



2016/2023 FIRST SEMESTER GRADE 12 MATHEMATICS PRACTICE QUESTIONS

DIRECTION: THIS PAPER CONTAINS MATHEMATICS **PRACTICE QUESTIONS** FROM UNIT **3 AND 4** OF GRADE 11 AND UNIT **3 AND 4** OF GRADE 12 FOR GRADE 12. CHOOSE THE BEST ANSWER FROM THE SUGGESTED OPTIONS.

G-11

UNIT THREE COORDINATE GEOMETRY

- What is the equation of the line passing through the mid-point of the line segment with end points $(-1, 3)$ and $(3, 1)$, and perpendicular to the line whose angle of inclination is double the angle of inclination of the line $2x + y = 7$?
A. $2y + 4x = 10$
B. $4y - 5x = 3$
C. $2y - x = 3$
D. $4y + 3x = 11$
- Which one of the following represents an equation of hyperbola whose foci are $(-2, -1)$ and $(-2, 9)$ and whose transverse axis has length 6?
A. $\frac{(x+2)^2}{9} + \frac{(y+4)^2}{36} = 1$
B. $\frac{(x+2)^2}{9} - \frac{(y-4)^2}{16} = 1$
C. $\frac{(x+1)^2}{81} - \frac{(y+4)^2}{4} = 1$
D. $\frac{(x-4)^2}{16} + \frac{(y+2)^2}{9} = 1$
- What type of curve does the graph of the equation $x^2 + xy + ky^2 + 6x + 10 = 0$ represent, for any constant k less than $\frac{1}{4}$?
A. a circle
B. a parabola
C. a hyperbola
D. an ellipse
- The length of the major axis of the ellipse $x^2 + 9y^2 - 2x + 18y + 1 = 0$ is:
A. 3
B. $\sqrt{10}$
C. 6
D. 9
- The equation of the circle tangent to the x -axis at $(6, 0)$ whose center is on the line $y = \frac{1}{2}x$ is:
A. $(x-6)^2 + y^2 = 9$
B. $(x-6)^2 + (y-3)^2 = 36$
C. $(x-6)^2 + y^2 = 36$
D. $(x-6)^2 + (y-3)^2 = 9$
- A mirror has an elliptic edge. If the shortest and the longest distances between any two points on the edge of the mirror through the geometric center of the mirror are respectively 6cm and 10cm , which of the following is a possible equation of the edge of the mirror?
A. $\frac{x^2}{9} + \frac{(y-1)^2}{5} = 1$
B. $\frac{(x-1)^2}{25} + \frac{y^2}{9} = 1$
C. $\frac{(x+1)^2}{36} + \frac{y^2}{100} = 1$
D. $\frac{(x+1)^2}{36} + \frac{(y-1)^2}{25} = 1$

