

> #  $a^h + (a + 1)^h + (a + 2)^h = \text{prime}$  by  $H \cdot E$  '20 - 7 - 24 :

>  $c := 0 : AS := \{ \} : \text{for } a \text{ from } 2 \text{ to } 1000000 \text{ do } c1 := 0 : \text{for } h \text{ from } 2 \text{ to } 8 \text{ by } 2 \text{ do } AP := a^h + (a + 1)^h + (a + 2)^h : \text{if } \text{isprime}(AP) \text{ then } c1 := c1 + 1 : c := c + 1 : \text{fi} : \text{od} : \text{if } c1 = 4 \text{ then } \text{print}(H4[H \cdot E] = a) : AS := AS \cup \{a\} : \text{for } h \text{ from } 2 \text{ to } 8 \text{ by } 2 \text{ do } \text{print}([a]^h + [a + 1]^h + [a + 2]^h = (a^h + (a + 1)^h + (a + 2)^h) \text{Prime}[H \cdot E]) : \text{od fi} : \text{od} : \text{print}(AS) :$

$$H4_{H \cdot E} = 2$$

$$[2]^2 + [3]^2 + [4]^2 = 29 \text{ Prime}_{H \cdot E}$$

$$[2]^4 + [3]^4 + [4]^4 = 353 \text{ Prime}_{H \cdot E}$$

$$[2]^6 + [3]^6 + [4]^6 = 4889 \text{ Prime}_{H \cdot E}$$

$$[2]^8 + [3]^8 + [4]^8 = 72353 \text{ Prime}_{H \cdot E}$$

$$H4_{H \cdot E} = 15056$$

$$[15056]^2 + [15057]^2 + [15058]^2 = 680139749 \text{ Prime}_{H \cdot E}$$

$$[15056]^4 + [15057]^4 + [15058]^4 = 154196694536966993 \text{ Prime}_{H \cdot E}$$

$$[15056]^6 + [15057]^6 + [15058]^6 = 34958434528716494835209249 \text{ Prime}_{H \cdot E}$$

$$[15056]^8 + [15057]^8 + [15058]^8 = 7925540574932191883023659484124033 \text{ Prime}_{H \cdot E}$$

$$H4_{H \cdot E} = 107246$$

$$[107246]^2 + [107247]^2 + [107248]^2 = 34505757029 \text{ Prime}_{H \cdot E}$$

$$[107246]^4 + [107247]^4 + [107248]^4 = 396882422806809654353 \text{ Prime}_{H \cdot E}$$

$$[107246]^6 + [107247]^6 + [107248]^6 = 4564909485600913634382263785889 \text{ Prime}_{H \cdot E}$$

$$[107246]^8 + [107247]^8 + [107248]^8 = 52505219226360109174432432840206554580353 \text{ Prime}_{H \cdot E}$$

$$H4_{H \cdot E} = 122912$$

$$[122912]^2 + [122913]^2 + [122914]^2 = 45322816709 \text{ Prime}_{H \cdot E}$$

$$[122912]^4 + [122913]^4 + [122914]^4 = 684719238266730708113 \text{ Prime}_{H \cdot E}$$

$$[122912]^6 + [122913]^6 + [122914]^6 = 10344468181348214182246921884929 \text{ Prime}_{H \cdot E}$$

$$[122912]^8 + [122913]^8 + [122914]^8 = 156280145194531640045366939007283855094273 \text{ Prime}_{H \cdot E}$$

$$H4_{H \cdot E} = 133476$$

$$[133476]^2 + [133477]^2 + [133478]^2 = 53448328589 \text{ Prime}_{H \cdot E}$$

$$[133476]^4 + [133477]^4 + [133478]^4 = 952241276461767119873 \text{ Prime}_{H \cdot E}$$

$$[133476]^6 + [133477]^6 + [133478]^6 = 16965234885191060246534934469769 \text{ Prime}_{H \cdot E}$$

$$[133476]^8 + [133477]^8 + [133478]^8 = 302254483046807705067947926892142666560993 \text{ Prime}_{H \cdot E}$$

