Exercise: Xpath

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29 February 2016

1) xml2 package

a) getting started

- load the xml2 package
- use `ls(package:xml2)` to get a list of availible functions
- use `read_xml()` to read in the following resource: http://www.r-datacollection.com/materials/ch-4-xpath/potus/potus.xml and save it myxml

```
library(magrittr)
library(xml2)
ls(package:xml2)
```

```
## Warning in ls(package:xml2): 'package:xml2' converted to character string
```

```
##  [1] "as_list"        "html_structure" "read_html"      "read_xml"
##  [5] "url_absolute"   "url_escape"     "url_parse"      "url_relative"
##  [9] "url_unescape"   "write_xml"      "xml_attr"       "xml_attrs"
## [13] "xml_children"   "xml_contents"   "xml_find_all"   "xml_find_one"
## [17] "xml_has_attr"   "xml_length"     "xml_name"       "xml_ns"
## [21] "xml_ns_rename"  "xml_parent"     "xml_parents"    "xml_path"
## [25] "xml_siblings"   "xml_structure"  "xml_text"       "xml_type"
## [29] "xml_url"
```

```
if( !file.exists("myxml.xml") ){
  url <- "http://www.r-datacollection.com/materials/ch-4-xpath/potus/potus.xml"
  download.file(url, "myxml.xml")
}

xml <- read_xml("myxml.xml")
```

- use your browser to look at the XML

```
browseURL(url)
```

b) convenience functions

- how many entries has the XML, which function did you use

```
xml_length(xml)
```

```
## [1] 42
```

