

Tall Tales & Twisted Truths



K-2

The Princess, Turtle & Beaver

TEKS Objective

Activity

Description

Food For Thought

Underlying Process

Equate informal language with math and its symbols
111.12B 14b
111.13B 12
111.14B 12c

Number Operations..

Name ordinal positions, quantities, basic addition. Intro to multiplication and division.
111.12B 1-3
111.13B 1-3
111.14B 1-4

Patterns

Odd/even and patterns in numbers to ninety-nine.
111.13B 4
111.14B 11

Probability.....

Display data in an organized manner, picture graphs
111.13B 9
111.14B 5-6

1. Double Trouble -

Checkerboard & Rice

Materials-

1 Checkerboard or
An 8x8 grid of floor tiles or 8'x8' mat (squares are 12"x12")
1 lb. bag of rice or beans

Time - 20-30 Minutes

Objective-

Astonish and wow your students with patterns and the magic of the number 2 in a fun interactive way.

K - Place one bean in corner square of board. Place 2 beans in square to the right, 4 in the next square. Stop for first question. Fill 3rd square, stop again for questions. With Kinder stop at 6 squares (32).

Gr 1-2 Use rice instead of beans with the checkerboard. Stop at 8 squares (128). Have children work in groups.

If using floor tiles, use the beans or larger objects, such as books or the children's shoes. Have the children place the items in each square. How many squares will the shoes fill up? (Not more than 5 squares)

2.Strength in Numbers

Materials -

Paper: 1 - 8.5 x 11 sheet per student.

Time - 15 minutes

Objective -

Show your students how strong paper can be by doubling its layers again and again. The students exposed to division, multiplication, estimation as well as fractions in the magical folding process.

2. Clean & Quick Version

Have each student fold the paper in half. Fold in half again. Ask the students to guess how many rectangles have been created. Open the paper and number the rectangles. Refold the paper. Fold a third time. Guess again. Number the rectangles on the back side. If possible, fold again 2 more times. Number the rectangles.

1a. How many beans will be in the 4th square? 5th square?

1b. 6th square? 8th square?

1c. How many squares do you think you can fill?

1d. Do you have enough rice/beans to fill all squares?

1e. When will the beans overflow? Which square?

1f. Brainteaser-

*Is there enough rice in the USA to fill the checkerboard?**

2a. Is your student stronger than paper?

2b. Can the paper be torn before it is folded the first time?

2c. After the 3rd fold, can you tear it? Why not?

2d. How many rectangles have been created by the folding? Number them.

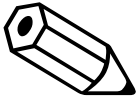
2e. Brainteaser -

*What is the maximum number of times that any size of paper can be folded?**

* If. **No!** The 2003 US crop totaled 19.16 billion pounds, which is equal to approximately 577.55 trillion grains..

*2e. Between **6-12** depending on the paper size. A high school junior from Pomona, CA came up with the mathematical proof that 12 is the limit.

For more details, downloadable worksheets, visit the **FUN STUFF** page of our website.



