



ST. LAWRENCE HIGH SCHOOL

27, BALLYGUNGE CIRCULAR ROAD

**Class : 12****Subject : MATHEMATICS****Term : FIRST TERM****Max Marks : 60****Q 1 :** Which of the following is not an equivalence relation on \mathbb{Z} ?**Marks :** 1

- a) $a R b \Leftrightarrow a + b \text{ is an even integer.}$
- b) $a R b \Leftrightarrow a - b \text{ is an even integer.}$
- c) $a R b \Leftrightarrow a < b$
- d) $a R b \Leftrightarrow a = b$

1. a
2. b
- 3. c**
4. d

 (This Answer is Correct)
Q 2 : If $A = \{1, 2, 3\}$ & $B = \{1, 4, 6, 9\}$ and R is a relation from A to B defined by "x is greater than y ; where x is in A and y is in B". The range of R is -**Marks :** 1

- a) $\{1, 4, 6, 9\}$; b) $\{4, 6, 9\}$; c) $\{1\}$; d) None of these.

1. a
2. b
- 3. c**
4. d

 (This Answer is Correct)
Q 3 : $A = [a_{ij}]$ is a 3×2 matrix whose elements are given by $a_{ij} = 3i - 2j$, then A will be -**Marks :** 1

- a) $\begin{bmatrix} 1 & 1 \\ 4 & 2 \\ 7 & 5 \end{bmatrix}$
- b) $\begin{bmatrix} 1 & -1 \\ 4 & 2 \\ 7 & 5 \end{bmatrix}$
- c) $\begin{bmatrix} -1 & -1 \\ 4 & 2 \\ 7 & 5 \end{bmatrix}$
- d) $\begin{bmatrix} 1 & -1 \\ 4 & -2 \\ 7 & 5 \end{bmatrix}$

1. a
- 2. b**
3. c
4. d

 (This Answer is Correct)
Q 4 : The value of $\cos \theta \begin{bmatrix} \cos \theta & \sin \theta \\ -\sin \theta & \cos \theta \end{bmatrix} + \sin \theta \begin{bmatrix} \sin \theta & -\cos \theta \\ \cos \theta & \sin \theta \end{bmatrix} = ?$ **Marks :** 1

- a) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$; b) $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$; c) $\begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}$; d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

1. a
2. b
3. c
- 4. d**

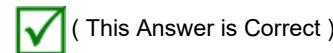
 (This Answer is Correct)

Q 5 : $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix} = ?$

- a) 1 ; b) -1 ; c) 0 ; d) 2

1. a
2. b
3. c
4. d

Marks : 1

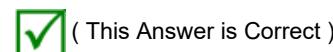


Q 6 : $\begin{vmatrix} 5^2 & 5^3 & 5^4 \\ 5^3 & 5^4 & 5^5 \\ 5^6 & 5^6 & 5^7 \end{vmatrix} = ?$

Marks : 1

- a) 1 ; b) -1 ; c) 0 ; d) 2

1. a
2. b
3. c
4. d

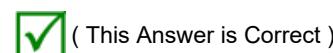


Q 7 : The value of $\lim_{x \rightarrow 1} \frac{\log x}{x-1} = ?$

Marks : 1

- a) 1 , b) 0 , c) e , d) -1

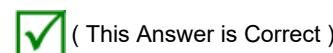
- 1. a**
2. b
3. c
4. d



Q 8 : $\int \sin x^\circ dx$ is -
a) $\frac{\pi}{180} \cos x^\circ + c$
b) $\frac{\pi}{180} \cos x^\circ + c$
c) $-\frac{\pi}{180} \cos x^\circ + c$
d) $-\frac{\pi}{180} \cos x^\circ + c$

Marks : 1

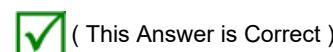
1. a
2. b
3. c
4. d



Q 9 : $\int \frac{2-3 \sin x}{\cos^2 x} dx = ?$
a) $2 \tan x - 3 \sec x + c$
b) $\tan x - 3 \sec x + c$
c) $2 \tan x - \sec x + c$
d) $3 \tan x - 2 \sec x + c$

