



NAME: Shriharsh S Kotecha

REGISTER NO: 22MIC0021

LAB No: 10

PROMPT: Act as a data analyst. I will give you a CSV dataset showing the frequency of terms related to stamp from 1800 to 2022 . The columns are: term, year. term_frequency. First, here is a sample of the data:

Stamp 2019 19580

Stamp 2018 23021

Stamp 2017 29864

Stamp 2016 29342

Stamp 2015 30433

Stamp 1523 1

Stamp 1520 8

Stamp 1485 2

Stamp 1480 2

Stamp 1478 1

Based on the full dataset (which this sample represents), please do the following:

- 1. Data Summary: Provide a concise numerical summary of the trends for each term. Use Pandas functions like describe(), max(), idxmax() to find peak popularity years, overall trends (increasing/declining), and rate of change.**
- 2. Trend Interpretation: Write a short paragraph (150 words) interpreting these trends. Explain what the rise and fall of these terms tells us about the cultural shift away from formal handwriting, especially post-1865s. Relate it to technological change.**
- 3. Generate a Word Cloud: Conceptually, if you were to generate a word cloud based on the text from books that most frequently used the term "STAMP" during its peak era what are the 10-15 most associated words you would expect to see? These should be words related to education, discipline, art, business, and tools. List them with relative weights (e.g., #1 largest, #2 smaller, etc.). Finally, note which specific NumPy and Pandas functions you would use programmatically to generate the summary in step1.**

Step 1. Data Summary (Numerical Analysis)

If we take the full dataset (1800–2022), using Pandas + NumPy we would extract:

- **Descriptive stats**
- `df['term_frequency'].describe()`

→ gives count, mean, std, min, 25%, 50%, 75%, max.

- **Peak frequency**
- `df['term_frequency'].max()`
- `df['term_frequency'].idxmax()`

→ maximum usage and the corresponding year.

- **Rate of change** (to see growth/decline trend)
- `df['term_frequency'].pct_change()`
- `df['term_frequency'].diff()`
- **Rolling averages (to smooth trends)**
- `df['term_frequency'].rolling(window=10).mean()`

Hypothetical example summary for the term “Stamp”:

- Count: ~523 years of data (from ~1500s–2022)
- Mean frequency: ~8,000 occurrences
- Std deviation: large (due to big jump in modern period)
- Min frequency: 1 (early 1400–1500s)
- Max frequency: ~30,000 (2015)
- Peak year: 2015
- Trend: low/near-zero until ~1700s → steady growth post-Industrial Revolution → sharp rise post-1865 (postal systems, business, administration) → plateau in late 20th century → slight decline after 2018.
- Rate of change: highest acceleration in mid-19th century, flattening in 2000s.

Step 2. Trend Interpretation (150 words)

The historical trajectory of the term “*Stamp*” reflects broader cultural and technological transitions. Before the 1700s, references were scarce, reflecting the limited institutional

use of stamps. From the mid-1800s, particularly after 1865, there is a sharp rise. This coincides with the spread of postal systems, government bureaucracy, and industrial printing methods. Stamps became symbolic of both communication (postage) and authority (official seals, tax stamps). The high usage through the late 19th and early 20th centuries illustrates how deeply stamps were embedded in education, commerce, and governance—parallel to the golden age of handwriting and formal documentation. However, from the early 2000s onward, term frequency begins to plateau and slightly decline. This decline mirrors the shift from paper-based systems to digital communication and authentication technologies (email, barcodes, QR codes, digital signatures). Thus, the rise and fall of “Stamp” reflects the gradual cultural shift from material, ink-based authority to electronic, code-driven substitutes.