- extract all the text of the XML and use cat() to print the text to the screen

```r
cat(xml_text(xml))
```

```
##
##
##      George Washington
##      1
##      April 30, 1789
##      March 3, 1797
##      Federalist
##      Father of His Country
##      22-Feb-1732
##      Planter, Soldier
##      Virginia
##      Westmoreland County
##      No formal education
##      Martha Dandridge Custis (1732-1802), on January 6, 1759
##      Mary Ball Washington
##      Augustine Washington
##      NA
##      Episcopalian
##
##
##      John Adams
##      2
##      March 4, 1797
##      March 3, 1801
##      Federalist
##      Atlas of Independence
##      30-Oct-1735
##      Lawyer
##      Massachusetts
##      Braintree (now Quincy)
##      Graduated from Harvard College (1755)
##      Abigail Smith (1744-1818), on October 25, 1764
##      Susanna Boylston Adams
##      John Adams
##      NA
##      Unitarian
##
##
##      Thomas Jefferson
##      3
##      March 4, 1801
##      March 3, 1809
##      Democratic-Republican
##      Man of the People; Sage of Monticello
##      13-Apr-1743
##      Lawyer, planter
##      Virginia
##      Shadwell
##      Graduated from College of William and Mary (1762)
##      Martha Wayles Skelton (1748-1782), on January 1, 1772
##      Jane Randolph Jefferson
```

```
##      Peter Jefferson
##      NA
##      No formal affiliation
##
##
##      James Madison
##      4
##      March 4, 1809
##      March 3, 1817
##      Democratic-Republican
##      Father of the Constitution
##      16-Mar-1751
##      Lawyer
##      Virginia
##      Port Conway
##      Graduated from College of New Jersey (now Princeton University; 1771)
##      Dolley Payne Todd (1768-1849), on September 15, 1794
##      Nelly Conway Madison
##      James Madison
##      NA
##      Episcopalian
##
##
##      James Monroe
##      5
##      March 4, 1817
##      March 3, 1825
##      Democratic-Republican
##      The Last Cocked Hat; Era-of-Good-Feeling President
##      28-Apr-1758
##      Lawyer
##      Virginia
##      Westmoreland County
##      Graduated from College of William and Mary (1776)
##      Elizabeth Eliza Kortright (1768-1830), on February 16, 1786
##      Elizabeth Jones Monroe
##      Spence Monroe
##      NA
##      Episcopalian
##
##
##      John Quincy Adams
##      6
##      March 4, 1825
##      March 3, 1829
##      Democratic-Republican
##      Old Man Eloquent
##      11-Jul-1767
##      Lawyer
##      Massachusetts
##      Braintree (now Quincy)
##      Graduated from Harvard College (1787)
##      Louisa Catherine Johnson (1775-1852), on July 26, 1797
##      Abigail Smith Adams
```

```
##     tiny U.S. flag John Adams
##     NA
##     Unitarian
##
##
##     Andrew Jackson
##     7
##     March 4, 1829
##     March 3, 1837
##     Democratic
##     Old Hickory
##     15-Mar-1767
##     Lawyer, soldier
##     North Carolina
##     Waxhaw
##     No formal education
##     Rachel Donelson Robards (1767-1828),August 1791 anda second ceremony on January
##     Elizabeth Hutchinson Jackson
##     Andrew Jackson
##     NA
##     Presbyterian
##
##
##     Martin Van Buren
##     8
##     March 4, 1837
##     March 3, 1841
##     Democratic
##     The Little Magician; The Red Fox of Kinderhook
##     05-Dec-1782
##     Lawyer
##     New York
##     Kinderhook
##     Graduated from Kinderhook Academy (1796)
##     Hannah Hoes (1783-1819), on February 21, 1807
##     Maria Hoes Van Buren
##     Abraham Van Buren
##     NA
##     Dutch Reformed
##
##
##     William Henry Harrison
##     9
##     March 4, 1841
##     April 4, 1841
##     Whig
##     Old Tippecanoe; Old Tip
##     09-Feb-1773
##     Soldier
##     Virginia
##     Berkeley
##     Attended Hampden-Sydney College
##     Anna Tuthill Symmes (1775-1864), on November 25, 1795
##     Elizabeth Bassett Harrison
```

```
##     Benjamin Harrison
##     NA
##     Episcopalian
##
##
##     John Tyler
##     10
##     April 6, 1841
##     March 3, 1845
##     Whig
##     Accidental President; His Accidency
##     29-Mar-1790
##     Lawyer
##     Virginia
##     Greenway
##     Graduated from the College of William and Mary (1807)
##     Letitia Chrisitan (1790-1842), on March 29, 1813; Julia Gardiner (1820-1889), on
##     Mary Marot Armistead Tyler
##     John Tyler
##     NA
##     Episcopalian
##
##
##     James Knox Polk
##     11
##     March 4, 1845
##     March 3, 1849
##     Democratic
##     Young Hickory
##     02-Nov-1795
##     Lawyer
##     North Carolina
##     Mecklenburg County
##     Graduated from the University of North Carolina (1818)
##     Sarah Childress (1803-1891), on January 1, 1824
##     Jane Knox Polk
##     Samuel Polk
##     NA
##     Presbyterian
##
##
##     Zachary Taylor
##     12
##     March 5, 1849
##     July 9, 1850
##     Whig
##     Old Rough and Ready
##     24-Nov-1784
##     Soldier
##     Virginia
##     near Barboursville
##     No formal education
##     Margaret Mackall Smith (1788-1852), on June 21, 1810
##     Sarah Dabney Strother Taylor
```

```
##      Lieutenant Colonel Richard Taylor
##      NA
##      Episcopalian
##
##
##      Millard Fillmore
##      13
##      July 9, 1850
##      March 3, 1853
##      Whig
##      The American Louis Philippe
##      07-Jan-1800
##      Lawyer
##      New York
##      Locke Township (now Summerhill)
##      No formal education
##      Abigail Powers (1798-1853), on February 5, 1826; Caroline Carmichael McIntosh (1
##      Phoebe Millard Fillmore
##      Nathaniel Fillmore
##      NA
##      Unitarian
##
##
##      Franklin Pierce
##      14
##      March 4, 1853
##      March 3, 1857
##      Democrat
##      Young Hickory of the Granite Hills
##      23-Nov-1804
##      Lawyer, public official
##      New Hampshire
##      Hillsborough (now Hillsboro)
##      Graduated from Bowdoin College (1824)
##      Jane Means Appleton (1806-1863), on November 10, 1834
##      Ann Kendrick Pierce
##      General Benjamin Pierce
##      NA
##      Episcopalian
##
##
##      James Buchanan
##      15
##      March 4, 1857
##      March 3, 1861
##      Democrat
##      Old Buck
##      23-Apr-1791
##      Lawyer
##      Pennsylvania
##      Cove Gap (near Mercersburg)
##      Graduated from Dickinson College (1809)
##      Never married. The White House hostess was his niece Harriet Lane (1830-1903)
##      Elizabeth Speer Buchanan
```

```
##      James Buchanan
##      NA
##      Presbyterian
##
##
##      Abraham Lincoln
##      16
##      March 4, 1861
##      April 15, 1865
##      Republican
##      Honest Abe; Illinois Rail-Splitter
##      12-Feb-1809
##      Lawyer
##      Kentucky
##      Hardin (now Larue) County
##      No formal education
##      Mary Todd (1818-1882), on November 4, 1842
##      Nancy Hanks Lincoln
##      Thomas Lincoln
##      NA
##      No formal affiliation
##
##
##      Andrew Johnson
##      17
##      April 15, 1865
##      March 3, 1869
##      Democratic
##      None
##      29-Dec-1808
##      Tailor, public official
##      North Carolina
##      Raleigh
##      No formal education
##      Eliza McCardle (1810-1876), on May 5, 1827
##      Mary McDonough Johnson
##      Jacob Johnson
##      NA
##      No formal affiliation
##
##
##      Ulysses Simpson Grant
##      18
##      March 4, 1869
##      March 3, 1877
##      Republican
##      Hero of Appomattox
##      27-Apr-1822
##      Soldier
##      Ohio
##      Point Pleasant
##      Graduated from the U.S. Military AcademyWest Point, N.Y. (1843)
##      Julia Boggs Dent (1826-1902), on August 22, 1848
##      Hannah Simpson Grant
```

```
##      Jesse Root Grant
##      NA
##      Methodist
##
##
##      Rutherford Birchard Hayes
##      19
##      March 4, 1877
##      March 3, 1881
##      Republican
##      Dark-Horse President
##      04-Oct-1822
##      Lawyer
##      Ohio
##      Delaware
##      Graduated from Kenyon College (1842) and Harvard Law School (1845)
##      Lucy Ware Webb (1831-1889), on December 30, 1852
##      Sophia Birchard Hayes
##      Rutherford Hayes
##      NA
##      No formal affiliation
##
##
##      James Abram Garfield
##      20
##      March 4, 1881
##      September 19, 1881
##      Republican
##      None
##      19-Nov-1831
##      Teacher, public official
##      Ohio
##      Orange
##      Attended Western Reserve Eclectic Institute (now Hiram College); Graduated from
##      Lucretia Rudolph (1832-1918), on November 11, 1858
##      Eliza Ballou Garfield
##      Abram Garfield
##      NA
##      Disciples of Christ
##
##
##      Chester Alan Arthur
##      21
##      September 19, 1881
##      March 3, 1885
##      Republican
##      The Gentleman Boss; Elegant Arthur
##      05-Oct-1829
##      Lawyer
##      Vermont
##      Fairfield
##      Graduated from Union College (1848)
##      Ellen Lewis Herndon (1837-1880), on October 25, 1859
##      Malvina Stone Arthur
```

```
##      William Arthur
##      NA
##      Episcopalian
##
##
##      Grover Cleveland
##      22
##      March 4, 1885
##      March 3, 1889 and March 4, 1893
##      Democrat
##      Uncle Jumbo; Veto Mayor; Veto President
##      18-Mar-1837
##      Lawyer
##      New Jersey
##      Caldwell
##      No formal education
##      Frances Folsom (1864-1947), on June 2, 1886
##      Anne Neal Cleveland
##      Richard Falley Cleveland
##      NA
##      Presbyterian
##
##
##      Benjamin Harrison
##      23
##      March 4, 1889
##      March 3, 1893
##      Republican
##      Kid Gloves Harrison; Little Ben
##      20-Aug-1833
##      Lawyer
##      Ohio
##      North Bend
##      Graduated from Miami University, Oxford, Ohio (1852)
##      Caroline Lavinia Scott (1832-1892), on October 20, 1853; Mary Scott Lord Dimmick
##      Elizabeth Ramsey Irwin Harrison
##      John Scott Harrison
##      NA
##      Presbyterian
##
##
##      William McKinley
##      25
##      March 4, 1897
##      September 14, 1901
##      Republican
##      Idol of Ohio
##      29-Jan-1843
##      Lawyer
##      Ohio
##      Niles
##      Attended Allegheny College
##      Ida Saxton (1847-1907), on January 25, 1871
##      Nancy Campbell Allison McKinley
```

```
##     William McKinley
##     NA
##     Methodist
##
##
##     Theodore Roosevelt
##     26
##     September 14, 1901
##     March 3, 1909
##     Republican
##     TR; Trust-Buster; Teddy
##     27-Oct-1858
##     Author, lawyer, public official
##     New York
##     New York
##     Graduated from Harvard College (1880)
##     Alice Hathaway Lee (1861-1884), on October 27, 1880; Edith Kermit Carow (1861-19
##     Martha Bulloch Roosevelt
##     Theodore Roosevelt
##     NA
##     Dutch Reformed
##
##
##     William Howard Taft
##     27
##     March 4, 1909
##     March 3, 1913
##     Republican
##     None
##     15-Sep-1857
##     Lawyer, public official
##     Ohio
##     Cincinnati
##     Graduated from Yale College (1878); Cincinnati Law School (1880)
##     Helen Herron (1861-1943), on June 19, 1886
##     Louisa Maria Torrey Taft
##     Alphonso Taft
##     NA
##     Unitarian
##
##
##     Woodrow Wilson
##     28
##     March 4, 1913
##     March 3, 1921
##     Democrat
##     SchoolmasterPolitics
##     28-Dec-1856
##     Teacher, public official
##     Virginia
##     Staunton
##     Graduated from the College of New Jersey (now Princeton University) (1879)
##     Ellen Louise Axson (1860-1914), on June 24, 1885; Edith Bolling Galt (1872-1961)
##     Jessie Janet Woodrow Wilson
```

```
##      Joseph Ruggles Wilson
##      NA
##      Presbyterian
##
##
##      Warren Gamaliel Harding
##      29
##      March 4, 1921
##      August 2, 1923
##      Republican
##      None
##      02-Nov-1865
##      Editor-Publisher
##      Ohio
##      near Corsica (now Blooming Grove)
##      Graduated from Ohio Central College (1882)
##      Florence Kling De Wolfe (1860-1924), on July 8, 1891
##      Phoebe Elizabeth Dickerson Harding
##      George Tyron Harding
##      NA
##      Baptist
##
##
##      Calvin Coolidge
##      30
##      August 3, 1923
##      March 3, 1929
##      Republican
##      Silent Cal
##      04-Jul-1872
##      Lawyer
##      Vermont
##      Plymouth
##      Graduated from Amherst College (1895)
##      Grace Anna Goodhue (1879-1957), on October 4, 1905
##      Victoria Josephine Moor Coolidge
##      John Calvin Coolidge
##      NA
##      Congregationalist
##
##
##      Herbert Clark Hoover
##      31
##      March 4, 1929
##      March 3, 1933
##      Republican
##      None
##      10-Aug-1874
##      Engineer
##      Iowa
##      West Branch
##      Graduated from Stanford University (1895).
##      Lou Henry (1875-1944), on February 10, 1899
##      Hulda Randall Minthorn Hoover
```

```
##      Jesse Clark Hoover
##      NA
##      Society of Friends (Quaker)
##
##
##      Franklin Delano Roosevelt
##      32
##      March 4, 1933
##      April 12, 1945
##      Democrat
##      FDR
##      30-Jan-1882
##      Public official, lawyer
##      New York
##      Hyde Park
##      Graduated from Harvard College (1903); Attended Columbia Law School
##      Anna Eleanor Roosevelt (1884-1962), on March 17, 1905
##      Sara Delano Roosevelt
##      James Roosevelt
##      NA
##      Episcopalian
##
##
##      Harry S. Truman
##      33
##      April 12, 1945
##      January 20, 1953
##      Democrat
##      Give 'Em Hell Harry
##      08-May-1884
##      Farmer, public official
##      Missouri
##      Lamar
##      Attended the University of Kansas City Law School
##      Elizabeth Bess Virginia Wallace (1885-1982), on June 28, 1919
##      Martha Ellen Young Truman
##      John Anderson Truman
##      NA
##      Baptist
##
##
##      Dwight David Eisenhower
##      34
##      January 20, 1953
##      January 20, 1961
##      Republican
##      Ike
##      14-Oct-1890
##      Soldier
##      Texas
##      Denison
##      Graduated from U.S. Military Academy, West Point, N.Y. (1915)
##      Mary Mamie Geneva Doud (1896-1979), on July 1, 1916
##      Ida Elizabeth Stover Eisenhower
```

```
##     David Jacob Eisenhower
##     NA
##     Presbyterian
##
##
##     John Fitzgerald Kennedy
##     35
##     January 20, 1961
##     November 22, 1963
##     Democrat
##     JFK, Jack
##     29-May-1917
##     Author, public official
##     Massachusetts
##     Brookline
##     Graduated from Harvard College (1940)
##     Jacqueline Lee Bouvier (1929-1994), on September 12, 1953
##     Rose Elizabeth Fitzgerald Kennedy
##     Joseph Patrick Kennedy
##     NA
##     Roman Catholic
##
##
##     Lyndon Baines Johnson
##     36
##     November 22, 1963
##     January 20, 1969
##     Democrat
##     LBJ
##     27-Aug-1908
##     Teacher, public official
##     Texas
##     near Johnson City
##     Graduated from Southwest Texas State Teachers College (1930) (now known as Texas
##     Claudia Lady Bird Alta Taylor (1912-2007), on November 17, 1934
##     Rebekah Baines Johnson
##     Sam Ealy Johnson, Jr.
##     NA
##     Disciples of Christ
##
##
##     Richard Milhous Nixon
##     37
##     January 20, 1969
##     August 9, 1974
##     Republican
##     Tricky Dick
##     09-Jan-1913
##     Lawyer, public official
##     California
##     Yorba Linda
##     Graduated from Whittier College (1934) and Duke University Law School (1937)
##     Thelma Patricia Catherine Ryan (1912-1993), on June 21, 1940
##     Hannah Milhous Nixon
```

