

# HOW TO THINK LIKE A MATHEMATICIAN CORRECTIONS

October 4, 2011

The following are corrections to my book *How to Think Like a Mathematician*. If you know of any more errors, then please email me or write to me at the address below. Unless you tell me you wish to remain anonymous, then I'll include your name and location.

The letter P refers to page, l refers to the line, where negative numbers indicate that one should count from the bottom of the page, Ex refers to Exercise. The name and location of person who first spotted the mistake is given in italics. My thanks to all of them.

P 127, l -1 The first mistake is rather embarrassing. It is well-known, by me as well as others, that 180 degrees is actually  $\pi$  radians, not  $2\pi$  as I claim! Spotted by *Andrew Houston, UK*

P 10, l 6 The definition of  $X \times Y$  should not have  $x \in Y$ . It should be

$$X \times Y = \{(x, y) \mid x \in X \text{ and } y \in Y\}.$$

Spotted by *Aschkan Mery, France*

P 173, Ex (x) This is the first serious mistake I've found. My apologies if you have been pulling your hair out trying to prove this. The statement is only true if  $n$  is prime (again, as I know well!) and so we cannot use induction to prove it. Why I put it in this chapter I don't know. Perhaps I meant this statement:

Show that  $\binom{n}{r}$  is an integer for all  $0 \leq r \leq n$ .

The statement ' $\binom{n}{r}/n$  is an integer for all  $1 \leq r \leq n-1$  if  $n$  is prime' is used later on page 212 so should be proved at some point.

**Note to translators:** Replace the exercise (x) on page 173 with: Show that  $\binom{n}{r}$  is an integer for all  $0 \leq r \leq n$ .

Next, add a new exercise, Exercise 27.23(xii) to page 194: Prove that  $\binom{n}{r}$  is divisible by  $n$  for all  $1 \leq r \leq n-1$  if  $n$  is a prime.

Lastly, the reference to Exercise 24.10(x) on page 212 should be changed to Exercise 27.23(xii)

P 194 and P 246 Not so much a typo or mathematical error but a small inconsistency on page 194 Ex (xi) and page 246 Ex (i). I use  $F_n$  to describe both the Fibonacci numbers and the Fermat numbers. However, I used  $x_n$  for Fibonacci numbers on page 178. I don't think this is a major problem. Mathematicians should be used to changes in notation!

P 76, l 13 Delete the word 'other'. Spotted by *Matt Daws, UK*

- P87, Eg 11.9 ‘as  $y$  is a natural number it is bigger than 1’ should be have the 1 replaced 0.  
Spotted by *Matt Daws, UK*
- P123, ‘Theorem’ 18.1 In the statement replace ‘natural numbers’ by ‘integers’. The whole point of the dodgy statement is that in the proof we have to avoid using 0. Well, in the book we take the convention that the natural numbers do not include 0 (as noted a few lines above the ‘Theorem’!) Spotted by *Matt Daws, UK*
- P 154, l 3 In the brackets it should say that ‘(and  $q$  and  $s$  are non-zero)’. Spotted by *Matt Daws, UK*
- P 155, l 11 Delete the word ‘be’. Spotted by *Matt Daws, UK* (and by Mark Summerfield).
- P227, l 1 Replace ‘rational’ with ‘real’. The number  $x$  created is definitely intended to be real. Spotted by *Matt Daws, UK*
- p54 line 6 The Goldbach conjecture should start with ‘Every *even* integer...’. Unknown member of MATH1225. (Whoever you are please let me know!)
- p68, Summary point 4 The negation of  $A \implies B$  is the same as ‘ $A$  and not( $B$ )’. Walter Weinmann, Switzerland and Phillip White, UK.
- p80 Eg 10.2 This says that the square of a real number is *non-negative*. Phillip White, UK. This is because positive is usually taken to exclude 0.
- p5 line 3 Zahlen is plural so I should translate it as numbers, not number. Hugh Crooke UK.
- p49 (iv) ‘Show, without using a calculator or computer, that ...’. In fact if you try to use a calculator, then you might think it’s wrong as calculators have rounding errors.
- p16 line -8 ‘...such as union...’. Mark Summerfield.
- p16 line -1 ‘...necessity of discriminating between *the concepts*  $\in$  and  $\subseteq$ , ...’ is hopefully clearer than what I wrote. Thanks to Mark Summerfield for pointing out the possible problem.
- p76, before Ex 9.3 Better to have ‘I also encourage them to ask it during my colleagues’ lectures...’  
Mark Summerfield.
- p88, Ex 11.11 line 6 ‘if someone give me’ should be ‘if someone gives me’. Mark Summerfield.
- p104, line 13 ‘we give a definition to’ rather than ‘we give definition to’. Mark Summerfield.
- p121, line 4 ‘ $m$  and  $n$  are odd’. Mark Summerfield.
- p121, line 9 ‘or it may *involve* the use of a definition’. Mark Summerfield.
- p72, line 23 The words ‘isosceles’ and ‘equilateral’ at the end of the example should be exchanged. Karina Kirkina, London. This is a nasty error as it is very confusing for people who don’t know about necessary and sufficient and difficult to spot as experts will read what they think is there and probably won’t notice.
- p175, line -2 Delete ‘that’. Spotted by Mark Summerfield.
- p197, Grey box The notation involving a colon in ‘ $S := \dots$ ’ is not explained. In mathematics the symbols ‘:=’ means defined to be. It can be safely replaced with just ‘=’. Thanks to Mark Summerfield for querying this.

p134 (iv)(d) Should be 1.4 not 1, 4. Spotted by George Woodrow September 2010.

p255 Para 2 ‘Like may’ should be ‘Like many’. Mark Summerfield Nov 2010. (Mark also suggested that the

p114-115 Yes, the mistake is deliberate. Queried by Iain Moal, March 2011.

p127, para 2 ‘This makes it obvious’ rather than ‘make’. Adam Boudreau, August 2011.

p133, Ex 19.11 In final paragraph: ‘then its sides’ rather than ‘it’. Adam Boudreau, August 2011.

p223 In exercise 30.16(ii) and on line -5 in the last paragraph the sine function should be restricted to  $[-\pi/2, \pi/2]$  rather than  $[-\pi, \pi]$ . Arthur Absalom, Sept 2011.

p5, line 1 The number  $-1$  is missing from the integers. Alex Chan, September 2011. (A very strange omission!)

p76, Defn 9.5 The advice on p35 says ‘If you use if, then use then’. If I were to follow my own advice, then there would be a ‘then’ in the first sentence. Spotted by Alex Chan, September 2011.

Thanks to Richard Pace and Richi for pointing out a page error in the above corrections. (Don’t think they are the same person!)

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