

“构造法”求数列的通项公式

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数列问题历年来都是高考命题的热点,求数列的通项公式更是高考重点考查的内容之一,常用的等差数列或等比数列可直接求出它们的通项公式,但有一些数列要通过构造来形成等差数列或等比数列,借助于构造出的等差数列或等比数列求原来数列的通项公式。

1.形如 $Aa_{n+1}=Ba_n+C$ 的形式,令 $A(+m)=B(+m)$,然后对比系数求 m 的值,从而构造出等比数列。

例1:数列 $\{a_n\}$ 中, $a_1=\frac{7}{6}$, $a_{n+1}=\frac{1}{2}a_n+\frac{1}{3}$,求数列 $\{a_n\}$ 的通项公式。

解析:设 $a_{n+1}+m=\frac{1}{2}(a_n+m)$,即 $a_{n+1}=\frac{1}{2}a_n-\frac{1}{2}m$,与 $a_{n+1}=\frac{1}{2}a_n+\frac{1}{3}$ 对比系数得 $m=-\frac{2}{3}$

$$\text{即 } a_{n+1}-\frac{2}{3}=\frac{1}{2}(a_n-\frac{2}{3}), \text{ 而 } a_1-\frac{2}{3}=\frac{1}{2}$$

所以,数列 $\{a_n-\frac{2}{3}\}$ 是首项为 $\frac{1}{2}$,公比为 $\frac{1}{2}$ 的等比数列,

$$\text{所以 } a_n-\frac{2}{3}=\frac{1}{2}\cdot(\frac{1}{2})^{n-1}=(\frac{1}{2})^n, \text{ 即 } a_n=(\frac{1}{2})^n+\frac{2}{3}$$

2. 递推式的两边同除以关于 n 的幂的形式构造等差数列。

例2:数列 $\{b_n\}$ 满足, $b_1=2$, $b_{n+1}=2b_n+2^{n+1}$,求数列 $\{b_n\}$ 的通项公式。

解析:等式 $b_{n+1}=2b_n+2^{n+1}$ 的两边同除以 2^{n+1} ,得到

$$\frac{b_{n+1}}{2^{n+1}}=\frac{b_n}{2^n}+1 \text{ 即 } \frac{b_{n+1}}{2^{n+1}}-\frac{b_n}{2^n}=1$$

所以,数列 $\{\frac{b_n}{2^n}\}$ 为首项是 $\frac{b_1}{2}=1$,公差是1的等差数列,

$$\text{所以, } \frac{b_n}{2^n}=1+(n-1)=n, \text{ 即 } b_n=n\cdot 2^n$$

3. 构造出数列的相邻两项之差,然后采用迭加的方法就可求得这一数列的通项公式。

例3 设 $\{a_n\}$ 是首项为1的正项数列,且 $a_n^2-a_{n-1}^2-na_n-na_{n-1}=0$, $(n\in N^*)$,求数列的通项公式 a_n 。

解:由题设得

$$(a_n+a_{n-1})(a_n-a_{n-1}-n)=0$$

$$\because a_n > 0, a_{n-1} > 0, \therefore a_n+a_{n-1} > 0$$

$$\therefore a_n-a_{n-1}=n$$

$$a_n=a_1+(a_2-a_1)+(a_3-a_2)+\dots+(a_n-a_{n-1})=1+2+3+\dots+n=\frac{n(n+1)}{2}$$

4. 构造数列相邻两项的商式,然后连乘也是求数列通项公式的一种方法。

例4: 数列 $\{a_n\}$ 中, $a_1=\frac{1}{2}$,前 n 项的和 $S_n=n^2a_n$,求 a_{n+1} 。

$$\text{解: } a_n=S_n-S_{n-1}=n^2a_n-(n-1)^2a_{n-1} \Rightarrow (n^2-1)a_n=(n-1)^2a_{n-1}$$

