

$$\begin{aligned}
 &= X_5 + X_3 + X_2 + X + 1 \\
 &+ (\alpha_3 + \alpha_6 + \alpha_{12} + \alpha_{19} + \alpha_{24})X + \alpha_0 \\
 &+ (\alpha_4 + \alpha_{15} + \alpha_{18} + \alpha_{29} + \alpha_9 + \alpha_{10} + \alpha_{20} + \alpha_3 + \alpha_{27} + \alpha_{30})X^2 \\
 &+ (\alpha + \alpha_4 + \alpha_8 + \alpha_{21} + \alpha_{22} + \alpha_{11} + \alpha_6 + \alpha_{13})X^3 \\
 &= X_5 + (\alpha_7 + \alpha_{14} + \alpha_{28} + \alpha_{35} + \alpha_{19})X^4 \\
 &+ (\alpha_5 + \alpha_{15} + \alpha_{18} + \alpha_{29})X + (\alpha_{12})X^2 \\
 &= [X_4 + (\alpha_7 + \alpha_{14} + \alpha_{28} + \alpha_{35})X^3 + (\alpha_{12} + \alpha_5 + \alpha_8 + \alpha_{27})X^2] \\
 &= [X_2 + (\alpha_7 + \alpha_{14})X + \alpha_{17}] [X_2 + (\alpha_{28} + \alpha_{35})X + \alpha_{22}] (X + \alpha_{19}) \\
 &= (X + \alpha_2)(X + \alpha_7)(X + \alpha_{28})(X + \alpha_{35})(X + \alpha_{19}) \\
 &\quad \beta^2 = \alpha^{14}, \beta^3 = \alpha^{28}, \beta^4 = \alpha^{56}, \beta^5 = \alpha^{84}, \beta^6 = \alpha^{112}, \beta^7 = \alpha^{140}, \beta^8 = \alpha^{168}, \beta^9 = \alpha^{196}, \beta^{10} = \alpha^{224}, \beta^{11} = \alpha^{252}, \beta^{12} = \alpha^{280}, \beta^{13} = \alpha^{308}, \beta^{14} = \alpha^{336}, \beta^{15} = \alpha^{364}, \beta^{16} = \alpha^{392}, \beta^{17} = \alpha^{420}, \beta^{18} = \alpha^{448}, \beta^{19} = \alpha^{476}, \beta^{20} = \alpha^{504}, \beta^{21} = \alpha^{532}, \beta^{22} = \alpha^{560}, \beta^{23} = \alpha^{588}, \beta^{24} = \alpha^{616}, \beta^{25} = \alpha^{644}, \beta^{26} = \alpha^{672}, \beta^{27} = \alpha^{700}, \beta^{28} = \alpha^{728}, \beta^{29} = \alpha^{756}, \beta^{30} = \alpha^{784}, \beta^{31} = \alpha^{812}, \beta^{32} = \alpha^{840}, \beta^{33} = \alpha^{868}, \beta^{34} = \alpha^{896}, \beta^{35} = \alpha^{924}, \beta^{36} = \alpha^{952}, \beta^{37} = \alpha^{980}, \beta^{38} = \alpha^{1008}, \beta^{39} = \alpha^{1036}, \beta^{40} = \alpha^{1064}, \beta^{41} = \alpha^{1092}, \beta^{42} = \alpha^{1120}, \beta^{43} = \alpha^{1148}, \beta^{44} = \alpha^{1176}, \beta^{45} = \alpha^{1204}, \beta^{46} = \alpha^{1232}, \beta^{47} = \alpha^{1260}, \beta^{48} = \alpha^{1288}, \beta^{49} = \alpha^{1316}, \beta^{50} = \alpha^{1344}, \beta^{51} = \alpha^{1372}, \beta^{52} = \alpha^{1400}, \beta^{53} = \alpha^{1428}, \beta^{54} = \alpha^{1456}, \beta^{55} = \alpha^{1484}, \beta^{56} = \alpha^{1512}, \beta^{57} = \alpha^{1540}, \beta^{58} = \alpha^{1568}, \beta^{59} = \alpha^{1596}, \beta^{60} = \alpha^{1624}, \beta^{61} = \alpha^{1652}, \beta^{62} = \alpha^{1680}, \beta^{63} = \alpha^{1708}, \beta^{64} = \alpha^{1736}, \beta^{65} = \alpha^{1764}, \beta^{66} = \alpha^{1792}, \beta^{67} = \alpha^{1820}, \beta^{68} = \alpha^{1848}, \beta^{69} = \alpha^{1876}, \beta^{70} = \alpha^{1904}, \beta^{71} = \alpha^{1932}, \beta^{72} = \alpha^{1960}, \beta^{73} = \alpha^{1988}, \beta^{74} = \alpha^{2016}, \beta^{75} = \alpha^{2044}, \beta^{76} = \alpha^{2072}, \beta^{77} = \alpha^{2100}, \beta^{78} = \alpha^{2128}, \beta^{79} = \alpha^{2156}, \beta^{80} = \alpha^{2184}, \beta^{81} = \alpha^{2212}, \beta^{82} = \alpha^{2240}, \beta^{83} = \alpha^{2268}, \beta^{84} = \alpha^{2296}, \beta^{85} = \alpha^{2324}, \beta^{86} = \alpha^{2352}, \beta^{87} = \alpha^{2380}, \beta^{88} = \alpha^{2408}, \beta^{89} = \alpha^{2436}, \beta^{90} = \alpha^{2464}, \beta^{91} = \alpha^{2492}, \beta^{92} = \alpha^{2520}, \beta^{93} = \alpha^{2548}, \beta^{94} = \alpha^{2576}, \beta^{95} = \alpha^{2604}, \beta^{96} = \alpha^{2632}, \beta^{97} = \alpha^{2660}, \beta^{98} = \alpha^{2688}, \beta^{99} = \alpha^{2716}, \beta^{100} = \alpha^{2744}, \beta^{101} = \alpha^{2772}, \beta^{102} = \alpha^{2800}, \beta^{103} = \alpha^{2828}, \beta^{104} = \alpha^{2856}, \beta^{105} = \alpha^{2884}, \beta^{106} = \alpha^{2912}, \beta^{107} = \alpha^{2940}, \beta^{108} = \alpha^{2968}, \beta^{109} = \alpha^{2996}, 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\alpha^{3976}, \beta^{145} = \alpha^{4004}, \beta^{146} = \alpha^{4032}, \beta^{147} = \alpha^{4060}, \beta^{148} = \alpha^{4088}, \beta^{149} = \alpha^{4116}, \beta^{150} = \alpha^{4144}, \beta^{151} = \alpha^{4172}, \beta^{152} = \alpha^{4200}, \beta^{153} = \alpha^{4228}, \beta^{154} = \alpha^{4256}, \beta^{155} = \alpha^{4284}, \beta^{156} = \alpha^{4312}, \beta^{157} = \alpha^{4340}, \beta^{158} = \alpha^{4368}, \beta^{159} = \alpha^{4396}, \beta^{160} = \alpha^{4424}, \beta^{161} = \alpha^{4452}, \beta^{162} = \alpha^{4480}, \beta^{163} = \alpha^{4508}, \beta^{164} = \alpha^{4536}, \beta^{165} = \alpha^{4564}, \beta^{166} = \alpha^{4592}, \beta^{167} = \alpha^{4620}, \beta^{168} = \alpha^{4648}, \beta^{169} = \alpha^{4676}, \beta^{170} = \alpha^{4704}, \beta^{171} = \alpha^{4732}, \beta^{172} = \alpha^{4760}, \beta^{173} = \alpha^{4788}, \beta^{174} = \alpha^{4816}, \beta^{175} = \alpha^{4844}, \beta^{176} = \alpha^{4872}, \beta^{177} = \alpha^{4900}, \beta^{178} = \alpha^{4928}, \beta^{179} = \alpha^{4956}, \beta^{180} = \alpha^{4984}, \beta^{181} = \alpha^{5012}, \beta^{182} = \alpha^{5040}, \beta^{183} = \alpha^{5068}, \beta^{184} = \alpha^{5096}, \beta^{185} = \alpha^{5124}, \beta^{186} = \alpha^{5152}, \beta^{187} = \alpha^{5180}, \beta^{188} = \alpha^{5208}, \beta^{189} = \alpha^{5236}, \beta^{190} = \alpha^{5264}, \beta^{191} = \alpha^{5292}, \beta^{192} = \alpha^{5320}, \beta^{193} = \alpha^{5348}, \beta^{194} = \alpha^{5376}, \beta^{195} = \alpha^{5404}, \beta^{196} = \alpha^{5432}, \beta^{197} = \alpha^{5460}, \beta^{198} = \alpha^{5488}, \beta^{199} = \alpha^{5516}, \beta^{200} = \alpha^{5544}, \beta^{201} = \alpha^{5572}, \beta^{202} = \alpha^{5600}, \beta^{203} = \alpha^{5628}, \beta^{204} = \alpha^{5656}, \beta^{205} = \alpha^{5684}, \beta^{206} = \alpha^{5712}, \beta^{207} = \alpha^{5740}, \beta^{208} = \alpha^{5768}, \beta^{209} = \alpha^{5796}, \beta^{210} = \alpha^{5824}, \beta^{211} = \alpha^{5852}, \beta^{212} = \alpha^{5880}, \beta^{213} = \alpha^{5908}, \beta^{214} = \alpha^{5936}, \beta^{215} = \alpha^{5964}, \beta^{216} = \alpha^{5992}, \beta^{217} = \alpha^{6020}, \beta^{218} = \alpha^{6048}, \beta^{219} = \alpha^{6076}, \beta^{220} = \alpha^{6104}, \beta^{221} = \alpha^{6132}, \beta^{222} = \alpha^{6160}, \beta^{223} = \alpha^{6188}, \beta^{224} = \alpha^{6216}, \beta^{225} = \alpha^{6244}, \beta^{226} = \alpha^{6272}, \beta^{227} = \alpha^{6300}, \beta^{228} = \alpha^{6328}, \beta^{229} = \alpha^{6356}, \beta^{230} = \alpha^{6384}, \beta^{231} = \alpha^{6412}, \beta^{232} = \alpha^{6440}, \beta^{233} = \alpha^{6468}, \beta^{234} = \alpha^{6496}, \beta^{235} = \alpha^{6524}, \beta^{236} = \alpha^{6552}, \beta^{237} = \alpha^{6580}, \beta^{238} = \alpha^{6608}, \beta^{239} = \alpha^{6636}, \beta^{240} = \alpha^{6664}, \beta^{241} = \alpha^{6692}, \beta^{242} = \alpha^{6720}, \beta^{243} = \alpha^{6748}, \beta^{244} = \alpha^{6776}, \beta^{245} = \alpha^{6804}, \beta^{246} = \alpha^{6832}, \beta^{247} = \alpha^{6860}, \beta^{248} = \alpha^{6888}, \beta^{249} = \alpha^{6916}, \beta^{250} = \alpha^{6944}, \beta^{251} = \alpha^{6972}, \beta^{252} = \alpha^{7000}, \beta^{253} = \alpha^{7028}, \beta^{254} = \alpha^{7056}, \beta^{255} = \alpha^{7084}, \beta^{256} = \alpha^{7112}, \beta^{257} = \alpha^{7140}, \beta^{258} = \alpha^{7168}, \beta^{259} = \alpha^{7196}, \beta^{260} = \alpha^{7224}, \beta^{261} = \alpha^{7252}, \beta^{262} = \alpha^{7280}, \beta^{263} = \alpha^{7308}, \beta^{264} = \alpha^{7336}, \beta^{265} = \alpha^{7364}, \beta^{266} = \alpha^{7392}, \beta^{267} = \alpha^{7420}, \beta^{268} = \alpha^{7448}, \beta^{269} = \alpha^{7476}, \beta^{270} = \alpha^{7504}, \beta^{271} = \alpha^{7532}, \beta^{272} = \alpha^{7560}, \beta^{273} = \alpha^{7588}, \beta^{274} = \alpha^{7616}, \beta^{275} = \alpha^{7644}, \beta^{276} = \alpha^{7672}, \beta^{277} = \alpha^{7700}, \beta^{278} = \alpha^{7728}, \beta^{279} = \alpha^{7756}, \beta^{280} = \alpha^{7784}, \beta^{281} = \alpha^{7812}, \beta^{282} = \alpha^{7840}, \beta^{283} = \alpha^{7868}, \beta^{284} = \alpha^{7896}, \beta^{285} = \alpha^{7924}, \beta^{286} = \alpha^{7952}, \beta^{287} = \alpha^{7980}, \beta^{288} = \alpha^{8008}, \beta^{289} = \alpha^{8036}, \beta^{290} = \alpha^{8064}, \beta^{291} = \alpha^{8092}, \beta^{292} = \alpha^{8120}, \beta^{293} = \alpha^{8148}, \beta^{294} = \alpha^{8176}, \beta^{295} = \alpha^{8204}, \beta^{296} = \alpha^{8232}, \beta^{297} = \alpha^{8260}, \beta^{298} = \alpha^{8288}, \beta^{299} = \alpha^{8316}, \beta^{300} = \alpha^{8344}, \beta^{301} = \alpha^{8372}, \beta^{302} = \alpha^{8400}, \beta^{303} = \alpha^{8428}, \beta^{304} = \alpha^{8456}, \beta^{305} = \alpha^{8484}, \beta^{306} = \alpha^{8512}, \beta^{307} = \alpha^{8540}, \beta^{308} = \alpha^{8568}, \beta^{309} = \alpha^{8596}, \beta^{310} = \alpha^{8624}, \beta^{311} = \alpha^{8652}, \beta^{312} = \alpha^{8680}, \beta^{313} = \alpha^{8708}, \beta^{314} = \alpha^{8736}, \beta^{315} = \alpha^{8764}, \beta^