Tall Tales & Twisted Truths



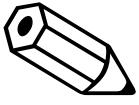
Gr 3-5

The Princess, Turtle & Beaver

TEKS Objective	Activity	Description	Food For Thought
<p>Underlying Process Identify math in everyday life, relate informal language to math & symbols Generalizations 111.15B15-17 111.16B14-15 111.17B14-15</p> <p>Number, Operation &... Read, write and place value of whole numbers. Compare & model fractions, + - x ÷ and estimation. 111.15B1-5 111.16B1-4 111.17B1-4</p> <p>Patterns & Algebraic... Patterns in ÷ & x includes pictorial models 111.15B6 111.16B6 111.17B6-7</p> <p>Probability... Interpret, record & display data in graphs. 111.15B14 111.16B13 111.17</p>	<p>1. Double Trouble - Checkerboard & Rice Materials- 1 Checkerboard or An 8x8 grid of floor tiles or An 8x8 mat (12"x12" square) 1 lb. bag of rice or beans Time - 20-30 Minutes Objective- Astonish and wow your students with the 'Power' of 2, while you explore multiplication, division, fractions and patterns in a fun interactive way.</p> <p>2. Strength in Numbers Materials - <i>Paper: 1 - 8.5 x 11 sheet per student.</i> Time - 10 minutes Objective - <i>Show your students how strong paper can be doubling its layers again and again. Explore the magic of estimation and multiplication while dividing. This introduces fractions.</i></p>	<p>1. Place one kernel of rice in corner square of board. Place 2 kernels in square to the right, 4 in the next square and so on. Continue doubling the amount of kernels until 4 squares of top row are filled. Ask questions. Stop at 8 squares (128). Make a T-Chart.</p> <p>If using floor tiles, place shoes or books in the squares. How many of the squares will the children's shoes fill? Probably no more than 5. Why?</p> <p>2. You're Such a Square Have each student fold the paper in half. Fold in half again. Ask students to estimate the number of rectangles. Open paper and confirm. Number the rectangles. Fold a third time. If possible, fold again 2 more times. Number the rectangles on the reverse side.</p>	<p>1a. How much rice will be in the 5th square? 6th? 1b. 8th square? 10th? 1c. How many squares can you fill yourself? 1d. Do you have enough rice to fill all squares? 1fe. When will the rice overflow a square? 1f. Brainteaser - <i>Is there enough rice in the USA to fill the checkerboard?*</i></p> <p>2a. Can the paper be torn before the first fold? 2b. After the 3rd fold, can you tear it? Why not? 2c. How is it possible to multiply while you divide? 2d. How many rectangles have been created by the folding? Number them. 2e. Brainteaser - <i>What is the maximum number of times that any size of paper can be folded?*</i></p>

1f. No! The 2003 US crop totaled 19.16 billion pounds, which equals approximately 577.55 trillion grains.

*2e. Between 6-12 depending on the paper size. A high school junior from Pomona, CA came up with the mathematical proof that 12 is the limit. For more details, downloadable worksheets, visit the FUN STUFF page of our website.



Tall Tales & Twisted Truths



Gr 6-8

The Princess, Turtle & Beaver

TEKS Objective	Activity	Description	Food For Thought
<p>Underlying Process Identify math in everyday life, relate informal language to math & symbols Generalizations 111.22B-11-12 111.23B13-14 111.24B14-15</p> <p>Number, Operation &... Prime factorization with exponents. Compare & model fractions, + - x ÷ and estimation. Simplify number with exponents 111.22B1-2 111.23B1-2 111.24B1-2</p> <p>Patterns & Algebraic... Patterns in ÷ & x Ratios; predict proportional situations. 111.22B3c 111.24B3</p> <p>Probability... Compare different representations of same data. Solve problems by collecting and interpreting data. 111.22B10a-d 111.23B10-11 111.24B12-13</p>	<p>1. Double Trouble - Checkerboard & Rice Materials- 1 Checkerboard or An 8x8 grid of floor tiles or An 8'x8'mat(12"x12" square) 1 lb. bag of rice or beans Time - 20-30 Minutes Objective- Astonish and wow your students with the 'Power' of 2, while you explore multiplication, division, fractions and patterns in a fun interactive way.</p> <p>2.Strength in Numbers Materials - <i>Paper: 1 - 8.5 x 11 sheet per student.</i> Time - 10 minutes Objective - <i>Show your students how strong paper can be doubling its layers again and again. Explore the magic of estimation, multiplication while dividing. This introduces fractions.</i></p>	<p>1. Place one kernel of rice in corner square of board. Place 2 kernels in square to the right, 4 in the next square and so on. Continue doubling the amount of kernels until 4 squares of top row are filled. Ask questions. Stop at 8 squares (128). Have the students figure out the value of the next row, first as whole numbers, then as exponents. Make a T-Chart or a graph.</p> <p>If using floor tiles, place shoes or books in the squares. How many of the squares will the children's shoes fill? Probably no more than 5. Why?</p> <p>2. You're Such a Square Have each student fold the paper in half. Fold in half again. Ask students to estimate the number of rectangles. Open paper and confirm. Number the rectangles. Fold a third time. Ask students to predict, then calculate the number of folds. If possible, fold again 2 more times. Number the rectangles on the reverse side. Simplify numbers with exponents.</p>	<p>1a. How much rice will be in the 5th square? 6th? 1b. 8th square? 10th? 1c. How many squares can you fill yourself? 1d. Do you have enough rice to fill all squares? 1fe. When will the rice overflow the square? 1f. Brainteaser- <i>Is there enough rice in the USA to fill the checkerboard?*</i></p> <p>2a. Can the paper be torn before the first fold? 2b. After the 3rd fold, can you tear it? Why not? 2c. How is it possible to multiply while dividing? 2d. How many rectangles have been created by the folding? Number them. 2e. Brainteaser - <i>What is the maximum number of times that any size of paper can be folded?*</i></p>

