u>-4</u>	6 <u>-2</u>	
Ride the Express – up to 10 and beyond	16 <u>-9</u>	12 <u>-3</u>	13 <u>-8</u>	16 <u>-7</u>	13 <u>-4</u>	15 <u>-6</u>	14 <u>-5</u>	13 <u>-7</u>	17 <u>-9</u>	16 <u>-8</u>	
What makes 10?	2 + <input type="text"/> = 10	4 + <input type="text"/> = 10	7 + <input type="text"/> = 10	5 + <input type="text"/> = 10	3 + <input type="text"/> = 10	6 + <input type="text"/> = 10	9 + <input type="text"/> = 10	8 + <input type="text"/> = 10	1 + <input type="text"/> = 10		
Adding a number to 10	10 + <input type="text"/> = 18	10 + <input type="text"/> = 17	10 + <input type="text"/> = 13	10 + <input type="text"/> = 14	10 + <input type="text"/> = 12	10 + <input type="text"/> = 11	10 + <input type="text"/> = 15	10 + <input type="text"/> = 16	10 + <input type="text"/> = 19		

Name _____

Multiplication Facts
Assessment of Strategies

Date _____

											Score
Twos	$\begin{array}{r} 3 \\ \times 2 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ \times 2 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ \times 2 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ \times 2 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ \times 2 \\ \hline \end{array}$	$\begin{array}{r} 0 \\ \times 2 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ \times 2 \\ \hline \end{array}$	
Fives	$\begin{array}{r} 2 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 0 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ \times 5 \\ \hline \end{array}$	
Zeros & Ones	$\begin{array}{r} 0 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ \times 1 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 0 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ \times 1 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ \times 0 \\ \hline \end{array}$	$\begin{array}{r} 0 \\ \times 0 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ \times 0 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ \times 1 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ \times 0 \\ \hline \end{array}$	
Nines	$\begin{array}{r} 3 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 0 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ \times 9 \\ \hline \end{array}$	
Squares	$\begin{array}{r} 5 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 1 \\ \times 1 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ \times 7 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 0 \\ \times 0 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ \times 3 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ \times 2 \\ \hline \end{array}$	
Threes & Fours	$\begin{array}{r} 8 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ \times 3 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ \times 3 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ \times 3 \\ \hline \end{array}$	
Sixes, Sevens & Eights	$\begin{array}{r} 6 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ \times 7 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ \times 7 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ \times 4 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ \times 5 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ \times 8 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ \times 6 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ \times 6 \\ \hline \end{array}$	

Individual Student Charts for Addition Facts (punch out each group of known facts when fluent)

	0	1	2	3	4	5	6	7	8	9	A D D I T I O N		0	1	2	3	4	5	6	7	8	9	A D D I T I O N
0	0	1	2	3	4	5	6	7	8	9		0	0	1	2	3	4	5	6	7	8	9	
1	1	2	3	4	5	6	7	8	9	10		1	1	2	3	4	5	6	7	8	9	10	
2	2	3	4	5	6	7	8	9	10	11		2	2	3	4	5	6	7	8	9	10	11	
3	3	4	5	6	7	8	9	10	11	12		3	3	4	5	6	7	8	9	10	11	12	
4	4	5	6	7	8	9	10	11	12	13		4	4	5	6	7	8	9	10	11	12	13	
5	5	6	7	8	9	10	11	12	13	14		5	5	6	7	8	9	10	11	12	13	14	
6	6	7	8	9	10	11	12	13	14	15		6	6	7	8	9	10	11	12	13	14	15	
7	7	8	9	10	11	12	13	14	15	16		7	7	8	9	10	11	12	13	14	15	16	
8	8	9	10	11	12	13	14	15	16	17		8	8	9	10	11	12	13	14	15	16	17	
9	9	10	11	12	13	14	15	16	17	18	9	9	10	11	12	13	14	15	16	17	18		
Name												Name											

