SCIR NET General Aptitude Physical Science PYP Held on July 2024 Shift-1

Q1. Suppose that the increase in a population can be modelled as

$$\left(\frac{dN}{dt}\right) = rN\frac{K-N}{K}$$

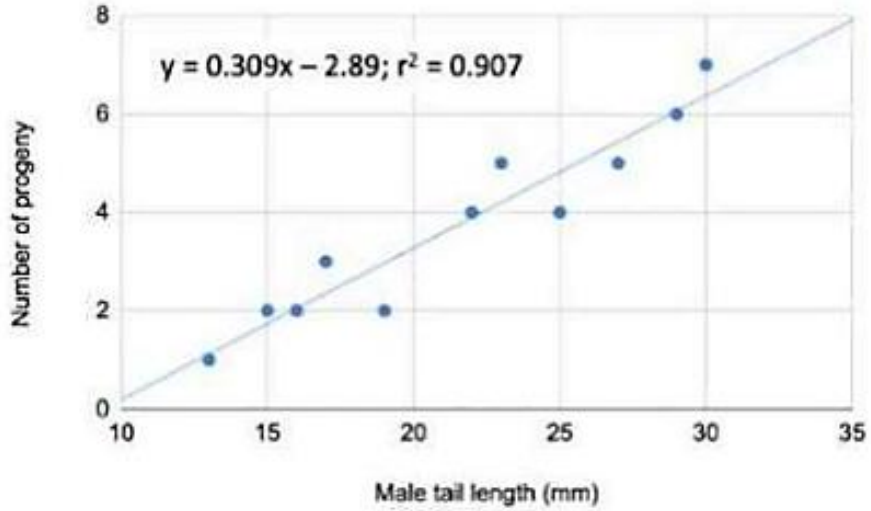
where N is the size of the population, K is the carrying capacity, r is the per capita growth rate and t is time. Which of the following statements is correct?

(a) When $N \approx 0$, the change in population N is nearly exponential.
(b) When $N = K$, the population goes extinct as dN/dt goes to zero.
(c) When $N \approx 0$, the population growth dN/dt is maximum.
(d) When $N \approx K/4$, the population growth dN/dt is maximum.

Q2. In a class of 70 students, 20% of girls have spectacles and 40% of boys have spectacles. If the total number of students having spectacle is 23, the number of boys in the class is

(a) 45
(b) 14
(c) 18
(d) 25

Q3. The graph shows observations and a regression line of the number of progeny on the tail length of male birds.



Which of the following can be inferred from the graph?

(a) Producing less progeny decreases the tail length of the males.
(b) Males cannot have a tail length lesser than 10 mm.
(c) Males with longer tails tend to father more progeny.
(d) For a male with a 25 mm tail, the expected number of progeny is 4.

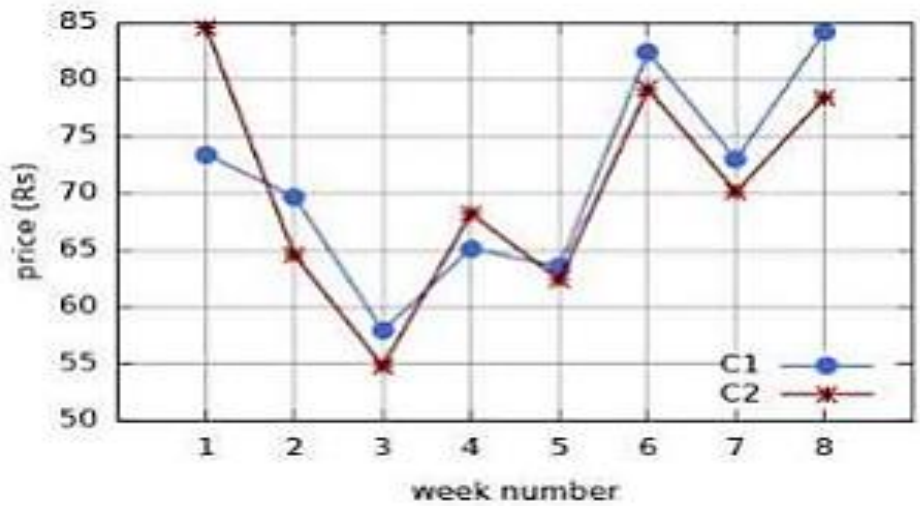
Q4. The population of a town is increasing at a uniform rate. If its population was 90,000 and 96,000 in 2022 and 2023 respectively, what would be its population in 2024?

(a) 102, 000
(b) 102, 400
(c) 102, 720
(d) 102, 960

Q5. In how many distinct ways can 128 identical marbles be arranged in a complete rectangular grid (disregarding the orientation of the grid)?
(a) 7
(b) 6
(c) 5
(d) 4

Q6. How many three-digit numbers exist whose first and last digits add up to 9?
(a) 90
(b) 81
(c) 80
(d) 72

Q7. The two graphs show the change in price of two commodities C1 and C2 over 8 weeks.



