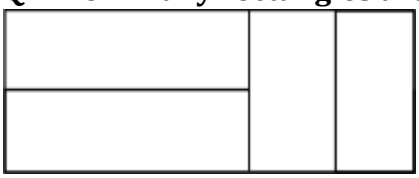
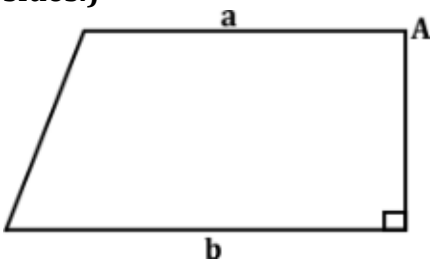
100 Important PYP Based CSIR NET General Aptitude Questions with Detailed Solutions- Part 1

Q1. How many rectangles are there in the given figure?



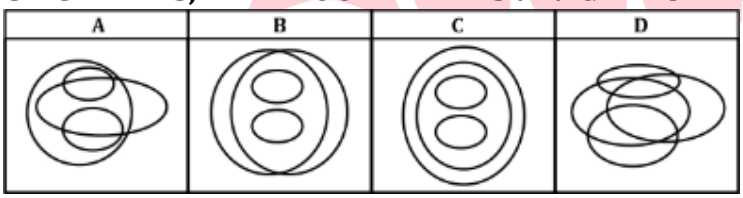
(a) 6
(b) 7
(c) 8
(d) 9

Q2. At what horizontal distance from A should a vertical line be drawn so as to divide the area of the trapezium shown in the figure into two equal parts ? (a and b are lengths of the parallel sides.)



(a) (a + b)/4
(b) (a + b)/3
(c) (a + b)/2
(d) (2a + b)/2

Q3. The correct pictorial representation of the relations among the categories PLAYERS, FEMALE CRICKETERS, MALE FOOTBALLERS and GRADUATES is



(a) A
(b) B
(c) C
(d) D

Q4. A liar always lies and a non-liar, never. If in a group of n persons seated around a round-table everyone calls his/her left neighbor a liar, then
(a) all are liars.
(b) n must be even and every alternate person is a liar
(c) n must be odd and every alternate person is a liar
(d) n must be a prime

Q5. In a four-digit PIN, the third digit is the product of the first two digits and the fourth digit is zero. The number of such PINs is
(a) 42
(b) 41
(c) 40
(d) 39

Q6. A walker takes steps, each of length L, randomly in the directions along east, west, north and south. After four steps its distance from the starting point is d. The probability that d≤3L is
(a) 63/64
(b) 59/64
(c) 57/64
(d) 55/64

Q7. Sections A, B, C and D of a class have 24, 27, 30 and 36 students, respectively. One section has boys and girls who are seated alternately in three rows, such that the first and the last positions in each row are occupied by boys. Which section could this be?
(a) A
(b) B
(c) C
(d) D

Q8. A boy has kites of which all but 9 are red, all but 9 are yellow, all but 9 are green, and all but 9 are blue. How many kites does he have?
(a) 12
(b) 15
(c) 9
(d) 18

Q9. In a round-robin tournament, after each team has played exactly four matches, the number of wins/ losses of 6 participating teams are as follows

Team	Win	Loss
A	4	0
B	0	4
C	3	1
D	2	2
E	0	4
F	3	1

Which of the two teams have certainly NOT played with each other?
(a) A and B
(b) C and F
(c) E and D
(d) B and E

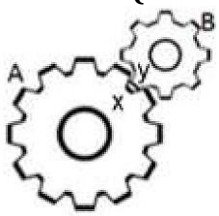
Q10. After 12:00:00 the hour hand and minute hand of a clock will be perpendicular to each other for the first time at

(a) 12:16:21
(b) 12:15:00
(c) 13:22:21
(d) 12:48:08

Q11. On a track of 200 m length, S runs from the starting point and R starts 20 m ahead of S at the same time. Both reach the end of the track at the same time. S runs at a uniform speed of 10 m/s. If R also runs at a uniform speed, what is R's speed (in m/s)?

(a) 9
(b) 10
(c) 12
(d) 8

Q12. A vehicle has tyres of diameter 1 m connected by a shaft directly to gearwheel A which meshes with gearwheel B as shown in the diagram. A has 12 teeth and B has 8. If points x on A and y on B are initially in contact, they will again be in contact after the vehicle has travelled a distance (in meters)



(a) 2π
(b) 3π
(c) 4π
(d) 12π

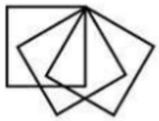
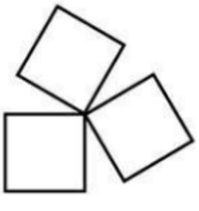
Q13. Starting from the top of a page and pointing downward, an ant moves according to the following commands

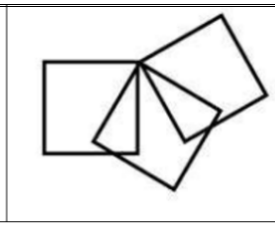
Start

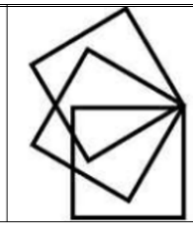
↓

Repeat actions in curly brackets 3 times
Repeat actions in the box 4 times
Move forward 100 units
↓
Turn right by 90 degrees
Turn left by 30 degrees

Of the following paths

A.		B.	
			

C. 

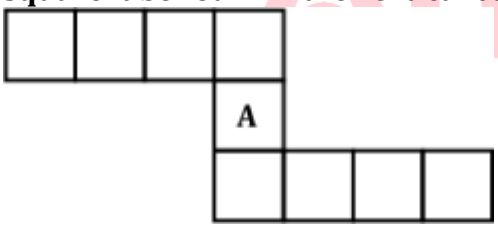
D. 

Which is the correct path of the ant?
(a) A
(b) B
(c) C
(d) D

Q14. I have a brother who is 4 years elder to me, and a sister who was 5 years old when my brother was born. When my sister was born, my father was 24 years old. My mother was 27 years old when I was born. How old (in years) were my father and mother, respectively, when my brother was born?
(a) 29 and 23
(b) 27 and 25
(c) 27 and 23
(d) 29 and 25

Q15. A plant grows by 10% of its height every three months. If the plant's height today is 1 m, its height after one year is the closest to
(a) 1.10 m
(b) 1.21 m
(c) 1.33 m
(d) 1.46 m

Q16. The squares in the following sketch are filled with digits 1 to 9, without any repetition, such that the numbers in the two horizontal rows add up to 20 each. What number appears in the square labelled A in the vertical column?



(a) It cannot be ascertained in the absence of the sum of the numbers in the column
(b) 3
(c) 5
(d) 7

Q17. A beam of square cross-section is to be cut out of a wooden log. Assuming that the log is cylindrical, what approximately is the largest fraction of the wood by volume that can be fruitfully utilised as the beam?
(a) 49%
(b) 64%
(c) 71%
(d) 81%

Q18. Tokens numbered from 1 to 25 are mixed and one token is drawn randomly. What is the probability that the number on the token drawn is divisible either by 4 or by 6?

(a) 8/25
(b) 10/25
(c) 9/25
(d) 12/25

Q19. What is the product of the number of capital letters and the number of small letters of the English alphabet in the following text?

A4;={c8%$56((+B/;,.H&r]]](u];#~K@>83<??/STvx%^(d)L:/<N347)))2;:$+}E$###[w]"..;/89

(a) 17
(b) 37
(c) 53
(d) 63

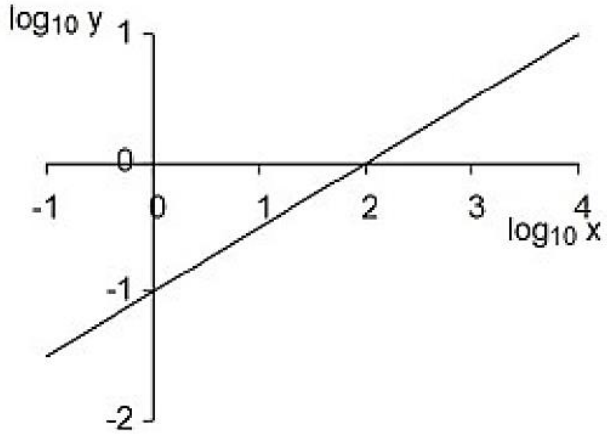
Q20. If one letter each is drawn at random from the words CAUSE and EFFECT, the chance that they are the same is

(a) 1/30
(b) 1/11
(c) 1/10
(d) 2/11

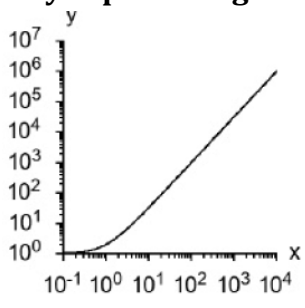
Q21. A person's viral load measured in some unit was 15, 25, 50, 200, 300, 150 and 30 on days 1 to 7, respectively. The maximum relative change took place between 2.0

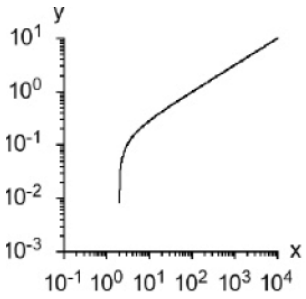
(a) day 3 to day 4.
(b) day 4 to day 5.
(c) day 5 to day 6.
(d) day 6 to day 7.

