

Cleaning the File

```
import pandas as pd

# Read the original CSV file
input_file = 'DHS_Contracts_PrimeTransactions_2024-08-26_H2IM02S33_1.csv'
output_file = 'DHS_output_file.csv' # Changed output file name

# List of columns to keep
columns_to_keep = [
    'contract_transaction_unique_key', 'parent_award_agency_name',
    'current_total_value_of_award',
    'period_of_performance_start_date',
    'period_of_performance_potential_end_date',
    'awarding_agency_name', 'funding_sub_agency_name',
    'object_classes_funding_this_award',
    'recipient_name', 'recipient_state_name',
    'primary_place_of_performance_state_name',
    'award_type', 'transaction_description',
    'prime_award_base_transaction_description',
    'product_or_service_code_description', 'naics_description',
    'recovered_materials_sustainability',
    'information_technology_commercial_item_category',
    'extent_competed', 'solicitation_procedures',
    'evaluated_preference', 'fair_opportunity_limited_sources',
    'other_than_full_and_open_competition',
    'number_of_offers_received', 'clinger_cohen_act_planning_code',
    'materials_supplies_articles_equipment',
    'labor_standards', 'performance_based_service_acquisition',
    'contingency_humanitarian_or_peacekeeping_operation',
    'minority_owned_business',
    'black_american_owned_business',
    'hispanic_american_owned_business', 'native_american_owned_business',
    'woman_owned_business', 'organizational_type'
]

# Read the CSV file, selecting only the specified columns
df = pd.read_csv(input_file, usecols=columns_to_keep)
df = df[df['awarding_agency_name'] == 'Department of Homeland Security']

# Write the filtered data to a new CSV file
df.to_csv(output_file, index=False)

print(f"Filtered CSV file has been created: {output_file}")
Filtered CSV file has been created: DHS_output_file.csv
```

What is the total number of AI/ML contracts?

```
import pandas as pd
import numpy as np

# File name
file_name = 'DHS_output_file.csv'

# Read the CSV file
df = pd.read_csv(file_name)

# Filter for Department of Homeland Security contracts
dhs_df = df[df['awarding_agency_name'] == 'Department of Homeland Security']

# Count the number of DHS contracts
dhs_contract_count = len(dhs_df)

# Calculate total value of DHS contracts
dhs_total_value = dhs_df['current_total_value_of_award'].sum()

# Get unique vendors for DHS contracts
dhs_unique_vendors = dhs_df['recipient_name'].nunique()

# Print results
print(f"Total number of contracts: {len(df)}")
print(f"Number of Department of Homeland Security contracts: {dhs_contract_count}")
print(f"Percentage of DHS contracts: {(dhs_contract_count / len(df)) * 100:.2f}%")
print(f"Total value of DHS contracts: ${dhs_total_value:,.2f}")
print(f"Number of unique vendors for DHS contracts: {dhs_unique_vendors}")

# Top 5 vendors for DHS by number of contracts
top_dhs_vendors = dhs_df['recipient_name'].value_counts().head(5)
print("\nTop 5 vendors for DHS by number of contracts:")
for vendor, count in top_dhs_vendors.items():
    print(f"{vendor}: {count} contracts")

# Top 5 NAICS descriptions for DHS contracts
top_dhs_naics = dhs_df['naics_description'].value_counts().head(5)
print("\nTop 5 NAICS descriptions for DHS contracts:")
for desc, count in top_dhs_naics.items():
    print(f"{desc}: {count} contracts")

# Optional: Distribution of contract values for DHS
print("\nDistribution of DHS contract values:")
print(dhs_df['current_total_value_of_award'].describe())

# Check for any contracts with other awarding agencies
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other_agencies = df[df['awarding_agency_name'] != 'Department of
Homeland Security']['awarding_agency_name'].unique()
if len(other_agencies) > 0:
    print("\nOther awarding agencies found in the dataset:")
    for agency in other_agencies:
        count = df[df['awarding_agency_name'] == agency].shape[0]
        print(f"{agency}: {count} contracts")
else:
    print("\nAll contracts in the dataset are from the Department of
Homeland Security.")