If. **No!** The 2003 US crop totaled 19.16 billion pounds which equals approximately 577.55 trillion grains.

*2e. Between **6-12** depending on the paper size. A high school junior from Pomona, CA came up with the mathematical proof that 12 is the limit. For more details, downloadable worksheets, visit the FUN STUFF page of our website.

Kit Myers

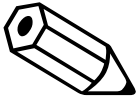
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Tall Tales & Twisted Truths



K-8

Princess, Turtle & Beaver

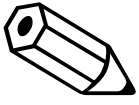
T- Chart

The T-Chart provides a mathematical representation of the patterns inherent in the story.

List the square number on the left side of the chart.

List the number of beans or rice kernels on the right side of the chart.

Square Number	Number of Beans/Rice in Square
1	1
2	2
3	4
4	8
5	16
6	32
7	64
8	128
9	256
10	512
11	1024
12	2048
13	4096

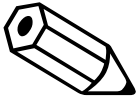


Tall Tales & Twisted Truths



K-8 Answer Table for "Double Trouble" Checkerboard

1	2	4	8	16	32	64	128
256	512	1,024	2,048	4,096	8,192	16,384	32,768
65,536	131,072	262,144	524,288	1,048,576 (Million)	2,097,152	4,194,304	8,388,608
16,777,216	33,554,432	67,108,864	134,217,728	268,435,456	536,870,912	1,073,741,824 (Billion)	2,147,483,648
4,294,967,296	8,589,934,592	17,179,869,184	34,359,738,368	68,719,476,736	137,438,953,472	275,877,906,944	549,755,813,888
1,099,511,627,776 (Trillion)	2,199,023,255,552	4,392,046,511,104	8,796,093,022,208	17,592,186,044,416	35,184,372,088,832	70,368,744,177,664	140,737,488,355,328
218,474,976,710.656	562,949,953,421,312	1,125,899,906,842,624 (Quadrillion)	2,251,799,813,685,248	4,503,599,627,370,496	9,007,199,254,740,992	18,014,398,509,481,984	36,028,797,018,963,968
72,057,594,037,927,936	144,115,188,075,855,872	288,230,376,151,711,744	576,460,752,303,423,488	1,152,921,504,606,846,976 (Quintillion)	2,305,843,009,213,693,952	4,611,686,018,427,387,904	9,233,372,036,854,775,808

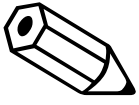


Tall Tales & Twisted Truths



Gr5-8 Answer Table for "Double Trouble" Checkerboard Exponents, Squares & Patterns

1	2	4	8	16	32	64	128
				4^2 2^4		4^3 8^2	
256 16^2 4^4	512 8^3	1,024 32^2	2,048	4,096 64^2 8^4	8,192	16,384 128^2	32,768 32^3
65,536 16^4	131,072	262,144 64^3	524,288	1,048,576	2,097,152 128^3	4,194,304	8,388,608
16,777,216	33,554,432	67,108,864	134,217,728	268,435,456	536,870,912	1,073,741,824	2,147,483,648
4,294,967,296	8,589,934,592	17,179,869,184	34,359,738,368	68,719,476,736	137,438,953,472	275,877,906,944	549,755,813,888
1,099,511,627,776	2,199,023,255,552	4,392,046,511,104	8,796,093,022,208	17,592,186,044,416	35,184,372,088,832	70,368,744,177,664	140,737,488,355,328
218,474,976,710.656	562,949,953,421,312	1,125,899,906,842,624	2,251,799,813,685,248	4,503,599,627,370,496	9,007,199,254,740,992	18,014,398,509,481,984	36,028,797,018,963,968
72,057,594,037,927,936	144,115,188,075,855,872	288,230,376,151,711,744	576,460,752,303,423,488	1,152,921,504,606,846,976	2,305,843,009,213,693,952	4,611,686,018,427,387,904	9,233,372,036,854,775,808