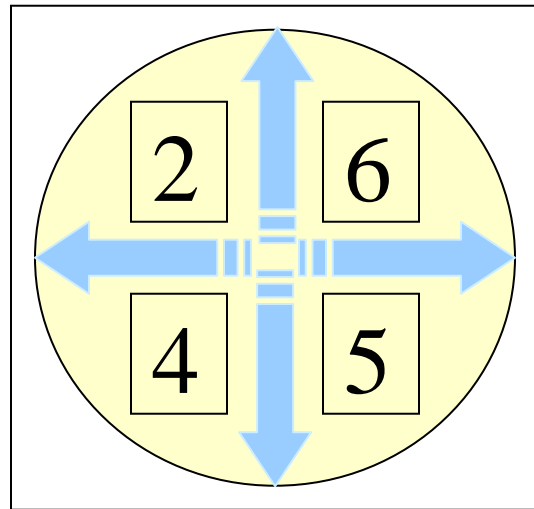
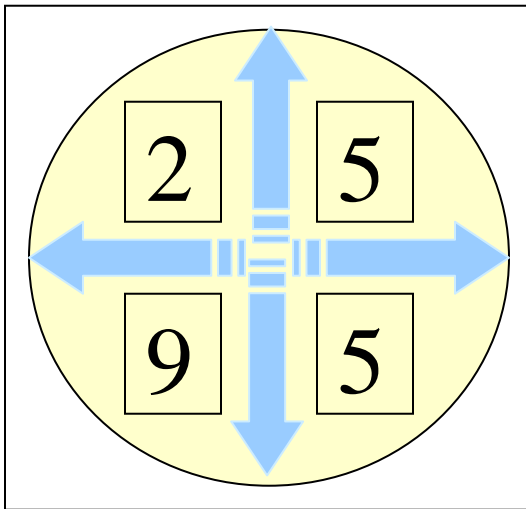
Individual Student Charts for Multiplication Facts (punch out each group of facts when fluent)

	0	1	2	3	4	5	6	7	8	9	M U L T I P L Y		0	1	2	3	4	5	6	7	8	9	M U L T I P L Y		
0	0	0	0	0	0	0	0	0	0	0			0	0	0	0	0	0	0	0	0	0			
1	0	1	2	3	4	5	6	7	8	9			1	0	1	2	3	4	5	6	7	8		9	
2	0	2	4	6	8	10	12	14	16	18			2	0	2	4	6	8	10	12	14	16		18	
3	0	3	6	9	12	15	18	21	24	27			3	0	3	6	9	12	15	18	21	24		27	
4	0	4	8	12	16	20	24	28	32	36			4	0	4	8	12	16	20	24	28	32		36	
5	0	5	10	15	20	25	30	35	40	45			5	0	5	10	15	20	25	30	35	40		45	
6	0	6	12	18	24	30	36	42	48	54			6	0	6	12	18	24	30	36	42	48		54	
7	0	7	14	21	28	35	42	49	56	63			7	0	7	14	21	28	35	42	49	56		63	
8	0	8	16	24	32	40	48	56	64	72			8	0	8	16	24	32	40	48	56	64		72	
9	0	9	18	27	36	45	54	63	72	81		9	0	9	18	27	36	45	54	63	72	81			
Name												Name													

When facts stick, challenge students with problem solving games to create mathematically powerful students

24 GAME www.24game.com or www.etacusenaire.com

Use ALL FOUR NUMBERS on one card with ANY COMBINATION OF OPERATIONS (addition, subtraction, multiplication or division) TO MAKE 24.



REJECTO

1. Decide if you are playing for the *greatest* or *least* grand total.
2. Use dice, spinners, or number cards to generate 4 numbers, one at a time. Three of the four numbers drawn will be used to do the computing.
3. Students decide where to write the first number. It must be written in all shapes of that kind (e.g. if 7 is the number and it is written in a square, it must go in all the squares). Three more numbers are generated and written in the shapes.
4. One of the numbers can be rejected at any time by writing it in the hexagon.
5. Students add problems horizontally. Then, they add those totals vertically to get their “Grand Total” The person with the greatest (or least) grand total wins.