7. Consider a circle whose center is on the x -axis. If a line given by $y = x$ is tangent to the circle at point $(2, 2)$, what is the equation of the circle?
A. $x^2 + y^2 = 8$
B. $(x-2)^2 + y^2 = 4$
C. $(x-4)^2 + y^2 = 8$
D. $(x-1)^2 + y^2 = 5$
8. What is the vertex and the equation of the directrix, respectively, of the parabola $x + y^2 + 2y + 1 = 0$?
A. $(0, -1), x = -\frac{1}{4}$
B. $(-1, 0), y = -\frac{1}{4}$
C. $(0, -1), x = \frac{1}{4}$
D. $(-1, 0), y = \frac{1}{4}$
9. The orbit of Mercury around the sun forms an ellipse with eccentricity 0.206 , length of major axis $1.16 \times 10^8 \text{ km}$ and the sun at one focus. Which of the following is the best approximation of the maximum distance from Mercury to the sun?
A. $7.596 \times 10^7 \text{ km}$
B. $5.695 \times 10^7 \text{ km}$
C. $8.695 \times 10^7 \text{ km}$
D. $6.995 \times 10^7 \text{ km}$
10. Suppose l_1 and l_2 are perpendicular lines intersecting at $(2, 1)$. If the angle of inclination of l_2 is 45° , what is the equation of l_1 ?
A. $y = -x + 2$
B. $y = -x + 3$
C. $y = x - 1$
D. $y = -2x + 5$
11. If $x^2 - 6x + y^2 + k = 0$ is equation of a circle with radius 2 , then what is the value of k ?
A. 13
B. 5
C. 4
D. -4
12. If a line with angle of inclination of $\frac{3}{4}\pi$ passes through $(0, 1)$, which one of the following is the equation of the line?
A. $y = -x + 1$
B. $y = x + 1$
C. $y = -x - 1$
D. $y = x - 1$
13. A satellite moves along a hyperbolic curve whose horizontal transverse axis is 24 km and an asymptote $y = \frac{5}{12}x + 2$. Then, what is the eccentricity of the hyperbola?
A. $\frac{5}{13}$
B. $\frac{12}{13}$
C. $\frac{13}{12}$
D. $\frac{15}{3}$
14. A circle of radius 1 unit is internally tangent to the circle $x^2 + y^2 - 2y = 8$ at $(3, 1)$. Then, the equation of the smaller circle is:
A. $x^2 + (y-1)^2 = 1$
B. $(x-2)^2 + (y-1)^2 = 1$
C. $(x-1)^2 + (y-2)^2 = 1$
D. $(x-4)^2 + (y-1)^2 = 1$
15. One of the following is an asymptote of the hyperbola $y^2 - x^2 + 4x - 5 = 0$.
A. $y = x + 2$
B. $y = -x + 2$
C. $y = x - 4$
D. $y = -x - 2$
16. Which of the following is **true** about the ellipse whose equation is given by $4x^2 + y^2 = 16$?
A. The length of the minor axis is 2 .
B. The length of the major axis is 16 .
C. The foci are $(0, -2)$ and $(0, 2)$.
D. $(0, -4)$ and $(0, 4)$ are vertices.

17. The equation of the ellipse with vertices at $(-2, 1)$ and $(2, 1)$, and passing through the origin is:
- A. $x^2 + 4(y-1)^2 = 4$ C. $\frac{x^2}{4} + (y-1)^2 = 4$
 B. $(x-1)^2 + 4y^2 = 1$ D. $\frac{(x+2)^2}{4} + (y-1)^2 = 1$
18. For what value of b does the parabola $p(x) = ax^2 + x + b$ pass through the points $(-1, 5)$ and $(2, -1)$?
- A. 9 B. 3 C. -3 D. -15
19. What is the distance from the origin to the line that passes through $(1, 0)$ and $(0, 1)$?
- A. $\frac{1}{2}\sqrt{2}$ B. 1 C. $\frac{1}{2}$ D. $\sqrt{2}$
20. What is the equation of the directrix for the parabola whose equation is $y^2 + 8x + 6y + 25 = 0$?
- A. $y = 3$ B. $x = 2$ C. $x = 0$ D. $x = 4$
21. If the equation $(x-2)^2 - (y-2)^2 = 1$ represents a hyperbola, which one of the following represents equation of an asymptote to the hyperbola?
- A. $y = 4 - x$ B. $x + y = 1$ C. $x = 2 - y$ D. $x + 2y = 3$
22. A semi-elliptical arc over a tunnel for a road through a mountain has a major axis of length 80 meters and a height of 30 meters at the center. What is the equation of the semi-elliptical arc over the tunnel, if the center is considered as the origin?
- A. $\frac{x^2}{6400} + \frac{y^2}{900} = 1$ C. $\frac{x^2}{900} + \frac{y^2}{6400} = 1$
 B. $\frac{x^2}{1600} + \frac{y^2}{900} = 1$ D. $\frac{x^2}{8100} + \frac{y^2}{6400} = 1$
23. Let the equation $x^2 + 2x + y^2 = 8$ represents a circle. Then which one of the following lines cut the circle at exactly two points?
- A. $4x + 3y + 19 = 0$ C. $2y = 5x + 43$
 B. $3x + 4y + 14 = 0$ D. $2x = y - 50$
24. The equation of an ellipse with center $(1, 4)$, vertices at $(10, 4)$ and $(1, 2)$ is:
- A. $4(x-1)^2 + 81(y-4)^2 = 324$ C. $9(x-1)^2 + 4(y-4)^2 = 1$
 B. $(x-1)^2 + 9(y-4)^2 = 4$ D. $2(x-1)^2 + 9(y-4)^2 = 4$
25. Two perpendicular lines l_1 and l_2 are intersecting at $(-1, 2)$. If the angle of inclination of l_1 is 45° , then what is the equation of l_2 ?
- A. $y = -x + 3$ B. $y = x + 3$ C. $y = -x + 1$ D. $y = x + 1$
26. Which one of the following is equation of a circle whose center is on y -axis and radius is 3?
- A. $x^2 + y^2 + 6y = 0$ C. $x^2 + (y-2)^2 = 3$
 B. $(x-2)^2 + y^2 = 9$ D. $x^2 - 2x + y^2 = 8$
27. The planet Mercury's orbit around the sun is an ellipse with eccentricity 0.206, length of major axis 1.16×10^8 km and the sun at one focus. What is the maximum distance from Mercury to the sun?
- A. 6.99×10^8 km C. 9.66×10^7 km
 B. 6.99×10^7 km D. 9.66×10^8 km

