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 $2.5 Q$, then $Q$ is what $\%$ of $P$ ?
(A) $\mathbf{1} \frac{9}{16} \%$
(B) $6.4 \%$
(C) $\mathbf{1 5 . 6 2 5 \%}$
(D) $25 \%$
(E) $64 \%$
3. Doug Upp rented a front end loader to dig up mesquite trees. The base rental fee was $\mathbf{\$ 2 3 0 . 0 0}$. The hourly rental rate was $\$ 25.00$ per hour. Doug rented the loader for 7 hours. He got $\mathbf{1 0 \%}$ 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) $\mathbf{P}$
5. Simplify: $\quad\left(\frac{x^{2}-4}{x^{2}+4 x+4}\right)\left(\frac{x^{2}-3 x-10}{x^{2}+3 x-10}\right)$
(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?

(A) -3
(B) -2
(C) $-\frac{1}{3}$
(D) $\frac{1}{2}$
(E) 3
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 $x+y=2,3 x-5 y=8$, and $13 x+k y=34$. Find the value of $k$ for the 3 intersecting lines.
(A) -19
(B) $-15 \frac{13}{16}$
(C) -2.8125
(D) $\mathbf{1 8 . 1 8 7 5}$
(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
10. The lines in the figure are coplanar with $m \| I$. Which of the following are true statements?

11. $\angle \mathrm{ABG} \& \angle \mathrm{FEI}$ are congruent
12. $\angle$ JBI $\& \angle$ BEF are vertical angles
13. $\mathrm{m} \angle \mathrm{DEB}+\mathrm{m} \angle \mathrm{CEB}=90^{\circ}$
14. $\angle \mathrm{EBC} \& \angle \mathrm{DEB}$ are complementary angles
(A) 1, 2, 3, \& 4
(B) $1 \& 2$
(C) $1,2, \& 4$
(D) $3 \& 4$
(E) $1 \& 4$
15. The adjacent dots on the grid are 1 cm apart when measured vertically and horizontally. Find the area of the shaded figure shown.

(A) $8 \mathrm{~cm}^{2}$
(B) $8.5 \mathrm{~cm}^{2}$
(C) $9 \mathrm{~cm}^{2}$
(D) $9.5 \mathrm{~cm}^{2}$
(E) $10 \mathrm{~cm}^{2}$
16. Points $A, B$, and $C$ lie on circle $P$ with point $P$ being the center of the circle. $\overline{A B}$ is a diameter and point $X$ lies on the chord $\overline{A C}$. Find $X C$ if $\overline{P X} \| \overline{B C}, A B=10 \mathrm{~cm}$ and $A C=8 \mathrm{~cm}$.
(A) 2 cm
(B) 3 cm
(C) 4 cm
(D) 5 cm
(E) 6 cm
17. Let $f(x)=\frac{3 x-2}{4}$. Find $f^{-1}(f(2))$.
(A) 0.25
(B) 0.5
(C) 1
(D) 2
(E) 4
18. If $a_{1}=3, a_{2}=-1$ and $a_{n}=a_{n-2}+a_{n-1}$, where $n \geq 3$, then $a_{7}$ equals:
(A) 7
(B) 4
(C) 11
(D) 6
(E) 11
19. Captain Saul T. Water leaves port Izzy and sails 30 miles on a bearing of $75^{\circ}$. Then he changes course and sails 30 miles on a bearing of $150^{\circ}$ to port Hugh. How far will Saul have to sail to go directly back to port Izzy? (nearest tenth mile)
(A) $\mathbf{4 0 . 0}$ miles
(B) $\mathbf{4 2 . 4}$ miles
(C) $\mathbf{4 5 . 0}$ miles
(D) 45.9 miles
(E) 47.6 miles
20. Simplify: $\frac{\sin 2 x}{2-2 \cos ^{2} x}$
(A) $\tan x$
(B) $\tan 2 x$
(C) $2 \tan x$
(D) $\cot 2 x$
(E) $\cot x$
21. Use the Fibonacci characteristic sequence ... $3, \mathbf{p}, \mathbf{q}, 5, \mathbf{r}, \ldots$ to Find $\mathbf{p}+\mathbf{q}+\mathbf{r}$.
(A) 13
(B) 14
(C) 18
(D) 21
(E) 22
22. Willie Taasette pitches for the Millersview Mudhens. He gets $\mathbf{\$ 2 5 . 0 0}$ for his first win, $\mathbf{\$ 5 0 . 0 0}$ for his second win, $\mathbf{\$ 1 0 0 . 0 0}$ for his third, and so on. How much will he receive for his $10^{\text {th }}$ win?
(A) $\$ 3,200.00$
(B) $\$ 8,000.00$
(C) $\mathbf{\$ 1 2 , 8 0 0 . 0 0}$
(D) $\$ 25,600.00$
(E) $\$ 38,400.00$
23. Let $f(x)=3 x^{2}-4 x-5$ and $g(x)=x+2$. Find $g\left(f^{\prime}(2 x-1)\right)$
(A) $12 x-8$
(B) $24 x+4$
(C) $6 x+1$
(D) $10 x-14$
(E) $12 x+2$
24. Find the area of the shaded region in square units.

(A) 9.333...
(B) 11.0
(C) 10.666...
(D) 9.5
(E) 10.5
25. 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) $\mathbf{2 8 \%}$
(D) $25 \%$
(E) $13 \%$
26. How many distinguishable arrangements can be made from the letters "TEXASMATH"?
(A) $\mathbf{1 5 , 1 2 0}$
(B) $\mathbf{1 0 5 , 8 4 0}$
(C) 90,720
(D) 30,240
(E) $\mathbf{6 0 , 4 8 0}$
27. How many integers $x$, where $1 \leq x \leq 2013$, are divisible by neither 3 nor 7 ?
(A) 863
(B) 958
(C) 1,053
(D) 1,055
(E) 1,150
28. Find BE.

(A) 26"
(B) 13 "
(C) 12"
(D) 10"
(E) 9"
29. 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) $\frac{1}{5}_{7}$

Mathematicians (** One new mathematician this year)

| Agnesi | Archimedes | Boole, George | Byron, Ada (Lady Lovelace) |
| :--- | :--- | :--- | :--- |
| Cantor, Georg | Descartes, Rene | Diophantus | Erastosthenes |
| Euclid | Euler, Leonard | Germain, Sophie | Goldbach, Christian |
| Hypatia | Kovalevsky, Sonya | Leibniz, Gottfried | Mandelbrot, Benoit |
| Napier, John | Noether, Emmy | Porter, Freda | Ptolemy, Claudius |
| Smith, Karen E. | Stott, Alicia | Theano | Venn, John |
| Williams, Grace | $* *$ Zeno of Elea |  |  |

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 | Happy |
| 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? $\qquad$ .
2. How many 3 -digit numbers can be made from the digits $1,1,2,3$, and 3 ? $\qquad$ .
3. Find the smallest positive integer with 25 divisors. $\qquad$ .
4. Which "trapezoidal mean" can be used to find the volume of a frustrum of a cone? $\qquad$ .
5. *** See \#23, 24, and 25 on the 2013SAC test.
