

Mathematics, 2013 EC, social science, entrance exam, round 1, booklet 18

Grade 12 · Mathematics · 2013 E.C.

Time allowed: 120 minutes

Questions: 65

Total marks: 65

Name _____ Grade _____ ID No. _____ Date _____

1. Which one of the following is a discrete variable? (1)
 - A. The temperature of an object.
 - B. The speed of a moving object.
 - C. Profit earned by a company.
 - D. Number of road accidents in Ethiopia.

2. The frequency distribution table of a grouped data X is given as shown below. | X | 10 – 14 | 15 – 19 | 20 – 24 | 25 – 29 | | --- | --- | --- | --- | --- | | Frequency | 2 | 3 | 5 | 4 | Which one of the following is true about this data? (1)
 - A. The upper class boundary of the 3rd class is 24
 - B. The class mark of the 2nd class is 17
 - C. The class mid-point of the 3rd class is 22.5
 - D. The lower class limit of the 4th class is 24.5

3. What is the range of the function f given by $f(x) = \left|x - \frac{1}{2}\right| + 3$? (1)
 - A. $[3, \infty)$
 - B. $\left[\frac{1}{2}, \infty\right)$
 - C. $\left[-\frac{1}{2}, \infty\right)$
 - D. $[-3, \infty)$

4. Let A and B be two sets and f be a function from A into B ($f : A \rightarrow B$). In order to say f is an on-to function which one of the following conditions should be fulfilled? (1)
 - A. If each element x in A is the pre-image of at least one element y in B under f , then f is onto function.
 - B. If any two elements in B are the images of exactly one element of A, then f is onto function.
 - C. If you can find two distinct elements in A that are the pre-image of exactly one elements of B, then f cannot be onto function.
 - D. If you can find an element y in B that is not an image of any one of the elements of A, then f is not onto function.

5. For a given ellipse, what do you call the ratio of the distance between the two foci to the length of the major axis? (1)
 - A. Eccentricity
 - B. Latus rectum
 - C. Directrix
 - D. Length of minor axis

6. Which one is the standard form of the equation of the parabola with vertex $(-2, 3)$ and focus $(2, 3)$? (1)
 - A. $(x + 2)^2 = 16(y - 3)$
 - B. $(x + 2)^2 = -16(y - 3)$
 - C. $(y - 3)^2 = 16(x + 2)$
 - D. $(y - 3)^2 = -16(x + 2)$

7. Which one of the following is equivalent to $(p \Rightarrow q) \wedge (q \Rightarrow p)$? (1)
 - A. $p \Leftrightarrow q$
 - B. $p \wedge q$
 - C. $(p \Rightarrow q) \vee (q \Rightarrow p)$
 - D. $(p \vee q) \wedge (q \vee p)$

8. When $3.\overline{125}$ is written in the form of $\frac{a}{b}$, it is equal to (1)
 - A. $\frac{3094}{990}$
 - B. $\frac{3094}{1000}$
 - C. $\frac{3100}{990}$
 - D. $\frac{3090}{1009}$

9. If z_1 and z_2 are complex numbers, then which one of the following statements is NOT true about them? (1)
- A. $z_1 - z_2$ is a complex number. B. $z_1 + z_2$ is a complex number.
C. $z_1 - z_2$ is always a real number. D. $z_1 + z_2$ can be a real number.

10. A system of linear equations is given as:
$$\begin{cases} x + 3y = 9 \\ -y + 4z = -2 \\ x - 5z = 0 \end{cases}$$
 Which one of the following is the augmented matrix (1)
- for the above system?

- A. $\begin{pmatrix} 1 & 3 & 0 \\ 0 & -1 & 4 \\ 1 & 0 & -5 \end{pmatrix}$ B. $\begin{pmatrix} 1 & 3 & 9 \\ -1 & 4 & -2 \\ 1 & -5 & 0 \end{pmatrix}$
C. $\begin{pmatrix} 1 & 3 & 9 & 0 \\ 0 & -1 & 4 & -2 \\ 1 & 0 & -5 & 0 \end{pmatrix}$ D. $\begin{pmatrix} 1 & 3 & 0 & 9 \\ 0 & -1 & 4 & -2 \\ 1 & 0 & -5 & 0 \end{pmatrix}$

11. Let $E = \begin{pmatrix} 2 & -2 & -4 \\ -4 & 8 & 6 \\ -6 & 10 & -8 \end{pmatrix}$ and $F = \begin{pmatrix} -1 & 1 & 2 \\ 2 & -4 & -3 \\ 3 & -5 & 4 \end{pmatrix}$. Which one of the following is true about E and F? (1)
- A. $F = \frac{1}{2}E$ B. $F = 2E$
C. $F = -\frac{1}{2}E$ D. $F = -2E$

12. Which one of the followings is NOT principle of taxation? (1)
- A. Taxation should seek to be neutral and equitable between forms of business activities.
B. Exemption of taxes are made to ensure revenue to cover government cost of administration.
C. Tax rules should be clear and simple to understand so that taxpayers know where they stand.
D. Compliance costs to business and administration costs for governments should be minimized as far as possible.

