Formulas

Density \( = \frac{\text{Mass}}{\text{Volume}} \)

Population Density \( = \frac{\text{People}}{\text{Area}} \)

Absolute change \( = \) New value – Old value

Relative change \( = \frac{\text{New value} – \text{Old value}}{\text{Old value}} \times 100\%

Absolute difference = Compared value – Reference value

Relative difference \( = \frac{\text{Compared value} – \text{Reference value}}{\text{Reference value}} \times 100\%

Absolute error = Measured value – True value

Relative error \( = \frac{\text{Measured value} – \text{True value}}{\text{True value}} \times 100\%

Index number \( = \frac{\text{Compared value}}{\text{Reference value}} \times 100\%

Price in \$_y = (\text{price in } \$_x) \times \left( \frac{\text{CPI}_y}{\text{CPI}_x} \right) \) or \( \frac{\text{CPI}_y}{\text{CPI}_x} = \frac{\text{Price in } \$_y}{\text{Price in } \$_x} \)

Rate of inflation \( = \frac{\text{CPI}_{\text{New}} – \text{CPI}_{\text{Old}}}{\text{CPI}_{\text{Old}}} \times 100\%


<table>
<thead>
<tr>
<th>Year</th>
<th>CPI</th>
<th>Year</th>
<th>CPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>130.7</td>
<td>1998</td>
<td>163.0</td>
</tr>
<tr>
<td>1991</td>
<td>136.2</td>
<td>1999</td>
<td>166.6</td>
</tr>
<tr>
<td>1992</td>
<td>140.3</td>
<td>2000</td>
<td>172.2</td>
</tr>
<tr>
<td>1993</td>
<td>144.5</td>
<td>2001</td>
<td>177.1</td>
</tr>
<tr>
<td>1994</td>
<td>148.2</td>
<td>2002</td>
<td>179.9</td>
</tr>
<tr>
<td>1995</td>
<td>152.4</td>
<td>2003</td>
<td>184.0</td>
</tr>
<tr>
<td>1996</td>
<td>156.9</td>
<td>2004</td>
<td>188.9</td>
</tr>
<tr>
<td>1997</td>
<td>160.5</td>
<td>2005</td>
<td>195.3</td>
</tr>
</tbody>
</table>
### Energy and Power

<table>
<thead>
<tr>
<th>Metric Prefixes</th>
<th>Energy (dry measure)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liter (l)</td>
<td>0.2642 gal</td>
</tr>
<tr>
<td>Liter (L)</td>
<td>1 L</td>
</tr>
<tr>
<td>Milliliter (mL)</td>
<td>1 cm³</td>
</tr>
<tr>
<td>Cubic centimeter</td>
<td>1 cm³</td>
</tr>
<tr>
<td>Cubic meter (m³)</td>
<td>1000 m³</td>
</tr>
<tr>
<td>Cubic millimeter</td>
<td>10⁻⁶ m³</td>
</tr>
<tr>
<td>Cubic foot (ft³)</td>
<td>1.0517 m³</td>
</tr>
<tr>
<td>Cubic yard (yd³)</td>
<td>0.76455 m³</td>
</tr>
</tbody>
</table>

### Currency Conversions from US Dollar

<table>
<thead>
<tr>
<th>Mexican Peso</th>
<th>Canadian Dollar</th>
<th>Japanese Yen</th>
<th>European Euro</th>
<th>British Pound</th>
</tr>
</thead>
<tbody>
<tr>
<td>$12,398</td>
<td>$1,021.56</td>
<td>$1,000,000</td>
<td>$778.65</td>
<td>$1,250.95</td>
</tr>
</tbody>
</table>

### Current Values are Generally Provided at the Beginning

### Of the Semester Only

### Note that these values fluctuate several times per day.

### Formulas

- \( C = (9/5) F - 32 \)
- \( F = (9/5) C + 32 \)

### Prefixes and Abbreviations

- \( g \): Gram
- \( G \): Gigagram
- \( M \): Megagram
- \( mg \): Milligram
- \( kg \): Kilogram
- \( g \): Gram
- \( mg \): Milligram
- \( c \): Centi
- \( m \): Metre
- \( mm \): Millimetre
- \( ml \): Millilitre
- \( L \): Litre
- \( yd \): Yard
- \( ft \): Foot
- \( in \): Inch
- \( gal \): Gallon
- \( L \): Litre
- \( m³ \): Cubic metre
- \( cm³ \): Cubic centimetre
- \( mm³ \): Cubic millimetre
- \( L \): Litre
- \( yd³ \): Cubic yard
- \( ft³ \): Cubic foot
- \( in³ \): Cubic inch
- \( cm³ \): Cubic centimetre
- \( mm³ \): Cubic millimetre
- \( L \): Litre

### Conversion Factors

- \( 10⁷ \) (million)
- \( 10² \) (thousand)
- \( 10⁻³ \) (thousandth)
- \( 10⁻⁶ \) (millionth)
- \( 10⁻⁹ \) (one thousandth)
- \( 10⁻¹² \) (one millionth)
Student’s Printed Name: _____________________  XID: C___________

Instructor: _________________________________ Section: _________

No questions will be answered during this exam.