```

```

Total number of contracts: 41
Number of Department of Homeland Security contracts: 41
Percentage of DHS contracts: 100.00%
Total value of DHS contracts: $24,206,870.59
Number of unique vendors for DHS contracts: 26

```

Top 5 vendors for DHS by number of contracts:

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CACI NSS, LLC: 5 contracts
LEMPUGH INC: 3 contracts
IEM INTERNATIONAL, INC.: 2 contracts
SYSTRAN SOFTWARE, INC.: 2 contracts
FORWARD EDGE AI INC: 2 contracts

```

Top 5 NAICS descriptions for DHS contracts:

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OTHER COMPUTER RELATED SERVICES: 11 contracts
RESEARCH AND DEVELOPMENT IN THE PHYSICAL, ENGINEERING, AND LIFE
SCIENCES (EXCEPT NANOTECHNOLOGY AND BIOTECHNOLOGY): 11 contracts
OTHER AIRPORT OPERATIONS: 4 contracts
ADVERTISING AGENCIES: 3 contracts
PROCESS, PHYSICAL DISTRIBUTION, AND LOGISTICS CONSULTING SERVICES: 2
contracts

```

Distribution of DHS contract values:

```

count    2.900000e+01
mean     8.347197e+05
std      1.012996e+06
min      9.511500e+04
25%     1.743179e+05
50%     2.758022e+05
75%     1.289418e+06
max      4.060486e+06
Name: current_total_value_of_award, dtype: float64

```

All contracts in the dataset are from the Department of Homeland Security.

What is the total spending on AI/ML contracts?

```
import pandas as pd
import numpy as np

# File name
file_name = 'DHS_output_file.csv'

# Read the CSV file
df = pd.read_csv(file_name)

# Ensure current_total_value_of_award is numeric
df['current_total_value_of_award'] =
pd.to_numeric(df['current_total_value_of_award'], errors='coerce')

# Calculate the sum
total_award_value = df['current_total_value_of_award'].sum()

# Print the result
print(f"Sum of current_total_value_of_award: $
{total_award_value:,.2f}")

# Optional: Print some additional statistics
print("\nAdditional statistics:")
print(f"Mean award value: $
{df['current_total_value_of_award'].mean():,.2f}")
print(f"Median award value: $
{df['current_total_value_of_award'].median():,.2f}")
print(f"Maximum award value: $
{df['current_total_value_of_award'].max():,.2f}")
print(f"Minimum award value: $
{df['current_total_value_of_award'].min():,.2f}")

# Check for any null or zero values
null_count = df['current_total_value_of_award'].isnull().sum()
zero_count = (df['current_total_value_of_award'] == 0).sum()
print(f"\nNumber of null values: {null_count}")
print(f"Number of zero values: {zero_count}")
```

Sum of current_total_value_of_award: \$24,206,870.59

Additional statistics:

Mean award value: \$834,719.68

Median award value: \$275,802.19

Maximum award value: \$4,060,486.32

Minimum award value: \$95,115.00

Number of null values: 12

Number of zero values: 0

What proportion of AI procurement contracts awarded to minority-owned?

```
import pandas as pd

# Read the CSV file
df = pd.read_csv('DHS_output_file.csv')

# List of columns to check
columns_to_check = [
    'minority_owned_business',
    'black_american_owned_business',
    'hispanic_american_owned_business',
    'native_american_owned_business',
    'woman_owned_business'
]

# Count 't' occurrences for each column
for column in columns_to_check:
    count = df[column].eq('t').sum()
    print(f"Number of 't' in {column}: {count}")

# Calculate percentage for minority_owned_business
total_entries = len(df)
minority_owned_count = df['minority_owned_business'].eq('t').sum()
percentage = (minority_owned_count / total_entries) * 100

print(f"\nTotal entries: {total_entries}")
print(f"Number of 't' in minority_owned_business: {minority_owned_count}")
print(f"Percentage of minority-owned businesses: {percentage:.2f}%")

Number of 't' in minority_owned_business: 8
Number of 't' in black_american_owned_business: 3
Number of 't' in hispanic_american_owned_business: 0
Number of 't' in native_american_owned_business: 0
Number of 't' in woman_owned_business: 9

Total entries: 41
Number of 't' in minority_owned_business: 8
Percentage of minority-owned businesses: 19.51%
```

