

## **Review article**

# ***A method of judging whether or not a remainder obtained by dividing by a multiple of 30 and 48 is a prime number***

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## ***Abstract***

Based on whether or not the remainder divided by 30 and 48 is a prime number, the prime number was judged.

It was difficult to judge which one was better, it seemed better to use both.

And, I was searching for a prime number determination method to be a multiple of 48, and to be able to judge with a remainder of multiples of 30, I came across a kind of pseudo prime number 203.

## ***Discussion***

(The following shows the multiplication of prime numbers or prime number)

when

$$\begin{aligned} 58043(\text{prime}) &= 1209 \times 48 + 11 = 604 \times 96 + 59 = 302 \times 192 + 59 = 151 \times 384 + 59 \\ &= 75 \times 768 + 443(\text{prime}) = 37 \times 1536 + 1211(\text{prime is } 1213) \\ &= 1934 \times 30 + 23 = 967 \times 60 + 23 = 483 \times 120 + 83 = 322 \times 180 + 83 \end{aligned}$$

$$\begin{aligned}
&=241 \times 240 + \mathbf{203(not\ prime)}= 161 \times 360 + 83=120 \times 480 + 443 \\
&=80 \times 720 + 443(\text{prime})= 60 \times 960 + 443=40 \times 1440 + 443 \\
&=30 \times 1920 + 443=20 \times 2880 + 443=15 \times 3840 + 443
\end{aligned}$$

when

$$\begin{aligned}
203&=(7 \times 29)=4 \times 48 + 11=2 \times 96 + 11=1 \times 192 + 11 \\
&=6 \times 30 + 23=3 \times 60 + 23=1 \times 120 + 83
\end{aligned}$$

when

$$\begin{aligned}
51521*51853&=2671518413=(51521=8586 \times 6 + 5, 51853=8642 \times 6 + 1)= 55656633 \times 48 + \\
29&=37104422 \times 72 + 29=27828316 \times 96 + \mathbf{77}=13914158 \times 192 + \mathbf{77}=6957079 \times 384 + \mathbf{77} \\
&=89050613 \times 30 + 23=44525306 \times 60 + 53=29683537 \times 90 + 83=22262653 \times 120 + 53 \\
&=14841768 \times 180 + 173(\text{prime})= 7420884 \times 360 + 173= \\
3710442 \times 720 + 173&=1855221 \times 1440 + 173
\end{aligned}$$

when

$$\begin{aligned}
27067*25367&=686608589=14304345 \times 48 + 29=7152172 \times 96 + \mathbf{77}=3576086 \times 192 + \mathbf{77} \\
&=1788043 \times 384 + 77 \\
&=22886952 \times 30 + 29=11443476 \times 60 + 29=5721738 \times 120 + 29=2860869 \times 240 + 29 \\
&=1430434 \times 480 + 269(\text{prime})= 715217 \times 960 + 269=357608 \times 1920 + 1229(\text{prime})
\end{aligned}$$

when

$$\begin{aligned}
28099*29137&=818720563=13(28099=4683 \times 6 + 1, 29137=4856 \times 6 + 1)= 17056678 \times 48 \\
+ 19&=8528339 \times 96 + 19=4264169 \times 192 + \mathbf{115} \\
&=27290685 \times 30 + 13=13645342 \times 60 + 43=6822671 \times 120 + 43=3411335 \times 240 + \\
163(\text{prime})&= 1705667 \times 480 + 403(\text{prime is 401})= 852833 \times 960 + 883(\text{prime}) \\
&=426416 \times 1920 + \mathbf{1843(not\ prime)}
\end{aligned}$$

when

$$\begin{aligned}
30271*25261&=(30271=5045 \times 6 + 1, 25261=4210 \times 6 + 1=2105 \times 12 + 1)= 15930744 \times 48 \\
+ 19&=7965372 \times 96 + 19=3982686 \times 192 + 19=1991343 \times 384 + 19=995671 \times 768 + \\
\mathbf{403(13*31)}&=995671 \times 768 + \mathbf{13*31}=764675731 \\
&=25489191 \times 30 + 1=12744595 \times 60 + 31=6372297 \times 120 + \mathbf{91}(\text{prime is 89})= 3186148 \times \\
240 + 211(\text{prime})&= 1593074 \times 480 + 211=796537 \times 960 + 211=398268 \times 1920 + \\
1171(\text{prime})&= 199134 \times 3840 + 1171
\end{aligned}$$