Which of the statements is correct?
(a) C1 has higher fluctuation than C2
(b) Average price of C1 is lower than that of C2
(c) The largest change in a week is shown by C2
(d) C1 shows a tendency of reduction

Q8. If 32XY6 is divisible by 9, X and Y being even decimal digits, then X =
(a) 2
(b) 4
(c) 6
(d) 8

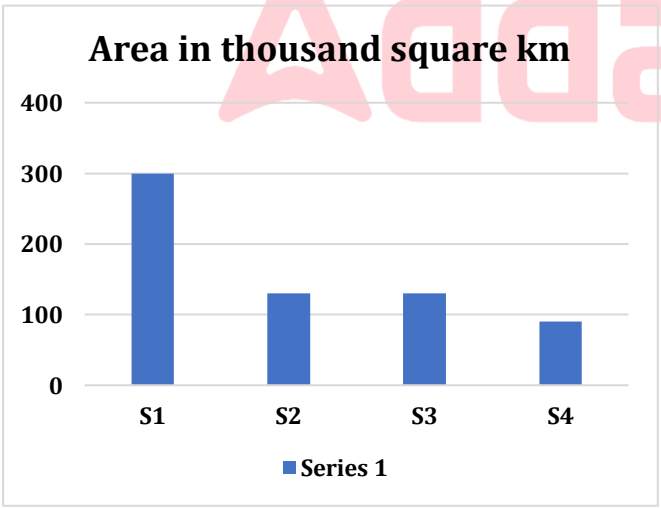
Q9. A record player stylus moves along a spiral groove cut on an annular portion of a disc with inner radius 4 cm and outer radius 10 cm. If the record turns 100 times when playing, the stylus travels approximately
(a) 2.2 m
(b) 4.4 m
(c) 22 m
(d) 44 m

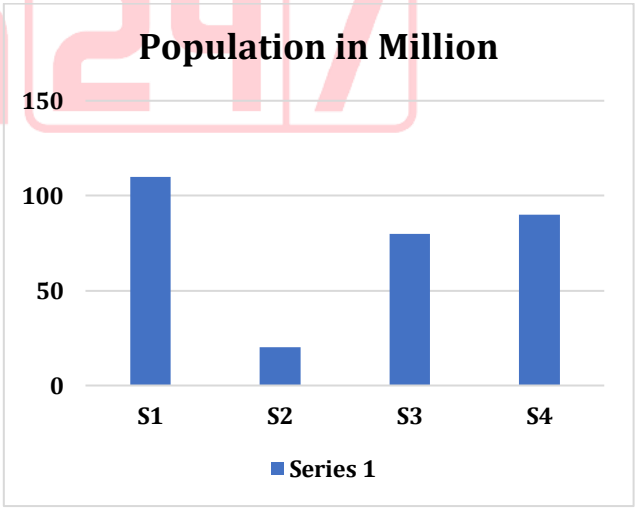
Q10. An egg tray has 30 cavities to hold eggs in 5 rows and 6 columns. Each cavity is surrounded by 4 raised corners shared by adjacent cavities. How many raised corners does the egg tray have?
(a) 30
(b) 35
(c) 36
(d) 42

Q11. A patient requires administration of 500 ml of an intravenous fluid in 1 hour. What is the approximate drip rate (number of drops per minute) at which the fluid should be administered, if the volume of a drop is 0.05 ml?
(a) 76
(b) 152
(c) 167
(d) 332

Q12. A rectangular tray of 30 cm × 60 cm size is used for baking circular biscuits. The diameter of each biscuit is 3 cm before baking, which increases by 10% on baking. What is the maximum number of biscuits that can be baked in the tray such that the base of each biscuit is in contact with the tray?
(a) 171
(b) 162
(c) 180
(d) 200

Q13. Areas and populations of four states S1, S2, S3 and S4 are shown.





Their arrangement in decreasing order of population density would be
(a) S4, S3, S1, S2
(b) S1, S2, S3, S4
(c) S4, S1, S3, S2
(d) S2, S1, S3, S4

Q14. A referendum on a proposal involved 7000 participants. Among the participants 3600 were women and the rest were men. 2900 participants, of whom 1300 were women, voted against while 3000 participants voted in favour. 400 women abstained. The ratio of the number of men that did not vote to the total number of participants is
(a) 11:70
(b) 17:35
(c) 1:10
(d) 8:70

Q15. Among A, B, C, D, E and F, D is taller than B but shorter than F. E is taller than B, but shorter than C. B is not the shortest of all. Then A is
(a) the shortest of all.
(b) the tallest of all.
(c) taller than E, but shorter than C.
(d) taller than C, but shorter than F.

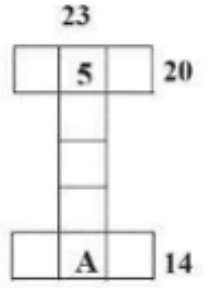
Q16. Canals A and B join to form canal C, all having semi-circular cross-sections of radii which are in the ratio 3:4:5, respectively. Assume smooth merger of A and B, and ignore the possibility of flooding. If the speed s of water is the same and uniform in both A and B then the speed of water flowing in C is
(a) s
(b) $7s/5$
(c) $2s$
(d) $5s/7$

Q17. On a one-way road, broken lines consisting of 2.5 m length segments separated by 2.5 m gaps are painted along the length of the road to demarcate 3 lanes, and continuous lines are painted along both the borders. What is the total length of the painted lines (in m) over a 250 m stretch of the road?
(a) 500
(b) 625
(c) 750
(d) 1000

Q18. Among 1000 squirrel babies, 200 have three stripes on their back, 500 have two stripes on their back and the rest have four stripes on their back. While 90% of the three-striped babies survive to adulthood, only 80% of the two-striped and 70% of the four-striped babies survive to adulthood. The fraction of four-striped squirrels among the adults is nearest to
(a) 0.21
(b) 0.3
(c) 0.266
(d) 0.228

Q19. A large number of birds, half of which belong to specie A and the other half to specie B, rest on a tree where they are distributed randomly across the branches. In a random sample of 5 birds from the tree, what is the probability that at least one is from specie A?
(a) 0.03125
(b) 0.15625
(c) 0.84375
(d) 0.96875

Q20. The squares in the following grid are filled with numbers 1 to 9, without repetition, such that the numbers in the squares forming the top and bottom rows add to 20 and 14 respectively and those forming the column to 23. What is the value of A?



(a) 4
(b) 6
(c) 7
(d) 8