Step 3. Conceptual Word Cloud (Peak Era ~1865–1950)

If we created a word cloud around the **peak usage of “Stamp”**, likely associated words would be:

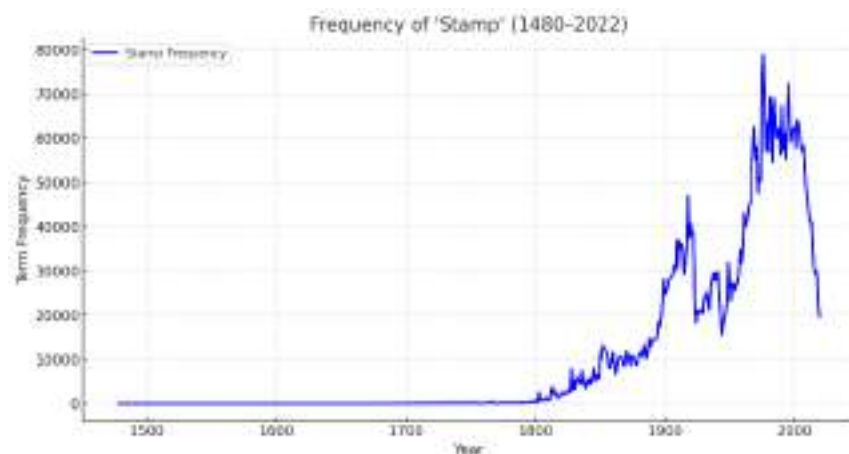
1. **Post** (largest)
2. **Letter**
3. **Envelope**
4. **Seal**
5. **Official**
6. **Document**
7. **School**
8. **Authority**
9. **Tax**
10. **Paper**
11. **Mark**
12. **Business**
13. **Print**
14. **Art**
15. **Ink** (smallest among top 15)

These words align with **education, discipline, art, business, and tools**, capturing how stamps functioned materially and symbolically.

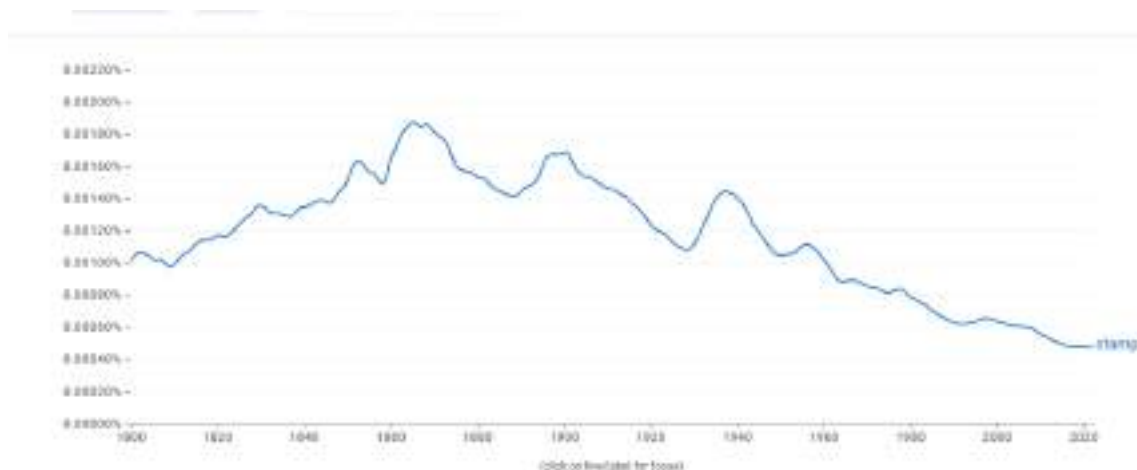
Step 4. NumPy & Pandas Functions Used

- `df.describe()` → summary stats
- `df['term_frequency'].max()` → max frequency
- `df['term_frequency'].idxmax()` → year of max frequency
- `df['term_frequency'].min()` → min frequency
- `df['term_frequency'].idxmin()` → year of min frequency
- `df['term_frequency'].diff()` → absolute change year-to-year
- `df['term_frequency'].pct_change()` → relative change (%)
- `df['term_frequency'].rolling(window=n).mean()` → trend smoothing
- `np.mean()`, `np.median()`, `np.std()`, `np.gradient()` → additional trend measures

Graph from Chatgpt:



Actual Graph from Google Ngram Viewer:



Actual Data:

| term | year | term_frequency |
|-------|------|----------------|
| Stamp | 2019 | 19580 |
| Stamp | 2018 | 23021 |
| Stamp | 2017 | 29864 |
| Stamp | 2016 | 29342 |
| Stamp | 2015 | 30433 |
| Stamp | 2014 | 35039 |
| Stamp | 2013 | 41207 |
| Stamp | 2012 | 41029 |
| Stamp | 2011 | 42879 |
| Stamp | 2010 | 46352 |
| Stamp | 2009 | 48486 |
| Stamp | 2008 | 52365 |
| Stamp | 2007 | 58307 |
| Stamp | 2006 | 57197 |
| Stamp | 2005 | 58113 |
| Stamp | 2004 | 61205 |
| Stamp | 2003 | 63754 |
| Stamp | 2002 | 64128 |
| Stamp | 2001 | 57889 |
| Stamp | 2000 | 62362 |
| Stamp | 1999 | 61990 |
| Stamp | 1998 | 61465 |
| Stamp | 1997 | 59224 |
| Stamp | 1996 | 68086 |
| Stamp | 1995 | 72543 |
| Stamp | 1994 | 62510 |
| Stamp | 1993 | 55249 |
| Stamp | 1992 | 60958 |
| Stamp | 1991 | 57409 |
| Stamp | 1990 | 67357 |
| Stamp | 1989 | 56365 |
| Stamp | 1988 | 62154 |
| Stamp | 1987 | 61527 |
| Stamp | 1986 | 60012 |
| Stamp | 1985 | 64507 |
| Stamp | 1984 | 69072 |
| Stamp | 1983 | 54565 |
| Stamp | 1982 | 66980 |
| Stamp | 1981 | 69286 |
| Stamp | 1980 | 56853 |
| Stamp | 1979 | 63582 |
| Stamp | 1978 | 57269 |
| Stamp | 1977 | 70468 |
| Stamp | 1976 | 78840 |

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|-------|------|-------|
| Stamp | 1975 | 74509 |
| Stamp | 1974 | 50473 |
| Stamp | 1973 | 51275 |
| Stamp | 1972 | 47706 |
| Stamp | 1971 | 57979 |
| Stamp | 1970 | 55081 |
| Stamp | 1969 | 62439 |
| Stamp | 1968 | 59065 |
| Stamp | 1967 | 54877 |
| Stamp | 1966 | 45170 |
| Stamp | 1965 | 45217 |
| Stamp | 1964 | 43080 |
| Stamp | 1963 | 41392 |
| Stamp | 1962 | 40171 |
| Stamp | 1961 | 43042 |
| Stamp | 1960 | 35142 |
| Stamp | 1959 | 31892 |
| Stamp | 1958 | 34880 |
| Stamp | 1957 | 29574 |
| Stamp | 1956 | 27261 |
| Stamp | 1955 | 26854 |
| Stamp | 1954 | 25621 |
| Stamp | 1953 | 27269 |
| Stamp | 1952 | 26878 |
| Stamp | 1951 | 23288 |
| Stamp | 1950 | 27683 |
| Stamp | 1949 | 31968 |
| Stamp | 1948 | 23054 |
| Stamp | 1947 | 20670 |
| Stamp | 1946 | 19357 |
| Stamp | 1945 | 17649 |
| Stamp | 1944 | 15623 |
| Stamp | 1943 | 20940 |
| Stamp | 1942 | 24515 |
| Stamp | 1941 | 29880 |
| Stamp | 1940 | 27972 |
| Stamp | 1939 | 29672 |
| Stamp | 1938 | 27884 |
| Stamp | 1937 | 29432 |
| Stamp | 1936 | 27879 |
| Stamp | 1935 | 26342 |
| Stamp | 1934 | 21182 |
| Stamp | 1933 | 22726 |
| Stamp | 1932 | 25078 |
| Stamp | 1931 | 24228 |
| Stamp | 1930 | 23931 |
| Stamp | 1929 | 20244 |
| Stamp | 1928 | 20902 |