How clear and detailed are the transaction descriptions and product/service descriptions in AI procurement contracts? (What is the average number of words used in AI contract descriptions?)

```
import pandas as pd

# File name
file_name = 'DHS_output_file.csv'
```

```

# Read the CSV file
df = pd.read_csv(file_name)

# Function to count words in a string
def word_count(string):
    return len(str(string).split())

# Apply word count function to transaction_description column
df['word_count'] = df['transaction_description'].apply(word_count)

# Calculate average word count
average_word_count = df['word_count'].mean()

print(f"Average number of words in transaction descriptions:
{average_word_count:.2f}")

# Find row with highest word count
max_word_count_row = df.loc[df['word_count'].idxmax()]
print("\nRow with highest word count:")
print(f"Word count: {max_word_count_row['word_count']}")
print(f>Description: {max_word_count_row['transaction_description']}")

# Find row with lowest word count (excluding empty descriptions)
min_word_count_row = df[df['word_count'] >
0].loc[df['word_count'].idxmin()]
print("\nRow with lowest word count (excluding empty descriptions):")
print(f"Word count: {min_word_count_row['word_count']}")
print(f>Description: {min_word_count_row['transaction_description']}")

# Optional: Display some statistics
print("\nWord count statistics:")
print(df['word_count'].describe())

# Count how many descriptions mention 'AI' or 'artificial
intelligence'
ai_mentions = df['transaction_description'].str.contains('AI|
artificial intelligence', case=False, na=False).sum()
print(f"\nNumber of descriptions mentioning AI: {ai_mentions}")

# Calculate average word count for AI-related descriptions
ai_descriptions = df[df['transaction_description'].str.contains('AI|
artificial intelligence', case=False, na=False)]
ai_average_word_count = ai_descriptions['word_count'].mean() if not
ai_descriptions.empty else 0

print(f"Average number of words in AI-related contract descriptions:
{ai_average_word_count:.2f}")

```

Average number of words in transaction descriptions: 15.34

Row with highest word count:

Word count: 34

Description: THE PURPOSE OF THIS CALL ORDER IS TO ACQUIRE PROGRAMMATIC AND TECHNICAL SUPPORT FOR FEMA'S PLANNING ASSISTANT FOR RESILIENT COMMUNITIES (PARC) ARTIFICIAL INTELLIGENCE (AI) PILOT PROJECT TO COORDINATE CRITICAL ACTIVITIES AND ENABLE PROJECT EXECUT

Row with lowest word count (excluding empty descriptions):

Word count: 5

Description: MARKETING AND ARTIFICIAL INTELLIGENCE SERVICES

Word count statistics:

count 41.000000

mean 15.341463

std 6.857878

min 5.000000

25% 9.000000

50% 17.000000

75% 17.000000

max 34.000000

Name: word_count, dtype: float64

Number of descriptions mentioning AI: 28

Average number of words in AI-related contract descriptions: 15.46

What is the ratio of offers received to contracts awarded in AI procurements, indicating the level of competitiveness?

```
import pandas as pd
import numpy as np

# File name
file_name = 'DHS_output_file.csv'

# Read the CSV file
df = pd.read_csv(file_name)

# Ensure 'number_of_offers_received' is numeric
df['number_of_offers_received'] =
pd.to_numeric(df['number_of_offers_received'], errors='coerce')

# Calculate overall statistics
total_contracts = len(df)
total_offers = df['number_of_offers_received'].sum()
avg_offers_per_contract = total_offers / total_contracts

print(f"Total contracts: {total_contracts}")
print(f"Total offers received: {total_offers}")
print(f"Average offers per contract: {avg_offers_per_contract:.2f}")
print(f"Ratio of offers to contracts: {avg_offers_per_contract:.2f} :
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1")

# Distribution of offers
print("\nDistribution of offers received:")
print(df['number_of_offers_received'].describe())

# Categorize competitiveness
df['competitiveness'] = pd.cut(df['number_of_offers_received'],
                               bins=[-np.inf, 1, 3, 5, np.inf],
                               labels=['Single offer', 'Low
competition', 'Moderate competition', 'High competition'])

print("\nCompetitiveness breakdown:")
print(df['competitiveness'].value_counts(normalize=True).sort_index().
mul(100).round(2))

# Contracts with highest number of offers
top_competitive = df.nlargest(5, 'number_of_offers_received')
print("\nTop 5 most competitive contracts:")
print(top_competitive[['contract_transaction_unique_key',
'number_of_offers_received']])

# Percentage of contracts with only one offer
single_offer_percentage = (df['number_of_offers_received'] ==
1).mean() * 100
print(f"\nPercentage of contracts with only one offer:
{single_offer_percentage:.2f}%")

Total contracts: 41
Total offers received: 186.0
Average offers per contract: 4.54
Ratio of offers to contracts: 4.54 : 1

Distribution of offers received:
count      29.000000
mean        6.413793
std         20.326825
min          1.000000
25%          1.000000
50%          2.000000
75%          2.000000
max         110.000000
Name: number_of_offers_received, dtype: float64

Competitiveness breakdown:
Single offer      31.03
Low competition   58.62
Moderate competition    0.00
High competition   10.34
Name: competitiveness, dtype: float64

```


Top 5 most competitive contracts:

	contract_transaction_unique_key \
33	7001_-NONE-_70RSAT23C000000020_0_-NONE-_0
16	7001_-NONE-_70RSAT24C000000008_0_-NONE-_0
35	7001_-NONE-_70RSAT23C000000037_0_-NONE-_0
21	7001_-NONE-_70RSAT23C000000028_0_-NONE-_0
22	7001_7001_70RDAD23FR00000022_P00001_HSHQDC12D00...

	number_of_offers_received
33	110.0
16	23.0
35	6.0
21	3.0
22	3.0

Percentage of contracts with only one offer: 21.95%

What percentage of AI procurement contracts meet established labor standards?

```
import pandas as pd

# File name
file_name = 'DHS_output_file.csv'

# Read the CSV file
df = pd.read_csv(file_name)

# Ensure the column name is correct and data is cleaned
df['labor_standards'] = df['labor_standards'].str.upper().str.strip()

# Count the occurrences of each category
total_contracts = len(df)
yes_count = (df['labor_standards'] == 'YES').sum()
no_count = (df['labor_standards'] == 'NO').sum()
na_count = (df['labor_standards'] == 'NOT APPLICABLE').sum()

# Calculate percentages
yes_percentage = (yes_count / total_contracts) * 100
no_percentage = (no_count / total_contracts) * 100
na_percentage = (na_count / total_contracts) * 100

# Print results
print(f"Total number of contracts: {total_contracts}")
print(f"\nContracts meeting labor standards (YES):")
print(f"Count: {yes_count}")
print(f"Percentage: {yes_percentage:.2f}%")

print(f"\nContracts not meeting labor standards (NO):")
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print(f"Count: {no_count}")
print(f"Percentage: {no_percentage:.2f}%")

print(f"\nContracts where labor standards are not applicable:")
print(f"Count: {na_count}")
print(f"Percentage: {na_percentage:.2f}%")

# Check for any other values
other_count = total_contracts - (yes_count + no_count + na_count)
if other_count > 0:
    print(f"\nContracts with other values:")
    print(f"Count: {other_count}")
    print(f"Percentage: {(other_count / total_contracts) * 100:.2f}%")
    print("\nUnique values in labor_standards column:")
    print(df['labor_standards'].value_counts())

```

Total number of contracts: 41

Contracts meeting labor standards (YES):

Count: 15

Percentage: 36.59%

Contracts not meeting labor standards (NO):

Count: 9

Percentage: 21.95%

Contracts where labor standards are not applicable:

Count: 17

Percentage: 41.46%

Are performance-based criteria present in AI procurement contracts to ensure service delivery accountability?

```

import pandas as pd

# File name
file_name = 'DHS_output_file.csv'

# Read the CSV file
df = pd.read_csv(file_name)

# Ensure the column name is correct and data is cleaned
df['performance_based_service_acquisition'] =
df['performance_based_service_acquisition'].str.upper().str.strip()

# Get value counts and percentages
value_counts =
df['performance_based_service_acquisition'].value_counts()
value_percentages =
df['performance_based_service_acquisition'].value_counts(normalize=True)

```

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e) * 100

# Total number of contracts
total_contracts = len(df)

# Print results
print(f"Total number of contracts: {total_contracts}")
print("\nUnique values in 'performance_based_service_acquisition'
column:")
print("\nValue          Count      Percentage")
print("-" * 40)

for value, count in value_counts.items():
    percentage = value_percentages[value]
    print(f"{value:<16} {count:<9} {percentage:.2f}%")

# Check for null values
null_count =
df['performance_based_service_acquisition'].isnull().sum()
if null_count > 0:
    null_percentage = (null_count / total_contracts) * 100
    print(f"\nNull values:      {null_count:<9} {null_percentage:.2f}
%")

# Number of unique values
num_unique = len(value_counts)
print(f"\nNumber of unique values: {num_unique}")

Total number of contracts: 41

Unique values in 'performance_based_service_acquisition' column:

Value          Count      Percentage
-----
YES - SERVICE WHERE PBA IS USED. 21      51.22%
NO - SERVICE WHERE PBA IS NOT USED. 14      34.15%
NOT APPLICABLE 6      14.63%

Number of unique values: 3

import pandas as pd

# File name
file_name = 'DHS_output_file.csv'

# Read the CSV file
df = pd.read_csv(file_name)

# Clean the column

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df['solicitation_procedures'] =
df['solicitation_procedures'].str.strip().str.upper()

# Get value counts and percentages
value_counts = df['solicitation_procedures'].value_counts()
value_percentages =
df['solicitation_procedures'].value_counts(normalize=True) * 100

# Total number of contracts
total_contracts = len(df)

# Print results
print(f"Total number of contracts: {total_contracts}")
print("\nSolicitation Procedures Breakdown:")
print("\nProcedure                                Count
Percentage")
print("-" * 70)

for value, count in value_counts.items():
    percentage = value_percentages[value]
    print(f"{value:<40} {count:<9} {percentage:.2f}%")

# Check for null or empty values
null_count = df['solicitation_procedures'].isnull().sum()
empty_count = (df['solicitation_procedures'] == '').sum()
if null_count > 0 or empty_count > 0:
    print(f"\nNull values: {null_count}")
    print(f"Empty values: {empty_count}")

# Number of unique values
num_unique = len(value_counts)
print(f"\nNumber of unique solicitation procedures: {num_unique}")

# Analyze the types of procedures
competitive_procedures = ['FULL AND OPEN COMPETITION', 'COMPETITIVE
DELIVERY ORDER', 'FULL AND OPEN COMPETITION AFTER EXCLUSION OF
SOURCES']
competitive_count =
df['solicitation_procedures'].isin(competitive_procedures).sum()
competitive_percentage = (competitive_count / total_contracts) * 100

print(f"\nContracts with clearly competitive procedures:
{competitive_count} ({competitive_percentage:.2f}%)")

# Check for specific AI-related keywords in other columns
ai_keywords = ['AI', 'ARTIFICIAL INTELLIGENCE', 'MACHINE LEARNING',
'DEEP LEARNING']
ai_related_count =
df['transaction_description'].str.contains('|'.join(ai_keywords),
case=False, na=False).sum()

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ai_related_percentage = (ai_related_count / total_contracts) * 100
print(f"\nContracts potentially related to AI: {ai_related_count}
({ai_related_percentage:.2f}%)")
```

Total number of contracts: 41

Solicitation Procedures Breakdown:

Procedure	Count	Percentage

SUBJECT TO MULTIPLE AWARD FAIR OPPORTUNITY	21	53.85%
NEGOTIATED PROPOSAL/QUOTE	15	38.46%
ONLY ONE SOURCE	2	5.13%
BASIC RESEARCH	1	2.56%

Null values: 2
Empty values: 0

Number of unique solicitation procedures: 4

Contracts with clearly competitive procedures: 0 (0.00%)

Contracts potentially related to AI: 41 (100.00%)

How well do AI procurements align with IT standards, such as those specified by the Clinger-Cohen Act?

