**Algebra I Ciphering**
**2011 VHHS Math Tournament**

| | | |
|---|---|---|
| 1-1 | Find the sum of the prime factors of the largest whole number such that 7 times the number is less than 100. | 9 |
| 1-2 | Find the sum of the roots of $x^2-564x+1254=0$. | 564 |
| 1-3 | The probability that Sisi will answer a question correctly is 5/6. The probability that Wendy will answer a question correctly is 6/7. The probability that Farhan will answer a question correctly is 3/4. What is the probability that at least one of them will answer this problem correctly? | $\frac{167}{168}$ |
| 1-4 | If $16^x=1024$, then what is the value of $x$? | $\frac{5}{2}$ |
| 1-5 | Given the parabola $y=(x-3)^2-1$, find the sum of the $x$-intercepts. | 6 |
| 2-1 | Simplify $\frac{(-3rs)^3t^{-5}}{-(6^{-1}st)^{-3}r^5}$ with no negative exponents in the answer. | $\frac{s^6}{8r^2t^2}$ |
| 2-2 | What is the equation of the line perpendicular to the line $y=-\frac{4}{5}x+2$ at $(0,2)$? | $y=\frac{5}{4}x+2$ |
| 2-3 | Bill has a 25% concentration solution of NaOH. If he must add one-half liter of water to reach a 10% NaOH concentration solution, how much of the 10% solution is produced in liters? | $\frac{5}{6}$ |
| 2-4 | *Terminal zeros* are the zeros to the left of the decimal point and to the right of all nonzero digits. How many terminal zeros are at the end of $(20!)^2$? | 8 |
| 2-5 | Rationalize the denominator: $\frac{12}{\sqrt[3]{36}}$. | $2\sqrt[3]{6}$ |
| 3-1 | Given that the ratio of $3x-4$ to $y+15$ is constant, and $y=3$ when $x=2$, then, when $y=12$, what is $x$? | $\frac{7}{3}$ |
| 3-2 | Consider this sequence: 5, 8, 11… What is the $16^{th}$ term? | 50 |
| 3-3 | Sisi and Wendy are galloping towards each other on horseback. Sisi's horse is traveling at 20 mph and Wendy's horse is traveling at 24 mph. They begin 55 miles apart. A fly is flying between the two horses at 10 mph. How many miles does the fly fly before Sisi and Wendy meet? | $\frac{25}{2}$ |
| 3-4 | When $2137^{753}$ is multiplied out, what is the units digit? | 7 |
| 3-5 | A bug standing on the point $(5,3)$ wants to travel to the line $3x+4y=8$. What is the shortest distance the bug can take? | $\frac{19}{5}$ |
| 4-1 | If $a*b=\frac{ab}{a+b}$, find the value of $4*(4*4)$. | $\frac{4}{3}$ |
| 4-2 | Solve for all values of $x$: $\sqrt{4x+5}+2x=3x-10$ | 19 |
| 4-3 | The difference between two numbers is 32. If the larger number is divided by the smaller number, the quotient is 4 and the remainder is 5. What are the two numbers? | 9 and 41 |
| 4-4 | Simplify: $((302^2-300^2)-(298^2-296^2))^2$. | 256 |
| 4-5 | On a farm, there are chickens and cows. A farmer counts 31 heads and 94 feet not including his own. How many chickens are there? | 15 |