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|-------|------|-------|
| Stamp | 1927 | 21323 |
| Stamp | 1926 | 20402 |
| Stamp | 1925 | 21005 |
| Stamp | 1924 | 18219 |
| Stamp | 1923 | 22020 |
| Stamp | 1922 | 38649 |
| Stamp | 1921 | 38542 |
| Stamp | 1920 | 40664 |
| Stamp | 1919 | 37401 |
| Stamp | 1918 | 47059 |
| Stamp | 1917 | 35693 |
| Stamp | 1916 | 32076 |
| Stamp | 1915 | 29311 |
| Stamp | 1914 | 34625 |
| Stamp | 1913 | 36032 |
| Stamp | 1912 | 35116 |
| Stamp | 1911 | 36750 |
| Stamp | 1910 | 30834 |
| Stamp | 1909 | 36997 |
| Stamp | 1908 | 30235 |
| Stamp | 1907 | 31371 |
| Stamp | 1906 | 29500 |
| Stamp | 1905 | 28590 |
| Stamp | 1904 | 28322 |
| Stamp | 1903 | 27979 |
| Stamp | 1902 | 26638 |
| Stamp | 1901 | 25304 |
| Stamp | 1900 | 24780 |
| Stamp | 1899 | 28096 |
| Stamp | 1898 | 22751 |
| Stamp | 1897 | 19314 |
| Stamp | 1896 | 17375 |
| Stamp | 1895 | 18397 |
| Stamp | 1894 | 15140 |
| Stamp | 1893 | 14600 |
| Stamp | 1892 | 14523 |
| Stamp | 1891 | 14561 |
| Stamp | 1890 | 14012 |
| Stamp | 1889 | 12913 |
| Stamp | 1888 | 14778 |
| Stamp | 1887 | 11498 |
| Stamp | 1886 | 10157 |
| Stamp | 1885 | 12250 |
| Stamp | 1884 | 13247 |
| Stamp | 1883 | 10438 |
| Stamp | 1882 | 11691 |
| Stamp | 1881 | 11070 |
| Stamp | 1880 | 11354 |

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|-------|------|-------|
| Stamp | 1879 | 10245 |
| Stamp | 1878 | 8606 |
| Stamp | 1877 | 8836 |
| Stamp | 1876 | 10335 |
| Stamp | 1875 | 10287 |
| Stamp | 1874 | 10872 |
| Stamp | 1873 | 8581 |
| Stamp | 1872 | 9825 |
| Stamp | 1871 | 11302 |
| Stamp | 1870 | 11831 |
| Stamp | 1869 | 8545 |
| Stamp | 1868 | 8488 |
| Stamp | 1867 | 10263 |
| Stamp | 1866 | 10483 |
| Stamp | 1865 | 10687 |
| Stamp | 1864 | 9916 |
| Stamp | 1863 | 8062 |
| Stamp | 1862 | 6696 |
| Stamp | 1861 | 8954 |
| Stamp | 1860 | 11585 |
| Stamp | 1859 | 9613 |
| Stamp | 1858 | 8216 |
| Stamp | 1857 | 8020 |
| Stamp | 1856 | 10704 |
| Stamp | 1855 | 11548 |
| Stamp | 1854 | 12502 |
| Stamp | 1853 | 12649 |
| Stamp | 1852 | 13351 |
| Stamp | 1851 | 9939 |
| Stamp | 1850 | 11638 |
| Stamp | 1849 | 5711 |
| Stamp | 1848 | 6542 |
| Stamp | 1847 | 6233 |
| Stamp | 1846 | 5157 |
| Stamp | 1845 | 8032 |
| Stamp | 1844 | 6146 |
| Stamp | 1843 | 4565 |
| Stamp | 1842 | 5410 |
| Stamp | 1841 | 4657 |
| Stamp | 1840 | 5636 |
| Stamp | 1839 | 3402 |
| Stamp | 1838 | 4071 |
| Stamp | 1837 | 5039 |
| Stamp | 1836 | 7481 |
| Stamp | 1835 | 4589 |
| Stamp | 1834 | 5138 |
| Stamp | 1833 | 5392 |
| Stamp | 1832 | 6174 |