$$\Rightarrow \frac{a_n}{a_{n-1}}=\frac{n-1}{n+1}$$

$$\therefore a_n=\frac{a_1}{a_{n-1}}\cdot\frac{a_{n-1}}{a_{n-2}}\cdot\frac{a_{n-2}}{a_{n-3}}\cdot\frac{a_{n-3}}{a_{n-4}}\cdot\frac{a_{n-4}}{a_{n-5}}\cdot\frac{a_{n-5}}{a_{n-6}}\cdot\frac{a_{n-6}}{a_{n-7}}\cdot\frac{a_{n-7}}{a_{n-8}}\cdot\frac{a_{n-8}}{a_{n-9}}\cdot\frac{a_{n-9}}{a_{n-10}}\cdot\frac{a_{n-10}}{a_{n-11}}\cdot\frac{a_{n-11}}{a_{n-12}}\cdot\frac{a_{n-12}}{a_{n-13}}\cdot\frac{a_{n-13}}{a_{n-14}}\cdot\frac{a_{n-14}}{a_{n-15}}\cdot\frac{a_{n-15}}{a_{n-16}}\cdot\frac{a_{n-16}}{a_{n-17}}\cdot\frac{a_{n-17}}{a_{n-18}}\cdot\frac{a_{n-18}}{a_{n-19}}\cdot\frac{a_{n-19}}{a_{n-20}}\cdot\frac{a_{n-20}}{a_{n-21}}\cdot\frac{a_{n-21}}{a_{n-22}}\cdot\frac{a_{n-22}}{a_{n-23}}\cdot\frac{a_{n-23}}{a_{n-24}}\cdot\frac{a_{n-24}}{a_{n-25}}\cdot\frac{a_{n-25}}{a_{n-26}}\cdot\frac{a_{n-26}}{a_{n-27}}\cdot\frac{a_{n-27}}{a_{n-28}}\cdot\frac{a_{n-28}}{a_{n-29}}\cdot\frac{a_{n-29}}{a_{n-30}}\cdot\frac{a_{n-30}}{a_{n-31}}\cdot\frac{a_{n-31}}{a_{n-32}}\cdot\frac{a_{n-32}}{a_{n-33}}\cdot\frac{a_{n-33}}{a_{n-34}}\cdot\frac{a_{n-34}}{a_{n-35}}\cdot\frac{a_{n-35}}{a_{n-36}}\cdot\frac{a_{n-36}}{a_{n-37}}\cdot\frac{a_{n-37}}{a_{n-38}}\cdot\frac{a_{n-38}}{a_{n-39}}\cdot\frac{a_{n-39}}{a_{n-40}}\cdot\frac{a_{n-40}}{a_{n-41}}\cdot\frac{a_{n-41}}{a_{n-42}}\cdot\frac{a_{n-42}}{a_{n-43}}\cdot\frac{a_{n-43}}{a_{n-44}}\cdot\frac{a_{n-44}}{a_{n-45}}\cdot\frac{a_{n-45}}{a_{n-46}}\cdot\frac{a_{n-46}}{a_{n-47}}\cdot\frac{a_{n-47}}{a_{n-48}}\cdot\frac{a_{n-48}}{a_{n-49}}\cdot\frac{a_{n-49}}{a_{n-50}}\cdot\frac{a_{n-50}}{a_{n-51}}\cdot\frac{a_{n-51}}{a_{n-52}}\cdot\frac{a_{n-52}}{a_{n-53}}\cdot\frac{a_{n-53}}{a_{n-54}}\cdot\frac{a_{n-54}}{a_{n-55}}\cdot\frac{a_{n-55}}{a_{n-56}}\cdot\frac{a_{n-56}}{a_{n-57}}\cdot\frac{a_{n-57}}{a_{n-58}}\cdot\frac{a_{n-58}}{a_{n-59}}\cdot\frac{a_{n-59}}{a_{n-60}}\cdot\frac{a_{n-60}}{a_{n-61}}\cdot\frac{a_{n-61}}{a_{n-62}}\cdot\frac{a_{n-62}}{a_{n-63}}\cdot\frac{a_{n-63}}{a_{n-64}}\cdot\frac{a_{n-64}}{a_{n-65}}\cdot\frac{a_{n-65}}{a_{n-66}}\cdot\frac{a_{n-66}}{a_{n-67}}\cdot\frac{a_{n-67}}{a_{n-68}}\cdot\frac{a_{n-68}}{a_{n-69}}\cdot\frac{a_{