13. A function f is continuous on an interval if and only if (1)
- A. for some point c in the interval $f(x) \neq f(c)$.
B. it is continuous at every point of the interval.
C. for some point c in the interval $\lim_{x \rightarrow c} f(x) = 0$.
D. for exactly one point c in the interval $f(x) \neq f(c)$.

14. If $\{a_n\}$ and $\{b_n\}$ are two given sequences so that $\lim_{n \rightarrow \infty} a_n = 3$ and $\lim_{n \rightarrow \infty} b_n = -2$, then which one of the following is NOT true about them? (1)
- A. $\lim_{n \rightarrow \infty} a_n b_n = -6$ B. $\lim_{n \rightarrow \infty} a_n + b_n = 1$
C. $\lim_{n \rightarrow \infty} \frac{a_n}{2} = -\frac{3}{2}$ D. $\lim_{n \rightarrow \infty} \frac{a_n}{b_n} = -\frac{3}{2}$

15. Which one of the following sequence has no upper bound? (1)
- A. $\{1 - n\}$ B. $\left\{\frac{(-1)^n}{n}\right\}$
C. $\left\{\frac{4n-1}{2n}\right\}$ D. $\{2^n - 1\}$

16. If two lines $\ell_1 : 2x + 3y - 5 = 0$ and $\ell_2 : kx + 2y + p = 0$, are perpendicular at point $(-2, 3)$, then which one of the following pairs gives the correct values of k and p ? (1)
- A. $k = -3$ and $p = 9$ B. $k = 3$ and $p = -6$
C. $k = 3$ and $p = 15$ D. $k = -3$ and $p = -12$

17. Which one of the following is equal to $\lim_{x \rightarrow 5} \frac{x-5}{\sqrt{x+4}-3}$? (1)
- A. 0
B. ∞
C. 6
D. 1
-
18. Which one of the following matrices is the inverse of $\begin{pmatrix} 2 & 3 \\ 1 & 5 \end{pmatrix}$? (1)
- A. $\begin{pmatrix} \frac{5}{13} & \frac{-3}{13} \\ \frac{-1}{13} & \frac{2}{13} \end{pmatrix}$
B. $\begin{pmatrix} \frac{1}{2} & \frac{1}{3} \\ 1 & \frac{1}{5} \end{pmatrix}$
C. $\begin{pmatrix} \frac{5}{7} & \frac{-3}{7} \\ \frac{-1}{7} & \frac{2}{7} \end{pmatrix}$
D. $\begin{pmatrix} \frac{1}{5} & \frac{-1}{3} \\ -1 & \frac{1}{2} \end{pmatrix}$
-
19. The fourth term of a geometric sequence with positive terms is 125. If the tenth term is $\frac{125}{64}$, then which one of the following is the first term this sequence? (1)
- A. 500
B. 250
C. 1000
D. 750
-
20. If $\{a_n\}$ is a sequence with $a_1 = 3$ and $a_{n+1} = a_n + 5$ for all $n \geq 1$, then which one of the following is the 100th term of the sequence? (1)
- A. 500
B. 498
C. 508
D. 503
-
21. Which one of the following statements gives the geometric interpretation of the Rolle's theorem stated for a continuous function f on $[a, b]$ that is differentiable in (a, b) ? (1)
- A. There exists at most one tangent line to the graph of the function which is parallel to the y-axis.
B. There is a point c in the interval (a, b) where a tangent line to the graph of the function through this point is parallel to the x-axis.
C. At every point within the interval, it is possible to draw a tangent line to the graph of f which is parallel to the x-axis.
D. There is a point on the graph of f where the tangent line through this point is not parallel to a secant line joining any two points of the graph.
-
22. Let $\{a_n\}_{n=1}^{\infty}$ be a sequence with $a_1 = 2$ and $a_{n+1} = na_n$ for $n \in \mathbb{N}$. Then which one of the following expressions correctly describes a_n ? (1)
- A. $(2n)!$
B. $2n!$
C. $2(n+1)!$
D. $2(n-1)!$
-
23. Which one of the following is the set of all critical numbers of $f(x) = x^3 - 2x^2 + x + 1$ on the interval $[-1, 3]$? (1)
- A. $\{\frac{1}{3}, 1\}$
B. $\{\frac{1}{3}, -1\}$
C. $\{\frac{1}{3}, -2\}$
D. $\{1\}$
-
24. What is the value of k so that $f(x) = \frac{x}{x^2+k}$ has a relative extremum at $x = 2$? (1)
- A. 4
B. 8
C. 0
D. 2