Marks : 1

1. a
2. b
3. c

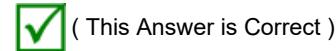


4 . d

- Q 10 :** The order of differential equation obtained by the elimination of the arbitrary constants a, b, c from the equation $ax + by + c = 0$ is -
- 2
 - 3
 - 1
 - None of these

Marks : 1

1 . a



2 . b

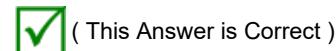
3 . c

4 . d

- Q 11 :** The order of differential equation $\left(\frac{d^4y}{dx^4}\right)^3 - \frac{d^3y}{dx^3} = \sqrt{1 + \frac{dy}{dx}}$ is -
- 6
 - 4
 - 3
 - 7

Marks : 1

1 . a



2 . b

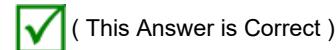
3 . c

4 . d

- Q 12 :** The integrating factor of the differential equation $x \frac{dy}{dx} - y = x^2$ is -
- $1/x$
 - e^x
 - $e^{2\log x}$
 - $e^{-2\log x}$

Marks : 1

1 . a



2 . b

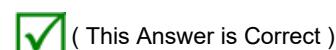
3 . c

4 . d

- Q 13 :** The integrating factor of the differential equation $x \log x \frac{dy}{dx} + y = \frac{2}{x} \log x$ is -
- x^2
 - $\log x$
 - $\frac{1}{x}$
 - $\frac{1}{x^2}$

Marks : 1

1 . a



2 . b

3 . c

4 . d

- Q 14 :** $\int_0^\pi \sin 3x \sin 5x \, dx = ?$

Marks : 1

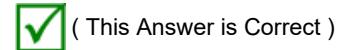
- $\frac{\pi}{2}$
- 0
- 1
- None of these

1. a

2. b

3. c

4. d

**Q 15 :**If the function $f(x)$ is differentiable at $x = a$, then it is increasing at $x = a$ when -

- a) $f'(a) > 0$
- b) $f'(a) < 0$
- c) $f'(a) \geq 0$
- d) $f'(a) \leq 0$

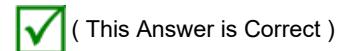
Marks : 1

1. a

2. b

3. c

4. d

**Q 16 :**A function $f(x)$ is defined in $a \leq x \leq b$ and $a < x_1 < x_2 < b$. Then $f(x)$ is strictly monotonic decreasing in $a \leq x \leq b$ when -

- a) $f(x_2) > f(x_1)$ when $x_2 > x_1$
- b) $f(x_2) < f(x_1)$ when $x_2 > x_1$
- c) $f(x_2) > f(x_1)$ when $x_2 < x_1$
- d) $f(x_2) < f(x_1)$ when $x_2 < x_1$.

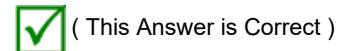
Marks : 1

1. a

2. b

3. c

4. d

**Q 17 :**The slope of the normal to the circle $x^2 + y^2 = a^2$ at $(a \cos \theta, b \sin \theta)$ is -

- a) $-\cot \theta$
- b) $-\tan \theta$
- c) $\tan \theta$
- d) $\cot \theta$

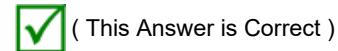
Marks : 1

1. a

2. b

3. c

4. d

**Q 18 :**The binary operation $*$ is defined on \mathbb{N} , by $a * b = a + b + ab$; $\forall a, b \in \mathbb{N}$
is -

- | | |
|-------------------------------------|---------------------|
| a) Associative only | b) Commutative only |
| c) Commutative and associative both | d) None of these. |

