Date: 21/11/2026

Aakash
Medical | IIT-JEE | Foundations

*Corporate Office :* AESL, 3rd Floor, Incuspaze Campus-2, Plot-13, Sector-18,
Udyog Vihar, Gurugram, Haryana-122018

# Answers & Solutions
# for
# Mukhyamantri Vigyan Pratibha Pariksha (MVPP)-2026

**Time : 200 Min.** **M.M. : 200**

**IMPORTANT INSTRUCTIONS:**

- This test consists of 200 questions, all are compulsory.
- The question paper is divided into two parts:
  Part-I: Mental Ability Test (MAT)
  Part-II: Scholastic Aptitude Test (SAT)
- Each part contains 100 questions:
  Part-I comprises questions based on Mental Ability.
  Part-II includes questions from Science (Physics, Chemistry & Biology), Mathematics, and Social Science.
- Since the time allotted for this question paper is very limited you should make the best use of it by not spending too much time on any one question.
- Use only Blue/Black ball point pen to darken the appropriate circle.
- The mark should be dark and should completely fill the circle.
- Darken only one circle for each question.
- Each question carries 1 mark. There is no negative marking.

# PART-I: MENTAL ABILITY (MAT)

1. If $\frac{4}{5}$th of a cistern is filled in 1 minute, how much more time will be required to fill the rest of it?

(1) 10 sec. (2) 15 sec.
(3) 20 sec. (4) 25 sec.

**Answer (2)**

**Sol.** Part filled in 60 s = 4/5, so the remaining part = 1 − 4/5 = 1/5.

Time for 4/5 = 60 s ⇒ time for 1/5 = 60 ÷ 4 = 15 s.

2. Two numbers are in the ratio 5:5, If 5 is subtracted from each of the numbers, the new ratio becomes 1:2. With is the original large number?

(1) 10 (2) 15
(3) 20 (4) 25

**Answer (3)**

**Sol.** Let the numbers be 5x and 8x. Then (5x − 5)/(8x − 5) = 1/2

10x − 10 = 8x − 5 ⇒ 2x = 5 ⇒ x = 5/2

Larger number = 8x = 8 × 5/2 = 20.

Check: numbers 12.5 and 20; after subtracting 5 → 7.5 and 15, ratio 1:2 ✓.

3. The Value of $\sqrt{176+\sqrt{2401}}$ is

(1) 10 (2) 15
(3) 20 (4) 25

**Answer (2)**

**Sol.** √2401 = 49 (since $49^2 = 2401$)

√(176 + 49) = √225 = 15.

4. The cells of a bacteria double in every 30 minutes. A scientist begins with a single cell. How many cells will be there after 12 hours?

(1) $2^{12}$ (2) $2^{24}$
(3) $3^{12}$ (4) $4^{26}$

**Answer (2)**

**Sol.** 12 hours = 12 × 60 = 720 minutes = 720 ÷ 30 = 24 intervals of 30 minutes.

Cells double 24 times: $1 \times 2^{24} = 2^{24}$.

5. 100 persons had food provision for 24 days. If 20 persons left the place, the provision will last for

(1) 30 days (2) $\frac{96}{5}$ days
(3) 120 days (4) 40 days

**Answer (1)**

**Sol.** Total food = 100 × 24 = 2400 person-days.

Persons left = 100 − 20 = 80. Days = 2400 ÷ 80 = 30 days.

(Persons and days are in inverse proportion: 100 × 24 = 80 × d)

6. What price should a shopkeeper mark on an article that costs him ₹600 to gain 20%, after allowing a discount of 10%.

(1) ₹600 (2) ₹700

(3) ₹800 (4) ₹900

**Answer (3)**

**Sol.** Required selling price (20% gain) = 600 × 120/100 = ₹720.

Let marked price = M. After 10% discount: 0.9 × M = 720

M = 720 ÷ 0.9 = ₹800.

7. The areas of two circles are in the ratio 49:64. Find the ratio of their circumferences

(1) 7:8 (2) 8:7

(3) 7π:8 (4) 8π:7

**Answer (1)**

**Sol.** $\pi r_1^2/\pi r_2^2 = 49/64 \Rightarrow (r_1/r_2)^2 = 49/64 \Rightarrow r_1/r_2 = 7/8$

Circumference = 2πr, so $C_1/C_2 = r_1/r_2 = 7:8$.

8. If $x + \frac{1}{x} = 5$, Evaluate $x^2 + \frac{1}{x^2} = 5$,

(1) 25 (2) 23

(3) 21 (4) 19

**Answer (2)**

**Sol.** $(x + 1/x)^2 = x^2 + 1/x^2 + 2$

$25 = x^2 + 1/x^2 + 2 \Rightarrow x^2 + 1/x^2 = 23$.

9. A swimming pool can be filled in 4 hours by 8 pumps of the same type. How many such pumps are required if the pool is to be filled in $2\frac{2}{3}$ hours.

(1) 10 (2) 12

(3) 14 (4) 16

**Answer (2)**

**Sol.** Pumps and time are inversely proportional.

8 × 4 = n × 8/3 (since 2⅔ = 8/3 h) ⇒ n = 32 × 3/8 = 12 pumps.

10. Which of the following numbers is divisible by 99

(1) 913462 (2) 114345

(3) 135792 (4) 3572406

**Answer (2)**

**Sol.** A number is divisible by 99 if it is divisible by both 9 and 11.

114345: digit sum = 1+1+4+3+4+5 = 18 (divisible by 9). (Sum of digits at odd places) − (sum at even places) = (1+4+4) − (1+3+5) = 9 − 9 = 0 (divisible by 11) ✓.

Others fail: 913462 (digit sum 25), 135792 (difference 15 − 12 = 3), 3572406 (difference 20 − 7 = 13).

11. Evaluate : -

$$\sqrt{56+\sqrt{56+\sqrt{56+\sqrt{56+\cdots\infty}}}}$$

(1) 7 (2) 8

(3) 9 (4) $(56)^2$

**Answer (2)**

**Sol.** Let $x = \sqrt{(56 + \sqrt{(56 + \ldots)})}$. Then $x = \sqrt{(56 + x)} \Rightarrow x^2 = 56 + x$

$x^2 - x - 56 = 0 \Rightarrow (x - 8)(x + 7) = 0 \Rightarrow x = 8$ (x cannot be negative).

12. If $2^{1998} - 2^{1997} - 2^{1996} - 2^{1995} = K.21995$

(1) 1 (2) 2

(3) 3 (4) 4

**Answer (3)**

**Sol.** Take $2^{1995}$ common: $2^{1995}(2^3 - 2^2 - 2 + 1) = 2^{1995}(8 - 4 - 2 + 1) = 3 \times 2^{1995}$

Hence K = 3.

13. Two trains of lengths 120 metres and 130 metres are moving in opposite directions at speed of 50kmph and 40kmph respectively. How much time will they take to cross each other?

(1) 5 seconds (2) 10 seconds

(3) 15 seconds (4) 20 seconds

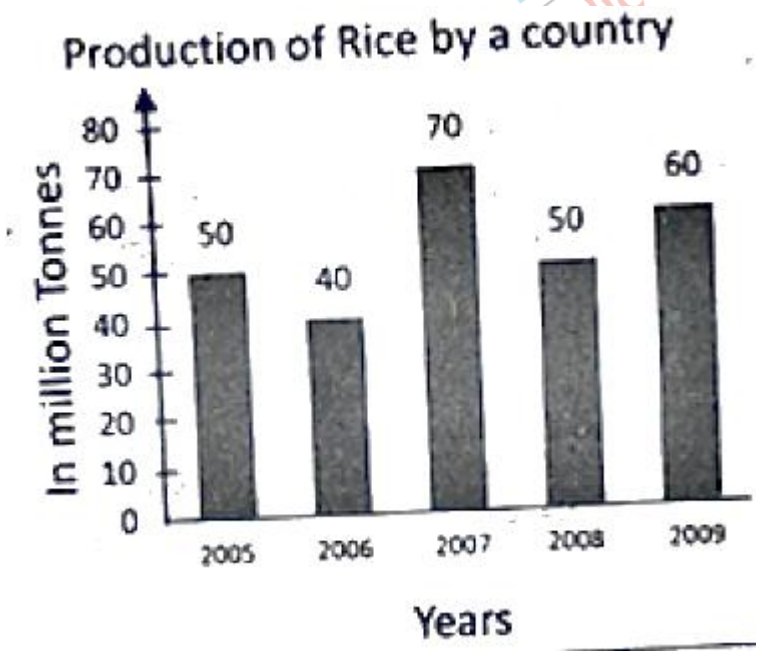
**Answer (2)**

**Sol.** Relative speed (opposite directions) = 50 + 40 = 90 km/h = 90 × 5/18 = 25 m/s.

Total distance = 120 + 130 = 250 m.

Time = 250 ÷ 25 = 10 s.

Direction (Q. 14-18) : - Study the bar graph given below and answer the question that below



14. What is the ratio of the rice production in the year 2005 and 2007?

(1) 1: 2 (2) 5 : 7

(3) 3 : 2 (4) 2 : 3

**Answer (2)**

**Sol.** From the graph: production in 2005 = 50 and in 2007 = 70.

Ratio = 50 : 70 = 5 : 7.

15. Just after which year was the maximum rice produced?

(1) 2009 (2) 2008

(3) 2007 (4) 2006

**Answer (4)**

**Sol.** Maximum production = 70 million tonnes, which is in 2007.

The year just before 2007 is 2006, i.e., the maximum production came just after 2006.

16. Find the average production of rice during the five years

(1) 72 million Tonnes (2) 60 million Tonnes

(3) 80 million Tonnes (4) 54 million Tonnes

**Answer (4)**

**Sol.** Average = (50 + 40 + 70 + 50 + 60) ÷ 5 = 270 ÷ 5 = 54 million tonnes.

17. Find the difference of rice production between years 2006 and 2008?

(1) 40 million Tonnes (2) 20 million Tonnes

(3) 10 million Tonnes (4) 5 million Tonnes

**Answer (3)**

**Sol.** Production in 2006 = 40, in 2008 = 50.

Difference = 50 − 40 = 10 million tonnes.