$$H4_{H \cdot E} = 238642$$

$$[238642]^2 + [238643]^2 + [238644]^2 = 170851444349 \text{ Prime}_{H \cdot E}$$

$$[238642]^4 + [238643]^4 + [238644]^4 = 9730072012502085196193 \text{ Prime}_{H \cdot E}$$

$$[238642]^6 + [238643]^6 + [238644]^6 = 554132285703814531112113661917049 \text{ Prime}_{H \cdot E}$$

$$[238642]^8 + [238643]^8 + [238644]^8 \\ = 31558100462069537171583618111222009484486433 \text{ Prime}_{H \cdot E}$$

$$H4_{H \cdot E} = 278714$$

$$[278714]^2 + [278715]^2 + [278716]^2 = 233046153677 \text{ Prime}_{H \cdot E}$$

$$[278714]^4 + [278715]^4 + [278716]^4 = 18103503248502756616577 \text{ Prime}_{H \cdot E}$$

$$[278714]^6 + [278715]^6 + [278716]^6 \\ = 1406317266810766063530240727602377 \text{ Prime}_{H \cdot E}$$

$$[278714]^8 + [278715]^8 + [278716]^8 \\ = 109245609971184004706769228593056676749002977 \text{ Prime}_{H \cdot E}$$

$$H4_{H \cdot E} = 537196$$

$$[537196]^2 + [537197]^2 + [537198]^2 = 865741850429 \text{ Prime}_{H \cdot E}$$

$$[537196]^4 + [537197]^4 + [537198]^4 = 249836317197051647429153 \text{ Prime}_{H \cdot E}$$

$$[537196]^6 + [537197]^6 + [537198]^6 \\ = 72097918519513156314504184205868089 \text{ Prime}_{H \cdot E}$$

$$[537196]^8 + [537197]^8 + [537198]^8 \\ = 20806061797630979378786672876673399675752529953 \text{ Prime}_{H \cdot E}$$

$$H4_{H \cdot E} = 602422$$

$$[602422]^2 + [602423]^2 + [602424]^2 = 1088740412789 \text{ Prime}_{H \cdot E}$$

$$[602422]^4 + [602423]^4 + [602424]^4 = 395118562149557346020273 \text{ Prime}_{H \cdot E}$$

$$[602422]^6 + [602423]^6 + [602424]^6 \\ = 143393848820542371018028115113544369 \text{ Prime}_{H \cdot E}$$

$$[602422]^8 + [602423]^8 + [602424]^8 \\ = 52039559386574071392222156443212858678157065793 \text{ Prime}_{H \cdot E}$$

$$H4_{H \cdot E} = 634256$$

$$[634256]^2 + [634257]^2 + [634258]^2 = 1206845826149 \text{ Prime}_{H \cdot E}$$

$$[634256]^4 + [634257]^4 + [634258]^4 = 485492282700972366259793 \text{ Prime}_{H \cdot E}$$

$$[634256]^6 + [634257]^6 + [634258]^6 \\ = 195304778337662244335860584296844449 \text{ Prime}_{H \cdot E}$$

$$[634256]^8 + [634257]^8 + [634258]^8 \\ = 78567585522816874942289410901422359657530165633 \text{ Prime}_{H \cdot E}$$

$$H4_{H \cdot E} = 887574$$

$$[887574]^2 + [887575]^2 + [887576]^2 = 2363368141877 \text{ Prime}_{H \cdot E}$$

$$\begin{aligned}
& [887574]^4 + [887575]^4 + [887576]^4 = 1861836324686016848739377 \text{ Prime}_{H.E} \\
& [887574]^6 + [887575]^6 + [887576]^6 \\
& \quad = 1466734885060694628814789557238059377 \text{ Prime}_{H.E} \\
& [887574]^8 + [887575]^8 + [887576]^8 \\
& \quad = 1155478166655756889503366938103116301326445549377 \text{ Prime}_{H.E} \\
& \{2, 15056, 107246, 122912, 133476, 238642, 278714, 537196, 602422, 634256, 887574\} \quad (1)
\end{aligned}$$