If you consider a question to be ambiguous, state your assumptions in the margin and do the best you can to provide the correct answer.

You have 90 minutes (1.5 hours) to complete this test.

General Directions:

- Any communication with any person (other than the instructor or a designated proctor) during this exam of any form, including written, signed, verbal, or digital, is understood to be a violation of academic integrity.

- All devices, such as computers, cell phones, cameras, and PDAs, must be turned off while the student is in the testing room.

- You may use any scientific calculator except a TI-89 or a TI-NSpire CAS.

- No part of this test may be removed from the examination room.

On my honor, I have neither given nor received inappropriate or unauthorized information at any time before or during this test.

Student’s Signature:_______________________________ _________________
Multiple Choice Portion

There are 20 multiple choice questions. Each question is worth 3 points and has one correct answer. Use a number 2 pencil and bubble in the letter of your response on the Scantron sheet. For your own record, also circle your choice on your test since the Scantron will not be returned to you. Only the responses recorded on your Scantron sheet will be graded.

1. How many seconds are there in one day?
   A) 3600 seconds
   B) 86,400 seconds
   C) 1440 seconds
   D) .007 seconds
   E) 144,000 seconds

2. Calculate \((3.2 \times 10^6) \times (8.71 \times 10^{-2})\). Report your answer in ordinary notation with the appropriate number of significant digits.
   A) 27.872
   B) 28
   C) .0028
   D) 280,000
   E) 278,720

3. A store is having a 30% off sale. What is the sale price of a shirt that was originally marked $40?
   A) $30
   B) $37
   C) $12
   D) $52
   E) $28
4. The average price of gasoline in France is 1.14 Euros per liter. How much would you pay for 1 gallon of gasoline in U.S. dollars? Round your answer to the nearest cent.

A) $3.36  
B) $2.34  
C) $3.87  
D) $5.55  
E) $5.35

5. How many significant digits are in the number –.07035?

A) 6  
B) 3  
C) 2  
D) 4  
E) 5

6. The average value of a house in Dallas grew from $53,100 in 2000 to $85,000 in 2010. Find the relative change in housing price for Dallas from 2000 to 2010. Round your answers to one decimal place.

A) –37.5%  
B) –60.1%  
C) 37.5%  
D) $31,900  
E) 60.1%
7. A parking lot measures 1.3 km\(^2\) in area. What is the lot’s area in square miles? Round your answer to one decimal place.

A) 0.8 miles\(^2\)
B) 0.6 miles\(^2\)
C) 0.5 miles\(^2\)
D) 1.8 miles\(^2\)
E) 0.9 miles\(^2\)

8. Select the statement below which BEST rephrases the given categorical proposition in standard form.

“At least one camper did not know how to swim.”

A) No campers are swimmers.
B) Some swimmers are not campers.
C) Some campers are swimmers.
D) Some campers are not swimmers.
E) Some swimmers are campers.

9. Select the Venn diagram below which BEST illustrates the argument.

Premise 1: All nurses are women.
Premise 2: Pat (X) is not a nurse.
Conclusion: Pat is not a woman.

A) B) 
C) D) 
E)
10. A 250 gram chunk of aluminum has a volume of 92.59 cm$^3$. Calculate the density of the aluminum chunk and determine whether it will float or sink in water. Water has a density of 1 g/cm$^3$. Round the density to the nearest hundredth.

(A) The density of aluminum is 2.70 g/cm$^3$; it will sink in water.

B) The density of aluminum is 23147.50 g/cm$^3$; it will sink in water.

C) The density of aluminum is .37 g/cm$^3$; it will sink in water.

D) The density of aluminum is .37 g/cm$^3$; it will float in water.

E) The density of aluminum is 2.70 g/cm$^3$; it will float in water.

11. In the first 15 games of the 2014 – 2015 college basketball season, the Clemson Tigers scored an average of 65 points per game. The Florida State Seminoles scored an average of 71 points per game.

Find the percentage: Clemson’s average score is ______ of Florida State’s average score.

