CSI: ALGEBRA

SAMPLE

UNIT 5

Lines

Project Title : *CSI Algebra: Lines*

Standard Focus: Patterns, Algebra and Functions	**Time Range** : 1-3 Days
	Supplies : Pencil and ~~Paper~~

Topics of Focus :

- Slope

- Calculating, graphing and interpreting lines

- Parallel and Perpendicular lines

This particular was mapped to the curriculum in Glencoe Algebra ~~Chapter~~ 5 and can ~~be~~ used as an enrichment or review activity.

Functions	8.F	3. Interpret the equation y = ~~mx + b~~ as defining ~~a line~~ar function, whose graph is a straight l~~ine~~; give exam~~ple~~s of functions ~~th~~at are not linear.
Functions	8.F	4. Construct a ~~function to~~ mod~~el~~ a linear relationship between two quantities. Determine t~~he rate of~~ change and initial value of the function from a de~~scrip~~tion of a rela~~tionship or~~ from two (x, y) values, including reading ~~these from~~ a table or fro~~m a gra~~ph. Interpret the rate of change and initia~~l value of a lin~~ear function ~~in~~ terms of the situation it models
Interpreting Functions	F-IF	7. Graph func~~tio~~ns ex~~pressed sym~~bolically and show key features of the ~~graph, by~~ hand ~~in s~~imple c~~ases~~ and using technology for more ~~complicated~~ ~~cases~~
Expressing Geometric Properties with Equations	G-~~G~~PE	5. Prove ~~the s~~lope criteria for parallel and perpendicular lines and use them to solv~~e geome~~tric problems (e.g., find the equation of a line parallel or perpendicula~~r t~~o a given line that passes through a given point).
Expressing Geometric Pro~~perties~~ with ~~E~~quations	G~~PE~~	6. Find t~~h~~e point on a directed line segment between two given points that partitions the segment in a given ratio.
~~Interpreting~~ ~~Categorical and~~ Quantitative Data		6c. Fit a linear function for a scatter plot that suggests a linear association.

Procedures:

A.) Student will be given the letter from Chief Harris, the possible suspects, and crime scene puzzles.

B.) Students will work in pairs or individually to solve the crime.

C.) Students will determine which suspect should be arrested.

D.) Students will create a portfolio of evidence proving that they have arrested the right person and will demonstrate their understanding of their mathematical content present in the problem.

*E.) Students can present their evidence to the class as an oral presentation.

*Extensions

CSI Algebra: Lines

Detectives,

The sun sets, the winds blow, and the international evil genius terrorist group the Mathemagicians wreak havoc on yet another world region. It seems they are making progress their plans to build a world conquering device despite our best efforts to apprehend their cronies. The victim the latest string of heists at the hands of a henchman (or henchwoman), Li Squareds. is ure, Li Squareds is definitely some kind of henchperson.

As has become the calling card of the Mathemagicians, have left behind a trail of notes with a cryptic text message. The text message when substituted correctly will calculate to the Li's favorite number. So far there are six suspects that questioned. It is hoped that someone with a relatively str number sense and spatial reasoning can crack codes th have puzzled the detectives on the case so far
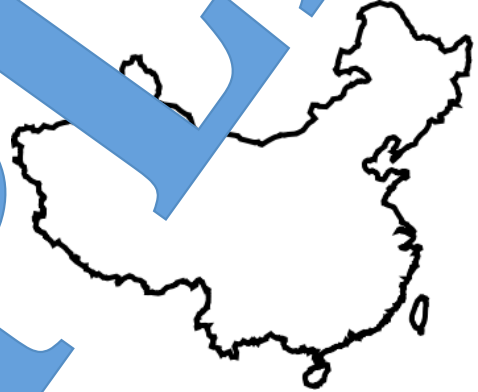
Your job is to bring Li Squareds to justice and save the You need to be prepared to state you and demonstr your understanding of the following skill own to use the notes.

- Slope & Rates of Change

- Calculating, grap lines

- Parallel and Perpendic lines

Be sure to include:

- Other ncepts

- Definitions

- y other rele t information.

This not a time to be slopp le slightest miscalculation or illegible footnote could result in a not guil dict tio that use of a calculator might prematurely set off his world conquering devic k to yo mshoe.