n-69}}{a_{n-70}}\cdot\frac{a_{n-70}}{a_{n-71}}\cdot\frac{a_{n-71}}{a_{n-72}}\cdot\frac{a_{n-72}}{a_{n-73}}\cdot\frac{a_{n-73}}{a_{n-74}}\cdot\frac{a_{n-74}}{a_{n-75}}\cdot\frac{a_{n-75}}{a_{n-76}}\cdot\frac{a_{n-76}}{a_{n-77}}\cdot\frac{a_{n-77}}{a_{n-78}}\cdot\frac{a_{n-78}}{a_{n-79}}\cdot\frac{a_{n-79}}{a_{n-80}}\cdot\frac{a_{n-80}}{a_{n-81}}\cdot\frac{a_{n-81}}{a_{n-82}}\cdot\frac{a_{n-82}}{a_{n-83}}\cdot\frac{a_{n-83}}{a_{n-84}}\cdot\frac{a_{n-84}}{a_{n-85}}\cdot\frac{a_{n-85}}{a_{n-86}}\cdot\frac{a_{n-86}}{a_{n-87}}\cdot\frac{a_{n-87}}{a_{n-88}}\cdot\frac{a_{n-88}}{a_{n-89}}\cdot\frac{a_{n-89}}{a_{n-90}}\cdot\frac{a_{n-90}}{a_{n-91}}\cdot\frac{a_{n-91}}{a_{n-92}}\cdot\frac{a_{n-92}}{a_{n-93}}\cdot\frac{a_{n-93}}{a_{n-94}}\cdot\frac{a_{n-94}}{a_{n-95}}\cdot\frac{a_{n-95}}{a_{n-96}}\cdot\frac{a_{n-96}}{a_{n-97}}\cdot\frac{a_{n-97}}{a_{n-98}}\cdot\frac{a_{n-98}}{a_{n-99}}\cdot\frac{a_{n-99}}{a_{n-100}}\cdot\frac{a_{n-100}}{a_{n-101}}\cdot\frac{a_{n-101}}{a_{n-102}}\cdot\frac{a_{n-102}}{a_{n-103}}\cdot\frac{a_{n-103}}{a_{n-104}}\cdot\frac{a_{n-104}}{a_{n-105}}\cdot\frac{a_{n-105}}{a_{n-106}}\cdot\frac{a_{n-106}}{a_{n-107}}\cdot\frac{a_{n-107}}{a_{n-108}}\cdot\frac{a_{n-108}}{a_{n-109}}\cdot\frac{a_{n-109}}{a_{n-110}}\cdot\frac{a_{n-110}}{a_{n-111}}\cdot\frac{a_{n-111}}{a_{n-112}}\cdot\frac{a_{n-112}}{a_{n-113}}\cdot\frac{a_{n-113}}{a_{n-114}}\cdot\frac{a_{n-114}}{a_{n-115}}\cdot\frac{a_{n-115}}{a_{n-116}}\cdot\frac{a_{n-116}}{a_{n-117}}\cdot\frac{a_{n-117}}{a_{n-118}}\cdot\frac{a_{n-118}}{a_{n-119}}\cdot\frac{a_{n-119}}{a_{n-120}}\cdot\frac{a_{n-120}}{a_{n-121}}\cdot\frac{a_{n-121}}{a_{n-122}}\cdot\frac{a_{n-122}}{a_{n-123}}\cdot\frac{a_{n-123}}{a_{n-124}}\cdot\frac{a_{n-124}}{a_{n-125}}\cdot\frac{a_{n-125}}{a_{n-126}}\cdot\frac{a_{n-126}}{a_{n-127}}\cdot\frac{a_{n-127}}{a_{n-128}}\cdot\frac{a_{n-128}}{a_{n-129}}\cdot\frac{a_{n-129}}{a_{n-130}}\cdot\frac{a_{n-130}}{a_{n-131}}\cdot\frac{a_{n-131}}{a_{n-132}}\cdot\frac{a_{n-132}}{a_{n-133}}\cdot\frac{a_{n-133}}{a_{n-134}}\cdot\frac{a_{n-134}}{a_{n-135}}\cdot\frac{a_{n-135}}{a_{n-136}}\cdot\frac{a_{n-136}}{a_{n-137}}\cdot\frac{a_{n-137}}{a_{