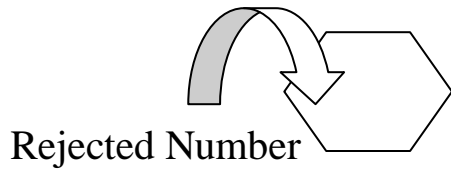
REJECTO • Version A

$$\square + \triangle = \underline{\hspace{2cm}}$$

$$\square + \bigcirc = \underline{\hspace{2cm}}$$

$$\bigcirc + \square = \underline{\hspace{2cm}}$$

Grand Total



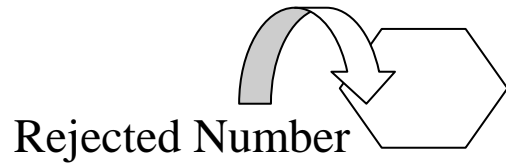
REJECTO • Version A

$$\square + \triangle = \underline{\hspace{2cm}}$$

$$\square + \bigcirc = \underline{\hspace{2cm}}$$

$$\bigcirc + \square = \underline{\hspace{2cm}}$$

Grand Total



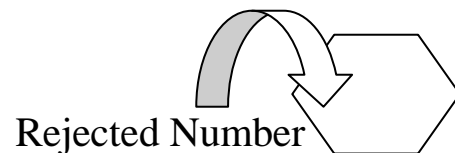
REJECTO • Version B

$$\square + \square + \square + \bigcirc = \underline{\hspace{2cm}}$$

$$\bigcirc + \bigcirc + \square + \triangle = \underline{\hspace{2cm}}$$

$$\triangle + \triangle + \bigcirc + \square = \underline{\hspace{2cm}}$$

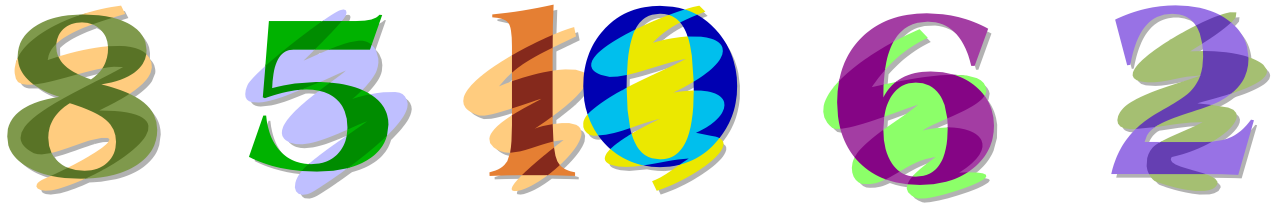
Grand Total



Nifty Numerals

Use $+$ $-$ \times \div

with 3, 4 or 5 of these numbers



to make



Krypto

The idea behind Nifty Numerals is a commercially available game called KRYPTO. In Krypto you have numeral cards from 1 to 25. You draw 5 cards to use with any of the four basic operations ($+$ $-$ \times \div) and then draw one more card which becomes the target number to make, using all 5 of the previously drawn cards. The commercial game is available from Making People Happy Company (<http://mphgames.com>) or search on “Krypto.”



Initial Assessments for Young Learners or Struggling Learners

If the more comprehensive Assessments of Strategies (in "Assessing Students" section) are too difficult for students you can use one of the initial assessments indicated below.

The five most helpful groups for young students or struggling students to master are:

- 1) *Combinations that make 5*
- 2) *Combinations that make 10*
- 3) *Adding 0 to a number*
- 4) *Adding 1 to a number*
- 5) *Doubles*

These groups give students power to use strategies to learn the remaining facts.

Half Sheet Assessments (pp. 80-82)

Have students do each half sheet separately. Watch to see if students are able to do each half sheet with quick recall or if they have to stop to count or calculate. You can also verbally give the problems to individual students. These assessments use child-friendly language and avoid some of the confusion beginning learners have with the symbols of mathematics. They are a way to see if students get some of the most important basic facts that are foundational to developing number sense and seeing relationships in mathematics.

Pocket Assessment Fact Cards (pp. 83-87)

Run fact cards on heavyweight cardstock and cut apart the cards in each set. Carry around the card sets in your pocket. Show individually to students to determine if they are fluent with the facts. They should be automatic in their responses - recalling the sums (or the missing addend) from their brains. They do not have to be super fast - just obviously recalling the fact in a reasonable amount of time.