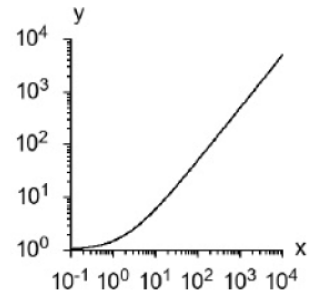
Q22. In the figure $\log_{10}y$ is plotted against $\log_{10}x$

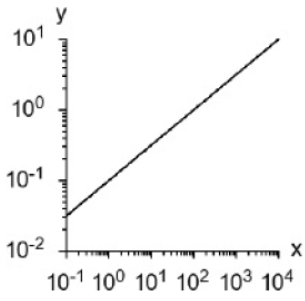


When y is plotted against x, then the plot in the provided range is

(a) 

(b) 

(c) 

(d) 

Q23. In a market, you can buy a mango for Rs.10, a lemon for Re 1 and 8 chillies for Re 1. How many of these items do you need to buy to get a mix of 100 items for exactly Rs. 100?

(a) 6 mangoes, 22 lemons, 72 chillis
(b) 7 mangoes, 21 lemons, 72 chillis
(c) 1 mango, 9 lemons, 80 chillis
(d) 8 mangoes, 12 lemons, 80 chillis

Q24. SCRIPT: DIRECTOR :: ??: CHEF

Choose the most appropriate option from the following to fill the blank

(a) MENU
(b) RECIPE
(c) RESTAURANT
(d) MEAL

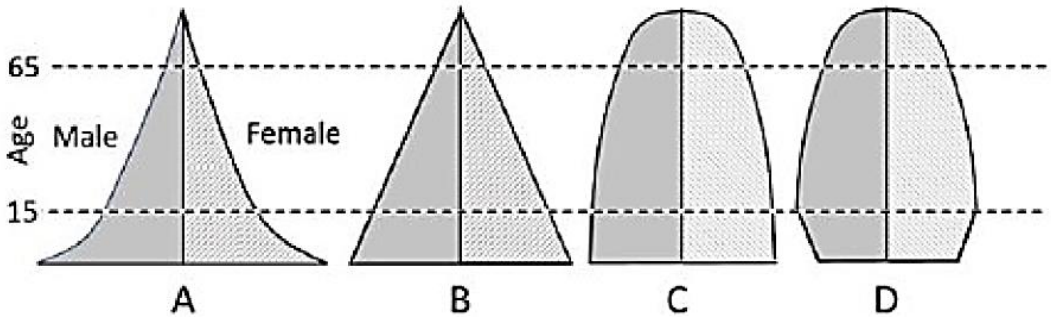
Q25. What is the value of x in the given magic square. (i.e, a square grid in which the sum of the numbers in rows, columns and diagonals is the same)?

x	x-5	8
x+1	y	y-2
2	9	4

(a) 6
(b) 4
(c) 3
(d) 1

Q26. What is the minimum number of pourings needed to get 4 litre of milk from a fully filled 8 litre can, using ungraduated empty 5 and 3 litre cans? No milk should be wasted.
(a) 4
(b) 5
(c) 6
(d) 8

Q27.



The above figures show population pyramids to four countries A, B, C and D. The country showing the most stable population is
(a) C
(b) A
(c) B
(d) D

Q28. For every 5 chocolates that Ramesh gets, Suresh gets 3 chocolates. Geeta gets 3 chocolates for every 2 chocolates that Suresh gets. If Geeta has 18 chocolates, then the sum of chocolates with Ramesh and Suresh is
(a) 16
(b) 30
(c) 32
(d) 38

Q29. The time seen in a mirror placed opposite a numberless analog (with hands) wall clock is 4 h 55 min. What approximately is the correct time?

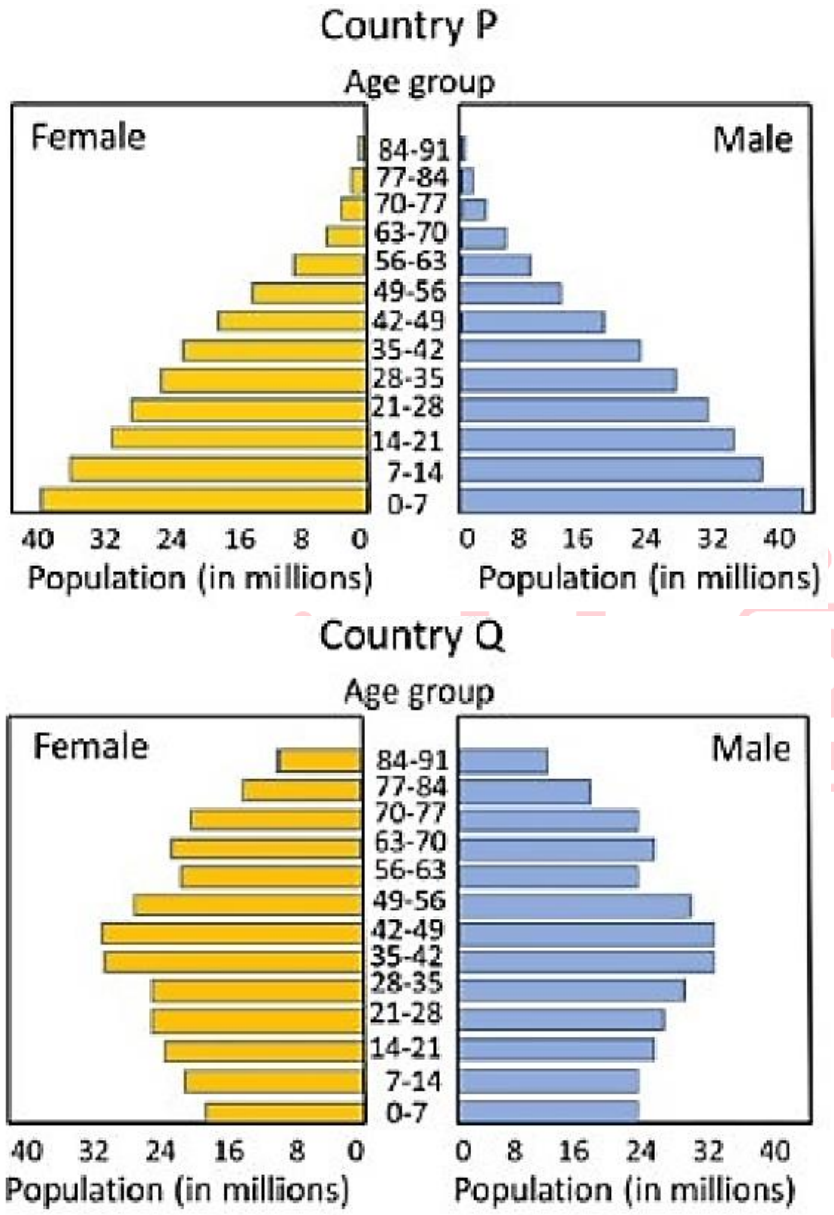
(a) 4 h 55 min

(b) 5 h 05 min

(c) 7 h 05 min

(d) 1 h 35 min

Q30. The figure shows age-wise bar graph of male and female population of two countries. Which one of the following is likely to be true?