n-138}}\cdot\frac{a_{n-138}}{a_{n-139}}\cdot\frac{a_{n-139}}{a_{n-140}}\cdot\frac{a_{n-140}}{a_{n-141}}\cdot\frac{a_{n-141}}{a_{n-142}}\cdot\frac{a_{n-142}}{a_{n-143}}\cdot\frac{a_{n-143}}{a_{n-144}}\cdot\frac{a_{n-144}}{a_{n-145}}\cdot\frac{a_{n-145}}{a_{n-146}}\cdot\frac{a_{n-146}}{a_{n-147}}\cdot\frac{a_{n-147}}{a_{n-148}}\cdot\frac{a_{n-148}}{a_{n-149}}\cdot\frac{a_{n-149}}{a_{n-150}}\cdot\frac{a_{n-150}}{a_{n-151}}\cdot\frac{a_{n-151}}{a_{n-152}}\cdot\frac{a_{n-152}}{a_{n-153}}\cdot\frac{a_{n-153}}{a_{n-154}}\cdot\frac{a_{n-154}}{a_{n-155}}\cdot\frac{a_{n-155}}{a_{n-156}}\cdot\frac{a_{n-156}}{a_{n-157}}\cdot\frac{a_{n-157}}{a_{n-158}}\cdot\frac{a_{n-158}}{a_{n-159}}\cdot\frac{a_{n-159}}{a_{n-160}}\cdot\frac{a_{n-160}}{a_{n-161}}\cdot\frac{a_{n-161}}{a_{n-162}}\cdot\frac{a_{n-162}}{a_{n-163}}\cdot\frac{a_{n-163}}{a_{n-164}}\cdot\frac{a_{n-164}}{a_{n-165}}\cdot\frac{a_{n-165}}{a_{n-166}}\cdot\frac{a_{n-166}}{a_{n-167}}\cdot\frac{a_{n-167}}{a_{n-168}}\cdot\frac{a_{n-168}}{a_{n-169}}\cdot\frac{a_{n-169}}{a_{n-170}}\cdot\frac{a_{n-170}}{a_{n-171}}\cdot\frac{a_{n-171}}{a_{n-172}}\cdot\frac{a_{n-172}}{a_{n-173}}\cdot\frac{a_{n-173}}{a_{n-174}}\cdot\frac{a_{n-174}}{a_{n-175}}\cdot\frac{a_{n-175}}{a_{n-176}}\cdot\frac{a_{n-176}}{a_{n-177}}\cdot\frac{a_{n-177}}{a_{n-178}}\cdot\frac{a_{n-178}}{a_{n-179}}\cdot\frac{a_{n-179}}{a_{n-180}}\cdot\frac{a_{n-180}}{a_{n-181}}\cdot\frac{a_{n-181}}{a_{n-182}}\cdot\frac{a_{n-182}}{a_{n-183}}\cdot\frac{a_{n-183}}{a_{n-184}}\cdot\frac{a_{n-184}}{a_{n-185}}\cdot\frac{a_{n-185}}{a_{n-186}}\cdot\frac{a_{n-186}}{a_{n-187}}\cdot\frac{a_{n-187}}{a_{n-188}}\cdot\frac{a_{n-188}}{a_{n-189}}\cdot\frac{a_{n-189}}{a_{n-190}}\cdot\frac{a_{n-190}}{a_{n-191}}\cdot\frac{a_{n-191}}{a_{n-192}}\cdot\frac{a_{n-192}}{a_{n-193}}\cdot\frac{a_{n-193}}{a_{n-194}}\cdot\frac{a_{n-194}}{a_{n-195}}\cdot\frac{a_{n-195}}{a_{n-196}}\cdot\frac{a_{n-196}}{a_{n-197}}\cdot\frac{a_{n-197}}{a_{n-198}}\cdot\frac{a_{n-198}}{a_{n-199}}\cdot\frac{a_{n-199}}{a_{n-200}}\cdot\frac{a_{n-200}}{a_{n-201}}\cdot\frac{a_{n-201}}{a_{n-202}}\cdot\frac{a_{n-202}}{a_{n-203}}\cdot\frac{a_{n-203}}{a_{n-204}}\cdot\frac{a_{n-204}}{a_{n-205}}\cdot\frac{a_{n-205}}{a_{n-206}}\cdot\frac{a_{n-206}}{a_{n-207}}\cdot\frac{a_{n-207}}{a_{n-208}}\cdot\frac{a_{n-208}}{a_{n-209}}\cdot\frac{a_{n-209}}{a_{n-210}}\cdot\frac{a_{n-210}}{a_{n-211}}\cdot\frac{a_{n-211}}{a_{n-212}}\cdot\frac{a_{n-212}}{a_{n-213}}\cdot\frac{a_{n-213}}{a_{n-214}}\cdot\frac{a_{n-214}}{a_{n-215}}\cdot\frac{a_{n-215}}{a_{n-216}}\cdot\frac{a_{n-216}}{a_{n-217}}\cdot\frac{a_{n-217}}{a_{n-218}}\cdot\frac{a_{n-218}}{a_{n-219}}\cdot\frac{a_{n-219}}{a_{n-220}}\cdot\frac{a_{n-220}}{a_{n-221}}\cdot\frac{a_{n-221}}{a_{n-222}}\cdot\frac{a_{n-222}}{a_{n-223}}\cdot\frac{a_{n-223}}{a_{n-224}}\cdot\frac{a_{n-224}}{a_{n-225}}\cdot\frac{a_{n-225}}{a_{n-226}}\cdot\frac{a_{n-226}}{a_{n-227}}\cdot\frac{a_{n-227}}{a_{n-228}}\cdot\frac{a_{n-228}}{a_{n-229}}\cdot\frac{a_{n-229}}{a_{n-230}}\cdot\frac{a_{n-230}}{a_{n-231}}\cdot\frac{a_{n-231}}{a_{n-232}}\cdot\frac{a_{n-232}}{a_{n-233}}\cdot\frac{a_{n-233}}{a_{n-234}}\cdot\frac{a_{n-234}}{a_{n-235}}\cdot\frac{a_{n-235}}{a_{n-236}}\cdot\frac{a_{n-236}}{a_{n-237}}\cdot\frac{a_{n-237}}{a_{n-238}}\cdot\frac{a_{n-238}}{a_{n-239}}\cdot\frac{a_{n-239}}{a_{n-240}}\cdot\frac{a_{n-240}}{a_{n-241}}\cdot\frac{a_{n-241}}{a_{n-242}}\cdot\frac{a_{n-242}}{a_{n-243}}\cdot\frac{a_{n-243}}{a_{n-244}}\cdot\frac{a_{n-244}}{a_{n-245}}\cdot\frac{a_{n-245}}{a_{n-246}}\cdot\frac{a_{n-246}}{a_{n-247}}\cdot\frac{a_{n-247}}{a_{n-248}}\cdot\frac{a_{n-248}}{a_{n-249}}\cdot\frac{a_{n-249}}{a_{n-250}}\cdot\frac{a_{n-250}}{a_{n-251}}\cdot\frac{a_{n-251}}{a_{n-252}}\cdot\frac{a_{n-252}}{a_{n-253}}\cdot\frac{a_{n-253}}{a_{n-254}}\cdot\frac{a_{n-254}}{a_{n-255}}\cdot\frac{a_{n-255}}{a_{n-256}}\cdot\frac{a_{n-256}}{a_{n-257}}\cdot\frac{a_{n-257}}{a_{n-258}}\cdot\frac{a_{n-258}}{a_{n-259}}\cdot\frac{a_{n-259}}{a_{n-260}}\cdot\frac{a_{n-260}}{a_{n-261}}\cdot\frac{a_{n-261}}{a_{n-262}}\cdot\frac{a_{n-262}}{a_{n-263}}\cdot\frac{a_{n-263}}{a_{n-264}}\cdot\frac{a_{n-264}}{a_{n-265}}\cdot\frac{a_{n-265}}{a_{n-266}}\cdot\frac{a_{n-266}}{a_{n-267}}\cdot\frac{a_{n-267}}{a_{n-268}}\cdot\frac{a_{n-268}}{a_{n-269}}\cdot\frac{a_{n-269}}{a_{n-270}}\cdot\frac{a_{n-270}}{