

# Olympiad Foundation

SAMPLE PAPER CLASS 12<sup>th</sup>



OLYMPIAD FOUNDATION



## Division of Marks

S.No.	Topic/Section	No. of Question	Marks
1	ALGEBRA	10	10
2	CALCULUS	10	10
3	TRIGONOMETRY	10	10
4	ACHIEVER SECTION	02	10
5	REASONING	10	10
	TOTAL	42	50

### INSTRUCTIONS :

1. Use Blue/Black ballpoint pen only to darken the appropriate circle.
2. Mark should be dark and should completely fill the circle.
3. Dark only one circle for each entry.
4. Dark the circle in the space provided only.
5. Rough work must not be done on the answer sheet and do not use white-fluid or any other rubbing material on Answer sheet.
6. Each question carries one mark.

Select the correct answer and darken your answer in the table :

### ALGEBRA

- The value of  $\det. A + |A|$  is what ? if  $A = \begin{bmatrix} 3 & -1 \\ 2 & 0 \end{bmatrix}$   
 (A) 0 (B) -1 (C) 2 (D)  $\sqrt{-2}$
- If we have any matrix A, then A is symmetric if -  
 (A)  $A' = A$  (B)  $A' = -A$  (C)  $A' = A/2$  (D)  $A' = 0$
- If A is any square matrix;  $A \begin{bmatrix} 0 & 1 \\ 2 & 3 \end{bmatrix}$  then the value of transpose of A is;  
 (A)  $\begin{bmatrix} 0 & 1 \\ 3 & 2 \end{bmatrix}$  (B)  $\begin{bmatrix} 3 & 2 \\ 0 & 1 \end{bmatrix}$   
 (C)  $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$  (D)  $\begin{bmatrix} 0 & 2 \\ 1 & 3 \end{bmatrix}$
- If  $\hat{a}$  is a unit vector and  $(x - a) \cdot (x + a) = 8$  then the value of  $|x|$  is ;  
 (A) 0 (B) 3  
 (C) 1 (D) 2
- Find the Magnitude of  $a = 3i + 2j + k$  ;  
 (A)  $2\sqrt{7}$  (B)  $\sqrt{14}$   
 (C)  $2\sqrt{5}$  (D) 14
- Two or more vectors having same initial point are called :  
 (A) Coinitial (B) Co - Linear  
 (C) Parallel (D) Null
- The direction cosines of the line joining the points A (-2, 1, -8) & B (4, 3, -5) ;  
 (A)  $6/7, 2/3, 5$  (B)  $6/7, 2/7, 3/7$   
 (C)  $6/7, 2/5, 3$  (D)  $6/7, 3/7, -2/7$

8. If  $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$  then  $2A$  is equal to ;

(A)  $\begin{bmatrix} 2 & 4 \\ -1 & 3 \end{bmatrix}$

(B)  $\begin{bmatrix} 2 & 4 \\ 2 & 1 \end{bmatrix}$

(C)  $\begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$

(D)  $\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$

9. If  $A$  is any matrix, then it be a skew symmetric matrix by applying ;

(A)  $\frac{1}{2} (A + A')$

(B)  $\frac{1}{2} (A - A')$

(C)  $\frac{1}{2} (A' + A')$

(D)  $\frac{1}{2} A'$

10. If  $A = \begin{bmatrix} 0 & 2 \\ -1 & 3 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 0 \\ 3 & 1 \end{bmatrix}$  then  $A + 2B$  is;

(A)  $\begin{bmatrix} 4 & 1 \\ 5 & 3 \end{bmatrix}$

(B)  $\begin{bmatrix} 1 & 0 \\ -1 & 3 \end{bmatrix}$

(C)  $\begin{bmatrix} 3 & 0 \\ 1 & 1 \end{bmatrix}$

(D)  $\begin{bmatrix} 4 & 1 \\ 5 & 5 \end{bmatrix}$

### CALCULUS

11. If  $y = \frac{\sin^{-1}x}{2x}$  then  $dy/dx$  is ;

(A)  $\frac{1}{2} \left[ \frac{1}{\sqrt{1-x^2}} \right]$

(B)  $\frac{1}{2} \left[ \frac{1}{\sqrt{1-x^2}} - \frac{\sin^{-1}x}{x^2} \right]$

(C)  $\frac{2}{\sqrt{1-x^2}} \cdot 2x$

(D)  $\frac{2x}{\sqrt{1-x^2}}$

12. If we have a function  $f$ , then  $f$  is said to be increasing on an interval  $(a, b)$  if;

(A)  $x_1 < x_2$  in  $(a, b) \Rightarrow F(x_1) \leq F(x_2) \quad \forall \quad x_1, x_2 \in (a, b)$