25. An object has a circular base of radius r cm. Its volume (V) is directly proportional to its height (h), the constant π and the square of its base radius (r). When $r = 5$ cm and $h = 12$ cm, its volume $V = 100\pi \text{ cm}^3$. If $r = 9$ cm and $h = 10$ cm, then which one of the following equals to its volume? (1)
- A. $210\pi \text{ cm}^3$ B. $270\pi \text{ cm}^3$
C. $120\pi \text{ cm}^3$ D. $150\pi \text{ cm}^3$
-
26. If 20,000 Birr is divided among three persons in the ratio 5:2:3, then which one of the following is the maximum share? (1)
- A. 3,000 Birr B. 6,000 Birr
C. 10,000 Birr D. 4,000 Birr
-
27. A sum of money is invested at a compound interest calculated annually which amounts to 21,632 Birr at the end of the second year and to 22,497.28 Birr at the end of the third year. Which one of the following pairs of values gives the rate of interest and the principal, respectively? (1)
- A. 0.04 and 20,000 Birr B. 0.03 and 18,550 Birr
C. 0.06 and 21,550 Birr D. 0.05 and 21,000 Birr
-
28. The n^{th} term of a sequence $\{a_n\}$ is given by $a_n = \frac{1-2n}{1+2n}$, then which one of the following statements is true about this sequence? (1)
- A. All its terms are positive numbers and hence diverges.
B. It converges to its least upper bound 0.
C. It is a monotonic sequence and converges to -1 .
D. It is unbounded sequence and hence diverges.
-
29. For all $n \in \mathbb{N}$, which one of the following sequences is a null sequence? (1)
- A. $\left\{\frac{n}{n+1}\right\}$ B. $\left\{\left(\frac{1}{8}\right)^n\right\}$
C. $\left\{\frac{n^2}{n^2+1}\right\}$ D. $\left\{\left(\frac{7}{5}\right)^n\right\}$
-
30. Which one of the following is the value of $\lim_{x \rightarrow 2} \frac{\sqrt{x+2}-2}{x-2}$? (1)
- A. $\frac{1}{4}$ B. 4
C. $\frac{1}{2}$ D. 2
-
31. Let $A = \begin{pmatrix} -4 & 2 & 0 \\ 1 & 3 & 6 \\ 5 & 7 & 9 \end{pmatrix}$. Which of the following is NOT true about this matrix? (1)
- A. Cofactor of $a_{13} = -8$ B. Minor of $a_{23} = -38$
C. Cofactor of $a_{23} = 38$ D. Minor of $a_{13} = \text{Cofactor of } a_{31}$
-
32. If $A = \begin{pmatrix} a & 1 & -1 \\ 1 & a & 1 \\ 1 & 1 & a \end{pmatrix}$, then $\det(A) = \text{-----}$. (1)
- A. $a^3 - a$ B. $a^2 - a$
C. $-a(a^2 - 1)$ D. $a^3 - 1$
-
33. If $f(x) = x^3 \log_{10} x$, then which one of the following is equal to $f'(x)$? (1)
- A. $\frac{x^2}{\ln 10} + 3x^2 \log_{10} x$ B. $\frac{x^3}{\ln 10} + 3x^2 \log_{10} x$
C. $\frac{x^3}{\log_{10} x} - 3x^2 \ln x$ D. $\frac{x^2}{\log_{10} x} - 3x^2 \ln x$