Chief Harris

CSI: THE EVIDENCE

NAME:_____

1.

CLUE

_____

2.

CLUE

_____

3.

CLUE

_____

SAMPLE

4.

CLUE

_____

5.

CLUE

_____

6.

CLUE

_____

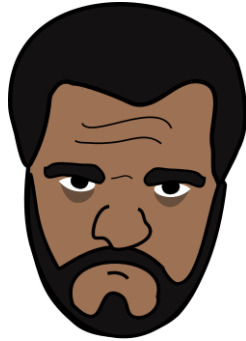CRYPTIC TEXT MESSAGE

SUSPECT

_____

Who is Li Squareds?

Name: Ken

Occupation: Butcher

Favorite Number : 7

Name: Tripiti

Occupation: Pet Store Owner

Favorite Number: 10

Name: Brandi

Occupation: Realtor

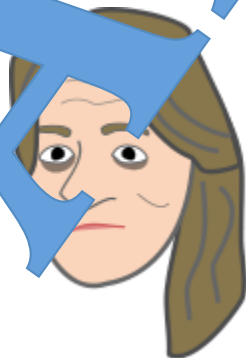Favorite Number: 13

Name: ___e

Occupation: Rock Star / Phil___

Favorite Number: -19

Name: Dawne

Occupation: Archivist

Favorite Number: -10

Name: Nash

Occupation: Insurance Salesman

Favorite Number: 11

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Li Squareds broke into the National Art Museum of China and emerged with a ceremonial dragon dance costume. Cameras caught a glimpse of this heist as Li danced out of the museum untouched -- in full dragon gear. Security Guards assumed the night custodians were having ~~some~~ fun.

Nǐhǎo dudes, I'm honored that your elite team of investigators has de~~cid~~ed to w~~ast~~e hundreds of man-hours attempting to crack my uncrackable puzzles. I hope you li~~ke~~ ~~chan~~ge. R~~ate~~s of cha~~ng~~e in fact. No place in the world changes as fast as China, and no evil mathematician group increases the rate of change like the Mathemagicians!!1!11!

I drew this amazing piece of dragon art out of 18 straight line segments.

Find the slope of all 18 segments and add them together. This answer will be equal to 龙. *(All Undefined Slopes will count as 0 and all ordered pairs are integer coordinates)*

(NOTE: Don't count the flaming ba~~ll~~ ~~of~~ fire, that's just there to be super cool.)
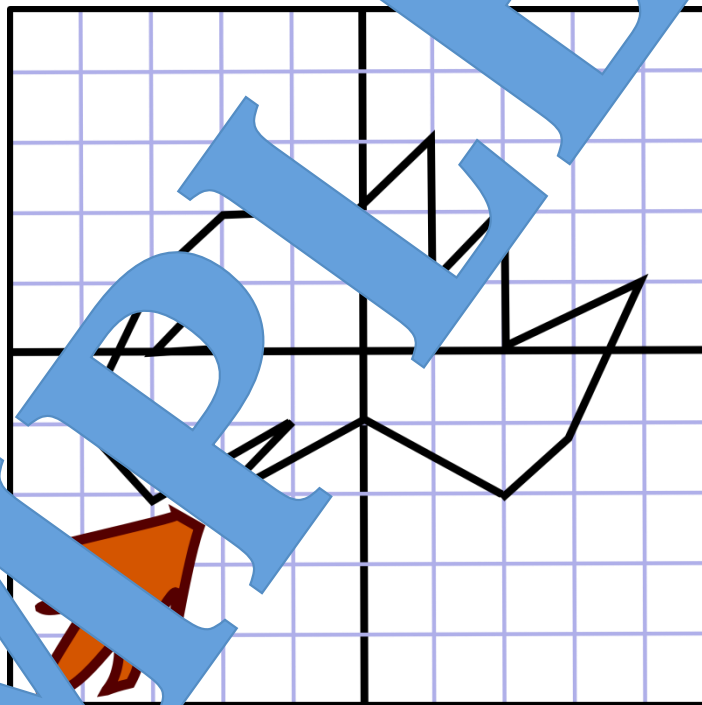
龙 = _____

A waitress noticed ~~that ei~~ghteen mutated duc~~k le~~gs were stolen. After a thorough investigation, police found pieces of thi~~s ~~ ~~in diffe~~rent fortunate cookies.