a_{n-271}}\cdot\frac{a_{n-271}}{a_{n-272}}\cdot\frac{a_{n-272}}{a_{n-273}}\cdot\frac{a_{n-273}}{a_{n-274}}\cdot\frac{a_{n-274}}{a_{n-275}}\cdot\frac{a_{n-275}}{a_{n-276}}\cdot\frac{a_{n-276}}{a_{n-277}}\cdot\frac{a_{n-277}}{a_{n-278}}\cdot\frac{a_{n-278}}{a_{n-279}}\cdot\frac{a_{n-279}}{a_{n-280}}\cdot\frac{a_{n-280}}{a_{n-281}}\cdot\frac{a_{n-281}}{a_{n-282}}\cdot\frac{a_{n-282}}{a_{n-283}}\cdot\frac{a_{n-283}}{a_{n-284}}\cdot\frac{a_{n-284}}{a_{n-285}}\cdot\frac{a_{n-285}}{a_{n-286}}\cdot\frac{a_{n-286}}{a_{n-287}}\cdot\frac{a_{n-287}}{a_{n-288}}\cdot\frac{a_{n-288}}{a_{n-289}}\cdot\frac{a_{n-289}}{a_{n-290}}\cdot\frac{a_{n-290}}{a_{n-291}}\cdot\frac{a_{n-291}}{a_{n-292}}\cdot\frac{a_{n-292}}{a_{n-293}}\cdot\frac{a_{n-293}}{a_{n-294}}\cdot\frac{a_{n-294}}{a_{n-295}}\cdot\frac{a_{n-295}}{a_{n-296}}\cdot\frac{a_{n-296}}{a_{n-297}}\cdot\frac{a_{n-297}}{a_{n-298}}\cdot\frac{a_{n-298}}{a_{n-299}}\cdot\frac{a_{n-299}}{a_{n-300}}\cdot\frac{a_{n-300}}{a_{n-301}}\cdot\frac{a_{n-301}}{a_{n-302}}\cdot\frac{a_{n-302}}{a_{n-303}}\cdot\frac{a_{n-303}}{a_{n-304}}\cdot\frac{a_{n-304}}{a_{n-305}}\cdot\frac{a_{n-305}}{a_{n-306}}\cdot\frac{a_{n-306}}{a_{n-307}}\cdot\frac{a_{n-307}}{a_{n-308}}\cdot\frac{a_{n-308}}{a_{n-309}}\cdot\frac{a_{n-309}}{a_{n-310}}\cdot\frac{a_{n-310}}{a_{n-311}}\cdot\frac{a_{n-311}}{a_{n-312}}\cdot\frac{a_{n-312}}{a_{n-313}}\cdot\frac{a_{n-313}}{a_{n-314}}\cdot\frac{a_{n-314}}{a_{n-315}}\cdot\frac{a_{n-315}}{a_{n-316}}\cdot\frac{a_{n-316}}{a_{n-317}}\cdot\frac{a_{n-317}}{a_{n-318}}\cdot\frac{a_{n-318}}{a_{n-319}}\cdot\frac{a_{n-319}}{a_{n-320}}\cdot\frac{a_{n-320}}{a_{n-321}}\cdot\frac{a_{n-321}}{a_{n-322}}\cdot\frac{a_{n-322}}{a_{n-323}}\cdot\frac{a_{n-323}}{a_{n-324}}\cdot\frac{a_{n-324}}{a_{n-325}}\cdot\frac{a_{n-325}}{a_{n-326}}\cdot\frac{a_{n-326}}{a_{n-327}}\cdot\frac{a_{n-327}}{a_{n-328}}\cdot\frac{a_{n-328}}{a_{n-329}}\cdot\frac{a_{n-329}}{a_{n-330}}\cdot\frac{a_{n-330}}{a_{n-331}}\cdot\frac{a_{n-331}}{a_{n-332}}\cdot\frac{a_{n-332}}{a_{n-333}}\cdot\frac{a_{n-333}}{a_{n-334}}\cdot\frac{a_{n-334}}{a_{n-335}}\cdot\frac{a_{n-335}}{a_{n-336}}\cdot\frac{a_{n-336}}{a_{n-337}}\cdot