



Class 12 Mathematics | Relations And Functions

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. On integers, aRb if $a-b$ is divisible by 3. R is:

- A. Not transitive
- B. Reflexive only
- C. An equivalence relation
- D. Symmetric only

2. On R , aRb if $a < b$. This relation is:

- A. Reflexive and symmetric
- B. An equivalence relation
- C. Symmetric but not transitive
- D. Transitive but not reflexive

3. The function $f:R \rightarrow R$, $f(x)=3x-2$ is:

- A. Onto only
- B. One-one only
- C. One-one and onto
- D. Neither

4. $f:R \rightarrow R$, $f(x)=x^2$ is:

- A. Onto only
- B. Neither one-one nor onto
- C. One-one and onto
- D. One-one only

5. $f:[0,\infty) \rightarrow [0,\infty)$, $f(x)=x^2$ is:

- A. Only one-one
- B. Neither
- C. Only onto
- D. Bijective

6. On a set of 3 elements, the identity relation has how many pairs?

- A. 1
- B. 9
- C. 3
- D. 6

7. The universal relation on a nonempty set is:

- A. Not reflexive
- B. Not symmetric
- C. An equivalence relation
- D. Not transitive

8. For $A=\{1,2\}$, which relation is reflexive?

- A. $\{(1,1),(2,2)\}$
- B. $\{(1,1)\}$
- C. $\emptyset$
- D. $\{(1,2),(2,1)\}$

9. For $A=\{1,2\}$, $R=\{(1,1),(2,2),(1,2)\}$ is:

- A. Symmetric only
- B. An equivalence relation
- C. Not reflexive
- D. Reflexive and transitive, not symmetric

10. $f:R \rightarrow R$, $f(x)=x^3$ is:

- A. Bijective
- B. Only one-one
- C. Only onto
- D. Neither

11. Which function $R \rightarrow R$ is one-one?

- A. $f(x)=\sin x$
- B. $f(x)=x^2$
- C. $f(x)=5x+7$
- D. $f(x)=3$

12. On R , aRb if $a^2=b^2$. R is:

- A. An equivalence relation
- B. Not symmetric
- C. Not reflexive
- D. Not transitive

13. If $f:A \rightarrow B$ is onto, then its range equals:

- A. B
- B. $\emptyset$
- C. $A \cap B$ always
- D. A

14. A function is one-one if:

- A. Its range is empty
- B. $a=b$ implies $f(a)=f(b)$ only
- C. Every output has two inputs
- D. $f(a)=f(b)$ implies $a=b$

15. The relation aRb iff $a=b$ on R is:

- A. Reflexive only
- B. Transitive only
- C. Symmetric only
- D. Reflexive, symmetric and transitive

ANSWER KEY — check after completing all 15 questions

1.C 2.D 3.C 4.B 5.D 6.C 7.C 8.A 9.D 10.A 11.C 12.A 13.A 14.D 15.D



Class 12 Mathematics | Inverse Trigonometric Functions

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. The principal value of $\sin^{-1}(1/2)$ is:

A. $\pi/3$ B. $\pi/6$ C. $5\pi/6$ D. $-\pi/6$

2. The principal value of $\cos^{-1}(-1/2)$ is:

A. $4\pi/3$ B. $-2\pi/3$ C. $\pi/3$ D. $2\pi/3$

3. $\tan^{-1}(-1)$ equals:

A. $3\pi/4$ B. $-3\pi/4$ C. $-\pi/4$ D. $\pi/4$

4. The domain of $\sin^{-1}(2x)$ is:

A. $[0, 1/2]$ B. $[-1/2, 1/2]$ C. $[-1, 1]$ D. $\mathbb{R}$

5. The range of $\cos^{-1} x$ is:

A. $(-\pi/2, \pi/2)$ B. $(0, \pi)$ C. $[0, \pi]$ D. $[-\pi/2, \pi/2]$

6. $\sin^{-1} x + \cos^{-1} x$ equals:

A. 0 B. 2π C. $\pi/2$ D. π

7. $\sin(\sin^{-1}(3/5))$ equals:

A. $3/5$ B. $5/4$ C. $5/3$ D. $4/5$

8. $\cos(\sin^{-1}(3/5))$ equals:

A. $5/4$ B. $3/5$ C. $4/5$ D. $-4/5$

9. $\sin^{-1}(\sin(5\pi/6))$ equals:

A. $-\pi/6$ B. $\pi/6$ C. $5\pi/6$ D. $-5\pi/6$

10. $\cos^{-1}(\cos(5\pi/3))$ equals:

A. $5\pi/3$ B. $2\pi/3$ C. $\pi/3$ D. $-\pi/3$

11. The domain of $\cos^{-1}(x-2)$ is:

A. $[0, 2]$ B. $[-1, 1]$ C. $[-3, -1]$ D. $[1, 3]$

12. $\tan(\tan^{-1} 2)$ equals:

A. 2 B. $\pi/2$ C. -2 D. $1/2$

13. The principal value of $\sec^{-1} 2$ is:

A. $\pi/3$ B. $\pi/6$ C. $2\pi/3$ D. $-\pi/3$

14. The principal value of $\cot^{-1}(-1)$ is:

A. $3\pi/4$ B. $5\pi/4$ C. $-\pi/4$ D. $\pi/4$

15. The principal value of $\operatorname{cosec}^{-1}(-2)$ is:

A. $-\pi/6$ B. $7\pi/6$ C. $\pi/6$ D. $-5\pi/6$

ANSWER KEY — check after completing all 15 questions

1.B 2.D 3.C 4.B 5.C 6.C 7.A 8.C 9.B 10.C 11.D 12.A 13.A 14.A 15.A

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Class 12 Mathematics | Matrices

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. A matrix with 3 rows and 2 columns has order:

A. 1×6 B. 2×3 C. 3×2 D. 6×1

2. If A is 2×3 and B is 3×4 , AB has order:

A. 2×3 B. 2×4 C. 3×3 D. 4×2

3. If A is 2×3 , the order of A^T is:

A. 2×3 B. 2×2 C. 3×2 D. 3×3

4. For $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, the (2,1) entry of A^T is:

A. 4 B. 2 C. 1 D. 3

5. If $\begin{bmatrix} x & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 5 & 2 \\ 3 & 4 \end{bmatrix}$, x equals:

A. 3 B. 5 C. 2 D. 4

6. For $A = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$, A^2 equals:

A. $\begin{bmatrix} 2 & 0 \\ 0 & 4 \end{bmatrix}$ B. $\begin{bmatrix} 1 & 2 \\ 0 & 4 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 0 \\ 0 & 4 \end{bmatrix}$ D. $\begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}$

7. Every diagonal entry of a real skew-symmetric matrix is:

A. 0 B. 1 C. -1 D. Arbitrary

8. Which identity is always true?

A. $(AB)^T = B^T A^T$ B. $(AB)^T = A^T B^T$ C. $AB = BA$ D. $A^2 = A$

9. For $A = \begin{bmatrix} 2 & 1 \\ 0 & 3 \end{bmatrix}$, $2A$ has (1,2) entry:

A. 2 B. 6 C. 4 D. 1

10. If A is square and I is the matching identity, AI equals:

A. 0 B. A^T C. I D. A

11. If A and B are 2×2 , $A+B$ is found by:

A. Adding row sums only
B. Multiplying row sums
C. Multiplying corresponding entries
D. Adding corresponding entries

12. For $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 0 \\ 1 & 3 \end{bmatrix}$, $(AB)_{12}$ is:

A. 2 B. 6 C. 3 D. 0

13. A square matrix A is symmetric when:

A. $A^T = A$ B. $A^2 = 0$ C. $A = 0$ only D. $A^T = -A$

14. If $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$, A^2 equals:

A. A B. -I C. 0 D. I

15. For any square A, $A+A^T$ is:

A. Always skew-symmetric
B. Symmetric
C. Always diagonal
D. Always zero

ANSWER KEY — check after completing all 15 questions

1.C 2.B 3.C 4.B 5.B 6.C 7.A 8.A 9.A 10.D 11.D 12.B 13.A 14.B 15.B



Class 12 Mathematics | Determinants

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. The determinant of $\begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$ is:

