The following questions explore parts of the material that will be covered on Test 2.

Problems 1, 2, and 3 refer to a sum of $20,000 which is deposited in a savings account that pays an annual rate of 4.9%.

1. What is the effective annual yield on the account, if interest is compounded continuously? Give your answer as a percentage, rounded to 2 decimal places, e.g., x.xx%.

2. What is the future value of the account after 5 years, if interest is compounded continuously?

3. What is the future value of the account after 5 years, if interest is compounded quarterly?

4. If interest is compounded continuously at 6.5%, what is the present value of a future payment of $50,000 that is to be made 8 years from now?

5. Fill in the Frequency, Relative Frequency, and Percentage columns, as they would be done by the Histogram and other functions in Excel. Do this manually, not with the help of Excel.

<table>
<thead>
<tr>
<th>Data</th>
<th>Bins</th>
<th>Frequency</th>
<th>Relative Frequency</th>
<th>Percentage</th>
</tr>
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<tr>
<td>6.2</td>
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</tbody>
</table>
Problems 6 and 7 refer to the following plot of ratios for 600 weekly closes on a stock.

**Ratios of Closing Prices**

6. Approximately how many ratios were between 0.995 and 1.025?

7. Assuming that these ratios are a random sample for the random variable $R$, which gives the weekly ratio of closes, estimate $P(R \geq 1.025)$.

8. Let $X$ be the random variable giving the value of the S and P 500 Index on July 1, 2001. Is $X$ finite or continuous? Is $f_X$ a p.m.f. or a p.d.f.?

9. Let $Y$ be the random variable giving the number of months in the year 2001 when the S and P 500 Index has a monthly high above 1,600. Is $Y$ finite or continuous? Is $f_Y$ a p.m.f. or a p.d.f.?

10. For each graph, select the statement that is most likely to be correct.

   a. The function is a **probability mass function** for a **finite** random variable.
   b. The function is a **probability density function** for a **continuous** random variable.
   c. The function is a **cumulative distribution function** for a **finite** random variable.
   d. The function is a **cumulative distribution function** for a **continuous** random variable.
   e. None of the above.

   **Hint:** look carefully at the numbers on the axes.

   (i)

   ____ a.   ____ b.   ____ c.   ____ d.   ____ e.
10. A random variable $W$ has the following values and probabilities.
\[ P(W = w) \quad \begin{array}{cccccc}
0 & 0.1 & 1 & 0.1 & 2 & 0.2 \\
8 & 0.2 & 4 & 0.3 & 16 & 0.1 \\
\end{array} \]

(i) The c.d.f., \( F_W \) has \( F_W(8) = \) ___.

(ii) The p.m.f., \( f_W \) has \( f_W(8) = \) ___.

(iii) The c.d.f., \( F_W \) has \( F_W(10) = \) ___.

(iv) The p.m.f., \( f_W \) has \( f_W(10) = \) ___.

11. A courier van that runs between two of your company's facilities encounters 5 traffic signals along its route. These operate independently, with each signal having a probability of 0.55 that the van has to stop. Let \( X \) be the random variable giving the number of signals at which the van must stop on a randomly selected trip.

(i) What kind of random variable is \( X \)?

(ii) Use Excel to generate a table containing all possible values of \( X \) and the corresponding values of \( f_X \) and \( F_X \), rounded to 4 decimal places.

(iii) On average, at how many of the signals can the courier van expect to stop?

12. \( T \) is a uniform continuous random variable on the interval \([0, 5]\).

(i) The p.d.f., \( f_T \) has \( f_T(3) = \) ___.

\[ P(T = 3) = \] ___.

13. Let \( X \) be an exponential random variable, whose p.d.f. has the form \( f_X(x) = 0.2 e^{-0.2x} \), for \( x \geq 0 \).

(i) Find a formula for the c.d.f. of \( X \).

(ii) Use your result from Part i to compute \( P(3.7 \leq X \leq 6.7) \), rounded to 4 decimal places.

(iii) \( \mu_X = \) ?

14. For each of the following functions, tell were it is located in Excel, and describe its use.

(i) VLOOKUP

(ii) IF

(iii) RAND

(iv) HISTOGRAM

(v) RANDBETWEEN

(vi) SORT

Problems 15, 16, and 17 refer to a 10 week European call option on ABC stock with a strike price of $90.

15. A few of the historical adjusted weekly closing prices are shown below.
16. Suppose that the only possible closing prices of ABC, at the end of the option, are $84, $91, and $93. If the three closing values are all equally likely, what is the expected value of $C$, the closing value? What does $E(C)$ tell you about the future value of the option?

17. Under the conditions in Problem 16, what is the expected future value of the option?

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