\frac{a_{n-337}}{a_{n-338}}\cdot\frac{a_{n-338}}{a_{n-339}}\cdot\frac{a_{n-339}}{a_{n-340}}\cdot\frac{a_{n-340}}{a_{n-341}}\cdot\frac{a_{n-341}}{a_{n-342}}\cdot\frac{a_{n-342}}{a_{n-343}}\cdot\frac{a_{n-343}}{a_{n-344}}\cdot\frac{a_{n-344}}{a_{n-345}}\cdot\frac{a_{n-345}}{a_{n-346}}\cdot\frac{a_{n-346}}{a_{n-347}}\cdot\frac{a_{n-347}}{a_{n-348}}\cdot\frac{a_{n-348}}{a_{n-349}}\cdot\frac{a_{n-349}}{a_{n-350}}\cdot\frac{a_{n-350}}{a_{n-351}}\cdot\frac{a_{n-351}}{a_{n-352}}\cdot\frac{a_{n-352}}{a_{n-353}}\cdot\frac{a_{n-353}}{a_{n-354}}\cdot\frac{a_{n-354}}{a_{n-355}}\cdot\frac{a_{n-355}}{a_{n-356}}\cdot\frac{a_{n-356}}{a_{n-357}}\cdot\frac{a_{n-357}}{a_{n-358}}\cdot\frac{a_{n-358}}{a_{n-359}}\cdot\frac{a_{n-359}}{a_{n-360}}\cdot\frac{a_{n-360}}{a_{n-361}}\cdot\frac{a_{n-361}}{a_{n-362}}\cdot\frac{a_{n-362}}{a_{n-363}}\cdot\frac{a_{n-363}}{a_{n-364}}\cdot\frac{a_{n-364}}{a_{n-365}}\cdot\frac{a_{n-365}}{a_{n-366}}\cdot\frac{a_{n-366}}{a_{n-367}}\cdot\frac{a_{n-367}}{a_{n-368}}\cdot\frac{a_{n-368}}{a_{n-369}}\cdot\frac{a_{n-369}}{a_{n-370}}\cdot\frac{a_{n-370}}{a_{n-371}}\cdot\frac{a_{n-371}}{a_{n-372}}\cdot\frac{a_{n-372}}{a_{n-373}}\cdot\frac{a_{n-373}}{a_{n-374}}\cdot\frac{a_{n-374}}{a_{n-375}}\cdot\frac{a_{n-375}}{a_{n-376}}\cdot\frac{a_{n-376}}{a_{n-377}}\cdot\frac{a_{n-377}}{a_{n-378}}\cdot\frac{a_{n-378}}{a_{n-379}}\cdot\frac{a_{n-379}}{a_{n-380}}\cdot\frac{a_{n-380}}{a_{n-381}}\cdot\frac{a_{n-381}}{a_{n-382}}\cdot\frac{a_{n-382}}{a_{n-383}}\cdot\frac{a_{n-383}}{a_{n-384}}\cdot\frac{a_{n-384}}{a_{n-385}}\cdot\frac{a_{n-385}}{a_{n-386}}\cdot\frac{a_{n-386}}{a_{n-387}}\cdot\frac{a_{n-387}}{a_{n-388}}\cdot\frac{a_{n-388}}{a_{n-389}}\cdot\frac{a_{n-389}}{a_{n-390}}\cdot\frac{a_{n-390}}{a_{n-391}}\cdot\frac{a_{n-391}}{a_{n-392}}\cdot\frac{a_{n-392}}{a_{n-393}}\cdot\frac{a_{n-393}}{a_{n-394}}\cdot\frac{a_{n-394}}{a_{n-395}}\cdot\frac{a_{n-395}}{a_{n-396}}\cdot\frac{a_{n-396}}{a_{n-397}}\cdot\frac{a_{n-397}}{a_{n-398}}\cdot\frac{a_{n-398}}{a_{n-399}}\cdot\frac{a_{n-399}}{a_{n-400}}\cdot\frac{a_{n-400}}{a_{n-401}}\cdot\frac{a_{n-401}}{a_{n-402}}\cdot\frac{a_{n-402}}{a_{n-403}}\cdot\frac{a_{n-403