UNIT FOUR

MATHEMATICAL REASONING

36. Which of the following statement is a **true** on $\mathbb{R}$?

- A. $(\forall x)(\exists y)[(x-1 < 0) \Rightarrow y^2 < x]$ C. $(\exists x)(\forall y)[x \leq y^2 - 1]$
 B. $(\forall x)(\forall y)[x^2 \geq y]$ D. $(\exists x)(\forall y)[x^2 - y^2 = 1]$

37. Let p : I pass the examination

q : I study hard

Which of the following represents the argument “I pass the examination if I study hard. I don’t study hard. Therefore, I pass the examination?”

- A. $p \Rightarrow q, \neg q \vdash p$ C. $q \Rightarrow p, \neg q \vdash p$
 B. $p \Rightarrow q, q \vdash p$ D. $q \Rightarrow p, \neg q \vdash \neg p$

38. If $(\neg P \vee Q) \Rightarrow (R \wedge \neg R)$ is true, then which of the following is necessarily true?

- A. $R \Rightarrow Q$ C. $P \wedge \neg R$
 B. $(Q \Rightarrow P) \wedge R$ D. $(Q \Rightarrow R) \Rightarrow P$

39. Suppose the proposition $p \Rightarrow \neg q$ is false (F), which of the following is **true**?

- A. $\neg q \wedge (p \Rightarrow q)$ C. $(\neg q \vee p) \Leftrightarrow q$
 B. $\neg p \wedge (q \Rightarrow \neg p)$ D. $(p \wedge q) \Leftrightarrow \neg p$

40. Suppose $e(x) \equiv x$ is even; $p(x) \equiv x$ is prime; $d(x) \equiv x$ is divisible by 2. Which one of the following has the truth value F on the set of natural numbers?

- A. $(\exists x)[e(x) \wedge p(x)]$ C. $(\exists x)[e(x) \wedge \neg d(x)]$
 B. $(\forall x)[e(x) \Rightarrow d(x)]$ D. $(\forall x)[e(x) \vee \neg d(x)]$

41. Consider the following argument form. Production is high if rain continues. Rain does not continue. Therefore, either production is low or rain continues.

Let p : production is low

q : rain continues

The following table is also given about p and q .

Rows	p	q	$\neg p$	$\neg q$	$\neg p \Rightarrow q$	$q \Rightarrow \neg p$	$p \vee q$
1	T	T	F	F	T	F	T
2	T	F	F	T	T	T	T
3	F	T	T	F	T	T	T
4	F	F	T	T	F	T	F

Which of the following is necessarily **true**?

- A. The argument form is valid due to row 2.
 B. The argument form is valid due to rows 2 and 3.
 C. The argument form is invalid due to row 4.
 D. The argument form is invalid due to rows 1 and 3.