```
import pandas as pd
import numpy as np

# File name
file_name = 'DHS_output_file.csv'

# Read the CSV file
df = pd.read_csv(file_name)

# Clean the column
df['clinger_cohen_act_planning_code'] =
df['clinger_cohen_act_planning_code'].str.strip().str.upper()

# Get value counts and percentages
value_counts = df['clinger_cohen_act_planning_code'].value_counts()
value_percentages =
df['clinger_cohen_act_planning_code'].value_counts(normalize=True) *
100

# Total number of contracts
total_contracts = len(df)
```

```

# Print results
print(f"Total number of contracts: {total_contracts}")
print("\nClinger-Cohen Act Planning Code Breakdown:")
print("\nCode          Count      Percentage")
print("-" * 50)

for value, count in value_counts.items():
    percentage = value_percentages[value]
    print(f"{value:<25} {count:<9} {percentage:.2f}%")

# Check for null or empty values
null_count = df['clinger_cohen_act_planning_code'].isnull().sum()
empty_count = (df['clinger_cohen_act_planning_code'] == '').sum()
if null_count > 0 or empty_count > 0:
    print(f"\nNull values: {null_count}")
    print(f"Empty values: {empty_count}")

# Number of unique values
num_unique = len(value_counts)
print(f"\nNumber of unique Clinger-Cohen Act Planning Codes: {num_unique}")

# Analyze compliance
compliant_codes = ['Y', 'YES']
compliant_count = df['clinger_cohen_act_planning_code'].isin(compliant_codes).sum()
compliant_percentage = (compliant_count / total_contracts) * 100

print(f"\nContracts compliant with Clinger-Cohen Act: {compliant_count} ({compliant_percentage:.2f}%)")

# Check for AI-related keywords in transaction description
ai_keywords = ['AI', 'ARTIFICIAL INTELLIGENCE', 'MACHINE LEARNING', 'DEEP LEARNING']
df['is_ai_related'] = df['transaction_description'].str.contains('|'.join(ai_keywords), case=False, na=False)

ai_related_count = df['is_ai_related'].sum()
ai_related_percentage = (ai_related_count / total_contracts) * 100

print(f"\nPotentially AI-related contracts: {ai_related_count} ({ai_related_percentage:.2f}%)")

# Analyze Clinger-Cohen Act compliance for AI-related contracts
ai_compliant_count = df[df['is_ai_related'] & df['clinger_cohen_act_planning_code'].isin(compliant_codes)].shape[0]
ai_compliant_percentage = (ai_compliant_count / ai_related_count * 100) if ai_related_count > 0 else 0

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```
print(f"\nAI-related contracts compliant with Clinger-Cohen Act:
{ai_compliant_count} ({ai_compliant_percentage:.2f}%)")
```

Total number of contracts: 41

Clinger-Cohen Act Planning Code Breakdown:

Code	Count	Percentage
N	38	92.68%
Y	3	7.32%

Number of unique Clinger-Cohen Act Planning Codes: 2

Contracts compliant with Clinger-Cohen Act: 3 (7.32%)

Potentially AI-related contracts: 41 (100.00%)

AI-related contracts compliant with Clinger-Cohen Act: 3 (7.32%)

Who are the top three main vendors? (value and number of contracts)

```
import pandas as pd
import numpy as np

# File name
file_name = 'DHS_output_file.csv'

# Read the CSV file
df = pd.read_csv(file_name)

# Clean the recipient_name column
df['recipient_name'] = df['recipient_name'].str.strip().str.upper()

# Ensure current_total_value_of_award is numeric
df['current_total_value_of_award'] =
pd.to_numeric(df['current_total_value_of_award'], errors='coerce')