> for *hs* from 1 to *nops(AS)* do *n* := *AS[hs]* : *fs* := 0 : *ft* := *n* : *fp* := 2 : *nc* := 0 : for *p* from 1 to *n* do if *ft mod fp* = 0 then *nc* := *nc* + 1 : *ft* :=  $\frac{ft}{fp}$  : *FT* || *nc* := *fp* : *fs* := *fs* + *fp* else *fp* := *nextprime(fp)* fi:od: *print*(*n* = [*seq*(*FT* || *j*, *j* = 1 .. *nc*)]) : *print*( ) : od: 2 = [2]

$$15056 = [2, 2, 2, 2, 941]$$

$$107246 = [2, 53623]$$

$$122912 = [2, 2, 2, 2, 2, 23, 167]$$

$$133476 = [2, 2, 3, 7, 7, 227]$$

$$238642 = [2, 119321]$$

$$278714 = [2, 23, 73, 83]$$

$$537196 = [2, 2, 11, 29, 421]$$

$$602422 = [2, 301211]$$

$$634256 = [2, 2, 2, 2, 7, 7, 809]$$

$$887574 = [2, 3, 29, 5101]$$

> for *x* from 10000 to 1000000 do *xp* := *ithprime(x)* : *c45* := 0 : for *h* from 2 to 10 by 2 do *ap* :=  $(2 \cdot xp)^h + (2 \cdot xp + 1)^h + (2 \cdot xp + 2)^h$  : if *isprime(ap)* then *c45* := *c45* + 1 : fi:od: if *c45* ≥ 4 then *print*( $2 \cdot xp[c45] = [2, xp]$ ) fi:od:

$$2 \ 119321_4 = [2, 119321]$$

$$2 \ 148207_4 = [2, 148207]$$

$$2 \ 301211_4 = [2, 301211]$$

$$2 \ 492077_4 = [2, 492077]$$

$$2 \ 871837_4 = [2, 871837]$$

$$2 \ 1243927_4 = [2, 1243927]$$

$$2 \ 1297411_4 = [2, 1297411]$$

$$2 \ 1494421_4 = [2, 1494421]$$

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$2\ 1610993_4 = [2, 1610993]$   
 $2\ 1680421_4 = [2, 1680421]$   
 $2\ 2095771_4 = [2, 2095771]$   
 $2\ 2697953_4 = [2, 2697953]$   
 $2\ 2755303_4 = [2, 2755303]$   
 $2\ 3067573_4 = [2, 3067573]$   
 $2\ 3295307_4 = [2, 3295307]$   
 $2\ 3682381_4 = [2, 3682381]$   
 $2\ 4520731_4 = [2, 4520731]$   
 $2\ 4611083_4 = [2, 4611083]$   
 $2\ 4839911_4 = [2, 4839911]$   
 $2\ 5136853_4 = [2, 5136853]$   
 $2\ 5392393_4 = [2, 5392393]$   
 $2\ 5448133_4 = [2, 5448133]$   
 $2\ 6115717_4 = [2, 6115717]$   
 $2\ 6557183_4 = [2, 6557183]$   
 $2\ 6725951_4 = [2, 6725951]$   
 $2\ 6969661_4 = [2, 6969661]$   
 $2\ 8082257_4 = [2, 8082257]$   
 $2\ 8114107_4 = [2, 8114107]$   
 $2\ 8386883_4 = [2, 8386883]$   
 $2\ 8936021_4 = [2, 8936021]$   
 $2\ 9154493_4 = [2, 9154493]$   
 $2\ 11007863_4 = [2, 11007863]$   
 $2\ 12263947_4 = [2, 12263947]$   
 $2\ 12308393_4 = [2, 12308393]$   
 $2\ 12763493_4 = [2, 12763493]$   
 $2\ 13167841_4 = [2, 13167841]$   
 $2\ 14067371_4 = [2, 14067371]$   
 $2\ 14558573_4 = [2, 14558573]$   
 $2\ 15031763_4 = [2, 15031763]$

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