

الف) $q=2 \rightarrow a_1 = \frac{1}{2} \rightarrow q_1 = a q^1 \rightarrow \frac{1}{2} \times 2^1 = 2^0$ ✓
 ب) $\frac{a q^1}{a q^1} = q^1 \rightarrow q^1 = 2^1$ ✓

ج) $\frac{1}{2} \times 2^1 \times \frac{1}{2} \times 2^1 = 2^0 \rightarrow \sqrt{2^0} = 2^0$ ✓

د) $128 = 2^7$ $\frac{1}{2} \times 2^8 = 2^7$ $2^8 = 256$ $2^7 = 128$ $2^6 = 64$ $2^5 = 32$ $2^4 = 16$ $2^3 = 8$ $2^2 = 4$ $2^1 = 2$ $2^0 = 1$ $2^{-1} = \frac{1}{2}$ $2^{-2} = \frac{1}{4}$ $2^{-3} = \frac{1}{8}$ $2^{-4} = \frac{1}{16}$ $2^{-5} = \frac{1}{32}$ $2^{-6} = \frac{1}{64}$ $2^{-7} = \frac{1}{128}$ $2^{-8} = \frac{1}{256}$ $2^{-9} = \frac{1}{512}$ $2^{-10} = \frac{1}{1024}$ $2^{-11} = \frac{1}{2048}$ $2^{-12} = \frac{1}{4096}$ $2^{-13} = \frac{1}{8192}$ $2^{-14} = \frac{1}{16384}$ $2^{-15} = \frac{1}{32768}$ $2^{-16} = \frac{1}{65536}$ $2^{-17} = \frac{1}{131072}$ $2^{-18} = \frac{1}{262144}$ $2^{-19} = \frac{1}{524288}$ $2^{-20} = \frac{1}{1048576}$ $2^{-21} = \frac{1}{2097152}$ $2^{-22} = \frac{1}{4194304}$ $2^{-23} = \frac{1}{8388608}$ $2^{-24} = \frac{1}{16777216}$ $2^{-25} = \frac{1}{33554432}$ $2^{-26} = \frac{1}{67108864}$ $2^{-27} = \frac{1}{134217728}$ $2^{-28} = \frac{1}{268435456}$ $2^{-29} = \frac{1}{536870912}$ $2^{-30} = \frac{1}{1073741824}$ $2^{-31} = \frac{1}{2147483648}$ $2^{-32} = \frac{1}{4294967296}$ $2^{-33} = \frac{1}{8589934592}$ $2^{-34} = \frac{1}{17179869184}$ $2^{-35} = \frac{1}{34359738368}$ $2^{-36} = \frac{1}{68719476736}$ $2^{-37} = \frac{1}{137438953472}$ $2^{-38} = \frac{1}{274877906944}$ $2^{-39} = \frac{1}{549755813888}$ $2^{-40} = \frac{1}{1099511627776}$ $2^{-41} = \frac{1}{2199023255552}$ $2^{-42} = \frac{1}{4398046511104}$ $2^{-43} = \frac{1}{8796093022208}$ $2^{-44} = \frac{1}{17592186044416}$ $2^{-45} = \frac{1}{35184372088832}$ $2^{-46} = \frac{1}{70368744177664}$ $2^{-47} = \frac{1}{140737488355328}$ $2^{-48} = \frac{1}{281474976710656}$ $2^{-49} = \frac{1}{562949953421312}$ $2^{-50} = \frac{1}{1125899906842624}$ $2^{-51} = \frac{1}{2251799813685248}$ $2^{-52} = \frac{1}{4503599627370496}$ $2^{-53} = \frac{1}{9007199254740992}$ $2^{-54} = \frac{1}{18014398509481984}$ $2^{-55} = \frac{1}{36028797018963968}$ $2^{-56} = \frac{1}{72057594037927936}$ $2^{-57} = \frac{1}{144115188075855872}$ $2^{-58} = \frac{1}{288230376151711744}$ $2^{-59} = \frac{1}{576460752303423488}$ $2^{-60} = \frac{1}{1152921504606846976}$ $2^{-61} = \frac{1}{2305843009213693952}$ $2^{-62} = \frac{1}{4611686018427387904}$ $2^{-63} = \frac{1}{9223372036854775808}$ $2^{-64} = \frac{1}{18446744073709551616}$ $2^{-65} = \frac{1}{36893488147419103232}$ $2^{-66} = \frac{1}{73786976294838206464}$ $2^{-67} = \frac{1}{147573952589676412928}$ $2^{-68} = \frac{1}{295147905179352825856}$ $2^{-69} = \frac{1}{590295810358705651712}$ $2^{-70} = \frac{1}{1180591620717411303424}$ $2^{-71} = \frac{1}{2361183241434822606848}$ $2^{-72} = \frac{1}{4722366482869645213696}$ $2^{-73} = \frac{1}{9444732965739290427392}$ $2^{-74} = \frac{1}{18889465931478580854784}$ $2^{-75} = \frac{1}{37778931862957161709568}$ $2^{-76} = \frac{1}{75557863725914323419136}$ $2^{-77} = \frac{1}{151115727451828646838272}$ $2^{-78} = \frac{1}{302231454903657293676544}$ $2^{-79} = \frac{1}{604462909807314587353088}$ $2^{-80} = \frac{1}{1208925819614629174706176}$ $2^{-81} = \frac{1}{2417851639229258349412352}$ $2^{-82} = \frac{1}{4835703278458516698824704}$ $2^{-83} = \frac{1}{9671406556917033397649408}$ $2^{-84} = \frac{1}{19342813113834066795298816}$ $2^{-85} = \frac{1}{38685626227668133590597632}$ $2^{-86} = \frac{1}{77371252455336267181195264}$ $2^{-87} = \frac{1}{154742504910672534362390528}$ $2^{-88} = \frac{1}{309485009821345068724781056}$ $2^{-89} = \frac{1}{618970019642690137449562112}$ $2^{-90} = \frac{1}{1237940039285380274899124224}$ $2^{-91} = \frac{1}{2475880078570760549798248448}$ $2^{-92} = \frac{1}{4951760157141521099596496896}$ $2^{-93} = \frac{1}{9903520314283042199192993792}$ $2^{-94} = \frac{1}{19807040628566084398385987584}$ $2^{-95} = \frac{1}{39614081257132168796771975168}$ $2^{-96} = \frac{1}{79228162514264337593543950336}$ $2^{-97} = \frac{1}{158456325028528675187087900672}$ $2^{-98} = \frac{1}{316912650057057350374175801344}$ $2^{-99} = \frac{1}{633825300114114700748351602688}$ $2^{-100} = \frac{1}{1267650600228229401496703205376}$ $2^{-101} = \frac{1}{2535301200456458802993406410752}$ $2^{-102} = \frac{1}{5070602400912917605986812821504}$ $2^{-103} = \frac{1}{10141204801825835211973625643008}$ $2^{-104} = \frac{1}{20282409603651670423947251286016}$ $2^{-105} = \frac{1}{40564819207303340847894502572032}$ $2^{-106} = \frac{1}{81129638414606681695789005144064}$ $2^{-107} = \frac{1}{162259276829213363391578010288128}$ $2^{-108} = \frac{1}{324518553658426726783156020576256}$ $2^{-109} = \frac{1}{649037107316853453566312041152512}$ $2^{-110} = \frac{1}{1298074214633706907132624082305024}$ $2^{-111} = \frac{1}{2596148429267413814265248164610048}$ $2^{-112} = \frac{1}{5192296858534827628530496329220096}$ $2^{-113} = \frac{1}{10384593717069655257060992658440192}$ $2^{-114} = \frac{1}{20769187434139310514121985316880384}$ $2^{-115} = \frac{1}{41538374868278621028243970633760768}$ $2^{-116} = \frac{1}{83076749736557242056487941267521536}$ $2^{-117} = \frac{1}{166153499473114484112975882535043072}$ $2^{-118} = \frac{1}{332306998946228968225951765070086144}$ $2^{-119} = \frac{1}{664613997892457936451903530140172288}$ $2^{-120} = \frac{1}{1329227995784915872903807060280344576}$ $2^{-121} = \frac{1}{2658455991569831745807614120560689152}$ $2^{-122} = \frac{1}{5316911983139663491615228241121378304}$ $2^{-123} = \frac{1}{10633823966279326983230456482242756608}$ $2^{-124} = \frac{1}{21267647932558653966460912964485513216}$ $2^{-125} = \frac{1}{42535295865117307932921825928971026432}$ $2^{-126} = \frac{1}{85070591730234615865843651857942052864}$ $2^{-127} = \frac{1}{170141183460469231731687303715884105728}$ $2^{-128} = \frac{1}{340282366920938463463374607431768211456}$ $2^{-129} = \frac{1}{680564733841876926926749214863536422912}$ $2^{-130} = \frac{1}{1361129467683753853853498429727072845824}$ $2^{-131} = \frac{1}{2722258935367507707706996859454145691648}$ $2^{-132} = \frac{1}{5444517870735015415413993718908291383296}$ $2^{-133} = \frac{1}{10889035741470030830827987437816582766592}$ $2^{-134} = \frac{1}{21778071482940061661655974875633165533184}$ $2^{-135} = \frac{1}{43556142965880123323311949751266331066368}$ $2^{-136} = \frac{1}{87112285931760246646623899502532662132736}$ $2^{-137} = \frac{1}{174224571863520493293247799005065324265472}$ $2^{-138} = \frac{1}{348449143727040986586495598010130648530944}$ $2^{-139} = \frac{1}{696898287454081973172991196020261297061888}$ $2^{-140} = \frac{1}{1393796574908163946345982392040522594123776}$ $2^{-141} = \frac{1}{2787593149816327892691964784081045188247552}$ $2^{-142} = \frac{1}{5575186299632655785383929568162090376495104}$ $2^{-143} = \frac{1}{11150372599265311570767859136324180752990208}$ $2^{-144} = \frac{1}{22300745198530623141535718272648361505980416}$ $2^{-145} = \frac{1}{44601490397061246283071436545296723011960832}$ $2^{-146} = \frac{1}{89202980794122492566142873090593446023921664}$ $2^{-147} = \frac{1}{178405961588244985132285746181186892047843328}$ $2^{-148} = \frac{1}{356811923176489970264571492362373784095686656}$ $2^{-149} = \frac{1}{713623846352979940529142984724747568191373312}$ $2^{-150} = \frac{1}{1427247692705959881058285969449495136382746624}$ $2^{-151} = \frac{1}{2854495385411919762116571938898990272765493248}$ $2^{-152} = \frac{1}{5708990770823839524233143877797980545530986496}$ $2^{-153} = \frac{1}{11417981541647679048466287755595961091061972992}$ $2^{-154} = \frac{1}{22835963083295358096932575511191922182123945984}$ $2^{-155} = \frac{1}{45671926166590716193865151022383844364247891968}$ $2^{-156} = \frac{1}{91343852333181432387730302044767688728495783936}$ $2^{-157} = \frac{1}{182687704666362864775460604089535377456991567872}$ $2^{-158} = \frac{1}{365375409332725729550921208179070754913983135744}$ $2^{-159} = \frac{1}{730750818665451459101842416358141509827966271488}$ $2^{-160} = \frac{1}{1461501637330902918203684832716283019655932542976}$ $2^{-161} = \frac{1}{2923003274661805836407369665432566039311865085952}$ $2^{-162} = \frac{1}{5846006549323611672814739330865132078623730171904}$ $2^{-163} = \frac{1}{11692013098647223345629478661730264157247460343808}$ $2^{-164} = \frac{1}{23384026197294446691258957323460528314494920687616}$ $2^{-165} = \frac{1}{46768052394588893382517914646921056628989841375232}$ $2^{-166} = \frac{1}{93536104789177786765035829293842113257979682750464}$ $2^{-167} = \frac{1}{187072209578355573530071658587684226515959365500928}$ $2^{-168} = \frac{1}{374144419156711147060143317175368453031918731001856}$ $2^{-169} = \frac{1}{748288838313422294120286634350736906063837462003712}$ $2^{-170} = \frac{1}{1496577676626844588240573268701473812127674924007424}$ $2^{-171} = \frac{1}{2993155353253689176481146537402947624255349848014848}$ $2^{-172} = \frac{1}{5986310706507378352962293074805895248510699696029696}$ $2^{-173} = \frac{1}{11972621413014756705924586149611790497021399392059392}$ $2^{-174} = \frac{1}{23945242826029513411849172299223580994042798784118784}$ $2^{-175} = \frac{1}{47890485652059026823698344598447161988085597568237568}$ $2^{-176} = \frac{1}{95780971304118053647396689196894323976171195136475136}$ $2^{-177} = \frac{1}{191561942608236107294793378393788647952342390272950272}$ $2^{-178} = \frac{1}{383123885216472214589586756787577295904684780545900544}$ $2^{-179} = \frac{1}{766247770432944429179173513575154591809369561091801088}$ $2^{-180} = \frac{1}{1532495540865888858358347027150309183618739122183602176}$ $2^{-181} = \frac{1}{3064991081731777716716694054300618367237478244367204352}$ $2^{-182} = \frac{1}{6129982163463555433433388108601236734474956488734408704}$ $2^{-183} = \frac{1}{12259964326927110866866776217202473468949912977468817408}$ $2^{-184} = \frac{1}{24519928653854221733733552434404946937899825954937634816}$ $2^{-185} = \frac{1}{49039857307708443467467104868809893875799651909875269632}$ $2^{-186} = \frac{1}{98079714615416886934934209737619787751599303819750539264}$ $2^{-187} = \frac{1}{196159429230833773869868419475239575503198607639501078528}$ $2^{-188} = \frac{1}{392318858461667547739736838950479151006397215279002157056}$ $2^{-189} = \frac{1}{784637716923335095479473677900958302012794430558004314112}$ $2^{-190} = \frac{1}{1569275433846670190958947355801916604025588861116008628224}$ $2^{-191} = \frac{1}{3138550867693340381917894711603833208051177722232017256448}$ $2^{-192} = \frac{1}{6277101735386680763835789423207666416102355444464034512896}$ $2^{-193} = \frac{1}{12554203470773361527671578846415332832204710888928069025792}$ $2^{-194} = \frac{1}{25108406941546723055343157692830665664409421777856138051584}$ $2^{-195} = \frac{1}{50216813883093446110686315385661331328818843555712276103168}$ $2^{-196} = \frac{1}{100433627766186892221372630771322662657637687111424552206336}$ $2^{-197} = \frac{1}{200867255532373784442745261542645325315275374222849104412672}$ $2^{-198} = \frac{1}{401734511064747568885490523085290650630550748445698208825344}$ $2^{-199} = \frac{1}{803469022129495137770981046170581301261101496891396417650688}$ $2^{-200} = \frac{1}{1606938044258990275541962092341162602522202993782792835301376}$ $2^{-201} = \frac{1}{3213876088517980551083924184682325205044405987565585670602752}$ $2^{-202} = \frac{1}{6427752177035961102167848369364650410088811975131171341205504}$ $2^{-203} = \frac{1}{12855504354071922204335696738729300820177623950262342682411008}$ $2^{-204} = \frac{1}{25711008708143844408671393477458601640355247900524685364822016}$ $2^{-205} = \frac{1}{51422017416287688817342786954917203280710495801049370729644032}$ $2^{-206} = \frac{1}{102844034832575377634685573909834406561420991602098741459288064}$ $2^{-207} = \frac{1}{205688069665150755269371147819668813122841983204197482918576128}$ $2^{-208} = \frac{1}{411376139330301510538742295639337626245683966408394965837152256}$ $2^{-209} = \frac{1}{822752278660603021077484591278675252491367932816789931674304512}$ $2^{-210} = \frac{1}{1645504557321206042154969182557350504982735865633579863348609024}$ $2^{-211} = \frac{1}{3291009114642412084309938365114701009965471731267159726697218048}$ $2^{-212} = \frac{1}{6582018229284824168619876730229402019930943462534319453394436096}$ $2^{-213} = \frac{1}{13164036458569648337239753460458804039861886925068638906788872192}$ $2^{-214} = \frac{1}{26328072917139296674479506920917608079723773850137277813577744384}$ $2^{-215} = \frac{1}{52656145834278593348959013841835216159447547700274555627155488768}$ $2^{-216} = \frac{1}{105312291668557186697918027683670432318895095400549111254310977536}$ $2^{-217} = \frac{1}{210624583337114373395836055367340864637790190801098222508621955072}$ $2^{-218} = \frac{1}{421249166674228746791672110734681729275580381602196445017243910144}$ $2^{-219} = \frac{1}{842498333348457493583344221469363458551160763204392890034487820288}$ $2^{-220} = \frac{1}{1684996666696914987166688442938726917102321526408785780068975640576}$ $2^{-221} = \frac{1}{3369993333393829974333376885877453834204643052817571560137951281152}$ $2^{-222} = \frac{1}{6739986666787659948666753771754907668409286105635143120275902562304}$ $2^{-223} = \frac{1}{13479973333575319897333507543509815336818572211270286240551805124608}$ $2^{-224} = \frac{1}{26959946667150639794667015087019630673637144422540572481103610249216}$ $2^{-225} = \frac{1}{53919893334301279589334030174039261347274288845081144962207220498432}$ $2^{-226} = \frac{1}{107839786668602559178668060348078522694548577690162289924414440996864}$ $2^{-227} = \frac{1}{215679573337205118357336120696157$