34. Which one of the following events explains the meaning of derivative? (1)
- A. It gives the position of an object that is moving along a coordinate line at a certain given time t .
 - B. It is the marginal cost of a product which is the rate of change of cost with respect to the level of production.
 - C. It is the slope of a secant line to the graph of a function f where this secant line passes through two distinct points (x_0, y_0) and (x_1, y_1) of f .
 - D. It gives the amount of money at the end of n years, if someone deposit P birr in a bank that pays $r\%$ annual interest compounded monthly.
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35. A committee of three members with the position of Chairman, Vice-chairman and Secretary is to be formed from 10 candidates. If every candidate has equal chance to be selected and to take any of the three positions, in how many ways can the committee with the specified positions be formed? (1)
- A. 360
 - B. 120
 - C. 720
 - D. 840
-
36. What is the 3rd decile (D_3) of the data 2, 5, 3, 4, 11, 9, 8, 7, 12, 19? (1)
- A. 5
 - B. 4
 - C. 5.5
 - D. 4.5
-
37. If $f(x) = 4 - x^2 \sin x$, then which of the following expressions describes $f'(x)$? (1)
- A. $-x(x \cos x + 2 \sin x)$
 - B. $1 + \cos x + 2 \sin x$
 - C. $x(x \cos x - 2 \sin x)$
 - D. $1 - \cos x - 2 \sin x$
-
38. Which of the following is an equation of the line tangent to the graph of $y = x^2 + e^x$ at $x = 0$? (1)
- A. $y = x - 1$
 - B. $y = x$
 - C. $y = 2x$
 - D. $y = x + 1$
-
39. Consider the function $f(x) = x^3 + x^2 - 4x - 3$ whose graph is shown below. Which one of the following is the slope of the tangent line at $(-2, 1)$? (1)
- [Figure: A hand-drawn Cartesian coordinate grid on square ruling, about 12 columns wide and 12 rows tall. The horizontal x-axis and vertical y-axis are drawn heavier than the grid lines and cross a little left of the middle of the frame; the y-axis carries the label "y" beside its arrow head at the top and a small mark sits at the right-hand end of the x-axis. Tick dots are placed at every grid crossing along both axes but NO numeric labels are printed anywhere on the figure. The cubic curve of $f(x) = x^3 + x^2 - 4x - 3$ is drawn as one heavy continuous line: it enters at the bottom-left of the frame, rises steeply and crosses the x-axis about two units to the left of the origin, turns over at a local maximum about two units above the x-axis (roughly one and a half units left of the y-axis), falls and crosses the x-axis again just under one unit left of the origin, cuts the y-axis at about three units below the origin, bottoms out at a local minimum about five units below the x-axis (roughly one unit right of the y-axis), then rises steeply, crosses the x-axis about two units right of the origin and leaves through the top of the frame.]*
- A. -4
 - B. 4
 - C. -3
 - D. 3
-
40. If $p \Rightarrow \neg q$ is False, then for any proposition r which one of the following statements is True? (1)
- A. $(p \wedge q) \Rightarrow (r \wedge \neg r)$
 - B. $(p \wedge \neg q) \Leftrightarrow (\neg r \wedge r)$
 - C. $(\neg p \vee r) \Leftrightarrow (\neg q \wedge r)$
 - D. $(p \vee q) \Rightarrow (p \wedge r)$