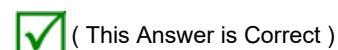
Marks : 1

1. a

2. b

3. c

4. d



Q 19 : If the positions vectors of the points P and Q be \vec{x} & \vec{y} respectively, then \overrightarrow{PQ} is ?
 a) $\vec{x} + \vec{y}$; b) $\vec{x} - \vec{y}$; c) $\vec{y} - \vec{x}$; d) $\frac{\vec{x} + \vec{y}}{2}$

Marks : 1

1. a
2. b
3. c
4. d



(This Answer is Correct)

Q 20 : Let R be a relation on the set \mathbb{N} given by $R = \{(a, b) : a = b - 2, b > 6\}$. Then -
 a) $(2, 4) \in R$, b) $(3, 8) \in R$, c) $(6, 8) \in R$, d) $(8, 7) \in R$

Marks : 1

1. a
2. b
3. c
4. d



(This Answer is Correct)

Q 21 : Let $R = \{(a, a), (b, b), (c, c), (a, b)\}$ be a relation on a set $A = \{a, b, c\}$. Then, R is -
 a) Transitive ; b) Reflexive ; c) Symmetric ; d) None of these.

Marks : 1

1. a
2. b
3. c
4. d



(This Answer is Correct)

Q 22 : If $2 \begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$, then the values of x & y are -
 a) $(3, 3)$; b) $(3, 2)$; c) $(2, 3)$; d) $(1, 1)$

Marks : 1

- 1. a**
2. b
3. c
4. d



(This Answer is Correct)

Q 23 : If $A = \begin{pmatrix} 1 & 2 & 3 & 4 \end{pmatrix}$ & $B = \begin{pmatrix} 1 \\ 2 \\ 3 \\ 4 \end{pmatrix}$ find $AB = ?$
 a) $|30|$; b) $|20|$; c) 30 ; d) 20

Marks : 1

- 1. a**
2. b
3. c
4. d



(This Answer is Correct)

Q 24 : The value of $\begin{vmatrix} a+tb & c+td \\ -c+td & a-tb \end{vmatrix} = ?$

- a) $d^2 + c^2 + b^2 + a^2$;
- b) $d^2 + c^2 + b^2 - a^2$;
- c) $d^2 + c^2 - b^2 + a^2$
- d) $d^2 - c^2 + b^2 + a^2$

Marks : 1

1 . a



(This Answer is Correct)

2 . b

3 . c

4 . d

Q 25 : If two rows (or two columns) of $|A|$ are identical , then $|A| = ?$

Marks : 1

- a) 1 ;
- b) 1 ;
- c) 0 ;
- d) -2

1 . a

2 . b

3 . c

4 . d



(This Answer is Correct)

Q 26 : $\frac{\text{Adj. } A}{|A|} =$

Marks : 1

- a) A^T
- b) A^{-1}
- c) $(A^T)^{-1}$
- d) $(A^{-1})^T$

1 . a

2 . b

3 . c

4 . d



(This Answer is Correct)

Q 27 : Which of the following statements is false -

Marks : 1

- a) $(A^{-1})^{-1} = A$
- b) $(A^T)^{-1} \neq (A^{-1})^T$
- c) $A^{-1} \cdot A = A \cdot A^{-1} = I$
- d) $(AB)^{-1} = B^{-1} \cdot A^{-1}$

1 . a

2 . b

3 . c

4 . d



(This Answer is Correct)

Q 28 : $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix} = ?$, where ω is an imaginary cube root of unity.

Marks : 1

- a) 1 ;
- b) 0 ;
- c) 3 ;
- d) 2

1 . a

2 . b



(This Answer is Correct)

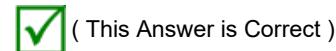
3 . c

4 . d

Q 29 : The value of $\lim_{x \rightarrow 0} \frac{\log(1+\sin x)}{x} = ?$ **Marks :** 1

- a) 1 , b) $\log_a e$, c) 0 , d) e

1 . a



2 . b

3 . c

4 . d

Q 30 : The value of $\lim_{x \rightarrow 0} \frac{\sin \log(1+x)}{x} = ?$ **Marks :** 1

- a) 0 , b) $\log_a e$, c) 1 , d) e

1 . a

2 . b

3 . c



4 . d

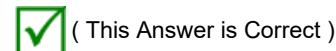
Q 31 : The function $f(x)$ is continuous at $x=0$ if -**Marks :** 1

- a. $\lim_{x \rightarrow 0} f(x)$ exists.
- b. $f(0)$ is infinite.
- c. $\lim_{x \rightarrow 0} f(x) = f(0)$
- d. $\lim_{x \rightarrow 0+} f(x) = \lim_{x \rightarrow 0-} f(x)$

1 . a

2 . b

3 . c



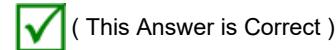
4 . d

Q 32 : Let the function $f(x) = |x|$. Then at $x = 0$ the function is -**Marks :** 1

- a) Not Continuous.
- b) Continuous but not differentiable
- c) Differentiable but not Continuous
- d) Differentiable and Continuous.

1 . a

2 . b



3 . c

4 . d

Q 33 : 1

Marks :

If the derivative of a function is \sqrt{x} , then the function is -

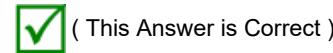
- a) $\frac{1}{2\sqrt{x}} + c$
- b) $\frac{2}{3}x^{\frac{3}{2}} + c$
- c) $\frac{3}{2}x^{\frac{3}{2}} + c$
- d) $\frac{2}{3\sqrt{x}} + c$

1. a

2. b

3. c

4. d



Q 34 : $\int \frac{x^2+1}{x} dx = ?$

Marks : 1

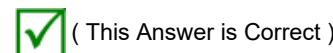
- a) $\frac{1}{2}x^2 + \log|x| + c$
- b) $\frac{1}{2}x^2 + \log x + c$
- c) $x + \log|x| + c$
- d) $x^2 + \log|x| + c$

1. a

2. b

3. c

4. d



Q 35 : The value of $\int \frac{dx}{9x^2+4} = ?$

Marks : 1

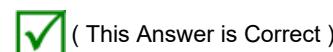
- a) $\frac{1}{2}\tan^{-1}\frac{3x}{2} + c$
- b) $\frac{1}{6}\tan^{-1}\frac{3x}{2} + c$
- c) $\frac{1}{6}\tan^{-1}\frac{2x}{3} + c$
- d) $\frac{2}{27}\tan^{-1}\frac{3x}{2} + c$

1. a

2. b

3. c

4. d



Q 36 : The integral of the form

Marks : 1

$\int \frac{dx}{(px+q)\sqrt{ax^2+bx+c}}$ can be obtained by the substitution-

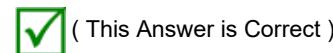
- a) $px + q = \frac{1}{z}$
- b) $ax^2 + bx + c = z^2$
- c) $ax^2 + bx + c = z$
- d) $px + q = \frac{1}{z^2}$

1. a

2. b

3. c

4. d



Q 37 : 1

Marks :

If $\int \frac{dx}{x^2-a^2} = k \log \left| \frac{x-a}{x+a} \right| + c$, then the value of k is -

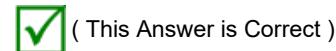
- a) $\frac{1}{a}$
- b) $\frac{1}{2a}$
- c) $2a$
- d) None of these.

1 . a

2 . b

3 . c

4 . d



Q 38 : The degree of the differential equation $(\frac{dy}{dx})^2 - 2 \frac{dy}{dx} = 3x$ is -

Marks : 1

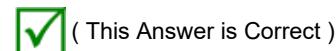
- a. 1
- b. 2
- c. 3
- d. 4

1 . a

2 . b

3 . c

4 . d



Q 39 : $\frac{d^3y}{dx^3} + y = \sqrt[3]{1 + \frac{dy}{dx}}$ is a differential equation of degree -

Marks : 1

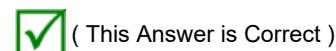
- a. 1
- b. 2
- c. 3
- d. 4

1 . a

2 . b

3 . c

4 . d



Q 40 : In the linear differential equation of the form $\frac{dy}{dx} + Py = Q$, Q is -

Marks : 1

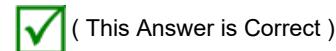
- a. A constant.
- b. A constant or a function of x.
- c. Function of y.
- d. Function of both x & y.