42. If x and y are non-negative integers, which of the following is **NOT** true?

- A. $(\forall x)(\exists y)(y > x^2 - 1)$ C. $(\forall y)(\exists x)(y \leq x^2 - 1)$
 B. $(\exists x)(\forall y)(y > x^2 - 1)$ D. $(\exists y)(\exists x)(y \leq x^2 - 1)$

43. If the truth values of p is T and q is F, then which one of the following compound proposition has truth value F?
- A. $(p \wedge q) \Leftrightarrow (q \wedge p)$ C. $(p \Rightarrow q) \Leftrightarrow (q \Rightarrow \neg p)$
 B. $(\neg p \wedge \neg q) \Rightarrow \neg(p \vee q)$ D. $(\neg p \vee \neg q) \Leftrightarrow (p \wedge \neg q)$
44. Consider the following argument:
 “If there is no rain, then there is starvation. There is rain. Therefore there is no starvation.”
 Letting $r \equiv$ 'There is rain' and $s \equiv$ 'There is starvation', which of the following is the correct symbolic form of the argument and its validity?
- A. $\neg r \Rightarrow s, r \vdash \neg s$, valid argument. C. $\neg r \Leftrightarrow s, r \vdash \neg s$, valid argument.
 B. $\neg r \Rightarrow s, r \vdash \neg s$, invalid argument. D. $\neg r \Leftrightarrow s, r \vdash \neg s$, invalid argument.
45. Which one of the following quantifiers has truth value T?
- A. $\neg(\exists x)(\exists y)(x^2 + y < 0)$ C. $(\forall x)(\exists y)(x^2 + y < 0)$
 B. $(\exists x)(\forall y)(x^2 + y < 0)$ D. $(\forall x)(\forall y)(x^2 + y < 0)$
46. If each of the compound propositions $P \wedge \neg Q, R \Rightarrow Q, \neg R \Leftrightarrow S$ is true, then which one of the following is **true**?
- A. Q B. S C. $P \wedge \neg S$ D. $S \Rightarrow R$
47. For real numbers x and y , which one of the following statements is **true**?
- A. $(\forall x)(\exists y)(x^2 + y + 1 = 0)$ C. $(\exists y)(\forall x)(x^2 + y + 1 = 0)$
 B. $(\exists x)(\forall y)(x^2 + y + 1 = 0)$ D. $(\forall y)(\exists x)(x^2 + y + 1 = 0)$
48. Let p, q and r be propositions such that $p \Rightarrow (r \vee \neg q)$ is false. Then which one of the following propositions is **true**?
- A. $p \Rightarrow r$ B. $\neg r \Rightarrow q$ C. $\neg p \Rightarrow q$ D. $q \Rightarrow r$
49. Let p, q and r be propositions such that p is false and q is true. Which of the following is FALSE?
- A. $p \Leftrightarrow \neg q$ B. $\neg p \vee r$ C. $r \Rightarrow q$ D. $r \wedge \neg q$
50. If p and q are propositions such that p and $q \Rightarrow p$ are true, which of the following compound proposition can possibly have a false truth-value?
- A. $p \vee q$ B. $p \Leftrightarrow q$ C. $p \vee (q \wedge p)$ D. $\neg p \Rightarrow \neg q$
51. Which of the following is a true statement on the set of real numbers?
- A. $(\forall x)(\exists y)(y = x + 5)$ C. $(\exists x)(\forall y)(x = y + 3)$
 B. $(\exists x)(x^2 + 1 = 0)$ D. $(\forall x)(\forall y)((x \geq y) \wedge (y \neq x))$
52. Suppose the following statements are the premises of an argument.
 “He was lazy or he did not like the classroom.
 If he was lazy, he could not pass the exam.
 He passed the exam.”
 Which one of the following can be a conclusion that makes the argument valid?
- A. He did like the classroom.
 B. He did not like the classroom.
 C. If he was not lazy, he did like the classroom.
 D. He was not lazy and he did like the classroom.
53. Which one of the following is equivalent to $\neg[(\forall x)(P(x) \Rightarrow Q(x))]$?
- A. $(\forall x)(\neg P(x) \Rightarrow \neg Q(x))$ C. $(\exists x)(\neg P(x) \wedge Q(x))$
 B. $(\exists x)(\neg P(x) \Rightarrow \neg Q(x))$ D. $(\exists x)(P(x) \wedge \neg Q(x))$

