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1. (10 points, 5 each)
   a) Find the equation of the line through the points (2, 1) and (1, 2).
   b) Find where the lines \( x - y = 1 \) intercepts the \( x \)-axis.

2. If \( A = \{1, 2, 3\} \), \( B = \{2, 3, 4\} \), with universe \( U = \{1, 2, 3, 4, 5, 6\} \), find
   (9 points, 3 each)
   a) \( A \cup B = \)
   b) \( A' \cap B' = \)
   c) \( (A' \cup B)' = \)

3. Out of 100 students, 34 like McDonalds, 33 like Burger King, and 20 like both of them. How many students like neither of them. Make a Venn Diagram.
   (8 points)
4. For 7 digit telephone numbers, find
(12 points, 3 each)
   a) The number of telephone numbers.

   b) The number of telephone numbers with all digits different.

   c) The number of telephone numbers with no 7’s and all digits different.

   d) The number of telephone numbers with no 7’s but exactly one 6, and all digits different.

5. Two fair dice are tossed. Write down the sample space and find
(12 points, 4 each)

   a) $P(\text{get 2 or 12}) =$

   b) $P(\text{get at least 10}) =$

   c) $P(\text{get the same number of both die}) =$

6. Evaluate $P_{10,4}$ and $C_{10,4}$.
(6 points)
7. In a room with 11 girls, 12 boys, and 13 warthogs, how many ways can you pick (10 points, 5 each)
   a) 2 boys, 2 girls, and 3 warthogs

   b) 10 of them, none of which are warthogs

8. Suppose there is a .9 chance that if you listen to music while taking this final you will flunk it, and there is a .3 chance that if don’t listen to music while taking this final you will still flunk it, and there is a .8 chance you will listen to music while taking the final. a) What is the chance you flunk the final? b) What is the probability you listened to music given you flunk.
   (10 points, 5 each)
   a) P(you pass the course) =

   b) P(you studied | you pass the course) =

9. Suppose you have an urn with a penny, two nickels, and two quarters in it. You randomly pick two coins out of the urn, and let $X =$ the value in cents of the two coins you get. Write down the probability distribution table for $X$ and compute the expected value of $X$, namely $E(X)$. (10 points)
10. Suppose you have an urn with 5 red balls and 4 white balls, and you pick two balls out randomly.
(12 points, 4 each) a) \( P(\text{Get 2 red balls}) = \)

\[ \text{b) } P(\text{The second ball is red } \mid \text{ the first ball is red}) = \]

\[ \text{c) } P(\text{The first ball is red } \mid \text{ the second ball is white}) = \]

\[ \text{d) } P(\text{Get exactly 1 white ball}) = \]

11. If you invest $600 at 9% annual interest, how much money do you have at the end of 4 years if
(12 points, 3 each)

a) It is simple interest.

\[ \text{b) It is compounded yearly.} \]

\[ \text{c) It is compounded quarterly.} \]

\[ \text{d) It is compounded monthly.} \]
12. If you want to end up with $30,000 in 3 years by making monthly deposits at 3% interest compounded monthly, how much should those monthly payments be? (8 points)

13. Solve any way you want. (12 points, 6 each)
   a) 
   \[3x_1 + 2x_2 = 7\]
   \[5x_1 + 3x_2 = 11\]

   b) 
   \[x_1 + x_2 + 3x_3 = 3\]
   \[x_1 + 3x_2 + 3x_3 = 2\]

14. Solve the equations using Gauss-Jordan elimination (10 points)
   a) 
   \[x_1 + 3x_2 = 1\]
   \[3x_1 + 7x_2 = 1\]

   b) 
   \[x_1 + 2x_2 + 3x_3 = 3\]
   \[x_1 + 3x_2 + 2x_3 = 1\]
   \[x_1 + 2x_2 + 4x_3 = 4\]
15. Solve 
(8 points) 
\[ \begin{align*} 
a) & \quad \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix} + 2 \begin{pmatrix} 3 & 2 & 1 \\ 6 & 5 & 4 \end{pmatrix} = \\
b) & \quad \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix} \begin{pmatrix} 3 & 2 \\ 6 & 5 \\ 1 & 0 \end{pmatrix} = \\
\end{align*} \]

16. Find the inverse of 
(8 points) 
\[ \begin{pmatrix} 1 & 2 & 1 \\ 2 & 3 & 1 \\ -1 & -2 & 1 \end{pmatrix} \]

17. Solve using matrices 
(10 points) 
\[ \begin{align*} 
x_1 + 3x_2 &= 1 \\
3x_1 + 7x_2 &= 1 \\
\end{align*} \]
18. Maximize \( P = x_1 + 2x_2 \) subject to

\[
\begin{align*}
  x_1 + 3x_2 & \leq 6 \\
  x_1 + x_2 & \leq 4 \\
  x_1, x_2 & \geq 0
\end{align*}
\]

24 points, 12 each)

a) Graphically

b) By the simplex method