when

$$44071*41281=1819294951=37901978 \times 48 + 7=18950989 \times 96 + 7=9475494 \times 192 + 103$$

$$\begin{aligned}
&=4737747 \times 384 + 103=2368873 \times 768 + 487=1184436 \times 1536 + \mathbf{1255} \\
&=1184436 \times 1536 + 1255(5 \times 251) \\
&(44071/6=7345 \times 6 + 1, \quad 41281/6=6880 \times 6 + 1) \\
&=60643165 \times 30 + 1=30321582 \times 60 + 31=15160791 \times 120 + 31=7580395 \times 240 + \\
&151(\text{prime})= 3790197 \times 480 + 391(\text{prime is } 389)= 1895098 \times 960 + \mathbf{871(\text{not prime,} } \\
&\mathbf{863(\text{prime})+8)}= 947549 \times 1920 + 871=473774 \times 3840 + 2791(\text{prime})= 236887 \times 7680 + \\
&2791=118443 \times 15360 + 10471(\text{not prime, } 10463(\text{prime})+8)
\end{aligned}$$

when

$$33581*35671=1197867851=24955580 \times 48 + 11=12477790 \times 96 + 11=6238895 \times 192 +$$

$$11=3119447 \times 384 + \mathbf{203(7 \times 29)}$$

$$\begin{aligned}
&=39928928 \times 30 + 11=19964464 \times 60 + 11=9982232 \times 120 + 11=4991116 \times 240 + 11 \\
&=2495558 \times 480 + 11=1247779 \times 960 + 11=623889 \times 1920 + 971(\text{prime})= 311944 \times 3840 + \\
&\mathbf{2891(\text{not prime, } 2887+4, \quad 2887 \text{ is prime})}
\end{aligned}$$

when

$$\begin{aligned}
7*151=1057=22 \times 48 + 1=11 \times 96 + 1=5 \times 192 + 97=2 \times 384 + \mathbf{289(17^2)} \\
=35 \times 30 + 7=17 \times 60 + 37=8 \times 120 + 97=4 \times 240 + 97=2 \times 480 + 97=1 \times 960 + 97
\end{aligned}$$

when(8)

$$\begin{aligned}
51859(\text{prime})= 2160 \times 24 + 19=1080 \times 48 + 19=540 \times 96 + 19=270 \times 192 + 19=135 \times 384 + \\
19=67 \times 768 + \mathbf{403(13*31)}= 51859 \\
=1728 \times 30 + 19=864 \times 60 + 19=432 \times 120 + 19=216 \times 240 + 19=108 \times 480 + 19 \\
=54 \times 960 + 19=27 \times 1920 + 19=13 \times 3840 + \mathbf{1939} \\
\mathbf{(1939=\text{not prime, } 1933+6, \quad 1933 \text{ is prime})}
\end{aligned}$$

when

$$\begin{aligned}
50051(\text{prime})= 1042 \times 48 + \mathbf{35}=1668 \times 30 + 11=834 \times 60 + 11=417 \times 120 + 11=208 \times 240 + \\
131=104 \times 480 + 131=52 \times 960 + 131=26 \times 1920 + 131=13 \times 3840 + 131=6 \times 7680 + \mathbf{3971} \\
\mathbf{(3971=\text{not prime, } 3967+4, \quad 3967 \text{ is prime})}
\end{aligned}$$

when

$$\begin{aligned}
51827(\text{prime})= 1079 \times 48 + \mathbf{35} \\
=1727 \times 30 + 17=863 \times 60 + 47=431 \times 120 + 107(\text{prime})= 215 \times 240 + 227(\text{prime}) \\
=107 \times 480 + 467(\text{prime})= 53 \times 960 + 947(\text{prime})= 26 \times 1920 + 1907(\text{prime}) \\
=13 \times 3840 + 1907=6 \times 7680 + 5747(\text{prime is } 5749)= 3 \times 15360 + 5747
\end{aligned}$$