A) 1.63%

B) 109.23%

C) –61.9%

D) –162.5%

E) 91.55%

12. Over the summer months, the temperature in Clemson is on average 85 °F. What is the average temperature in °C? Round your answer to the nearest tenth of a degree.

A) 23.2 °C

B) 29.4 °C

C) 95.4 °C

D) 34.2 °C

E) 67.2 °C
13. Determine the overall rate of inflation experienced between 1973 and 1976 given that the CPI$_{1973} = 44.4$ and CPI$_{1976} = 56.9$.
Round your answer to the nearest tenth of a percent.

   A) 55.9%
   B) 22.0%
   C) 28.2%
   D) 43.1%
   E) 56.1%

14. Your total bill for dinner at a restaurant is $22.68 including tip. If you payed 20% tip, what was the amount of the bill without tip? Round your answer to two decimal places.

   A) $18.14
   B) $27.22
   C) $26.46
   D) $15.12
   E) $18.90

15. Which of the Venn diagrams below BEST illustrates the categorical proposition? "Some poets are men."

   NOTE: “X” indicates a non-empty region.

   A)  
   B)  
   C)  
   D)  
   E)  

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16. Over the last several years the price of televisions has been growing at a rate that is less than the rate of inflation. What can we conclude about the affordability of televisions?

A) Televisions are becoming less affordable.
B) Televisions are becoming more affordable.
C) No conclusion can be made about the affordability of televisions.
D) Televisions are becoming neither more nor less affordable.
E) None of the above

The following Venn diagram describes the desserts people ordered at a party. Use the diagram to answer questions 17 and 18.

17. How many people ordered neither ice cream nor cake?

A) 19
B) 13
C) 29
D) 10
E) 9

18. How many people ordered (at least) cake?

A) 29
B) 19
C) 13
D) 9
E) 10
19. Write the following number in **scientific notation**: .008709.

   A) $8.709 \times 10^4$
   B) $0.008709 \times 10^0$
   C) $8.709 \times 10^{-3}$
   D) $8.709 \times 10^{-4}$
   E) $8.709 \times 10^3$

20. A meal in a restaurant cost $33 in 2000. What was its price in 1997 dollars?
    Round your answer to the nearest whole dollar.

   A) $31$
   B) $27$
   C) $33$
   D) $29$
   E) $25$
Free Response Portion

Show all necessary work. Verify that the answers carry the appropriate units.

Partial credit may be given for work towards the correct solution.
However, if answers are shown without necessary work,
YOU MAY RECEIVE LITTLE OR NO CREDIT FOR THE CORRECT ANSWER.

1. Students in a high school graduating class were asked if they could speak and understand each of the following foreign languages: French (F), Spanish (S), and German (G). You may assume that all of the students speak and understand English.

<table>
<thead>
<tr>
<th>Foreign Language(s)</th>
<th>Students</th>
<th>Foreign Language(s)</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>F only</td>
<td>8</td>
<td>F and S only</td>
<td>12</td>
</tr>
<tr>
<td>S only</td>
<td>86</td>
<td>F and G only</td>
<td>4</td>
</tr>
<tr>
<td>G only</td>
<td>27</td>
<td>S and G only</td>
<td>7</td>
</tr>
<tr>
<td>None</td>
<td>19</td>
<td>F, S, and G</td>
<td>13</td>
</tr>
</tbody>
</table>

a. Complete the Venn diagram which depicts the data above.

Venn Diagram: ½ point per value
(8 values => 4 pts total)

Points earned on this question: __________________________
Available points on this question: 10

b. How many students are in the graduating class of the high school? ________

\[ 8 + 86 + 27 + 19 + 12 + 4 + 7 + 13 = 176 \]

How many students don't speak Spanish? ________

\[ 176 - (86 + 12 + 13 + 7) = 58 \]

d. How many students speak (at least) French? ________

\[ 8 + 12 + 13 + 4 = 37 \]
2. Consider the following argument. Assume all of the premises are true.

Premise 1: All lawyers earn a lot of money.
Premise 2: Ben (X) does not earn a lot of money.
Conclusion: Ben is not a lawyer.

a. Draw a Venn diagram that best illustrates the above argument.

```
Lawyers

People who earn a lot of money

X
```

2 points for Venn diagram showing subset relationship (ignoring set labels)
1 point for Venn diagram showing set labels in correct location
1 point for “X” located appropriately, following work

b. Is the argument valid? Circle one: Yes OR No

b. Is the argument sound? Circle one: Yes OR No

1 point per choice, following work from above
So, if answer for part b agrees with diagram, award credit, even if it is incorrect.
And, if answer for part c agrees with part b, award credit, even if it is incorrect.
However, if answers for parts b and/or c are correct, award credit even there is no
work or work doesn’t agree. (Students may deduce answers without Venn diagram.)
3. A refrigerator-freezer has an energy usage rating of 800 watts.

