SUN 日	MON 一	TUE 二	WED 三	THU 四	FRI 五	SAT 六

MAY
五月 2010

懸鏈線
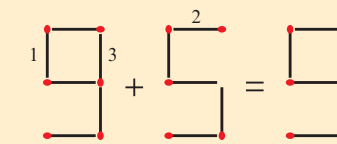
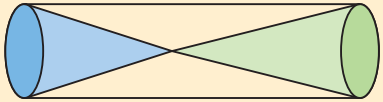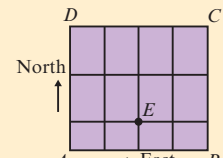懸鏈線看來像拋物線，當在懸鏈線的等分處掛上重物，鏈就變成拋物線，像一條吊橋。如三藩市的金門大橋及香港的青馬大橋。

懸鏈線的方程式為：$y = a\cosh(\frac{x}{a})$

Refer to the figure, which match should be moved to make the equality hold?

1 勞動節 十八

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2 十九 — If a is the smallest prime number which divides $3^{11} + 5^{13}$, find a.

3 二十 — If $ab_{(7)} = ba_{(5)}$ where a and b are two non-zero integers, find b.

4 廿一 — 工人搬運物品 100 箱，規定每箱運費 80 元。若搬運途中破損一箱，除不需付運費外，還須賠償 120 元；最後只需付運費 7200 元，求破損的箱數。

5 立夏 — A and B are two cones inside a cylindrical tube with length of 20 and diameter of 6. If the volumes of A and B are in the ratio $3:1$ and b is the height of the cone B, find b.

6 廿三 — At p minutes after 4 o'clock (where p is an integer), the angle between the minutes hand and the hours hand first becomes an acute angle. Find p.

7 廿四 — If a ten-digit number $\overline{2468m\,2468m}$ is divisible by 3, find the maximum value of m.

8 廿五 — A six-digit number $\overline{1234xy}$ is divisible by both 8 and 9, find $x + y$.

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9 廿六 — A group of youngsters went for a picnic. They agreed to share all expenses. The total amount used was \$288. One youngster had no money to pay his share, and each of the others had to pay \$4 more to cover the expenses. How many youngsters were there in the group?

10 廿七 — Find the sum of last two digits of $1 + 2 + 3 + \ldots + 2009 + 2010$ without calculating the exact value of the sum.

11 廿八 — $\frac{1}{2}, \frac{1}{3}, \frac{2}{3}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{1}{5}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \ldots$ Given that the denominator of the 1001th term of the above sequence is 46, find the numerator of this term.

12 廿九 — From a group of 2 boys and 4 girls, how many committees with 3 members can be formed containing 1 boy and 2 girls?

13 三十 — Given that $f(x) = -2x + 1$, when $x < 1$ and $f(x) = x^2 - 12x + 3$, when $x \geqslant 1$. If d is the maximum integral solution of $f(x) = 16$, find d.

14 四月 — Given A and B are independent events, $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{4}$, $P(A \cap B) = \frac{1}{x}$, and $P(A \cup B) = \frac{1}{y}$. Find $x + y$.

15 初二 — The height s m of an object moving vertically is given by $s = -t^2 + 30t + 30$ where t is the time. Find t when the maximum height occurs.

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16 初三 — Let $f(x) = 41x^2 - 4x + 4$ and $g(x) = -2x^2 + x$. If k is a positive number such that $f(x) + kg(x) = 0$ has a single root, find k.

17 初四 — Compute $50^{250} \pmod{83}$.

18 初五 — The figure represents a 4×3 rectangular spiderweb. If a spider walks along the web from A to C passing through the intersection E, and it always walks either due East or due North. Find the total number of possible paths.

19 初六 — If X is a normally distributed random variable with mean 12, variance 16 and $P(X > y) = 0.04$, find y (Correct to the nearest integer).

20 初七 — Find the sum of the moduli of all the 4th roots of $4\sqrt{12207} + \sqrt{195313}\,i$.

21 佛誕 小滿 — If $2^{34} \div 4^{32} = 8^n$, find n.

22 初九 — 八個自然數排成一行，從第三個數開始，每個數都是前面兩個數的和。已知第一個數是 3，第八個數是 310，第二個數是多少？

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23 初十 — Given that $\cos 16° = \sin 14° + \sin(2d)°$ and $0 < d < 90$, find d without using calculator.

30 十七 — Let $f(0) = 0$; $f(n) = f(n-1) + 3$ when $n = 1, 2, 3, 4, \ldots$, if $f(10) = R$, find R.

24 廿一 — A point is located at a distance of 25 units from the centre of a circle of radius 7 units. Find the length of a tangent from the point to the circle.

31 十八 — For $-1 < x < 1$, find the coefficient of x^{30} in the Taylor expansion of $(1 + x)^{-2}$.

25 十二 — Given $n^4 = \overline{3abcd5}$ is a 6-digit number, solve n without using calculator.

26 十三 — Birthday of **Abraham de Moivre**. He is a French mathematician famous for de Moivre's formula, which links complex numbers and trigonometry, and for his work on the normal distribution and probability theory. He was elected a Fellow of the Royal Society in 1697, and was a friend of Isaac Newton, Edmund Halley and James Stirling.

27 十四 — How many positive factors does 6400 have?

28 十五 — In how many ways can 9 identical balls be distributed into 3 different boxes such that no box is empty?

29 十六 — $9(3.\dot{2}) = ?$

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THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

DEPARTMENT OF APPLIED MATHEMATICS 應用數學系