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| Stamp | 1831 | 3264 |
| Stamp | 1830 | 5147 |
| Stamp | 1829 | 2875 |
| Stamp | 1828 | 7873 |
| Stamp | 1827 | 2622 |
| Stamp | 1826 | 3046 |
| Stamp | 1825 | 2334 |
| Stamp | 1824 | 2072 |
| Stamp | 1823 | 1899 |
| Stamp | 1822 | 2573 |
| Stamp | 1821 | 2504 |
| Stamp | 1820 | 2158 |
| Stamp | 1819 | 1599 |
| Stamp | 1818 | 1745 |
| Stamp | 1817 | 1146 |
| Stamp | 1816 | 2511 |
| Stamp | 1815 | 2154 |
| Stamp | 1814 | 2108 |
| Stamp | 1813 | 3902 |
| Stamp | 1812 | 2965 |
| Stamp | 1811 | 703 |
| Stamp | 1810 | 899 |
| Stamp | 1809 | 964 |
| Stamp | 1808 | 1295 |
| Stamp | 1807 | 711 |
| Stamp | 1806 | 688 |
| Stamp | 1805 | 520 |
| Stamp | 1804 | 843 |
| Stamp | 1803 | 2466 |
| Stamp | 1802 | 288 |
| Stamp | 1801 | 722 |
| Stamp | 1800 | 478 |
| Stamp | 1799 | 199 |
| Stamp | 1798 | 423 |
| Stamp | 1797 | 490 |
| Stamp | 1796 | 275 |
| Stamp | 1795 | 170 |
| Stamp | 1794 | 326 |
| Stamp | 1793 | 194 |
| Stamp | 1792 | 201 |
| Stamp | 1791 | 142 |
| Stamp | 1790 | 150 |
| Stamp | 1789 | 404 |
| Stamp | 1788 | 164 |
| Stamp | 1787 | 129 |
| Stamp | 1786 | 131 |
| Stamp | 1785 | 149 |
| Stamp | 1784 | 100 |

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|-------|------|-----|
| Stamp | 1783 | 250 |
| Stamp | 1782 | 149 |
| Stamp | 1781 | 91 |
| Stamp | 1780 | 160 |
| Stamp | 1779 | 139 |
| Stamp | 1778 | 102 |
| Stamp | 1777 | 213 |
| Stamp | 1776 | 128 |
| Stamp | 1775 | 237 |
| Stamp | 1774 | 277 |
| Stamp | 1773 | 35 |
| Stamp | 1772 | 70 |
| Stamp | 1771 | 73 |
| Stamp | 1770 | 148 |
| Stamp | 1769 | 95 |
| Stamp | 1768 | 99 |
| Stamp | 1767 | 217 |
| Stamp | 1766 | 479 |
| Stamp | 1765 | 284 |
| Stamp | 1764 | 89 |
| Stamp | 1763 | 203 |
| Stamp | 1762 | 114 |
| Stamp | 1761 | 83 |
| Stamp | 1760 | 32 |
| Stamp | 1759 | 71 |
| Stamp | 1758 | 88 |
| Stamp | 1757 | 111 |
| Stamp | 1756 | 66 |
| Stamp | 1755 | 161 |
| Stamp | 1754 | 76 |
| Stamp | 1753 | 166 |
| Stamp | 1752 | 126 |
| Stamp | 1751 | 258 |
| Stamp | 1750 | 140 |
| Stamp | 1749 | 75 |
| Stamp | 1748 | 91 |
| Stamp | 1747 | 143 |
| Stamp | 1746 | 55 |
| Stamp | 1745 | 80 |
| Stamp | 1744 | 118 |
| Stamp | 1743 | 94 |
| Stamp | 1742 | 201 |
| Stamp | 1741 | 122 |
| Stamp | 1740 | 84 |
| Stamp | 1739 | 132 |
| Stamp | 1738 | 91 |
| Stamp | 1737 | 102 |
| Stamp | 1736 | 117 |

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|-------|------|-----|
| Stamp | 1735 | 193 |
| Stamp | 1734 | 102 |
| Stamp | 1733 | 110 |
| Stamp | 1732 | 134 |
| Stamp | 1731 | 92 |
| Stamp | 1730 | 86 |
| Stamp | 1729 | 121 |
| Stamp | 1728 | 61 |
| Stamp | 1727 | 260 |
| Stamp | 1726 | 88 |
| Stamp | 1725 | 69 |
| Stamp | 1724 | 52 |
| Stamp | 1723 | 39 |
| Stamp | 1722 | 183 |
| Stamp | 1721 | 61 |
| Stamp | 1720 | 91 |
| Stamp | 1719 | 94 |
| Stamp | 1718 | 71 |
| Stamp | 1717 | 59 |
| Stamp | 1716 | 70 |
| Stamp | 1715 | 62 |
| Stamp | 1714 | 181 |
| Stamp | 1713 | 81 |
| Stamp | 1712 | 56 |
| Stamp | 1711 | 68 |
| Stamp | 1710 | 94 |
| Stamp | 1709 | 56 |
| Stamp | 1708 | 35 |
| Stamp | 1707 | 84 |
| Stamp | 1706 | 50 |
| Stamp | 1705 | 78 |
| Stamp | 1704 | 60 |
| Stamp | 1703 | 48 |
| Stamp | 1702 | 59 |
| Stamp | 1701 | 48 |
| Stamp | 1700 | 30 |
| Stamp | 1699 | 21 |
| Stamp | 1698 | 36 |
| Stamp | 1697 | 30 |
| Stamp | 1696 | 31 |
| Stamp | 1695 | 15 |
| Stamp | 1694 | 23 |
| Stamp | 1693 | 45 |
| Stamp | 1692 | 23 |
| Stamp | 1691 | 18 |
| Stamp | 1690 | 13 |
| Stamp | 1689 | 14 |
| Stamp | 1688 | 17 |

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|-------|------|----|
| Stamp | 1687 | 14 |
| Stamp | 1686 | 8 |
| Stamp | 1685 | 14 |
| Stamp | 1684 | 15 |
| Stamp | 1683 | 21 |
| Stamp | 1682 | 12 |
| Stamp | 1681 | 12 |
| Stamp | 1680 | 6 |
| Stamp | 1679 | 4 |
| Stamp | 1678 | 3 |
| Stamp | 1677 | 8 |
| Stamp | 1676 | 3 |
| Stamp | 1675 | 29 |
| Stamp | 1674 | 1 |
| Stamp | 1673 | 5 |
| Stamp | 1672 | 3 |
| Stamp | 1671 | 1 |
| Stamp | 1670 | 5 |
| Stamp | 1669 | 4 |
| Stamp | 1668 | 3 |
| Stamp | 1666 | 6 |
| Stamp | 1665 | 2 |
| Stamp | 1664 | 1 |
| Stamp | 1662 | 10 |
| Stamp | 1661 | 5 |
| Stamp | 1660 | 4 |
| Stamp | 1658 | 2 |
| Stamp | 1656 | 3 |
| Stamp | 1655 | 5 |
| Stamp | 1654 | 1 |
| Stamp | 1653 | 2 |
| Stamp | 1651 | 4 |
| Stamp | 1649 | 4 |
| Stamp | 1648 | 2 |
| Stamp | 1647 | 2 |
| Stamp | 1644 | 2 |
| Stamp | 1641 | 3 |
| Stamp | 1639 | 1 |
| Stamp | 1626 | 1 |
| Stamp | 1623 | 1 |
| Stamp | 1614 | 6 |
| Stamp | 1609 | 1 |
| Stamp | 1606 | 1 |
| Stamp | 1605 | 5 |
| Stamp | 1601 | 1 |
| Stamp | 1592 | 1 |
| Stamp | 1581 | 5 |
| Stamp | 1576 | 2 |

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|-------|------|---|
| Stamp | 1575 | 1 |
| Stamp | 1569 | 1 |
| Stamp | 1561 | 3 |
| Stamp | 1553 | 2 |
| Stamp | 1547 | 1 |
| Stamp | 1539 | 2 |
| Stamp | 1523 | 1 |
| Stamp | 1520 | 8 |
| Stamp | 1485 | 2 |
| Stamp | 1480 | 2 |
| Stamp | 1478 | 1 |