Phase 1: Data Import and Cleaning

Purpose:

- Import and parse the raw CSV data for UCSD course grade distributions.
- Clean and classify rows into "computable" (has GPA data) vs. "noncomputable".
- Save the cleaned DataFrame to disk for further analysis in Phase 2.

Key Steps:

1. Load raw CSV into `df`.
2. Parse letter grades, excluding non-traditional letters and “not available” rows.
3. Compute `enhanced_calculated_gpa`.
4. Mark each row with a `gpa_status`.
5. Serialize the cleaned `df` so Phase 2 can pick it up without re-running all cleaning steps.

In [2]:

```
import os
import pandas as pd
import matplotlib.pyplot as plt

# For inline plots in Jupyter
%matplotlib inline
```

In [3]:

```
# Define the path to the CSV file
data_file = os.path.join("..", "data", "Crowd-sourced grade distributions –

# Read the CSV file into a DataFrame
df = pd.read_csv(data_file)

# Quick preview
print("Preview of the dataset:")
display(df.head())

# Basic info
print("\nDataFrame info:")
df.info()

print("\nMissing values per column:")
display(df.isnull().sum())
```

```
Preview of the dataset:
```

	Submission time	User ID	Term	Course	Professor	dist
0	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Fall Qtr 2023	CSE 120	Voelker, Geoffrey M.	A+: B+:
1	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Fall Qtr 2023	CSE 132A	Vianu, Victor Dan	A+ B+: C
2	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Fall Qtr 2023	CSE 141L	Eldon, John	A+ A- B C
3	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Fall Qtr 2023	CSE 167	Li, Tzumao	A:2 B B-
4	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Fall Qtr 2023	CSE 230	Jhala, Ranjit	A:4 B+ B-

```
DataFrame info:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9454 entries, 0 to 9453
Data columns (total 7 columns):
 #   Column                Non-Null Count  Dtype  
---  ------                --------------  -----  
 0   Submission time       9454 non-null   object 
 1   User ID               9454 non-null   object 
 2   Term                  9454 non-null   object 
 3   Course                9454 non-null   object 
 4   Professor             9454 non-null   object 
 5   Grade distribution    9454 non-null   object 
 6   Recommend professor?  0 non-null      float64
dtypes: float64(1), object(6)
memory usage: 517.1+ KB

Missing values per column:
Submission time            0
User ID                    0
Term                       0
Course                     0
Professor                  0
Grade distribution         0
Recommend professor?    9454
dtype: int64
```

Processing & Cleaning Strategy

1. **Letter-Grade Parsing**
   - Each row has a `Grade distribution` string, e.g. `"A+:12, A-:3, B:10, W:1, ..."`.
   - We split by commas, then by ":" to map each grade letter to its count.
2. **Standard vs. Non-Traditional**
   - We define a `grade_points_map_lower` for standard letters (`"a", "b", "c", "d", "f"` and +/-).
   - We define a `skip_letters` set for meta info or non-traditional letters (`p, np, w, i, ip, s, u, class gpa, total students, blank`).
   - If a row indicates `"Grade Distribution is not available..."`, we consider that row entirely noncomputable.
3. **Compute Average GPA**
   - Sum of (grade_count × letter_GPA_value) / total_students for that row.
   - If `total_students == 0`, return `None`.
4. **Handling Pandas NaN**
   - When `None` is stored in a DataFrame cell, it becomes `NaN`. We use `pd.notna()` to check if the computed GPA is a valid number. Otherwise, it's "noncomputable."
5. **Classification**
   - We create a `gpa_status` column: `"computable"` if `enhanced_calculated_gpa` is a valid float, `"noncomputable"` if it's `NaN`.
6. **Outcome**
   - We'll see how many rows are computable vs. noncomputable, then show a distribution histogram of `enhanced_calculated_gpa`.