}}{a_{n-404}}\cdot\frac{a_{n-404}}{a_{n-405}}\cdot\frac{a_{n-405}}{a_{n-406}}\cdot\frac{a_{n-406}}{a_{n-407}}\cdot\frac{a_{n-407}}{a_{n-408}}\cdot\frac{a_{n-408}}{a_{n-409}}\cdot\frac{a_{n-409}}{a_{n-410}}\cdot\frac{a_{n-410}}{a_{n-411}}\cdot\frac{a_{n-411}}{a_{n-412}}\cdot\frac{a_{n-412}}{a_{n-413}}\cdot\frac{a_{n-413}}{a_{n-414}}\cdot\frac{a_{n-414}}{a_{n-415}}\cdot\frac{a_{n-415}}{a_{n-416}}\cdot\frac{a_{n-416}}{a_{n-417}}\cdot\frac{a_{n-417}}{a_{n-418}}\cdot\frac{a_{n-418}}{a_{n-419}}\cdot\frac{a_{n-419}}{a_{n-420}}\cdot\frac{a_{n-420}}{a_{n-421}}\cdot\frac{a_{n-421}}{a_{n-422}}\cdot\frac{a_{n-422}}{a_{n-423}}\cdot\frac{a_{n-423}}{a_{n-424}}\cdot\frac{a_{n-424}}{a_{n-425}}\cdot\frac{a_{n-425}}{a_{n-426}}\cdot\frac{a_{n-426}}{a_{n-427}}\cdot\frac{a_{n-427}}{a_{n-428}}\cdot\frac{a_{n-428}}{a_{n-429}}\cdot\frac{a_{n-429}}{a_{n-430}}\cdot\frac{a_{n-430}}{a_{n-431}}\cdot\frac{a_{n-431}}{a_{n-432}}\cdot\frac{a_{n-432}}{a_{n-433}}\cdot\frac{a_{n-433}}{a_{n-434}}\cdot\frac{a_{n-434}}{a_{n-435}}\cdot\frac{a_{n-435}}{a_{n-436}}\cdot\frac{a_{n-436}}{a_{n-437}}\cdot\frac{a_{n-437}}{a_{n-438}}\cdot\frac{a_{n-438}}{a_{n-439}}\cdot\frac{a_{n-439}}{a_{n-440}}\cdot\frac{a_{n-440}}{a_{n-441}}\cdot\frac{a_{n-441}}{a_{n-442}}\cdot\frac{a_{n-442}}{a_{n-443}}\cdot\frac{a_{n-443}}{a_{n-444}}\cdot\frac{a_{n-444}}{a_{n-445}}\cdot\frac{a_{n-445}}{a_{n-446}}\cdot\frac{a_{n-446}}{a_{n-447}}\cdot\frac{a_{n-447}}{a_{n-448}}\cdot\frac{a_{n-448}}{a_{n-449}}\cdot\frac{a_{n-449}}{a_{n-450}}\cdot\frac{a_{n-450}}{a_{n-451}}\cdot\frac{a_{n-451}}{a_{n-452}}\cdot\frac{a_{n-452}}{a_{n-453}}\cdot\frac{a_{n-453}}{a_{n-454}}\cdot\frac{a_{n-454}}{a_{n-455}}\cdot\frac{a_{n-455}}{a_{n-456}}\cdot\frac{a_{n-456}}{a_{n-457}}\cdot\frac{a_{n-457}}{a_{n-458}}\cdot\frac{a_{n-458}}{a_{n-459}}\cdot\frac{a_{n-459}}{a_{n-460}}\cdot\frac{a_{n-460}}{a_{n-461}}\cdot\frac{a_{n-461}}{a_{n-462}}\cdot\frac{a_{n-462}}{a_{n-463}}\cdot\frac{a_{n-463}}{a_{n-464}}\cdot\frac{a_{n-464}}{a_{n-465}}\cdot\frac{a_{n-465}}{a_{n-466}}\cdot\frac{a_{n-466}}{a_{n-467}}\cdot\frac{a_{n-467}}{a_{n-468}}\cdot\frac{a_{n-468}}{a_{n-469}}\cdot\frac{a_{n-469}}{a_{n-470$$