Use following codes to answer Q1-Q5.

(1) Statement-1 is true, statement -2 is true ; statement -2 is a correct explanation for statement-1
(2) Statement-1 is true, statement -2 is true ; statement -2 is a Not correct explanation for statement-1
(3) Statement-1 is true, statement -2 is false.
(4) Statement-1 is false, statement -2 is true.

Q1. Suppose four distinct positive numbers a_1, a_2, a_3, a_4 are in GP. Let $b_1 = a_1,\ b_2 = b_1 + a_2$

$b_3 = b_2 + a_3$ *and* $b_4 = b_3 + a_4$

Statement -1 : The numbers b_1 , b_2 , b_3 *and* b_4 Are neither in AP nor in GP.
Statement -2 : The numbers b_1 , b_2 , b_3 *and* b_4 Are in HP.

Q2. Statement -1 : the curve $y = -\frac{x^2}{2} + x + 1$ is symmetric with respect to line x = 1 .
Because
Statement -2 : A parabola is symmetric about its axis.

Q3. Tangents are drawn from the point (17,7) to the circle $x^2 + y^2 = 169$
Statement -1 : the tangents are mutually perpendicular.
Because
Statement -2 : the locus of the points from which mutually perpendicular tangents can be drawn to the given circle is $x^2 + y^2 = 338$

Q4. Give in Δ ABC , $a: b: c = Cos\ A : Cos\ B: Cos\ C$.
Statement -1 : Δ ABC *is equilateral.*
Because
Statement -2 : $CosA = \frac{b^2+c^2-a^2}{2bc}$, $Cos\ B = \frac{a^2+c^2-b^2}{2ac}$

$Cos\ C = \frac{a^2+b^2-c^2}{2ab}$

Q5. Consider $L_1 = 2x + 3y + p - 3 = 0$ *and* $L_2 = 2x + 3y + p + 3 = 0$, where p is a real number and

$C:\ x^2 + y^2 + 6x - 10y + 30 = 0$

Statement -1 : if the line L_1 is a chord of the circle C then the line L_2 is not always a diameter of the circle C.

Statement -2 : if the line L_1 is a diameter of the circle C then the line L_2 is not a chord of the circle C.

Q6. The equation of the plane through the point $(1, -2, 3)$ and the line of intersection of the planes

$4x + y - 3z = 1$ *and* $x - 3y + z + 2 = 0$

(1) $14x - 3y + 7z + 1 = 0$
(2) $14x - 3y - 7z - 1 = 0$
(3) $14x - 3y - 7z + 1 = 0$
(4) $14x - 3y + 7z - 1 = 0$

Q7. The solution to the following differential equation is :

$x\,dy - ydx = \sqrt{x^2 + y^2}\,dx$

(1) $y + \sqrt{x^2 + y^2} = c$
(2) $y + \sqrt{x^2 + y^2} = cx^2$
(3) $y + \sqrt{x^2 + y^2} = x^2 + x$
(4) None of these.

Q8. For the following integral which is true :

$$\int_0^{\frac{\pi}{2}} \frac{dx}{\left(\left(\sqrt{\cos x}\right)+\left(\sqrt{\sin x}\right)\right)^4}$$

(1) The value of the integral is 2/3
(2) The value of the integral is 3
(3) The given integral is equivalent to $I = \int_0^{\infty} dt/\left(1+\left(\sqrt{t}\right)\right)^4$
(4) Cant integrate the given function .

Q9. The value of the following limit of a sum is

$$\lim_{n\to\infty}\left(\left(\frac{1}{n+1}\right)+\left(\frac{1}{n+2}\right)+\left(\frac{1}{n+3}\right)\ldots\ldots\frac{1}{6n}\right)$$

(1) $ln3$
(2) $ln6$
(3) $ln2$
(4) None of these

Q10. If a, b and c are the sides of a $\Delta\ ABC\ \ and\ 3a = b + c\ , then\ the\ value\ of\ Cot\frac{B}{2}\ .Cot\frac{C}{2}\ = ?$

(1) 4
(2) 2
(3) ½
(4) ¼

Q11. $Let\ a\ and\ b\ be\ real\ numbers\ such\ that\ a, b\ \geq 0\ and\ x\ be\ such\ that\ 0 < x < \frac{\pi}{2}\ .Then\ the\ Minimum\ valve\ of\ the\ expression\ \left(1+\frac{a}{\sin x}\right)\left(1+\frac{b}{\cos x}\right)\ is\ ?$

(1) $1+\sqrt{2ab}$
(2) $\sqrt{2ab}$
(3) $\left(1+\sqrt{2ab}\right)^2$
(4) $none\ of\ these$

Q12. Suppose $(x) = x^3 + ax^2 + bx + c$, where a ,b and c are chose respectively by throwing a die three times. Then the probability that $f(x)$ is an increasing function is ?

(1) 4/9
(2) 3/8
(3) 2/5
(4) 16/34

Q13. 20 persons are invited for a party. In how many different ways can they and the host be seated at circular table, if the two particular persons are to be seated on either side of the host?

