

## Imo 2013 Shortlist Solutions

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IMO 2013 Problem 3

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IMO 2012 Math Olympiad Problem 6 ~~A mysterious Chinese contest problem~~. Basics (Inequality) Part 1..for beginners *Imo 2013 Shortlist Solutions*  
6 IMO 2013 Colombia Geometry G1. Let ABC be an acute-angled triangle with orthocenter H, and let W be a point on side BC. Denote by M and N the feet of the altitudes from B and C, respectively. Denote by  $\omega$  the circumcircle of BWN, and let X be the point on  $\omega$  which is diametrically opposite to W. Analogously, denote by  $\omega'$

*Shortlisted Problems with Solutions*

First, for  $x > 1$  pick a large  $m$  and note  $am = f(am) f(amx) + f(x) (amx) + x = am$ : Finally, for  $x < 1$  use  $nf(x) = f(n)f(x) f(nx) nf(x)$  for large  $n$ . Remark. Note that  $a > 1$  is essential; if  $b < 1$  then  $f(x) = bx^2$  works with unique fixed point  $1 = b$ . 9. IMO 2013 Solution Notes web.evanchen.cc, updated November 2, 2020.

*IMO 2013 Solution Notes - Evan Chen*

IMO 2013 (problems and solutions) JPN-N2 AUS-C2 RUS-G6 THA-G1 BGR-A3 RUS-C7; IMO 2014 (problems and solutions) ... ELMO 2017 (shortlist with solutions) ELMO 2018 (shortlist with solutions) ELMO 2019 (shortlist with solutions) Taiwan Team Selection Test. These are the problems I worked on in high school when competing for a spot on the Taiwanese ...

*Evan Chen & Problems*

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To the current moment, there is only a single IMO problem that has two distinct proposing countries: The if-part of problem 1994/2 was proposed by Australia and its only-if part by Armenia. See also. IMO problems statistics (eternal) IMO problems statistics since 2000 (modern history) IMO problems on the Resources page; IMO Shortlist Problems

### *Art of Problem Solving*

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Problems. Language versions of problems are not complete. Please send relevant PDF files to the webmaster: [webmaster@imo-official.org](mailto:webmaster@imo-official.org).

### *International Mathematical Olympiad*

60th International Mathematical Olympiad Bath — UK, 11th–22nd July 2019. Note of Confidentiality The Shortlist has to be kept strictly confidential until the conclusion of the following International Mathematical Olympiad. IMO General Regulations §6.6 ... Solutions ` ? 2019 2019. “ ´ “ ...

### *IMO2019 Shortlisted Problems with Solutions*

Shortlist has to be kept strictly confidential until the conclusion of the following International Mathematical Olympiad. IMO General Regulations 6.6  
tributing Countries The Organising Committee and the Problem Selection of IMO 2018 thank you for contributing with 168 problem proposals: Armenia, Australia, Austria ...

### *IMO2018 Shortlisted Problems with Solutions*

1.1 The Forty-Sixth IMO Mérida, Mexico, July 8–19, 2005 1.1.1 Contest Problems First Day (July 13) 1. Six points are chosen on the sides of an equilateral triangle ABC:  $A_1, A_2$  on BC;  $B_1, B_2$  on CA;  $C_1, C_2$  on AB. These points are vertices of a convex hexagon  $A_1A_2B_1B_2C_1C_2$  with equal side lengths. Prove that the lines  $A_1B_2$ ,  $B_1C_2$  and  $C_1A_2$  are ...

### *IMO Shortlist 2005 - IMOMath*

Solution. Let  $x = (1 + \sqrt{5})/2$  and  $y = (1 - \sqrt{5})/2$  be the roots of the quadratic equation  $t^2 - t - 1 = 0$ . So  $xy = -1$ ,  $x + y = 1$  and  $1 + x = y^2$ . An easy induction shows that the general term  $c_n$  of the given sequence satisfies  $c_n = x^n y - y^n x$  for  $n \geq 0$ .

### *IMO 2006 Shortlisted Problems*

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$a^2 = (2ab^2 + b^3 + 1) > 0$ , we have  $2ab^2 + b^3 + 1 > 0$ ,  $a > b = 2; 1 = 2b^2$ , and hence  $a = b = 2$ . Using this, we infer from  $k = 1$ , or  $a^2 = b^2(2a + b) + 1$ , that  $a^2 > b^2(2a + b)$ ,  $0$ . Hence  $a > b$  or  $2a = b$ : (?) Now consider the two solutions  $a_1, a_2$  to the equation.  $a^2 + 2kb^2 + a + k(b^3 + 1) = 0$  (I) for fixed positive integers  $k$  and  $b$ , and assume that one of them is an integer.

## Short-listed Problems and Solutions

IMO Shortlist Official 2001-18 EN with solutions.pdf ... .. Sign in

IMO Shortlist Official 2001-18 EN with solutions.pdf ...

2 2nd International Monsters' Olympiad, Bath — UK, 11th–22nd July 2019 Problems Algebra A1. Let  $Z$  be the set of integers. Determine all functions  $f: Z \rightarrow Z$  such that, for all integers  $a$  and  $b$ ,  $f(2a) - 2f(b) = f(f(a) - b)$ . A2. When the age of Ann will be the same as Mary's age now, Mary will be exactly 32

## The Real Shortlisted Problems - ELTE

1.1 The Forty-Ninth IMO Madrid, Spain, July 10–22, 2008 1.1.1 Contest Problems First Day (July 16) 1. An acute-angled triangle  $ABC$  has orthocenter  $H$ . The circle passing through  $H$  with center the midpoint of  $BC$  intersects the line  $BC$  at  $A_1$  and  $A_2$ . Similarly, the circle passing through  $H$  with center the midpoint of  $CA$  intersects the line

## IMO Shortlist 2008 - IMOMath

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## ELMO - Evan Chen

IMO Shortlist 2009 From the book "The IMO Compendium" ... 1.1 The Fiftieth IMO Bremen, Germany, July 10–22, 2009 1.1.1 Contest Problems First Day (July 15) 1.

## IMO Shortlist 2009

PIN 5019.17, Contract D900013 2 Final, July 18, 2013 a) Providing cost-effective solutions that improve traffic circulation and access to area facilities and maximize value over the remaining lifespans of the bridges; maximizing the use of existing right-of-way;

## REQUEST FOR PROPOSALS INSTRUCTIONS TO PROPOSERS GENERAL ...

The problems in this archive do not include shortlist problems which were actually used in the IMO. There are currently about 459 problems and 282 solutions in this archive. I have now got the official solutions for most of the years from 1983 onwards, and hope to put up the remaining solutions for these in due course.

## IMO shortlist - PraSe

$m = 12p(a, b, c) p^{a+c} r^b p(1, 1, r^2) = 2(r^2)(r^3)r = 2, 3. p(a, b, 2b^2a) = 3b(3a^2 + 6ab + 2b^2 + 1) = 3b(3(a^2 + 2ab + b^2) + 1)$  Page 4. and recall the well-known result

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that there are infinitely many solutions to the Pell equation . Thus there are infinitely many positive integers satisfying .  $x^2 = 3y^2 + 1$   $a < b$   $p(a, b, 2b^2/a) = 0$  3.

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