Tall Tales & *Twisted Truths*



K-2

FIND AND CIRCLE THE WORDS IN THE PUZZLE:

PRINCESS
TAIL
WATER

SKY
TREE

TURTLE
TALE

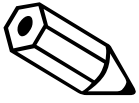
BEAVER
MUCK

ALL WORDS ARE HIDDEN - LEFT TO RIGHT



P	R	I	N	C	E	S	S	R	D
T	R	E	E	Z	T	S	N	P	U
M	U	C	K	E	J	G	I	I	A
Q	P	M	A	L	W	V	R	N	W
B	E	A	V	E	R	T	A	I	L
T	U	R	T	L	E	G	H	J	M
W	A	T	E	R	F	D	U	O	H
J	X	A	R	H	I	J	X	X	Q
G	E	R	A	J	J	N	S	K	Y
G	P	Y	B	Z	T	A	L	E	M

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Tall Tales & *Twisted Truths*



3-5 Princess, Turtle & Beaver

FIND AND CIRCLE THE WORDS IN THE PUZZLE:

PRINCESS
TAIL
WATER
INCREDIBLE

SKY
TREE
SPIRIT
MULTIPLY

TURTLE
TALE
DOUBLING

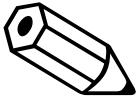
BEAVER
MUCK
STORYTELLER

ALL WORDS ARE HIDDEN - LEFT TO RIGHT; UP OR DOWN



F	R	D	Y	R	W	T	S	E	O
N	S	O	K	W	P	A	T	L	E
T	S	U	S	B	Y	L	O	T	E
S	E	B	E	A	V	E	R	R	R
P	C	L	T	A	I	L	Y	U	T
I	N	I	K	C	U	M	T	T	L
R	I	N	Z	G	E	N	E	O	F
I	R	G	H	M	E	J	L	B	T
T	P	Y	L	P	I	T	L	U	M
W	W	C	H	P	E	B	E	A	W
R	E	T	A	W	A	T	R	F	S
E	L	B	I	D	E	R	C	N	I

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FIND THE FOLLOWING FIFTEEN WORDS HIDDEN IN THE PUZZLE BELOW:

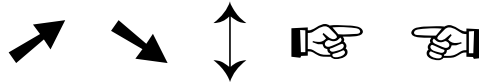
STORYTELLER
EXPONENTIAL
MULTIPLY
TALE

TAIL
PRINCESS
WATER
TREE

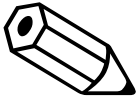
TURTLE
BEAVER
MUCK
SPIRIT

INCREDIBLE
DOUBLING
SKY

WORDS ARE LISTED IN ANY DIRECTION:



V	R	D	Q	I	G	F	B	Q	Z	L	L
M	E	O	K	C	U	M	G	X	T	P	A
D	V	U	W	E	O	V	E	Y	N	F	I
Y	A	B	Q	Q	K	C	L	U	K	O	T
R	E	L	L	E	T	Y	R	O	T	S	N
W	B	I	O	P	E	K	U	I	D	C	E
T	A	N	U	V	R	L	R	F	M	K	N
A	R	G	Y	L	P	I	T	L	U	M	O
I	N	E	X	I	P	A	N	R	E	Q	P
L	S	Q	E	S	L	F	R	C	U	W	X
I	N	C	R	E	D	I	B	L	E	T	E
L	H	O	W	A	T	E	R	D	Z	S	A
O	O	P	O	C	W	K	U	K	C	O	S