(a) Country Q has higher life expectancy

(b) Country P has higher per-capita income

(c) The population of country P is decreasing more rapidly than Q

(d) Country P has better health facilities

Q31. Radius of a sphere is measured with 5% uncertainty. What is the uncertainty in the volume, determined from this radius?
(a) 5%
(b) 6.6%
(c) 125%
(d) 15%

Q32. If a < x < b then for which of the following relations does 0 < y < 1 always hold?
(a) y = (a - x)/(b + a)
(b) y = (x - a)/(b - a)
(c) y = (x - b)/(b - a)
(d) y = (b - x)/(a + b)

Q33. A letter is drawn at random from the following string of letters.
R A M U K Y A J N A S
What is the probability that it is NOT a vowel?
(a) 1/2
(b) 6/11
(c) 7/11
(d) 8/11

Q34. Four children had 27 apples among them. No child had less than 5 apples. If no two children had the same number of apples, then which of the following could NOT be the number of apples a child had?
(a) 5
(b) 6
(c) 8
(d) 9

Q35. All the four entries in column A must be matched with all those in column B. Each correctly matched option gets one mark and no mark is awarded otherwise. Which of the following mark(s) CANNOT be scored?
(a) 3
(b) 1
(c) 2
(d) 4

Q36. A truck from a post office is sent to collect post from a plane as per schedule. The plane lands ahead of schedule, therefore its contents are transported by a rickshaw. The rickshaw meets the truck 30 minutes after the arrival of plane, and the post is transferred. The truck returns to the post office 20 minutes early. How early did the plane arrive? (Assume all transactions are instantaneous.)
(a) 10 minutes
(b) 20 minutes
(c) 30 minutes
(d) 40 minutes

Q37. In 1979, Ramesh's age was the sum of the digits of his year of birth. In 2017, on his birthday, what was his age?
(a) 49
(b) 57
(c) 60
(d) 64

Q38. The sum of the two positive integers is 14. Then their product CANNOT be divisible by
(a) 12
(b) 13
(c) 14
(d) 49

Q39. In how many ways can a menu be made from 5 dishes, if the menu contains either 3 or 4 dishes?
(a) 2
(b) 3
(c) 7
(d) 15

Q40. A bird keeps flying continuously between two trains, that are following each other on a straight track. The train behind is slower than the one ahead by 1.5 km/h. If the speed of the bird is 20 km/h. what distance would the bird cover in an hour?
(a) 20 km
(b) 30 km
(c) 50 km
(d) 60 km

Q41. 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

Q42. 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

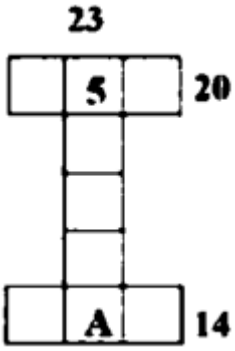
Q43. A random walker takes a step of unit length towards right or left at any discrete time step. Starting from x = 0 at time t = 0, it goes right to reach x = 1 at t = 1. Hereafter if it repeats the direction taken in the previous step with probability p, the probability that it is again at x = 1 at t = 3 is

(a) $1 - p$
(b) $(1 - p)^2$
(c) $2p(1 - p)$
(d) $4p^2(1 - p)$

Q44. 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?

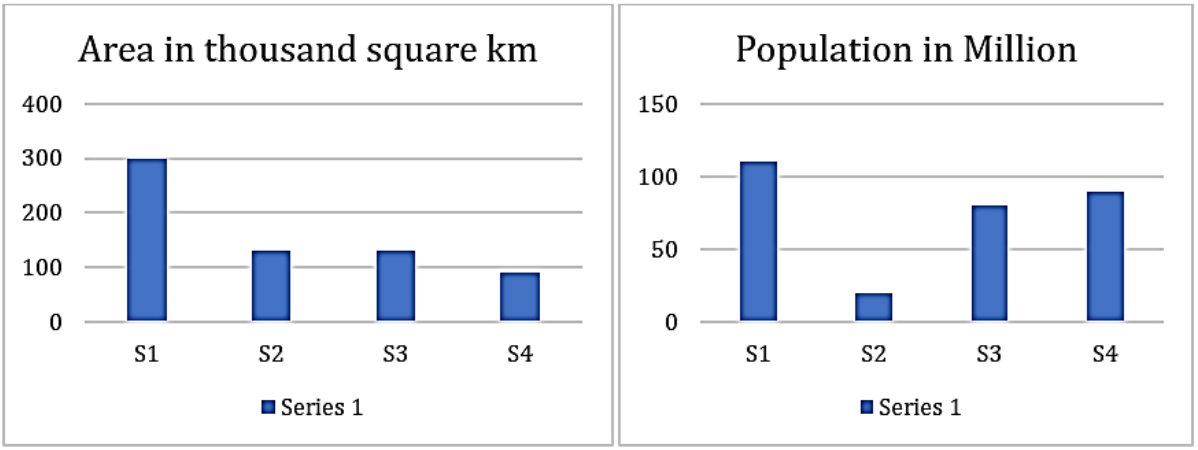
(a) 0.03125
(b) 0.15625
(c) 0.84375
(d) 0.96875

Q45. 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

Q46. Areas and populations of four states S1, S2, S3 and S4 are shown.



Their arrangement in decreasing order of population density would be

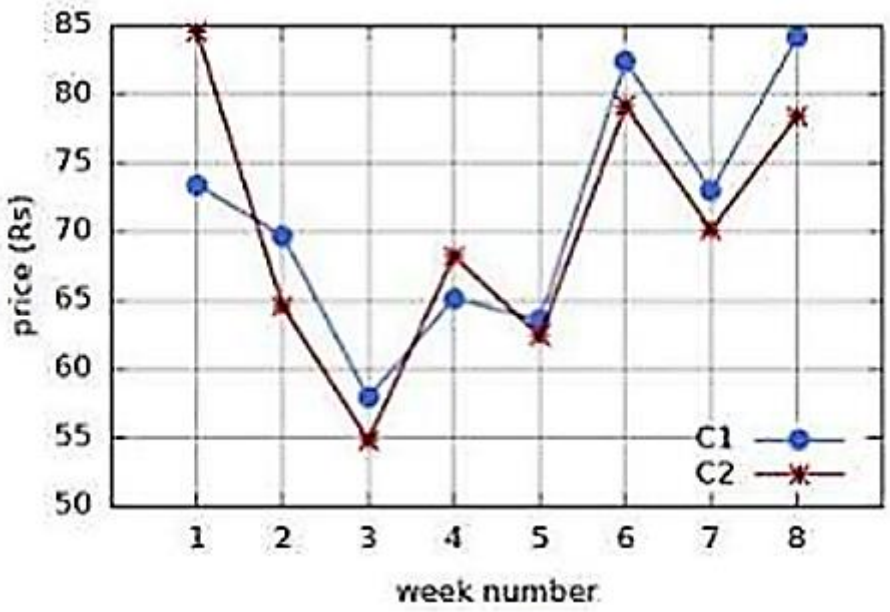
(a) S4, S3, S1, S2

(b) S1, S2, S3, S4

(c) S4, S1, S3, S2

(d) S2, S1, S3, S4

Q47. The two graphs show the change in price of two commodities C1 and C2 over 8 weeks.



Which of the statements is correct?

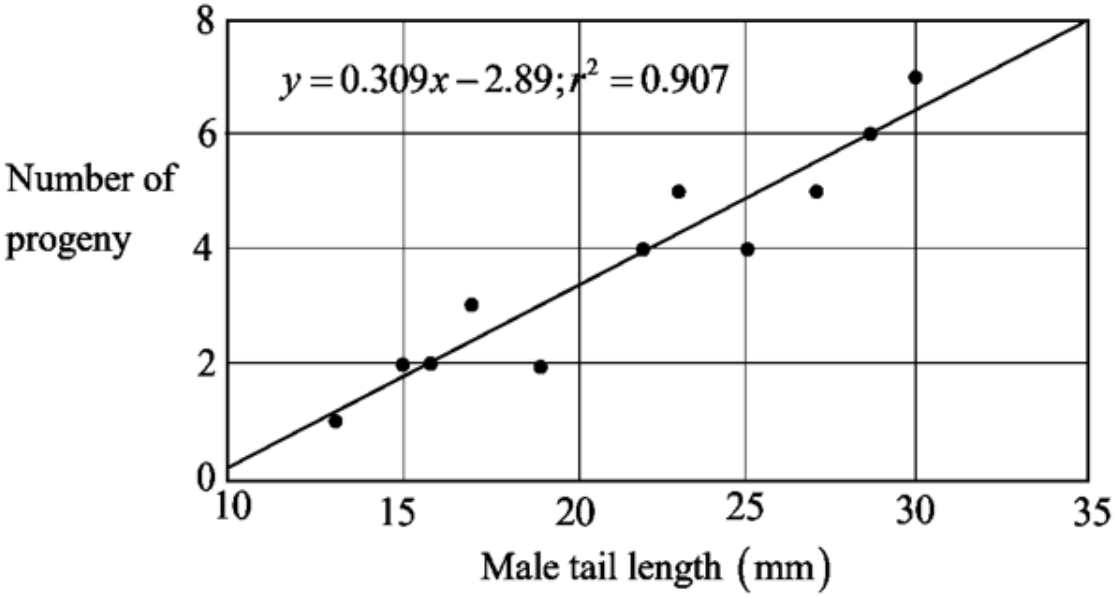
(a) C1 has higher fluctuation than C2

(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

Q48. 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.