{316} = \alpha^{8792}, \beta^{317} = \alpha^{8820}, \beta^{318} = \alpha^{8848}, \beta^{319} = \alpha^{8876}, \beta^{320} = \alpha^{8904}, \beta^{321} = \alpha^{8932}, \beta^{322} = \alpha^{8960}, \beta^{323} = \alpha^{8988}, \beta^{324} = \alpha^{9016}, \beta^{325} = \alpha^{9044}, \beta^{326} = \alpha^{9072}, \beta^{327} = \alpha^{9100}, \beta^{328} = \alpha^{9128}, \beta^{329} = \alpha^{9156}, \beta^{330} = \alpha^{9184}, \beta^{331} = \alpha^{9212}, \beta^{332} = \alpha^{9240}, \beta^{333} = \alpha^{9268}, \beta^{334} = \alpha^{9296}, \beta^{335} = \alpha^{9324}, \beta^{336} = \alpha^{9352}, \beta^{337} = \alpha^{9380}, \beta^{338} = \alpha^{9408}, \beta^{339} = \alpha^{9436}, \beta^{340} = \alpha^{9464}, \beta^{341} = \alpha^{9492}, \beta^{342} = \alpha^{9520}, \beta^{343} = \alpha^{9548}, \beta^{344} = \alpha^{9576}, \beta^{345} = \alpha^{9604}, \beta^{346} = \alpha^{9632}, \beta^{347} = \alpha^{9660}, \beta^{348} = \alpha^{9688}, \beta^{349} = \alpha^{9716}, \beta^{350} = \alpha^{9744}, \beta^{351} = \alpha^{9772}, \beta^{352} = \alpha^{9800}, \beta^{353} = \alpha^{9828}, \beta^{354} = \alpha^{9856}, \beta^{355} = \alpha^{9884}, \beta^{356} = \alpha^{9912}, \beta^{357} = \alpha^{9940}, \beta^{358} = \alpha^{9968}, \beta^{359} = \alpha^{9996}, \beta^{360} = \alpha^{10000}
 \end{aligned}$$

$$\begin{aligned}
 &= X_5 + X_4 + X_3 + X_2 + X + 1 \\
 &= X_5 + (X + X_4 + X_{17})X^4 + (X_9 + X_{18} + X_{24})X^3 + (X_2 + X_4 + X_{15} + X_{25})X^2 + (X + X_{19})X \\
 &= [X_4 + (X + X_4 + X_9 + X_{18})X + X_{24}] (X + X_{17}) \\
 &= [X_4 + (X + X_4 + X_9 + X_{18})X^2 + (X_2 + X_4 + X_{15} + X_{25})X + X_{25}] (X + X_{19}) \\
 &= (X + X_4 + X_{19})(X + X_4 + X_9 + X_{18})(X + X_2 + X_4 + X_{15} + X_{25}) \\
 &= [X + (X_3 + X_4 + X_{17})X + X_{19}] [X + (X_2 + X_4 + X_{18})X + X_{24}] (X + X_{19}) \\
 &= (X + X_3)(X + X_4)(X + X_{17})(X + X_{19})(X + X_2 + X_4 + X_{18})(X + X_{24}) \\
 &\quad \beta = \alpha^3, \beta^2 = \alpha^6, \beta^3 = \alpha^{12}, \beta^4 = \alpha^{24}, \beta^5 = \alpha^{48}, \beta^6 = \alpha^{96}, \beta^7 = \alpha^{192}, \beta^8 = \alpha^{384}, \beta^9 = \alpha^{768}, \beta^{10} = \alpha^{1536}, \beta^{11} = \alpha^{3072}, \beta^{12} = \alpha^{6144}, \beta^{13} = \alpha^{12288}, \beta^{14} = \alpha^{24576}, \beta^{15} = \alpha^{49152}, \beta^{16} = \alpha^{98304}, \beta^{17} = \alpha^{196608}, \beta^{18} = \alpha^{393216}, \beta^{19} = \alpha^{786432}, \beta^{20} = \alpha^{1572864}, \beta^{21} = \alpha^{3145728}, \beta^{22} = \alpha^{6291456}, \beta^{23} = \alpha^{12582912}, \beta^{24} = \alpha^{25165824}, \beta^{25} = \alpha^{50331648}, \beta^{26} = \alpha^{100663296}, \beta^{27} = \alpha^{201326592}, \beta^{28} = \alpha^{402653184}, \beta^{29} = \alpha^{805306368}, \beta^{30} = \alpha^{1610612736}, \beta^{31} = \alpha^{3221225472}, \beta^{32} = \alpha^{6442450944}, \beta^{33} = \alpha^{12884901888}, \beta^{34} = \alpha^{25769803776}, \beta^{35} = \alpha^{51539607552}, \beta^{36} = \alpha^{103079