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1. A salesman buys 50 computers for $1,000 each. If he sells 30 of them at a profit of 10%, for how much, in dollars, must he sell each of the remaining 20 to have an average profit of 25%?

   a) 1,200
   b) 1,225
   c) 1,250
   d) 1,475
   e) 1,500

2. The supply and demand equations of a product are respectively \( p = \frac{q}{30} + 5 \) and \( p = \frac{15,000}{q} \).

   At equilibrium, \( p \) and \( q \) satisfy

   a) \( q = 24p \)
   b) \( q = p - 600 \)
   c) \( q = 25p \)
   d) \( q = 28p \)
   e) \( q = \frac{p}{25} \)
3. A manufacturer sells a product at $10 per unit, selling all that is produced. Fixed cost is $4,000 and variable cost per unit is \( \alpha \). If the total revenue at the break-even point is $8,000, then \( \alpha = \)

a) 1  

b) \( \frac{22}{9} \)  

c) 5  

d) 10  

e) 800  

4. If \( x, y, z \) satisfy the system

\[
\begin{align*}
  x + y - z &= 3 \\
  2x + 2y + z &= 0 \\
  x + y &= 1
\end{align*}
\]

then \( 2x + y + z = \)

a) \( x - 1 \)  

b) \( x \)  

c) \( y \)  

d) \( y + 1 \)  

e) 0
5. A publishing company finds that the cost of publishing each copy of a certain magazine is $1.90. The revenue from dealers is $1.80 per copy. The advertising revenue is 12% of the revenue received from dealers for all copies sold beyond 15,000. The least number of copies that must be sold so as to have a profit for the company is

a) 26,031
b) 27,001
c) 27,901
d) 27,930
e) 27,932

6. A company manufactures three types of toys A, B, and C. Each requires rubber, plastic, and aluminum as listed below.

<table>
<thead>
<tr>
<th>TOY</th>
<th>RUBBER</th>
<th>PLASTIC</th>
<th>ALUMINUM</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

The company has available 600 units of rubber, 800 units of plastic, and 1,400 units of aluminum. The company makes a profit of $4, $3, and $2 on toys A, B, and C, respectively. Assuming all toys manufactured can be sold, An initial tableau set up to determine a production order so that profit is maximum, is

a) \[
\begin{bmatrix}
2 & 1 & 1 & 0 & 0 & 0 & : & 600 \\
2 & 2 & 2 & 0 & 1 & 0 & : & 800 \\
4 & 2 & 4 & 0 & 0 & 1 & 0 & : & 1400 \\
4 & 3 & 2 & 0 & 0 & 0 & 1 & : & 0
\end{bmatrix}
\]

b) \[
\begin{bmatrix}
2 & 1 & 1 & 1 & 0 & 0 & 0 & : & 1400 \\
2 & 2 & 2 & 0 & 1 & 0 & 0 & : & 600 \\
4 & 2 & 4 & 0 & 0 & 1 & 0 & : & 800 \\
4 & 3 & 2 & 0 & 0 & 0 & 1 & : & 0
\end{bmatrix}
\]

c) \[
\begin{bmatrix}
2 & 1 & 1 & 0 & 0 & 0 & : & 600 \\
2 & 2 & 2 & 0 & 1 & 0 & 0 & : & 800 \\
4 & 2 & 4 & 0 & 0 & 1 & 0 & : & 1400 \\
-4 & -3 & -2 & 0 & 0 & 0 & 1 & : & 0
\end{bmatrix}
\]

d) \[
\begin{bmatrix}
2 & 1 & 1 & 1 & 0 & 0 & 0 & : & 600 \\
2 & 2 & 2 & 0 & 1 & 0 & 0 & : & 800 \\
4 & 2 & 4 & 0 & 0 & 1 & 0 & : & 1400 \\
-2 & -4 & -3 & 0 & 0 & 0 & 1 & : & 0
\end{bmatrix}
\]