Q49. 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

Q50. 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

Q51. How many three-digit numbers exist whose first and last digits add up to 9?
(a) 90
(b) 81
(c) 80
(d) 72

Q52. If 32XY6 is divisible by 9, X and Y being even decimal digits, then X =
(a) 2
(b) 4
(c) 6
(d) 8

Q53. 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

Q54. 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

Q55. 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

Q56. 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

Q57. 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.

Q58. 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

Q59. 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

Q60. 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

Q61. A and B have in their collection, coins of Re. 1. Rs. 2, Rs. 5 and Rs. 10 in the ratio 3:2:2:1 and 4:3:2:1, respectively. The total number of coins with each of them is equal. If the value of coins with A is Rs. 270/-, what is the value of the coins (in Rs) with B?
(a) 213
(b) 240
(c) 275
(d) 282

Q62. If the speed of a train is increased by 20%, its travel time between two stations reduces by 2 hrs. If its speed is decreased by 20%, the travel time increases by 3 hrs. What is the normal duration of travel (in hrs)?
(a) 11.5
(b) 12.0
(c) 13.2
(d) 14.0

Q63. Person A tells the truth 30% of the times and B tells the truth 40% of the times, independently. What is the minimum probability that they would contradict each other?
(a) 0.18
(b) 0.42
(c) 0.46
(d) 0.50

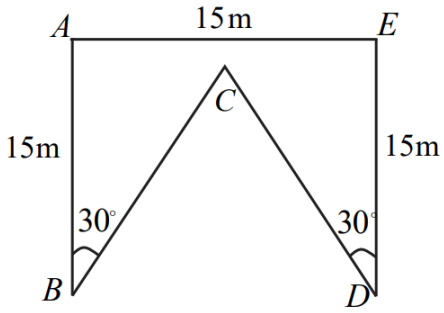
Q64. The standard deviation of data $x_1, x_2, x_3, \ldots\ldots x_n$ **is** σ $(\sigma > 0)$. **Then the standard deviation of data** $3x_1 + 2, 3x_2 + 2, 3x_3 + 2, \ldots\ldots 3x_n + 2$ **is**
(a) 3 σ
(b) σ
(c) 3σ + 2
(d) 9 σ

Q65. A device needs 4 batteries to run. Each battery runs for 2 days. If there are a total of 6 batteries available, what is the maximum number of days for which the device can be run by strategically replacing the batteries till all the batteries are completely drained of power?
(a) 2
(b) 3
(c) 4
(d) 5

Q66. The difference of the squares of two distinct two-digit numbers with one being obtained by reversing the digits of the other is always divisible by
(a) 4
(b) 6
(c) 10
(d) 11

Q67. A person takes loan of Rs. 1,50,000 at a compound interest rate of 10% per annum. If the loan is repaid at the end of the 3rd year, what is the total interest paid?
(a) 145000
(b) 82600
(c) 94600
(d) 49650

Q68. The figure shows map of a field bounded by ABCDE. If AB and DE are perpendicular to AE, then the perimeter of the field is



(a) 70 m
(b) 75 m
(c) 80 m
(d) 85 m

Q69. The ratio of ages of a mother and daughter is 14:1 at present. After four years, the ratio of their ages will be 16:3. What was the age of mother when the daughter was born?
(a) 26
(b) 28
(c) 30
(d) 32

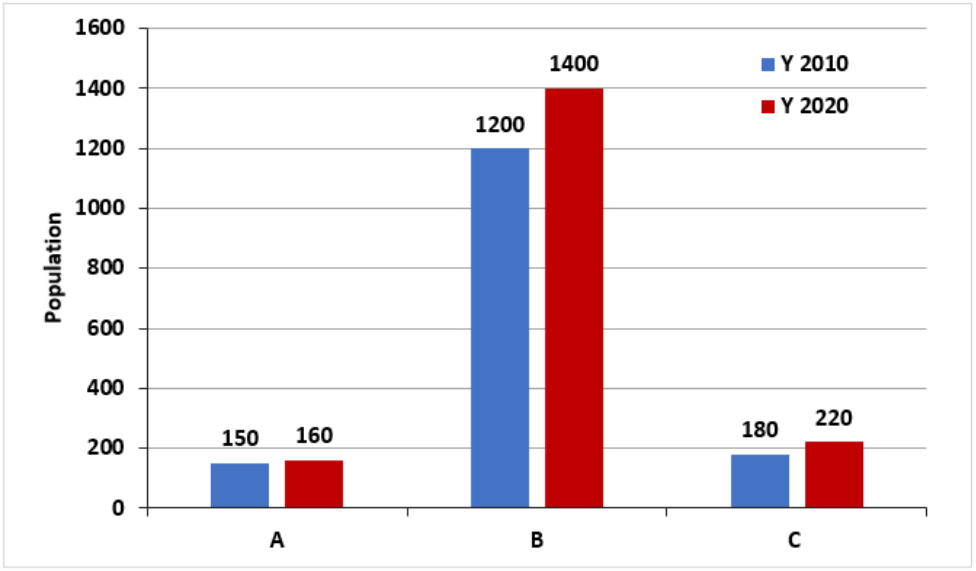
Q70. Five identical incompressible spheres of radius 1 unit are stacked in a pyramidal form as shown in the figure. The height of the structure is

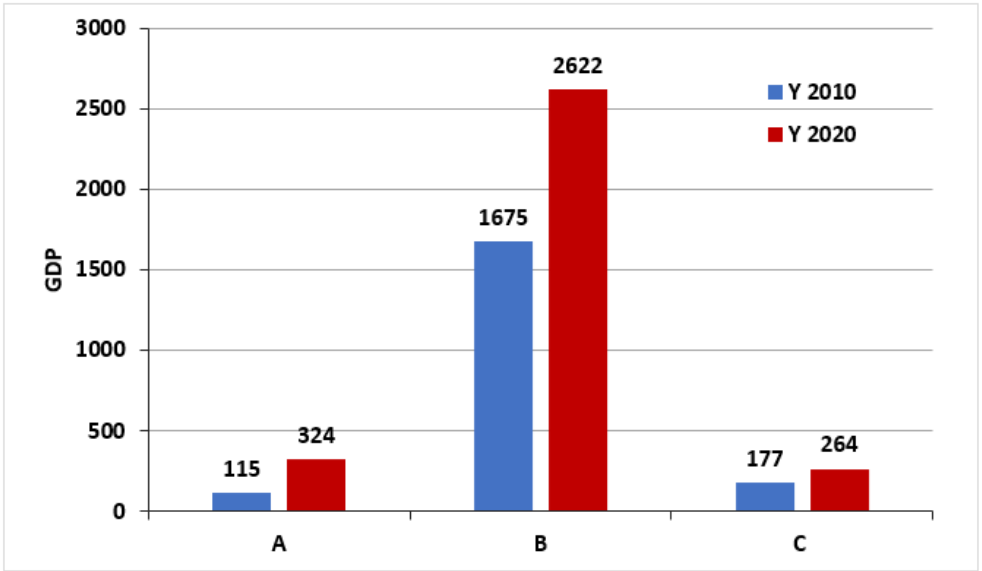
Top view

(a) $2+\sqrt{2}$
(b) $2+\sqrt{3}$
(c) $2+2\sqrt{2/3}$
(d) 3

Q71. In a meeting of 45 people, there are 40 people who know one another and the remaining know no one. People who know each other only hug, whereas those who do not know each other only shake hands. How many handshakes occur in this meeting?
(a) 225
(b) 10
(c) 210
(d) 200

Q72. The populations and gross domestic products (GDP) in billion USD of three countries A, B and C in the years 2010 and 2020 are shown in the two figures below.





In terms of increase in per capita GDP from 2010-2020, their ranking from high to low is

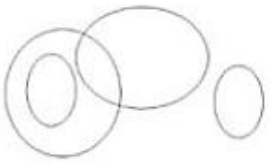
(a) A, B, C

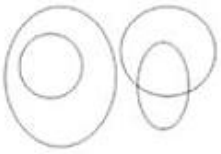
(b) B. A, C

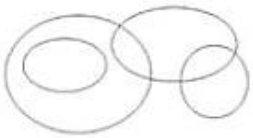
(c) B, C, A

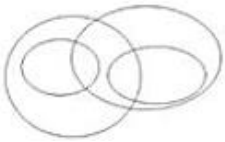
(d) C, A, B,

Q73. An appropriate diagram to depict the relationships between the categories INSECTS, BIRDS, EXTINCT ANIMALS and PEACOCKS is

A. 

