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 = $\frac{\text{Measured value} - \text{True value}}{\text{True value}} \times 100\%$
### Current Conversions from US Dollar

<table>
<thead>
<tr>
<th>Currency</th>
<th>Conversion Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexican Peso</td>
<td>15.3695 MXN/USD</td>
</tr>
<tr>
<td>Canadian Dollar</td>
<td>1.2354 CDN/USD</td>
</tr>
<tr>
<td>Japanese Yen</td>
<td>100 JPY/USD</td>
</tr>
<tr>
<td>European Euro</td>
<td>1.3252 EUR/USD</td>
</tr>
<tr>
<td>British Pound</td>
<td>1.5625 GBP/USD</td>
</tr>
</tbody>
</table>

### Prefixes and Abbreviation

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Abbreviation</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cent</td>
<td>c</td>
<td>1/100</td>
</tr>
<tr>
<td>Mill</td>
<td>m</td>
<td>1/1000</td>
</tr>
<tr>
<td>Kilowatt</td>
<td>kW</td>
<td>1000</td>
</tr>
<tr>
<td>Joule</td>
<td>J</td>
<td>1</td>
</tr>
<tr>
<td>Foot</td>
<td>ft</td>
<td>1</td>
</tr>
<tr>
<td>Inch</td>
<td>in</td>
<td>1/12</td>
</tr>
</tbody>
</table>

### Energy and Power

<table>
<thead>
<tr>
<th>Energy</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0000 J/s</td>
<td>1.0000 W</td>
</tr>
<tr>
<td>1.0000 J/s</td>
<td>1.0000 W</td>
</tr>
</tbody>
</table>

### Volume (Dry Measure)

<table>
<thead>
<tr>
<th>Volume (Dry Measure)</th>
<th>Fluid Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1             lb</td>
<td>16 oz</td>
</tr>
<tr>
<td>1             gallon</td>
<td>32 oz</td>
</tr>
<tr>
<td>1             quart</td>
<td>40 oz</td>
</tr>
<tr>
<td>1             pint</td>
<td>20 oz</td>
</tr>
</tbody>
</table>

### Length

<table>
<thead>
<tr>
<th>Length</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1     ft</td>
<td>12 in</td>
</tr>
<tr>
<td>1     yd</td>
<td>3 ft</td>
</tr>
<tr>
<td>1     mi</td>
<td>5280 ft</td>
</tr>
</tbody>
</table>

### Conversion Factors

- 1 gallon = 3.7854 L
- 1 liter = 1000 ml
- 1 mile = 1609.34 m
- 1 yard = 0.9144 m
- 1 foot = 0.3048 m
- 1 inch = 2.54 cm

Values are rounded to four significant digits.
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:__________________________________________________________________________

Do not write below this line.

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>Scantron</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points</td>
<td>12</td>
<td>7</td>
<td>8</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Earned</td>
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<td></td>
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</tr>
<tr>
<td>Free Response Total</td>
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<tr>
<td>Multiple Choice Total</td>
<td>60</td>
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</tbody>
</table>

Test Score
**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. Carry out the indicated operation and give your answer in **scientific notation** with **appropriate significant digits**.

\[
\frac{7.5 \times 10^5}{3.1 \times 10^{-4}}
\]

A) \(2.3 \times 10^2\)

B) \(2.4 \times 10^9\)

C) \(2.4 \times 10^1\)

D) \(2 \times 10^9\)

E) \(2.42 \times 10^9\)

2. Suppose you bought gold in 1980 for $800 per ounce and sold it in 2010 for $1200 per ounce.

**Find the percentage**: The 2010 price was _______ of the 1980 price.

A) 400%

B) 50%

C) 160%

D) 150%

E) 67%
3. Two brands of bleach are available at the local dollar store. Brand X is sold in a 96 fluid ounce bottle and sells for $1.79. Brand Y is in a 182 fluid ounce bottle and sells for $2.12. Which brand is the better deal and why? (When making your calculations, round to four decimal places.)