1 . a

2 . b

3 . c

4 . d



Q 41 : The integrating factor of the differential equation $\frac{dx}{dy} + Px = Q$ is -

Marks : 1

- a. e^x
- b. e^{Px}
- c. $e^{\int P dx}$
- d. $e^{\int P dy}$

1 . a

2 . b

3 . c

4 . d



(This Answer is Correct)

Q 42 : $\int_0^{\pi} \sqrt{1 + \sin x} dx = ?$ **Marks :** 1

- a) $\frac{\pi}{4}$ b) 0 c) 4 d) None of these

1 . a

2 . b

3 . c

4 . d



(This Answer is Correct)

Q 43 : If $0 < x < \frac{\pi}{2}$ then ,**Marks :** 1

- i. $\sin x$ is an increasing function ;
- ii. $\cos x$ is an increasing function ;
- iii. $\tan x$ is an increasing function .

Then -

- a) i. and ii. are true
b) ii. and iii. Are true
c) i. and iii. Are true
d) only i. is true.

1 . a

2 . b

3 . c

4 . d



(This Answer is Correct)

Q 44 : If the tangent to the continuous curve $y = f(x)$ at $P(a, b)$ is parallel to y -axis, then the equation of the normal to the curve at P is -**Marks :** 1

- a) $y = a$
b) $y = b$
c) $x = a$
d) $x = b$

1 . a

2 . b

3 . c

4 . d



(This Answer is Correct)

Q 45 : The slope of the normal to the parabola $x^2 = 4ay$ at $(2at, at^2)$ is -**Marks :** 1

- a) $\frac{1}{t}$
b) t
c) $-t$
d) $-\frac{1}{t}$

1 . a

2 . b

3 . c

4 . d



(This Answer is Correct)

Q 46 : The length of the tangent drawn from the point (-4 , 5) to the circle $x^2 + y^2 = 16$ is –
 a) 3 unit
 b) 4 unit
 c) 5 unit
 d) 6 unit

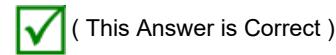
Marks : 1

1 . a

2 . b

3 . c

4 . d



Q 47 : For any non-empty set A , the identity mapping on A will be –
 a) Injective but not surjective.
 b) Surjective but not injective.
 c) Bijective
 d) Neither surjective nor injective.

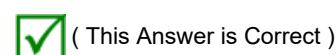
Marks : 1

1 . a

2 . b

3 . c

4 . d



Q 48 : Two functions f & g are defined on \mathbb{R} by $f(x) = \cos x$ & $g(x) = x^2$; then $(g \circ f)(x) = ?$
 a) $\cos^2 x$; b) $\cos x^2$; c) $\sin^2 x$; d) $\sin x^2$

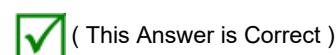
Marks : 1

1 . a

2 . b

3 . c

4 . d



Q 49 : If the binary operation * is defined on \mathbb{Z} , by $a * b = a^2 - b^2 + ab + 4$,
 then the value of $(2 * 3) * 4$ is –
 a) 233 ; b) 33 ; c) 55 ; d) -55

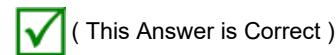
Marks : 1

1 . a

2 . b

3 . c

4 . d



Q 50 : If $\vec{a} = 2\hat{i} - \hat{j}$ and $\vec{b} = 3\hat{i} - 2\hat{j} + 4\hat{k}$, then the value of $\vec{a} \times \vec{b}$ is –
 a) $4\hat{i} - 8\hat{j} - \hat{k}$
 b) $-4\hat{i} - 8\hat{j} + \hat{k}$
 c) $4\hat{i} - 8\hat{j} + \hat{k}$
 d) $-4\hat{i} - 8\hat{j} - \hat{k}$