18. Find the percentage increase in the production of rice between year 2005 and 2009 :

(1) 40% (2) 30%

(3) 25% (4) 20%

**Answer (4)**

**Sol.** Production in 2005 = 50, in 2009 = 60. Increase = 10.

% increase = (10/50) × 100 = 20%.

**Direction (Q.No. 19-23) :- Monthly family budget of ₹40,000 allocation such that**

**Rent :- 25%**

**Food :- 30%**

**Education :- 20%**

**Savings :- 15%**

**Miscellaneous : 10%**

19. How much amount is spent on food each month?

(1) ₹10,000 (2) ₹12,000

(3) ₹8,000 (4) ₹14,000

**Answer (2)**

**Sol.** Food = 30% of ₹40,000 = 30/100 × 40,000 = ₹12,000.

20. What is the total combined expenditure on Rent and Eduction

(1) ₹16,000 (2) ₹18,000

(3) ₹20,000 (4) ₹22,000

**Answer (2)**

**Sol.** Rent + Education = 25% + 20% = 45%.

45% of ₹40,000 = ₹18,000.

21. What is the central angle corresponding to the saving sector in a pie chart

(1) 36° (2) 72°

(3) 108° (4) 54°

**Answer (4)**

**Sol.** Savings = 15% of the budget.

Central angle = 15/100 × 360° = 54°.

22. What is the ratio of expenditure on education and saving?

(1) 4 : 3 (2) 3 : 2

(3) 5 : 3 (4) 2 : 1

**Answer (1)**

**Sol.** Education : Savings = 20% : 15% = 20 : 15 = 4 : 3.

23. If total income increases by 10% next month and percentage allocation stays unchanged. What is the new saving amount?

(1) ₹6,000 (2) ₹7,000

(3) ₹6,600 (4) ₹7,200

**Answer (3)**

**Sol.** New income = 40,000 × 110/100 = ₹44,000.

Savings = 15% of 44,000 = ₹6,600.

24. Which of the following is an irrational number?

(1) $\sqrt{16}$ (2) 16

(3) 25 (4) 256.25

**Answer (3)**

**Sol.** √16 = 4 (rational); 0.333… = 1/3 (rational, recurring decimal); 22/7 is a fraction (rational).

√7 is non-terminating and non-recurring, so it is irrational.

25. The value of $(256)^{0.10} \times (256)^{0.09}$ is

(1) 4 (2) 16

(3) 64 (4) 256.25

**Answer (1)**

**Sol.** Same base: add the powers: 256^(0.16 + 0.09) = 256^0.25 = 256^(1/4)

256 = $4^4$ ⇒ 256^(1/4) = 4.

26. Find the remainder when $x^3 - 3x^2 + 4x + 2$

(1) 2 (2) 4

(3) 0 (4) 6

**Answer (2)**

**Sol.** By the Remainder Theorem, remainder = p(1) = 1 − 3 + 4 + 2 = 4.

27. Any point on the line $y = x$ is of the form

(1) $(a, 0)$ (2) (0, a)

(3) $(a, a)$ (4) (a, — $a$)

**Answer (3)**

**Sol.** On the line y = x, the y-coordinate equals the x-coordinate, so every point is (a, a).

28. The graph of x = —3 is a line parallel to

(1) x - axis (2) y - axis

(3) Both axis (4) Origin

**Answer (2)**

**Sol.** x = −3 is a vertical line passing through (−3, 0), so it is parallel to the y-axis.

29. The average of five consecutive number is 20. What is largest of these numbers?

(1) 20 (2) 21

(3) 22 (4) 23

**Answer (3)**

**Sol.** For consecutive numbers the average is the middle number: numbers are 18, 19, 20, 21, 22.

Largest = 22.

30. A can complete a work in 10 days and B in 15 days, working together, they can finish it in

(1) 5 days (2) 6 days

(3) 8 days (4) 12.5 days

**Answer (2)**

**Sol.** A's 1-day work = 1/10, B's 1-day work = 1/15.

Together = 1/10 + 1/15 = 3/30 + 2/30 = 5/30 = 1/6

Time = 6 days.

31. The distance of point (3,4) from the origin is

(1) 3 (2) 4

(3) 5 (4) 7

**Answer (3)**

**Sol.** Distance = $\sqrt{(3^2 + 4^2)} = \sqrt{(9 + 16)} = \sqrt{25} = 5$.

32. The radius of a sphere is 7 cm, Its surface area is (Take $\pi = 22/7$)

(1) 154 $cm^2$ (2) 308 $cm^2$

(3) 1232 $cm^2$ (4) 616 $cm^2$

**Answer (3)**

**Sol.** Surface area of sphere = $4\pi r^2 = 4 \times 22/7 \times 7 \times 7 = 4 \times 22 \times 7 = 616\ cm^2$.

33. The side of an equilateral triangle is 6cm. Its area is

(1) $9\sqrt{3}\ cm^2$ (2) $18\sqrt{3}\ cm^2$

(3) $12\sqrt{3}\ cm^2$ (4) $36\sqrt{3}\ cm^2$

**Answer (1)**

**Sol.** Area = $(\sqrt{3}/4)\ a^2 = (\sqrt{3}/4) \times 36 = 9\sqrt{3}\ cm^2$.

34. A standard die is thrown. The probability of getting a prime number is

(1) $\frac{1}{6}$ (2) $\frac{1}{3}$

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

**Answer (3)**

**Sol.** Sample space = {1, 2, 3, 4, 5, 6}: 6 outcomes. Prime numbers = 2, 3, 5 (3 outcomes).

P = 3/6 = 1/2.

35. A card is drawn from a well shuffled deck of 52 playing cards. The probability of getting a red queen is

(1) $\frac{1}{52}$ (2) $\frac{1}{25}$

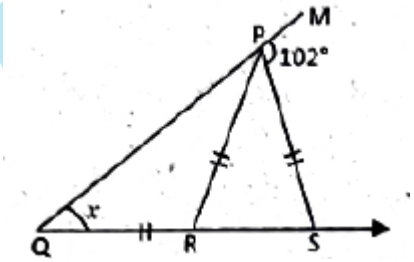
(3) $\frac{2}{13}$ (4) $\frac{1}{13}$

**Answer (2)**

**Sol.** A deck has 2 red queens (hearts and diamonds).

P = 2/52 = 1/26.

36. In the given figure PR = PS = QR and ∠SPM is 102° then find the value of x.




(1) 32 (2) 33

(3) 34 (4) 35

**Answer (3)**

**Sol.** QR = PR ⇒ ∠QPR = ∠PQR = x. Exterior angle ∠PRS of ΔPQR = x + x = 2x.

PR = PS ⇒ ∠PSR = ∠PRS = 2x.

∠SPM is the exterior angle of ΔPQS at P: ∠SPM = ∠PQS + ∠PSQ = x + 2x = 3x.

3x = 102° ⇒ x = 34°.

37. If 2x = a and 4a = 2b what is $\frac{x}{b}$ ?

(1) $\frac{1}{2}$(2) $\frac{2}{1}$

(3) $\frac{1}{4}$(4) $\frac{1}{8}$

**Answer (3)**

**Sol.** $4a = 2b \Rightarrow b = 2a$, and $a = 2x \Rightarrow b = 4x$.

$x/b = x/4x = 1/4$.

38. A sum of ₹350 made up of 110 coins which are either ₹1 or ₹5 denomination. How many coins are of ₹5.

(1) 50 (2) 55

(3) 60 (4) 175

**Answer (3)**

**Sol.** Let number of ₹5 coins = n; then ₹1 coins = 110 − n.

$5n + (110 - n) = 350 \Rightarrow 4n = 240 \Rightarrow n = 60$.

39. If the ratio of boys and girls in a class 7:5 which of the following cannot be the total number of students in the class?

(1) 36 (2) 50

(3) 60 (4) 120

**Answer (2)**

**Sol.** Total students = 7k + 5k = 12k, so the total must be a multiple of 12.

36, 60 and 120 are multiples of 12; 50 is not.

40. If $x = \frac{\sqrt{5}-1}{\sqrt{5}+1}$ and xy = 1 then the value of x + y is

(1) 3 (2) $\sqrt{5}$

(3) 6 (4) $\sqrt{6}$

**Answer (1)**

**Sol.** $y = 1/x = (\sqrt{5} + 1)/(\sqrt{5} - 1)$.

$x + y = [(\sqrt{5} - 1)^2 + (\sqrt{5} + 1)^2]/[(\sqrt{5})^2 - 1^2] = (6 - 2\sqrt{5} + 6 + 2\sqrt{5})/4 = 12/4 = 3$.

41. Two successive discounts of 10%, 20% are given on cost price of an article. Selling price now is 720. Find the cost price of the article is

(1) ₹1200 (2) ₹900

(3) ₹1000 (4) ₹1100

**Answer (3)**

**Sol.** SP = CP × (90/100) × (80/100) = 0.72 × CP

0.72 × CP = 720 ⇒ CP = ₹1000.

42. If the diagonals of a rhombus are 16 cm and 12 cm, then the area of rhombus is

(1) 95 cm² (2) 96 cm²

(3) 97 cm² (4) 98 cm²

**Answer (2)**

**Sol.** Area of rhombus = ½ × $d_1$ × $d_2$ = ½ × 16 × 12 = 96 cm².

43. An aeroplane travels distance 2500km, 1200km and 500km at the rate of 500km/h, 400km/h and 250 km/h respectively. The average speed of plane is

(1) 420 km/h (2) 410 km/h

(3) 405 km/h (4) 575 km/h

**Answer (1)**

**Sol.** Total distance = 2500 + 1200 + 500 = 4200 km.

Time = 2500/500 + 1200/400 + 500/250 = 5 + 3 + 2 = 10 h.

Average speed = 4200 ÷ 10 = 420 km/h.

44. $\left(\frac{3}{4}\right)^{3}\left(\frac{4}{3}\right)^{-7} = \left(\frac{3}{4}\right)^{2x}$ then x is

(1) 2 (2) 5

(3) $2\frac{1}{2}$ (4) -2

**Answer (2)**

**Sol.** $(4/3)^{-7} = (3/4)^{7}$.

LHS = $(3/4)^{3} \times (3/4)^{7} = (3/4)^{10}$.

So $2x = 10 \Rightarrow x = 5$.

