Aptitude Test for Mathematical Science

No. __________________

For each question, choose one correct answer and write its symbol (A–E) in the box.

Q1 There are three integers A, B and C. The mean of all the integers is 66, and that of A and B is 70. What is the value of C?
(A) 58  (B) 61  (C) 62  (D) 65  (E) 66

Q2 What is the distance between a vertex and the center of gravity of an equilateral triangle whose sides are 4cm.
(A) $\frac{\sqrt{3}}{2}$ cm  (B) $\frac{\sqrt{2}}{2}$ cm  (C) $\frac{2\sqrt{3}}{3}$ cm  (D) $\frac{4\sqrt{3}}{3}$ cm  (E) 1 cm

Q3 Let $w = \frac{z - y}{x - y}$. How is $y$ represented in terms of $x$, $y$ and $w$?
(A) $\frac{z - w}{x - w}$  (B) $\frac{z + w}{x + w}$  (C) $\frac{wz - w}{xz + w}$  (D) $\frac{z - xw}{1 - w}$  (E) $\frac{z + xw}{w - 1}$

Q4 When $|x| = 3$, what is the set of all possible values of $y$ that satisfies $|x - y| = 6$?
(A) $\{-3\}$  (B) $\{9\}$  (C) $\{-3, 9\}$  (D) $\{3, -9\}$  (E) $\{-9, -3, 3, 9\}$

Q5 What is the value of $x$ that satisfies $4(2x - 1) = 6x + 2$?
(A) $-3$  (B) $1.5$  (C) $3$  (D) $5$  (E) $7$

Q6 Which of the following is the one that the fraction $\frac{450}{840}$ is reduced to?
(A) $\frac{4}{7}$  (B) $\frac{5}{8}$  (C) $\frac{1}{2}$  (D) $\frac{23}{42}$  (E) $\frac{15}{28}$

Q7 There are three brothers. The ratio of their ages is 5:3:2, and the sum of their ages is equal to $5/9$ the father’s age. When eight years have passed from now, the sum of three brothers’ ages will be equal to the father’s age. What is the father’s current age?
(A) $26$  (B) $28$  (C) $30$  (D) $36$  (E) $39$
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Q8 A boat on a river connects two cities. The water speed of the river is 3km/hour. When the boat goes upward, it takes two hours, and when it goes downward, it takes one hour and twelve minutes. How many kilometers are the two cities apart?
(A) 18km (B) 20km (C) 25km (D) 27km (E) 34km

Q9 There are three men, A, B, and C. If A and B together work on a job, it takes 15 days to finish the job. If B and C, and C and A do the same job together, 20 days and 12 days are needed, respectively. If all the three men engage the job, how many days are needed to finish the job?
(A) 7 days (B) 8 days (C) 9 days (D) 10 days (E) 11 days

Q10 The water from a tap fills up a tank in 20 minutes. When the tank’s drain is opened, the filled tank becomes empty in 25 minutes. Suppose now 1/5 of the tank is filled with water, and we open the tap and the drain at the same time. How many minutes does it take to fill up the tank with water?
(A) 60 min (B) 70 min (C) 80 min (D) 90 min (E) 100 min

Q11 Let \( T(0) = 0 \), and \( T(n) = 2T(n-1) + 1 \) for \( n \geq 1 \). Which of the following is correct?
(A) \( T(n) = n \) (B) \( T(n) = n^2 \) (C) \( T(n) = (n^2 + n)/2 \) (D) \( T(n) = 2^n - 1 \) (E) \( T(n) = 2^{n+1} - 2 \)

Q12 What is the length of the longest distance between two corners in a rectangular box with dimension 3 cm by 4 cm by 5 cm?
(A) \( 2\sqrt{5} \) cm (B) 7 cm (C) \( 5\sqrt{2} \) cm (D) \( 4\sqrt{5} \) cm (E) 9 cm

Q13 There is a circular railroad track for miniature train models. The space between the two rails is 3cm. How much longer is the outer rail than the inner rail?
(A) \( \pi \) cm (B) \( 2\pi \) cm (C) \( 4\pi \) cm (D) \( 6\pi \) cm (E) \( 8\pi \) cm

Q14 Consider the strings on \( \{a, b, c, d\} \). We are allowed to use the same letter repeatedly. Which of the following is the number of strings of length 3 containing an odd number of \( a \)'s on \( \{a, b, c, d\} \)? For example, \( aaa, bab, \) and \( bca \) are such strings.
(A) 26 (B) 28 (C) 30 (D) 32 (E) 36
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Q15  Let \( S = \{a, b, c, d, e\} \). What is the number of subsets with two elements of set \( S \)?
(A) 4  (B) 8  (C) 10  (D) 16  (E) 20

Q16  There are seven points on a plane, where any three are not on the same line. If we connect all the points with lines, how many lines are drawn?
(A) 7  (B) 14  (C) 21  (D) 28  (E) 35

Q17  Betty is throwing two fair dice. The score of each throw is the sum of the outcomes of the two dice. Which of the following scores of one throw of the two dice has the highest probability?
(A) 5  (B) 6  (C) 7  (D) 8  (E) 12

Q18  We repeat tossing up a coin until we get a heads. What is the probability that we toss up five times, assuming the probabilities for heads and tails are even?
(A) \(1/2\)  (B) \(1/2^2\)  (C) \(1/2^3\)  (D) \(1/2^4\)  (E) \(1/2^5\)

Q19  Consider functions \( f \) and \( g \), such that \((f \circ g)(x) = \sqrt{x^2+2} + x^2 + 1\) and \(g(x) = x^2 + 1\). What is the value of \( f(3) \)?
(A) 5  (B) 9  (C) \(\sqrt{11}\)  (D) \(5 + \sqrt{11}\)  (E) \(10 + \sqrt{11}\)

Q20  The long and short hands of a clock overlap now. When will the two hands overlap again? Answer the elapsed minutes from now.
(A) 60min  (B) 65min  (C) \(65 \frac{4}{10}\)min  (D) \(65 \frac{4}{11}\)min  (E) \(65 \frac{5}{11}\)min
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(Use the space below for your calculations)