(B)  $x_1 > x_2$  in  $(a, b) \Rightarrow F(x_1) \leq F(x_2) \quad \forall \quad x_1, x_2 \in (a, b)$

(C)  $x_1 \leq x_2$  in  $(a, b) \Rightarrow F(x_1) < F(x_2) \quad \forall \quad x_1, x_2 \in (a, b)$

(D)  $x_1 < x_2$  in  $(a, b) \Rightarrow F(x_1) > F(x_2) \quad \forall \quad x_1, x_2 \in (a, b)$

13. If  $y = x^3 - 3x + 2$  at  $x = 3$  then slope of tangent is ;  
 (A)  $-1/24$  (B)  $-1$  (C)  $0$  (D)  $1/24$
14. If  $y = x^2 + 2$  then it is strictly increasing on ;  
 (A)  $(0,1)$  (B)  $(0,-2)$  (C)  $(0,-3)$  (D)  $(0,-2/3)$
15. If  $d/dx f(x) = 12x^2 + 6x$  then the function is ;  
 (A)  $f(x) = 4x^3 + 3x^2$  (B)  $3x^2 + 9x$   
 (C)  $12x + 6x^2$  (D)  $6x + 9x^2$
16.  $\int \sin^{-1}(\cos x) dx = ?$   
 (A)  $\pi x/2 - \pi/2 + c$  (B)  $\pi x/2 - x^2/2 + c$   
 (C)  $\pi/2 + \pi x^2/2 + c$  (D)  $0$
17.  $\int x \sec^2(x^2 - 1) dx = ?$   
 (A)  $1/2 \tan(x^2 + 1) C$  (B)  $2 \tan^2(1+x^2) + C$   
 (C)  $\sin^2(x^2 + 1) + C$  (D)  $\frac{1}{\sin(x^2 + 1)} + C$
18.  $\int_{\pi/6}^{\pi/3} \frac{dx}{1 + \sqrt{\tan x}} = ?$   
 (A)  $\pi/12$  (B)  $0$  (C)  $\pi/2$  (D)  $\pi/4$
19.  $\int_0^{\pi/4} \tan x dx = ?$   
 (A)  $1/2 \log 2$  (B)  $0$  (C)  $2$  (D)  $1/2 \log 5$
20. If  $f(x) = \sin 2x - x$  ;  $0 \leq x \leq 2\pi$   
 (A)  $f'(x) = 2\cos 2x - 1$  (B)  $f'(x) = 2\cos 2x$   
 (C)  $f'(x) = 1/2 \cos 2x$  (D)  $f'(x) = 3\cos 2x$

### TRIGONOMETRY

21. The value of  $\sin(3\pi/2 + 45^\circ)$  is ;  
 (A)  $0$  (B)  $\sqrt{2}$  (C)  $-1/\sqrt{2}$  (D)  $1$

22. The value of  $\sin(\pi/3 + \pi/4)$  is ;  
 (A)  $\sqrt{3}+1/2\sqrt{2}$  (B)  $\sqrt{3}/2 +1$  (C)  $\sqrt{2}/3 +1$  (D) 0
23. The interval of strictly increasing function  $f(x) = \sin x$  is;  
 (A)  $(0, 2\pi)$  (B)  $(0, \pi)$  (C)  $(-\pi, 3\pi)$  (D)  $(0, \pi/2)$
24. The formula of  $\sin 3x$  is ;  
 (A)  $\frac{\sin 3x}{\cos 3x}$  (B)  $3\sin x - 4\cos^3 x$   
 (C)  $3\sin x - 4\sin^3 x$  (D)  $4\cos 3x - 4\sin x$
25. The value of  $\cos^2 x + \cos^2(x + \pi/3) + \cos^2(x - \pi/3) = ?$   
 (A)  $3/2$  (B) 2 (C) 1 (D) 0
26. If  $\tan x = 3/4$  then  $\sin x/2 = ?$   
 (A)  $3/\sqrt{10}$  (B)  $3/\sqrt{5}$  (C)  $1/\sqrt{5}$  (D) 1
27. The value of  $\sin 15$  is ;  
 (A)  $\sqrt{3}-1/2\sqrt{2}$  (B) 1  
 (C)  $\sqrt{3}/2$  (D)  $2/\sqrt{2}$
28. The form of  $2 \cos x \cos y$  is ;  
 (A)  $\cos(x+y) + \cos(x-y)$  (B)  $\sin(x+y) + \cos(x-y)$   
 (C)  $\sin(x+y) + \sin(x-y)$  (D)  $\sin(x+y) + \sin(2x+y)$
29. The value of  $\tan \pi/8$  is ;  
 (A)  $\sqrt{2} +1$  (B)  $1/\sqrt{2}$   
 (C)  $\sqrt{2}-1$  (D)  $\sqrt{2}$
30. The form of  $\cot(x-y)$  is ;  
 (A)  $\cot x \cot y -1$  (B)  $\cot x - \cot y$   
 (C)  $\cot x - \tan y$  (D)  $\frac{\cot x \cot y -1}{\cot y - \cot x}$