In [5]:

```python
grade_points_map_lower = {
    "a+": 4.0, "a": 4.0, "a-": 3.7,
    "b+": 3.3, "b": 3.0, "b-": 2.7,
    "c+": 2.3, "c": 2.0, "c-": 1.7,
    "d+": 1.3, "d": 1.0, "d-": 0.7,
    "f": 0.0
}

skip_letters = {
    "class gpa", "total students", "blank",
    "p", "np", "s", "u", "w", "i", "ip"
}

def parse_grade_distribution_enhanced(dist_str):
    dist_str_lower = dist_str.lower()
    if "not available" in dist_str_lower:
        return {}
    grades = {}
    parts = dist_str.split(',')
    for part in parts:
        part = part.strip()
        if not part:
            continue
        letter_count = part.split(':')
        if len(letter_count) == 2:
            letter_raw, count_str = letter_count
            letter_lower = letter_raw.strip().lower()

            if letter_lower in skip_letters:
                continue

            try:
                count = int(count_str.strip())
            except ValueError:
                count = 0

            if letter_lower in grade_points_map_lower:
                grades[letter_lower] = grades.get(letter_lower, 0) + count
    return grades

def compute_average_gpa_enhanced(grades_dict):
    total_students = 0
    total_points = 0.0
    for letter_lower, cnt in grades_dict.items():
        if letter_lower in grade_points_map_lower:
            total_students += cnt
            total_points += cnt * grade_points_map_lower[letter_lower]
    if total_students == 0:
        return None
    return total_points / total_students
```

In [6]:

```
df["enhanced_grade_dict"] = df["Grade distribution"].astype(str).apply(parse
df["enhanced_calculated_gpa"] = df["enhanced_grade_dict"].apply(compute_aver

import pandas as pd

def classify_gpa_status(gpa_value):
    # Use pd.notna() to handle NaN
    return "computable" if pd.notna(gpa_value) else "noncomputable"

df["gpa_status"] = df["enhanced_calculated_gpa"].apply(classify_gpa_status)

print("Finished parsing and classifying. Sample rows:")
display(df.head(10))
```

```
Finished parsing and classifying. Sample rows:
```

	Submission time	User ID	Term	Course	Professor	dis
0	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Fall Qtr 2023	CSE 120	Voelker, Geoffrey M.	A- B+
1	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Fall Qtr 2023	CSE 132A	Vianu, Victor Dan	A B+
2	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Fall Qtr 2023	CSE 141L	Eldon, John	A A C
3	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Fall Qtr 2023	CSE 167	Li, Tzumao	A: B
4	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Fall Qtr 2023	CSE 230	Jhala, Ranjit	A:4 B B
5	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Spring Qtr 2023	CSE 101	Jones, Miles E	A:6 B+ B-
6	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Spring Qtr 2023	CSE 105	Minnes Kemp, Mor Mia	A+ B+
7	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Spring Qtr 2023	CSE 110	Powell, Thomas Allan	A A C+
8	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Spring Qtr 2023	PHYS 2C	Yang, Liang	A C
9	2023-12-23T05:50:18.840Z	b144031aa5f07b5677aa3431b98f674d	Winter Qtr 2023	CAT 125	Bigham, David Joseph	A A C