215104}, \beta^{37} = \alpha^{206158430208}, \beta^{38} = \alpha^{412316860416}, \beta^{39} = \alpha^{824633720832}, \beta^{40} = \alpha^{1649267441664}, \beta^{41} = \alpha^{3298534883328}, \beta^{42} = \alpha^{6597069766656}, \beta^{43} = \alpha^{13194139533312}, \beta^{44} = \alpha^{26388279066624}, \beta^{45} = \alpha^{52776558133248}, \beta^{46} = \alpha^{105553116266496}, \beta^{47} = \alpha^{211106232532992}, \beta^{48} = \alpha^{422212465065984}, \beta^{49} = \alpha^{844424930131968}, \beta^{50} = \alpha^{1688849860263936}, \beta^{51} = \alpha^{3377699720527872}, \beta^{52} = \alpha^{6755399441055744}, \beta^{53} = \alpha^{13510798882111488}, \beta^{54} = \alpha^{27021597764222976}, \beta^{55} = \alpha^{54043195528445952}, \beta^{56} = \alpha^{108086391056891904}, \beta^{57} = \alpha^{216172782113783808}, \beta^{58} = \alpha^{432345564227567616}, \beta^{59} = \alpha^{864691128455135232}, \beta^{60} = \alpha^{1729382256910270464}, \beta^{61} = \alpha^{3458764513820540928}, \beta^{62} = \alpha^{6917529027641081856}, \beta^{63} = \alpha^{13835058055282163712}, \beta^{64} = \alpha^{27670116110564327424}, \beta^{65} = \alpha^{55340232221128654848}, \beta^{66} = \alpha^{110680464442257309696}, \beta^{67} = \alpha^{221360928884514619392}, \beta^{68} = \alpha^{442721857769029238784}, \beta^{69} = \alpha^{885443715538058477568}, \beta^{70} = \alpha^{1770887431076116955136}, \beta^{71} = \alpha^{3541774862152233910272}, \beta^{72} = \alpha^{7083549724304467820544}, \beta^{73} = \alpha^{14167099448608935641088}, \beta^{74} = \alpha^{28334198897217871282176}, \beta^{75} = \alpha^{56668397794435742564352}, \beta^{76} = \alpha^{113336795588871485128704}, \beta^{77} = \alpha^{226673591177742970257408}, \beta^{78} = \alpha^{453347182355485940514816}, \beta^{79} = \alpha^{906694364710971881029632}, \beta^{80} = \alpha^{1813388729421943762059264}, \beta^{81} = \alpha^{3626777458843887524118528}, \beta^{82} = \alpha^{7253554917687775048237056}, \beta^{83} = \alpha^{14507109835375550096474112}, \beta^{84} = \alpha^{29014219670751100192948224}, \beta^{85} = \alpha^{58028439341502200385896448}, \beta^{86} = \alpha^{116056878683004400771792896}, \beta^{87} = \alpha^{232113757366008801543585792}, \beta^{88} = \alpha{464227514732017603087171584}, \beta^{89} = \alpha{928455029464035206174343168}, \beta^{90} = \alpha{1856910058928070412348686336}, \beta^{91} = \alpha{3713820117856140824697372672}, \beta^{92} = \alpha{7427640235712281649394745344}, \beta^{93} = \alpha{14855280471424563298789490688}, \beta^{94} = \alpha{29710560942849126597578981376}, \beta^{95} = \alpha{59421121885698253195157962752}, \beta^{96} = \alpha{118842243771396506390315925504}, \beta^{97} = \alpha{237684487542793012780631851008}, \beta^{98} = \alpha{475368975085586025561263702016}, \beta^{99} = \alpha{950737950171172051122527404032}, \beta^{100} = \alpha{1901475900342344102245054808064}, \beta^{101} = 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