A. 11 B. 8 C. -5 D. 5

2. If two rows of a determinant are equal, its value is:

A. -1 B. 1 C. 0 D. Their sum

3. Interchanging two rows changes a determinant to:

A. Zero always B. Twice its value
C. The same value D. Its negative

4. For a 3×3 matrix A , $\det(2A)$ equals:

A. $2\det(A)$ B. $4\det(A)$ C. $6\det(A)$ D. $8\det(A)$

5. If $\det A = 5$, then $\det(A^T)$ equals:

A. $1/5$ B. 25 C. 5 D. -5

6. A square matrix is singular if its determinant is:

A. 0 B. Positive C. -1 D. 1

7. The determinant of diagonal matrix $\text{diag}(2,3,4)$ is:

A. 12 B. 24 C. 9 D. 6

8. If $\det A = 2$ and $\det B = 3$, $\det(AB)$ equals:

A. 5 B. 8 C. 1 D. 6

9. If $\det A = 4$, $\det(A^{-1})$ equals:

A. -4 B. 16 C. 4 D. $1/4$

10. The cofactor of a_{12} in $\begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$ is:

A. 5 B. 7 C. -5 D. -3

11. The area of the triangle $(0,0), (4,0), (0,3)$ is:

A. 12 B. 3 C. 6 D. 7

12. If $\det \begin{bmatrix} x & 2 \\ 3 & 6 \end{bmatrix} = 0$, x equals:

A. 6 B. 2 C. 1 D. 3

13. For invertible A , $A \text{adj}(A)$ equals:

A. $\det(A)A$ B. $\det(A)I$ C. A^T D. I

14. The inverse of $\text{diag}(2,5)$ is:

A. $\text{diag}(5,2)$ B. $\text{diag}(2,5)$
C. $\text{diag}(1/2, 1/5)$ D. $\text{diag}(-2, -5)$

15. The equations $x+y=3$ and $2x-y=0$ have solution:

A. (0,3) B. (1,2) C. (3,0) D. (2,1)

ANSWER KEY — check after completing all 15 questions

1.D 2.C 3.D 4.D 5.C 6.A 7.B 8.D 9.D 10.C 11.C 12.C 13.B 14.C 15.B

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Class 12 Mathematics | Continuity And Differentiability

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. For $f(x) = (x^2 - 1)/(x - 1)$, $x \neq 1$, continuity at 1 requires $f(1) =$:

- A. -1 B. 0 C. 2 D. 1

2. The function absolute value of x at 0 is:

- A. Continuous but not differentiable
B. Neither
C. Both
D. Differentiable but not continuous

3. If a function is differentiable at a point, it is necessarily:

- A. Constant nearby B. Positive there
C. Continuous there D. Increasing there

4. The derivative of e^{3x} is:

- A. e^{3x} B. $3x e^{3x}$ C. $e^{3x}/3$ D. $3e^{3x}$

5. The derivative of $\ln x$ for $x > 0$ is:

- A. $1/x$ B. x C. $-1/x$ D. $\ln x$

6. The derivative of $\sin^{-1} x$ for $-1 < x < 1$ is:

- A. $1/\sqrt{1-x^2}$ B. $-1/(1+x^2)$
C. $-1/\sqrt{1-x^2}$ D. $1/(1+x^2)$

7. The derivative of $\tan^{-1}(2x)$ is:

- A. $1/(1+4x^2)$ B. $2/(1+x^2)$
C. $1/(1+2x)$ D. $2/(1+4x^2)$

8. If $y = x^x$, $x > 0$, then dy/dx is:

- A. x^x/x B. $x x^{x-1}$ C. $x^x \ln x$ D. $x^x(\ln x + 1)$

9. If $x^2 + y^2 = 25$, then dy/dx is:

- A. $-x/y$ B. $-y/x$ C. x/y D. y/x

10. If $x = t^2$ and $y = t^3$, $t \neq 0$, dy/dx equals:

- A. $2t$ B. $2/(3t)$ C. $3t/2$ D. $3t^2$

11. The second derivative of x^4 is:

- A. $4x^3$ B. $12x^2$ C. $12x^3$ D. $24x$

12. If $f(x) = kx + 1$ for $x \leq 2$ and $f(x) = 5$ for $x > 2$, continuity at 2 gives $k =$:

- A. 4 B. 3 C. 2 D. 1

13. The derivative of $\ln(\sin x)$, where defined, is:

- A. $-\cot x$ B. $\tan x$ C. $\cot x$ D. $\sec x$

14. The derivative of $x e^x$ is:

- A. $e^x(1-x)$ B. e^x C. $e^x(1+x)$ D. $x e^x$

15. The derivative of $\cos(x^2)$ is:

- A. $2x \cos(x^2)$ B. $2x \sin(x^2)$
C. $-2x \sin(x^2)$ D. $-\sin(x^2)$

ANSWER KEY — check after completing all 15 questions

1.C 2.A 3.C 4.D 5.A 6.A 7.D 8.D 9.A 10.C 11.B 12.C 13.C 14.C 15.C

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Class 12 Mathematics | Applications Of Derivatives

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1. For $f(x)=x^2-4x+1$, f is increasing on:

A. R B. $(-\infty, 0)$ C. $(-\infty, 2)$ D. $(2, \infty)$

2. The minimum value of $x^2-6x+10$ is:

A. 1 B. 10 C. 3 D. -1

3. The local maximum of $f(x)=-x^2+4x$ occurs at $x=$:

A. 0 B. 2 C. 4 D. -2

4. If $f'(x)>0$ throughout an interval, f is:

A. Strictly decreasing B. Constant
C. Strictly increasing D. Always positive

5. For $f(x)=x^3-3x$, local maximum occurs at:

A. $x=3$ B. $x=0$ C. $x=-1$ D. $x=1$

6. The radius of a circle increases at 2 cm/s. At $r=3$ cm, its area increases at:

A. 6π cm²/s B. 18π cm²/s
C. 12π cm²/s D. 4π cm²/s

7. A sphere's radius increases at 1 cm/s. At $r=2$ cm, dV/dt is:

A. 16π cm³/s B. 8π cm³/s
C. 32π cm³/s D. 4π cm³/s

8. A square side increases at 2 cm/s. At side 5 cm, its area increases at:

A. 25 cm²/s B. 4 cm²/s C. 10 cm²/s D. 20 cm²/s

9. Among rectangles of perimeter 24 cm, the greatest area is:

A. 72 cm² B. 36 cm² C. 24 cm² D. 48 cm²

10. If $f'(a)=0$ and $f''(a)>0$, f has at a :

A. No extremum always
B. A local maximum
C. A local minimum
D. A discontinuity

11. For $f(x)=x^3$, the stationary point $x=0$ is:

A. A local minimum
B. A discontinuity
C. A local maximum
D. Neither maximum nor minimum

12. The maximum of $f(x)=x(8-x)$ on $[0,8]$ is:

A. 16 B. 64 C. 8 D. 32

13. For $f(x)=1/x$, $x>0$, f is:

A. Constant
B. First increasing then decreasing
C. Strictly decreasing
D. Strictly increasing

14. If $s(t)=t^3-3t$, velocity at $t=2$ is:

A. 9 B. 6 C. 3 D. 12

15. The absolute minimum of x^2 on $[-2,3]$ is attained at:

A. 0 B. -2 C. 3 D. Both endpoints

ANSWER KEY — check after completing all 15 questions

1.D 2.A 3.B 4.C 5.C 6.C 7.A 8.D 9.B 10.C 11.D 12.A 13.C 14.A 15.A



Class 12 Mathematics | Integrals

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. $\int x^3 dx$ equals:

- A. $x^4/4+C$ B. $3x^2+C$ C. $x^3/3+C$ D. x^4+C

2. $\int \cos x dx$ equals:

- A. $\sin x+C$ B. $\cos x+C$
C. $-\sin x+C$ D. $-\cos x+C$

3. $\int 1/x dx$, $x \neq 0$, equals:

- A. $\ln(\text{abs}(x))+C$ B. $-1/x^2+C$
C. $1/x^2+C$ D. $x \ln x+C$

4. $\int e^{2x} dx$ equals:

- A. $e^{2x}+C$ B. $x e^{2x}+C$ C. $e^{2x}/2+C$ D. $2e^{2x}+C$

5. $\int 1/(1+x^2) dx$ equals:

- A. $\sin^{-1} x+C$ B. $\ln(1+x^2)+C$
C. $\tan^{-1} x+C$ D. $1/(2x)+C$

6. $\int 2x/(1+x^2) dx$ equals:

- A. $1/(1+x^2)+C$ B. $\ln(1+x^2)+C$
C. $\tan^{-1} x+C$ D. $2\ln(1+x^2)+C$

7. $\int x e^x dx$ equals:

- A. $e^x(x-1)+C$ B. $e^x(x+1)+C$
C. $x^2 e^x/2+C$ D. e^x+C

8. $\int \sin x \cos x dx$ equals:

- A. $-\sin^2 x/2+C$ B. $\sin^2 x/2+C$
C. $\cos^2 x/2+C$ D. $\sin^2 x+C$

9. $\int$ from 0 to 1 of $x^2 dx$ is:

- A. 3 B. $1/2$ C. 1 D. $1/3$

10. $\int$ from -2 to 2 of $x^3 dx$ is:

- A. 0 B. -8 C. 4 D. 8

11. $\int$ from 0 to π of $\sin x dx$ is:

- A. 1 B. 0 C. π D. 2

12. $\int$ from 0 to $\pi/2$ of $\cos^2 x dx$ is:

- A. 0 B. $\pi/2$ C. 1 D. $\pi/4$

13. If $\int$ from 0 to 2 of $f(x) dx=5$, then $\int$ from 2 to 0 of $f(x) dx$ is:

- A. 5 B. -5 C. 0 D. 10

14. $\int 1/(x^2-1) dx$, $x>1$, equals:

- A. $\frac{1}{2}\ln((x+1)/(x-1))+C$ B. $\ln(x^2-1)+C$
C. $\tan^{-1} x+C$ D. $\frac{1}{2}\ln((x-1)/(x+1))+C$

15. $\int$ from 0 to 1 of $(3x^2+2x) dx$ is:

- A. 5 B. 1 C. 2 D. 3

ANSWER KEY — check after completing all 15 questions

1.A 2.A 3.A 4.C 5.C 6.B 7.A 8.B 9.D 10.A 11.D 12.D 13.B 14.D 15.C



Class 12 Mathematics | Applications Of Integrals

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. The area under $y=x$ from $x=0$ to $x=4$ is:

A. 12 B. 8 C. 4 D. 16

2. The area under $y=x^2$ on $[0,2]$ is:

A. $8/3$ B. 4 C. 8 D. $4/3$

3. The area between $y=x$ and $y=x^2$ on $[0,1]$ is:

A. $1/2$ B. $1/6$ C. $1/3$ D. 1

4. The area under $y=\sin x$ from 0 to π is:

A. 0 B. π C. 2 D. 1

5. The area between $y=4$ and $y=x^2$ is:

A. 8 B. $16/3$ C. 16 D. $32/3$

6. The area enclosed by $x^2+y^2=9$ is:

A. 3π B. 9π C. 18π D. 6π

7. The area enclosed by $x^2/16+y^2/9=1$ is:

A. 25π B. 7π C. 24π D. 12π

8. The area bounded by $y=2x$, $x=0$, $x=3$ and the x-axis is:

A. 18 B. 3 C. 9 D. 6

9. The area between $y=x^2$ and the x-axis on $[-1,1]$ is:

A. $2/3$ B. 0 C. $1/3$ D. 2

10. The area between $y=-x$ and the x-axis on $[0,2]$ is:

A. 2 B. 0 C. 4 D. -2

11. Curves $y=x^2$ and $y=2x$ meet at $x=$:

A. -2 and 2 B. 0 and 2 C. 0 and 1 D. 1 and 2

12. The area enclosed by $y=x^2$ and $y=2x$ is:

A. $2/3$ B. $8/3$ C. 4 D. $4/3$

13. The first-quadrant area under $y=\sqrt{x}$ on $[0,4]$ is:

A. $8/3$ B. 8 C. 4 D. $16/3$

14. The area between $x=y^2$ and $x=4$ is:

A. 16 B. $16/3$ C. $32/3$ D. 8

15. To find area between upper curve $y=f(x)$ and lower $y=g(x)$, use:

A. $\int fg \, dx$ B. $\int (g-f) \, dx$ C. $\int (f-g) \, dx$ D. $\int (f+g) \, dx$

ANSWER KEY — check after completing all 15 questions

1.B 2.A 3.B 4.C 5.D 6.B 7.D 8.C 9.A 10.A 11.B 12.D 13.D 14.C 15.C

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Class 12 Mathematics | Differential Equations

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. The order of $d^2y/dx^2 + 3dy/dx + y = 0$ is:

A. 2 B. 1 C. 3 D. 0

2. The degree of $(d^2y/dx^2)^3 + (dy/dx)^2 = 0$ is:

A. 1 B. 3 C. 2 D. 6

3. The general solution of $dy/dx = 2x$ is:

A. $y = x + C$ B. $y = 2 + C$ C. $y = x^2 + C$ D. $y = 2x^2 + C$

4. For $dy/dx = 3x^2$ with $y(0) = 2$, y equals:

A. $x^3 + 2$ B. $x^2 + 2$ C. $x^3 - 2$ D. $3x^3 + 2$

5. The general solution of $dy/dx = y$ is:

A. $y = Cx$ B. $y = x + C$ C. $y = Ce^x$ D. $y = Ce^{-x}$

6. The integrating factor of $y' + 2y = x$ is:

A. e^{2x} B. e^x C. $2x$ D. e^{-2x}

7. The integrating factor of $y' + y/x = x$, $x > 0$, is:

A. x B. e^x C. x^2 D. $1/x$

8. Which equation is separable?

A. $dy/dx = x/y$ B. $dy/dx = \sin(x+y)$
C. $dy/dx = x^2 + y^2$ D. $dy/dx = x + y$

9. The general solution of $dy/dx = -y$ is:

A. $y = Ce^x$ B. $y = Ce^{-x}$ C. $y = -x + C$ D. $y = x + C$

10. A general solution of a first-order differential equation contains:

A. One arbitrary constant
B. No constants
C. Two arbitrary constants
D. Three arbitrary constants

11. The solution of $dy/dx = y/x$ with $y(1) = 3$ is:

A. $y = 3x$ B. $y = x + 2$ C. $y = 3/x$ D. $y = x/3$

12. The solution of $y' = \cos x$ with $y(0) = 1$ is:

A. $y = -\sin x + 1$ B. $y = \sin x$
C. $y = \cos x$ D. $y = \sin x + 1$

13. The equation $dy/dx = F(y/x)$ is classified as:

A. Homogeneous first order
B. Constant coefficient only
C. Second order
D. Always linear

14. For $y' + y = e^x$, the general solution is:

A. $y = e^{-x}/2 + Ce^x$ B. $y = 2e^x + Ce^{-x}$
C. $y = e^x + Ce^{-x}$ D. $y = e^x/2 + Ce^{-x}$

15. The degree of $y' + \sin y = 0$ is:

A. Not defined B. 1 C. 0 D. 2

ANSWER KEY — check after completing all 15 questions

1.A 2.B 3.C 4.A 5.C 6.A 7.A 8.A 9.B 10.A 11.A 12.D 13.A 14.D 15.B

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Class 12 Mathematics | Vector Algebra

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. The magnitude of $2\mathbf{i}-3\mathbf{j}+6\mathbf{k}$ is:

A. $\sqrt{13}$ B. 7 C. 49 D. 11

2. A unit vector along $3\mathbf{i}+4\mathbf{j}$ is:

A. $3\mathbf{i}+4\mathbf{j}$ B. $(4\mathbf{i}+3\mathbf{j})/5$ C. $(3\mathbf{i}+4\mathbf{j})/7$ D. $(3\mathbf{i}+4\mathbf{j})/5$

3. If $\mathbf{a}=\mathbf{i}+2\mathbf{j}$ and $\mathbf{b}=3\mathbf{i}-\mathbf{j}$, then $\mathbf{a}\cdot\mathbf{b}$ equals:

A. 5 B. -1 C. 7 D. 1

4. The dot product of perpendicular vectors is:

A. 0 B. Their magnitudes' product C. -1 D. 1

5. The value of $\mathbf{i}\times\mathbf{j}$ is:

A. $\mathbf{i}$ B. 0 C. $\mathbf{k}$ D. $-\mathbf{k}$

6. The value of $\mathbf{j}\times\mathbf{i}$ is:

A. 0 B. $-\mathbf{k}$ C. $\mathbf{j}$ D. $\mathbf{k}$

7. If magnitudes of $\mathbf{a}, \mathbf{b}$ are 2, 3 and angle is 60° , $\mathbf{a}\cdot\mathbf{b}$ is:

A. 0 B. $3\sqrt{3}$ C. 3 D. 6

8. If magnitudes of $\mathbf{a}, \mathbf{b}$ are 2, 3 and angle is 30° , magnitude of $\mathbf{a}\times\mathbf{b}$ is:

A. 0 B. 6 C. $3\sqrt{3}$ D. 3

9. The area of a triangle with side vectors $\mathbf{a}, \mathbf{b}$ is:

A. $\mathbf{a}\cdot\mathbf{b}$

B. $\frac{1}{2}$ magnitude of $\mathbf{a}\times\mathbf{b}$

C. $\frac{1}{2}\mathbf{a}\cdot\mathbf{b}$

D. Magnitude of $\mathbf{a}\times\mathbf{b}$

10. The scalar projection of $3\mathbf{i}+4\mathbf{j}$ on $\mathbf{i}$ is:

A. 3 B. 5 C. 4 D. 7

11. If $\mathbf{a}=2\mathbf{i}+\mathbf{j}$ and $\mathbf{b}=\mathbf{i}-2\mathbf{j}$, the angle between them is:

A. 45° B. 180° C. 90° D. 0°

12. If $\mathbf{a}$ is a unit vector, $\mathbf{a}\cdot\mathbf{a}$ equals:

A. 0 B. 2 C. -1 D. 1

13. The vector from A(1,2,3) to B(4,0,5) is:

A. $3\mathbf{i}-2\mathbf{j}+2\mathbf{k}$

B. $5\mathbf{i}+2\mathbf{j}+8\mathbf{k}$

C. $3\mathbf{i}+2\mathbf{j}+2\mathbf{k}$

D. $-3\mathbf{i}+2\mathbf{j}-2\mathbf{k}$

14. If nonzero $\mathbf{a}, \mathbf{b}$ are parallel, $\mathbf{a}\times\mathbf{b}$ is:

A. Zero vector B. Unit vector C. $\mathbf{a}-\mathbf{b}$ D. $\mathbf{a}+\mathbf{b}$

15. For $\mathbf{a}=\mathbf{i}+\mathbf{j}$ and $\mathbf{b}=\mathbf{i}-\mathbf{j}$, magnitude of $\mathbf{a}+\mathbf{b}$ is:

A. $\sqrt{2}$ B. 2 C. 0 D. 4

ANSWER KEY — check after completing all 15 questions

1.B 2.D 3.D 4.A 5.C 6.B 7.C 8.D 9.B 10.A 11.C 12.D 13.A 14.A 15.B

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Class 12 Mathematics | Three-Dimensional Geometry

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. Direction cosines l, m, n satisfy:

- A. $l^2 + m^2 + n^2 = 1$ B. $l^2 + m^2 + n^2 = 0$
C. $lmn = 1$ D. $l + m + n = 1$

2. A line with direction ratios 2, -1, 2 has direction cosines:

- A. $1/3, 2/3, 2/3$ B. $2, -1, 2$
C. $2/5, -1/5, 2/5$ D. $2/3, -1/3, 2/3$

3. The line through (1, 2, 3), parallel to (2, 1, -1), is:

- A. $r = (1, 2, 3) + t(1, 2, 3)$ B. $r = (1, 2, 3) + t(2, 1, -1)$
C. $r = (2, 1, -1) + t(1, 2, 3)$ D. $r = t(1, 2, 3)$

4. For $r = (1, 2, 3) + t(2, -1, 1)$, the point at $t = 2$ is:

- A. (3, 1, 4) B. (2, 4, 6) C. (5, 4, 1) D. (5, 0, 5)

5. Lines with direction ratios (1, 2, 3) and (2, 4, 6) are:

- A. Parallel B. Always intersecting
C. Perpendicular D. Always coincident

6. Lines with direction ratios (1, 1, 0) and (1, -1, 0) have angle:

- A. 45° B. 60° C. 90° D. 0°

7. The angle between directions (1, 0, 0) and (1, 1, 0) is:

- A. 90° B. 60° C. 30° D. 45°

8. Direction ratios of the line joining (1, 2, 3) to (3, 5, 7) are:

- A. 2, 3, 4 B. 3, 5, 7 C. 4, 7, 10 D. 1, 2, 3

9. The line $(x-1)/2 = (y+1)/3 = (z-2)/4$ passes through:

- A. (2, 3, 4) B. (1, 1, 2) C. (-1, 1, -2) D. (1, -1, 2)

10. A line parallel to the z-axis has direction ratios:

- A. 1, 1, 0 B. 0, 1, 0 C. 0, 0, 1 D. 1, 0, 0

11. The shortest distance between the x-axis and $r = (0, 2, 3) + t(1, 0, 0)$ is:

- A. 2 B. 5 C. 3 D. $\sqrt{13}$

12. The lines $r = (t, 0, 0)$ and $r = (0, s, 1)$ are:

- A. Skew B. Coincident C. Intersecting D. Parallel

13. The shortest distance between $r = (t, 0, 0)$ and $r = (0, s, 2)$ is:

- A. 2 B. 0 C. 1 D. $\sqrt{2}$

14. The lines $r = (t, t, 0)$ and $r = (1+s, 1-s, 0)$ intersect at:

- A. (1, 0, 0) B. (0, 1, 0) C. (0, 0, 0) D. (1, 1, 0)

15. If a direction has $l = 3/5, m = 4/5$, then n equals:

- A. -1 B. $1/5$ C. 1 D. 0

ANSWER KEY — check after completing all 15 questions

1.A 2.D 3.B 4.D 5.A 6.C 7.D 8.A 9.D 10.C 11.D 12.A 13.A 14.D 15.D



Class 12 Mathematics | Linear Programming

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. In linear programming, the quantity to maximise or minimise is the:

- A. Feasible region
- B. Objective function
- C. Origin
- D. Constraint boundary

2. A feasible point must satisfy:

- A. All constraints
- B. Only the objective equation
- C. Any one constraint
- D. Only nonnegativity

3. Maximise $Z=2x+3y$ over $x,y\geq 0$, $x+y\leq 4$. The maximum is:

- A. 12
- B. 4
- C. 24
- D. 8

4. For $x,y\geq 0$ and $x+y\leq 5$, which point is infeasible?

- A. (0,5)
- B. (3,3)
- C. (2,2)
- D. (5,0)

5. Minimise $x+y$ subject to $x,y\geq 0$ and $x+y\geq 6$. The minimum is:

- A. No finite minimum
- B. 12
- C. 0
- D. 6

6. Maximise $3x+y$ on $0\leq x\leq 2$, $0\leq y\leq 3$. The maximum is:

- A. 5
- B. 3
- C. 6
- D. 9

7. The region $x\geq 0, y\geq 0$ is:

- A. Empty
- B. A single point
- C. Unbounded
- D. Bounded

8. Constraints $x+y\leq 2$ and $x+y\geq 5$ yield:

- A. A unique optimum always
- B. A bounded nonempty region
- C. No feasible solution
- D. All first-quadrant points