I just realized that go~~ing~~ to C~~hi~~na qu~~alifi~~es as roaming on my cell phone plan. I need to get a lo~~c~~al cell or I'm ~~go~~ing to need to sell my car and I really need to stay in touch with th~~e rest~~ of the Mathe~~ma~~gicians. Oh no! More change! Here are my options:

Com~~pany~~	Unlimited Calls (per month)	Texts
Mo~~bile~~ 中国~~移~~动通信	30 RMB	.08 RMB/text
Unicorn 中国联~~通~~	20 RMB	.10 RMB/text
Telecom 中国~~电~~信	10 RMB	.12 RMB/text

RMB = Renminbi, the official currency of China

If I send 1,500 texts per month, which plan is the cheapest? Write equations for each company to find out! <u>The first English letter of the cheapest company will be equal to 2.</u>

____ = 2

© 21st Century Math Projects

A conductor on a high speed train entered an onboard restroom and imagine his surprise to find the ceiling been dismantled, the wiring in disarray, and a hybrid electric fuel cell missing. Found written on a roll of toilet paper was this note left by Li Squareds.

These trains sure go fast. After doing some riding, I built these linear models to estimate their travel time including their station stops. If I'm trying to conquer the world quickly, I need the fastest train.

Which one is the fastest? (x = hours, y = miles. I'm using mph instead of km/h for you silly Americans.)

ZHŌNGGUÓ GĀOSÙ TIĚLÙ

U	D	T	M	B
$y + 12 = 175x$	$\dfrac{y + 5}{5} = 31x$	$19\ldots 10$	$y = 100x - 10$	$\dfrac{y}{100} = x - .15$

(letter of train)=(speed of train)

_____

A kiloton of pure Mongolian snow was snatched from the top of the highest mountain in the Yabuli Ski Resort. Investigators deciphered this note written in the snow in some sort of liquid.

As you can imagine when descending the slope I need speed -- a need for speed. Figure out which gives me the steepest slope, decrease. Graph and label them so you don't get confused.
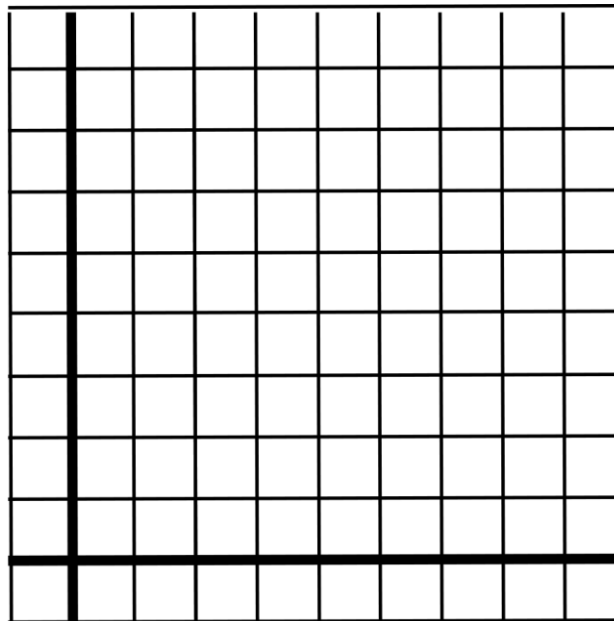
hill M: Travels through points (1, 7) & (6, 4)

hill T:

hill U: Travels through the point (6, 1) with a slope of -4/5

**(fastest hill)=(its slope)**

_____ = _____

Investigators believe forty-five perfectly square limestone bricks were taken from the North Pass in the Great Wall. It is believed these bricks will be foundational pieces in the world conquering device.

Lots of interesting landscaping in this country. I'm certainly happy to be heading back home with all my goodies, but I've been inspired to go home and do some yard work. In fact I plan to build the Great Wall of Li Squareds. The big question is where to put it...

