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Shortlist

Solutions

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IMO 2013/4,
Geometry, Miquel's
Theorem,
Collinearity IMO

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2013 Problem 4

IMO 2013 Problem
2 A Crazy

Inequality under a
Bizarre Condition |

Turkish Junior

Mathematical

Olympiad 2012

Problem 3 IMO

Shortlist 2012 G3:

ONE MORE

INCENTER IMO

Shortlist 2002 C7:

TURAN CLONING

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IMO Shortlist |

2006: A2

International Math

Olympiad | 1998

Question 4 from the

IMO shortlist...

~~Indian Math~~

~~Olympiad 2014 #2~~

~~| A floor problem~~

~~amenable to~~

~~experimentation~~

Olympiad Geometry

Problem #34: IMO

Shortlist 2002 G7

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AN IMO PROBLEM
ON GEOMETRY

Math gold medalist
talks about the art
of math 58th

International

Mathematical

Olympiad (IMO

2017) ~~Solving IMO~~

~~2020 Q2 in 7~~

~~Minutes!! |~~

~~International~~

~~Mathematical~~

~~Olympiad 2020~~

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~~Problem 2~~ Solving
An Insanely Hard
Problem For High
School Students

IMO 2020 The
opening ceremony
British Math

Olympiad | 2009
Round 2 Question 1
Look for
Symmetries in
Equations | Algebra
| Polish Junior
Math Olympiad

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2018 International

Math Olympiad |

2006 Question 4

Solving the 2006

IMO Problems: Day

2 Bulgarian Math

Olympiad | 1999

IMO 2013 Problem

3 Pragmatic

Approach IMO

Shortlist 2009 | N2

F=ma Exam 2020 B

- Solutions to

Selected Problems

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Solving an IMO

Problem in 10

Minutes! |

International

Mathematical

Olympiad 2006 P4

IMO 2013 Problem

3

IMO 2012 Math

Olympiad Problem 6

~~A mysterious~~

~~Chinese contest~~

~~problem.~~ Basics

(Inequality) Part

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1..for beginners Imo
2013 Shortlist
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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.

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Denote by Γ_1 the
circumcircle of
BWN, and let X be
the point on Γ_1
which is
diametrically
opposite to W .
Analogously, denote
by

Shortlisted

Problems with

Solutions

First, for $x > 1$ pick

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a large m and note
 $a^m = f(a^m) f(amx)$
 $+ f(x) (amx) + x =$
 a^m : Finally, for $x \neq 1$
use $nf(x) =$
 $f(n)f(x) f(nx) nf(x)$
for large n . Remark.
Note that $a > 1$ is
essential; if $b \neq 1$
then $f(x) =$
 bx^2 works with
unique fixed point
 $1 = b^{-1}$. 9. IMO 2013
Solution Notes

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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

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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 ...

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Evan Chen &
Problems

Solutions

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

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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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EN with solutions ...

Problems. Language

versions of

problems are not

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official.org.

International
Mathematical
Olympiad
60th International
Mathematical
Olympiad Bath —
UK, 11th – 22nd July

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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. “`
“`
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tries Coun The
Organising
Committee and the
Problem Selection
of IMO 2018 thank
wing follo 49 tries
coun for tributing
con 168 problem
prop osals:
Armenia, Australia,
Austria ...

IMO2018

Shortlisted

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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

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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 $\alpha =$

$(1 + \sqrt{5})/2$ and

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Shortlist Solutions
= (1 - 5)/2 be
the roots of the
quadratic equation

$t^2 - t - 1 = 0$. So

$\alpha = -1, \beta = 1$
and $1 + \alpha = 2$.

An easy induction
shows that the
general term c_n of
the given sequence
satisfies $c_n =$

$$c_n = \frac{1}{\sqrt{5}} \left(\frac{1 + \sqrt{5}}{2} \right)^n - \frac{1}{\sqrt{5}} \left(\frac{1 - \sqrt{5}}{2} \right)^n$$

for $n \geq 0$.

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IMO 2006

Shortlisted
Problems

$$a^2 = (2ab^2 + b^3 + 1)$$

> 0 , we have

$$2ab^2 + b^3 + 1 > 0, a >$$

$$b = 2 + 1 = 2b^2, \text{ and}$$

hence $a = 2, b = 2$.

Using this, we infer

$$\text{from } k = 1, \text{ or } a^2 =$$

$$b^2(2a + b) + 1,$$

$$\text{that } a^2 >$$

$$b^2(2a + b), 0.$$

Hence. $a > b$ or

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2a=b:(/) Now
consider the two
solutions a_1, a_2 to the
equation. $a_2 \mid 2kb$
 $a+k(b^3 \mid 1) = 0$ (])
for fixed positive
integers k and b , and
assume that one of
them is an integer.

Short-listed
Problems and
Solutions

IMO Shortlist

Page 29/39

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

IMO Shortlist

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2 2nd International
Monsters '

Olympiad, Bath —

UK, 11th – 22nd July

2019 Problems

Algebra A1. Let Z

be the set of

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integers. Determine
all functions $f: \mathbb{Z} \rightarrow \mathbb{Z}$
such that, for all
integers a and b ,
 $f(2a) - 2f(b) = f(a) - f(b)$. A2.

When the age of
Ann will be the
same as Mary ' s age
now, Mary will be
exactly 32

The Real
Shortlisted

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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

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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

Webmaster), [evan](mailto:evan[at]evanchen.cc)

[at] evanchen.cc

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USA MOP

Solutions

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.

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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

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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

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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.

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IMO shortlist -

PraSe

$$m = 12p(a, b, c)p$$

$$a + c = rb \quad r \mid p(1, 1, r -$$

$$1) = 2(r - 2)(r -$$

$$3) \quad r = 2, 3. \quad p(a, b,$$

$$2b - a) = 3b(3a^2 -$$

$$6ab + 2b^2 + 1) =$$

$$3b(3(a - b)^2 - b^2 +$$

1) Page 4. and

recall the well-

known result that

there are infinitely

many solutions to

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the Pell equation .

Thus there are infinitely many positive integers satisfying . $x^2 = 3y^2 + 1$ $a < b$ $p(a, b, 2b - a) = 0$ 3.

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