B. 

C. 

D. 

(a) A

(b) B

(c) C

(d) D

Q74. Two datasets A and B have the same mean. Which of the following MUST be true?

(a) Sum of the observations in A = Sum of the observations in B.

(b) Mean of the squares of the observations in A = Mean of the squares of the observations in B.

(c) If the two datasets are combined, then the mean of the combined dataset = mean of A + mean of B.

(d) If the two datasets are combined, then the mean of the combined dataset = mean of A.

Q75. In an assembly election, parties A, B, C, D and E won 30, 25, 20, 10 and 4 seats, respectively; whereas independents won 9 seats. Based on this data, which of the following statements must be INCORRECT?

(a) No party has majority.

(b) A and C together can form the government.

(c) A and D with the support of independents get the majority.

(d) An MLA from E can become Chief Minister.

Q76. A boy can escape through a window of size at least 4 feet. The 28 windows of a house are of sizes 2, 3, 4 or 5 feet and their numbers are proportional to their sizes. The number of windows available for the boy to escape through is

(a) 2

(b) 9

(c) 10

(d) 18

Q77. In an examination containing 10 questions, each correct answer is awarded 2 marks, each incorrect answer is awarded-1 and each unattempted question is awarded zero. Which of the following CANNOT be a possible score in the examination?
(a) -9
(b) -7
(c) 17
(d) 19

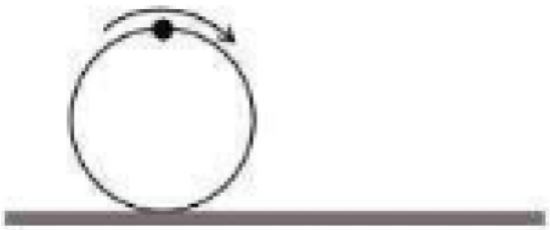
Q78. Consider the following paragraph: THE ABILITY TO REASON ACCURATELY IS VERY IMPORTANT, AS IS THE ABILITY TO COUNT. AS AN EXERCISE IN BOTH, LET US COUNT HOW MANY TIMES THE LETTER "E" OCCURS IN THIS PARAGRAPH. THE CORRECT COUNT IS _____.
Which option when put in the blank in the above paragraph will make the final sentence accurate?
(a) SIXTEEN
(b) SEVENTEEN
(c) EIGHTEEN
(d) NINETEEN

Q79. In a group of 7 people, 4 have exactly one sibling and 3 have exactly two siblings. Two people selected at random from the group, what is the probability that they are NOT siblings?
(a) 5/21
(b) 16/21
(c) 3/7
(d) 4/7

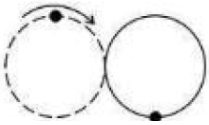
Q80. On a spherical globe of radius 10 units, the distance between A and B is 25 units. If it is uniformly expanded to a globe of radius 50 units, the distance between them in the same units would be
(a) 75
(b) 125
(c) 150
(d) 625

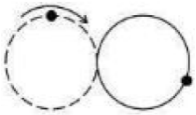
Q81. A group of 540 persons is to be seated row wise such that the number of persons in each row is 4 less than in the previous row. Which of the following number of rows is not possible?
(a) 5
(b) 6
(c) 8
(d) 9

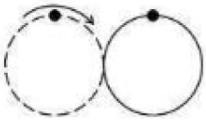
Q82. A ring is rolling along a straight track as shown. The topmost point of the ring is marked.



Which of the diagrams shows a possible position of the ring at a later time, relative to the original position (shown by dashed circle)?

A. 

B. 

C. 

D. 

(a) A
(b) B
(c) C
(d) D

Q83. An experiment consists of tossing four fair coins independently. The outcome of the experiment is considered favourable, if the number of heads is greater than the number of tails. The probability of a favourable outcome from a single experiment is
(a) 1/2
(b) 3/16
(c) 5/16
(d) 3/4

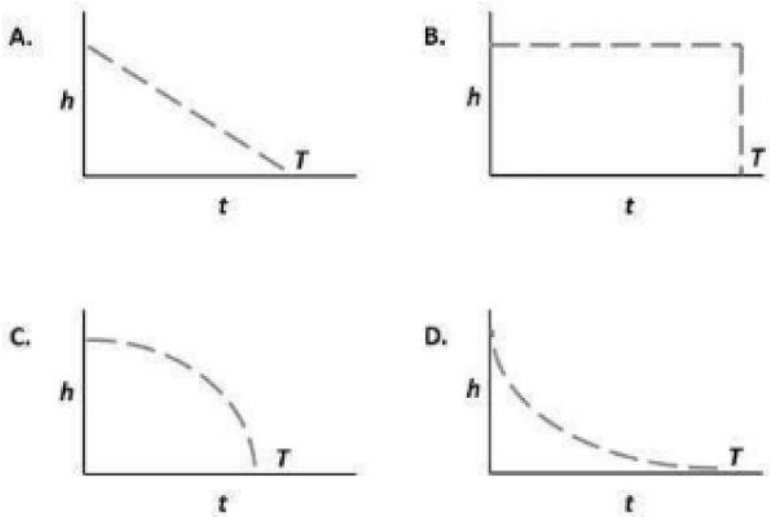
Q84. In a class, among the boys B is taller than 10 boys, but shorter than 13 others. Among girls, G is taller than 6 girls, but shorter than 8 others. Two boys and three girls are shorter than B, but taller than G. If no two persons have the same height, then in the entire class, B is
(a) taller than 21, but shorter than 18 others
(b) taller than 20, but shorter than 18 others
(c) taller than 20, but shorter than 19 others
(d) taller than 19, but shorter than 19 others

Q85. On a one-way road, to demarcate 4 lanes, line segments of 3.5 m length are painted with gaps of 3.5 m along the length of the road. What is the total length of the painted lines (in m) over a 350 m stretch of the road?
(a) 300
(b) 400
(c) 525
(d) 700

Q86. An athlete running on a track falls short of the finish line by 10 m when she runs at a constant speed for a given time. If she increases her speed by 20%, she overshoots by 20 m in the same time. What is the length of the track?

(a) 134 m
(b) 156 m
(c) 160 m
(d) 164 m

Q87. A cylindrical container has a tiny hole at the bottom. The container is initially filled to its brim with water. If T is the time taken for it to be completely emptied, the graph of height of the water column as a function of time is closest to



(a) A
(b) B
(c) C
(d) D

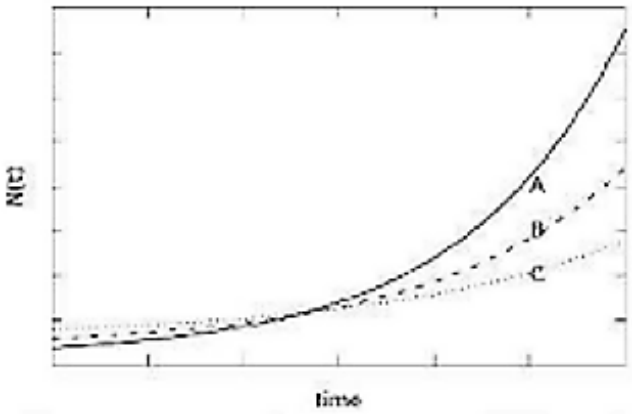
Q88. The length of bristle mouth fish is uniformly distributed between 2 and 4 inches. If a fisherman randomly catches 5 bristle mouth fishes, what is the probability that at least one of them will be 3 inches or longer?

(a) 0.03125
(b) 0.15625
(c) 0.84375
(d) 0.96875

Q89. In a class of 30 students, those with roll numbers 1 to 20 secure an average of 72% marks, while those with roll numbers 11 to 30 secure an average of 75% marks. If the average marks of the entire class are 70%, what is the average marks of roll numbers 11 to 20 (in percent)?

(a) 68
(b) 74
(c) 78
(d) 84

Q90. The graph shows the growth curves for three independent populations (A, B, and C). The growth model for each of these populations is
$N(t) = N_0e^{rt}$
where N(t) is the population at time t, No is the initial population and r is the per capita growth rate.