If you want to figure out where I'm going to put it, just follow the directions and figure out the equation of the final line.
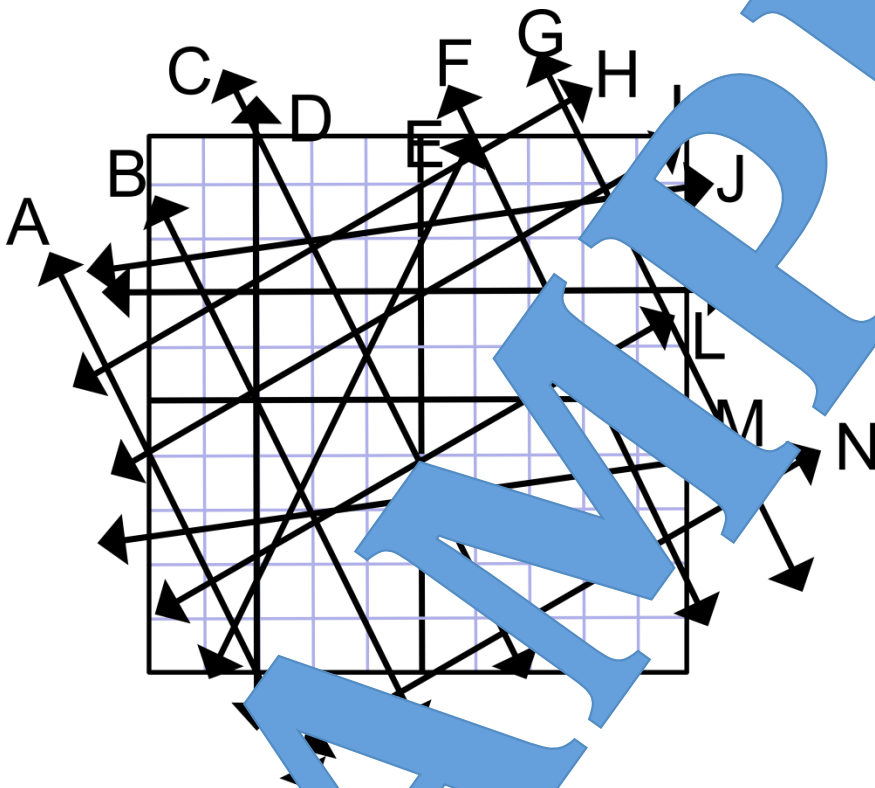
1. A line parallel to A that travels through the point (5, 1).

This line is _____

2. A line perpendicular to the new line that travels through the point (0, 2).

This line is _____

3. A line perpendicular to the new line that travels through the point (-2, -2).

This line is _____

4. A line parallel to the new line that travels through the point (-1, 1).

This line is _____

Find the line and then the next piece of the puzzle.

$y = 2x + 1$	$y = -2x - 1$	$y = -2x + 1$	$y = \frac{1}{2}x - 1$
爱= ½	喜 = -2	信 = -2	熊猫 = ½

Inside what is now the modern Palace Museum, curators discovered nine ritual bronze vessels of the Shang and Zhou eras were stolen. These vessels demonstrate the technological sophistication of early metal casting. Li Squareds left this note their place.

Change is good. F... change... better. You should take a l... ...hing... recent ...ess Domestic Product. It's ...... and up...

Based on the trend line, wh... ...e GDP predicte... ...o be in the year 2018?

有一个愉快的一天

钱=_____

y... ...6 + 48863x

GDP (100 millions)

450 000

400

...50 000

...000

| 1 (2007) | 2 (2008) | 3 (2009) | 4 (2010) | 5 (2011) |

Years (2006 - 2011)

CRYPTIC... ...UZZLE SO...VER TEXT MESSAGE

Double ch... ...k y...r stroke order when using y...r Mand...rin. Loving Lines. ttyl Li Squareds

$$(\mathbf{M} + 喜) * 钱 + (龙 * \mathbf{U}) + [(\mathbf{T} + \mathbf{M} - 喜) / 龙]$$

Thank you for being my Math Friend

If you liked this

21st Century Math Project

You might like others. [Click the logo]

SAMPLE

Math it Up.

Boomdiggy.

Who is Li Squareds?

