MATHEMATICS - CLASS XII

SUGGESTIONS FOR COMPETENCY BASED QUESTIONS

TOPIC	QUESTION	REMARK
PROBABILITY	Q) Mini forgot to write down a very important phone number. All she remembers is that it started with 621 and that the next set of 4 digits involved are 3, 5 and 9 with one of these numbers appearing twice. She guesses a phone number and dials randomly. The odds in favour of dialling the correct telephone number, is	Problems involving odds in favour are not included in the syllabus
	Q) Assertion (A): For $P(E_1) = 4/10$, $P(E_2) = 4/10$, $P(E_3) = 2/10$,$P(E/E_1)=45/ 100$ $P(E/E_2)=60/100$, $P(E/E_3)= 35/100$, we have $P(E)=0.49$ (using total probability). Reason (R): $P(E) = P(E_1)P(E/E_1)+P(E_2)P(E/E_2)+P(E_3)P(E/E_3)$.	"using total probability" can be excluded
	Q) If both of them hit the Archery target, then find the probability that(a) exactly one of them earns 10 points.(b) both of them earn 10 points.	Sentence can be changed as - If both try to hit the target
Probability	Q)A, B and C are three students. Their probability of solving a problem are 30%,25% and 45% respectively. The problem of making error by these children are 1%, 1.2% and 2% respectively. Then total Probability of committing an error in solving the problem is	The word "total" can be excluded

		Qn. 3 in the answer key for mean it is given as P(X) it should be replaced as E(X) .
Relations and Functions	Q) Assertion (A) : Let R be the relation defined in the set A = {1, 2, 3, 4, 5, 6, 7} by R = {(a, b) : both and b are either odd or even}. R is equivalence relation. Reason (R) : Since R is reflexive, symmetric but R is not transitive.	In one set answers are provided along with the questions both a and b are either odd or even MCQ's are not competency based questions
Linear programming	Q)Assertion (A) : The constraints $-x_1 + x_2 \leq 1, -x_1 + 3x_2 \geq 9$ and x, y ≥ 0, defines an unbounded feasible region. Reason (R) : The maximum value of Z = 4x + 2y subject to the constraints, 2x + 3y ≤ 18, x + y ≥ 10 and x, y ≥ 0 is 5.	Assertion (A) : The constraints $-x + y \leq 1, -x + 3y \geq 9$ and x, y ≥ 0, defines an unbounded feasible region. Answer wrong Both Assertion and Reason are false . Question can be corrected as 1) $-x_1 + x_2 \geq 1$
Linear programming	Q no 5 case study	Answer for Sub question 1 is given in sub question 3. Also third question is very direct and simple .
Differential equations	Q) Polio drops are delivered to 50K children in a district. The rate at which polio drops are given is directly proportional to the number of children who have not been administered the drops…..(case based question) (i) (a) Find the solution of the differential equation $\frac{dy}{dx}$ = k(50 – y) (b) Find the value of C in the particular solution given that y (0) = 0 and k = 0.049 (ii) Find the solution that may be used to find the number of children who have been given the polio drops. Answer key case study question	Can be replaced as "Find the value of the constant in the general solution"

	(ii) $-\log \lvert 50 - y \rvert = kx + \log \frac{1}{50}$ $-kx = \log \lvert 50 - y \rvert + \log \frac{1}{50}$ $-kx = \log \frac{50-y}{50}$ $e^{-kx} = \frac{50-y}{y} = 1 - \frac{y}{50}$ $\frac{y}{50} = 1 - e^{-kx}$ $y = 50(1 - e^{-kx})$	$e^{-kx} = \frac{50-y}{50}$
Three Dimensional Geometry	Q) Assertion(A): Direction cosines of y- axis are 0,1,0. Reason(R): Any order triplet represents direction cosines of a line. Case based question:Fighter jets are flying in a formation for an aero show as shown in the figure. Taking their control tower as the reference point and reference point being origin, the coordinates of two fighters in flight path are A (10.5 km, 10 km, 1 km) andB (10 km, 10.5 km, 0.9 km).They are moving along the straight line joining A and B at that point as seen in the figure <u>Assertion -Reason based</u> 1. Assertion (A): If the points (3,2,2), (2,3,4) and (1, λ-2,6) and (3,1,5) are collinear, then λ=6 Reason (R): Three points A, B and C are collinear if direction ratios of AB and BC are proportional.	Ordered km can be removed First 3 points enough (3,1,5) can be removed.