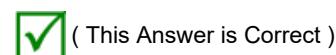
Marks : 1

1 . a

2 . b

3 . c

4 . d



Q 51 : The Direction cosines of z-axis are ? **Marks :** 1

- a) 1, 0, 0 ; b) 0, 1, 0 ; c) 0, 0, 1 ; d) 1, 1, 1

1. a
2. b
3. c
4. d



(This Answer is Correct)

Q 52 : State which of the following statements for the square matrix $A = [a_{ij}]$ is false **Marks :** 1

- a) { (i) $a_{ij} = 0, \forall i \neq j$ & (ii) $a_{ij} = k, \forall i = j, \text{ where } k \neq 0$ } will form a scalar matrix.
b) { (i) $a_{ij} = 0, \forall i = j$ & (ii) $a_{ij} = 1, \forall i \neq j$ } will form a unit matrix.
c) { (i) $a_{ij} = 0, \forall i \neq j$ & (ii) $a_{ij} \neq 0, \forall i = j$ } will form a diagonal matrix.
d) If A is diagonal and all the elements of its principle diagonal are same , A is scalar matrix.

1. a
2. b
3. c
4. d



(This Answer is Correct)

Q 53 : If $A = \begin{bmatrix} 1 & 2 & 3 \\ -3 & 2 & -1 \\ 2 & -4 & 3 \end{bmatrix}$, then the Cofactor of a_{23} (i.e. C_{23}) is ? **Marks :** 1

- a) 8 ; b) -8 ; c) -3 ; d) 3

- 1. a**
2. b
3. c
4. d



(This Answer is Correct)

Q 54 : If $f(x) = \begin{vmatrix} \sin x & \cos x & \tan x \\ x^3 & x^2 & x \\ 2x & 1 & 1 \end{vmatrix}$, then $\lim_{x \rightarrow 0} \frac{f(x)}{x^2} = ?$ **Marks :** 1

- a) -1 ; b) 1 ; c) 0 ; d) -2

1. a
2. b
3. c
4. d



(This Answer is Correct)

Q 55 : The greatest integer function $f(x) = [x]$ is - **Marks :** 1

- a) Continuous at all real values of x
b) Continuous only at non-integral values of x
c) Continuous at all integral values of x
d) None of these.

1. a
2. b
3. c



(This Answer is Correct)

4 . d

- Q 56 :** The order of the differential equation $\left(\frac{d^2y}{dx^2}\right)^3 - \left(\frac{dy}{dx}\right)^4 + 5y = x$ is -
 a. 1
 b. 2
 c. 3
 d. 4

Marks : 1

1 . a

2 . b

3 . c

4 . d



(This Answer is Correct)

- Q 57 :** The integrating factor of the differential equation $(x + y + 1)\frac{dy}{dx} = 1$ is -
 a. e^{-y}
 b. e^x
 c. e^{-x}
 d. e^y

Marks : 1

1 . a

2 . b

3 . c

4 . d



(This Answer is Correct)

- Q 58 :** The slope of the normal to the rectangular hyperbola $xy = 4$ at $(2t, \frac{2}{t})$ is -
 a) $-t^2$
 b) t^2
 c) $2t$
 d) $-2t$

Marks : 1

1 . a

2 . b

3 . c

4 . d



(This Answer is Correct)

- Q 59 :** The minimum value of the function $f(x) = x^3 - 3x^2 + 5$ is ?
 a) 5 ; b) 0 ; c) 2 ; d) 1

Marks : 1

1 . a

2 . b

3 . c

4 . d



(This Answer is Correct)

- Q 60 :** If $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = -\hat{i} + 3\hat{j} + 4\hat{k}$, then the value of $\vec{a} \cdot \vec{b}$ is -
 a) 1 ; b) -1 ; c) 3 ; d) -3

Marks : 1

1 . a

2 . b

3 . c



(This Answer is Correct)

4 . d