## ACHIEVER SECTION

Each question carrying 5 marks each :

31. The value of  $I = \int \frac{3x - 2}{(x + 1)^2 (x + 3)} dx$  is ;

(A)  $11/4 \log \left| \frac{x+1}{x+2} \right| + \frac{5}{(x+1)} + C$

(B)  $11/4 \log \left| \frac{x+2}{x+1} \right| + C$

(C)  $11/2 \times 4 \log \left| \frac{x+1}{x+2} \right| + C$

(D)  $11/4 \log \left| \frac{x+1}{x+3} \right| + \frac{5}{2(x+1)} + C$

32. The area of the region enclosed by two circles  $x^2 + y^2 = 1$  and  $(x-1)^2 + y^2 = 1$  is ;

(A)  $(2\pi/3 - \sqrt{3}/2)$  sq. units

(B)  $(2\pi/4 - \sqrt{3})$  sq. units

(C)  $(2\pi - \sqrt{3})$  sq. units

(D)  $(2\pi/6 - 1/\sqrt{3})$  sq. units

### REASONING

33. Find the missing number :-  $23 : 13 :: 54 : ?$

(A) 44

(B) 39

(C) 40

(D) 41

34. Select the pair in which the numbers are similarly related as in given pair ?

(A)  $216 : 81$

(B)  $49 : 16$

(C)  $216 : 36$

(D)  $125 : 36$

35. Select the lettered pair which has the same relationship as the original pair of words ;  
Weight : Kilogram

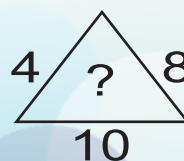
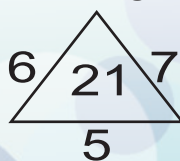
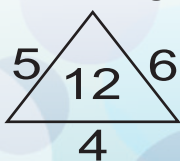
(A) Seconds : Hours

(B) Distance : Kilometer

(C) Bushel : Corn

(D) Mile : Length

36. Find the missing number, acc. to given pattern ;



(A) 14

(B) 22

(C) 32

(D) 320



37. To find the missing term, acc. to given sequence ;  
A, C, F, H, \_\_\_\_\_, M
- (A) L (B) K (C) M (D) I
38. Obtain the number from the sequence of the given numbers which does not belongs to given sequence ;  
225, 375, 312, 431, 261, 711
- (A) 225 (B) 312 (C) 431 (D) 261
39. Find the next number in each of the given sequence of numbers :  
7, 26, 63, 124, 215, 342, \_\_\_\_\_
- (A) 511 (B) 512 (C) 513 (D) 521
40. 3, 14, 35, 63, 99, \_\_\_\_\_
- (A) 1377 (B) 133 (C) 143 (D) 153
41. 7, 65, 215, 513, 99 \_\_\_\_\_
- (A) 888 (B) 1000 (C) 1001 (D) 1729
42. 4, 9, 21, 47, 101, 213, \_\_\_\_\_
- (A) 439 (B) 438 (C) 437 (D) 430

### ANSWER KEY

- |       |       |       |       |       |
|-------|-------|-------|-------|-------|
| 1. C  | 11. B | 21. C | 31. D | 41. D |
| 2. A  | 12. A | 22. A | 32. A | 42. A |
| 3. D  | 13. A | 23. D | 33. D |       |
| 4. B  | 14. A | 24. C | 34. C |       |
| 5. B  | 15. A | 25. A | 35. B |       |
| 6. A  | 16. B | 26. A | 36. C |       |
| 7. B  | 17. A | 27. A | 37. B |       |
| 8. C  | 18. A | 28. A | 38. C |       |
| 9. B  | 19. A | 29. C | 39. A |       |
| 10. D | 20. A | 30. D | 40. C |       |