Three Dimensional Geometry	Q)In the following questions consist of two statements – Assertion(A) and Reason(R). Answer these questions by selecting the appropriate option given below:	Can be corrected as "The following questions consists of two statements"
Application of Integration	Q)A thief was escaping after robbing a bank and follow the path which represent the ……(case based question)	Equation of parabola is not having vertex as the origin. Only parabolas in the standard form are given in the syllabus
Application of derivatives	Q)If a < 0, $f(x) = e^{ax} + e^{-ax}$, then which of the following is true for x ? x > 0 b) x < 0 c) x > 1 d) x < 1	Question is incomplete Should mention f(x) is a decreasing function
Application of derivatives **Application of derivates**	Q) Let a, b ϵ R be such that the function $f(x) = log$ [redacted] $+ bx^2 + ax, x \neq 0$ *has extreme* values at x = -1 and x = 2. Assertion(A): Function f has local maxima at x = -1 and at x = 2 Reason(R): $a = \frac{1}{2}, b = -\frac{1}{4}$ ASSERTION : I f x= 3 0, then the function y has a maxima at the critical point. REASON: x = c is a point of maxima if f'(c) 0 Answer: Assertion and Reasoning statements are false.	f(x)=log|x|+bx^2+ax Answer is given as option (a) , instead of (b) All the questions in this paper are having lengthy calculations Answer is not there in the option Answers not given separately. Given along with the questions

Application of derivatives	Q)Let Assertion(A): Function f is strictly increasing in $(-\infty,2]\cup[6,\infty)$ Reason(R): Function f is strictly decreasing in [2,6] Q)An orange grower finds that an orange tree produces , on average 400 oranges per year, if no more than 16 trees are planted in a unit area. For each additional tree planted per unit area, the grower finds that the yield decreases by 20 oranges per tree .	Answers not given separately. Given along with the questions Reason: It should be (2,6) An orange grower finds that an orange tree produces , an average of 400 oranges per year, if 16 trees are planted in a unit area.
Application of Derivatives	**MCQ** Q) If the perimeter and area of a circle are equal numerically then the diameter of the circle is (a) 2 units (b) π units (c) 4 units (d) 7 units **ASSERTION – REASON BASED QUESTIONS** Assertion (A) : If the length, breadth and height of a cuboid are 4,3 and 2cm respectively, then the length of each of the diagonal is $\sqrt{29}$ units. Reason (R) : Length of each of the diagonal is $\sqrt{l^2+b^2+h^2}$ units. Q)Assertion (A) : In a competition, a person to inflate a huge spherical balloon at the rate of 900 cubic cm of gas per second. The rate at which the	MCQ1, Assertion & Reasoning qn. 1&3 and case study question are all based on class 10 concepts. Answers not provided

	radius is increasing, when the radius is 15 cm is $1/\pi$ cm/sec. Reason (R) : Volume of a sphere is $1/3\ \pi r^3$. Q) Assertion (A) : The two concentric circles with radii a and b where a>b is given. The length of the chord of the larger circle which touches the smaller circle is $2\sqrt{a^2 - b^2}$. Reason (R) : Concentric circles have the same centre. **CASE STUDY QUESTIONS** 1. A Rectangle having perimeter 72 cm is revolved about one of its sides (length). a. Name the figure obtained after revolution. b. Find the area of the rectangle in terms of its length (length – x, breadth – y). c. Find the volume of the resultant figure (After revolution). d. Find the value of x for which the volume is maximum.	
MATRICES AND DETERMINANTS	Q) If A is a square matrix of order 2 such that A (adj A) = 10 I , then $\lvert adj\ A \rvert$ is equal to	10 **I** (**I** should be entered in bold otherwise children might read it as 101)

	(a) 1 (b) 10 (c) 100 (d) 10 *I* Case study question , option 4 ,answer key	Steps are wrong in the answer key , but answer is correct
Continuity and Differentiability	Q) Assertion(A): If $x = at^2$ and $y = 2at$, then $\frac{d^2y}{dx^2}\|_{t=2} = -\frac{1}{6a}$. Reason(R): $\frac{d^2y}{dx^2} = \left(\frac{dy}{dt}\right)^2 \times \left(\frac{dt}{dx}\right)^2$. Q) Assertion(A): The function f(x) = |sin x| is not differentiable at points $x = n\pi$. Reason(R): The left-hand derivative and right hand derivative of the function f(x) = |sin x| are not equal at points $x = n\pi$.	Here both assertion and reason are false and since such an option is not there, the assertion to be corrected as $\frac{d^2y}{dx^2}\|_{t=2} = -\frac{1}{16a}$ Answer is given as option d) but correct answer is a)
Continuity and Differentiability	**Assertion (A):** If $x = at^3$ and $y = 3at^2$ where 't' is the parameter and 'a' is a constant, then $\frac{d^2y}{dx^2} = \frac{-2}{3at^3}$. **Reason (R):** $\frac{d^2y}{dx^2} = \frac{d^2y}{dt^2} \div \frac{d^2x}{dt^2}$	Here both assertion and reason are false and since such an option is not there, the assertion to be corrected as $\frac{d^2y}{dx^2} = \frac{-2}{3at^4}$