If r_A, r_B, r_C are the intrinsic growth rates of populations A, B, and C respectively, which of these statements is true?
(a) $r_A = r_B = r_C$
(b) $r_A > r_B = r_C$
(c) $r_A = r_B > r_C$
(d) $r_A > r_B > r_C$

Q91. Among finches males and females have one of the three colours - Red, Blue or Yellow - on their head. During the mating season, males and females pair up randomly. For a large population of finches with 50% red, 30% blue and 20% yellow coloured individuals among both males and females, what is the expected number of pairings between red males and yellow females if the total number of pairs formed is 10000?
(a) 2500
(b) 1500
(c) 1000
(d) 600

Q92. In a district, every second teacher who teaches chemistry also teaches physics and every third teacher who teaches physics also teaches chemistry. The ratio of teachers who only teach chemistry to those who only teach physics is
(a) 3:2
(b) 1:2
(c) 2:3
(d) 2:1

Q93. The son was born when his mother was 28 years old. The father is older to the mother by 4 years. If the current ages of the father and mother are in the ratio 9:8, what is the current age (in years) of the son?
(a) 2
(b) 3
(c) 4
(d) 5

Q94. By selling two items at the same price, a person gains 20% on one item and loses 20% on the other. Then over all

(a) he neither loses nor gains.
(b) he loses 5%.
(c) he loses 4%.
(d) he gains 4%.

Q95. Rajesh went to Sunil's house situated 1km North-East of his house. From there, he went to Arjun's house that is situated 707 m South of Sunil's house. What is the distance between Rajesh's current location and his house (to the nearest metre)?

(a) 800 m
(b) 600 m
(c) 707 m
(d) 1000 m

Q96. The diagrams show the distribution of trees in two forest patches A and B. Each patch is divided into smaller "quadrats". The number of trees in each quadrat is shown. Which one of the following statements about the means

(μ)

and standard deviations

(σ)

of the numbers of trees in the two patches is true?

Forest Patch *A*

1	1	1	1	1
1	1	1	1	1
1	1	1	1	1
1	1	1	1	1
1	1	1	1	1

Forest Patch *B*

2	0	0	0	0
0	0	0	0	0
0	0	0	7	0
0	10	0	0	0
0	0	0	0	6

(a) $\mu(A) = \mu(B), \sigma(A) = \sigma(B)$
(b) $\mu(A) > \mu(B), \sigma(A) > \sigma(B)$
(c) $\mu(A) = \mu(B), \sigma(A) < \sigma(B)$
(d) $\mu(A) < \mu(B), \sigma(A) < \sigma(B)$

Q97. What would be the minimum number of notes for Rs 4849 if notes are available only in denominations of Rs 2, 5, 20, 50, 500?

(a) 19
(b) 20
(c) 21
(d) 22

Q98. Out of a class of 100 students who can speak at least one of English or Hindi, 41 students can speak English. 21 students can speak both English and Hindi. How many students can speak Hindi?
(a) 58
(b) 80
(c) 59
(d) 38

Q99. The hypotenuse of a right triangle, whose sides are integers, is 17 cm. Its area in sq.cm is
(a) not calculable due to insufficient data
(b) 60
(c) 68
(d) 225

Q100. Choose the best alternative:
CURRY is to SPICE as _____ is to COLOUR.
(a) CANVAS
(b) PAINTING
(c) BRUSH
(d) BRIGHTNESS

Solutions

S1. Ans.(c)
Sol. The large outer rectangle itself counts as 1 rectangle.
Smaller rectangles are formed by the internal divisions:
The grid inside the larger rectangle has horizontal and vertical lines that intersect.
There are 3 vertical lines and 2 horizontal lines, creating several combinations of rectangles.
Counting rectangles of different sizes:
Smallest rectangles: Each 1x1 section inside the figure counts as a rectangle. There are **4 small rectangles**.
Larger rectangles: We can count other rectangles formed by combining the smaller ones:
2 rectangles formed by combining two adjacent small rectangles horizontally.
2 rectangles formed by combining two small rectangles vertically.
1 large rectangle: The entire figure itself counts as 1 large rectangle.
Total Rectangles:
4 small rectangles (1x1).
2 larger rectangles formed by combining two small rectangles horizontally.
2 larger rectangles formed by combining two small rectangles vertically.
1 large rectangle (the entire figure).
Thus, the total number of rectangles is **8**.
Final Answer: 8.

S2. Ans.(a)

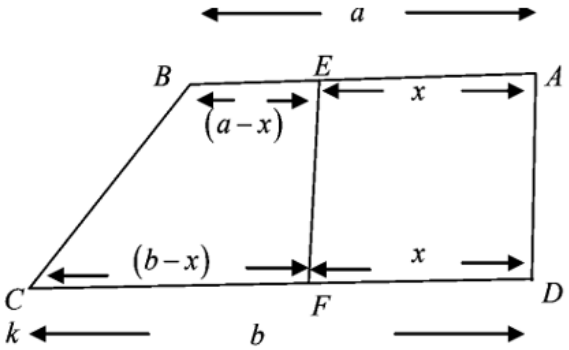
Sol. Solution:

Let the vertical line be drawn at a distance x from A.

EA = x = FDE

BE = a−x

CF = b−x



The area of trapezium EBCF equals the area of trapezium AEFD:

Area formula: (1/2) × EF × ((a - x) + (b - x)) = EF × x

Simplify the equation: (1/2) × EF × (a + b - 2x) = EF × x

a + b - 2x = 2x

4x = a + b

Solve for x: x = (a + b) / 4

Final Answer: The vertical line should be drawn at a distance **(a + b) / 4** from A.

S3. Ans.(a)

Sol. Concept:

A **Venn diagram** is a type of chart with **overlapping circles that indicates how much different groups have in common.** A way to visualize relationships between different groups, known as sets.

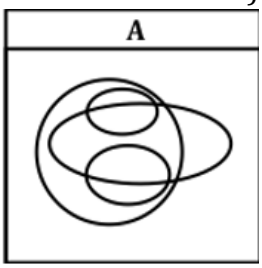
Here's a basic way how a Venn Diagram works:

- Each **set of elements or event is represented as a circle or other shape.**
- **If elements belong to more than one set, the shapes are overlapped.** For example, if you have two sets A and B, then the intersection of these sets (those elements that belong to both A and B) are represented by the area where the circles overlap.
- Sometimes, a **rectangle is drawn around the whole diagram to represent the universal set,** which includes all the elements under consideration.
- The **areas where circles interact or overlap represent all the possible logical relations between the sets.**

Solution:

- Draw a large circle and label it as "PLAYERS." This circle contains all individuals who fall into the category of playing any type of sport.
- Within the "PLAYERS" circle, draw two smaller circles that don't intersect and label one as "FEMALE CRICKETERS" and the other as "MALE FOOTBALLERS". The fact that these two circles are mutually exclusive represents the fact that a person cannot be both a female cricketer and a male footballer.

- Finally, draw a separate large circle intersecting with the "PLAYERS" circle and label it as "GRADUATES". This circle will also overlap the "FEMALE CRICKETERS" and "MALE FOOTBALLERS" circles (because they are subsets of the "PLAYERS" circle).



S4. Ans.(b)
Sol. Solution:
Given the information that a liar always lies and a non-liar never lies, let's analyze the options:
"All are liars": This statement contradicts the information given because **if all are liars, they would call their left neighbor a liar, but that would mean the person on their left is telling the truth,** which is inconsistent.
"n must be even, and every alternate person is a liar": **This option is correct**. If n is even and every alternate person is a liar, then it can work without logical contradictions. For example:
Person 1 (on the far left) is a truth-teller. Person 2 (to the right of Person 1) is a liar. Person 3 (to the right of Person 2) is a truth-teller. Person 4 (to the right of Person 3) is a liar.
This pattern continues around the table. In this setup, every alternate person is a liar, which means they will always lie and call their left neighbor a liar, while the truth-tellers will always tell the truth and call their left neighbor a liar. There are no logical contradictions in this arrangement.
"n must be odd, and every alternate person is a liar": This option does not work because if n is odd, then there will be an even number of people between any two liars, which means there will be a truth-teller in between. This breaks the condition that every alternate person is a liar.
"n must be a prime": This option does not necessarily hold true. For example, you can have a group of 6 people where every alternate person is a liar, and this satisfies the conditions without n being a prime number.
Conclusion:-
So, **the correct answer is option b: "n must be even, and every alternate person is a liar."**

S5. Ans.(a)
Sol. Given: In a four-digit PIN, the third digit is the product of the first two digits and the fourth digit is zero.
Solution:
Let the four digit number is abcd.
Now according to the question, we have -
d = 0 and c = ab
Now we **choose the values for a and b** and make sure that the product of the **numbers is one digit number.**
Now make cases-
when a = 0 then choices for b = 0,1,2,.....9
this case gives you total 10 numbers

when a = 1 then choices for b = 0,1,2,.....9
this case gives you total 10 numbers
when a = 2 then choices for b = 0,1,2,.....4
this case gives you total 5 numbers
when a = 3 then choices for b = 0,1,2,.....3
this case gives you total 4 numbers
when a = 4 then choices for b = 0,1,2
this case gives you total 3 numbers
when a = 5 then choices for b = 0,1,
this case gives you total 2 numbers
when a = 6 then choices for b = 0,1
this case gives you total 2 numbers
when a = 7 then choices for b = 0,1
this case gives you total 2 numbers
when a = 8 then choices for b = 0,1
this case gives you total 2 numbers
when a = 9 then choices for b = 0,1
this case gives you total 2 numbers
total numbers - 42
Hence option (a) is correct.