A) Brand X is the better deal because it is cheaper by $.33 per ounce.
B) Brand X is the better deal because it is cheaper by $.007 per ounce.
C) Brand Y is the better deal because it is cheaper by $.0035 per ounce.
D) Brand X is the better deal because it is cheaper by $.0035 per ounce.
E) Brand Y is the better deal because it is cheaper by $.007 per ounce.

4. Which pair of sets is disjoint?

A) Milk and Dairy products
B) U.S. Residents and Citizens of South Carolina
C) Teachers and Men
D) Vegetables and Fruits
E) {10, 20, 30, 40, 50} and {40, 50, 60, 70, 80}

5. American Quarter Horses are the fastest horses in the world. They can run 55 miles per hour. How fast is this in feet per second? Round your answer to the nearest whole number.

A) 38 feet per second
B) 27 feet per second
C) 1613 feet per second
D) 81 feet per second
E) 4840 feet per second
6. The hard drive of a computer has a capacity of 12 gigabytes. Express the capacity in scientific notation. (HINT: The prefix \textit{giga} mean 1 billion.)

A) \(1.2 \times 10^{13}\) bytes
B) \(1.2 \times 10^9\) bytes
C) \(12 \times 10^9\) bytes
D) \(.12 \times 10^{11}\) bytes
E) \(1.2 \times 10^{10}\) bytes

7. Using the currency exchange rates found in the Conversion Factors, calculate the value of 1 British Pound in European Euros. Round your answer to \textit{three decimal places}.

A) .569 Euros
B) 1.758 Euros
C) 1.388 Euros
D) .720 Euros
E) 1 Euro

8. Evaluate the following argument. Assume the premises are \textbf{TRUE}.

“Surveys show that Hondas and Nissans have the highest ratings for reliability among foreign cars. So, Japanese cars are the most reliable foreign cars.”

A) The argument is a sound deductive argument, but it is not valid.
B) The argument is a valid and sound deductive argument.
C) The argument is a strong inductive argument.
D) The argument is a weak inductive argument.
E) The argument is a valid deductive argument, but it is not sound.
9. A brick of salt measuring 10.0 cm x 10.0 cm x 2.0 cm weighs 433 grams. Calculate the density of the salt brick and determine if it will float or sink in water. Water has a density of 1 g/cm$^3$. Round your answer to the nearest hundredth.

A) The density of the salt brick is 2.17 g/cm$^3$; it will float in water.
B) The density of the salt brick is .46 g/cm$^3$; it will sink in water.
C) The density of the salt brick is 2.17 g/cm$^3$; it will sink in water.
D) The density of the salt brick is 4.33 g/cm$^3$; it will sink in water.
E) The density of the salt brick is .46 g/cm$^3$; it will float in water.

10. A car rental company offers 10% off the cost of any rental car. The company also sends you an email with a promotional code for 20% off. You decide to use both discounts to reserve a car. The regular price for renting a car is $70 per day. What is the final price per day after both discounts? Round your answer to two decimal places.

A) $50.40
B) $49.00
C) $40.50
D) $52.10
E) $55.00

Due to the problem statement being unclear about application of both discounts, answers A and B were both given full credit.

11. State the number of significant digits and the implied precision of the given number. 710,020

A) 3 significant digits, precise to the nearest tens place
B) 5 significant digits, precise to the nearest ones place
C) 6 significant digits, precise to the nearest ones place
D) 2 significant digits, precise to the nearest ten-thousands place
E) 5 significant digits, precise to the nearest tens place
12. Verkhoanst, Russia is one of the coldest towns on earth. In January, the average temperature is $-45.5$ degrees Celsius. Convert this average temperature to degrees Fahrenheit. Round your answer to the nearest tenth of a degree.

A) $113.9 \, ^{\circ}\text{F}$
B) $-49.9 \, ^{\circ}\text{F}$
C) $-43.1 \, ^{\circ}\text{F}$
D) $-113.5 \, ^{\circ}\text{F}$
E) $7.5 \, ^{\circ}\text{F}$

13. An enclosure measures 5 square meters. What is the area of the enclosure in square yards? Round your answer to two decimal places.

