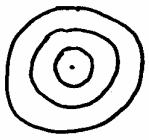
Ciphering Solutions – Theta Division

0. $\frac{2-4i}{3-i}\cdot\frac{3+i}{3+i}=\frac{6+4-12i+2i}{9+1}$

$=\frac{10-10i}{10}=\boxed{1-i}$

1. \$25 means you won twice & lost once.

$\binom{3}{1}\left(\frac{1}{6}\right)^2\left(\frac{5}{6}\right)=\frac{3\cdot5}{216}=\boxed{\frac{5}{72}}$

2. 

$\frac{4}{36}\cdot50+\frac{12}{36}\cdot25+\frac{20}{36}\cdot11$

$\frac{50}{9}+\frac{75}{9}+\frac{95}{9}=\frac{180}{9}=\boxed{20}$

3. $360=3^2\cdot40=2^3\cdot3^2\cdot5$

$84=\quad 2^2\cdot3^1\quad 7$

LCM= $2^3\cdot3^2\cdot5\cdot7=\boxed{2520}$

4. A 5, 20, ___ $\Rightarrow d=15$

B ~~6~~, -12, ___

C 4, 8, 12

5th term $=a+4d$

$=5+4\cdot15=\boxed{65}$

5. $\left(\frac{1}{20}+\frac{1}{12}\right)t=1$

$\frac{32}{12\cdot20}t=1$

$t=\frac{12\cdot20}{32}=\boxed{\frac{15}{2}}$

6. $\ln3+\ln x-2\ln x=\frac{5}{2}$

$\ln x=\ln3-\frac{5}{2}$

$x=e^{\left(\ln3-\frac{5}{2}\right)}=\frac{e^{\ln3}}{e^{5/2}}$

$=\boxed{3e^{-5/2}}$

7. $\frac{4}{3}\cdot3^1=\frac{1}{3}\cdot3^2h$

$h=\boxed{12}$

8. $4\cdot125+3\cdot25+2\cdot5$

$500+75+10$

$\boxed{585}$

9. $\frac{1}{3}+\frac{2}{3}\cdot\frac{2}{3}\cdot\frac{1}{3}+\left(\frac{2}{3}\right)^4\cdot\frac{1}{3}+\cdots$

$S=\frac{a}{1-r}=\frac{\frac{1}{3}}{1-\frac{4}{9}}=\frac{1}{3}\cdot\frac{9}{5}=\frac{3}{5}$ (Tom)

$\Rightarrow$ Bill $=\boxed{\frac{2}{5}}$

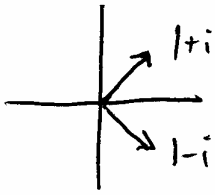
10. 30th term $=14+29\cdot-3$

$=14-87=-73$

$\frac{30}{2}=15$ pairs

each sums to $14+-73=-59$

$S=15\cdot-59=\boxed{-885}$

11. 

$\left|\frac{(1+i)^7}{(1-i)^3}\right| = \frac{|1+i|^7}{|1-i|^3} = \frac{\sqrt{2}^7}{\sqrt{2}^3} = \sqrt{2}^4 = 4$

$\angle\frac{(1+i)^7}{(1-i)^3} = 7\angle(1+i) - 3\angle(1-i) = 7\cdot 45^\circ - 3\cdot -45^\circ = 10\cdot 45^\circ = 450^\circ = 90^\circ$

$\Rightarrow \boxed{4i}$

12. $432 = 2^4\cdot 3^3 = 2^{2a+b}3^{a+b}$

$2a+b=4$
$a+b=3$
$a=1 \Rightarrow b=2$

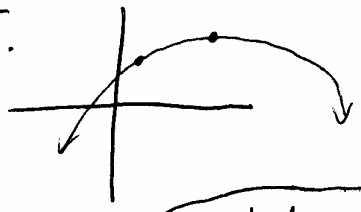
13. $-1\cdot\begin{vmatrix}5 & -3\\ -2 & 1\end{vmatrix} - 1\cdot\begin{vmatrix}2 & -3\\ -4 & 1\end{vmatrix} + 4\begin{vmatrix}2 & 5\\ -4 & -2\end{vmatrix}$

$-1\cdot -1 - 1\cdot -10 + 4\cdot 16 = \boxed{75}$

14. $\sum_1^{10}((n-3)\log_2 4) = \sum_1^{10}(2n-6)$

$= 2\sum_1^{10} n - 6\sum_1^{10} 1$

$= 10\cdot 11 - 6\cdot 10 = 5\cdot 10 = \boxed{50}$

15. 

$y = A(x-5)^2+3$
$2 = A(1-5)^2+3$
$-1 = A(16)$

$\boxed{y = \frac{-1}{16}(x-5)^2+3}$

16. $\underline{37}\ \underline{37}\ \underline{56}\ \underline{57}\ \underline{x}$

$187+x = 5\cdot 55 = 275$
$x = \boxed{88}$

17. $x = \frac{-b}{2a} = \frac{4}{6} = \frac{2}{3}$ axis of symmetry

$f\left(\frac{2}{3}\right) = 3\cdot\frac{4}{9} - 4\cdot\frac{2}{3} + \frac{15}{3}$

$= \frac{4}{3} - \frac{8}{3} + \frac{15}{3} = \boxed{\frac{11}{3}}$