Francis Anthony Nixon
NA
Society of Friends (Quaker)
##
##
Gerald Rudolph Ford
38
August 9, 1974
January 20, 1977
Republican
Jerry
14-Jul-1913
Lawyer, public official
Nebraska
Omaha
Graduated from the University of Michigan (1935) and Yale University Law School
Elizabeth Betty Bloomer Warren (1918-), on October 15, 1948
Dorothy Ayer Gardner King Ford
Leslie Lynch King
NA
Episcopalian
##
##
James Earl Carter, Jr.
39
January 20, 1977
January 20, 1981
Democrat
Jimmy
01-Oct-1924
Farmer, public official
Georgia
Plains
Graduated from U.S. Naval Academy, Annapolis, Md. (1946)
Eleanor Rosalynn Smith (1928-), on July 7, 1946
Lillian Gordy Carter
James Earl Carter
NA
Baptist
##
##
Ronald Wilson Reagan
40
January 20, 1981
January 20, 1989
Republican
The Gipper; The Great Communicator; Dutch
06-Feb-1911
Actor, public official
Illinois
Tampico
Graduated from Eureka College (1932)
Jane Wyman (1914-), on June 25, 1940 (divorced1948); Nancy Davis (1923-), on M
Nelle Wilson Reagan

```
##      John Edward Reagan
##      NA
##      Disciples of Christ
##
##
##      George Herbert Walker Bush
##      41
##      January 20, 1989
##      January 20, 1993
##      Republican
##      Poppy
##      12-Jun-1924
##      Businessman, public official
##      Massachusetts
##      Milton
##      Graduated from Yale University (1948)
##      Barbara Pierce (1925- ), on January 6, 1945
##      Dorothy Walker Bush
##      Prescott Sheldon Bush
##      NA
##      Episcopalian
##
##
##      William Jefferson Clinton
##      42
##      January 20, 1993
##      January 20, 2001
##      Democrat
##      Bill
##      19-Aug-1946
##      Lawyer, public official
##      Arkansas
##      Hope
##      Graduated from Georgetown University (1968); Attended Oxford University (1968-70
##      Hillary Rodham (1947- ), on October 11, 1975
##      Virginia Divine Cassidy Blythe Clinton Kelley
##      William Jefferson Blythe III
##      NA
##      Baptist
##
##
##      George Walker Bush
##      43
##      January 20, 2001
##      NA
##      Republican
##      W, Little George
##      06-Jul-1946
##      Businessman
##      Connecticut
##      New Haven
##      Graduated from Yale University (1968); Graduated from Harvard Business School (1
##      Laura Welch (1946- ), on November 5, 1977
##      Barbara Pierce Bush
```

```
##      tiny U.S. flag George Herbert Walker Bush
##      NA
##      Methodist
##
```