# Count unique vendors
unique_vendors = df['recipient_name'].nunique()

# Get top vendors by number of contracts
top_vendors_by_contracts = df['recipient_name'].value_counts().head(3)

# Get top vendors by total award value
vendor_stats = df.groupby('recipient_name').agg({
    'current_total_value_of_award': 'sum',
    'recipient_name': 'count'
}).rename(columns={'recipient_name': 'contract_count'})

top_vendors_by_value = vendor_stats.nlargest(3,
```

```

'current_total_value_of_award')

# Get unique vendor names
unique_vendor_names = df['recipient_name'].unique()

# Total number of contracts and total award value
total_contracts = len(df)
total_award_value = df['current_total_value_of_award'].sum()

# Print results
print(f"Total number of contracts: {total_contracts}")
print(f"Total award value: ${total_award_value:,.2f}")
print(f"Number of unique vendors: {unique_vendors}")

print("\nTop 3 vendors by number of contracts:")
for vendor, count in top_vendors_by_contracts.items():
    percentage = (count / total_contracts) * 100
    print(f"{vendor}: {count} contracts ({percentage:.2f}%)")

print("\nTop 3 vendors by total award value:")
for vendor, row in top_vendors_by_value.iterrows():
    value = row['current_total_value_of_award']
    count = row['contract_count']
    value_percentage = (value / total_award_value) * 100
    count_percentage = (count / total_contracts) * 100
    print(f"{vendor}:")
    print(f"  Total value: ${value:,.2f} ({value_percentage:.2f}% of total value)")
    print(f"  Number of contracts: {count} ({count_percentage:.2f}% of total contracts)")

# Print first 20 unique vendor names
print("\nFirst 20 unique vendor names:")
for i, name in enumerate(unique_vendor_names[:20], 1):
    print(f"{i}. {name}")

if len(unique_vendor_names) > 20:
    print(f"... and {len(unique_vendor_names) - 20} more.")

# Optional: Display distribution of contracts among vendors
print("\nDistribution of contracts among vendors:")
vendor_contract_counts = df['recipient_name'].value_counts()
print(vendor_contract_counts.describe())

# Optional: Check for any unnamed or generic vendors
unnamed_count = df['recipient_name'].isin(['', 'UNNAMED', 'UNKNOWN', 'N/A']).sum()
if unnamed_count > 0:
    print(f"\nContracts with unnamed or generic vendors: {unnamed_count}")

```


Total number of contracts: 41
Total award value: \$24,206,870.59
Number of unique vendors: 26

Top 3 vendors by number of contracts:
CACI NSS, LLC: 5 contracts (12.20%)
LEMPUGH INC: 3 contracts (7.32%)
IEM INTERNATIONAL, INC.: 2 contracts (4.88%)

Top 3 vendors by total award value:
LEMPUGH INC:
Total value: \$10,258,120.32 (42.38% of total value)
Number of contracts: 3.0 (7.32% of total contracts)
CACI NSS, LLC:
Total value: \$5,357,671.80 (22.13% of total value)
Number of contracts: 5.0 (12.20% of total contracts)
NOBLIS, INC.:
Total value: \$1,348,957.80 (5.57% of total value)
Number of contracts: 1.0 (2.44% of total contracts)

First 20 unique vendor names:
1. LEMPUGH INC
2. CACI NSS, LLC
3. VOICECAST SYSTEMS INC
4. TRANSPORTATION MANAGEMENT SERVICES INC
5. AMERICAN MEDICAL RESPONSE, INC.
6. MAG DS CORP
7. IEM INTERNATIONAL, INC.
8. C & C INTERNATIONAL COMPUTERS & CONSULTANTS, INC.
9. MIRACLE SYSTEMS LLC
10. MICHIGAN ENGINEERING SERVICES LLC
11. AGILE DATA DECISIONS, INC.
12. STREAMLINE AUTOMATION LLC
13. AVAWATZ CO
14. ANACAPA MICRO PRODUCTS, INC.
15. FORWARD EDGE AI INC
16. CTG FEDERAL, LLC
17. NOBLIS, INC.
18. SYSTRAN SOFTWARE, INC.
19. THE RAND CORPORATION
20. 9 CORNER SOLUTIONS LLC
... and 6 more.

Distribution of contracts among vendors:

count	26.000000
mean	1.576923
std	0.902134
min	1.000000
25%	1.000000
50%	1.000000

