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| --- | --- | --- |
| **#0 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#0 Theta Ciphering**  **FAMAT State Convention 2021** |
| If the two lines below are parallel, what is the value of ? |  | If the two lines below are parallel, what is the value of ? |
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| **#0 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#0 Theta Ciphering**  **FAMAT State Convention 2021** |
| If the two lines below are parallel, what is the value of ? |  | If the two lines below are parallel, what is the value of ? |
| **#1 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#1 Theta Ciphering**  **FAMAT State Convention 2021** |
| Find the sum of the negative roots of the function: |  | Find the sum of the negative roots of the function: |
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| **#1 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#1 Theta Ciphering**  **FAMAT State Convention 2021** |
| Find the sum of the negative roots of the function: |  | Find the sum of the negative roots of the function: |
| **#2 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#2 Theta Ciphering**  **FAMAT State Convention 2021** |
| Mr. Lu has 2 solutions: one is 44% Lu-Goo and the other is 35% Lu-Goo. If he mixes the 2 solutions together to form a 40% Lu-Goo solution, how much of the 44% one must be added to make a 240-unit solution? |  | Mr. Lu has 2 solutions: one is 44% Lu-Goo and the other is 35% Lu-Goo. If he mixes the 2 solutions together to form a 40% Lu-Goo solution, how much of the 44% one must be added to make a 240-unit solution? |
|  |  |  |
| **#2 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#2 Theta Ciphering**  **FAMAT State Convention 2021** |
| Mr. Lu has 2 solutions: one is 44% Lu-Goo and the other is 35% Lu-Goo. If he mixes the 2 solutions together to form a 40% Lu-Goo solution, how much of the 44% one must be added to make a 240-unit solution? |  | Mr. Lu has 2 solutions: one is 44% Lu-Goo and the other is 35% Lu-Goo. If he mixes the 2 solutions together to form a 40% Lu-Goo solution, how much of the 44% one must be added to make a 240-unit solution? |
| **#3 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#3 Theta Ciphering**  **FAMAT State Convention 2021** |
| There are 9 six-digit natural numbers that have the property that all of their digits are the same (such as 111111 and 222222). Find the 2nd largest prime number that is a divisor of all of them. |  | There are 9 six-digit natural numbers that have the property that all of their digits are the same (such as 111111 and 222222). Find the 2nd largest prime number that is a divisor of all of them. |
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| **#3 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#3 Theta Ciphering**  **FAMAT State Convention 2021** |
| There are 9 six-digit natural numbers that have the property that all of their digits are the same (such as 111111 and 222222). Find the 2nd largest prime number that is a divisor of all of them. |  | There are 9 six-digit natural numbers that have the property that all of their digits are the same (such as 111111 and 222222). Find the 2nd largest prime number that is a divisor of all of them. |
| **#4 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#4 Theta Ciphering**  **FAMAT State Convention 2021** |
| Find the 2020th digit to the right of the decimal point in the decimal expansion of. |  | Find the 2020th digit to the right of the decimal point in the decimal expansion of. |
|  |  |  |
| **#4 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#4 Theta Ciphering**  **FAMAT State Convention 2021** |
| Find the 2020th digit to the right of the decimal point in the decimal expansion of. |  | Find the 2020th digit to the right of the decimal point in the decimal expansion of. |
| **#5 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#5 Theta Ciphering**  **FAMAT State Convention 2021** |
| Given: solve for k. |  | Given: solve for k. |
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| **#5 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#5 Theta Ciphering**  **FAMAT State Convention 2021** |
| Given: solve for k. |  | Given: solve for k. |
| **#6 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#6 Theta Ciphering**  **FAMAT State Convention 2021** |
| Mr. Lu loves perfect squares. His favorite sequence is:After the 1 he has 2 negations of perfect squares followed by 2 positive perfect squares, then repeating in this pattern. What is the sum of the first 2020 terms of this sequence? |  | Mr. Lu loves perfect squares. His favorite sequence is:After the 1 he has 2 negations of perfect squares followed by 2 positive perfect squares, then repeating in this pattern. What is the sum of the first 2020 terms of this sequence? |
|  |  |  |
| **#6 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#6 Theta Ciphering**  **FAMAT State Convention 2021** |
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| **#7 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#7 Theta Ciphering**  **FAMAT State Convention 2021** |
| If 1 – i is one of the fourth roots of the complex number a + bi, then what is the value of. |  | If 1 – i is one of the fourth roots of the complex number a + bi, then what is the value of. |
|  |  |  |
| **#7 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#7 Theta Ciphering**  **FAMAT State Convention 2021** |
| If 1 – i is one of the fourth roots of the complex number a + bi, then what is the value of. |  | If 1 – i is one of the fourth roots of the complex number a + bi, then what is the value of. |
| **#8 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#8 Theta Ciphering**  **FAMAT State Convention 2021** |
| The legs of a right triangle have length a and b and the hypotenuse length c. A perpendicular from the right-angle vertex divides c into segments L and U, adjacent respectively to a and b. If a:b=1:3, then  is? |  | The legs of a right triangle have length a and b and the hypotenuse length c. A perpendicular from the right-angle vertex divides c into segments L and U, adjacent respectively to a and b. If a:b=1:3, then  is? |
|  |  |  |
| **#8 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#8 Theta Ciphering**  **FAMAT State Convention 2021** |
| The legs of a right triangle have length a and b and the hypotenuse length c. A perpendicular from the right-angle vertex divides c into segments L and U, adjacent respectively to a and b. If a:b=1:3, then  is? |  | The legs of a right triangle have length a and b and the hypotenuse length c. A perpendicular from the right-angle vertex divides c into segments L and U, adjacent respectively to a and b. If a:b=1:3, then  is? |
| **#9 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#9 Theta Ciphering**  **FAMAT State Convention 2021** |
| The line segment joining the midpoints of the diagonals of a trapezoid has length 8. If the longer base is 92, what is the length of the shorter base? |  | The line segment joining the midpoints of the diagonals of a trapezoid has length 8. If the longer base is 92, what is the length of the shorter base? |
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| **#9 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#9 Theta Ciphering**  **FAMAT State Convention 2021** |
| The line segment joining the midpoints of the diagonals of a trapezoid has length 8. If the longer base is 92, what is the length of the shorter base? |  | The line segment joining the midpoints of the diagonals of a trapezoid has length 8. If the longer base is 92, what is the length of the shorter base? |
| **#10 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#10 Theta Ciphering**  **FAMAT State Convention 2021** |
| Mr. Lu's pet ant is on the parabolaat point L whose ordinate is 6. The ant crawls along the parabola until it reaches the nearest point U whose ordinate is -6. The positive difference between the abscissas for L and U is? |  | Mr. Lu's pet ant is on the parabolaat point L whose ordinate is 6. The ant crawls along the parabola until it reaches the nearest point U whose ordinate is -6. The positive difference between the abscissas for L and U is? |
|  |  |  |
| **#10 Theta Ciphering**  **FAMAT State Convention 2021** |  | **#10 Theta Ciphering**  **FAMAT State Convention 2021** |
| Mr. Lu's pet ant is on the parabolaat point L whose ordinate is 6. The ant crawls along the parabola until it reaches the nearest point U whose ordinate is -6. The positive difference between the abscissas for L and U is? |  | Mr. Lu's pet ant is on the parabolaat point L whose ordinate is 6. The ant crawls along the parabola until it reaches the nearest point U whose ordinate is -6. The positive difference between the abscissas for L and U is? |