بزرگترین جمله ۲۷ است

۱	۲	۹	۲۷
۲۷	۹	۳	۱

$$a + aq^3 = 28$$

$$aq + aq^5 = 12$$

$$\frac{a(1+q^3)}{aq(1+q)} = \frac{(1+q)(1-q+q^2)}{q(1+q)} = \frac{28}{12} = \frac{7}{3} \rightarrow 2 - 2q + 2q^2 = 7q$$

$$2q^2 - 10q + 2 = 0$$

$$q^2 - 5q + 1 = 0 \rightarrow (q-1)(q-4) = 0 \rightarrow$$

$$\rightarrow q < 1 \rightarrow \frac{1}{4}$$

$$a(1+q^3) = 28$$

$$a(1+\frac{1}{27}) \rightarrow a_1 = 27$$

$$a(1+\frac{1}{27}) \rightarrow a_1 = 27$$

$$a + aq + aq^2 = 12$$

$$a^2 q^2 = 27$$

$$\sqrt{a^2 q^2} = aq = 3$$

$$a + aq^2 = 10$$

$$a(1+q^2) = 10$$

$$a^2 q^2 = 9$$

$$a = 1 \quad aq^2 = 9$$

$$\frac{2}{x^2} \times \frac{1}{x^2} = 1$$

$$q = 2$$

$$q = aq^2 = 2 \times 2^2$$

$$\text{الف) } 2 \left(\frac{2^{10} - 1}{2 - 1} \right) = 2^{10} - 1 = 1023$$

$$\text{ب) } \sqrt{(2 \times 2 \times 2^9)^{10}} = (2 \times 2^9)^5 = 2^{10} \times 2^{45}$$

$$a, aq, aq^2, aq^3, \dots$$

$$(a - aq), (aq - aq^2), (aq^2 - aq^3), \dots$$

$$a(1-q), aq(1-q), aq^2(1-q), \dots$$

$$\frac{aq(1-q)}{a(1-q)} = q$$

(۱-۹) چون در هشتاد و شش مشترک بیرون می کشیم

پس این دنباله هم هندسی

و قدر نسبت آن ۹ است

$$\text{الف) } S_n = a + a + d + a + 2d + \dots + a + (n-1)d$$

نهمی اول

$$S_n = a + (n-1)d + a + (n-2)d + \dots + a$$

$$2S_n = (2a + (n-1)d) + (2a + (n-1)d) + \dots + (2a + (n-1)d)$$

تعداد این عبارت برابر n است

$$2S_n = n(2a + (n-1)d)$$

$$S_n = \frac{n}{2} (2a + (n-1)d)$$

$$\text{ب) } S_n = a + aq + aq^2 + \dots + aq^{n-1}$$

$$qS_n = aq + aq^2 + aq^3 + \dots + aq^n$$

$$qS_n - S_n = aq^n - a$$

$$S_n(q-1) = a(q^n - 1) \rightarrow S_n = a \left(\frac{q^n - 1}{q - 1} \right)$$

هر طرف را در ۹ ضرب می کنیم

حالا اگر این n جمله را از آخر به اول بنویسیم و با هم جمع کنیم

(۲)