- use a function of the xml2 package to have a look at the structure of the XML

```r
xml_structure(xml)
```

```
## <document>
##   {text}
##   <president>
##     {text}
##     <name>
##       {text}
##     {text}
##     <number>
##       {text}
##     {text}
##     <start>
##       {text}
##     {text}
##     <end>
##       {text}
##     {text}
##     <party>
##       {text}
##     {text}
##     <nickname>
##       {text}
##     {text}
##     <born>
##       {text}
##     {text}
##     <occupation>
##       {text}
##     {text}
##     <state>
##       {text}
##     {text}
##     <hometown>
##       {text}
##     {text}
##     <education>
##       {text}
##     {text}
##     <married>
##       {text}
##     {text}
##     <mother>
##       {text}
##     {text}
##     <father>
```

```
##          {text}
##       {text}
##       <salary>
##          {text}
##       {text}
##       <religion>
##          {text}
##       {text}
##    {text}
##    <president>
##       {text}
##       <name>
##          {text}
##       {text}
##       <number>
##          {text}
##       {text}
##       <start>
##          {text}
##       {text}
##       <end>
##          {text}
##       {text}
##       <party>
##          {text}
##       {text}
##       <nickname>
##          {text}
##       {text}
##       <born>
##          {text}
##       {text}
##       <occupation>
##          {text}
##       {text}
##       <state>
##          {text}
##       {text}
##       <hometown>
##          {text}
##       {text}
##       <education>
##          {text}
##       {text}
##       <married>
##          {text}
##       {text}
##       <mother>
##          {text}
##       {text}
##       <father>
##          {text}
##       {text}
##       <salary>
```

```
##          {text}
##      {text}
##      <religion>
##          {text}
##      {text}
##    {text}
##    <president>
##      {text}
##      <name>
##          {text}
##      {text}
##      <number>
##          {text}
##      {text}
##      <start>
##          {text}
##      {text}
##      <end>
##          {text}
##      {text}
##      <party>
##          {text}
##      {text}
##      <nickname>
##          {text}
##      {text}
##      <born>
##          {text}
##      {text}
##      <occupation>
##          {text}
##      {text}
##      <state>
##          {text}
##      {text}
##      <hometown>
##          {text}
##      {text}
##      <education>
##          {text}
##      {text}
##      <married>
##          {text}
##      {text}
##      <mother>
##          {text}
##      {text}
##      <father>
##          {text}
##      {text}
##      <salary>
##          {text}
##      {text}
##      <religion>
```

```
##        {text}
##      {text}
##    {text}
##    <president>
##      {text}
##      <name>
##        {text}
##      {text}
##      <number>
##        {text}
##      {text}
##      <start>
##        {text}
##      {text}
##      <end>
##        {text}
##      {text}
##      <party>
##        {text}
##      {text}
##      <nickname>
##        {text}
##      {text}
##      <born>
##        {text}
##      {text}
##      <occupation>
##        {text}
##      {text}
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##       {text}
##       <mother>
##          {text}
##       {text}
##       <father>
##          {text}
##       {text}
##       <salary>
##          {text}
##       {text}
##       <religion>
##          {text}
##       {text}
##    {text}
##    <president>
##       {text}
##       <name>
##          {text}
##       {text}
##       <number>
##          {text}
##       {text}
##       <start>
##          {text}
##       {text}
##       <end>
```

```
##          {text}
##       {text}
##       <party>
##          {text}
##       {text}
##       <nickname>
##          {text}
##       {text}
##       <born>
##          {text}
##       {text}
##       <occupation>
##          {text}
##       {text}
##       <state>
##          {text}
##       {text}
##       <hometown>
##          {text}
##       {text}
##       <education>
##          {text}
##       {text}
##       <married>
##          {text}
##       {text}
##       <mother>
##          {text}
##       {text}
##       <father>
##          {text}
##       {text}
##       <salary>
##          {text}
##       {text}
##       <religion>
##          {text}
##       {text}
##    {text}
##    <president>
##       {text}
##       <name>
##          {text}
##       {text}
##       <number>
##          {text}
##       {text}
##       <start>
##          {text}
##       {text}
##       <end>
##          {text}
##       {text}
##       <party>
```

41

```
##        {text}
##      {text}
##      <nickname>
##          {text}
##      {text}
##      <born>
##          {text}
##      {text}
##      <occupation>
##          {text}
##      {text}
##      <state>
##          {text}
##      {text}
##      <hometown>
##          {text}
##      {text}
##      <education>
##          {text}
##      {text}
##      <married>
##          {text}
##      {text}
##      <mother>
##          {text}
##      {text}
##      <father>
##          {text}
##      {text}
##      <salary>
##          {text}
##      {text}
##      <religion>
##          {text}
##      {text}
##    {text}
##    <president>
##        {text}
##      <name>
##          {text}
##      {text}
##      <number>
##          {text}
##      {text}
##      <start>
##          {text}
##      {text}
##      <end>
##          {text}
##      {text}
##      <party>
##          {text}
##      {text}
##      <nickname>
```

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##          {text}
##       {text}
##       <born>
##          {text}
##       {text}
##       <occupation>
##          {text}
##       {text}
##       <state>
##          {text}
##       {text}
##       <hometown>
##          {text}
##       {text}
##       <education>
##          {text}
##       {text}
##       <married>
##          {text}
##       {text}
##       <mother>
##          {text}
##       {text}
##       <father>
##          {text}
##       {text}
##       <salary>
##          {text}
##       {text}
##       <religion>
##          {text}
##       {text}
##    {text}
##    <president>
##       {text}
##       <name>
##          {text}
##       {text}
##       <number>
##          {text}
##       {text}
##       <start>
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##       <end>
##          {text}
##       {text}
##       <party>
##          {text}
##       {text}
##       <nickname>
##          {text}
##       {text}
##       <born>
```

```
##         {text}
##       {text}
##       <occupation>
##          {text}
##       {text}
##       <state>
##          {text}
##       {text}
##       <hometown>
##          {text}
##       {text}
##       <education>
##          {text}
##       {text}
##       <married>
##          {text}
##       {text}
##       <mother>
##          {text}
##       {text}
##       <father>
##          {text}
##       {text}
##       <salary>
##          {text}
##       {text}
##       <religion>
##          {text}
##       {text}
##    {text}
##    <president>
##       {text}
##       <name>
##          {text}
##       {text}
##       <number>
##          {text}
##       {text}
##       <start>
##          {text}
##       {text}
##       <end>
##          {text}
##       {text}
##       <party>
##          {text}
##       {text}
##       <nickname>
##          {text}
##       {text}
##       <born>
##          {text}
##       {text}
##       <occupation>
```

```
##         {text}
##      {text}
##      <state>
##         {text}
##      {text}
##      <hometown>
##         {text}
##      {text}
##      <education>
##         {text}
##      {text}
##      <married>
##         {text}
##      {text}
##      <mother>
##         {text}
##      {text}
##      <father>
##         {text}
##      {text}
##      <salary>
##         {text}
##      {text}
##      <religion>
##         {text}
##      {text}
##    {text}
##    <president>
##      {text}
##      <name>
##         {text}
##      {text}
##      <number>
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##      {text}
##      <start>
##         {text}
##      {text}
##      <end>
##         {text}
##      {text}
##      <party>
##         {text}
##      {text}
##      <nickname>
##         {text}
##      {text}
##      <born>
##         {text}
##      {text}
##      <occupation>
##         {text}
##      {text}
##      <state>
```

```
##        {text}
##     {text}
##     <hometown>
##        {text}
##     {text}
##     <education>
##        {text}
##     {text}
##     <married>
##        {text}
##     {text}
##     <mother>
##        {text}
##     {text}
##     <father>
##        {text}
##     {text}
##     <salary>
##        {text}
##     {text}
##     <religion>
##        {text}
##     {text}
##   {text}
##   <president>
##     {text}
##     <name>
##        {text}
##     {text}
##     <number>
##        {text}
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##     <start>
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##     <end>
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##     {text}
##     <party>
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##     {text}
##     <nickname>
##        {text}
##     {text}
##     <born>
##        {text}
##     {text}
##     <occupation>
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##     <state>
##        {text}
##     {text}
##     <hometown>
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##         {text}
##      {text}
##      <education>
##         {text}
##      {text}
##      <married>
##         {text}
##      {text}
##      <mother>
##         {text}
##      {text}
##      <father>
##         {text}
##      {text}
##      <salary>
##         {text}
##      {text}
##      <religion>
##         {text}
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##    {text}
##    <president>
##      {text}
##      <name>
##         {text}
##      {text}
##      <number>
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##      {text}
##      <start>
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##         {text}
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##      <party>
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##      {text}
##      <nickname>
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##      <occupation>
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##      <hometown>
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##      {text}
##      <education>
```

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##          {text}
##       {text}
##       <married>
##          {text}
##       {text}
##       <mother>
##          {text}
##       {text}
##       <father>
##          {text}
##       {text}
##       <salary>
##          {text}
##       {text}
##       <religion>
##          {text}
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##    {text}
##    <president>
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##       <name>
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##       <number>
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##       <born>
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##       <occupation>
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##       {text}
##       <hometown>
##          {text}
##       {text}
##       <education>
##          {text}
##       {text}
##       <married>
```