54. If $(p \vee q) \Rightarrow (\neg r \wedge r)$ is true, then which one of the following is necessarily **true**?
- A. $(p \vee r) \Rightarrow q$ B. $\neg q \wedge r$ C. $\neg p \Leftrightarrow r$ D. $\neg p \vee r$
55. Suppose that p represents the statement “*He missed the tournament.*”, q represents the statement “*He got the gold medal.*” And r represents the statement “*He took a trip abroad.*”. Then which of the following symbolic expression represents the statement: “If he takes a trip abroad and he does not miss the tournament, then he will get the gold medal.”?
- A. $(r \Rightarrow q) \wedge \neg p$ C. $(r \wedge \neg p) \Rightarrow q$
 B. $r \wedge (p \Rightarrow q)$ D. $\neg(r \vee p) \vee q$
56. For arbitrary propositions p and q , which one of the following is a valid equivalence?
- A. $\neg(p \Rightarrow q) \equiv (q \Rightarrow p)$ C. $[p \vee \neg q] \equiv [p \Rightarrow q]$
 B. $[\neg(p \Rightarrow q) \wedge p] \equiv (p \wedge \neg q)$ D. $[(p \vee q) \Rightarrow q] \equiv [p \Rightarrow \neg q]$
57. Which one of the following is **NOT** a tautology?
- A. $[p \vee (q \Rightarrow r)] \Leftrightarrow [\neg p \Rightarrow (q \Rightarrow r)]$ C. $p \Rightarrow (p \Rightarrow q) \vee q$
 B. $p \vee (q \Rightarrow \neg p)$ D. $[p \Leftrightarrow (q \wedge \neg r)] \Leftrightarrow [\neg p \Leftrightarrow (\neg q \vee r)]$
58. If each of the compounds propositions $P \vee Q$, $P \Rightarrow R$ and $\neg R$ is True, then which one of the following is True?
- A. P B. Q C. $Q \Rightarrow P$ D. $P \wedge \neg R$
59. What is the contra positive of “If $x \in \mathbb{N}$, then x is an integer and $x > 0$?”
- A. If x is not integer or $x < 0$, then $x \notin \mathbb{N}$. C. If x is not integer or $x \leq 0$, then $x \notin \mathbb{N}$.
 B. If x is integer and $x > 0$, then $x \in \mathbb{N}$. D. If $x \notin \mathbb{N}$, then x is not integer and $x \leq 0$.
60. Which one of the following compound propositions is a tautology?
- A. $(q \vee \neg q) \Rightarrow p$ C. $p \vee (q \wedge \neg q)$
 B. $p \Rightarrow (q \vee \neg q)$ D. $p \Rightarrow (q \wedge \neg q)$
61. If the truth value of a proportion p is False, then which one of the following compound proposition has a truth value Truth?
- A. $\neg p \wedge p$ B. $\neg p \Rightarrow p$ C. $\neg(\neg p \vee p)$ D. $p \Rightarrow \neg p$
62. Suppose that the statements p , q and r have truth values, F, F and T respectively. Which of the following statements has a truth value F?
- A. $r \Leftrightarrow (\neg p \wedge \neg q)$ C. $\neg p \wedge (q \Rightarrow \neg r)$
 B. $\neg q \Rightarrow (p \vee \neg r)$ D. $p \vee [\neg(q \wedge r)]$
63. Suppose p , q and r are statements such that p and $p \Rightarrow (q \vee r)$ have truth values of T and F respectively. Which of the following compound statements has a truth value T?
- A. $q \Leftrightarrow r$ B. $p \Rightarrow q$ C. $p \Rightarrow r$ D. $q \Leftrightarrow p$
64. Which of the following statements violates the rules for truth value assignments of the propositions p and q connected by the logical connectives?
- A. $p \Leftrightarrow q \equiv T$, only when both p and q have the same truth value.
 B. $p \Rightarrow q \equiv F$, only when both p and q are False.
 C. $p \wedge q \equiv T$, only when both p and q are True.
 D. $p \vee q \equiv F$, only when both p and q are False.
65. If the truth value of the compound proposition $\neg(p \Rightarrow (q \wedge r))$ is F, then which of the following triplets does **NOT** represent the correct values of p , q and r respectively?
- A. F, F, F B. F, F, T C. T, F, F D. T, T, T

66. You are given a data on the age of students, in a primary school.

Age	8	10	11	12	13
Number of students	5	15	8	10	2

Which of the following is **NOT** true about the data?

