1. In function $F = \alpha v^2 \sin \beta t$, F denotes force, v velocity and t time. The dimensional formula of $\alpha\beta^2$ is same as dimensional formula of
(A) acceleration due to gravity
(B) work done
(C) atmospheric pressure
(D) power

2. The approximate value of x where $x = \sin 2° \cos 2°$, is

(A) $\dfrac{\pi}{90}$
(B) 2
(C) 1
(D) $\dfrac{\pi}{45}$

3. The potential energy of a particle varies with distance x from a fixed point as $U = \dfrac{A\sqrt{x}}{x + B^2}$ where A and B are constants. Then the dimension of AB^2 is -
(A) $ML^{3/2}T^{-2}$
(B) $ML^{7/2}T^{-2}$
(C) $M^2L^{5/2}T^{-2}$
(D) Dimensionless

4. The drag force of flowing water of river on a spherical stone in the river depends only on density of the water, its flow speed and radius of the stone. Ratio of the drag forces on two spherical stones of radii 10 cm and 20 cm would be :-
(A) 1 : 2
(B) 2 : 1
(C) 1 : 4
(D) 4 : 1

5. Consider three physical quantities *x*, *y* and *z*. Operations *x + y* and *y-z* are valid with these physical quantities. Which of the following conclusions can you make?
(A) The operation *x ± z* is also valid.
(B) If dimension of any of the three is known, dimension of other two can be predicted.
(C) If dimension of product of any two of them is known, dimension of all of them can be predicted.
(D) If dimension of quotient of any two of them is known, dimension of all of them can be predicted.

6. Use dimensional analysis to see which of the following expressions is/are NOT allowed if p is a pressure, t is a time, m is a mass, r is a distance, v is a velocity and T is a temperature?

(A) $\log\left(\dfrac{pt}{mr}\right)$
(B) $\log\left(\dfrac{prt^2}{m}\right)$
(C) $\log\left(\dfrac{pr^2}{mt^2}\right)$
(D) $\log\left(\dfrac{pr}{mtT}\right)$

7. Suppose two students are trying to make a new measurement system so that they can use it like a code measurement system and others do not understand it. Insted of taking 1 kg, 1m and 1 sec. as basic unit they took unit of mass as α kg, the unit of length as β m and unit of time as γ second. They called power in new system as ACME then match the two columns.
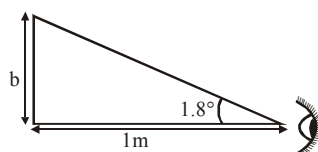
Column-I		Column-II	
(A)	1N in new system	(P)	$\alpha^{-1} \beta^{-2} \gamma^2$
(B)	1J in new system	(Q)	$\alpha^{-1} \beta^{-1} \gamma^2$
(C)	1 Pascal (SI unit of pressure) in new system	(R)	$\alpha^{-1} \beta \gamma^2$
(D)	α ACME in watt	(S)	$\alpha^2 \beta^2 \gamma^{-3}$

8. A normal human eye can see an object making an angle of 1.8° at the eye. What is the approximate height of object which can be seen by an eye placed at a distance of 1m from the eye.

9. Force F and density d are related as $F = \dfrac{\alpha}{\beta + \sqrt{d}}$ then find the dimensions of α and β.

10. Viscous force acting on a spherical ball is given by $F = 6\pi \eta rv$, where r is radius of the ball, v is the velocity of the ball & η is coefficient of viscosity. Dimension formula of η is given by $[\eta] = M^aL^{-b}T^{-c}$. Find the value of a + b + c.

N_Race # 04	ANSWER KEY

1. Ans. (C)	2. Ans. (A)	3. Ans. (B)	4. Ans. (C)
5. Ans. (A, B, C)	6. Ans. (A,C,D)	7. Ans. (A) Q; (B) P; (C) R; (D) S	
8. Ans. π cm	9. Ans. $M^{3/2}L^{-\frac{1}{2}}T^{-2}$, $M^{\frac{1}{2}}L^{-3/2}$		10. Ans. 3