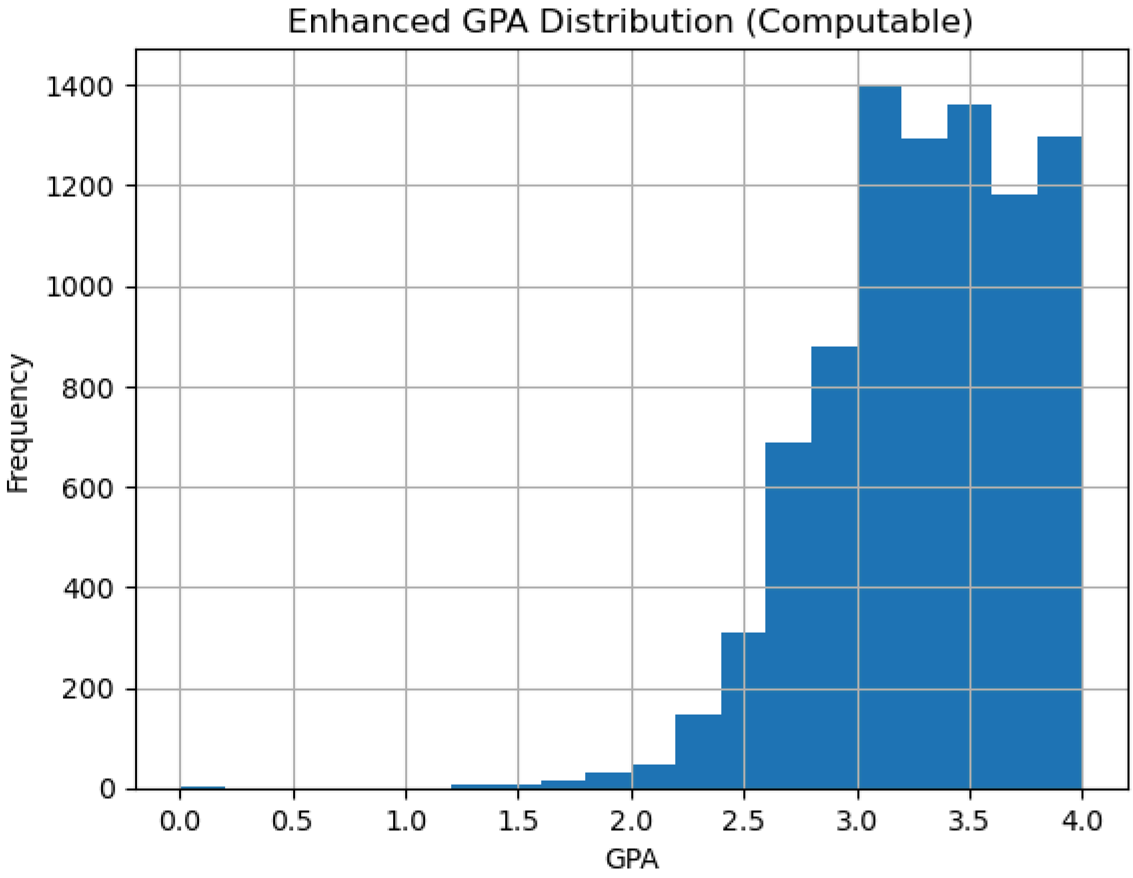
In [7]:

```
total_rows = len(df)
computable_rows = (df["gpa_status"] == "computable").sum()
noncomputable_rows = (df["gpa_status"] == "noncomputable").sum()

print(f"Total rows: {total_rows}")
print(f"Computable rows: {computable_rows}")
print(f"Noncomputable rows: {noncomputable_rows}")
print(f"Percentage of computable rows: {computable_rows / total_rows * 100:.

df_computable = df[df["gpa_status"] == "computable"]
df_computable["enhanced_calculated_gpa"].hist(bins=20)
plt.title("Enhanced GPA Distribution (Computable)")
plt.xlabel("GPA")
plt.ylabel("Frequency")
plt.show()
```

```
Total rows: 9454
Computable rows: 8664
Noncomputable rows: 790
Percentage of computable rows: 91.64%
```



In [8]:

```
# We'll use Pickle for easy reloading in Phase 2
output_file = os.path.join("..", "data", "cleaned_grades.pkl")
df.to_pickle(output_file)

print(f"Cleaned DataFrame saved to: {output_file}")
```

```
Cleaned DataFrame saved to: ../data/cleaned_grades.pkl
```

Conclusion

We have successfully:

1. Imported the raw CSV.
2. Parsed standard letter grades and computed `enhanced_calculated_gpa`.
3. Classified rows into `"computable"` or `"noncomputable"`.
4. Saved the cleaned `df` to a pickle file (`cleaned_grades.pkl`) for future analysis.

Next steps: Open `02_exploratory_analysis.ipynb` or another downstream notebook.
Load `cleaned_grades.pkl` and proceed with deeper GPA, course, or professor-level analysis.

In [ ]: