- 1. Evaluate: $2 \times (1 3) + 4 \div 7^{0} \times 11 + 18$
 - (A) 66 (B) 58 (C) 29 (D) 18 (E) 14.363636...
- 2. If $\frac{5}{8}$ of P has the same value as 2.5Q, then Q is what % of P?
 - (A) $1\frac{9}{16}\%$ (B) 6.4% (C) 15.625% (D) 25% (E) 64%
- 3. Doug Upp rented a front end loader to dig up mesquite trees. The base rental fee was \$230.00. The hourly rental rate was \$25.00 per hour. Doug rented the loader for 7 hours. He got 10% off the rental fee for cleaning the loader before returning it. What was Doug's total cost if the tax rate was 8%?
 - (A) \$247.86 (B) \$393.66 (C) \$426.60 (D) \$412.56 (E) \$437.40
- 4. Let K be a two-digit number such that neither digit is zero. Reverse the digits and add the results to K. Divide the sum by the sum of the digits. What is the quotient?
 - (A) 1 (B) 2 (C) 10 (D) 11 (E) P
- 5. Simplify: $\left(\frac{x^2-4}{x^2+4x+4}\right)\left(\frac{x^2-3x-10}{x^2+3x-10}\right)$ (A) $\frac{x-5}{x+5}$ (B) $\frac{x-6}{x+6}$ (C) -1 (D) $\frac{x+6}{x-6}$ (E) $\frac{x+5}{x-5}$
- 6. What is the slope of the line parallel to the line shown?



7. Dee Loper and Les Speed start at the starting line of the 400 meter oval track. Dee runs clockwise around the track at an average rate of 5 meters per second and Les runs counter clockwise around the track at an average rate of 7 meters per second. How far will Dee have run when the two meet?

(A)
$$233\frac{1}{3}$$
 meters (B) 200 meters (C) $166\frac{2}{3}$ meters (D) 80 meters (E) 300 meters

- 8. Let x + y = 2, 3x 5y = 8, and 13x + ky = 34. Find the value of k for the 3 intersecting lines.
 - (A) -19 (B) $-15\frac{13}{16}$ (C) -2.8125 (D) 18.1875 (E) 21
- 9. Which of the following numbers will appear in row 11 of Pascal's triangle?
 - (A) 210 (B) 333 (C) 357 (D) 462 (E) 468

UIL Math SAC 2013 - page 1

10. The lines in the figure are coplanar with $m \parallel l$. Which of the following are true statements?



- 1. ∠ABG & ∠FEI are congruent2. m∠DEB + m∠CEB = 90°3. ∠JBI & ∠BEF are vertical angles4. ∠EBC & ∠DEB are complementary angles
- (A) 1, 2, 3, & 4 (B) 1 & 2 (C) 1, 2, & 4 (D) 3 & 4 (E) 1 & 4
- 11. The adjacent dots on the grid are 1 cm apart when measured vertically and horizontally. Find the area of the shaded figure shown.



(A) 8 cm^2 (B) 8.5 cm^2 (C) 9 cm^2 (D) 9.5 cm^2 (E) 10 cm^2

12. Points A, B, and C lie on circle P with point P being the center of the circle. AB is a diameter and point X lies on the chord \overrightarrow{AC} . Find XC if $\overrightarrow{PX} \parallel \overrightarrow{BC}$, AB = 10 cm and AC = 8 cm.

- (A) 2 cm (B) 3 cm (C) 4 cm (D) 5 cm (E) 6 cm
- 13. Let $f(x) = \frac{3x-2}{4}$. Find $f^{-1}(f(2))$.
 - (A) 0.25 (B) 0.5 (C) 1 (D) 2 (E) 4

14. If $a_1 = 3$, $a_2 = -1$ and $a_n = a_{n-2} + a_{n-1}$, where $n \ge 3$, then a_7 equals:

- (A) 7 (B) 4 (C) 11 (D) 6 (E) 11
- 15. Captain Saul T. Water leaves port Izzy and sails 30 miles on a bearing of 75°. Then he changes course and sails 30 miles on a bearing of 150° to port Hugh. How far will Saul have to sail to go directly back to port Izzy? (nearest tenth mile)

16. Simplify: $\frac{\sin 2x}{2-2\cos^2 x}$ (A) $\tan x$ (B) $\tan 2x$ (C) $2\tan x$ (D) $\cot 2x$ (E) $\cot x$

UIL Math SAC 2013 - page 2

- 17. Use the Fibonacci characteristic sequence \dots 3, p, q, 5, r, \dots to Find p + q + r.
 - (A) 13 (B) 14 (C) 18 (D) 21 (E) 22
- 18. Willie Taasette pitches for the Millersview Mudhens. He gets \$25.00 for his first win, \$50.00 for his second win, \$100.00 for his third, and so on. How much will he receive for his 10th win?
 - (A) \$3,200.00 (B) \$8,000.00 (C) \$12,800.00 (D) \$25,600.00 (E) \$38,400.00
- 19. Let $f(x) = 3x^2 4x 5$ and g(x) = x + 2. Find g(f'(2x 1))
 - (A) 12x 8 (B) 24x + 4 (C) 6x + 1 (D) 10x 14 (E) 12x + 2
- 20. Find the area of the shaded region in square units.

(B) 11.0



- 21. Lynn Kahn tossed a penny five times and recorded the results. What is the probability of at least three consecutive heads? (nearest per cent)
 - (A) 50% (B) 33% (C) 28% (D) 25% (E) 13%
- 22. How many distinguishable arrangements can be made from the letters "TEXASMATH"?
 - (A) 15,120 (B) 105,840 (C) 90,720 (D) 30,240 (E) 60,480
- 23. How many integers x, where $1 \le x \le 2013$, are divisible by neither 3 nor 7?
 - (A) 863 (B) 958 (C) 1,053 (D) 1,055 (E) 1,150
- 24. Find BE.

(A) 26"

(A) 9.333...



(E) **9''**

(D) 10"

(E) 10.5

- 25. The repeating decimal 0.515151... in base 7 can be written as which of the following fractions in base 7?
 - (A) $\frac{3}{4}_{7}$ (B) $\frac{51}{343}_{7}$ (C) $\frac{17}{22}_{7}$ (D) $\frac{5}{6}_{7}$ (E) $\frac{1}{5}_{7}$

Archimedes	Boole, George	Byron, Ada (Lady Lovelace)
Descartes, Rene	Diophantus	Erastosthenes
Euler, Leonard	Germain, Sophie	Goldbach, Christian
Kovalevsky, Sonya	Leibniz, Gottfried	Mandelbrot, Benoit
Noether, Emmy	Porter, Freda	Ptolemy, Claudius
Stott, Alicia	Theano	Venn, John
** Zeno of Elea		,
	Archimedes Descartes, Rene Euler, Leonard Kovalevsky, Sonya Noether, Emmy Stott, Alicia ** Zeno of Elea	ArchimedesBoole, GeorgeDescartes, ReneDiophantusEuler, LeonardGermain, SophieKovalevsky, SonyaLeibniz, GottfriedNoether, EmmyPorter, FredaStott, AliciaTheano** Zeno of EleaFreda

Mathematicians (** One new mathematician this year)

Types of Numbers (**One new number this year)

Complex	Real	Imaginary	Rational	Irrational
Transcendental	Integer	Whole	Natural	Even
Odd	Prime	Composite	Unit	Deficient
Frugal	Economical	Perfect	Equidigital	Abundant
Extravagant	Wasteful	Fibonacci	Lucas	Нарру
Unhappy	Lucky	Unlucky	Evil	Odious
Polite	Primeval	** Harmonic		

2013-14 Special Emphasis Concepts: number theory problems and the 7 trapezoidal "means".

Possible questions (but not limited to) might include:

- 1. The product of a two-digit number and the same number with its digits reversed is 1944. What is the sume of the two numbers? ______.
- 2. How many 3-digit numbers can be made from the digits 1, 1, 2, 3, and 3? _____.

3. Find the smallest positive integer with 25 divisors. _____.

4. Which "trapezoidal mean" can be used to find the volume of a frustrum of a cone? _____.

5. *** See #23, 24, and 25 on the 2013SAC test.