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|  | |  |  |  | | --- | --- | --- | | Meno: | Ondrej Krajčovič | Hodnotenie projektu:  (max 10(TS)/5(RAM) bodov) | | Cvičenie: | Pondelok 11:00 – 12:50 |  | | Dátum: | 28.5.2024 | |

**Projekt TZIV LS2023/24 – RAM 7.**

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| --- | --- | --- | --- |
| **Zadanie:** | Na vstupe sú dve celé čísla A a D (max 20) a číslo N (max 100000). Navrhnite programový kód pre RAM - riešenie, ktoré vypíše prvých N členov aritmetickej postupnosti usporiadaných od najväčšieho po najmenší. A je prvý člen a D je rozdiel.  Príklad:   |  |  | | --- | --- | | Vstup:  **2, 3, 7**  Výstup:  **20, 17, 14, 11, 8, 5, 2** | Vstup:  **1, 2, 10**  Výstup:  **19, 17, 15, 13, 11, 9, 7, 5, 3, 1** |   Zadanie riešte nedeštruktívne (vstup nepremazávajte a spracovávajte po registroch, výstup umiestnite na pásku, ak je to potrebné, použite Accept/Reject). Ošetrite nedefinované vstupy, ak je to potrebné. Diskutujte jednotkovú časovú zložitosť Vášho riešenia – počet krokov v závislosti od veľkosti vstupu. Počet opakovaní a asymptotickú zložitostnú mieru vypíšte. |
| **Neakceptovaný Vstup:** | |  |  |  | | --- | --- | --- | | Vstup:  **22, 3, 7** | Vstup:  **2, 22, 7** | Vstup:  **2, 3, 100002** | |
| **Neformálne riešenie:** | Najprv sa načítam zo vstupu tri celé čísla. Následne ich od každého z nich odčítam hornú hranicu, ktorá mi bola daná v zadní. Ak je číslo po odčítaní menšie ako nula, terminujeme program. Následne vypočítame najväčšie číslo našej postupnosti a zistí či je väčšie ako A. Od tohto čísla odčítame číslo D v slučke až pokým nedostaneme číslo menšie ako A. |

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| Časová zložitosť riešenia: | |  |  |  |  | | --- | --- | --- | --- | |  | O | log |  | | read 2 | 1 | l(i) + l(2) |  | | read 3 | 1 | l(j) + l(3) |  | | read 4 | 1 | l(k) + l(4) |  | |  |  |  |  | | load 2 | 1 | l(2) + l(i) |  | | sub =20 | 1 | l(i) + l(20) |  | | jgtz end | 1 | l(i-20) |  | |  |  |  |  | | load 3 | 1 | l(3) + l(j) |  | | sub =20 | 1 | l(j) + l(20) |  | | jgtz end | 1 | l(j-20) |  | |  |  |  |  | | load 4 | 1 | l(4) + l(k) |  | | sub =100000 | 1 | l(k) + l(100000) |  | | jgtz end | 1 | l(k-100000) |  | |  |  |  |  | |  |  |  |  | | load 4 | 1 | l(4) + l(k) |  | | mul 3 | 1 | l(k) + l(3) + l(j) |  | | sub =1 | 1 | l(k\*j) + l(1) |  | | sub 2 | 1 | l(k\*j - 1) + l(2) + l(i) | **a = k\*j - 1** | | jzero hop | 1 | l(a-i) |  | | jgtz hop | 1 | l(a-i) |  | | jump end | 1 | 1 |  | | hop: | 1 |  |  | | add 2 | 1 | l(a - i) + l(2) + l(i) |  | | store 1 | 1 | l(a) + l(1) |  | | write 1 | 1 | l(1) + l(a) |  | |  |  |  |  | | sub 3 | 1 | l(a) + l(3) + l(j) |  | | sub 2 | 1 | l(a - j) + l(2) + l(i) |  | | jzero skok | 1 | l(a - j - i) |  | | jgtz skok | 1 | l(a - j - i) |  | | jump end | 1 | 1 |  | | skok: | 1 |  |  | | add 2 | 1 | l(a - j - i) + l(2) + l(i) |  | | store 1 | 1 | l(a-j) + l(1) |  | | jgtz loop | 1 | l(a - j) |  | |  |  |  |  | | halt | 1 | 1 |  | |  |  |  |  | | loop: |  |  |  | | load 1 | n + 1 | l(1) + l(a - j\*(n+1)) |  | | write 1 | n + 1 | l(1) + l(a - j\*(n+1)) |  | | sub 3 | n + 1 | l(a - j\*(n+1)) +l(3) + l(j) |  | | sub 2 | n + 1 | l(a - j\*(n+2)) +l(2) + l(i) |  | | jzero tralala | n + 1 | l(a - j\*(n+2)) |  | | jgtz tralala | n + 1 | l(a - j\*(n+2)) |  | | jump end | 1 | 1 |  | | tralala: | n |  |  | | add 2 | n | l(a - j\*(n+2)) +l(2) + l(i) |  | | store 1 | n | l(a - j\*(n+1)) + l(1) |  | | jump loop | n | l(a - j\*(n+1)) |  | |  |  |  |  | | end: |  |  |  | | halt | 1 | 1 |  | |  |  |  |  | |  | 10\*n + 27 |  |  | |  | O(n) |  |  |     \*Pre zjednodušenie výrazu som substituoval **k\*j – 1** na **a**  Pri riešení zadania som použil jeden cyklus ktorý odčítava číslo D od vopred lineárne vypočítaného maxima. |
| Priestorová zložitosť riešenia: | |  |  |  | | --- | --- | --- | | register | použitie |  | | 0 |  |  | | 1 | temp |  | | 2 | i | A | | 3 | j | D | | 4 | k | N |   Na výpočet používam 4 registre naplnené vstupmi i,j,k temporary registrom na ukladanie priebežných výsledkov a nul-tým registrom ktorý je povinný na výpočty  **best case scenario:**  A = 1, D = 1, N = 1  **worst case scenario:**  A = 19 D = 19, N =99,999  Celková jednotková zložitosť riešenia je O(n) |
| Použitý Simulátor: | Simstudio |