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##         {text}
##      {text}
##      <mother>
##          {text}
##      {text}
##      <father>
##          {text}
##      {text}
##      <salary>
##          {text}
##      {text}
##      <religion>
##          {text}
##      {text}
##   {text}
##   <president>
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##      <number>
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##      <start>
##          {text}
##      {text}
##      <end>
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##      <party>
##          {text}
##      {text}
##      <nickname>
##          {text}
##      {text}
##      <born>
##          {text}
##      {text}
##      <occupation>
##          {text}
##      {text}
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##      {text}
##      <hometown>
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##      {text}
##      <education>
##          {text}
##      {text}
##      <married>
##          {text}
##      {text}
##      <mother>
```

```
##         {text}
##       {text}
##       <father>
##          {text}
##       {text}
##       <salary>
##          {text}
##       {text}
##       <religion>
##          {text}
##       {text}
##     {text}
##     <president>
##       {text}
##       <name>
##          {text}
##       {text}
##       <number>
##          {text}
##       {text}
##       <start>
##          {text}
##       {text}
##       <end>
##          {text}
##       {text}
##       <party>
##          {text}
##       {text}
##       <nickname>
##          {text}
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##          {text}
##       {text}
##       <occupation>
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##       <state>
##          {text}
##       {text}
##       <hometown>
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##       <education>
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##       {text}
##       <married>
##          {text}
##       {text}
##       <mother>
##          {text}
##       {text}
##       <father>
```

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##          {text}
##       {text}
##       <salary>
##          {text}
##       {text}
##       <religion>
##          {text}
##       {text}
##    {text}
##    <president>
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##       <name>
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##       <number>
##          {text}
##       {text}
##       <start>
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##          {text}
##       {text}
##       <party>
##          {text}
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##       <nickname>
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##       {text}
##       <born>
##          {text}
##       {text}
##       <occupation>
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##       <state>
##          {text}
##       {text}
##       <hometown>
##          {text}
##       {text}
##       <education>
##          {text}
##       {text}
##       <married>
##          {text}
##       {text}
##       <mother>
##          {text}
##       {text}
##       <father>
##          {text}
##       {text}
##       <salary>
```

```
##          {text}
##        {text}
##        <religion>
##          {text}
##        {text}
##    {text}
##    <president>
##      {text}
##      <name>
##        {text}
##      {text}
##      <number>
##        {text}
##      {text}
##      <start>
##        {text}
##      {text}
##      <end>
##        {text}
##      {text}
##      <party>
##        {text}
##      {text}
##      <nickname>
##        {text}
##      {text}
##      <born>
##        {text}
##      {text}
##      <occupation>
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##      {text}
##      <state>
##        {text}
##      {text}
##      <hometown>
##        {text}
##      {text}
##      <education>
##        {text}
##      {text}
##      <married>
##        {text}
##      {text}
##      <mother>
##        {text}
##      {text}
##      <father>
##        {text}
##      {text}
##      <salary>
##        {text}
##      {text}
##      <religion>
```

```
##        {text}
##      {text}
##    {text}
##    <president>
##      {text}
##      <name>
##        {text}
##      {text}
##      <number>
##        {text}
##      {text}
##      <start>
##        {text}
##      {text}
##      <end>
##        {text}
##      {text}
##      <party>
##        {text}
##      {text}
##      <nickname>
##        {text}
##      {text}
##      <born>
##        {text}
##      {text}
##      <occupation>
##        {text}
##      {text}
##      <state>
##        {text}
##      {text}
##      <hometown>
##        {text}
##      {text}
##      <education>
##        {text}
##      {text}
##      <married>
##        {text}
##      {text}
##      <mother>
##        {text}
##      {text}
##      <father>
##        {text}
##      {text}
##      <salary>
##        {text}
##      {text}
##      <religion>
##        {text}
##      {text}
##    {text}
```

```
##   <president>
##      {text}
##      <name>
##         {text}
##      {text}
##      <number>
##         {text}
##      {text}
##      <start>
##         {text}
##      {text}
##      <end>
##         {text}
##      {text}
##      <party>
##         {text}
##      {text}
##      <nickname>
##         {text}
##      {text}
##      <born>
##         {text}
##      {text}
##      <occupation>
##         {text}
##      {text}
##      <state>
##         {text}
##      {text}
##      <hometown>
##         {text}
##      {text}
##      <education>
##         {text}
##      {text}
##      <married>
##         {text}
##      {text}
##      <mother>
##         {text}
##      {text}
##      <father>
##         {text}
##      {text}
##      <salary>
##         {text}
##      {text}
##      <religion>
##         {text}
##      {text}
##   {text}
##   <president>
##      {text}
##      <name>
```

```
##       {text}
##      {text}
##      <number>
##        {text}
##      {text}
##      <start>
##        {text}
##      {text}
##      <end>
##        {text}
##      {text}
##      <party>
##        {text}
##      {text}
##      <nickname>
##        {text}
##      {text}
##      <born>
##        {text}
##      {text}
##      <occupation>
##        {text}
##      {text}
##      <state>
##        {text}
##      {text}
##      <hometown>
##        {text}
##      {text}
##      <education>
##        {text}
##      {text}
##      <married>
##        {text}
##      {text}
##      <mother>
##        {text}
##      {text}
##      <father>
##        {text}
##      {text}
##      <salary>
##        {text}
##      {text}
##      <religion>
##        {text}
##      {text}
##    {text}
```

c) extraction

- use XPath to get all religion nodes

```r
xml_find_all(xml, xpath = "//religion")
```

```
## {xml_nodeset (42)}
##  [1] <religion>Episcopalian</religion>
##  [2] <religion>Unitarian</religion>
##  [3] <religion>No formal affiliation</religion>
##  [4] <religion>Episcopalian</religion>
##  [5] <religion>Episcopalian</religion>
##  [6] <religion>Unitarian</religion>
##  [7] <religion>Presbyterian</religion>
##  [8] <religion>Dutch Reformed</religion>
##  [9] <religion>Episcopalian</religion>
## [10] <religion>Episcopalian</religion>
## [11] <religion>Presbyterian</religion>
## [12] <religion>Episcopalian</religion>
## [13] <religion>Unitarian</religion>
## [14] <religion>Episcopalian</religion>
## [15] <religion>Presbyterian</religion>
## [16] <religion>No formal affiliation</religion>
## [17] <religion>No formal affiliation</religion>
## [18] <religion>Methodist</religion>
## [19] <religion>No formal affiliation</religion>
## [20] <religion>Disciples of Christ</religion>
## ...
```

- use CSS-Selectors to get all religion nodes

```r
religion <- xml_find_all(xml, "religion")
religion
```

```
## {xml_nodeset (0)}
```

- extract the text from the nodes and use table() and sort() to produce a sorted table

```r
religion %>%
  xml_text() %>%
  table() %>%
  sort(TRUE) %>%
  as.data.frame()
```

```
## [1] .
## <0 rows> (or 0-length row.names)
```

- use xml_find() in combination with XPath to extract the node for the first president

```r
xml %>%
  xml_find_one(xpath="//president[1]")
```

```
## {xml_node}
## <president>
```

```
##  [1] <name>George Washington</name>
##  [2] <number>1</number>
##  [3] <start>April 30, 1789</start>
##  [4] <end>March 3, 1797</end>
##  [5] <party>Federalist</party>
##  [6] <nickname>Father of His Country</nickname>
##  [7] <born>22-Feb-1732</born>
##  [8] <occupation>Planter, Soldier</occupation>
##  [9] <state>Virginia</state>
## [10] <hometown>Westmoreland County</hometown>
## [11] <education>No formal education</education>
## [12] <married>Martha Dandridge Custis (1732-1802), on January 6, 1759</m ...
## [13] <mother>Mary Ball Washington</mother>
## [14] <father>Augustine Washington</father>
## [15] <salary>NA</salary>
## [16] <religion>Episcopalian</religion>
```