S6. Ans.(d)
Sol. Solution:
Let's proceed by understanding what could be the possible outcomes after N steps.
If one-step is taken, the person could end up anywhere (East, West, South, North) so **d = L.**
If two-steps are taken, the person could move two steps back to the origin (move East then West, or move North then South), move a step East or West and then a step North or South, or move two steps in the same direction.
Therefore, the possible distances are **0L, $\sqrt{2}$L, or 2L**.
If three-steps are taken, the person could return to the origin (e.g., East, West, North), or make several other moves producing distances of **$\sqrt{2}$L, $\sqrt{3}$L, $\sqrt{5}$L**.
If four-steps are taken, there are more possibilities. In this problem, we are only interested in the possibilities where the total displacement vector's magnitude d ≤ 3L.
Considering all possible combinations of moves in four steps, we get four situations: Four moves in the same direction (e.g., North, North, North, North).
This leads to a distance of 4L.
Three moves in the same direction and one move in a different plane (e.g., North, North, North, East).
This can lead to distances of **$\sqrt{10}$L, $\sqrt{2}$L**.
Two pairs move in the same direction but in different planes (e.g., North, North, East, East). This leads to a distance of **2$\sqrt{2}$L**.
Two moves in one direction and the other two moves in two different directions (e.g., North, North, East, South). This can give **$\sqrt{5}$L, 1L, $\sqrt{2}$L**.
Four moves in four different directions (e.g., North, South, East, West). This leads to a distance of 0L.
From the above, we can notice that distances greater than **3L** (i.e., **$\sqrt{5}$L, $\sqrt{10}$L and 4L**) can only occur in situations 1 and 2.

So, let's calculate the probabilities.
The total number of outcomes in this situation is 4 (one for each direction). There are 4×4 ways of choosing which direction to go three times, and 3 ways of choosing the direction for the fourth step. This gives a total of 48 outcomes.
But only 16 of these result in a distance of $\sqrt{2}$L (8 of the form NNNE and 8 of the form NNNW), while the remaining 32 results in a distance greater than 3L.
This situation always results in a distance less than or equal to 3L. This situation always results in a distance less than or equal to 3L. This situation always results in a distance less than or equal to 3L.
Finally, the total number of outcomes is 44 = 256, and the number of undesired outcomes (where d > 3L) is **4 + 32 = 36**.
This gives us a probability
$P(d \leq 3L) = 1 - P(d > 3L) = 1 - \frac{36}{256} = \frac{220}{256} = \frac{55}{64}$.

S7. Ans.(b)
Sol. Given:
1. Sections A, B, C, and D have 24, 27, 30, and 36 students, respectively.
2. In the section we're looking for:
- Boys and girls are seated alternately in three rows.
- The first and last positions in each row are occupied by boys.

Analysis:
1. Since boys and girls are seated alternately, each row must start and end with boys, meaning each row must contain an **odd number of seats** (so that boys occupy the first and last positions).
2. Let's assume each row has an odd number of seats, say x, where x is odd.
3. Since there are three rows, the total number of seats in that section would be 3×x
4. We need to check which section has a total number of students that is a multiple of 3 and can be arranged with an odd number of seats in each row.

Checking Each Section:
- **Section A** has 24 students.
- If divided into 3 rows, each row would have 24 ÷ 3 = 8 seats (even number). So, Section A does not meet the condition.
- **Section B** has 27 students.
- If divided into 3 rows, each row would have 27 ÷ 3 = 9 seats (odd number). This satisfies the condition of an odd number of seats per row, where boys can sit at the first and last positions.
- **Section C** has 30 students.
- If divided into 3 rows, each row would have 30 ÷ 3 = 10 seats (even number). So, Section C does not meet the condition.
- **Section D** has 36 students.
- If divided into 3 rows, each row would have 36 ÷ 3 = 12 seats (even number). So, Section D does not meet the condition.

Conclusion:
The only section that meets the criteria is **Section B**, with 27 students, where each row can have 9 seats, allowing boys to occupy the first and last positions in each row.
Answer:
The correct answer is **Section B**.

S8. Ans.(a)
Sol. Given:
1. The boy has kites of different colors: red, yellow, green, and blue.
2. All but 9 of the kites are red.
3. All but 9 of the kites are yellow.
4. All but 9 of the kites are green.
5. All but 9 of the kites are blue.

This means that the total number of kites minus the number of kites of each color is 9.
Let the total number of kites be "N."

- The number of red kites is "N - 9."
- The number of yellow kites is "N - 9."
- The number of green kites is "N - 9."
- The number of blue kites is "N - 9."

Approach:
Each color (red, yellow, green, and blue) has "N - 9" kites, but there are only "N" kites in total, so there is exactly one kite of each color that is not included in the count for each color.
Thus, the total number of kites is 9 plus one kite for each color (one red, one yellow, one green, and one blue). Therefore, the total number of kites is:
N = 9 + 3 = 12.
Final Answer:
The boy has **12 kites**.
Correct Option: (a) 12.

S9. Ans.(d)
Sol. Given:
1. It's a round-robin tournament with each team playing exactly four matches.
2. There are 6 teams (A, B, C, D, E, F) with the following win/loss records:

- Team A: 4 wins, 0 losses
- Team B: 0 wins, 4 losses
- Team C: 3 wins, 1 loss
- Team D: 2 wins, 2 losses
- Team E: 0 wins, 4 losses
- Team F: 3 wins, 1 loss

Observations:
1. **Team A** has 4 wins and 0 losses, which means Team A won all of its matches.
2. **Team B** and **Team E** both have 0 wins and 4 losses, which means they lost all of their matches.
3. Since each team plays exactly four matches, any team with 0 wins could not have played against any other team with 0 wins (because they would each need to lose that match, which is impossible in a single game).

Conclusion:
Since **Team B** and **Team E** both lost all of their matches, it's certain that **B and E did not play against each other**. If they had, one of them would have at least one win.
Answer:
The correct answer is: **(d) B and E**

S10. Ans.(a)
Sol. Given:
After 12:00:00 the hour hand and minute hand of a clock will be perpendicular to each other for the first time
Solution:
After 12:00, the first time the hour and minute hands of a clock are perpendicular, or form a 90-degree angle, is at approximately 1:05.
Let me explain why that is:
Both the hour and the minute hand start off at 12:00 (with "0" degrees between them).
Every minute, the minute hand moves 6 degrees (as 360 (full circle) divided by 60 (minutes) equals 6 (degrees every minute)), and the hour hand moves 0.5 degrees (as 360 (full circle) divided by 12 (hours) divided by 60 (minutes) yields 0.5 (degrees every minute)).
So, for the angle between both hands to be 90 degrees, the difference in their positions must be 90 degrees. If "M" stands for the number of minutes passed, the equation is:
6M - 0.5M = 90
Solving for M (the number of minutes after 12:00), we get:
5.5M = 90 --> M = 90/5.5 ≈ 16.36 minutes,
which is close to 16 minutes and 21 seconds.

S11. Ans.(a)
Sol. Concept:
In a mathematical context, you can calculate uniform speed by dividing the total distance traveled by the total time it took to travel that distance. The formula is:
Speed = Distance / Time
Solution:
S starts on the starting line and runs the full length of the **200m track at a speed of 10m/s**.
Therefore, the time S takes to finish the race can be calculated by dividing distance over speed:
t = Distance / Speed
t = 200m / 10m/s
t = 20 seconds
During this time, **R runs from a point 20m** in front of the starting line to the finish line.
This means **R runs a distance of (200m - 20m) = 180m.**
Since **the time taken by R is the same as S,** we can use this to find R's speed:
Speed = Distance / Time Speed
180m / 20s Speed = **9 m/s**
Conclusion:
So, **R's speed is 9 m/s**

S12. Ans.(a)
Sol. Given:
1. Diameter of the tyre = 1 meter.
2. Gearwheel A has 12 teeth, and Gearwheel B has 8 teeth.
3. Gearwheel A meshes with Gearwheel B.
4. Points "x" on A and "y" on B are initially in contact.
We need to determine the distance traveled by the vehicle when "x" and "y" are in contact again.