A) $6.02 \, \text{yd}^2$
B) $3.59 \, \text{yd}^2$
C) $5.98 \, \text{yd}^2$
D) $5.47 \, \text{yd}^2$
E) $3.93 \, \text{yd}^2$

14. Evaluate the following argument. Assume the premises are TRUE.

Premise 1: All doctors have high salaries.
Premise 2: Dennis (X) has a high salary.
Conclusion: Dennis is a doctor.

A) The argument is a strong inductive argument. We should accept the conclusion.
B) The argument is valid and sound.
C) The argument is sound, but not valid.
D) The argument is valid, but not sound.
E) The argument is neither valid nor sound.
15. The land area of Nevada is 109,826 square miles. The federal government owns about 92,800 square miles of Nevada. What percentage of Nevada land is owned by the federal government? Round your answer to the nearest tenth of a percent.

A) 84.5%  
B) 78.8%  
C) 80.1%  
D) 89.0%  
E) 82.3%

16. In a classroom of 37 students, 22 people have a part-time job, 14 people have a part-time job and a scholarship, and 5 people have neither a part-time job nor a scholarship. How many people have a scholarship, but no part-time job? (HINT: Completing a Venn diagram may help you answer this question.)

A) 5  
B) 10  
C) 0  
D) 8  
E) 15

17. Given that an argument is not sound, determine which of the following statements is most correct about the relationship between the argument’s validity and the truth of the premises.

A) If the argument is valid, then the premises must be true. 
B) If the premises are true, then the argument must be valid. 
C) If the argument is not valid, then the premises must be true. 
D) If the premises are not true, then the argument must be valid. 
E) If the argument is valid, then the premises cannot be true.
18. Which of the Venn diagrams below BEST illustrates the categorical proposition?

“Some singers are not children.”

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A)</td>
<td>![Venn Diagram A]</td>
<td></td>
</tr>
<tr>
<td>B)</td>
<td></td>
<td>![Venn Diagram B]</td>
</tr>
<tr>
<td>C)</td>
<td></td>
<td>![Venn Diagram C]</td>
</tr>
<tr>
<td>D)</td>
<td></td>
<td>![Venn Diagram D]</td>
</tr>
<tr>
<td>E)</td>
<td></td>
<td>![Venn Diagram E]</td>
</tr>
</tbody>
</table>

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

19. A dish towel is advertised as being 30” long, but its true length is 32”. Find the relative error in the bath towel length. Round your answer to the nearest tenth of a percent.

A) 6.7%

B) 2%

C) –6.3%

D) 6.3%

E) –6.7%

20. If you take 2000 steps to walk one mile, how many miles can you walk in one million steps? Express your answer in scientific notation.

A) $5 \times 10^2$ miles

B) $5 \times 10^3$ miles

C) $2 \times 10^6$ miles

D) $5 \times 10^4$ miles

E) $2 \times 10^9$ miles
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. New telephone customers have the option to choose one of two free features, either Caller ID or Call Waiting.
   a. Complete the two-way table describing the optional feature chosen by new telephone customers in one day.

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call Waiting</td>
<td>17</td>
<td>25</td>
<td>42</td>
</tr>
<tr>
<td>Caller ID</td>
<td>77</td>
<td>31</td>
<td>108</td>
</tr>
<tr>
<td>Total</td>
<td>94</td>
<td>56</td>
<td>150</td>
</tr>
</tbody>
</table>

   1 point per value in table

   b. The Venn diagram below shows the relationship between new telephone customers who are Men and new customers who chose Call Waiting. Complete the Venn diagram.

