1. A lumber company owns a forest that is of rectangular shape, 1 mi by 2 mi. If the company cuts a uniform strip of trees along the outer edges of this forest, how wide should the strip be if $\frac{3}{4}$ sq mi of forest is to remain?

Q#6, Ex 1.8

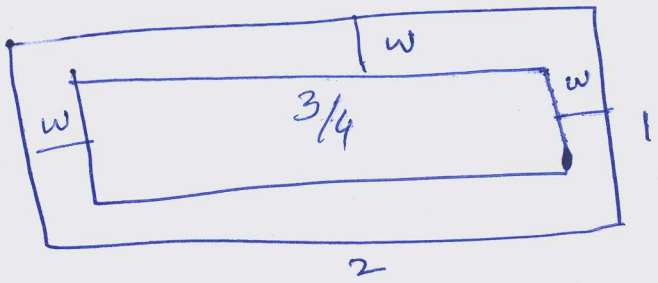
✓(a) $\frac{1}{4}$ mi

(b) $\frac{5}{4}$ mi

(c) $\frac{3}{4}$ mi

(d) $\frac{1}{3}$ mi

(e) $\frac{1}{5}$ mi



$(1-2w)(2-2w) = \frac{3}{4}$

$w = \frac{5}{4}$ or $w = \frac{1}{4}$

rejected

2. Suppose consumers will purchase q units of a product at a price of $\frac{100}{q} + 1$ dollars per unit. What is minimum number of units that must be a sold in order that sales revenue be greater than \$5000?

See Q# 10, Ex 1.3

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✓(a) At least 4901 units

(b) At least 4900 units

(c) At most 4900 units

(d) At most 4901 units

(e) At least 5000 units

$P = \frac{100}{q} + 1$

Selling Price $= Pq$

$= 100 + q$

$100 + q > 5000$

$q \geq 4900$

3. An electric utility company charges residential customers 12.5 cents per kilowatt-hour plus a base charge each month. One customer's monthly bill comes to \$51.65 for 380 kilowatt-hours. A linear function $f(x)$ that describes the total monthly charges for electricity if x is the number of kilowatt-hours used in a month is

See Q#21/Ex 3.2

(a) $f(x) = 0.125x + 4.15$
(b) $f(x) = 4.15x + 12.5$
(c) $f(x) = 12.5x + 12.5$
(d) $f(x) = 1.25x + 4.00$
(e) $f(x) = 0.145x + 12.5$

$f(x) = ax + b$

$f(x) = 0.125x + b$

$51.65 = 0.125(380) + b$

$b = 4.15$

$f(x) = 0.125x + 4.15$

4. A business-copier repair company charges a fixed amount plus an hourly rate for a service call. If a customer is billed \$159 for a one-hour service call and \$287 for a three-hour service call, then the bill of the customer for 6 hours service call is

See Q#27 Ex 3.2

(a) \$479
(b) \$450
(c) \$449
(d) \$379
(e) \$384

(1, 159), (3, 287)

(6, y)

$y = 64x + 95$

$= 64(6) + 95$

$= 384 + 95$

$= 479$

5. A company manufactures three products: X,Y, and Z. Each product requires the use of time on machines A and B as given in the following table:

See Q #31
Page # 354

	Machine A	Machine B
$x \rightarrow$ Product X	1 hr	1 hr
$y \rightarrow$ Product Y	2 hr	1 hr
$z \rightarrow$ Product Z	2 hr	2 hr

The numbers of hours per week that A and B are available for production are 40 and 34, respectively. The profit per unit on X, Y, and Z is \$10, \$15, and \$22, respectively. What should be the weekly production order if maximum profit is to be obtained?

$x + 2y + 2z \leq 40$ ✓
$x + y + 2z \leq 34$ ✓

Max. $10x + 15y + 22z$

$x, y, z \geq 0$

✓(a) 0 units of X, 6 units of Y, and 14 units of Z
(b) 6 units of X, 0 units of Y, and 14 units of Z
(c) 0 units of X, 14 units of Y, and 6 units of Z
(d) 6 units of X, 14 units of Y, and 14 units of Z
(e) 0 units of X, 6 units of Y, and 6 units of Z

$x = 0$
$y = 6$
$z = 14$ ✓

6. Consider the system

$$\begin{cases} 5x + 7y + 2 = 9y - 4x + 6, \\ \frac{21}{2}x - \frac{4}{3}y - \frac{11}{4} = \frac{3}{2}x + \frac{2}{3}y + \frac{5}{4}. \end{cases}$$

$\Rightarrow 5x + 4x + 7y - 9y = 6 - 2$

$\boxed{9x - 2y = 4}$ ✓

$\Rightarrow \frac{21}{2}x + \frac{3}{2}x - \frac{4}{3}y - \frac{2}{3}y = \frac{11}{4} + \frac{5}{4}$

$18x - \frac{6}{3}y = \frac{16}{4}$ ✓

$\boxed{9x - 2y = 4}$

Which of the following statement is **True**?

