#0 Theta Ciphering
MAΘ National Convention 2015

The two lines with equations $17x-8y=159$ and $9x+7y=219$ intersect at the point (A,B). Find the least common multiple of A and B.

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f is a polynomial of least degree n such that $f(1)=-5, f(2)=f(6)=0, f(3)=9, f(4)=16,$ and $f(5)=15$. Find the value of n.

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#2 Theta Ciphering
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A function $y = a \cdot x^b$, where a and b are real, passes through the points $(2,1)$ and $(6,5)$. If $\log_5 a = \log_3 c$, find the value of c.

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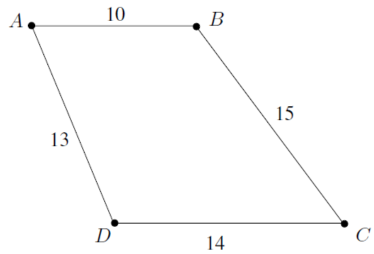
In given quadrilateral $ABCD$, $\overline{AB}$ is parallel to $\overline{CD}$, and the side lengths of the quadrilateral are as shown. Find the area enclosed by the quadrilateral.



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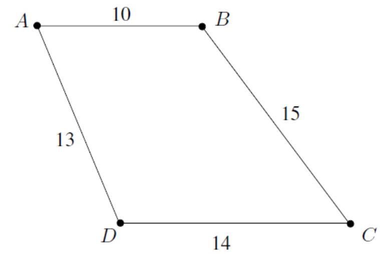

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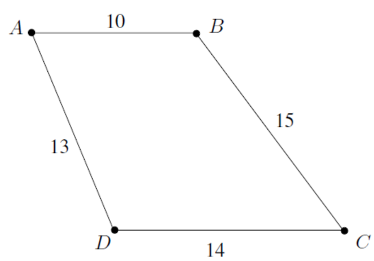

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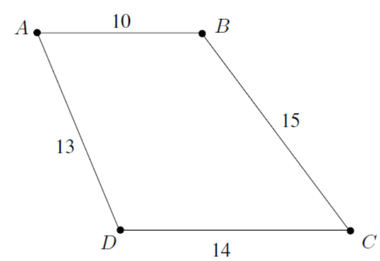

#5 Theta Ciphering
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Evaluate: $\begin{vmatrix} 0 & 1 & 3 & -1 \\ -2 & -1 & 0 & -3 \\ 1 & -1 & 1 & 0 \\ 3 & -1 & -2 & 2 \end{vmatrix}$

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#6 Theta Ciphering
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When Pablito is dealt three cards from a standard deck of 52 playing cards, the chances of his being dealt three cards of three unique ranks (rank is the "number" on the card: 2, 3, …, Q, K, A) is how many more times likely than being dealt one pair and a third card of a different rank than the pair? Write your answer in decimal form, rounded to the nearest tenth.

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A triangle has vertices at the points $(4,7)$, $(7,5)$, and $(6,-3)$. If the interior of this triangle is revolved about the line with equation $5x+y=27$, find the volume of the resulting solid.

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#10 Theta Ciphering
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Simplify as a single trigonometric function of some angle involving θ:

$$\sin\theta - \sin\theta\cos\theta + \ldots + \sin\theta\left(-\cos\theta\right)^{n-1} + \ldots$$

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