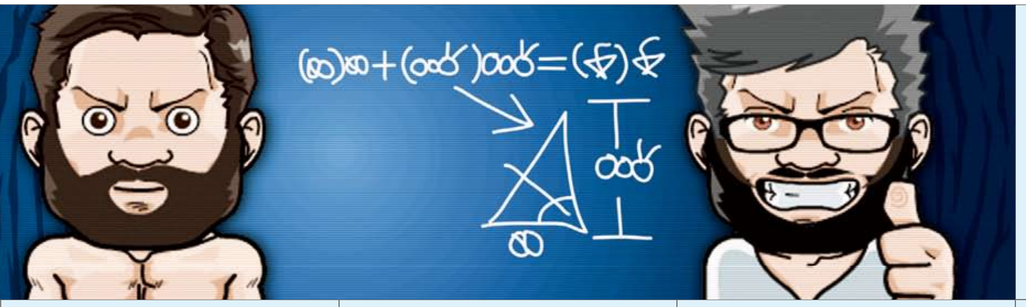
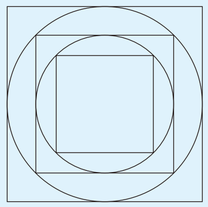
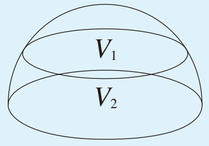
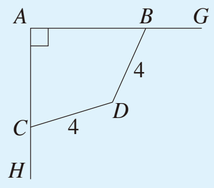
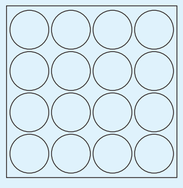
APR
四月 2011

SUN 日	MON 一	TUE 二	WED 三	THU 四	FRI 五	SAT 六
	Q: When will you use algebraic symbols? A: Algebraic symbols are used when you do not know what you are talking about. 				Let X be a discrete random variable for $x = 1, 2, 3, 4$. It is known that the probability density function $f(x) = \frac{2x - c}{16}$ for $x = 1, 2, 3, 4$. Using the property of $f(x)$, find the value of c. **1** 廿八	Given that $v_{n+2} + 3v_{n+1} + 2v_n = 0$, where $v_n \neq 0$ for all n, $u_n = (\frac{v_{n+1}}{v_n}) + 4$ and $u_1 = 1$. Find $\lim_{n\to\infty} u_n$. **2** 廿九
It is given that $\sum_{i=1}^{20}(2x_i + 5y_i) = 36$ and $\sum_{i=1}^{20}(3x_i + y_i) = 15$. Find the value of $\sum_{i=1}^{20} x_i$. **3** 三月	Find the ratio of the area of the largest square to that of the smallest square.  **4** 初二	What is the radius of the circle $z\bar{z} + (3 - 13i)z + (3 + 13i)\bar{z} + 153 = 0$ in the Argand Diagram? **5** 清明	If there are three effective ways of treating a cancer patient, i.e. surgery, radiation, and chemotherapy, how many different ways can the patient be treated with two different treatments if the order of treatment is crucial? **6** 初四	考慮圓 C: $4x^2 + 4y^2 - 8x - 8y - 61 = 0$。若 $A(3, 2)$ 在圓 C 內，而弦 PQ 的中點為 A，求 PQ 的長度。 **7** 初五	If $(x + 2)^n$ is expanded in descending powers of x, the ratio of coefficients of the 2nd, 3rd, and 4th terms is 1 : 7 : 28. Find n. **8** 初六	已知 $x, y \in \mathbf{R}^+$，且 $x + 4y = 1$，求 $\frac{1}{x} + \frac{1}{y}$ 的最小值。 **9** 初七
求方程 $x^{\log x} = 1000^2 x$ 所有實數解的積。 **10** 初八	In the diagram, a hemisphere is cut by a plane parallel to the base circle such that the heights of the two solids are the same. Find $\frac{5V_2}{V_1}$, where V_1 and V_2 are the volumes of the solids.  **11** 初九	Three fruits are taken out randomly without replacement from a bag containing three apples and three bananas. If the probability of getting at least two bananas is $\frac{n}{24}$, find n. **12** 初十	Given $P(A \cap B) = \frac{3}{8}$, $P(A' \cap B) = \frac{1}{6}$ and $P(B) = \frac{L}{24}$, $L = ?$ **13** 十一	If the radius of a circle is increased by 7 units, the circumference is increased by $n\pi$ units, what is n? **14** 十二	Birthday of **Leonhard Euler**. The most prolific mathematician of all times, Euler became totally blind in 1771 but produced almost half of his phenomenal output in St. Petersburg after 1766, with the help of several assistants. **15** 十三	If the ellipse $\begin{cases} x = 4\cos\theta \\ y = 3\sin\theta \end{cases}$ is revolved about the x-axis and y-axis respectively, the difference of the volumes of two solids is $n\pi$. What is n? **16** 十四
今有共買璫，人出半 (即$\frac{1}{2}$)，盈四；人出少半 (即$\frac{1}{3}$)，不足三。問璫價。 **17** 十五	There are some cuboids of dimension 1 X 2 X 6. Find the least number of such cuboids such that they can form a cube. **18** 十六	B and C move freely along AG and AH respectively. Find the maximum area of $ABDC$. (Correct the answer to the nearest integer.)  **19** 十七	有一機器能從正方形卡紙上切割出半徑為一個單位的圓形，若卡紙的邊長為 9 個單位，則最多能從卡紙上切割出多少個圓形？  **20** 穀雨	Find $(10 + 11 + 12 + \ldots + 20112010 + 20112011) \bmod 100$. **21** 十九	Round $\log_2 \sum_{\substack{10\geq p\geq q>0 \\ 10\geq r\geq s>0}} C_q^p C_s^r$ to the nearest integer. **22** 耶穌受難節 二十	When 274 is divided by a two-digit integer, the remainder is 21. Find the maximum possible value of the two-digit integer. **23** 耶穌受難節翌日 廿一
It is given that the three sides of a right-angled triangle are three consecutive even integers. Find all possible value(s) of the area of the triangle. **24** 復活節 廿二	Find the distance between two points in the xy-plane if their polar coordinates are $A(7, 70°)$ and $B(24, 160°)$ respectively. **25** 復活節翌日 廿三	Find the remainder when $x^{2001} + 27$ is divided by $x + 1$. **26** 廿四	Find the cube of the reminder when $47^{35^{23}}$ is divided by 7. **27** 廿五	If $\overbrace{\overline{7ab7ab\ldots\ldots7ab}}^{\text{Number of } \overline{7ab} = 2011}$ is divisible by 91, find the value of $\overline{ab}$. **28** 廿六	Birthday of **Jules Henri Poincaré**. Poincaré was described the last universal genius and quintessential absent-minded professor (cf. Savant Cosinus comic strip). Poincaré conceived Special Relativity before Einstein did. His mathematical legacy includes chaos theory and topology. **29** 廿七	Birthday of **Johann Carl Friedrich Gauss**. At the age of 7, the Prince of Mathematics found instantly the sum (5050) of all integers from 1 to 100 (as the sum of 50 pairs, each adding up to 101). At age 19, his breakthrough about constructible polygons helped him choose a mathematical career. **30** 廿八

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