45. $7\frac{1}{2}\%$ of 400 + $12\frac{1}{2}\%$ of 800 = ?% of 1300

(1) 10 (2) 30

(3) $33\frac{1}{3}$ (4) 40

**Answer (1)**

**Sol.** 7½% of 400 = 7.5/100 × 400 = 30.

12½% of 800 = 12.5/100 × 800 = 100.

Sum = 130 = x% of 1300 ⇒ x = 130/1300 × 100 = 10.

46. The amount of ₹5000 after. two years, compounded annually at the rate of 10% per annum is

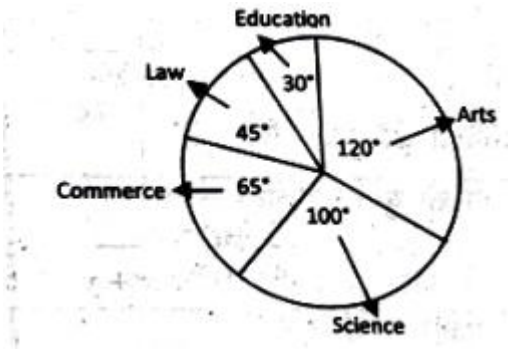
(1) ₹6143 (2) ₹6050

(3) ₹6500 (4) ₹6341

**Answer (2)**

**Sol.** $A = P(1 + r/100)^{n} = 5000 \times (1.1)^{2} = 5000 \times 1.21 = ₹6050$.

Direction: (Q.No. 47 - 50) The following Pie chart shows the number of students admitted in different faculties of a college. Study the chart and answer.




47. If 1000 students are admitted in science, what is the ratio of students in science and arts

(1) 7:5 (2) 7:6

(3) 3:6 (4) 6:5

**Answer (3)**

**Sol.** Students are proportional to central angles.

Science : Arts = 100° : 120° = 5 : 6.

48. If 1000 students are admitted in science, what is the total number of students.

(1) 1800 (2) 3600

(3) 360 (4) 180

**Answer (2)**

**Sol.** Science = 100° ↔ 1000 students ⇒ 1° ↔ 10 students.

Total = 360° × 10 = 3600 students.

49. How. many students are more in commerce than in law if 1000 students are in science?

(1) 2000 (2) 500

(3) 20 (4) 200

**Answer (4)**

**Sol.** 1° ↔ 10 students.

Commerce − Law = 65° − 45° = 20° ⇒ 20 × 10 = 200 students.

50. If total students are 1800 then how many students are in Arts.

(1) 600 (2) 900

(3) 1200 (4) 1000

**Answer (1)**

**Sol.** Arts = 120° out of 360°.

Students in Arts = 120/360 × 1800 = 600.

51. How many male members are there in the family

(1) 1 (2) 2

(3) 3 (4) 4

**Answer (4)**

**Sol.** B is C's son but C is not his mother ⇒ C is the father (male). A is C's wife (female).

E is C's brother (male). D is A's daughter (female). F is B's brother (male). B is male.

Males: B, C, E, F = 4.

52. Who is the mother of B.

(1) D (2) F

(3) E (4) A

**Answer (4)**

**Sol.** C is B's father and A is C's wife, so A is the mother of B.

53. How many children does 'A' have?

(1) 1 (2) 2

(3) 3 (4) 4

**Answer (3)**

**Sol.** A's children: B (son), D (daughter) and F (B's brother, hence also son) = 3.

54. Who is the wife of E?

(1) A (2) F

(3) B (4) Can not be determined

**Answer (4)**

**Sol.** Nothing is given about E's wife; A is C's wife, F and B are male. So it cannot be determined.

55. Which of the following is a pair of females.

(1) AE (2) BD

(3) DF (4) AD

**Answer (4)**

**Sol.** Females in the family: A (mother) and D (daughter).

The pair of females is AD.

56. How is E related of D?

(1) Father (2) Brother

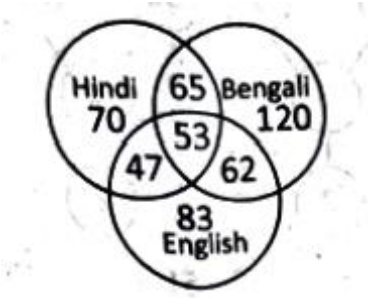
(3) Uncle (4) Can not be determined

**Answer (3)**

**Sol.** D is C's daughter and E is C's brother.

So E is D's paternal uncle (chacha).

Direction : (Q No. 57 – 61) : The diagram shows the survey on a sample of 500 persons with respect to their knowledge of Bengali, Hindi and English




57. How many persons know the Bengali and English language but not know the Hindi language.

(1) 53 (2) 62

(3) 65 (4) 37

**Answer (2)**

**Sol.** The region common to Bengali and English but outside Hindi = 62.

58. How many persons know all the three languages?

(1) 65 (2) 62

(3) 53 (4) 47

**Answer (3)**

**Sol.** The region common to all three circles = 53.

59. How many persons who do not know Hindi language?

(1) 265 (2) 200

(3) 255 (4) 201

**Answer (1)**

**Sol.** Persons knowing Hindi = 70 + 65 + 47 + 53 = 235.

Do not know Hindi = 500 − 235 = 265.

60. What is the ratio of those who know all the three languages to those who do not know Hindi language

(1) 3 : 5 (2) 2 : 5

(3) 1 : 5 (4) 4 : 5

**Answer (3)**

**Sol.** All three = 53; do not know Hindi = 265.

Ratio = 53 : 265 = 1 : 5.

61. What is the ratio of those who know only Bengali language to those who do not know Bengali language.

(1) 2 : 5 (2) 3 : 5

(3) 2 : 3 (4) 5 : 4

**Answer (2)**

**Sol.** Only Bengali = 120.

Knowing Bengali = 120 + 65 + 62 + 53 = 300 ⇒ do not know Bengali = 500 − 300 = 200.

Ratio = 120 : 200 = 3 : 5.

62. If A : B = 2 : 5 and B : C = 3 : 4 then what will be the value of A : C.

(1) 1 : 2 (2) 3 : 10

(3) 2 : 3 (4) 5 : 4

**Answer (2)**

**Sol.** A/C = (A/B) × (B/C) = (2/5) × (3/4) = 6/20 = 3/10.

A : C = 3 : 10.

63. The total age of 'a', 'b' and 'c' is 93 years. Ten years ago, the ratio of their ages was 2 : 3 : 4. Then the present age of 'c' is

(1) 18 years (2) 28 years

(3) 38 years (4) 48 years

**Answer (3)**

**Sol.** Total age 10 years ago = 93 − 3 × 10 = 63 years.

Ratio sum = 2 + 3 + 4 = 9 ⇒ one part = 63/9 = 7.

c's age 10 years ago = 4 × 7 = 28 ⇒ present age = 28 + 10 = 38 years.

64. 'A + B' means A is the son of B. 'A – B' means A is the wife of B. Then what does P + R – Q mean?

(1) Q is the father of P (2) Q is the son of P

(3) P is the father of Q (4) R is the son of Q

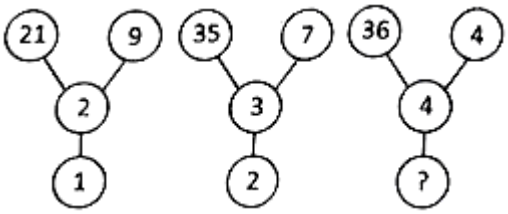
**Answer (1)**

**Sol.** P + R: P is the son of R. R − Q: R is the wife of Q.

So Q is the husband of R, and P is R's son ⇒ Q is the father of P.

Direction : (Q. 65 – 66 ) : Find the mission number in each of the following questions

65.



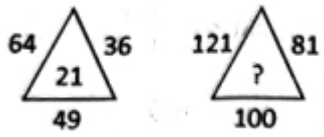

(1) 54 (2) 51

(3) 5 (4) 6

**Answer (Bonus)**

**Sol.**

66.




(1) 40 (2) 30

(3) 20 (4) 10

**Answer (2)**

**Sol.** Centre number = sum of the square roots of the three corner numbers.

Triangle 1: $\sqrt{64} + \sqrt{36} + \sqrt{49} = 8 + 6 + 7 = 21$ ✓.

Triangle 2: $\sqrt{121} + \sqrt{81} + \sqrt{100} = 11 + 9 + 10 = 30$.

67. If 1st January, 2008 is Tuesday, then what day of the week lies on January 2009?

(1) Wednesday (2) Thursday

(3) Sunday (4) Monday

**Answer (2)**

**Sol.** 2008 is a leap year with 366 days = 52 weeks + 2 odd days.

Tuesday + 2 days = Thursday.

68. Select the related word from the given alternatives:

Newspaper : Press :: Cloth : ?

(1) Tailor (2) Textile

(3) Mill (4) Fiber

**Answer (3)**

**Sol.** A newspaper is produced (printed) in a press; similarly cloth is produced in a mill.

69. Complete the series:

3, 7, 15, 31, 63, ?

(1) 92 (2) 115

(3) 127 (4) 131

**Answer (3)**

**Sol.** Each term = previous × 2 + 1: 3×2+1 = 7, 7×2+1 = 15, 15×2+1 = 31, 31×2+1 = 63.

Next = 63 × 2 + 1 = 127.

70. If 'DELHI' is coded as 'CCIDD', how is 'BOMBAY' coded in that language?

(1) AMJXVS (2) MJXAMV

(3) AJMTVT (4) WXAMXJ

**Answer (1)**

**Sol.** Each letter is moved backwards by 1, 2, 3, 4, 5 places: D−1 = C, E−2 = C, L−3 = I, H−4 = D, I−5 = D.

BOMBAY: B−1 = A, O−2 = M, M−3 = J, B−4 = X, A−5 = V, Y−6 = S.

Code = AMJXVS.

71. Find the odd one out:

(1) Square (2) Triangle

(3) Circle (4) Rectangle

**Answer (3)**

**Sol.** Square, triangle and rectangle are polygons (made of straight sides); a circle has no straight sides or vertices, so Circle is the odd one.

72. Pointing to a photograph, a man said, "I have no brother or sister, but that man's father is my father's son." Whose photograph was it?

(1) His own (2) His son's

(3) His father's (4) His nephew's

**Answer (2)**

**Sol.** "My father's son" (with no brother) is the speaker himself.

So the man in the photograph's father is the speaker ⇒ the photograph is of the speaker's son.

