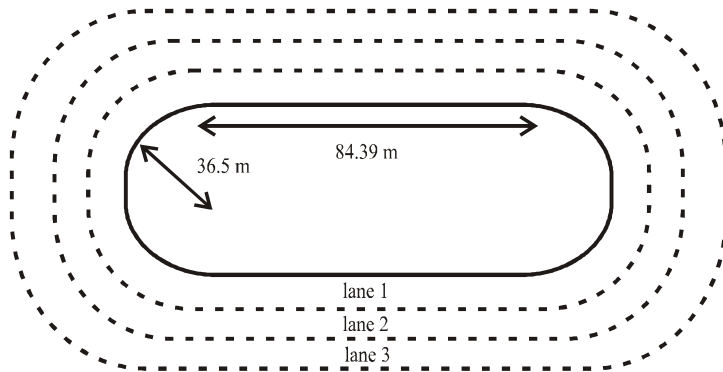


SAMPLE QUESTIONS

Activity-1 Track Layout

The sketch opposite shows the two main dimensions of a standard 400 metres running track.

- Find the inside perimeter of this shape.
Why do you think that it is not equal to 400 metres?



The inside runner cannot run at the every edge of his lane (there is normally an inside curve) but let us assume that the athlete runs at a constant distance of, say x cm from the inside edge.

- What is the radius of the two circular parts run by the athlete in the inside lane?
 - Show that the total distance travelled, in centimetres, is $2\pi(3650 + x) + 16878$ and equate this to 40000 cm to find a value for x . Is it realistic?
- For 200 m and 400 m races, the runners run in specified lanes. Clearly, the further out you are the further you have to run, unless the starting positions are staggered.
- The width of each lane is 1.22 m, and it is assumed that all runners (except the inside one) run about 20 cm from the inside of their lanes.
- With these assumptions, what distance does the athlete in Lane 2 cover when running one complete lap? Hence deduce the required stagger for a 400 m race.
 - What should the stagger be for someone running in Lane 3 ?
 - If there are 8 runners in the 400 m, what is the stagger of the athlete in Lane 8 compared with that in Lane 1 ? Is there any advantage in being in Lane 1 ?

Extensions

- The area available for a school running track is $90 \text{ m} \times 173 \text{ m}$. How many lanes could it be?
- Design a smaller running track, with lanes, to fit an area $40 \text{ m} \times 90 \text{ m}$.

Section-A

After the introduction of colour printing presses there was much interest in minimising the number of colours used to distinguish different countries, in order to reduce, costs.

The printers had to be careful that no two countries with shared borders were coloured the same!

Map A below would not have been allowed.

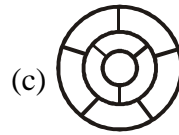
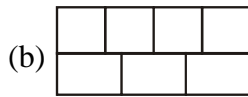
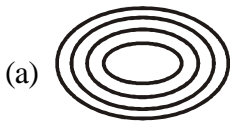
Two adjacent countries have the same colour.

Map B is allowed. Countries with the same colour can meet at a point.

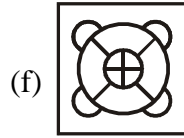
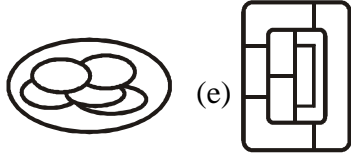


- How many colours would be needed for map A?

2. Colour the following maps, using a minimum number of colours.



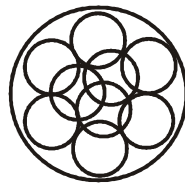
(d)



3. Draw some maps to your own design, making them as complicated as you like. Give them to a friend to find out the minimum numbers of colours needed.

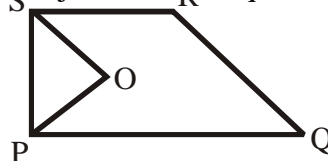
Extensions

- Find a Map of Europe which includes the new states which used to make up the USSR. What is the least number of colours needed :
 - If you do not colour the sea.
 - If one colour is used for the sea?
- Map colouring on a sphere is more complicated. Draw patterns on a plain ball and investigate the minimum number of colours needed to colour any map.

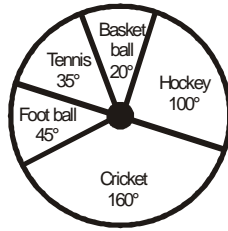


Section-B- [Mathematics]

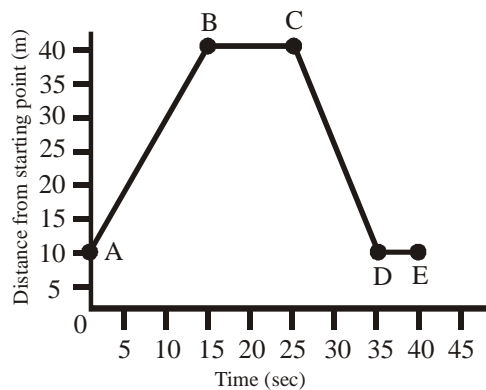
- The value of $\frac{x^{a+b} \cdot x^{b+c} \cdot x^{c+a}}{(x^a \cdot x^b \cdot x^c)^2}$ is
 - x^2
 - x^{a+b+c}
 - x^{abc}
 - x^0
- The value of $(999)^2$ is
 - 998001
 - 898001
 - 798001
 - 989001
- The difference between the simple and compound interest on a certain sum for 3 years at 10% p.a. is Rs.63.86. Then the sum is
 - Rs. 2,600
 - Rs.2,006
 - Rs. 2,060
 - Rs. 2,080
- In figure, SO and PO are bisectors of two adjacent sides of quadrilateral, $\angle Q + \angle R$ is
 - $2 \angle SOP$
 - $\angle OSP + \angle OPS$
 - $\angle SOP$
 - $2(\angle OSP + \angle OPS)$
- The pie-chart represents the amount spent on different sports by a school administration in a calendar year. If the money spent on football is Rs. 9000, what is the total amount spent on sports ?