Unit 5
Answer Key

Name: Ken

Occupation: Butcher

Favorite Number : 7

Name: Tripiti

Occupation: Store Owner

Favorite Number: 10

Name: Brandi

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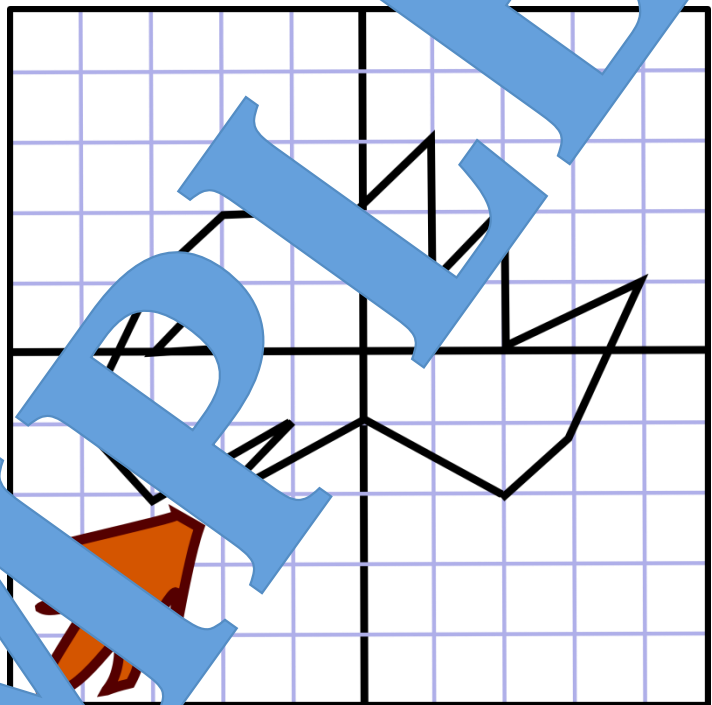
龙 = 10

A waitress noticed that eighteen mutated ~~du~~ck legs were stolen. After a thorough investigation, police found pieces of thi~~s note i~~n five different fortu~~ne~~ cookies.

I just realized that g~~oin~~g to ~~China~~ ~~w~~as roaming on my cell phone plan. I need to get a local cell or ~~I'm~~ goin~~g to~~ ne~~ed to~~ sell my car and I really need to stay in touch with the ~~re~~st of the Math~~ema~~gicians. Oh no! More change! Here are my options:

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If I send 1,500 texts per month, which plan is the cheapest? Write equations for each company to find out! <u>The first English letter of the cheapest company will be equal to 2.</u>

___ = 2   M = 2

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ZHŌNGGUÓ GĀOSÙ TIĚLÙ

U	D	T	M	B
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(letter of train)=(speed of train)

T = 186

A kiloton of pure Mongolian snow was snatched from the top of the highest mountain in the Yabuli Ski Resort. Investigators deciphered this note written in the snow in some sort of liquid.