- A. The median is 10.5
 B. The mode is 10
 C. The mean is 10.5
 D. The range is 5

67. The following is the table of simple frequency distribution of a data with variable x .

x	1	3	4	5	7
Frequency	2	5	6	5	2

The standard deviation of the data is equal to:

- A. $\sqrt{3}$
 B. 3
 C. $\sqrt{2.3}$
 D. $\sqrt{3.6}$

68. The following table shows the frequency distribution of a group data in which the frequency of the class interval, f_1 , is missed.

Class interval	3 – 7	8 – 12	13 – 17	18 – 22
Frequency	f_1	9	4	1

If the mean of the data is 10, what is the frequency f_1 of the first class interval?

- A. 4
 B. 6
 C. 7
 D. 8

69. Below are the marks of grade 12 students in Mathematics out of 100. What is the variance of the frequency distribution given below?

Marks	20 – 40	40 – 60	60 – 80	80 – 100
Number of students	4	10	4	2

- A. 107.2
 B. 4
 C. 304
 D. 17.5

70. The mark that students scored in an examination is grouped in class intervals as shown in the following table.

Class Interval (Mark)	Number of Students
55 – 64	8
65 – 74	12
75 – 84	20
85 – 94	6
95 – 104	4

What is the median of the mark?

- A. 25.0
 B. 75.5
 C. 77.0
 D. 79.5

71. Which one of the following is **true** is normal distribution?

- A. mean < median < mode
 B. mean > median > mode
 C. mean = median = mode
 D. mean = median $\times$ mode

72. If 25% of the item are less than 20 and 25% are more than 40, then find the quartile deviation.
 A. 10 B. 20 C. 30 D. 40
73. The sum of the squares of deviation for 10 observations taken from their mean 30 is 90. Find the coefficient of variation.
 A. 10% B. 11% C. 12% D. 20%
74. If the mean deviation of numbers $1, 1+d, 1+2d, \dots, 1+50d$ from their mean is 260, then which one of the following is the value of d ?
 A. 20.5 B. 20.3 C. 20.4 D. 10.4

UNIT FOUR

INTRODUCTION TO LINEAR PROGRAMMING

75. Which of the following point is not lie in the half-plane $2x+3y-12 < 0$?
 A. $(-2, 3)$ B. $(2, 3)$ C. $(2, 1)$ D. $(1, 2)$
76. The maximum value of the object function $Z = 5x + 10y$,

$$\left. \begin{array}{l} x + 2y \leq 120 \\ x + y \geq 60 \\ x - 2y \geq 0 \\ x \geq 0 \\ y \geq 0 \end{array} \right\} \text{ subject to the constraints } \left. \begin{array}{l} x + 2y \leq 120 \\ x + y \geq 60 \\ x - 2y \geq 0 \\ x \geq 0 \\ y \geq 0 \end{array} \right\} \text{ is equal to:}$$

 A. 800 B. 300 C. 600 D. 400
77. Maximize $Z = 5x + 10y$,

$$\left. \begin{array}{l} x + 4y \leq 24 \\ 3x + y \leq 21 \\ x + y \leq 9 \\ x, y \geq 0 \end{array} \right\} \text{ subject to}$$

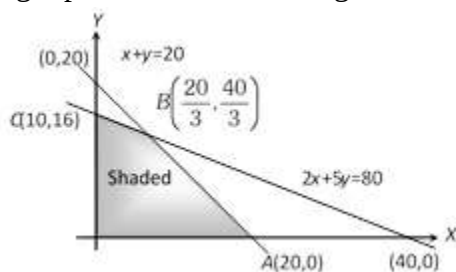
 A. 20 at $(1, 0)$ B. 30 at $(0, 6)$ C. 37 at $(4, 5)$ D. 33 at $(6, 3)$
78. The region represented by $2x+3y-5 \leq 0$ and $4x-3y+2 \leq 0$ is:
 A. Not in first quadrant C. Bounded in first quadrant
 B. Unbounded in first quadrant D. It is in second quadrant
79. A factory produces two products A and B. In the manufacturing of product A, the machine and the carpenter requires 3 hour each and in manufacturing of product B, the machine and carpenter requires 5 hour and 3 hour respectively. The machine and carpenter work at most 80 hour and 50 hour per week respectively. The profit on A and B is Birr 6 and 8 respectively. If profit is maximum by manufacturing x and y units of A and B type product respectively, then find the constraints for the function $6x+8y$.
 A. $x \geq 0, y \geq 0, 5x+3y \geq 80, 3x+2y \geq 50$ C. $x \geq 0, y \geq 0, 5x+3y \leq 80, 3x+2y \leq 50$
 B. $x \geq 0, y \geq 0, 3x+5y \geq 80, 2x+3y \geq 50$ D. $x \geq 0, y \geq 0, 3x+5y \leq 80, 3x+3y \leq 50$