41. Which one of the following is the contra positive of the statement: "If 9 is divisible by 2, then 5 is an even number"?
- A. If 5 is not an even number, then 9 is divisible by 2.
B. If 9 is not divisible by 2, then 5 is not an even number.
C. If 5 is not an even number, then 9 is not divisible by 2.
D. If 5 is an even number, then 9 is divisible by 2.
42. Let a function f be continuous on $[a, b]$ and differentiable in (a, b) . Which one of the following is correct about f ?
- A. $f'(x) = 0$, for all $x \in (a, b)$, then f is a constant on $[a, b]$.
B. If $f'(x) \leq 0$ for all $x \in (a, b)$, then f is increasing on (a, b) .
C. If $f(a) = f(b)$ and $f(x) > f(a)$ for all $x \in (a, b)$, then f has got a minimum value at $c \in (a, b)$ where $f'(c) = 0$.
D. If $f'(c) = 0$ and f'' is continuous at c such that $f''(c) > 0$, then f has a local maximum at c .
43. A textile factory produces shirts and calculates the revenue r , cost c and profit p as functions of the number of shirts. The functions are as follows: $r(x)$ = the revenue from selling x shirts, $c(x)$ = the cost of producing the x shirts, $p(x) = r(x) - c(x)$ = the profit from producing and selling x shirts. If $r(x) = 9x$ and $c(x) = x^3 - 6x^2 + 15x$, where x represents thousands of shirts produced, then which one of the following statements is correct about the loss or profit gained at the given production level?
- A. Maximum profit occurs at about $x = 3414$
B. Maximum loss occurs at about $x = 2510$
C. Maximum profit occurs at about $x = 6828$
D. Maximum loss occurs at about $x = 1586$
44. If $z_1 = 5 - 3i$ and $z_2 = 3 - 4i$, then $\frac{z_1}{z_2}$ is equal to _____.
- A. $\frac{3}{25} + \frac{11}{25}i$
B. $\frac{27}{25} + \frac{11}{25}i$
C. $\frac{27}{25} - \frac{11}{25}i$
D. $\frac{27}{25} + \frac{29}{25}i$
45. Which one of the following pairs contains the modulus and argument of the complex number $1 + \sqrt{3}i$ respectively?
- A. 2 and $\frac{\pi}{6}$ rad
B. 1 and $\frac{\pi}{3}$ rad
C. 2 and $\frac{\pi}{3}$ rad
D. 1 and $\frac{\pi}{6}$ rad
46. What is the third derivative of $f(x) = \frac{1}{3}x^6 + \frac{1}{2}x^4 - 3x^3 + 2x^2 + 4x - 1$?
- A. $10x^4 + 6x^2 - 18x + 4$
B. $20x^3 + 12x^2 - 18x - 4$
C. $40x^3 + 12x - 18$
D. $40x^3 + 12x^2 - 18x + 4$
47. Which of the following is true about the graph of the function given by $f(x) = \frac{-8}{x^2 - 4}$?
- A. $(2, 0)$ is the x-intercept.
B. It is symmetric about the origin.
C. Its vertical asymptote is $x = 4$.
D. Its horizontal asymptote is $y = 0$.
48. If $f(x) = \ln(2 + \sin x)$, then $f'(x)$ is equal to
- A. $\frac{-\cos x}{1 + \sin x}$
B. $\frac{\cos x}{2 + \sin x}$
C. $\frac{\csc x}{1 + \sin x}$
D. $\frac{\sec x}{1 + \sin x}$

49. Which one of the following functions is NOT invertible? (1)
- A. $g = \{(x, y) : y = x^2 + 1\}$, where $g : \mathbb{R} \rightarrow \mathbb{R}$
- B. $f = \{(x, y) : y = 4x - 3\}$, where $f : \mathbb{R} \rightarrow \mathbb{R}$
- C. $k = \{(x, y) : y = e^{2x}\}$, where $k : \mathbb{R} \rightarrow (0, \infty)$
- D. $h = \{(x, y) : y = \log_3 2x\}$, where $h : (0, \infty) \rightarrow \mathbb{R}$
-
50. Which one of the following is a possible solution for $\frac{2x^2-5x+2}{2x^2-x} = 1 - \frac{1+x}{2x-1}$? (1)
- A. 0
- B. 2
- C. -1
- D. $\frac{1}{2}$
-
51. A water tank is in the form of a right circular cylinder with base radius 2m and height 3m. If water is pumped into the tank at the rate of $0.5 \text{ m}^3/\text{min}$, what is the rate at which the water level is rising? (1)
- A. $\frac{8}{\pi} \text{ m/min}$
- B. $\frac{1}{8\pi} \text{ m/min}$
- C. $\frac{4\pi}{3} \text{ m/min}$
- D. $\frac{3\pi}{8} \text{ m/min}$
-
52. What is the number that satisfies the conclusion of the Mean Value Theorem for $f(x) = x^3 - 1$ on the interval $[0, 2]$? (1)
- A. $\sqrt{\frac{2}{3}}$
- B. $\frac{2}{3}$
- C. $\frac{\sqrt{2}}{3}$
- D. $\frac{2}{3}\sqrt{3}$
-
53. Which one of the following triplets of values of x , y and z contains all solutions for $\begin{cases} 4x - y + z = -5 \\ 2x + 2y + 3z = 10 \\ 5x - 2y + 6z = 1 \end{cases}$? (1)
- A. $x = -1, y = 3, z = 2$
- B. $x = 3, y = -1, z = 2$
- C. $x = 3, y = 2, z = -1$
- D. $x = 2, y = -1, z = 3$
-
54. What is the sixth term in the expanded form of $(x + 2y)^8$? (1)
- A. $1120x^4y^4$
- B. $1792x^3y^5$
- C. $448x^5y^3$
- D. $1024xy^7$
-
55. Among a group of 200 students who are asked whether or not they like Mathematics and/or History, it is found that 80 of them like Mathematics only, 20 like History only and 40 like both. If a student is randomly selected from the group, what is the probability that the student likes neither Mathematics nor History? (1)
- A. 0.5
- B. 0.3
- C. 0.8
- D. 0.7
-
56. Let f, g and h be differentiable functions such that $f(x) = g(x) + c$, for some $c \in \mathbb{R}$. If $f'(x) = e^{-x} - 2$ and $\frac{d}{dx}(f(x) + g(x) - h(x)) = e^{-x}$, then $h'(x) =$ _____. (1)
- A. $2e^{-x} + 2$
- B. $e^{-x} - 4$
- C. $e^{-x} - 2 + g'(x)$
- D. $2 - g'(x)$
-
57. If $f(x) = x^{3/2} + \frac{8}{x} + 7$, then $\lim_{x \rightarrow 4} \frac{f(x) - f(4)}{x - 4} =$ _____. (1)
- A. $\frac{3}{2}$
- B. 1
- C. $\frac{7}{2}$
- D. $\frac{5}{2}$