Tall Tales & *Twisted Truths*



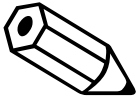
Gr 3-5 Princess, Turtle & Beaver

Word Puzzle Solution

Words are hidden: Left to Right , Right to Left , Up or Down 
No Diagonals

F	R	D	Y	R	W	T	S	E	O
N	S	O	K	W	P	A	T	L	E
T	S	U	S	B	Y	L	O	T	E
S	E	B	E	A	V	E	R	R	R
P	C	L	T	A	I	L	Y	U	T
R	N	I	K	C	U	M	T	T	L
R	N	Z	G	E	N	E	O	F	
T	R	G	H	M	E	J	L	B	T
T	P	Y	L	P	I	T	L	U	M
W	W	C	H	P	E	B	E	A	W
R	E	T	A	W	A	T	R	F	S
E	L	B	I	D	E	R	C	N	I

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Tall Tales & *Twisted Truths*



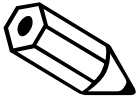
Gr 6-8

Solution

Princess, Turtle & Beaver

All fifteen words appear in every possible direction, including diagonally.





Tall Tales & *Twisted Truths*



K-8

Princess, Turtle & Beaver

Resources

Sharing resources is an integral part of storytelling. That is why I am sharing the following details with you.

Books -

Anno's Mysterious Multiplying Jar

Anno, Mitsumasa & Masaichiro

\$8.99 Paperback/\$13.99 Hardback

Available at Amazon & Borders

Although this book introduces factorials, the magical qualities of math are the focus, just as in the princess legend.

Blanche Neige ISBN #133177812

Warja Lavater

Special thanks to Paul Garro at NEISD in San Antonio for the loan of this unique version of Snow White. This book drives home the importance of symbols in our world. Although I wasn't able to find a reasonably priced copy of Blanche Neige, Warja Lavater's books are available online. His art has been featured in exhibits worldwide.

Materials - All prices approximate

\$1 Checkerboard - Goodwill

\$19 Clear Vinyl Mat - Walmart Fabrics Dept or

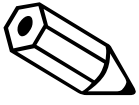
\$ 7 Opaque/Black Plastic Sheeting - Home Depot

\$ 4 Electrician's Tape - 4 pack

\$ 1.60 2lbs Lima Beans

\$.90 2lbs Rice

PLEASE NOTE: The rice and beans I used are not nontoxic. If you want to use colored rice, food coloring is available in the grocery store near baking items.



Tall Tales & *Twisted Truths*



K-8

The Princess, Turtle & Beaver Magical Math Details & Ideas

- 1 - The *Princess* legend is an integral part of the culture of many Native American tribes. The Algonkian tribes in upstate New York have long considered the turtle to be sacred. Recently, a tribal council building was constructed in the shape of a turtle.
- 2 - We live on the back of a floating turtle. Absurd? Not really. Elements of the *Princess* legend are close to scientific truth. Since the 1960's, the concept of plate tectonics has become widely accepted. According to plate tectonics, the continents drift atop the earth's mantle. Legends and folklore have long explained natural phenomena in entertaining ways.
- 3 - Is there enough rice in the USA to fill the checkerboard? No, you'd need approximately 16 times what was produced last year just to fill the last square. According to the USDA National Agriculture Statistical Service Report for 2003, the US produced 19,915,700,000 pounds of rice. To see details of the report, here is the link:
<http://usda.mannlib.cornell.edu/reports/nassr/field/pcp-bban/>
There are approximately 29,000 kernels of rice in one pound of rice.
 $19,915,700,000 \text{ lbs.} \times 29,000 \text{ kernels} = 577,555,300,000,000 \text{ kernels}$. This would fill the 50th square only. This does not include any previous squares.
- 4 - Is there enough rice produced in the world to fill the checkerboard? To fill the just the last square?
- 5 - The paper folding activity incorporates multiplication and division at the same time. It is an excellent visual way to explain multiplication of fractions. Fractions get smaller when multiplied.
- 6 - Britney Gallivan, as a high school junior in Pomona, California developed the mathematical proof that paper can't be folded in half more twelve times. She is featured on the website for the Historical Society of Pomona
<http://www.osb.net/Pomona/12times.htm>
The society even sells a booklet detailing the young lady's challenges in developing the proof.
- 7 - What is an exponent?
- 8 - What is the relationship between exponents, squares and cubes?
- 9 - What is the total number of rice kernels needed to fill every single square? Approximately 18.46 quintillions.