80. A shopkeeper wants to purchase two articles A and B of cost price Birr 4 and 3 respectively. He thought that he may earn 30 praise by selling article A and 10 praise by selling article B. He has not to purchase total article worth more than Birr 24. If he purchases the number of articles of A and B, x and y respectively, then linear constraints are:
- A. $x \geq 0, y \geq 0, 4x + 3y \leq 24$ C. $x \geq 0, y \geq 0, 30x + 40y \leq 24$
 B. $x \geq 0, y \geq 0, 30x + 10y \leq 24$ D. $x \geq 0, y \geq 0, 4x + 3y \geq 24$
81. Which one of the following is the vertex of a feasible region by the linear constraints $3x + 4y \leq 18, 2x + 3y \geq 3$ and $x, y \geq 0$?
- A. $(0, 3)$ B. $(0, 2)$ C. $(4.8, 0)$ D. $(0, 5)$
82. A toy manufacturer produces two types of dolls; a basic version doll A and a deluxe version doll B. Each doll of type B takes twice as long to produce as one doll of type A. The company have time to make a maximum of 2000 dolls of type A per day, the supply of plastic is sufficient to produce 1500 dolls per day and each type requires equal amount of it. The deluxe version, i.e. type B requires a fancy dress of which there are only 600 per day available. If the company makes a profit of Birr 3 and Birr 5 per doll, respectively, on doll A and B, then the number of each should be produced per day in order to maximize profit, is equal to:
- A. 800, 500 B. 500, 600 C. 450, 450 D. 1000, 500
83. The corner point of the feasible region determined by the system of linear constraints are $(0, 0), (0, 40), (20, 40), (60, 20), (60, 0)$. The objective function is $Z = 4x + 3y$.

Compare the quantity in column A and column B

Column A	Column B
Maximum of Z	325

- A. The quantity in column A is greater
 B. The two quantities are equal
 C. The quantity in column B is greater
 D. The relationship cannot be determined based on the given information.
84. Which of the following represent the shaded region?



- A. $2x + 5y \geq 80, x + y \leq 20, x \geq 0, y \leq 0$ C. $2x + 5y \geq 80, x + y \leq 20, x \geq 0, y \geq 0$
 B. $2x + 5y \leq 80, x + y \leq 20, x \geq 0, y \leq 0$ D. $2x + 5y \leq 80, x + y \leq 20, x \geq 0, y \geq 0$
85. A feasible solution to linear programming:
- A. Must be a corner point of feasible region.
 B. Must optimize the value of the objective function.
 C. Need not satisfy all of the constraints, only some of them.
 D. Must satisfy all of the problem's constraints simultaneously.

86. The sum of two positive numbers is at most 5. The difference between two times a second number and the first number is at most 4. If the first number is x and second number is y , then which of the following is the mathematical formulation for maximizing the product of these two numbers?
- A. $x + y \geq 5, 2y - x \geq 4, x \geq 0, y \geq 0$ C. $x + y \leq 5, 2y - x \leq 4, x \geq 0, y \geq 0$
 B. $x + y \geq 5, -2x + y \geq 4, x \geq 0, y \geq 0$ D. $x + y \leq 5, 2x - y \leq 4, x \geq 0, y \geq 0$
87. Find the solution of the set of constraints $x + 2y \geq 11, 3x + 4y \leq 30, 2x + 5y \leq 30, x \geq 0, y \geq 0$.
- A. (2, 3) B. (3, 2) C. (3, 4) D. (4, 3)
88. The maximum and minimum values of the objective function $Z = x + 2y$ subject to constraints
 $x + 2y \geq 100$
 $2x - y \leq 0$
 $2x + y \leq 200$
 $x, y \geq 0$ occur respectively at:
- A. one point and three points. C. one point and infinitely points.
 B. two points and one point. D. one point and one point.
89. Which of the following is **true** about the constraint of a linear optimizing function $Z = x_1 + x_2$, given by
 $x_1 + x_2 \leq 1, 3x_1 + x_2 \geq 3$, and $x_1, x_2 \geq 0$?
- A. There are two feasible regions. C. There is no feasible region.
 B. There are infinite feasible regions. D. There are three feasible regions.
90. In Mathematics test there are multiple choice and workout part questions to be answered. The relevant data is given in the following table:

Type of questions	Time taken to solve	Marks	Number of questions
Multiple choice	5 minute	3	10
Workout	10 minute	5	14

The total mark is 100. Students can solve all questions. To secure maximum marks, a student solves x multiple choice and y workout questions in three hours, then linear constraints except $x, y \geq 0$ are:

- A. $5x + 10y \leq 180, x \leq 10, y \leq 14$ C. $x + 10y \geq 180, x \leq 10, y \leq 14$
 B. $5x + 10y \leq 180, x \geq 10, y \geq 14$ D. $5x + 10y \geq 180, x \geq 10, y \geq 14$
91. Consider the following linear programming model:
 objective function $Z = 3x + 5y$,
 $3x + y \leq 6$
 subject to $x + y \geq 1$
 $x + 2y \leq 6$.
 $x \geq 0, y \geq 0$
- Which of the following is the minimum value of Z ?
- A. 5 C. It has no minimum value
 B. 3 D. 0

92. What is the maximum value of the function $Z = 3x + y$ subject to: $2x - 3y \geq 1$, $x + y \leq 3$, for $x \geq 0$ and $y \geq 0$?

- A. 7 B. 9 C. $\frac{9}{2}$ D. $\frac{3}{2}$

93. Consider a line with equation $y = mx + b$. Which of the following is **true**?

- A. The line intersects the x -axis, if $m = 0$ and $b > 0$. C. The line passes through the origin.
B. The line intersects the y -axis, if $m \neq 0$ and $b > 0$. D. The line has no slope.

94. A problem to be solved using linear programming method is given as follows:

“A coffee packer blends coffee from Harar and from Sidama to prepare two kinds products, viz., “*Super*” and “*Deluxe*” brands. Each kilogram of *Super* coffee contains 0.5kg of Harar coffee and 0.5kg of Sidama coffee, whereas each kilogram of *Deluxe* coffee contains 0.25kg of Harar coffee and 0.75kg of Sidama coffee. The packer has 120kg of Harar coffee and 160kg of Sidama coffee in store. Moreover, the plan is to get 20 Birr profit on each kilogram of *Super* coffee and a profit of 30 Birr on each kilogram of *Deluxe* coffee. In order to maximize profit the packer needs to know the amount (in kg) of each brand of coffee that should be blended.”

If x = the amount of *Super* coffee in kilograms and

y = the amount of *Deluxe* coffee in kilograms, then which one of the following standard forms of linear programming models should be used to solve the above problem?

- | | |
|--|--|
| <p>A. Maximize $P = 30x + 20y$
 $0.5x + 0.75y \leq 120$
 subject to: $0.5x + 0.25y \leq 160$
 $x \geq 0, y \geq 0$</p> | <p>C. Maximize $P = 20x + 30y$
 $0.75x + 0.25y \leq 120$
 subject to: $0.5x + 0.5y \leq 160$
 $x \geq 0, y \geq 0$</p> |
| <p>B. Maximize $P = 20x + 30y$
 $0.5x + 0.25y \leq 120$
 subject to: $0.5x + 0.75y \leq 160$
 $x \geq 0, y \geq 0$</p> | <p>D. Maximize $P = 30x + 20y$
 $0.5x + 0.5y \leq 120$
 subject to: $0.25x + 0.75y \leq 160$
 $x \geq 0, y \geq 0$</p> |

95. Consider the following linear programming model:

objective function $Z = 2x - 5y$,

$$\text{subject to } \begin{cases} 3x + 2y \leq 6 \\ 2x + 5y \leq 10 \\ x \geq 0, y \geq 0 \end{cases}$$

Which of the following is the minimum value of Z ?

- A. $-\frac{150}{11}$ B. -10 C. 4 D. 0

Practice and practice again, that makes you perfect!