- (a) 11,000
- (b) 72,000
- (c) 32,000
- (d) 75,000



6. An orderly distribution of the raw data into certain specified categories is known as:
- (a) Frequency distribution
 - (b) Frequency
 - (c) Cummulative frequency
 - (d) Primary data
7. What will be the value of $[(-3)^{(-2)}]^{(-3)}$
- (a) 729
 - (b) 927
 - (c) 18
 - (d) 169
8. What is the least number of which 8640 is divided, the quotient as a complete cube number?
- (a) 6
 - (b) 7
 - (c) 5
 - (d) 8
9. If V is the volume of cuboid of a dimension a, b, c, and S is the surface area then $\frac{1}{V}$ is equal to
- (a) $\frac{2}{S} \left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c} \right)$
 - (b) $\frac{2}{a} \left(\frac{1}{S} + \frac{1}{b} + \frac{1}{c} \right)$
 - (c) $\frac{2}{S} \left(\frac{1}{a} - \frac{1}{b} - \frac{1}{c} \right)$
 - (d) None of these
10. If $x^2 = \frac{1}{x^2} + 1$, then $x^2 + \frac{1}{x^2}$ is equal to
- (a) 5
 - (b) $\pm\sqrt{5}$
 - (c) $\sqrt{5}$
 - (d) 0
11. Find the quadrant on which (7, -5) points lie.
- (a) 1st quadrant
 - (b) 2nd quadrant
 - (c) 3rd quadrant
 - (d) 4th quadrant
12. For what possible value of b, the numbers are 7b23 are divisible by 3?
- (a) 0, 2, 1, 5
 - (b) 2, 5, 8
 - (c) 0, 3, 6, 9
 - (d) 1, 2, 3, 4
13. If the parallel sides of a trapezium are 12cm and 8cm and the distance between them is 10cm, then its area is
- (a) 100cm²
 - (b) 120cm²
 - (c) 125cm²
 - (d) None of these
14. Observe the graph calculate the speed of the object during 0 – 10 sec.



- (a) 3 m / sec
- (b) 2 m / sec
- (c) 4 m / sec
- (d) 5 m / sec

15. If $5^{3x} \cdot 5^7 = 125^{2x}$ what is value of x ?
- (a) $\frac{6}{7}$ (b) $\frac{5}{7}$ (c) $\frac{3}{7}$ (d) $\frac{7}{3}$

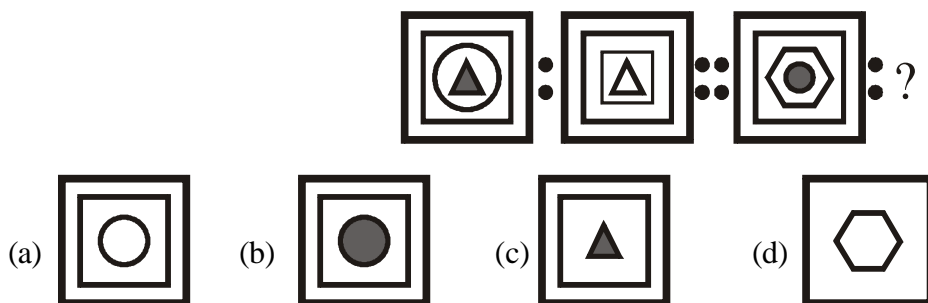
Section C - [Mental Ability]

16. Which one is like French, Canadian and American?
- (a) Hindi (b) Russian (c) Yemen (d) Korea
17. Four young men Raj, Prem, Ved and Ashok are friendly with four girls Sushma, Kusum, Vimla and Poonam, Sushma and Vimla are friends. Ved's girl friend does not like Sushma and Vimla. Kusum does not care for Ved. Prem's friend friendly with Sushma. Sushma does not like Raj. Who is Raj's girl friend?
- (a) Poonam (b) Vimla (c) Sushma (d) Kusum

18. The numbers in each row or coloumn of the square are written according to the same rule. Find the missing number.
- (a) 25
(b) 7
(c) 5
(d) 2
- | | | |
|----|----|-----|
| 13 | 4 | 165 |
| 3 | 2 | 7 |
| ? | 11 | 14 |

19. Locate the figure which would fit the question mark from Answer figure.

Problem



20. Ashok started walking towards North, After walking 30m he turned left and walked 40m. He then turned left and walked 30m. He again turned left and walked 50m. How far was he from his original position?
- (a) 50m (b) 40m (c) 30m (d) None of these