58. Let $f(x) = \begin{cases} \frac{x^3+8}{x+2}, & \text{if } x \neq -2 \\ 12, & \text{if } x = -2 \end{cases}$. What is the maximum possible interval on which f is continuous? (1)
- A. $(-2, \infty)$ B. $(-\infty, -2)$
C. $(-\infty, -2) \cup (-2, \infty)$ D. $(-\infty, \infty)$
-
59. The value of $\lim_{n \rightarrow \infty} \sum_{k=1}^n \left(\frac{1}{(k+2)(k+3)} \right)$ is equal to _____. (1)
- A. $\frac{4}{3}$ B. $\frac{1}{3}$
C. 0 D. $\frac{2}{3}$
-
60. Assuming that the population of Ethiopia increases at the rate of 3% per year and the current population is 102 million, which one of the following is the best approximate of the population of Ethiopia 10 years from now? (If you need, you may take: $1.03^{10} = 1.344$, $1.03^9 = 1.305$, $1.03^5 = 1.159$) (1)
- A. 137 million B. 125 million
C. 141 million D. 133 million
-
61. A person has 2 parents, 4 grandparents, 8 great grandparents and so on. What is the total number of his ancestors during the ten generations preceding his own? (1)
- A. 4092 B. 1024
C. 2046 D. 5048
-
62. If the line $y = 2x + 1$ is tangent to a circle centered at $(4, 0)$, then what are the coordinates for the intersection point of the line and the circle? (1)
- A. $(\frac{4}{5}, \frac{8}{5})$ B. $(\frac{3}{4}, \frac{5}{2})$
C. $(\frac{2}{5}, \frac{8}{5})$ D. $(\frac{2}{5}, \frac{9}{5})$
-
63. What is the tangent of the angle formed by the lines $\ell_1 : 2x + 3y = 5$ and $\ell_2 : x - 2y = 4$? (1)
- A. $-\frac{7}{4}$ B. $\frac{1}{3}$
C. $-\frac{1}{4}$ D. $\frac{2}{3}$
-
64. Consider the following linear programming model: objective function $Z = 3x + 5y$ subject to $3x + y \leq 6$, $x + y \geq 1$, $x + 2y \leq 6$, $x \geq 0$, $y \geq 0$. Which one of the following is the minimum value of Z ? (1)
- A. 3 B. 0
C. It has no minimum value. D. 5
-
65. 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 0.5 kg of Harar coffee and 0.5 kg of Sidama coffee, whereas each kilogram Deluxe coffee contains 0.25 kg of Harar coffee and 0.75 kg of Sidama coffee. The packer has 120 kg of Harar coffee and 160 kg of Sidama coffee in the 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? (1)
- A. Maximize $P = 20x + 30y$ subject to: $0.75x + 0.25y \leq 120$, $0.5x + 0.5y \leq 160$, $x \geq 0$, $y \geq 0$.
B. Maximize $P = 30x + 20y$ subject to: $0.5x + 0.5y \leq 120$, $0.25x + 0.75y \leq 160$, $x \geq 0$, $y \geq 0$.
C. Maximize $P = 30x + 20y$ subject to: $0.5x + 0.75y \leq 120$, $0.5x + 0.25y \leq 160$, $x \geq 0$, $y \geq 0$.
D. Maximize $P = 20x + 30y$ subject to: $0.5x + 0.25y \leq 120$, $0.5x + 0.75y \leq 160$, $x \geq 0$, $y \geq 0$.

— END OF EXAMINATION —

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