73. A man walks 5 km south then turns right and walks 3 km. After this, he turns left and walks 5 km. In which direction is he now from the starting point?

(1) South – East (2) South – West

(3) North – East (4) North – West

**Answer (2)**

**Sol.** Facing south, a right turn faces west: 3 km west. Facing west, a left turn faces south: 5 km south.

Net displacement: 5 + 5 = 10 km south and 3 km west.

He is in the South–West direction from the start.

74. Arrange the words in a meaningful logical order:

A. Country B. Furniture

C. Forest D. Wood

E. Trees

(1) A, C, E, D, B (2) B, D, C, E, A

(3) A, E, C, D, B (4) E, C, A, B, D

**Answer (1)**

**Sol.** Country has Forests → Forest has Trees → Trees give Wood → Wood makes Furniture.

Order: A, C, E, D, B.

75. Find the missing character in the sequence:

A, C, F, J, O, ?

(1) S (2) T

(3) U (4) V

**Answer (3)**

**Sol.** Position values: 1, 3, 6, 10, 15 – differences are +2, +3, +4, +5.

Next difference +6 ⇒ 15 + 6 = 21 = U.

76. Select the word which cannot be formed using the letters of the word PERMANENT:

(1) RENT (2) MEAN

(3) PARTY (4) NEAR

**Answer (3)**

**Sol.** PERMANENT contains P, E, R, M, A, N, E, N, T.

The word PARTY needs the letter Y, which is not present. RENT, MEAN and NEAR can all be formed.

77. If A = 1, CAT = 24, then BUS = ?

(1) 42 (2) 40

(3) 38 (4) 44

**Answer (1)**

**Sol.** Letters carry their alphabetical position: CAT = 3 + 1 + 20 = 24 ✓.

BUS = 2 + 21 + 19 = 42.

78. Identify the odd pair of numbers:

(1) 8 – 64 (2) 6 – 36

(3) 9 – 81 (4) 7 – 50

**Answer (4)**

**Sol.** In pairs 8–64, 6–36 and 9–81 the second number is the square of the first ($8^2 = 64$, $6^2 = 36$, $9^2 = 81$).

$7^2 = 49$, not 50 ⇒ 7–50 is the odd pair.

79. Select the option that is related to the third term in the same way as the second term is related to the first term:

Thermometer : Temperature :: Hygrometer : ?

(1) Pressure (2) Humidity

(3) Density (4) Wind speed

**Answer (2)**

**Sol.** A thermometer measures temperature; a hygrometer measures humidity.

80. Find the missing term:

B2D, E5H, H4L, ?

(1) K5P (2) J5P

(3) K5O (4) L5Q

**Answer (1)**

**Sol.** First letters: B, E, H, K (+3 each). Middle numbers: 2, 3, 4, 5.

Last letters: D, H, L, P (+4 each).

Next term = K5P.

81. If a clock image in a mirror shows 3:15, what is the actual time?

(1) 8:45 (2) 9:15

(3) 8:15 (4) 9:45

**Answer (1)**

**Sol.** Actual time = 12:00 − mirror time = 11:60 − 3:15 = 8:45.

82. Find the odd figure among the following geometric solids:

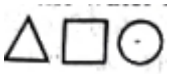
(1) Cube (2) Cuboid

(3) Sphere (4) Prism

**Answer (3)**

**Sol.** Cube, cuboid and prism are polyhedra (have flat faces, edges and vertices); a sphere has only a curved surface.

83. Find the water image of the symbol string



(1)  (2) 

(3)  (4) 

**Answer (1)**

**Sol.** A water image is the reflection in a horizontal line, so the figures turn upside down while their left-to-right order stays the same.

△ becomes ▽; □ and ○ remain the same ⇒ ▽ □ ○.

Direction: (Q.No. 84 - 85): The following questions are based on the information given below. Archana is older than Suman. Arti is older than Archana but younger than Kusum, Kusum is older than Suman. Suman is younger than Arti and Geeta is the oldest.

84. Who is youngest?

(1) Archana (2) Suman

(3) Arti (4) Kusum

**Answer (2)**

**Sol.** Geeta is the oldest; Kusum > Arti > Archana > Suman.

Order (oldest to youngest): Geeta, Kusum, Arti, Archana, Suman ⇒ Suman is youngest.

85. Who is in the middle with respect to the age?

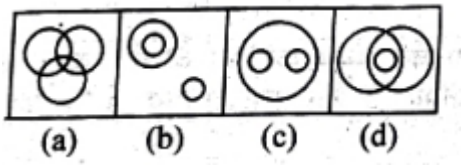
(1) Suman (2) Archana

(3) Arti (4) Kusum

**Answer (3)**

**Sol.** In the order Geeta > Kusum > Arti > Archana > Suman the middle (3rd) person is Arti.

86. Which of the following figures depicts relation between sparrows, birds and mice.




(1) a (2) b

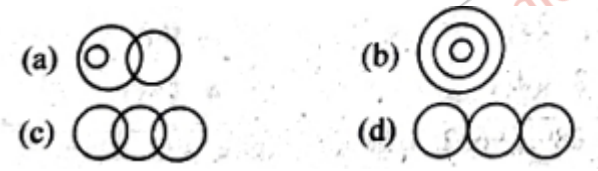
(3) c (4) d

**Answer (2)**

**Sol.** Sparrows are a part of birds (small circle inside big circle); mice are a separate group (circle outside).

This is shown by figure (b).

87. Which of the following diagram represents the relationship among Red, Clothes and Rose?




(1) a (2) b

(3) c (4) d

**Answer (3)**

**Sol.** Some clothes can be red and some roses can be red, but no clothes are roses.

So Clothes and Rose are separate circles, each overlapping the Red circle (the middle one) – figure (c).

Direction: (Q.No. 88 - 92): Study the given information and answer the following questions: All the faces of cube of side 4cm is painted red and then Cut into small cubes of side 1 cm each.

88. Find the total number of small cubes.

(1) 8 (2) 16

(3) 32 (4) 64

**Answer (4)**

**Sol.** Number of small cubes = $(4/1)^3 = 4^3 = 64$.

89. How many cubes will have their three surfaces painted?

(1) 4 (2) 8

(3) 16 (4) 24

**Answer (2)**

**Sol.** Cubes with three painted faces are the corner cubes of the big cube.

A cube has 8 corners ⇒ 8 small cubes.

90. How many cubes will have their none of their surfaces coloured?

(1) 0 (2) 8

(3) 16 (4) 24

**Answer (2)**

**Sol.** Unpainted cubes lie completely inside: $(n - 2)^3 = (4 - 2)^3 = 2^3 = 8$.

91. How many cubes will have their two opposite surfaces painted red?

(1) 0 (2) 8

(3) 16 (4) 24

**Answer (1)**

**Sol.** For a small cube to have two opposite faces painted, it would have to touch two opposite faces of the big cube. Since the side is 4 cm (4 small cubes), no small cube touches both opposite faces.

Hence the number is 0.

92. How many cubes have only one surface painted?

(1) 4 (2) 8

(3) 16 (4) 24

**Answer (4)**

**Sol.** Cubes with exactly one painted face = $6(n - 2)^2 = 6 \times (4 - 2)^2 = 6 \times 4 = 24$.

Direction (Q.No. 93 - 99): Find the missing numberwhich will come in place of (?)

93. 9,19, 30, 42, 55, 69, ?

(1) 85 (2) 89

(3) 84 (4) 79

**Answer (3)**

**Sol.** Differences: 10, 11, 12, 13, 14 – increasing by 1.

Next difference = 15 ⇒ 69 + 15 = 84.

94. 3,5, 6, 11, 9, 17, 12, ?

(1) 23 (2) 20

(3) 10 (4) 22

**Answer (1)**

**Sol.** Two alternate series: 3, 6, 9, 12 (+3) and 5, 11, 17, ? (+6).

Missing = 17 + 6 = 23.

95. 289, 196, 256, 169, ?

(1) 144 (2) 256

(3) 225 (4) 324

**Answer (3)**

**Sol.** Terms are squares: $17^2$, $14^2$, $16^2$, $13^2$, …

Bases: 17, 14, 16, 13, 15 (−3, +2, −3, +2) ⇒ $15^2 = 225$.

96. 2,6, 12, 20, 30, 42,?

(1) 62 (2) 63

(3) 54 (4) 56

**Answer (4)**

**Sol.** Terms are n(n + 1): 1×2, 2×3, 3×4, 4×5, 5×6, 6×7, 7×8.

Next = 7 × 8 = 56.

97. 7, 14, 22, 31, 41,?

(1) 52 (2) 45

(3) 56 (4) 48

**Answer (1)**

**Sol.** Differences: 7, 8, 9, 10 – next difference 11.

41 + 11 = 52.

98. BDFH, IKMD, PRTV,?

(1) WYAC (2) WXYA

(3) WXYZ (4) WYXA

**Answer (Bonus)**

**Sol.**

99. ACE, BDF, CEG,?

(1) CED (2) DFH

(3) DEM (4) HED

**Answer (2)**

**Sol.** Every letter of a group moves one place forward in the next group: ACE → BDF → CEG → DFH.

100. A class of girls stands in a line. One girl is 19th in order from both the ends. How many girls are there in the class.

