Question #2 on 2018 Sample 6 is a Patristocrat with a K1 alphabet and a simple clue:

> 2) **[300 Points]** Solve this Patristocrat which is a quote by Aristotle which is encoded using a K1 key and starts and ends with the word **IT**.
>
> VCVBC  UNXQA  IKTQJ  NODSQ  CNOXV  JOCKR  NQRMN  CKNJC
>
> NACQV  JQCUK  DPUCL  VCUKD  CQSSN  YCVJP  VC

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| Replacement | | | | | | | | | | | | | | | | | | | | | | | | | | |

## Here's one approach to solving it.

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1. Since we are given that **VC** corresponds to **IT**, we can go through and make that substitution globally as well as put it in our replacement below

VCVBC  UNXQA  IKTQJ  NODSQ  CNOXV  JOCKR  NQRMN  CKNJC
ITI T                           T       I       T               T       T
NACQV  JQCUK  DPUCL  VCUKD  CQSSN  YCVJP  VC
  T  I      T          T      IT        T           TI        IT

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| Replacement | | | N | | | | | | | | | | | | | | | | | | | I | | | | |

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2. Next we see that the frequency of **N** is the highest remaining, we are going to guess that it is the letter **E**. even though we have **C** at a very high frequency which we were told what it maps to.

VCVBC  UNXQA  IKTQJ  NODSQ  CNOXV  JOCKR  NQRMN  CKNJC
ITI T      E                 E         TE      I       T      E       E T E T
NACQV  JQCUK  DPUCL  VCUKD  CQSSN  YCVJP  VC
E  T  I      T          T      IT        T      E      TI        IT

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| Replacement | | | T | | | | | | | | | | | E | | | | | | | | I | | | | |

3. Looking at the start, we see **IT  I?** and can't help but think that it says "IT IS" so we go ahead and fill that in.  This also shows us a **ST** corresponding to **BC** which gives us a little confidence in the choice. We also can see that there are too many letters between the **E** and **I** tells us the **E** must be part of a key phrase.

```
VCVBC UNXQA IKTQJ NODSQ CNOXV JOCKR NQRMN CKNJC
IT IS T   E                E       TE   I    T      E     E T E T
NACQV JQCUK DPUCL VCUKD CQSSN YCVJP VC
E  T  I      T           T    IT     T    E    TI     IT
```

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| Replacement | | S | T | | | | | | | | | | | E | | | | | | | | I | | | | |

4. Since we think that I is probably not part of the key phrase, it is a good bet that **U** corresponds to either a **G** or an **H**.  Looking at the start of our phrase, Trying an **H** for the **U** makes the phrase start out as **IT IS THE** giving us another boost of confidence.

```
VCVBC UNXQA IKTQJ NODSQ CNOXV JOCKR NQRMN CKNJC
IT IS T HE                E       TE   I    T      E     E T E T
NACQV JQCUK DPUCL VCUKD CQSSN YCVJP VC
E  T  I    TH        HT    ITH      T    E    TI     IT
```

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| Replacement | | S | T | | | | | | | | | | | E | | | | | | | H | I | | | | |

5. Looking at the **HT?ITH** sequence, there are very few words that have **ITH** in them with the most obvious being **WITH** so we will take a guess that **L** stands for **W**.  This is reasonable since W is a very low frequency letter and there is only a single occurrence of **L** in the text. We can also be certain that it is part of the keyphrase.

```
VCVBC UNXQA IKTQJ NODSQ CNOXV JOCKR NQRMN CKNJC
IT IS T HE                E       TE   I    T      E     E T E T
NACQV JQCUK DPUCL VCUKD CQSSN YCVJP VC
E  T  I    TH        HTW   ITH      T    E    TI     IT
```

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| Replacement | | S | T | | | | | | | | | W | | E | | | | | | | H | I | | | | |

6. Remembering that W has been taken now, we make a quick count of the letters after the **ST** we notice that **UVXYZ** fills in for **DEFGH** and given that **EFGH** are not used, **VXYZ** not appearing in the quote is logical. So we will guess that **D** stands for **U** and it also tells us our keyphrase probably starts at **I**.

```
VCVBC UNXQA IKTQJ NODSQ CNOXV JOCKR NQRMN CKNJC
ITIST HE              E  U    TE   I     T     E      E T E  T
NACQV JQCUK DPUCL VCUKD CQSSN YCVJP VC
E  T  I     TH   U  HTW ITH U  T      E   TI     IT
```

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| Replacement | | S | T | U | V | X | Y | Z | | | | W | | E | | | | | | | H | I | | | | |

7. Now we take a quick check of our six most frequent letters ETAOIN, we only need to see where A O and N might be used. For this, J K and Q stand out for their higher frequency.

```
VCVBC UNXQA IKTQJ NODSQ CNOXV JOCKR NQRMN CKNJC
ITIST HE aon     aon aonaon  E U aon  TE   I aon  T aon  E aon   E T aonE aon T
NACQV JQCUK DPUCL VCUKD CQSSN YCVJP VC
E  T aon I aonaon TH aon U HTW ITH aonU T Ao/n    E   TI aon   IT
```

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| Replacement | | S | T | U | V | X | Y | Z | | aon | aon | W | | E | | | aon | | | | H | I | | | | |

8. Looking at this, **WITHaonUT** tells us the K must be O. WNow we take a quick check of our six most frequent letters ETAOIN, we only need to see where A O and N might be used. For this, J K and Q stand out for their higher frequency.

```
VCVBC UNXQA IKTQJ NODSQ CNOXV JOCKR NQRMN CKNJC
ITIST HE an      O an an  E U an  TE   I an  TO   E an   E TOE an T
NACQV JQCUK DPUCL VCUKD CQSSN YCVJP VC
E  T an I an an THO U HTW ITHOU T an    E   TI an   IT
```

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| Replacement | | S | T | U | V | X | Y | Z | | an | O | W | | E | | | an | | | | H | I | | | | |

9. **THOU?HT** can only be **THOUGHT** which tells us the **P** must stand for **G**. It also tells us that the keyphrase must extend to the letter P.

```
VCVBC UNXQA IKTQJ NODSQ CNOXV JOCKR NQRMN CKNJC
ITIST HE    O    an an E U   an TE   I   an TO   E  an   E TOE an T
```
(overlay: ITIST HE [an] O [an an] E U [an] TE I [an] TO E [an] E TOE [an] T)

```
NACQV JQCUK DPUCL VCUKD CQSSN YCVJP VC
E T an I  an an THO UGHTW ITHOU T an   E  TI an G IT
```

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| Replacement | | S | T | U | V | X | Y | Z | an | O | W | | E | | G | an | | | | H | I | | | | | |

10. This gives us a really nice breakthrough as it tells us that **J** must be **N** (and **Q** is **A**) by looking at the **WITHOUT an??E?TIaonG IT**. It wouldn't make sense to for **J** to be **A** which would read as **WITHOUT N??E?TIAG IT**. Filling that in gives us:

```
VCVBC UNXQA IKTQJ NODSQ CNOXV JOCKR NQRMN CKNJC
ITIST HE A    O AN E U A TE   I N TO   EA   E TOENT
```

```
NACQV JQCUK DPUCL VCUKD CQSSN YCVJP VC
E TAI NATHO UGHTW ITHOU TA   E   TING IT
```

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| Replacement | | S | T | U | V | X | Y | Z | | N | O | W | | E | | G | A | | | | H | I | | | | |

11. Stepping back in to the K1 alphabet, we see that there is only one letter gap in the Q-U mapping for A-H and a two letter gap in the V-B range for I-S. So we fill out those letters and look to see what that gives us.

```
VCVBC UNXQA IKTQJ NODSQ CNOXV JOCKR NQRMN CKNJC
ITIST HE klm A pqr   O df AN E U cd A TE kl/m I N TO bc EA bc  E TOENT
```

```
NACQV JQCUK DPUCL VCUKD CQSSN YCVJP VC
E pqr TAI NATHO UGHTW ITHOU TA cd cd E lm/p TING IT
```

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| Replacement | pqr | S | T | U | V | X | Y | Z | | N | O | W | | E | | G | A | bc | cd | df | H | I | | jkl | klm | lmp | mpq |

12. Reading through what this gives us, you can immediately see that **AcdcdElmpTING** must be **ACCEPTING** which means that **S** must be **C** (forcing **R** to be **B**) and **Y** must be **P** which forces **Z** to be **Q** and **A** to be **R**. Filling just those gives us.

```
VCVBC UNXQA IKTQJ NODSQ CNOXV JOCKR NQRMN CKNJC
ITIST HE klmAR  OdfAN E UCA TE  klmI N TOB EAB E TOENT
NACQV JQCUK DPUCL VCUKD CQSSN YCVJP VC
ERTAI NATHO UGHTW ITHOU TACCE PTING IT
```

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Frequency** | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| **Replacement** | R | S | T | U | V | X | Y | Z | | N | O | W | | E | | G | A | B | C | df | H | I | jkl | klm | P | Q |

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13. Next we see **E?UCATE** which tells us that **O** must be **D** (leaving **T** to map to **F**).

```
VCVBC UNXQA IKTQJ NODSQ CNOXV JOCKR NQRMN CKNJC
ITIST HE klmAR  OFAN EDUCA TED klmI NDTOB EAB E TOENT
NACQV JQCUK DPUCL VCUKD CQSSN YCVJP VC
ERTAI NATHO UGHTW ITHOU TACCE PTING IT
```

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Frequency** | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| **Replacement** | R | S | T | U | V | X | Y | Z | | N | O | W | | E | D | G | A | B | C | F | H | I | jkl | klm | P | Q |

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14. Seeing **OF AN EDUCATED** klm**IND** tells us that **X** must be **M**.

```
VCVBC UNXQA IKTQJ NODSQ CNOXV JOCKR NQRMN CKNJC
ITIST HEMAR  OFAN EDUCA TEDMI NDTOB EAB E TOENT
NACQV JQCUK DPUCL VCUKD CQSSN YCVJP VC
ERTAI NATHO UGHTW ITHOU TACCE PTING IT
```

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Frequency** | 2 | 1 | 13 | 3 | | | | | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 | | 2 | 1 | |
| **Replacement** | R | S | T | U | V | X | Y | Z | | N | O | W | | E | D | G | A | B | C | F | H | I | jkl | M | P | Q |

15. At this point we could simply stop as we have gotten all but two letters of the solution and it would be counted as correct, but with the K1 alphabet in mind, and only **J K** and **L** to place, it is pretty apparent that the key phrase is **KNOWLEDGE** with **I** for **K** and **M** for **L**.  Filling this in gives us a final answer and a complete K1 alphabet:

VCVBC UNXQA IKTQJ NODSQ CNOXV JOCKR NQRMN CKNJC
ITIST HEMAR KOFAN EDUCA TEDMI NDTOB EABLE TOENT
NACQV JQCUK DPUCL VCUKD CQSSN YCVJP VC
ERTAI NATHO UGHTW ITHOU TACCE PTING IT

| K1 | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Frequency** | 2 | 1 | 13 | 3 |  |  |  |  | 1 | 5 | 5 | 1 | 1 | 8 | 3 | 2 | 7 | 2 | 3 | 1 | 4 | 7 |  | 2 | 1 |  |
| **Replacement** | R | S | T | U | V | X | Y | Z | K | N | O | W | L | E | D | G | A | B | C | F | H | I | J | M | P | Q |