✓(a) System has infinitely many solutions
(b) System has no solution
(c) System has unique solution at $x = \frac{4}{9}$, $y = 0$
(d) System has unique solution at $x = 0$, $y = -2$
(e) System has infinitely many solution because given equation of lines are perpendicular

See Q # 10, Ex. 3.4

7. If $x = A$, $y = B$ and $z = C$ are the solutions of the following system

$$\begin{cases} x + 4y + 3z &= 10 \\ 4x + 2y - 2z &= -2 \\ 3x - y + z &= 11 \end{cases}$$

See Q#11 Ex. 3.4

then $A - B + C =$ $2-(-1)+4 =$

$x = 2$
$y = -1$
$z = 4$

✓(a) 7
(b) 3
(c) 5
(d) 6
(e) 4

8. A manufacturer sells a product at \$8 per unit, selling all that is produced. Fixed cost is \$5000 and variable cost per unit is $\frac{22}{9}$ (dollars). The output required to obtain a profit of \$10,000 is

Profit = Selling Price − Cost

$= 8q - \left(\frac{22}{9}q + 5000\right)$

$10{,}000 = 8q - \left(\frac{22}{9}q + 5000\right)$

$q = 2700$

✓(a) 2700 units
(b) 2000 units
(c) 7200 units
(d) 2500 units
(e) 1700 units

See Example 3 Page # 165

9. A manufacturer of a product sells all that is produced. The total revenue is given by $y_{TR} = 7q$, and the total cost is given by $y_{TC} = 6q + 800$, where q represents the number of units produced and sold. What is the level of production at the break-even point if the total cost increases by 5%?

✓(a) 1200 units
(b) 900 units
(c) 1000 units
(d) 1100 units
(e) 1400 units

$7q = 1.05(6q + 800)$
$= 6.3q + 840$
$0.7q = 840 \Rightarrow q = \frac{840}{0.7}$
$q = 1200$

See Q# 16
Ex 3.6

10. A total of \$35,000 was invested at three interest rates: 7%, 8%, and 9%. The interest for the first year was \$2830, which was not reinvested. The second year the amount originally invested at 9% earned 10% instead, and the other rates remained the same. The total interest the second year was \$2960. How much was invested at 8% rate?

✓(a) \$12000
(b) \$10000
(c) \$13000
(d) \$8000
(e) \$11000

$x + y + z = 35000$
$0.07x + 0.08y + 0.09z = 2830$
$0.07x + 0.08y + 0.10z = 2960$

$x = 10,000$
$y = 12,000$
$z = 13,000$

See Q #40
Ex. 3.4

11. How long (approximately) will it take for \$600 to amount to \$900 at an annual rate of 6% compounded quarterly?

✓(a) 6 years, 9.5 months
(b) 9 years, 6 months
(c) 6 years, 2 months
(d) 5 years, 7 months
(e) 6 years, 5 months

$$900 = 600\left(1 + \frac{0.06}{4}\right)^{4n}$$

$$n = 6.808$$

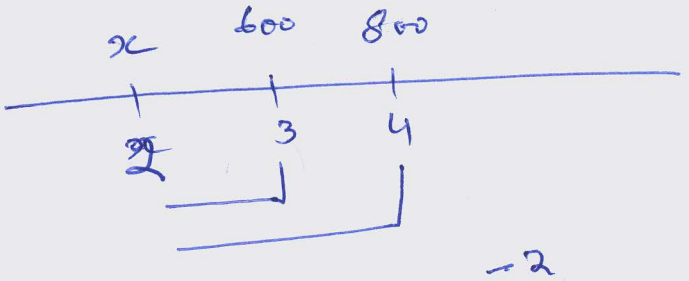
$$\approx 6 \text{ years } 9.5 \text{ months}$$

See Example 3 Page # 210

12. A debt of \$600 due in three years and \$800 due in four years is to be repaid by a single payment two years from now. If the interest rate is 8% compounded semiannually, then how much is the approximately payment?

See Q#15, Ex. 5.2

✓(a) \$1238.58
(b) \$1328.58
(c) \$1823.58
(d) \$2318.58
(e) \$1811.58



$$x = 600\left(1 + \frac{0.08}{2}\right)^{-2} + 800\left(1 + \frac{0.08}{2}\right)^{-4}$$

$$= 1238.57$$

13. The premiums on an insurance policy are \$50 per quarter, payable at the beginning of each quarter. If the policy holder wishes to pay one year's premium in advance, how much should be paid, provided that the interest rate is 4% compounded quarterly?