(1) 27 (2) 37

(3) 38 (4) 39

**Answer (2)**

**Sol.** Total = (position from left) + (position from right) − 1 = 19 + 19 − 1 = 37.

# PART-II - SCHOLASTIC APTITUDE TEST (SAT)

## SCIENCE

101. A body travels half the distance with speed of 20 m/s and the other half with speed of 30 m/s. The average speed of the body during whole journey is:

(1) 50 m/s (2) 2.5 m/s

(3) 24 m/s (4) 10 m/s

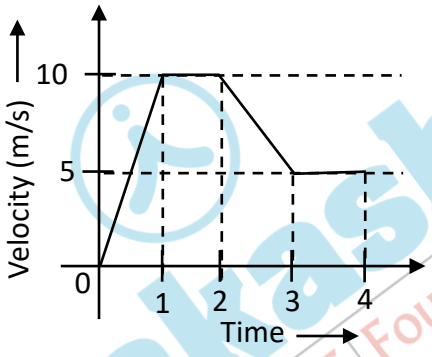
**Answer (3)**

**Sol.** $v_{avg} = \frac{2v_1v_2}{v_1 + v_2}$

$= \frac{2 \times 20 \times 30}{20 + 30} = 24\,\text{m/s}$

102. The variation of velocity of a particle moving along a straight line is shown in the figure.

The distance travelled by the particle in 4 second is:




(1) 26.5 m (2) 27.5 m

(3) 28.5 m (4) 29.5 m

**Answer (2)**

**Sol.** Distance = Area under velocity-time graph

$= \frac{1}{2} \times 1 \times 10 + 1 \times 10 + \frac{1}{2} \times (10 + 5) \times 1 + 1 \times 5$

**=** 5 + 10 + 7.5 + 5

= 27.5 m

103. The brakes applied to a car produces an acceleration of 5 $ms^{-2}$ in opposite direction to the motion. If the car takes 4 seconds to stop after the application of brakes, the distance it travels during the time will be:

(1) 40 m (2) 50 m

(3) 60 m (4) 70 m

**Answer (1)**

**Sol.** Using formula

v = u + at

0 = u – 5 × 4

u = 20 m/s

Now

$$s = ut + \frac{1}{2}at^2$$

$$= 20(4) - \frac{1}{2} \times (5) \times (4)^2$$

$$= = 80 - 40 = 40\,\text{m}$$

104. An object of mass 4 kg is sliding with a constant velocity of 10 $ms^{-1}$ on a frictionless surface. The force required to keep the object moving with same velocity is

(1) 0N (2) 1N

(3) 2N (4) 3N

**Answer (1)**

**Sol.** Since the surface is frictionless and the object moves with constant velocity, its acceleration is zero. Hence, no external force is required.

105. An object of mass 3 kg takes 4 seconds to stop when a force of 15N is applied in a direction opposite to the motion of the object. The initial speed of the object was:

(1) 45 $ms^{-1}$ (2) 5 $ms^{-1}$

(3) 20 $ms^{-1}$ (4) 25 $ms^{-1}$

**Answer (3)**

**Sol.** Acceleration (a) = $\frac{F}{m} = \frac{-15}{3} = -5\text{m/s}^2$

v = u + at

0 = u – 5 × 4

u = 20 m/s

106. When a constant force is applied to a body, it moves with uniform:

(1) speed (2) Acceleration

(3) Velocity (4) Momentum

**Answer (2)**

**Sol.** For a constant force and constant mass, acceleration remains constant. Therefore, the object moves with uniform acceleration.

107. An apple falls from a tree because of the gravitational attraction between the earth and apple. If $F_1$ is the magnitude of force exerted by the earth on the apple and $F_2$ is the magnitude of force exerted by apple on earth, then

(1) $F_1$ is greater than $F_2$ (2) $F_2$ is greater than $F_1$

(3) $F_1$ and $F_2$ cannot be determined (4) $F_1$ and $F_2$ are equal

**Answer (4)**

**Sol.** Gravitational force between two objects are equal and opposite therefore $F_1$ and $F_2$ are equal.

108. For a moving object, the ratio of displacement to the distance covered will be

(1) $\leq 1$ (2) = 1

(3) < 1 (4) > 1

**Answer (1)**

**Sol.** For a moving object, displacement is always less than or equal to distance covered.

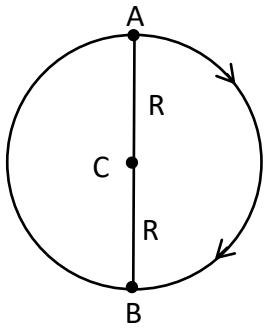
109. A person travels distance $\pi R$ along the circumference of circle of radius R. Displacement of the person is

(1) R (2) 2R

(3) $2\pi R$ (4) Zero

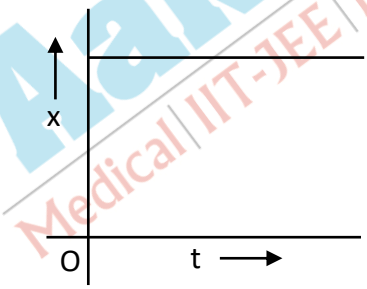
**Answer (2)**

**Sol.**




Since the circumference of a circle of radius R is $2\pi r$ , therefore, for distance covered $\pi R$ i.e AB, displacement is 2R.

110. From the given x – t graph, it can be inferred that the object is




(1) at rest (2) in uniform motion

(3) increasing acceleration (4) in non-uniform motion

**Answer (1)**

**Sol.** In a distance-time graph, if graph is parallel to time axis then the object is at rest.

111. Why do passengers fall forward when a fast-moving bus suddenly applies brakes?

(1) due to the backward push of the seats on the passengers.

(2) due to gravity pulling them toward the front of the bus.

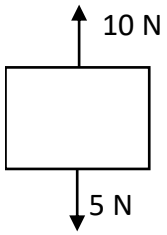
(3) due to inertia of motion, as the upper body tends to keep moving forward.

(4) due to the inertia of rest stopping the lower body.

**Answer (3)**

**Sol.** Due to inertia of motion.

112. What is the net force on the block if two forces are acting on it?




(1) 5 N up (2) 5 N down

(3) 15 N up (4) 15 N down

**Answer (1)**

**Sol.** $F_{net}$ = 10 N – 5 N

= 5 N

113. If no external force acts on a body, its momentum:

(1) increases (2) decreases

(3) remains constant (4) becomes zero

**Answer (3)**

**Sol.** According to Newton's 2nd law, force is equal to rate of change of momentum.

114. If one mL of a liquid pesticide is mixed with sufficient amount of water to form 0.1 litre of a pesticide spray for rice crop, the concentration of spray in terms of volume by volume percent is

(1) 10% v/v (2) 1% v/v

(3) 0.1% v/v (4) 100% v/v

**Answer (2)**

**Sol.** Volume of solute = 1 mL; volume of solution = 0.1 L = 100 mL.

Volume % = (1/100) × 100 = 1% v/v.

115. A mixture of two miscible liquids, with a difference in boiling point of less than 25°C, is best separated by the technique

(1) Distillation (2) Sublimation

(3) By use of separating funnel (4) Fractional distillation

**Answer (4)**

**Sol.** Simple distillation works when the boiling points differ by more than 25 °C. For miscible liquids with a smaller difference, fractional distillation (using a fractionating column) is used.

116. The method of separating coloured pigments from the flower petals is called

(1) Coagulation (2) Paper chromatography

(3) Sublimation (4) Deposition

**Answer (2)**

**Sol.** Chromatography separates the different coloured components (pigments) of a mixture on the basis of their different solubilities/rates of movement – done on paper for flower pigments.

117. A student dissolves 20g of sugar in 80g of water to prepare a syrup. The mass by mass (m/m%) concentration of this solution is –

(1) 20% (2) 80%

(3) 25% (4) 16.6

**Answer (1)**

**Sol.** Mass of solution = 20 + 80 = 100 g.

Mass % = (mass of solute/mass of solution) × 100 = (20/100) × 100 = 20%.

118. A solution turns the red litmus paper to blue. Excess addition of which of the following solution would reverse the change?

(1) Lime water (2) Baking soda

(3) Vinegar (4) Common salt solution

**Answer (3)**

**Sol.** Red litmus turns blue in a basic solution. To reverse the change the solution has to be neutralised and made acidic by an acid.

Vinegar (acetic acid) is the acid; lime water and baking soda are basic and common salt is neutral.

119. The size of the colloidal particles lie in the range of –

(1) 3500 – 4500 nm (2) 2000 – 3000 nm

(3) 1 – 1000 nm (4) 4600 – 5000 nm

**Answer (3)**

**Sol.** Particle size: true solution < 1 nm; colloid 1 – 1000 nm; suspension > 1000 nm.

120. Which of the following is an example of oil in water emulsion?

(1) Milk (2) Butter

(3) Body lotion (4) Cold cream

**Answer (1)**

**Sol.** Milk is an emulsion of tiny fat (oil) droplets dispersed in water.

121. Brass is a mixture of approximately

(1) 80% Copper and 20% zinc (2) 20% Copper and 80% zinc

(3) 50% Copper and 50% zinc (4) 10% Copper and 90% zinc

**Answer (1)**

**Sol.** Brass is an alloy (homogeneous mixture) of about 80% copper and 20% zinc.

122. Clouds are an example of

(1) Solutions (2) Suspensions

(3) Colloids (4) None of the above

**Answer (3)**

**Sol.** Clouds are tiny water droplets dispersed in air – a colloid of the aerosol type (liquid in gas).

123. Which among the following mixtures show Tyndall effect?

(1) Salt and water (2) Starch and water

(3) Sugar and water (4) Copper sulphate and water solution

**Answer (2)**

**Sol.** Only colloids (and suspensions) scatter a beam of light. Starch in water forms a colloid, while the others are true solutions whose particles are too small to scatter light.

124. 5g of glucose is dissolved in water to make 200 mL of the solution, the concentration of solution in mass by volume (m/v) percentage is-

(1) 2.5% (2) 3.5%

(3) 4.5% (4) 5%

**Answer (1)**

**Sol.** Mass by volume % = (mass of solute/volume of solution in mL) × 100 = (5/200) × 100 = 2.5%.

125. A common talcum powder contains 4% (m/m) mass by mass zinc oxide. How much zinc oxide is present in 300g of the talcum powder?

(1) 12g (2) 16g

(3) 7g (4) 120g

**Answer (1)**

**Sol.** Zinc oxide = 4% of 300 g = (4/100) × 300 = 12 g.

126. Which of the following is not a constituent obtained by fractional distillation of petroleum?

(1) Diesel (2) Petrol

(3) Kerosene (4) Coke

**Answer (4)**

**Sol.** Diesel, petrol and kerosene are fractions of petroleum. Coke is obtained from the destructive distillation of coal, not from petroleum

127. Which of the following organelle is present in prokaryotic cell?

(1) Endoplasmic reticulum (2) Mitochondrion

(3) Chloroplast (4) Mesosomes

**Answer (4)**

**Sol.** Prokaryotic cells lack membrane-bound organelles such as ER, mitochondria and chloroplasts. They have mesosomes – infoldings of the plasma membrane that help in respiration and cell-wall formation.