Record class results on the recording chart (p. 88) using the key below:

O	Needs help
/	Close to mastery - might be a bit slow or has only a few (1-2) errors
X	Knows this group of facts; time is quick enough and accuracy is good

Name _____ Date _____

Make 5

2 and _____ make 5	1 and _____ make 5
4 and _____ make 5	0 and _____ make 5
5 and _____ make 5	3 and _____ make 5

Name _____ Date _____

Make 10

4 and _____ make 10	7 and _____ make 10
3 and _____ make 10	9 and _____ make 10
5 and _____ make 10	0 and _____ make 10
8 and _____ make 10	6 and _____ make 10
1 and _____ make 10	2 and _____ make 10

Name _____ Date _____

Double It

3 and 3 make _____	1 and 1 make _____
5 and 5 make _____	8 and 8 make _____
9 and 9 make _____	4 and 4 make _____
0 and 0 make _____	7 and 7 make _____
2 and 2 make _____	6 and 6 make _____

Name _____ Date _____

Adding 0

4 and 0 make _____	0 and 7 make _____
3 and 0 make _____	0 and 9 make _____
5 and 0 make _____	0 and 0 make _____
8 and 0 make _____	0 and 6 make _____
1 and 0 make _____	0 and 2 make _____

Name _____ Date _____

Adding 1

4 and 1 make _____	1 and 7 make _____
3 and 1 make _____	1 and 2 make _____
1 and 0 make _____	5 and 1 make _____
8 and 1 make _____	1 and 6 make _____
1 and 1 make _____	1 and 9 make _____

Pocket Assessment Fact Cards-Adding 0

$$\begin{array}{r} 4 \\ + 0 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ + 0 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ + 0 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ + 0 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ + 0 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ + 7 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ + 9 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ + 6 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ + 0 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ + 0 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ + 5 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \\ + 0 \\ \hline \end{array}$$

Pocket Assessment Fact Cards-Adding 1

$$\begin{array}{r} 4 \\ +1 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ +1 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ +1 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ +1 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ +1 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ +7 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ +9 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ +2 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ +0 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ +6 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ +1 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ +3 \\ \hline \end{array}$$

Pocket Assessment Fact Cards-Combinations of 10

4

$$\begin{array}{r} + \square \\ \hline \end{array}$$

10

3

$$\begin{array}{r} + \square \\ \hline \end{array}$$

10

5

$$\begin{array}{r} + \square \\ \hline \end{array}$$

10

8

$$\begin{array}{r} + \square \\ \hline \end{array}$$

10

1

$$\begin{array}{r} + \square \\ \hline \end{array}$$

10

0

$$\begin{array}{r} + \square \\ \hline \end{array}$$

10

7

$$\begin{array}{r} + \square \\ \hline \end{array}$$

10

9

$$\begin{array}{r} + \square \\ \hline \end{array}$$

10

6

$$\begin{array}{r} + \square \\ \hline \end{array}$$

10

Pocket Assessment Fact Cards- Combinations of 5

$$\begin{array}{r} 4 \\ + \square \\ \hline 5 \end{array}$$

$$\begin{array}{r} 3 \\ + \square \\ \hline 5 \end{array}$$

$$\begin{array}{r} 5 \\ + \square \\ \hline 5 \end{array}$$

$$\begin{array}{r} 2 \\ + \square \\ \hline 5 \end{array}$$

$$\begin{array}{r} 1 \\ + \square \\ \hline 5 \end{array}$$

$$\begin{array}{r} 0 \\ + \square \\ \hline 5 \end{array}$$

Pocket Assessment Fact Cards-Doubles

$$\begin{array}{r} 4 \\ +4 \\ \hline \end{array}$$

$$\begin{array}{r} 3 \\ +3 \\ \hline \end{array}$$

$$\begin{array}{r} 5 \\ +5 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \\ +8 \\ \hline \end{array}$$

$$\begin{array}{r} 1 \\ +1 \\ \hline \end{array}$$

$$\begin{array}{r} 7 \\ +7 \\ \hline \end{array}$$

$$\begin{array}{r} 9 \\ +9 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \\ +6 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \\ +2 \\ \hline \end{array}$$

$$\begin{array}{r} 0 \\ +0 \\ \hline \end{array}$$