   New Telephone Customers

   Men
   77

   Call Waiting
   17

   25

   31

   1 point per value in diagram, following work above

   c. How many women did not choose Call Waiting? __31__

   d. How many new customers chose Caller ID? __108__

   2 points

   2 points

   Points earned on this question: ____________

   Available points on this question: __12__
2. Suppose water flows from a shower at a rate of 0.44 cubic feet per minute. Do you use more water by taking an 9-minute shower or by filling a bathtub with 0.42 cubic yards of water? **Show all calculations** and answer in a **complete sentence**.

**Shower:** \[
\frac{0.44 \text{ ft}^3}{\text{1 min}} \times 9 \text{ min} = 3.96 \text{ ft}^3 \text{ of water}
\]

**Tub:** \[
0.42 \text{ yd}^3 \times \frac{3 \text{ ft}^3}{1 \text{ yd}^3} = 11.34 \text{ ft}^3 \text{ of water}
\]

**Difference:** \[
11.34 \text{ ft}^3 - 3.96 \text{ ft}^3 = 7.38 \text{ ft}^3
\]

The tub uses 7.38 ft\(^3\) more water than the shower.

3 points for calculating shower water usage
3 points for calculating tub water usage
1 point for sentence answering the question

–½ if units of any factor are missing or incorrect, up to a maximum of 2 points deducted
–½ if answer not rounded correctly

3. An electric space heater has an energy usage rating of 1440 watts on the high setting.

If electricity costs $0.12 per kilowatt-hour, how much does it cost to run this appliance for 5 days? Give your answer in dollars rounded to **two decimal places**.

\[
\frac{0.12}{1 \text{ kw} - \text{h}} \times 1440 \text{ watts} \times 5 \text{ days} \times \frac{1 \text{ kw}}{1000 \text{ watts}} \times \frac{24 \text{ hours}}{1 \text{ day}} = 20.74
\]

1 point for given cost of electricity
1 point for given wattage of refrigerator
1 point for given number of days
2 points for conversion factor: kw to watts (Full credit awarded for any correct conversion.)
2 points for conversion factor: hours to days
1 point for calculation, following reasonable work

–½ if units of any factor are missing or incorrect, up to a maximum of 2 points deducted
–½ if answer not rounded correctly

**Answer:** $20.74
4. Driving home from campus your true speed is 37.6 mph, but your speedometer reads 39 mph. Assume that your speedometer reports to the nearest whole number mph.

a. What is the absolute error and relative error for your speedometer?

**Do not round** the absolute error. Round the relative error to the nearest tenth of a percent. Include units with your answer.

**Absolute Error** = 39 mph – 37.6 mph = 1.4 mph

**Relative Error** = \( \frac{39 - 37.6}{37.6} \times 100\% = 3.7\% \)

<table>
<thead>
<tr>
<th>Absolute error:</th>
<th>1 point for work</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 point for numeric answer</td>
</tr>
<tr>
<td></td>
<td>1 point for units</td>
</tr>
<tr>
<td>Relative error:</td>
<td>1 point for work</td>
</tr>
<tr>
<td></td>
<td>1 point for numeric answer</td>
</tr>
<tr>
<td></td>
<td>1 point for “units” (%)</td>
</tr>
<tr>
<td>–½ if answer not rounded correctly</td>
<td></td>
</tr>
<tr>
<td>No credit if incorrect formula is used.</td>
<td></td>
</tr>
</tbody>
</table>

Absolute error: _______________

Relative error: _______________

b. A radar system reads your speed as 36.1 mph.

Which device is more precise? **Speedometer** OR **Radar system**

(Circle your answer above.)

Why? **The radar system reports to the tenths place while the speedometer reports to the nearest whole number place.**

1 point for correctly selecting the radar system as more precise
2 points for reasonable explanation of why

Which device is more accurate? **Speedometer** OR **Radar system**

(Circle your answer above.)

**Absolute error for radar system** = 36.1 mph – 37.6 mph = –1.5 mph

Why? **The speedometer is more accurate because it is closer to the true speed by .1 mph.**

1 point for correctly selecting the speedometer as more accurate
2 points for reasonable explanation of why

Points earned on this question: _______________

Available points on this question: 12
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.