when

$$\begin{aligned}51829(\text{prime}) &= 1079 \times 48 + 37 \\ &= 1727 \times 30 + 19 = 863 \times 60 + 49 = 431 \times 120 + 109 = 215 \times 240 + 229 = 107 \times 480 + \mathbf{469} \\ (\text{prime is } 467) &= 53 \times 960 + 949(\text{prime is } 947) = 26 \times 1920 + 1909(\text{prime is } 1907) \\ &= 13 \times 3840 + 1909 = 6 \times 7680 + 5749(\text{prime}) = 3 \times 15360 + 5749(\text{prime})\end{aligned}$$

when

$$\begin{aligned}46477(\text{prime}) &= 1549 \times 30 + 7 = 774 \times 60 + 37 = 387 \times 120 + 37 = 193 \times 240 + 157(\text{prime}) = 96 \times \\ &480 + 397(\text{prime}) = 48 \times 960 + 397 = 24 \times 1920 + 397 = 12 \times 3840 + 397\end{aligned}$$

when

$$\begin{aligned}49331(\text{prime}) &= 1027 \times 48 + \mathbf{35} \\ &= 1644 \times 30 + 11 = 822 \times 60 + 11 = 411 \times 120 + 11 = 205 \times 240 + 131(\text{prime}) \\ &= 102 \times 480 + 371(\text{prime is } 373) = 51 \times 960 + 371 = 25 \times 1920 + \mathbf{1331}(\text{not prime, } 1327+4, \\ &\mathbf{1327 \text{ is prime}})\end{aligned}$$

when

$$\begin{aligned}49333(\text{prime}) &= 1027 \times 48 + 37 = 513 \times 96 + \mathbf{85} \\ &= 1644 \times 30 + 13 = 822 \times 60 + 13 = 411 \times 120 + 13 = 205 \times 240 + 133(\text{prime is } 131) = 102 \times 480 \\ &+ 373(\text{prime}) = 51 \times 960 + 373 = 25 \times 1920 + \mathbf{1333}(\text{not prime, } 1327+6, 1327 \text{ is prime})\end{aligned}$$

when

$$\begin{aligned}42641 * 43103 &= 1837955023 = 61265167 \times 30 + 13 = 30632583 \times 60 + 43(\text{prime}) = 15316291 \times \\ &120 + 103(\text{prime}) = 7658145 \times 240 + 223(\text{prime}) = 3829072 \times 480 + 463(\text{prime}) = 1914536 \times \\ &960 + 463 = 957268 \times 1920 + 463 = 478634 \times 3840 + 463 = 239317 \times 7680 + 463 = 119658 \times \\ &15360 + 8143(\text{prime}) = 59829 \times 30720 + 8143 = 29914 \times 61440 + 38863(\text{prime is } 38861) \\ &= 14957 \times 122880 + 38863 = 7478 \times 245760 + 161743(\text{prime}) = 3739 \times 491520 + 161743 \\ &= \mathbf{1869 \times 983040 + 653263(13 \times 31 \times 1621)} = 934 \times 1966080 + 1636303(\text{prime}) = 467 \times\end{aligned}$$

$$3932160 + 1636303$$

$$\begin{aligned}&= 38290729 \times 48 + 31 = 19145364 \times 96 + 79 = 9572682 \times 192 + 79 = 4786341 \times 384 + 79 \\ &= 2393170 \times 768 + 463(\text{prime}) = 1196585 \times 1536 + 463 = 598292 \times 3072 + 1999(\text{prime}) \\ &= 299146 \times 6144 + 1999 = 149573 \times 12288 + 1999 = 74786 \times 24576 + \mathbf{14287}(\text{not prime, } \\ &14281+6, 14281 \text{ is prime}) = 37393 \times 49152 + 14287 = 18696 \times 98304 + 63439\end{aligned}$$

when

$$\begin{aligned}41077 * 44279 &= 1818848483 = 101047137 \times 18 + 17 = 151570706 \times 12 + 11 = 75785353 \times 24 + \\ &11 = 37892676 \times 48 + \mathbf{35}\end{aligned}$$

$$=60628282 \times 30 + 23=30314141 \times 60 + 23=15157070 \times 120 + 83=7578535 \times 240 + 83$$

$$=3789267 \times 480 + \mathbf{323(not\ prime)}$$

when

$$41*43=1763=97 \times 18 + 17=146 \times 12 + 11=73 \times 24 + 11=73 \times 24 + 11=36 \times 48 + \mathbf{35}$$