If electricity costs $0.085 per kilowatt-hour, how much does it cost to run this appliance for two weeks? Give your answer in dollars rounded to two decimal places.

\[
\frac{0.085}{1 \text{ kw - h}} \times 800 \text{ watts} \times 2 \text{ weeks} \times \frac{1 \text{ kw}}{1000 \text{ watts}} \times \frac{24 \text{ hours}}{1 \text{ day}} \times \frac{7 \text{ days}}{1 \text{ week}} = 22.848
\]

Answer: $22.85$

Points earned on this question: __________

Available points on this question: 7
4. The actual width of a table is 4.700 feet. You measure it and report the width as 4.9 feet.

   a. What is the absolute error and relative error for your measurement?
      *Do not round the absolute error.* Round the relative error to the nearest tenth of a percent. Include units with your answer.

      | Absolute Error | Relative Error |
      |----------------|---------------|
      | $4.9 - 4.7 = 0.2$ feet | $\frac{4.9 - 4.7}{4.7} \times 100\% = 4.2553\%$ |

      Absolute error: _______________  
      Relative error: _______________

      Suppose your friend reports the width as 4.469 feet.

   b. State which person (you or your friend) is measuring more precisely and how you know this.

      *My friend’s measurement is more precise because it is reported to the thousandths place while mine is reported to the tenths place.*

      1 point for correctly stating that your friend’s measurement is more precise  
      1 point for reasonable explanation of why

   c. State which person (you or your friend) is measuring more accurately and how you know this. Show work which supports your reasoning.

      | Absolute error for my friend’s measurement | Relative error |
      |-------------------------------------------|---------------|
      | $4.469 - 4.7 = -0.231$ feet | $\frac{-0.231}{4.7} \times 100\% = 4.3\%$ |

      **My measurement is more accurate because it is closer to the true width.**

      1 point for correctly stating that your measurement is more accurate  
      1 point for reasonable explanation of why

   Points earned on this question: |  
   Available points on this question: | 9
5. When choosing between jobs it is important to consider the difference in the cost of living. Using the following equation, we can compare the cost of housing.

\[
\text{price (your town)} = \text{price (other town)} \times \frac{\text{index (your town)}}{\text{index (other town)}}
\]

For this situation, we use the Housing Price Index.

<table>
<thead>
<tr>
<th>City</th>
<th>Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denver, CO</td>
<td>100</td>
</tr>
<tr>
<td>Tulsa, OK</td>
<td>45</td>
</tr>
<tr>
<td>Boston, MA</td>
<td>158</td>
</tr>
<tr>
<td>Manhattan, NY</td>
<td>431</td>
</tr>
<tr>
<td>Providence, RI</td>
<td>90</td>
</tr>
</tbody>
</table>

Suppose Bob lives in Denver.

a. Bob finds an apartment in Boston that is $2,250/month. Using the Housing Price Index, what would be the price of a comparable apartment in Denver? Round your answer to the nearest cent.

\[
\text{Answer: } \$ \frac{2,250 \times 100}{158} = \$1,424.05
\]

b. Bob finds an apartment in Manhattan that is $4,550/month. Using the Housing Price index, what would be the price of a comparable apartment in Denver? Round your answer to the nearest cent.

\[
\text{Answer: } \$ \frac{4,550 \times 100}{431} = \$1,055.68
\]

c. Suppose Bob has to choose between Boston and Manhattan. Which city offers him the best deal for an apartment considering his current location, the comparable apartments he has found, and the Housing Price Index? (This answer must agree with your work above or you will receive no credit.)

Circle one: **Boston** OR **Manhattan**

Due to confusion about this question, all students were awarded full credit of 1 point.

| Points earned on this question: | 1 |
| Available points on this question: | 7 |
Scantron (1 pt.)

Check to make sure your Scantron form meets the following criteria. If any of the items are NOT satisfied when your Scantron is handed in and/or when your Scantron is processed one point will be subtracted from your test total.

My Scantron:

- is bubbled with firm marks so that the form can be machine read;
- is not damaged and has no stray marks (the form can be machine read);
- has 20 bubbled in answers;
- has MATH 1010 and my Section number written at the top;
- has my Instructor’s name written at the top;
- has Test No. 1 written at the top;
- has Test Version A both written at the top and bubbled in below my CUID;
- and shows my correct XID written in and then bubbled in with a zero in the first column followed by the eight digits.