(a) 197.05
(b) 179.05
(c) 971.05
(d) 791.05
(e) 917.05

$50 + 50a_{\overline{3}|0.01} = 197.05$

See Example 4, Page # 224

14. Consider the following Linear Programming Problem (LLP)
Maximize

$$W = x_1 - 12x_2 + 4x_3$$

subject to

$$\begin{array}{lcl} 4x_1 + 3x_2 - x_3 & \leq & 1 \\ x_1 + x_2 - x_3 & \geq & -2 \\ -x_1 + x_2 + x_3 & \geq & -1 \\ x_1, x_2, x_3 & \geq & 0 \end{array}$$

See Q # 13
Ex. 7.4

If $x_1 = A$, $x_2 = B$ and $x_3 = C$ satisfy the above LLP then $A + B + C =$

(a) 4
(b) 5
(c) 3
(d) 2
(e) 1

$x_1 = 1$
$x_2 = 0$
$x_3 = 3$

15. A company manufactures three products: X, Y, and Z. Each product requires machine time and finishing time as shown in the following table:

	Machine Time (hours)	Finishing Time (hours)
X	1	4
Y	2	4
Z	3	8

The numbers of hours of machine time and finishing time available per month are 900 and 5000, respectively. The unit profit on X, Y and Z is \$6, \$8, and \$12, respectively. What is the **maximum profit per month** that can be obtained?

✓(a) \$5400
(b) \$5000
(c) \$4500
(d) \$6400
(e) \$3400

$Z = 6x + 8y + 12Z$

$x + 2y + 3Z \leq 900$

$4x + 4y + 8Z \leq 5000$

see Q # 18, Ex 7.4

16. At a restaurant, a complete dinner consists of an appetizer, an entree, a dessert, and a beverage. The choices for the **appetizer** are soup and salad; for the **entree**, the choices are chicken, fish, ~~and~~ steak, and lamb; for the **dessert**, the choices are cherries jubilee, fresh peach cobbler, chocolate truffle cake, and blueberry roly-poly; for the **beverage**, the choices are coffee, tea, and milk. How many complete dinners are possible?

✓(a) 96
(b) 192
(c) 64
(d) 69
(e) 256

app → 2
entree → 4
dessert → 4
beverage → 3

$2 \cdot 4 \cdot 4 \cdot 3 = 96$

see Q # 7
Ex. 8.1

17. A waiter takes the following order from a table with seven people: three hamburgers, two cheeseburgers, and two steak sandwiches. Upon returning with the food, he forgets who ordered what item and simply places an item in front of each person. In how many ways can the waiter do this?

(a) 210
(b) 840
(c) 240
(d) 120
(e) 710

hamburgers → 3
cheeseburgers → 2
sandwiches → 2

$$\frac{7!}{3!\,2!\,2!} = \frac{7\cdot 6\cdot 5\cdot 4\cdot 3\cdot 2\cdot 1}{3!\cdot 2!\,2!}$$

$$= 210$$

See Q#26 Ex. 8.2 /30

18. A card is randomly selected from a standard deck of 52 playing cards. The probability that the card is a club or a 4 is.

(a) $\frac{4}{13}$
(b) $\frac{13}{52}$
(c) $\frac{1}{2}$
(d) $\frac{4}{52}$
(e) $\frac{17}{52}$

$$P(\text{club or } 4) = P(\text{club}) + P(4) - P(\text{club} \cap 4)$$

$$= \frac{13}{52} + \frac{4}{52} - \frac{1}{52}$$

$$= \frac{16}{52} = \frac{4}{13}$$

See Q#9(9) Ex. 8.4

19. A fair coin and a fair die are tossed. The probability that a head and an even number show is.

✓(a) $\frac{1}{4}$
(b) $\frac{1}{2}$
(c) $\frac{3}{4}$
(d) $\frac{1}{3}$
(e) $\frac{2}{3}$

$1 \cdot 3 = 3$

$n(E_{\text{head and even}}) = 1 \cdot 3 = 3$

$n(S) = 2 \cdot 6 = 12$

$\frac{3}{12} = \frac{1}{4}$

See Q # 10, Ex. 8.4

20. From a group of three women and four men, two persons are selected at random to form a committee. The probability that the committee consists of women only is

✓(a) $\frac{1}{7}$
(b) $\frac{1}{21}$
(c) $\frac{1}{10}$
(d) $\frac{2}{7}$
(e) $\frac{7}{10}$

$\frac{{}_3C_2}{{}_7C_2} = \frac{3}{21} = \frac{1}{7}$

See Q # 21 Ex. 8.4

$n(S) = {}_7C_2 = 21$

$n(E_{\text{2women}}) = {}_3C_2 = 3$

$P = \frac{3}{21} = \frac{1}{7}$

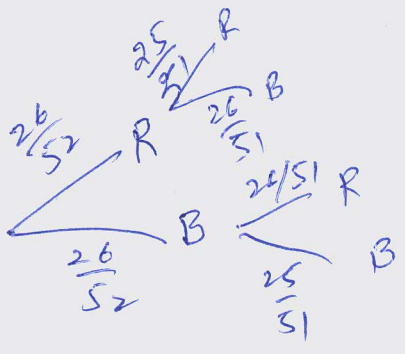
21. A bag contains two blue jelly beans and two white jelly beans. If two jelly beans are randomly taken from the bag, **without replacement**, then what is the probability that the second jelly bean taken is white, given that the first one is blue.