128. The limit of resolution of the human eye is

(1) 1.0 mm (2) 0.1 mm

(3) 0.01 mm (4) 10 mm

**Answer (2)**

**Sol.** The smallest distance at which two points can be seen separately by the unaided human eye is about 0.1 mm.

129. Which of the following is not true about mitosis?

(1) Mitosis produces two daughter cells

(2) Mitosis does not change chromosome

(3) Mitosis help in tissue repair and body growth

(4) Mitosis results in reduction in chromosome number

**Answer (4)**

**Sol.** Mitosis gives two identical daughter cells with the same chromosome number as the parent, helping in growth and repair.

Reduction of chromosome number occurs in meiosis, not in mitosis

130. Mycoplasma mycoides is an example of a _____.

(1) Fungus (2) Bacterium

(3) Virus (4) Lichen

**Answer (2)**

**Sol.** Mycoplasma is the smallest bacterium; it lacks a cell wall.

131. The Birbal Sahni Institute of Palaeoscience is located in _____

(1) Lucknow (2) Allahabad (Prayagraj)

(3) Varanasi (4) Kolkata

**Answer (1)**

**Sol.** The Birbal Sahni Institute of Palaeosciences (BSIP) is in Lucknow, Uttar Pradesh.

132. Plant cells do not contact inhibition due to presence of _____.

(1) Nucleus (2) Cell membrane

(3) Cell wall (4) Vacuoles

**Answer (3)**

**Sol.** Contact inhibition is the phenomenon in which normal cells stop dividing and growing when they come into contact with neighbouring cells. In plant cells, the rigid cell wall already fixes the cells in place, so they do not show it.

133. Select the correct statement.

(1) Glycerine is used to stain onion peel cells

(2) A cell will swell when placed in an isotonic solution

(3) Meiosis occurs in gamete producing cells

(4) Xylem transport food in plant

**Answer (3)**

**Sol.** Safranin/methylene blue is used for staining, glycerine only mounts the slide.

In an isotonic solution there is no net water movement, so the cell does not swell.

Phloem transports food in plant.

Meiosis occurs in the gamete-producing (germ) cells. Therefore, statement 3 is correct.

134. Epithelial cells are not related to function of _____.

(1) Absorption (2) Secretion

(3) Protection (4) Excitation

**Answer (4)**

**Sol.** Epithelial tissue functions in protection, absorption and secretion. Excitation (conduction of nerve impulses) is the function of nerve cells.

135. Which type of joint will involve when we kick a football?

(1) Hinge joint (2) Pivot joint

(3) Ball and socket joint (4) Fixed joint

**Answer (1)**

**Sol.** The primary action is the motion of lower leg while kicking a football. This involves hinge joint which allows movement in one plane.

136. Which of the following can divide actively?

(1) R.B.C (2) Meristematic cells

(3) Sclerenchyma (4) Nerve cells

**Answer (2)**

**Sol.** Meristematic cells/tissue are located in the growing regions of plants and consist of undifferentiated cells that divides continuously.

137. Human plasma makes about _____% of total blood volume.

(1) 45 (2) 50

(3) 55 (4) 80

**Answer (3)**

**Sol.** Plasma makes up about 55% of the total blood volume, while formed elements constitute around 45%.

138. Which of the following is dead at maturity?

(1) Xylem parenchyma (2) Companion cells

(3) Sieve tubes (4) Xylem vessels

**Answer (4)**

**Sol.** Xylem vessels lose their protoplasm and become lignified, making them dead at maturity.

139. Select the incorrect statement.

(1) Tendons connect bone to a muscle

(2) Ligaments connect bone to bone

(3) Striated muscles are also called voluntary muscles

(4) Pivot joint is located in knee region

**Answer (4)**

**Sol.** A pivot joint is present between the atlas and axis vertebrae in the neck region. Knee joint is the hinge joint, which allows movement mainly in one plane

140. What structures are common to both mitochondrion and chloroplast?

(i) Inner membrane (ii) Outer membrane

(iii) Matrix/Stroma (iv) Their own DNA

(v) Thylakoids

(1) i, ii, iii and iv only (2) i, ii and v only

(3) iv and v inly (4) iii, iv and v only

**Answer (1)**

**Sol.** The structures common to both mitochondria and chloroplast are inner and outer membrane and they both have their DNA. Matrix is present in mitochondria and stroma is present in chloroplast. Thylakoids are present in chloroplast only.

## MATHEMATICS

141. if $x^2+\frac{1}{x^2}=18$, then the value pf $x-\frac{1}{x}$ is :

(1) $\pm 3$ (2) $\pm 4$

(3) $\pm 6$ (4) $\pm 9$

**Answer (2)**

**Sol.** $x^2+\frac{1}{x^2}=18$

$x^2+\frac{1}{x^2}-2=18-2$

$\left(x-\frac{1}{x}\right)^2=16$

$x-\frac{1}{x}=\pm 4$

142. If $x+y+2=0$, then the value of $x^3+y^3+8$ is:

(1) 8xy (2) -8xy

(3) 6xy (4) -6xy

**Answer (3)**

**Sol.** x + y + 2= 0

x + y = –2

$x^3+y^3=(x+y)(x^2+y^2-xy)$

$=(x+y)\left[(x+y)^2-3xy\right]$

$=(-2)\left[(-2)^2-3xy\right]$

$x^3+y^3=-8+6xy$

$\therefore x^3+y^3+8=6xy$

143. If $\frac{a}{b}+\frac{b}{a}=1(a\neq 0,b\neq 0)$ then the value of $a^3+b^3$ is ?

(1) 0 (2) $\frac{1}{2}$

(3) 1 (4) -1

**Answer (1)**

**Sol.** a/b + b/a = 1 ⇒ (a² + b²)/ab = 1 ⇒ a² + b² = ab ⇒ a² − ab + b² = 0.

$a^3 + b^3 = (a + b)(a^2 - ab + b^2) = (a + b) \times 0 = 0$.

144. The coordinates of the mid point of the value of segment joining the points A(-1, 0) and B(3, 4) is?

(1) (1,1) (2) (1,2)

(3) (2,1) (4) (2,2)

**Answer (2)**

**Sol.** Midpoint = $((x_1 + x_2)/2, (y_1 + y_2)/2) = ((-1 + 3)/2, (0 + 4)/2) = (1, 2)$.

145. $2.0\bar{5}$ in fraction $\left(\frac{p}{q}\right)$ is equal to?

(1) $\frac{41}{20}$ (2) $\frac{37}{20}$

(3) $\frac{41}{18}$ (4) $\frac{37}{18}$

**Answer (4)**

**Sol.** $x = 2.0555555555.....$

$10x = 20.55555555.....$

$100x = 205.55555.....$

$100x - 10x = (205.5555.....) - (20.5555.....)$

$90x = 185$

$x = \frac{185}{90}$

$= \frac{37}{18}$

146. If $a = 29 + 12\sqrt{5}$ and $b = \frac{\sqrt{a}}{a}$, then the value of $\sqrt{a} + b$ is ?

(1) $\frac{22 + 18\sqrt{5}}{11}$ (2) $\frac{20 + 2\sqrt{5}}{11}$

(3) $\frac{30 + 24\sqrt{5}}{11}$ (4) $\frac{20 + 18\sqrt{5}}{11}$

**Answer (3)**

**Sol.** $a = 29 + 12\sqrt{5}$

$(x + y)^2 = 29 + 12\sqrt{5}$

$x^2 + y^2 + 2xy = 29 + 12\sqrt{5}$

$x^2 + y^2 = 29$ **... (i)**

$2xy = 12\sqrt{5}$ **... (ii)**

$x = 3, y = 2\sqrt{5}$

$a = (x+y)^2$

$x+y = \sqrt{a}$

$\sqrt{a} = 3+2\sqrt{5}$

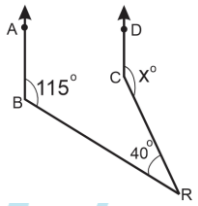
$b = \frac{\sqrt{a}}{a} = \frac{1}{\sqrt{a}}$

$\because \sqrt{a} + \frac{1}{\sqrt{a}} = 3+2\sqrt{5} + \frac{1}{3+2\sqrt{5}}$

$= 3+2\sqrt{5} + \frac{3-2\sqrt{5}}{(-11)}$

$= \frac{30+24\sqrt{5}}{11}$

147. In the following figure AB||CD and ∠ABR=115°, ∠BRC=40° and ∠RCD=x°, find the value of x.




(1) 140 (2) 125

(3) 165 (4) 155

**Answer (4)**

**Sol.** Draw a line RE through R parallel to AB (and CD).

∠ABR + ∠BRE = 180° (co-interior angles) ⇒ ∠BRE = 180° − 115° = 65°.

∠CRE = ∠BRE − ∠BRC = 65° − 40° = 25°.

∠RCD + ∠CRE = 180° (co-interior angles) ⇒ x = 180° − 25° = 155°.

148. if a + b + c = 0, then the value of $(x)^{a^2b^{-1}c^{-1}} \cdot (x)^{a^{-1}b^2c^{-1}} \cdot (x)^{a^{-1}b^{-1}c^2}$ is ?

(1) $(x)^{a^2+b^2c^2}$ (2) $(x)^{\frac{1}{a^2b^2c^2}}$

(3) $x^{\frac{1}{2}}$ (4) $x^3$

**Answer (4)**

**Sol.** Add the powers: $a^2/(bc) + b^2/(ac) + c^2/(ab) = (a^3 + b^3 + c^3)/(abc)$.

Since a + b + c = 0, $a^3 + b^3 + c^3 = 3abc$.

Power = 3abc/abc = 3 ⇒ value = $x^3$.

149. The perimeter of a circle is equal to perimeter of a square. Then the ratio of their areas respectively is (Ar. Of circle : Area of square).