(1) 20!
(2) 2. 18!
(3) 18!
(4) None of these

Q14. If $\sqrt{2}\sec\theta + \tan\theta = 1,$ then the general value of θ is :

(1) $n\pi + \frac{3\pi}{4}$
(2) $2n\pi + \frac{\pi}{4}$
(3) $2n\pi - \frac{\pi}{4}$
(4) $2n\pi \pm \frac{\pi}{4}$

Q15. $\tan[\ 2\ \tan^{-1}\left(\frac{1}{5}\right) - \frac{\pi}{4}]$ is equal to :

(1) $17/7$
(2) $-17/7$
(3) $7/17$
(4) $-7/17$

Q16. If the sum of the slopes of the lines given by $x^2 - 2cxy - 7y^2 = 0$ is four times their product , then c has the value :

(1) 1
(2) -1
(3) 2

(4). -2

Q17. The equation of the tangent to the circle $x^2 + y^2 + 4x - 4y + 4 = 0$ which makes equal intercepts on the positive co-ordinate axes is :

(1) $x + y = 2$
(2) $x + y = 2\sqrt{2}$
(3) $x + y = 4$
(4) $x + y = 8$

Q18. The parabola $y^2 = 8x \; and \; the \; circle \; x^2 + y^2 = 2$:

(1) Have only two common tangents which are mutually perpendicular.
(2) Have only two common tangents which are parallel to each other.
(3) Have infinitely many common tangents
(4) Does not have any common tangent

Q19. Tangent at a point of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is drawn cuts the co-ordinate axes at A and B . The minimum areas of the triangle OAB (O being the origin) :

(1) $ab \; sq \; units$
(2) $\frac{a^3+ab+b^3}{3} \; sq \; units$
(3) $(a^2 + b^2) sq \; units$
(4) $\frac{a^2+b^2}{4} \; sq \; units$

Q20. If $f(x + 2) + f(x) = f(x + 1)$, then :

(1) $f(x + 1) = f(x)$
(2) $f(x + 1) = 2f(x)$
(3) $f(x + 2) = 2f(x)$
(4) $f(x)$ is a periodic function

Q21. Let function $f: R \to R$ be defined by $f(x) = 2x + \sin x$ for $x \in R$, $then \; f \; is$:

(1) One –one and onto
(2) One-one but not onto
(3) Onto but not one-one
(4) Neither one –one nor onto

Q22. Which of the following statements is true ?

(1) Periodic functions are invertible functions
(2) Periodic functions may not be invertible functions
(3) Periodic functions attain local maximum or local minimum
(4) A continuous periodic function is bounded.

Q23. The value of

$\lim_{x \to \frac{\pi}{2}} \tan^{-1}\left(\frac{\sin(a \; tan^3 x + b \; tan^2 x + c \tan x)}{a \; tan^3 x + b \; tan^2 x + c \tan x}\right)$ is

(1) 0
(2) 1
(3) $\frac{\pi}{4}$
(4) $\frac{\pi}{2}$

Q24. Which of the following is not true ?

(1) A polynomial function is always continuous.
(2) A continuous function is always differentiable
(3) A differentiable function is always continuous.
(4) $e^x \; is \; continuous \; for \; all \; x$

Q25. The marks of some students were listed out of 75. The standard deviation of marks was found to be 9. Subsequently the marks were raised to a maximum of 100 and variance of new marks was calculated. The new variance is :

(1) 144
(2) 122
(3) 81
(4) None of these

Q26. A ball of mass 3 kg moving with velocity of 3 m/s collides with another ball of mass 1 kg moving with velocity u in the opposite direction . if the first

Ball comes to rest after the impact and e = 2/ 7 . then u is in m/s is :

(1) 13/3
(2) 17/3
(3) 19/3
(4) 23/3

Q27. If $|\vec{a}| = \left|\vec{b}\right| = 1\ and\ \left|\vec{a} + \vec{b}\right| = \sqrt{3}$, then the value of $\left(3\vec{a} - 4\vec{b}\right).\left(2\vec{a} + 5\vec{b}\right)\ is$:

(1) -21
(2) -21/2
(3) 21
(4) 21/2

Q28. The area bounded by the curve $y = f(x), x - axis\ \ and\ ordinates\ x = 1\ and\ x =\ b\ is\ (b - 1)\sin(3b + 4)\ , then\ f(x) is$:

(1) $3(x - 1)\cos(3x + 4) + \sin(3x + 4)$
(2) $(b - 1)\sin(3x + 4) + 3\cos(3x + 4)$
(3) $(b - 1)\cos(3x + 4) + 3\sin(3x + 4)$
(4) None of the above

Q29. The value of the indefinite integral is

$$\int \frac{dx}{x(x^7 + 1)}$$

(1) $\mathrm{Ln}\left(\frac{x^7}{x^7+1}\right) + c$
(2) $\frac{1}{7}\mathrm{Ln}\left(\frac{x^7}{x^7+1}\right) + c$
(3) $\ln\left(\frac{x^7+1}{x^7}\right) + c$
(4) $\frac{1}{7}\ln\left(\frac{x^7+1}{x^7}\right) + c$

Q30. Let function $f: R \to R$ be defined by $f(x) = \tan x\ - x$, then $f(x)$ is

(1) Increases
(2) Decreases
(3) Remains constant
(4) Becomes zero