9. For bounded nonempty feasible regions, a linear objective attains an optimum at:

- A. At least one corner point
- B. Every interior point
- C. No boundary point
- D. Only the origin

10. Maximise $x+y$ for $x,y\geq 0$ and $x+y\leq 4$. Optimal points include:

- A. Every point on $x+y=4$ in the first quadrant
- B. Only (0,4)
- C. Only (0,0)
- D. Only (4,0)

11. A product uses 2 hours/unit and another uses 3 hours/unit; 18 hours are available. Constraint:

- A. $2x+3y\geq 18$
- B. $3x+2y\leq 18$
- C. $x+y\leq 18$
- D. $2x+3y\leq 18$

12. If profits are ₹40 per x-item and ₹50 per y-item, the objective is:

- A. Maximise $40x+50y$
- B. Maximise $50x+40y$
- C. Minimise $40x+50y$
- D. Maximise xy

13. The intersection of $x+y=6$ and $x+2y=8$ is:

- A. (4,2)
- B. (6,0)
- C. (2,4)
- D. (0,4)

14. For vertices (0,0), (4,0), (2,3), (0,4), maximum of $3x+2y$ is:

- A. 14
- B. 12
- C. 8
- D. 10

15. For $x,y\geq 0$ with no upper restrictions, maximising $x+y$ gives:

- A. Maximum 0
- B. Maximum 1
- C. A unique maximum
- D. No finite maximum

ANSWER KEY — check after completing all 15 questions

1.B 2.A 3.A 4.B 5.D 6.D 7.C 8.C 9.A 10.A 11.D 12.A 13.A 14.B 15.D

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Class 12 Mathematics | Probability

MCQ WORKSHEET • 15 questions • Choose one correct option • Suggested time: 25 minutes

1. If $P(A \cap B) = 0.2$ and $P(B) = 0.5$, then $P(A \text{ given } B)$ is:

A. 0.7 B. 0.1 C. 0.3 D. 0.4

2. If A, B are independent with probabilities 0.3 and 0.4, $P(A \cap B)$ is:

A. 0.58 B. 0.7 C. 0.1 D. 0.12

3. If A, B are independent and $P(A) = 0.6$, $P(A \text{ given } B)$, for $P(B) > 0$, is:

A. 0.6 B. $P(B)$ C. 0 D. 1

4. Two fair dice are rolled. Given sum 8, probability first die shows 3 is:

A. $1/4$ B. $1/6$ C. $1/5$ D. $1/3$

5. A bag has 3 red and 2 blue balls. Two are drawn without replacement. $P(\text{both red})$ is:

A. $3/10$ B. $9/25$ C. $3/5$ D. $2/5$

6. For two mutually exclusive events with positive probabilities, the events are:

A. Always independent
B. Not independent
C. Complements necessarily
D. Identical

7. If $P(A) = 0.7$ and $P(B \text{ given } A) = 0.4$, $P(A \cap B)$ is:

A. 0.28 B. 0.3 C. 0.175 D. 1.1

8. If $P(A \text{ given } B) = 0.8$, $P(A' \text{ given } B)$ equals:

A. -0.2 B. 0.8 C. 1.8 D. 0.2

9. A box is chosen equally from two boxes with red-ball probabilities $1/4$ and $3/4$. $P(\text{red})$ is:

A. $1/4$ B. $3/4$ C. $3/16$ D. $1/2$

10. In the preceding equal-choice two-box model, $P(\text{second box given red})$ is:

A. $1/2$ B. $1/4$ C. $3/8$ D. $3/4$

11. Machines A and B make 60% and 40% of items, with defect rates 2% and 3%. $P(\text{defective})$ is:

A. 0.05 B. 0.012 C. 0.025 D. 0.024

12. For those machines, $P(A \text{ given defective})$ is:

A. $2/5$ B. $1/2$ C. $3/5$ D. $1/3$

13. If $P(A) = 1/2$, $P(B) = 1/3$ and independent, $P(A \cup B)$ is:

A. $5/6$ B. $2/3$ C. $1/6$ D. $1/2$

14. A fair coin is tossed twice. Given at least one head, probability of two heads is:

A. $1/4$ B. $1/2$ C. $1/3$ D. $2/3$

15. If $P(B) > 0$, $P(A \text{ given } B) = 1$ means:

A. $P(B) = 1$ necessarily
B. $P(A) = 1$ necessarily
C. $P(A \cap B) = P(B)$
D. A and B are independent necessarily

ANSWER KEY — check after completing all 15 questions

1.D 2.D 3.A 4.C 5.A 6.B 7.A 8.D 9.D 10.D 11.D 12.B 13.B 14.C 15.C

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