(a) $\frac{2}{3}$
(b) $\frac{1}{3}$
(c) $\frac{1}{2}$
(d) $\frac{1}{6}$
(e) $\frac{2}{5}$

See Example 1
Page # 396

22. If two cards are drawn **without replacement** from a standard deck of cards, then the probability that both cards are red is .

(a) $\frac{25}{102}$
(b) $\frac{25}{51}$
(c) $\frac{25}{52}$
(d) $\frac{26}{102}$
(e) $\frac{26}{51}$



$\frac{26}{52} \times \frac{25}{51} = \frac{25}{102}$

See Example 7
Page # 405

23. Consider the following game. You are to toss three fair coins. If three heads or three tails turn up, your friend pays you \$10. If either one or two heads turn up, you must pay your friend \$6. What are your expected winnings or losses per game?

✓(a) \$ 2 loss
(b) \$ 2 gain
(c) \$ 4 loss
(d) \$ 4 gain
(e) No loss, no gain

See Q#14
Ex. 9.1

$X = 10, -6$

$f(10) = \frac{2}{8} = \frac{1}{4}$

$f(-6) = \frac{6}{8} = \frac{3}{4}$

$E(X) = \sum_x x f(x)$

$= 10 \cdot \frac{1}{4} + (-6)\frac{3}{4}$

$= -2$

24. A basket contains 10 balls, each of which shows a number. Five balls show 1, two show 2, and three show 3. A ball is selected at random. If X is the number that shows, then the standard deviation σ is

✓(a) $\frac{\sqrt{19}}{5}$
(b) $\frac{19}{25}$
(c) $\frac{9}{5}$
(d) $\frac{81}{25}$
(e) $\frac{9}{25}$

See Example 4
Page # 437

25. In a large production lot of electronic devices, it is believed that one-fifth are defective. If a sample of six is randomly selected, find the probability that no more than one will be defective.

(a) 0.655
(b) 0.955
(c) 0.832
(d) 0.225
(e) 0.555

See Q #19
Ex. 9.2

$p = \frac{1}{5}, \quad n = 6$

$P(X \leq 1) = P(X=0) + P(X=1)$

$= 0.655$

26. Given the sample space $S = \{1, 2, \ldots, 10\}$, and the three sets $E = \{1, 4, 7\}$, $F = \{2, 4, 7\}$, and $G = \{10\}$. Which of the following sets represents the event $(E' \cap (F \cup G))'$?

(a) $\{1, 3, 4, 5, 6, 7, 8, 9\}$
(b) $\{3,4,5,6,7,8,9\}$
(c) $\{1, 3, 4, 5, 6, 7, 8\}$
(d) $\{1, 3, 6, 7, 8, 9\}$
(e) $\{1, 3, 8, 9\}$

$E' = \{2, 3, 5, 6, 8, 9, 10\}$

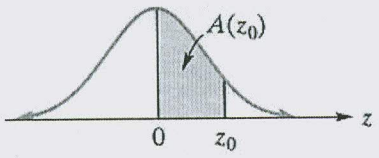
$F \cup G = \{2, 4, 7, 10\}$

$E' \cap (F \cup G) = \{2, 10\}$

$(E' \cap (F \cup G))' = \{1, 3, 4, 5, 6, 7, 8, 9\}$

27. Suppose that X is normally distributed with $\mu = 16$ and $\sigma = 4$, then $P(10.8 < X < 12.4) =$

[From Appendix C: $A(0.9) = 0.3159$ $A(1.0) = 0.3413$ $A(1.2) = 0.3849$
$A(1.3) = 0.4032$ $A(1.4) = 0.4192$]



✓(a) 0.0873

(b) 0.0993

(c) 0.0793

(d) 0.0773

(e) 0.0888

See Q #19
Ex. 16.2

28. From the following data, what is the estimated of the standard deviation of the life time of components (l in hours)? Where f is the frequency.

l	$300 \leq l < 400$	$400 \leq l < 500$	$500 \leq l < 600$	$600 \leq l < 700$	$700 \leq l < 800$
f	13	25	66	58	38

✓(a) 112.37 hours

(b) 12691.206 hours

(c) 591.5 hours

(d) 212.37 hours

(e) 312.37 hours