```
75%      2.000000
max      5.000000
Name: recipient_name, dtype: float64
```

Vendor details and types of services they provide

```
import pandas as pd
import numpy as np

# File name
file_name = 'DHS_output_file.csv'

# Read the CSV file
df = pd.read_csv(file_name)

# Clean the recipient_name column
df['recipient_name'] = df['recipient_name'].str.strip().str.upper()

# Ensure current_total_value_of_award is numeric
df['current_total_value_of_award'] =
pd.to_numeric(df['current_total_value_of_award'], errors='coerce')

# Get top 3 vendors by number of contracts
top_vendors_by_contracts = df['recipient_name'].value_counts().head(3)

# Get top 3 vendors by total award value
vendor_stats = df.groupby('recipient_name').agg({
    'current_total_value_of_award': 'sum',
    'recipient_name': 'count'
}).rename(columns={'recipient_name': 'contract_count'})

top_vendors_by_value = vendor_stats.nlargest(3,
'current_total_value_of_award')

# Function to get NAICS descriptions for a vendor
def get_naics_descriptions(vendor_name):
    vendor_contracts = df[df['recipient_name'] == vendor_name]
    naics_desc = vendor_contracts['naics_description'].value_counts()
    return naics_desc.head(5) # Return top 5 NAICS descriptions

# Print results
print("Top 3 vendors by number of contracts:")
for vendor, count in top_vendors_by_contracts.items():
    print(f"\n{vendor}: {count} contracts")
print("Top 5 NAICS descriptions:")
naics_desc = get_naics_descriptions(vendor)
for desc, freq in naics_desc.items():
    print(f"  - {desc}: {freq} contracts")

print("\nTop 3 vendors by total award value:")
```

```

for vendor, row in top_vendors_by_value.iterrows():
    value = row['current_total_value_of_award']
    count = row['contract_count']
    print(f"\n{vendor}:")
    print(f"    Total value: ${value:,.2f}")
    print(f"    Number of contracts: {count}")
    print("Top 5 NAICS descriptions:")
    naics_desc = get_naics_descriptions(vendor)
    for desc, freq in naics_desc.items():
        print(f"    - {desc}: {freq} contracts")

# Calculate and print total award value
total_award_value = df['current_total_value_of_award'].sum()
print(f"\nTotal award value across all contracts: $
{total_award_value:,.2f}")

```

Top 3 vendors by number of contracts:

CACI NSS, LLC: 5 contracts
 Top 5 NAICS descriptions:
 - OTHER COMPUTER RELATED SERVICES: 5 contracts

LEMPUGH INC: 3 contracts
 Top 5 NAICS descriptions:
 - ADVERTISING AGENCIES: 3 contracts

IEM INTERNATIONAL, INC.: 2 contracts
 Top 5 NAICS descriptions:
 - OTHER AIRPORT OPERATIONS: 2 contracts

Top 3 vendors by total award value:

LEMPUGH INC:
 Total value: \$10,258,120.32
 Number of contracts: 3.0
 Top 5 NAICS descriptions:
 - ADVERTISING AGENCIES: 3 contracts

CACI NSS, LLC:
 Total value: \$5,357,671.80
 Number of contracts: 5.0
 Top 5 NAICS descriptions:
 - OTHER COMPUTER RELATED SERVICES: 5 contracts

NOBLIS, INC.:
 Total value: \$1,348,957.80
 Number of contracts: 1.0
 Top 5 NAICS descriptions:
 - ADMINISTRATIVE MANAGEMENT AND GENERAL MANAGEMENT CONSULTING
 SERVICES: 1 contracts

Total award value across all contracts: \$24,206,870.59