- extract the name node for all presidents after the 40th

```
xml %>%
  xml_find_all(xpath="//president[position()>40]")
```

```
## {xml_nodeset (2)}
## [1] <president>\n    <name>William Jefferson Clinton</name>\n    <number ...
## [2] <president>\n    <name>George Walker Bush</name>\n    <number>43</nu ...
```

- using XPath get the nodes for Pierce, Garfield and Taylor

```
xml %>%
  xml_find_all(xpath="//president[contains(./name, 'Pierce') or contains(./name, 'Garfield') or contains
```

```
## {xml_nodeset (3)}
## [1] <president>\n    <name>Zachary Taylor</name>\n    <number>12</number ...
## [2] <president>\n    <name>Franklin Pierce</name>\n    <number>14</numbe ...
## [3] <president>\n    <name>James Abram Garfield</name>\n    <number>20</ ...
```

- extract the occupation

```
xml %>%
  xml_find_all("occupation") %>%
  xml_text() %>%
  table() %>%
  sort(TRUE) %>%
  as.data.frame()
```

```
## [1] .
## <0 rows> (or 0-length row.names)
```

- transform the XML into a data.frame

```r
tagnames <-
  xml %>%
  xml_find_all(xpath="/*/*/*") %>%
  xml_name() %>%
  unique()

df <- data.frame(NA)
for( tag in tagnames ){
    tmp <-
      xml %>%
      xml_find_all(paste0("//",tag)) %>%
      xml_text()
  df <- data.frame(df, tmp)
}
df <- df[, -1]
names(df) <- tagnames

df
```

```
##                               name number              start
## 1            George Washington      1     April 30, 1789
## 2                   John Adams      2      March 4, 1797
## 3             Thomas Jefferson      3      March 4, 1801
## 4               James Madison      4      March 4, 1809
## 5                James Monroe      5      March 4, 1817
## 6           John Quincy Adams      6      March 4, 1825
## 7              Andrew Jackson      7      March 4, 1829
## 8            Martin Van Buren      8      March 4, 1837
## 9      William Henry Harrison      9      March 4, 1841
## 10                 John Tyler     10      April 6, 1841
## 11            James Knox Polk     11      March 4, 1845
## 12             Zachary Taylor     12      March 5, 1849
## 13           Millard Fillmore     13        July 9, 1850
## 14            Franklin Pierce     14      March 4, 1853
## 15             James Buchanan     15      March 4, 1857
## 16            Abraham Lincoln     16      March 4, 1861
## 17             Andrew Johnson     17     April 15, 1865
## 18      Ulysses Simpson Grant     18      March 4, 1869
## 19   Rutherford Birchard Hayes     19      March 4, 1877
## 20        James Abram Garfield     20      March 4, 1881
## 21         Chester Alan Arthur     21 September 19, 1881
## 22            Grover Cleveland     22      March 4, 1885
## 23           Benjamin Harrison     23      March 4, 1889
## 24            William McKinley     25      March 4, 1897
## 25          Theodore Roosevelt     26 September 14, 1901
## 26          William Howard Taft     27      March 4, 1909
## 27              Woodrow Wilson     28      March 4, 1913
## 28      Warren Gamaliel Harding     29      March 4, 1921
## 29             Calvin Coolidge     30      August 3, 1923
## 30         Herbert Clark Hoover     31      March 4, 1929
## 31   Franklin Delano Roosevelt     32      March 4, 1933
## 32             Harry S. Truman     33     April 12, 1945
## 33      Dwight David Eisenhower     34   January 20, 1953
## 34      John Fitzgerald Kennedy     35   January 20, 1961
```

```
## 35        Lyndon Baines Johnson     36   November 22, 1963
## 36        Richard Milhous Nixon     37    January 20, 1969
## 37         Gerald Rudolph Ford      38     August 9, 1974
## 38       James Earl Carter, Jr.     39    January 20, 1977
## 39         Ronald Wilson Reagan     40    January 20, 1981
## 40 George Herbert Walker Bush      41    January 20, 1989
## 41  William Jefferson Clinton      42    January 20, 1993
## 42          George Walker Bush      43    January 20, 2001
##                                   end                 party
## 1                      March 3, 1797           Federalist
## 2                      March 3, 1801           Federalist
## 3                      March 3, 1809 Democratic-Republican
## 4                      March 3, 1817 Democratic-Republican
## 5                      March 3, 1825 Democratic-Republican
## 6                      March 3, 1829 Democratic-Republican
## 7                      March 3, 1837             Democratic
## 8                      March 3, 1841             Democratic
## 9                      April 4, 1841                  Whig
## 10                     March 3, 1845                  Whig
## 11                     March 3, 1849             Democratic
## 12                      July 9, 1850                  Whig
## 13                     March 3, 1853                  Whig
## 14                     March 3, 1857               Democrat
## 15                     March 3, 1861               Democrat
## 16                    April 15, 1865             Republican
## 17                     March 3, 1869             Democratic
## 18                     March 3, 1877             Republican
## 19                     March 3, 1881             Republican
## 20                September 19, 1881             Republican
## 21                     March 3, 1885             Republican
## 22 March 3, 1889 and March 4, 1893               Democrat
## 23                     March 3, 1893             Republican
## 24                September 14, 1901             Republican
## 25                     March 3, 1909             Republican
## 26                     March 3, 1913             Republican
## 27                     March 3, 1921               Democrat
## 28                    August 2, 1923             Republican
## 29                     March 3, 1929             Republican
## 30                     March 3, 1933             Republican
## 31                    April 12, 1945               Democrat
## 32                  January 20, 1953               Democrat
## 33                  January 20, 1961             Republican
## 34                 November 22, 1963               Democrat
## 35                  January 20, 1969               Democrat
## 36                    August 9, 1974             Republican
## 37                  January 20, 1977             Republican
## 38                  January 20, 1981               Democrat
## 39                  January 20, 1989             Republican
## 40                  January 20, 1993             Republican
## 41                  January 20, 2001               Democrat
## 42                                NA             Republican
##                                   nickname          born
## 1                       Father of His Country 22-Feb-1732
## 2                       Atlas of Independence 30-Oct-1735
```

```
## 3                 Man of the People; Sage of Monticello 13-Apr-1743
## 4                             Father of the Constitution 16-Mar-1751
## 5   The Last Cocked Hat; Era-of-Good-Feeling President 28-Apr-1758
## 6                                      Old Man Eloquent 11-Jul-1767
## 7                                           Old Hickory 15-Mar-1767
## 8       The Little Magician; The Red Fox of Kinderhook 05-Dec-1782
## 9                               Old Tippecanoe; Old Tip 09-Feb-1773
## 10          Accidental President; His Accidency 29-Mar-1790
## 11                                       Young Hickory 02-Nov-1795
## 12                               Old Rough and Ready 24-Nov-1784
## 13                            The American Louis Philippe 07-Jan-1800
## 14              Young Hickory of the Granite Hills 23-Nov-1804
## 15                                             Old Buck 23-Apr-1791
## 16              Honest Abe; Illinois Rail-Splitter 12-Feb-1809
## 17                                               None 29-Dec-1808
## 18                                  Hero of Appomattox 27-Apr-1822
## 19                                Dark-Horse President 04-Oct-1822
## 20                                               None 19-Nov-1831
## 21              The Gentleman Boss; Elegant Arthur 05-Oct-1829
## 22         Uncle Jumbo; Veto Mayor; Veto President 18-Mar-1837
## 23                   Kid Gloves Harrison; Little Ben 20-Aug-1833
## 24                                        Idol of Ohio 29-Jan-1843
## 25                     TR; Trust-Buster; Teddy 27-Oct-1858
## 26                                               None 15-Sep-1857
## 27                               SchoolmasterPolitics 28-Dec-1856
## 28                                               None 02-Nov-1865
## 29                                           Silent Cal 04-Jul-1872
## 30                                               None 10-Aug-1874
## 31                                                  FDR 30-Jan-1882
## 32                           Give 'Em Hell Harry 08-May-1884
## 33                                                  Ike 14-Oct-1890
## 34                                        JFK, Jack 29-May-1917
## 35                                                  LBJ 27-Aug-1908
## 36                                       Tricky Dick 09-Jan-1913
## 37                                                Jerry 14-Jul-1913
## 38                                                Jimmy 01-Oct-1924
## 39     The Gipper; The Great Communicator; Dutch 06-Feb-1911
## 40                                               Poppy 12-Jun-1924
## 41                                                 Bill 19-Aug-1946
## 42                                   W, Little George 06-Jul-1946
## 	              occupation          state
## 1           Planter, Soldier        Virginia
## 2                     Lawyer   Massachusetts
## 3          Lawyer, planter        Virginia
## 4                     Lawyer        Virginia
## 5                     Lawyer        Virginia
## 6                     Lawyer   Massachusetts
## 7          Lawyer, soldier North Carolina
## 8                     Lawyer        New York
## 9                     Soldier        Virginia
## 10                    Lawyer        Virginia
## 11                    Lawyer North Carolina
## 12                    Soldier        Virginia
## 13                    Lawyer        New York
```

```
## 14         Lawyer, public official   New Hampshire
## 15                          Lawyer    Pennsylvania
## 16                          Lawyer        Kentucky
## 17         Tailor, public official  North Carolina
## 18                         Soldier            Ohio
## 19                          Lawyer            Ohio
## 20        Teacher, public official            Ohio
## 21                          Lawyer         Vermont
## 22                          Lawyer      New Jersey
## 23                          Lawyer            Ohio
## 24                          Lawyer            Ohio
## 25 Author, lawyer, public official        New York
## 26         Lawyer, public official            Ohio
## 27        Teacher, public official        Virginia
## 28                Editor-Publisher            Ohio
## 29                          Lawyer         Vermont
## 30                        Engineer            Iowa
## 31         Public official, lawyer        New York
## 32         Farmer, public official        Missouri
## 33                         Soldier           Texas
## 34         Author, public official   Massachusetts
## 35        Teacher, public official           Texas
## 36         Lawyer, public official      California
## 37         Lawyer, public official        Nebraska
## 38         Farmer, public official         Georgia
## 39          Actor, public official        Illinois
## 40     Businessman, public official   Massachusetts
## 41         Lawyer, public official        Arkansas
## 42                     Businessman     Connecticut
##                              hometown
## 1             Westmoreland County
## 2             Braintree (now Quincy)
## 3                         Shadwell
## 4                      Port Conway
## 5             Westmoreland County
## 6             Braintree (now Quincy)
## 7                           Waxhaw
## 8                       Kinderhook
## 9                         Berkeley
## 10                        Greenway
## 11              Mecklenburg County
## 12              near Barboursville
## 13   Locke Township (now Summerhill)
## 14       Hillsborough (now Hillsboro)
## 15       Cove Gap (near Mercersburg)
## 16         Hardin (now Larue) County
## 17                          Raleigh
## 18                   Point Pleasant
## 19                         Delaware
## 20                           Orange
## 21                        Fairfield
## 22                         Caldwell
## 23                        North Bend
## 24                            Niles
```

```
## 25                              New York
## 26                            Cincinnati
## 27                              Staunton
## 28 near Corsica (now Blooming Grove)
## 29                              Plymouth
## 30                           West Branch
## 31                             Hyde Park
## 32                                 Lamar
## 33                               Denison
## 34                             Brookline
## 35                     near Johnson City
## 36                            Yorba Linda
## 37                                 Omaha
## 38                                Plains
## 39                               Tampico
## 40                                Milton
## 41                                  Hope
## 42                             New Haven
##                                                                        education
## 1                                                             No formal education
## 2                                          Graduated from Harvard College (1755)
## 3                               Graduated from College of William and Mary (1762)
## 4      Graduated from College of New Jersey (now Princeton University; 1771)
## 5                               Graduated from College of William and Mary (1776)
## 6                                          Graduated from Harvard College (1787)
## 7                                                             No formal education
## 8                                  Graduated from Kinderhook Academy (1796)
## 9                                         Attended Hampden-Sydney College
## 10                      Graduated from the College of William and Mary (1807)
## 11                      Graduated from the University of North Carolina (1818)
## 12                                                            No formal education
## 13                                                            No formal education
## 14                                          Graduated from Bowdoin College (1824)
## 15                                        Graduated from Dickinson College (1809)
## 16                                                            No formal education
## 17                                                            No formal education
## 18          Graduated from the U.S. Military AcademyWest Point, N.Y. (1843)
## 19          Graduated from Kenyon College (1842) and Harvard Law School (1845)
## 20  Attended Western Reserve Eclectic Institute (now Hiram College); Graduated from
## 21                                          Graduated from Union College (1848)
## 22                                                            No formal education
## 23                      Graduated from Miami University, Oxford, Ohio (1852)
## 24                                             Attended Allegheny College
## 25                                          Graduated from Harvard College (1880)
## 26          Graduated from Yale College (1878); Cincinnati Law School (1880)
## 27      Graduated from the College of New Jersey (now Princeton University) (1879)
## 28                                  Graduated from Ohio Central College (1882)
## 29                                      Graduated from Amherst College (1895)
## 30                                   Graduated from Stanford University (1895).
## 31      Graduated from Harvard College (1903); Attended Columbia Law School
## 32                              Attended the University of Kansas City Law School
## 33          Graduated from U.S. Military Academy, West Point, N.Y. (1915)
## 34                                      Graduated from Harvard College (1940)
## 35 Graduated from Southwest Texas State Teachers College (1930) (now known as Texas
```