e) \[
\begin{bmatrix}
2 & 1 & 1 & 1 & 0 & 0 & 0 & : & 4 \\
2 & 2 & 2 & 0 & 1 & 0 & 0 & : & 3 \\
4 & 2 & 4 & 0 & 0 & 1 & 0 & : & 2 \\
-600 & -800 & -1400 & 0 & 0 & 0 & 1 & : & 0
\end{bmatrix}
\]
7. A trust fund is to be established by a single payment so that at the end of 5 years there will be $5,000 in the fund. The fund earns interest at the rate of 8% compounded semiannually. The initial deposited principal in dollars is in the interval

a) [3330, 3360)
b) [3360, 3390)
c) [3390, 3420)
d) [3420, 3450)
e) [3450, 4000)

8. The region indicated (shaded) in the diagram is described by

\[
\begin{align*}
\text{a) } & \begin{cases} 
  x + 4y & \leq 12 \\
  x & \leq 8 \\
  x + y & \geq 2 \\
  x \geq 0, \quad y \geq 0
\end{cases} \\
\text{b) } & \begin{cases} 
  x + 4y & \geq 12 \\
  x & \leq 8 \\
  x + y & \geq 2 \\
  x \geq 0, \quad y \geq 0
\end{cases} \\
\text{c) } & \begin{cases} 
  x + 4y & \leq 12 \\
  x & \geq 8 \\
  x + y & \geq 2 \\
  x \geq 0, \quad y \geq 0
\end{cases} \\
\text{d) } & \begin{cases} 
  x + 4y & \leq 12 \\
  x & \leq 8 \\
  x + y & \leq 2 \\
  x \geq 0, \quad y \geq 0
\end{cases} \\
\text{e) } & \begin{cases} 
  x + 4y & \geq 12 \\
  x & \geq 8 \\
  x + y & \leq 2 \\
  x \geq 0, \quad y \geq 0
\end{cases}
\end{align*}
\]
9. Consider the standard maximum linear programming problem given by:

Maximize \( Z = x_1 - 2x_2 + 3x_3 \)

subject to

\[
\begin{align*}
2x_1 & + x_2 & + 2x_3 & \leq 10 \\
x_1 & - x_2 & + x_3 & \leq 8 \\
x_1, & x_2, & x_3 & \geq 0
\end{align*}
\]

The maximum value of \( Z \) is equal to

a) 0  
b) 5  
c) 10  
d) 15  
e) 20

10. The future value of an ordinary annuity that earns 7\% compounded annually for 8 years is $18,000. The annual payment in dollars made at the end of each year is in the interval

a) [1150, 1160]  
b) [1750, 1760]  
c) [1795, 1805]  
d) [2245, 2255]  
e) [2400, 2410]
11. A man would like to invest a sum of money using one of the following options

I  9.9 % compounded annually
II 9.8 % compounded semiannually
III 9.7 % compounded quarterly
IV  9.6 % compounded monthly
V  9.5 % compounded continuously

Which one is the best choice?

a) I
b) II
c) III
d) IV
e) V

12. Suppose that you can invest $5000 in a business that guarantees you the following cash flows: $3000 at the end of 2 years, $2000 at the end of 4 years, and $2000 at the end of 6 years. Assuming an interest rate of 6% compounded monthly, find the net present value of the cash flows in dollars. Is the investment profitable?

a) 522.51; Yes
b) 632.36; Yes
c) −400.72; No
d) −351.62; No
e) −740.56; No
13. A coin is tossed three times in succession, and the results are observed. If $E_1$ is the event that at least one head occurs, and $E_2$ is the event that at least one tail occurs. $\left(E_1 \cap E_2 \right)' = $

   a) $\emptyset$
   
   b) $\{HHH\}$
   
   c) $\{TTT\}$
   
   d) $\{TTT, HHH\}$
   
   e) $\{HTT, THH\}$

14. A student answers three multiple-choice questions randomly. If each question has 4 choices, the probability that the student answers exactly two questions correctly is

   a) $\frac{9}{64}$
   
   b) $\frac{1}{16}$

   c) $\frac{3}{64}$

   d) $\frac{1}{64}$

   e) $\frac{1}{81}$
15. Two marbles are randomly drawn in succession without replacement from an urn that contains 5 blue and 3 yellow marbles. The probability that one marble is blue and the other is yellow is

a) $\frac{1}{2}$

b) $\frac{3}{8}$

c) $\frac{15}{56}$

d) $\frac{13}{28}$

e) $\frac{15}{28}$

16. A physical education class at KFUPM has 12 students. The instructor is to select 5 students to play basketball and 4 students to play volleyball. In how many ways can he do that?