(1) 4:1 (2) 11:7

(3) 7:11 (4) 22:7

**Answer (None of the given options matches)**

**Sol.** Perimeter of circle = Perimeter of square

$2\pi r = 4a$

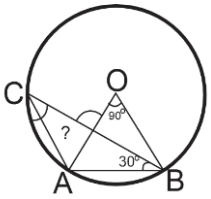
$\frac{r}{a} = \frac{4\times 7}{2\times 22}$

$r : a = 7 : 11$

$\therefore \frac{\text{Area of circle}}{\text{area of square}} = \frac{\pi r^2}{a^2} = \frac{22\times 7\times 7}{7\times 11\times 11} = \frac{14}{11}$

= 14 : 11 (or) 4: $\pi$

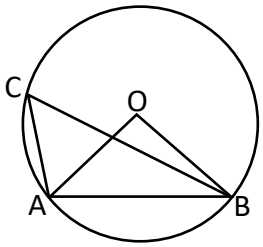
150. In the given figure, 'O' is centre of the circle, in $\angle AOB = 90°$ and $\angle ABC = 30°$, then the measure of $\angle CAO$ is :




(1) 30°
(2) 45°
(3) 90°
(4) 60°

**Answer (4)**

**Sol.**




$\angle ACB = \frac{1}{2}\angle AOB = \frac{90°}{2} = 45°$

In $\Delta AOB$

OA = OB (radii of same circle)

$\therefore \angle OAB = \angle OBA$

and $\angle AOB = 90$ (given)

$\therefore \angle OAB = 45°$

Now in $\Delta ACB$

$\angle ACB + \angle CAB + \angle ABC = 180$

$45° + \angle CAB + 30° = 180$ [$\angle ABC = 30°$ given]

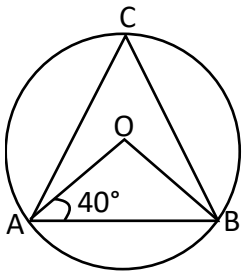
$\angle CAB = 105°$

$\therefore \angle CAB = \angle CAO + \angle OAB = 105°$

$\angle CAO + 45° = 105$

$\angle CAO = 60°$

151. In the given figure, 'O' is centre of the circle. If $\angle OAB = 40°$, then the measure of $\angle ACB$




(1) 40° (2) 50°

(3) 80° (4) 60°

**Answer (2)**

**Sol.** OA = OB (radii) ⇒ ∠OBA = ∠OAB = 40°.

∠AOB = 180° − 40° − 40° = 100°.

Angle at the circumference = ½ × angle at the centre: ∠ACB = ½ × 100° = 50°.

152. If $x^2 - 10x + 21 = (x - a)(x - b)$ then the value of $a^2 + b^2$ is:

(1) 42 (2) 58

(3) 79 (4) 100

**Answer (2)**

**Sol.** Compare: $(x - a)(x - b) = x^2 - (a + b)x + ab \Rightarrow a + b = 10$ and $ab = 21$.

$a^2 + b^2 = (a + b)^2 - 2ab = 100 - 42 = 58$.

(Factorising: $x^2 - 10x + 21 = (x - 3)(x - 7) \Rightarrow 9 + 49 = 58$

153. If $x + y = 9$ and $x^2 + y^2 = 53$, then find the value of $x^3 + y^3$.

(1) 135 (2) 153

(3) 351 (4) 511

**Answer (3)**

**Sol.** $x + y = 9, x^2 + y^2 = 53$

$\therefore (x + y)^2 = x^2 + y^2 + 2xy$

$81 = 53 + 2xy$

$\Rightarrow xy = 14$

$\therefore x^3 + y^3 = (x + y)(x^2 + y^2 - xy)$

$= (9)(53 - 14)$

= 351

154. Let the polynomial $p(x) = 16x^4 - 16x^2 - 16x$.

If $a = \sqrt{\frac{1}{2} + \sqrt{\frac{1}{2} + \sqrt{\frac{1}{2} + .....\infty}}}$ then find the value of p(a).

(1) 0.5 (2) 1

(3) 2 (4) 4

**Answer (4)**

**Sol.** $a = \sqrt{\frac{1}{2} + \sqrt{\frac{1}{2} + \sqrt{\frac{1}{2} + .....\infty}}}$

$a = \sqrt{\frac{1}{2} + a}$

$\Rightarrow a^2 = \frac{1}{2} + a$

$\Rightarrow 2a^2 - 2a = 1$

Now,

$p(a) = 16a^4 - 16a^2 - 16a$

$\Rightarrow p(a) = 8a^2(2a^2 - 2a) + 16a^3 - 16a^2 - 16a$

$\Rightarrow p(a) = 8a^2(1) + 16a^3 - 16a^2 - 16a$

$\Rightarrow p(a) = 16a^3 - 8a^2 - 16a$

$\Rightarrow p(a) = 8a(2a^2 - 2a) + 8a^2 - 16a$

$= 8a^2 - 8a$

$p(a) = 4 \times 1 = 4$

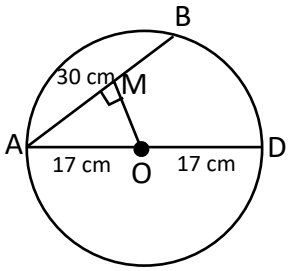
155. AD is diameter of a circle and AB is a chord. If AD = 34cm and AB = 30 cm. Find the distance of AB from the centre of the circle.

(1) 17 cm (2) 15 cm

(3) 4 cm (4) 8 cm

**Answer (4)**

**Sol.**



$AO = \frac{34}{2} = 17\,cm$

$AM = \frac{AB}{2} = \frac{30}{2} = 15\,cm$

$\therefore OM = \sqrt{AO^2 - AM^2}$

$= \sqrt{17^2 - 15^2}$

$OM = 8\,cm$

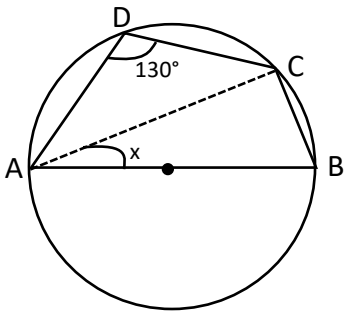
156. A quadrilateral ABCD is inscribed in a circle such that AB is diameter and $\angle ADC = 130°$.

(1) 40° (2) 50°

(3) 60° (4) 65°

**Answer (1)**

**Sol.**




As AB is diameter

$\therefore \angle ACB = 90°$

Also, $\angle ABC = 180° - \angle ADC$ [(cyclic quad. prop.)]

= 180° – 130°

$\angle ABC = 50°$

$\therefore \angle BAC = x = 180° - 90° - 50°$

= 40°

157. Two dice are rolled. What is the probability that the sum of the numbers on two dice is a prime number greater than 5?

(1) $\frac{2}{9}$ (2) $\frac{1}{6}$

(3) $\frac{7}{36}$ (4) $\frac{5}{36}$

**Answer (1)**

**Sol.** Total outcomes = $6 \times 6 = 36 = n(s)$

Favourable outcomes:

$(1,6),(2,5),(3,4),(4,3),(5,2),(5,6),(6,1),(6,5) = n(E)$

$\therefore$ Required probability = $\frac{n(E)}{n(S)} = \frac{8}{36} = \frac{2}{9}$

158. Which term of the sequence

$2, 2\sqrt{2}, 4, \ldots$ is 128?

(1) $7^{th}$ (2) $12^{th}$

(3) $13^{th}$ (4) $14^{th}$

**Answer (3)**

**Sol.** $2, 2\sqrt{2}, 4, \ldots\ldots$

$a = 2, r = \sqrt{2}$

$128 = 2 \cdot \left(\sqrt{2}\right)^{n-1}$

$2^7 = 2 \cdot 2^{\frac{n-1}{2}}$

$2^6 = 2^{\frac{n-1}{2}}$

$\therefore n = 12 + 1 = 13^{th}$ *term*

159. How many three digit numbers are divisible by 7?

(1) 128 (2) 130

(3) 126 (4) 127

**Answer (1)**

**Sol.** Smallest three-digit multiple of 7 = 105 (7 × 15); largest = 994 (7 × 142).

Number of terms = (994 − 105)/7 + 1 = 127 + 1 = 128.

160. Which term of the G.P. 2,8,32,… is 131072?

(1) $9^{th}$ (2) $8^{th}$

(3) $10^{th}$ (4) $11^{th}$

**Answer (1)**

**Sol.** a = 2, r = 4. $a_n = 2 \times 4^{n-1} = 131072 \Rightarrow 4^{n-1} = 65536$.

$65536 = 4^8 \Rightarrow n - 1 = 8 \Rightarrow n = 9$.

## SOCIAL SCIENCE

161. Which term of human ancestor was the first to migrate out of Africa?

(1) Homo erectus (2) Neanderthals

(3) Homosapiens (4) Australopithecus

**Answer (1)**

**Sol.** Homo erectus ("upright man") was the first early human species to migrate out of Africa, spreading to Asia and Europe about 1.8 million years ago.

162. Which famous Sanskrit grammer text was authored by Panini?

(1) Mahabhashya (2) Ashtadhyayi

(3) Chhandashastra (4) Nitisara

**Answer (2)**

**Sol.** Panini wrote the Ashtadhyayi ("eight chapters"), the famous Sanskrit grammar. The Mahabhashya is by Patanjali.

163. Which minister position was introduced in the civil administration during the Gupta period?

(1) Senapti (2) Sandhivigrahika

(3) Gramila (4) Amatya

**Answer (2)**

**Sol.** Sandhivigrahika (minister of war and peace) was a new post in the Gupta administration (seen in the Allahabad Pillar inscription of Samudragupta). Amatya and Senapati existed earlier, and the Gramika was the village head.

164. What royal emblem represented the ancient chola kindom in Sangam Literature?

(1) Bow (2) Fish

(3) Tiger (4) Elephant

**Answer (3)**

**Sol.** The emblems of the three Sangam kingdoms: Chola – Tiger, Pandya – Fish, Chera – Bow.

165. Which chola emperor adopted the title 'Gangaikonda?

(1) Parantaka 1 (2) Rajraja 1

(3) Rajendra 1 (4) Karikala

**Answer (3)**

**Sol.** Rajendra Chola I took the title Gangaikonda Chola after his victorious march to the Ganga, and built the city Gangaikonda Cholapuram.

166. In Kalutila's Arthashastra, how many constituents of the state are identified?

(1) Five (2) Seven

(3) Nine (4) Twelve

**Answer (2)**

**Sol.** Kautilya's Saptanga theory lists seven elements (prakritis) of the state: Swami (king), Amatya, Janapada, Durga, Kosha, Danda and Mitra.