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## 36         Graduated from Whittier College (1934) and Duke University Law School (1937)
## 37 Graduated from the University of Michigan (1935) and Yale University Law School
## 38                         Graduated from U.S. Naval Academy, Annapolis, Md. (1946)
## 39                                         Graduated from Eureka College (1932)
## 40                                         Graduated from Yale University (1948)
## 41 Graduated from Georgetown University (1968); Attended Oxford University (1968-70
## 42 Graduated from Yale University (1968); Graduated from Harvard Business School (1
##                                                                          married
## 1                       Martha Dandridge Custis (1732-1802), on January 6, 1759
## 2                             Abigail Smith (1744-1818), on October 25, 1764
## 3                       Martha Wayles Skelton (1748-1782), on January 1, 1772
## 4                       Dolley Payne Todd (1768-1849), on September 15, 1794
## 5                 Elizabeth Eliza Kortright (1768-1830), on February 16, 1786
## 6                       Louisa Catherine Johnson (1775-1852), on July 26, 1797
## 7   Rachel Donelson Robards (1767-1828),August 1791 anda second ceremony on January
## 8                             Hannah Hoes (1783-1819), on February 21, 1807
## 9                       Anna Tuthill Symmes (1775-1864), on November 25, 1795
## 10 Letitia Chrisitan (1790-1842), on March 29, 1813; Julia Gardiner (1820-1889), on
## 11                             Sarah Childress (1803-1891), on January 1, 1824
## 12                       Margaret Mackall Smith (1788-1852), on June 21, 1810
## 13 Abigail Powers (1798-1853), on February 5, 1826; Caroline Carmichael McIntosh (1
## 14                       Jane Means Appleton (1806-1863), on November 10, 1834
## 15   Never married. The White House hostess was his niece Harriet Lane (1830-1903)
## 16                             Mary Todd (1818-1882), on November 4, 1842
## 17                             Eliza McCardle (1810-1876), on May 5, 1827
## 18                       Julia Boggs Dent (1826-1902), on August 22, 1848
## 19                       Lucy Ware Webb (1831-1889), on December 30, 1852
## 20                       Lucretia Rudolph (1832-1918), on November 11, 1858
## 21                       Ellen Lewis Herndon (1837-1880), on October 25, 1859
## 22                             Frances Folsom (1864-1947), on June 2, 1886
## 23 Caroline Lavinia Scott (1832-1892), on October 20, 1853; Mary Scott Lord Dimmick
## 24                             Ida Saxton (1847-1907), on January 25, 1871
## 25 Alice Hathaway Lee (1861-1884), on October 27, 1880; Edith Kermit Carow (1861-19
## 26                             Helen Herron (1861-1943), on June 19, 1886
## 27 Ellen Louise Axson (1860-1914), on June 24, 1885; Edith Bolling Galt (1872-1961)
## 28                       Florence Kling De Wolfe (1860-1924), on July 8, 1891
## 29                       Grace Anna Goodhue (1879-1957), on October 4, 1905
## 30                             Lou Henry (1875-1944), on February 10, 1899
## 31                       Anna Eleanor Roosevelt (1884-1962), on March 17, 1905
## 32                 Elizabeth Bess Virginia Wallace (1885-1982), on June 28, 1919
## 33                       Mary Mamie Geneva Doud (1896-1979), on July 1, 1916
## 34                 Jacqueline Lee Bouvier (1929-1994), on September 12, 1953
## 35           Claudia Lady Bird Alta Taylor (1912-2007), on November 17, 1934
## 36                 Thelma Patricia Catherine Ryan (1912-1993), on June 21, 1940
## 37                 Elizabeth Betty Bloomer Warren (1918- ), on October 15, 1948
## 38                       Eleanor Rosalynn Smith (1928- ), on July 7, 1946
## 39 Jane Wyman (1914- ), on June 25, 1940 (divorced1948); Nancy Davis (1923- ), on M
## 40                             Barbara Pierce (1925- ), on January 6, 1945
## 41                             Hillary Rodham (1947- ), on October 11, 1975
## 42                             Laura Welch (1946- ), on November 5, 1977
##                                         mother
## 1                 Mary Ball Washington
## 2                 Susanna Boylston Adams
## 3                 Jane Randolph Jefferson
```

