A Group of Teenagers. There is a group of teenagers. The product of their ages is a large number.

a) The product of their ages is 18,726,552. Find the age of each teenager.

b) Given the product of their ages, how do you know if there is at least one 13-year-old?

c) Given the product of their ages, how do you know if there is at least one 18-year-old?

d) The product of their ages is 17,442,000. Find the age of each teenager.
How does this relate to your answer for part C?

e) Now, I will give you the product of their ages expressed as its prime factorization.
Find the ages of all the teenagers in the group. (Some are not possible.)

i) $2^{12} \cdot 13^4 \cdot 17$

ii) $2^{12} \cdot 13^4 \cdot 11$

iii) $2^4 \cdot 3^3 \cdot 5^3 \cdot 7^4 \cdot 17^2$

iv) $2 \cdot 3^4 \cdot 5^6 \cdot 19^3$

v) $2 \cdot 3^6 \cdot 5^4 \cdot 19^3$

vi) $2^{10} \cdot 3^6 \cdot 7^3 \cdot 13^4 \cdot 17^3$

vii) $2^{19} \cdot 3^8 \cdot 5^2 \cdot 7^4 \cdot 17^2 \cdot 19^3$

viii) $2^4 \cdot 3^6 \cdot 5^4 \cdot 7^3 \cdot 13$

ix) $2^{15} \cdot 3^{10} \cdot 5^2 \cdot 7 \cdot 13^3 \cdot 19^2$