

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

Mathematics for Computer Science
6.042J/18.062J

PROOFS, I



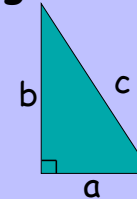
Albert R. Meyer, 2015

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proof-intro.I.1

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

Getting started:
Pythagorean theorem



$$a^2 + b^2 = c^2$$

Familiar? Yes!

Obvious? No!



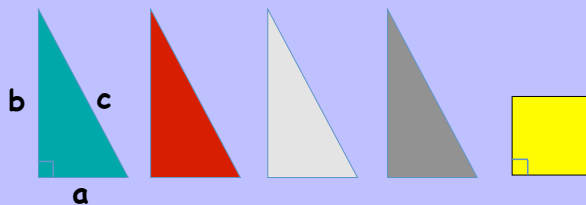
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proof-intro.I.3

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

A Cool Proof



Rearrange into:

- (i) a $c \times c$ square, and then
- (ii) an $a \times a$ & a $b \times b$ square



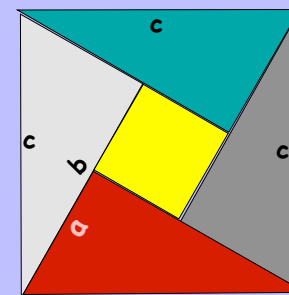
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proof-intro.I.4

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

A Cool Proof



$c \times c$ square



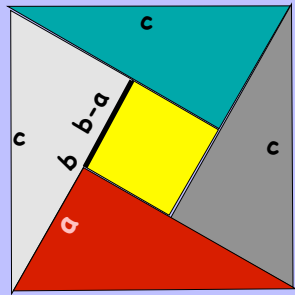
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proof-intro.I.5

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

A Cool Proof



$c \times c$ square



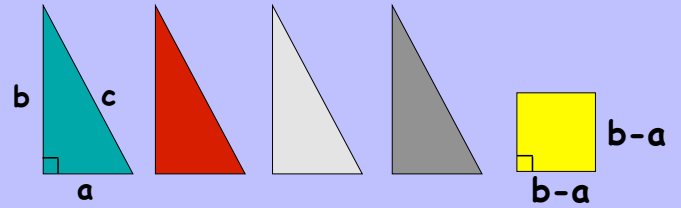
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proof-intro.I.6

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

A Cool Proof



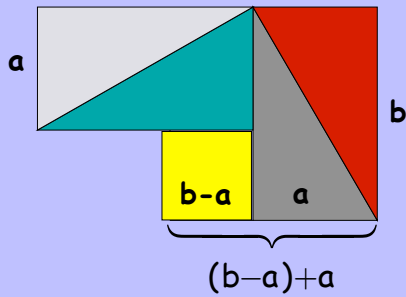
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proof-intro.I.7

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

A Cool Proof



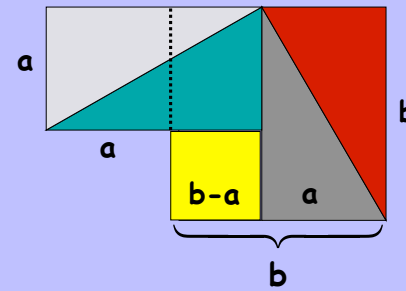
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proof-intro.I.8

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

A Cool Proof



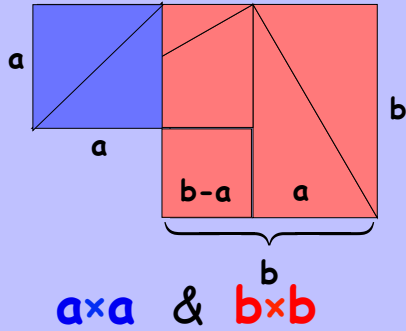
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proof-intro.I.9

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

A Cool Proof



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proof-intro.I.10

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

Proof by Picture

- elegant and correct
--in this case
- worrisome in general
--hidden assumptions



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proof-intro.I.11

6	9	13	7
12		10	5
3	1	4	14
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Bogus Proof: Getting Rich By Diagram



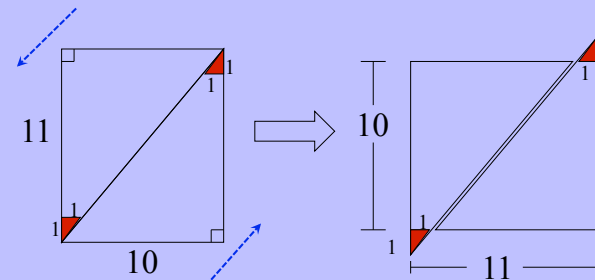
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proof-intro.I.12

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

Bogus Proof: Getting Rich By Diagram



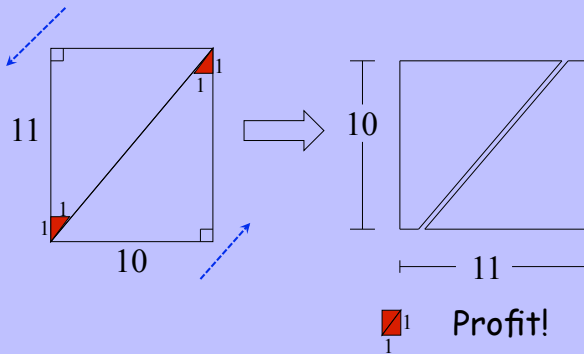
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proof-intro.I.13

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

A False Proof: Getting Rich By Diagram



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proof-intro.I.14

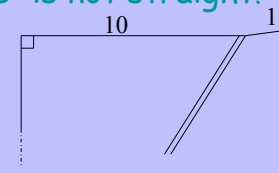
6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

Getting Rich

The bug:

\triangle \triangle are not right triangles!

So the top and bottom line of the "rectangle" is not straight!



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proof-intro.I.15

6	9	13	7
12		10	5
3	1	4	14
15	8	11	2

More Bogus Picture Proofs

Lots of good examples,
for example:

Gardner, Martin

Mathematics, Magic and Mystery

(Dover, 1956, 12 + 176)

<http://store.doverpublications.com/0486203352.html>

or https://en.m.wikipedia.org/wiki/Missing_square_puzzle



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proofintro.I.16