

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1 十九	2 二十 In the series $\frac{1}{1} + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \dots$, if we remove all terms with the denominator having digit 2, then the resulting series converges. Combining the fact that $\frac{1}{2} + \frac{1}{3} + \frac{1}{5} + \frac{1}{7} + \dots$ diverges, this shows that there exists infinitely many prime p with a digit 2.	3 廿一 3 is the number of non-collinear points that will determine a plane and a circle.	4 廿二 In the IMO Hall of Fame, what is the maximum number of IMO Gold medals obtained by a contestant so far?	5 廿三 There are 5 types of regular polyhedra.
6 廿四 How many ways of writing 365625 as sum of two squares (ignoring order and signs) are there?	7 廿五 What is the minimum number of distinct integer-sided rectangles needed to tile a rectangle such that no 2 rectangles share a common side-length?	8 白露 The square of any odd number is $1 \pmod{8}$.	9 廿七 $1! + 2! + 3! = ?$	10 廿八 Do you know that if you write the number 10 twice as 1010, you get the binary representation of 10!	11 廿九 What is the smallest prime p such that $2^p - 1$ is not a prime?	12 三十 12 is the smallest weight such that a cusp form exists.
13 八月 There are 13 books of Euclid's Elements.	14 初二 14 is represented as E in the hexadecimal base.	15 初三 Find the coefficient of x^2 in $\left(\frac{1}{2} + 4x\right)^6$.	16 初四 If $P(1) = P(2) = P(3) = 1$ and $P(n) = P(n-2) + P(n-3)$, find $P(12)$.	17 初五 Today is the 189 th birthday of Georg Friedrich Bernhard Riemann.	18 初六 If $\cos 2x^\circ - \cos 4x^\circ = \frac{1}{2}$, where $0 < x < 45$, find x .	19 初七 Andrew Wiles's revelation for the proof of Fermat's last theorem came this day in 1994.
20 初八 20 can be written as the sum of three Fibonacci numbers uniquely.	21 初九 21 is the 3 rd star number.	22 初十 22 is a centered heptagonal number.	23 秋分 If ϕ is the golden ratio, $[\phi^{2015}] \pmod{23} = ?$	24 十二 There is a card game called "24".	25 十三 A quadrilateral inscribed in a circle has sides 7, 15, 20 and 24. Find the diameter of the circle.	26 十四 There are 26 letters in the English alphabet.
27 中秋節 27 is the only positive integer that is 3 times the sum of its digits.	28 中秋節翌日 Some people are having an event. When they are asked to form groups of 6, 4 people cannot form a group. When they are then asked to form groups of 13, 2 people cannot form a group. What is the minimum number of people gathering?	29 十七 The planet Saturn requires over 29 years to orbit the Sun.	30 十八 30 is the smallest number with 3 distinct prime factors.			



第五十七屆國際數學奧林匹克
57th International Mathematical Olympiad

SEPTEMBER 2015