a) 479,001,600

b) 166,320

c) 27,720

d) 2,880

e) 1,320
17. A clothing manufacturer has three production runs each day. Each run produces either Pants, Shirts, or Hats. Because of equipment considerations, no Shirts run can come immediately after a Pants run. How many three-run sequences are there? [Note: The three runs may or may not produce the same product.]

a) 27
b) 21
c) 18
d) 9
e) 6

18. The table below shows a survey which was taken among 200 students to see the relation between their grades in a Mathematics course and their Physics course. If a student is selected at random, what is the probability that he dislikes Physics given that he did not get "A" on his Math course?

<table>
<thead>
<tr>
<th>Math Grade</th>
<th>Like Physics</th>
<th>Dislike Physics</th>
<th>Neutral</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>25</td>
<td>5</td>
<td>10</td>
<td>40</td>
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<tr>
<td>B</td>
<td>21</td>
<td>15</td>
<td>24</td>
<td>60</td>
</tr>
<tr>
<td>C</td>
<td>12</td>
<td>60</td>
<td>28</td>
<td>100</td>
</tr>
<tr>
<td>Total</td>
<td>58</td>
<td>80</td>
<td>62</td>
<td>200</td>
</tr>
</tbody>
</table>

a) \(\frac{1}{8}\)
b) \(\frac{1}{5}\)
c) \(\frac{2}{5}\)
d) \(\frac{15}{32}\)
e) \(\frac{29}{64}\)
19. The probability that Ahmed scores full marks on an examination is \( \frac{4}{5} \), and the probability that Khalid scores full marks is \( \frac{5}{6} \). The probability that exactly one of them scores full marks is

a) \( \frac{2}{3} \)

b) \( \frac{11}{30} \)

c) \( \frac{2}{15} \)

d) \( \frac{1}{6} \)

e) \( \frac{3}{10} \)

20. If \( P(E \mid F) = \frac{1}{2} \), \( P(E \cup F) = \frac{9}{10} \), and \( P(E \cap F) = \frac{2}{5} \), then \( P(E) = \)

a) \( \frac{1}{10} \)

b) \( \frac{1}{5} \)

c) \( \frac{1}{2} \)

d) \( \frac{4}{5} \)

e) \( \frac{9}{10} \)
21. The test results of a major exam are 9, 3, 3, 44, 17, 17, 44, 15, 15, 27, 15, 40, 8, 51. The median and the mode, respectively, are

a) 16, 15
b) 15, 15
c) 16, 17
d) 15, 16
e) 15, 17

22. A store's customers are 25% female and 75% male. Let $X$ be the number of women among the next 5 customers. $P(X > 3) =$

a) $\frac{1}{1024}$
b) $\frac{15}{1024}$
c) $\frac{53}{512}$
d) $\frac{1}{64}$
e) $\frac{1}{4}$
23. From a group of two students and three teachers, two persons are selected at random to form a committee. Let $X$ be the number of teachers on the committee. $E(X) =$

a) 1.00  

b) 1.05  

c) 1.10  

d) 1.15  

e) 1.20  

24. A random variable $X$ has the probability histogram shown. The variance of $X$ is

a) 0.80  

b) 0.70  

c) 0.62  

d) 0.50  

e) 0.48
25. If $X$ is normally distributed with $\mu = 150$ and $\sigma = 30$, then $P(90 < X < 180) =$

a) 0.8243

b) 0.8185
c) 0.8173
d) 0.3185
e) 0.1359