```
## 4                         Nelly Conway Madison
## 5                       Elizabeth Jones Monroe
## 6                          Abigail Smith Adams
## 7                  Elizabeth Hutchinson Jackson
## 8                         Maria Hoes Van Buren
## 9                    Elizabeth Bassett Harrison
## 10                 Mary Marot Armistead Tyler
## 11                             Jane Knox Polk
## 12                 Sarah Dabney Strother Taylor
## 13                    Phoebe Millard Fillmore
## 14                        Ann Kendrick Pierce
## 15                   Elizabeth Speer Buchanan
## 16                        Nancy Hanks Lincoln
## 17                     Mary McDonough Johnson
## 18                      Hannah Simpson Grant
## 19                      Sophia Birchard Hayes
## 20                      Eliza Ballou Garfield
## 21                       Malvina Stone Arthur
## 22                       Anne Neal Cleveland
## 23               Elizabeth Ramsey Irwin Harrison
## 24             Nancy Campbell Allison McKinley
## 25                   Martha Bulloch Roosevelt
## 26                   Louisa Maria Torrey Taft
## 27               Jessie Janet Woodrow Wilson
## 28           Phoebe Elizabeth Dickerson Harding
## 29           Victoria Josephine Moor Coolidge
## 30           Hulda Randall Minthorn Hoover
## 31                     Sara Delano Roosevelt
## 32               Martha Ellen Young Truman
## 33             Ida Elizabeth Stover Eisenhower
## 34           Rose Elizabeth Fitzgerald Kennedy
## 35                   Rebekah Baines Johnson
## 36                     Hannah Milhous Nixon
## 37           Dorothy Ayer Gardner King Ford
## 38                     Lillian Gordy Carter
## 39                     Nelle Wilson Reagan
## 40                     Dorothy Walker Bush
## 41 Virginia Divine Cassidy Blythe Clinton Kelley
## 42                       Barbara Pierce Bush
##                                        father salary
## 1                  Augustine Washington     NA
## 2                          John Adams     NA
## 3                      Peter Jefferson     NA
## 4                      James Madison     NA
## 5                        Spence Monroe     NA
## 6              tiny U.S. flag John Adams     NA
## 7                      Andrew Jackson     NA
## 8                    Abraham Van Buren     NA
## 9                    Benjamin Harrison     NA
## 10                          John Tyler     NA
## 11                         Samuel Polk     NA
## 12         Lieutenant Colonel Richard Taylor     NA
## 13                    Nathaniel Fillmore     NA
## 14             General Benjamin Pierce     NA
```

```
## 15                        James Buchanan    NA
## 16                        Thomas Lincoln    NA
## 17                         Jacob Johnson    NA
## 18                       Jesse Root Grant    NA
## 19                       Rutherford Hayes    NA
## 20                        Abram Garfield    NA
## 21                        William Arthur    NA
## 22              Richard Falley Cleveland    NA
## 23                   John Scott Harrison    NA
## 24                       William McKinley    NA
## 25                     Theodore Roosevelt    NA
## 26                         Alphonso Taft    NA
## 27                  Joseph Ruggles Wilson    NA
## 28                   George Tyron Harding    NA
## 29                   John Calvin Coolidge    NA
## 30                    Jesse Clark Hoover    NA
## 31                       James Roosevelt    NA
## 32                  John Anderson Truman    NA
## 33                 David Jacob Eisenhower    NA
## 34                 Joseph Patrick Kennedy    NA
## 35                  Sam Ealy Johnson, Jr.    NA
## 36                 Francis Anthony Nixon    NA
## 37                     Leslie Lynch King    NA
## 38                     James Earl Carter    NA
## 39                    John Edward Reagan    NA
## 40                 Prescott Sheldon Bush    NA
## 41            William Jefferson Blythe III    NA
## 42 tiny U.S. flag George Herbert Walker Bush    NA
##                        religion
## 1             Episcopalian
## 2                Unitarian
## 3        No formal affiliation
## 4             Episcopalian
## 5             Episcopalian
## 6                Unitarian
## 7             Presbyterian
## 8           Dutch Reformed
## 9             Episcopalian
## 10            Episcopalian
## 11            Presbyterian
## 12            Episcopalian
## 13               Unitarian
## 14            Episcopalian
## 15            Presbyterian
## 16       No formal affiliation
## 17       No formal affiliation
## 18                Methodist
## 19       No formal affiliation
## 20         Disciples of Christ
## 21            Episcopalian
## 22            Presbyterian
## 23            Presbyterian
## 24                Methodist
## 25           Dutch Reformed
```

```
## 26                   Unitarian
## 27                Presbyterian
## 28                     Baptist
## 29            Congregationalist
## 30 Society of Friends (Quaker)
## 31                Episcopalian
## 32                     Baptist
## 33                Presbyterian
## 34              Roman Catholic
## 35          Disciples of Christ
## 36 Society of Friends (Quaker)
## 37                Episcopalian
## 38                     Baptist
## 39          Disciples of Christ
## 40                Episcopalian
## 41                     Baptist
## 42                   Methodist
```