As you can imagine when descending the slope I need speed -- a need for speed. Figure out which gives me the steepest slope, decimal. Graph and label them so you don't get confused.
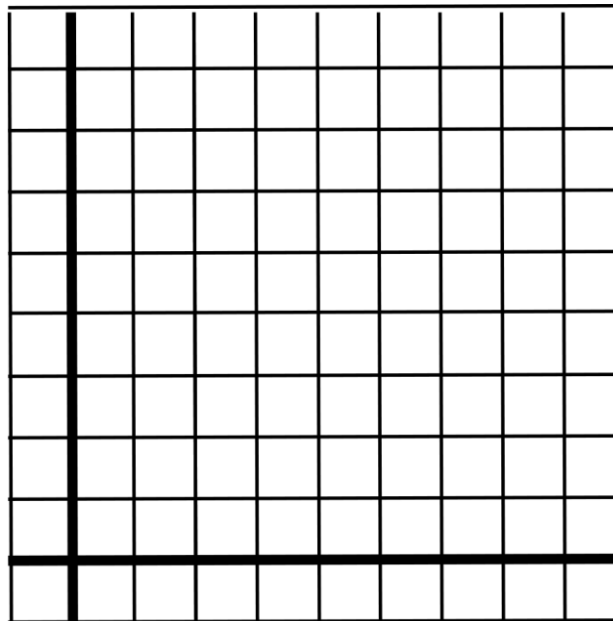
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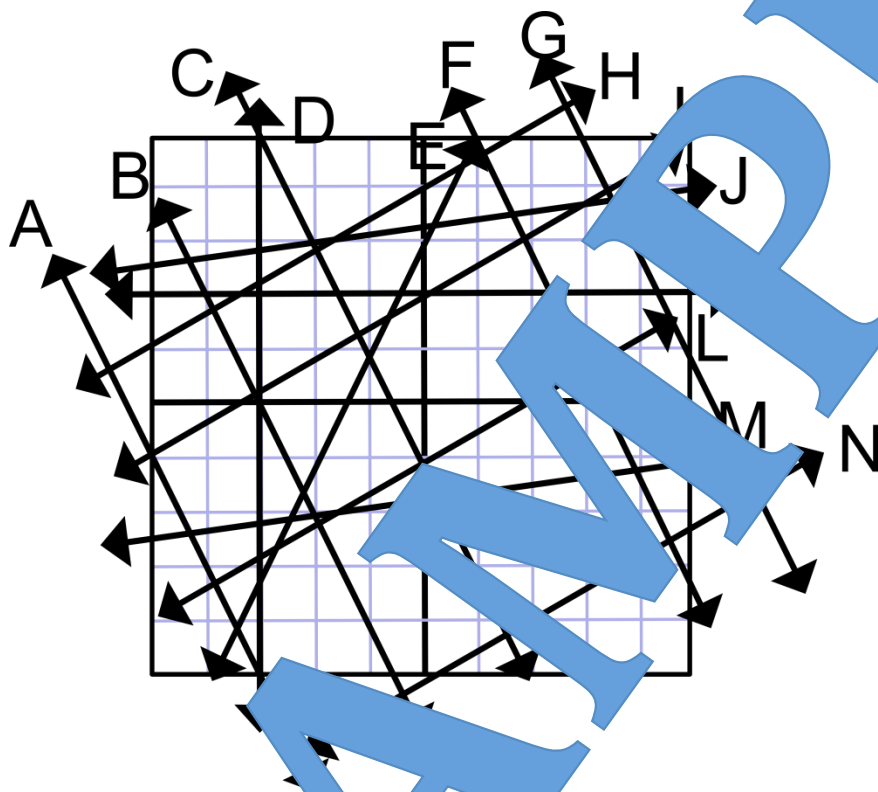### Hill M slope = -3/5, U = -4/5, T = -1/3

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Lots of interesting landscaping in this country. I'm certainly happy to be heading back home with all my goodies, but I've been inspired to go home and do some yard work. In fact I plan to build the Great Wall of Li Squareds. The big question is where to put it…

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This line is G

2. A line perpendicular to the new line that travels through the point (0, 2).

This line is I

3. A line perpendicular to the new line that travels through the point (-2, -2).

This line is B

4. A line parallel to the new line that travels through the point (-1, 1).

This line is C

Find the line and then the next piece of the puzzle.

y = ... x + 1	**y = -2x -1**	y = -2x + 1	y = ½ x - 1
爱 = ½	**喜 = -2**	信 = -2	熊猫 = ½

Inside what is now the modern Palace Museum, curators discovered nine ritual bronze vessels of the Shang and Zhou eras were stolen. These vessels demonstrate the technological sophistication of early metal casting. Li Squareds left this note their place.

Change is good. But change is better. You should take a look at China's recent Gross Domestic Product. It's and up

Based on the trend line, what the GDP predicted to be in the year 2018?

有一个愉快的一天

212866 + 48863(12)

钱=_____ **799222**

GDP (100 millions)
450 000
400
60 000
2   6 + 48863x
000

1
(2007)   2
(2008)   3
(2009)   4
(2010)   5
(2011)

Years (2006 - 2011)

CRYPTIC PUZZLE SOLVER TEXT MESSAGE

Double check your stroke order when using your Mandarin. Loving Lines. ttyl Li Squareds

10=龙··· **T = 186** ... **U = -4/5** ...钱=**799222** ...**M = 2**   喜 = -2

(**M** +喜)* 钱 （龙* **U**)+[(**T** + **M** – 喜)/ 龙]

(2+-2)*799222 + (10*-4/5)+ [(186+2- -2)/ 10]

0 +-8 +19 = 11