167. Which metal was combined with copper to produce bronze during the bronge age?

(1) Iron (2) Tin

(3) Gold (4) Lead

**Answer (2)**

**Sol.** Bronze is an alloy of copper and tin.

168. Who were the first to start writing around 3200 BCE?

(1) Harppans (2) Sumerians

(3) Akkadians (4) Magadhians

**Answer (2)**

**Sol.** The Sumerians of Mesopotamia developed the earliest writing (cuneiform) around 3200 BCE.

169. What was the basis of the organisation of early vedic socity?

(1) Terriotial Boundaries? (2) Kinship ties

(3) Trade networks (4) Written Laws

**Answer (2)**

**Sol.** Early Vedic society was tribal; it was organised on the basis of kinship (family → kula, village → grama, clan → vis, tribe → jana).

170. Which of the following was primarily concerned with policy decisions and political affairs?

(1) Sobha? (2) Samiti

(3) Vidatha (4) Parishad

**Answer (2)**

**Sol.** The Samiti was the general assembly of the people in the early Vedic period; it took policy and political decisions (e.g. choosing/approving the king, war and peace). The Sabha was a smaller council of elders.

171. Which trade name did mesopotamian text use for the Sindhu-Saraswati Civilization?

(1) Dilmun (2) Magan

(3) Meluha (4) Sumer

**Answer (3)**

**Sol.** Mesopotamian records call the Indus (Sindhu-Saraswati) region Meluha. Dilmun = Bahrain, Magan = Oman region, Sumer = southern Mesopotamia.

172. Which semi-molten layer of earth allows tectonic plates to move over it?

(1) Crust (2) Inner core

(3) Outer core (4) Asthenosphere

**Answer (4)**

**Sol.** The asthenosphere is the semi-molten, plastic layer of the upper mantle on which the lithospheric (tectonic) plates move.

173. The Mid-Atlantic Ridge is a prime example of which type of plate boundary?

(1) Divergent boundary (2) Convergent boundary

(3) Transform boundary (4) Passive margin

**Answer (1)**

**Sol.** At the Mid-Atlantic Ridge plates move apart and new crust forms from rising magma – a divergent boundary.

174. The traditional integrated farming and water conservation 'Zabo System' is practiced in the state of :

(1) Nagaland (2) Sikkim

(3) Assam (4) Meghalaya

**Answer (1)**

**Sol.** The Zabo ("impounding water") system is a traditional farming system of Nagaland.

175. Icicle-shaped mineral formations hanging down from the ceiling of limestone caves are :

(1) Sinkholes (2) Dolines

(3) Stalactites (4) Stalagmites

**Answer (3)**

**Sol.** Stalactites hang from the roof of limestone caves; stalagmites grow upward from the floor.

176. The colourful light display seen in the sky near the North Pole is named :

(1) Aurora Australis (2) Aurora Borealis

(3) Solar Flare (4) Stratopause

**Answer (2)**

**Sol.** The Northern Lights are called Aurora Borealis; near the South Pole it is Aurora Australis.

177. The total amount of greenhouse gases released due to human activities is called :

(1) Carbon sink (2) Carbon credit

(3) Global Index (4) Carbon footprint

**Answer (4)**

**Sol.** Carbon footprint is the total greenhouse gas emissions caused directly or indirectly by human activities.

178. The 'Ring of Fire' is associated with which of the following ocean?

(1) Atlantic Ocean (2) Pacific Ocean

(3) Indian Ocean (4) Arctic Ocean

**Answer (2)**

**Sol.** The Ring of Fire is the belt of volcanoes and earthquakes around the Pacific Ocean.

179. Weathering can be defined as :

(1) Breaking down of rocks in-situ

(2) Weather conditions of a place

(3) Erosion of rocks

(4) Transportation of eroded materials

**Answer (1)**

**Sol.** Weathering is the breakdown (disintegration/decomposition) of rocks in their original place (in situ), without transportation.

180. Yardang is formed by :

(1) River (2) Glacier

(3) Groundwater (4) Wind

**Answer (4)**

**Sol.** Yardangs are streamlined ridges of rock sculpted by wind erosion (abrasion) in deserts.

181. The South-West monsoon in India occurs during the months of :

(1) March – May (2) June – September

(3) October – November (4) December – February

**Answer (2)**

**Sol.** The south-west (summer) monsoon is active from June to September.

182. Which monsoon wind brings rainfall to Tamil Nadu coast?

(1) North-East Monsoon (2) South-West Monsoon

(3) Western Disturbances (4) Tropical Cyclones

**Answer (1)**

**Sol.** The Tamil Nadu coast lies in the rain shadow of the Western Ghats in summer and gets most rain in October–December from the retreating (North-East) monsoon.

183. Which of the following is an essential feature of a democratic setup?

(1) Censorship of press (2) Free and Fair elections

(3) Hereditary succession (4) Single Party Monopoly

**Answer (2)**

**Sol.** Free and fair elections, in which people choose their representatives, are an essential feature of democracy.

184. Which principle states that no one is above the law?

(1) Popular sovereignity (2) Rule of law

(3) Federalism (4) Direct Democracy

**Answer (2)**

**Sol.** The Rule of Law means everyone – including the government – is subject to the same laws.

185. Which article of the Indian constitution provides for amendments to keep the constitution flexible and responsive?

(1) Article 21 (2) Article 356

(3) Article 368 (4) Article 370

**Answer (3)**

**Sol.** Article 368 (Part XX) deals with the power of Parliament to amend the Constitution and the procedure for it.

186. During which period was the National Emergency imposed in India?

(1) 1962 – 64 (2) 1973 – 74

(3) 1975 – 77 (4) 1980 – 82

**Answer (3)**

**Sol.** The internal National Emergency (Article 352) was imposed on 25 June 1975 and lasted till 21 March 1977.

187. Which system is used for electing members to the Lok Sabha and Vidhan Sabha in India?

(1) Proportional representation

(2) First-Past-The-Post (FPTP)

(3) Direct Majority voting

(4) Single transferable vote

**Answer (2)**

**Sol.** Lok Sabha and State Assembly members are elected by the First-Past-The-Post system – the candidate with the highest number of votes in a constituency wins.

188. On which date was the election commission of India (ECI) established?

(1) 26 January 1950 (2) 15 August 1947

(3) 25 January 1950 (4) 26 November 1949

**Answer (3)**

**Sol.** The Election Commission of India was established on 25 January 1950 (celebrated as National Voters' Day), a day before India became a Republic.

189. When did the constitution of India came into force?

(1) 26 November 1949 (2) 15 August 1947

(3) 26 January 1950 (4) 26 January 1952

**Answer (3)**

**Sol.** The Constitution was adopted on 26 November 1949 and came into force on 26 January 1950.

190. Which pillar is often refered as the fourth pillar of Democracy?

(1) Judiciary (2) Police

(3) Media (4) Bureaucracy

**Answer (3)**

**Sol.** The three pillars are the legislature, executive and judiciary; the media is called the fourth pillar of democracy.

191. Who was the chairman of Drafting Committee of the Indian Constitution.

(1) Dr. Rajendra Prasad (2) Jawaharlal Nehru

(3) Dr. B.R. Ambedkar (4) Sardar Vallabhbhai Patel

**Answer (3)**

**Sol.** Dr. B.R. Ambedkar was the Chairman of the Drafting Committee; Dr. Rajendra Prasad was President of the Constituent Assembly.

192. How many fundamental rights are enshrined in the Indian constitution?

(1) 5 (2) 6

(3) 9 (4) 8

**Answer (2)**

**Sol.** The Constitution guarantees six Fundamental Rights: Equality, Freedom, Against Exploitation, Freedom of Religion, Cultural & Educational Rights, and Constitutional Remedies (the Right to Property was removed in 1978).

193. In a parliamentary democracy like India, to whom is Executive accountable?

(1) The Judiciary (2) The Legislature

(3) The Election Commission (4) The Armed Forces

**Answer (2)**

**Sol.** In a parliamentary system the Council of Ministers is collectively responsible to the Lok Sabha, i.e., the executive is accountable to the Legislature.

194. Which of the following is not one of the three key questions of Economics?

(1) What to produce? (2) How to produce?

(3) Why to produce? (4) For whom to produce?

**Answer (3)**

**Sol.** Every economy must answer: What to produce? How to produce? For whom to produce? 'Why to produce?' is not a central problem.

195. An economy producing on its Production Possibility Curve (PPC) wants to Produce more barley. What must happen to wheat production?

(1) Wheat Production increases

(2) Wheat Production decreases

(3) Wheat Production stays unchanged

(4) Wheat Production doubles immediately

**Answer (2)**

**Sol.** On the PPC all resources are fully used, so producing more of one good (barley) is possible only by shifting resources away from the other (wheat) – wheat production decreases (opportunity cost).

196. Rising Cinema Ticket prices lead to fewer theater visits, causing cinema popcorn sales to fall. Cinema tickets and popcorn are :

(1) Substitute goods (2) Independent goods

(3) Complementary goods (4) Public goods

**Answer (3)**

**Sol.** Goods that are used together, so that a price rise of one lowers the demand for the other, are complementary goods.

197. What does the word 'Economics' originally mean derived from Greek?

(1) Money Management (2) Commerce Management

(3) Trade Management (4) Household Management

**Answer (4)**

**Sol.** 'Economics' comes from the Greek word 'oikonomia' (oikos = house, nomos = management), meaning household management.

198. Which of the following is an example of a 'Need'?

(1) Food (2) Vacation

(3) Luxury car (4) Jewellery

**Answer (1)**

**Sol.** Needs are things essential for survival, such as food, clothing and shelter. Vacation, luxury car and jewellery are wants.

199. In which year did India introduce major economic reforms?

(1) 1947 (2) 1966

(3) 1975 (4) 1991

**Answer (4)**

**Sol.** India introduced major economic reforms (liberalisation, privatisation and globalisation – LPG) in 1991.

200. Which of these countries is given as an example of current planned economy?

(1) Japan (2) Taiwan

(3) North Korea (4) South Korea

**Answer (3)**

**Sol.** In a planned (command) economy the government takes economic decisions. North Korea is the example; Japan, Taiwan and South Korea are market-based economies.

❑ ❑ ❑

Aakash Medical|IIT-JEE|Foundations