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<b>SEP</b> <b>九月 2010</b>	<b>幾何與對稱建築物</b> 數學上的幾何和對稱已於西元年間為建築師所應用，哥德式風格是其中一種。哥德式建築在結構上有三項特徵：尖拱、拱肋和飛扶壁，均以幾何及對稱結合藝術而建成。如米蘭的哥德式圓頂建築物，從藍圖上，清楚呈現幾何與對稱的運用。 		Find $C_n^n - C_{n-1}^n + C_{n-2}^n - \dots - C_2^n + C_1^n$ for all odd numbers $n$ .	Suppose $x^y + x^{-y} = 2\sqrt{2}$ , where $x > 1$ and $y > 0$ , find $x^y - x^{-y}$ .	If $\cos^6 \theta + \sin^6 \theta = 0.4$ and $d = 2 + 5\cos^2 \theta \sin^2 \theta$ , find $d$ .	$x$ is a positive integer and $1 \geq x^2 - 6x + 7 \geq -1$ . Find the maximum value of $x$ .																														
	Let $d$ be an odd prime number. If $89 - (d+3)^2$ is the square of an integer, find $d$ .	Given that $x + y = 18$ . Find the maximum value of $\sqrt{x} + \sqrt{y}$ .	The length of the three sides of a triangle are 15 cm, 21 cm and $x$ cm respectively. If $x$ is an integer, find the minimum value of $x$ .	A and C are given mutually exclusive events. So are B and C. If $P(A \cup B) = \frac{5}{12}$ , $P(C) = \frac{3}{12}$ and $P(A \cup B \cup C) = \frac{x}{12}$ , find $x$ .	It is given that the 6-digit number $N = x1527y$ is a multiple of 4, and the remainder is 5 when $N$ is divided by 11, find the value of $x + y$ .	父子二人在同一家工廠工作，兒子步行到工廠需20分鐘而父親需要30分鐘。如果，父親先走5分鐘後，兒子才出發，問兒子出發後多久才能追上父親？	Arrange the natural numbers in the following order. In the arrangement, 9 is in row 3 and column 2. If the number 2006 is in row $x$ and column $y$ , find $y$ . <table border="1" style="margin-left: auto; margin-right: auto;"> <tr><td>1</td><td>2</td><td>4</td><td>7</td><td>11</td><td>...</td></tr> <tr><td>3</td><td>5</td><td>8</td><td>...</td><td></td><td></td></tr> <tr><td>6</td><td>9</td><td>...</td><td></td><td></td><td></td></tr> <tr><td>10</td><td>...</td><td></td><td></td><td></td><td></td></tr> <tr><td>...</td><td></td><td></td><td></td><td></td><td></td></tr> </table>	1	2	4	7	11	...	3	5	8	...			6	9	...				10	...					...				
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<b>5</b> 廿七	<b>6</b> 廿八	<b>7</b> 廿九	<b>8</b> 白霧	<b>9</b> 初二	<b>10</b> 初三	<b>11</b> 初四																														
A rectangular piece of paper is folded into the following figure. If the area of $\triangle ABC$ is $\frac{1}{3}$ of the area of the original rectangular piece of paper, find $p$ . 	How many terms are in the sequence $-5, -2, 1, 4, \dots, 31$ ?	If $a$ is the largest real root of the equation $\sqrt{x(x+1)(x+2)(x+3)} + 1 = 71$ , find $2a$ .	The product of 5 consecutive odd numbers is 692835. Find the mean of the 5 numbers without using calculator.	Suppose a parabola $y = 4x^2 - 4\sqrt{2}x + c$ intersects the $x$ -axis at $(\cos \theta, 0)$ and $(\cos \phi, 0)$ . If $\theta$ and $\phi$ are two acute angles of a right angled triangle. Find the value of $\frac{4\pi}{\theta}$ .	<b>Birthday of Georg Friedrich Bernhard Riemann.</b> In 1851, his thesis introduced Riemann surfaces. His habilitation lecture on the foundations of geometry (1854) stunned even Gauss. In 1859, Riemann probed the distribution of primes using his zeta function and he formulated the Riemann Hypothesis.	Write down a three-digit number whose digits are decreasing. Then reverse the digits to create a new number, and subtract this number from the original number. With the resulting number, add it to the reverse of itself. Find the sum of digits of the number obtained.																														
<b>12</b> 初五	<b>13</b> 初六	<b>14</b> 初七	<b>15</b> 初八	<b>16</b> 初九	<b>17</b> 初十	<b>18</b> 十一																														
If $5x = \frac{1}{2} + (\frac{1}{3} + \frac{2}{3}) + (\frac{1}{4} + \frac{2}{4} + \frac{3}{4}) + \dots + (\frac{1}{20} + \frac{2}{20} + \dots + \frac{19}{20})$ , find $x$ .	How many integer solutions are there for the equation $a_1 + a_2 + a_3 + a_4 = 10$ where $a_1 \geq 3, a_2 \geq 1, a_3 \geq -2, a_4 \geq 5$ ?	$a, b, c, d$ 四個不同的整數中，有1個是偶數，其他3個是奇數。從中各挑出2個相加，和為54, 63, 75, 86, 98, 107。求3個奇數中最小的奇數。	<b>Birthday of Charles François Sturm.</b> In 1829, he discovered the theorem which bears his name and which concerns the determination of the number of real roots of a numerical equation included between given limits. Published in 1834, Sturm's work on the theory of differential equations of the second order, conducted with his friend Joseph Liouville, won him prestigious awards in France. Sturm made significant contributions to projective geometry and to the differential geometry of curves and surfaces.	Given that $n$ is a positive integer and $24^3 - n^3$ is a prime number. Find $n$ .	Let $f$ be a function such that for all integers $m$ and $n$ , $f(m)$ is an integer and $f(mn) = f(m)f(n)$ . Given that $f(m) > f(n)$ when $9 > m > n$ , $f(2) = 3$ and $f(6) > 22$ , find $f(6)$ .	Let $p$ and $q$ be prime numbers that are the two distinct roots of the equation $x^2 - 13x + R = 0$ , where $R$ is a real number. If $5b = p^2 + q^2$ , find $b$ .																														
<b>19</b> 十二	<b>20</b> 十三	<b>21</b> 十四	<b>22</b> 十五	<b>23</b> 十六	<b>24</b> 十七	<b>25</b> 十八																														
On the coordinate plane, the points $A(3, 7)$ and $B(8, 14)$ are reflected about the line $y = kx + c$ , where $k$ and $c$ are constants, their images are $C(5, 5)$ and $D(12, 10)$ respectively. Find $26\left(\frac{k}{c}\right)$ .	If $27^a = 5$ and $27^b = 10$ , find $2^{\frac{1}{b-a}}$ .	The probability of picking a girl from a group of teenagers is 40%. If 30% of the girls in the group are married, find the chance (in %) of picking an unmarried girl.	新建的公路全長146.5公里，設計行車時速100公里，行車時間將比在同樣長的公路上行駛時縮短了36分鐘，問現在的時速比過去的快多少？(答案準確至整數)	有 $a, b, c, d$ 四個整數， $a$ 和 $b$ 的積是72； $b$ 和 $c$ 的積是54； $b$ 和 $d$ 的積是90。找出四個整數之和的最小值。																																
<b>26</b> 十九	<b>27</b> 二十	<b>28</b> 廿一	<b>29</b> 廿二	<b>30</b> 廿三																																

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