$$=58 \times 30 + 23=29 \times 60 + 23=14 \times 120 + 83=7 \times 240 + 83=3 \times 480 + 323$$

$$=1 \times 960 + \mathbf{803(not\ prime)}$$

when

$$46591*49037=2284682867=126926825 \times 18 + 17=190390238 \times 12 + 11=95195119 \times 24 +$$

$$11$$

$$=76156095 \times 30 + 17=47597559 \times 48 + \mathbf{35}$$

when

$$191(\text{prime})=955=53 \times 18 + 1=79 \times 12 + 7=39 \times 24 + 19$$

$$=6 \times 30 + 11=3 \times 60 + 11=1 \times 120 + 71(\text{prime})$$

when

$$101 \times 53 = 5353 = 111 \times 48 + \mathbf{25=(48*2+5)*(48*1+5)} = 55 \times 96 + 73$$

$$=27 \times 192 + 169(\text{prime is 167})= 13 \times 384 + 361(\text{prime is 359})$$

$$=6 \times 768 + 745=3 \times 1536 + 745$$

$$=178 \times 30 + 13=89 \times 60 + 13=44 \times 120 + 73=22 \times 240 + 73=11 \times 480 + 73$$

$$=5 \times 960 + \mathbf{553(not\ prime)}= 2 \times 1920 + \mathbf{1513(\text{prime is 1511})}$$

when

$$59207(\text{prime})= 1973 \times 30 + 17=986 \times 60 + 47=657 \times 90 + \mathbf{77(\text{prime is 79})}=493 \times 120 +$$

$$47=328 \times 180 + 167=246 \times 240 + 167=164 \times 360 + 167=123 \times 480 + 167=61 \times 960 +$$

$$647(\text{prime})$$

when

$$59209(\text{prime})= 1973 \times 30 + 19=986 \times 60 + \mathbf{49(\text{prime is 47})}=657 \times 90 + 79=493 \times 120 + 49$$

$$=328 \times 180 + 169(\text{prime is 167})= 246 \times 240 + 169(\text{prime is 167})= 123 \times 480 + 169$$

$$=61 \times 960 + 649(\text{prime is 647})= 30 \times 1920 + 1609(\text{prime})= 15 \times 3840 + 1609$$

$$=7 \times 7680 + 5449(\text{prime})$$

when

$$61121(\text{prime})= 2037 \times 30 + 11=1018 \times 60 + 41=679 \times 90 + 11=509 \times 120 + 41$$

$$=339 \times 180 + 101=254 \times 240 + 161(\text{prime is 163})= 169 \times 360 + 281$$

$$=127 \times 480 + 161=84 \times 720 + 641(\text{prime})= 42 \times 1440 + 641=21 \times 2880 + 641$$

## *conclusion*

prime number can express  $48n+5$  or  $48n+7$ , Therefore, The multiplication's remainder divided by 48 may be 25 or 35.

In the case of  $30n + p$ , at  $p = 5$ . It does not become a prime number, it becomes a prime even when  $p = 7$ , so even if it divides by 30, the remainder can not be 25 or 35.

It seems that there is practicality for judging whether or not it is a prime number by the remainder obtained by dividing it by a multiple of 30.

## *Reference*

- 1) [https://en.wikipedia.org/wiki/Prime\\_number](https://en.wikipedia.org/wiki/Prime_number)
- 2) [https://en.m.wikipedia.org/wiki/Formula\\_for\\_primes](https://en.m.wikipedia.org/wiki/Formula_for_primes)





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I would like to receive an email. I will not answer the phone.

I am very poor of english. Document are all google-translation.

When it is translated into English, Japanese becomes cryptographically.

$$\zeta(s) = \sum_{n=1}^{\infty} \frac{1}{n^s} \quad (1)$$

$$\zeta(s) = \frac{2^s}{2^s - 1} \frac{3^s}{3^s - 1} \frac{5^s}{5^s - 1} \frac{7^s}{7^s - 1} \cdots \quad (2)$$

### ***【References】***

- 1) [https://en.wikipedia.org/wiki/Riemann\\_hypothesis](https://en.wikipedia.org/wiki/Riemann_hypothesis)



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