Concept/Formula Used:

1. **Teeth Ratio for Contact Alignment:** To realign points "x" and "y", both gearwheels need to complete an integer number of revolutions simultaneously. This happens when the number of revolutions corresponds to the least common multiple (LCM) of their teeth.
2. **Circumference of the Tyre:** The tyre rotates as the vehicle moves forward. The distance traveled by the vehicle equals the circumference of the tyre multiplied by the number of tyre revolutions.
3. **Link Between Tyre and Gearwheel A:** The tyre's rotation is directly proportional to the rotation of Gearwheel A since they are connected by the same shaft.
4. **Distance Traveled = Circumference × Number of Tyre Revolutions.**

Solution:

LCM of Teeth Counts: Gearwheel A has 12 teeth, and Gearwheel B has 8 teeth. The least common multiple (LCM) of 12 and 8 is 24. This means Gearwheel A must complete 2 revolutions (24 ÷ 12), and Gearwheel B must complete 3 revolutions (24 ÷ 8) for "x" and "y" to realign.

Circumference of the Tyre: The circumference of the tyre = π × diameter = π × 1 = π meters.

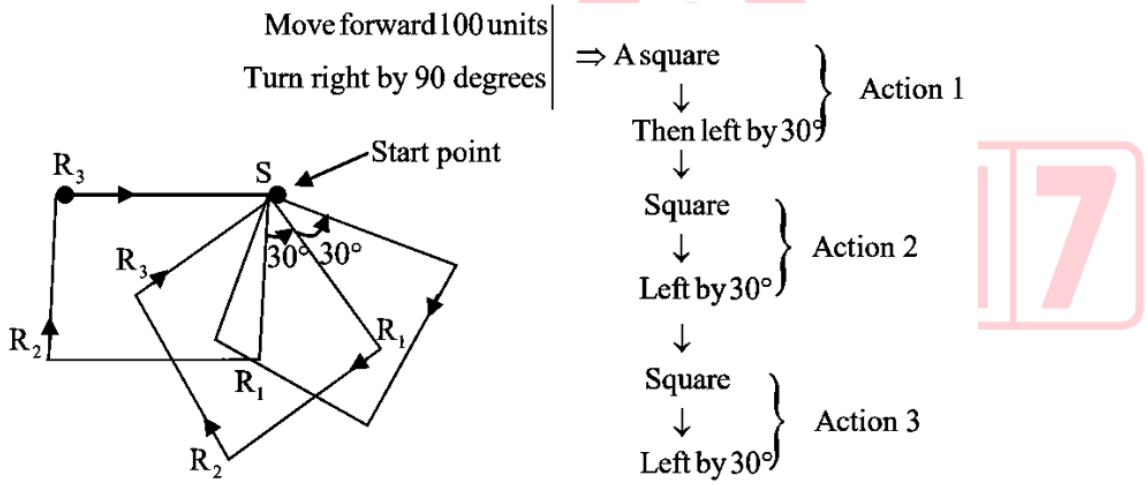
Tyre Revolutions Required: Gearwheel A completes 1 revolution for every tyre revolution. Since Gearwheel A completes 2 revolutions, the tyre also completes 2 revolutions.

Distance Traveled by the Vehicle: Distance traveled = Circumference of the tyre × Number of tyre revolutions. Distance traveled = π × 2 = 2π meters.

Final Answer: The vehicle will travel **2π meters**. **Correct option: (a) 2π.**

S13. Ans.(a)

Sol. Solution:



From the diagrams provided, the correct path that matches this description is **option (a)**.

S14. Ans.(a)

Sol. Given:

1. My brother is 4 years older than me. Let my age be "x" and my brother's age is "x + 4."
2. My sister was 5 years old when my brother was born. This means my sister is 5 years older than my brother. Therefore, my sister's age is "x + 4 + 5 = x + 9."
3. When my sister was born, my father was 24 years old. So, my father's age is "my sister's age + 24," which is "x + 9 + 24 = x + 33."
4. My mother was 27 years old when I was born. So, my mother's age is "my age + 27," which is "x + 27."

To Find:
The ages of my father and mother when my brother was born. When my brother was born, I was 4 years younger than him, i.e., "x - 4."
Solution:
1. **Father's Age When My Brother Was Born:** My father's age when I was "x" is "x + 33." When my brother was born (4 years earlier), my father's age was: "x + 33 - 4 = x + 29."
2. **Mother's Age When My Brother Was Born:** My mother's age when I was "x" is "x + 27." When my brother was born (4 years earlier), my mother's age was: "x + 27 - 4 = x + 23."

Final Answer:
The ages of my father and mother when my brother was born are **29 and 23**, respectively.
Correct Option: (a) 29 and 23.

S15. Ans.(d)
Sol. Concept:
In the context of plant growth, **"successive increment"** typically refers to **the gradual and consecutive increases in various aspects of a plant's development over time.**
It's a form of compound growth, where the increase is applied to the original amount as well as any already accumulated increases
Solution:
If the **plant grows by 10%** of its height **every three months,** then it means the **plant's height after every three months will be 1.1 times** its height at the beginning of those three months. So, after one year (which consists of 4 quarters), the plant's height can be calculated as follows:
After the first quarter: 1 m * 1.1 = 1.1 m
After the second quarter: 1.1 m * 1.1 = 1.21 m
After the third quarter: 1.21 m * 1.1 = 1.331 m
After the fourth quarter: 1.331 m * 1.1 = **1.4641 m**
Conclusion:
So, approximately the plant's **height will be 1.464 m after one year.**

S16. Ans.(c)
Sol. Given:
The squares are filled with digits from 1 to 9, without any repetition.
The two horizontal rows each sum up to 20.
We need to determine the number that appears in the square labeled "A" in the vertical column.
Concept:
This problem involves using the properties of unique numbers from 1 to 9. The key points to consider:
The sum of numbers from 1 to 9 is 45.
If each row sums to 20, then the two horizontal rows together sum to 20 + 20 = 40.
This means the remaining number in the column (which is "A") must complete the total sum to 45.
Solution:
Calculate the total sum of numbers from 1 to 9:
1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 = 45
Since the sum of the two horizontal rows is given as 20 each, the combined sum of both rows is: 20 + 20 = 40
To find the number in the square labeled "A," subtract the sum of the horizontal rows from the total sum of numbers 1 to 9:
45 - 40 = 5
Therefore, the number in the square labeled "A" must be 5.
Answer:
The correct answer is: (c) 5

S17. Ans.(b)

Sol. Given:

- A wooden log with a cylindrical shape.
- A beam with a square cross-section is to be cut from the cylindrical log.
- We need to determine the largest fraction of the wood by volume that can be fruitfully utilized as the beam.

Approach:

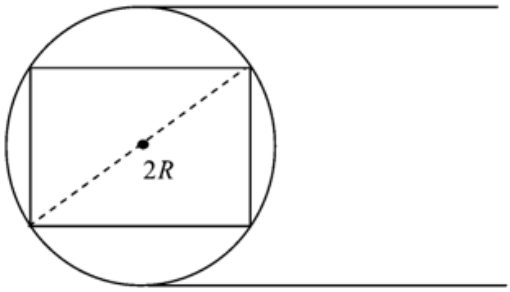
To maximize the volume of the square cross-section beam that can be cut from the cylindrical log, we need to ensure that the square fits perfectly within the circular cross-section of the cylinder.

Consider the geometry:

The log has a circular cross-section with radius "r."

The beam has a square cross-section with side length "s."

Square inscribed in a circle:



For the largest square that fits inside the circle, the diagonal of the square is equal to the diameter of the circle.

The diagonal of the square is given by: Diagonal =

$$d = \sqrt{s^2 + s^2} = \sqrt{2} \cdot s.$$

The diagonal of the square must be equal to the diameter of the circle, which is 2r. Therefore, $\sqrt{2} \times s = 2r$, and solving for "s" gives: $s = r\sqrt{2}$.

Volume of the cylindrical log:

The volume of the cylinder is: Volume of cylinder = $\pi \times r^2 \times h$, where "h" is the height of the cylinder.

Volume of the square beam:

The volume of the square beam is: Volume of beam =

$$V_{\text{beam}} = s^2 h = (r\sqrt{2})^2 h = 2r^2 h.$$

Fraction of the wood utilized:

The fraction of the wood used by the beam is the ratio of the volume of the beam to the volume of the cylinder: Fraction = (Volume of beam) / (Volume of cylinder)

$$\text{Fraction} = \frac{V_{\text{beam}}}{V_{\text{cylinder}}} = \frac{2r^2 h}{\pi r^2 h} = \frac{2}{\pi}.$$

Simplifying this gives: Fraction = $2 / \pi \approx 0.6366$, which is approximately 64%.

Final Answer:

The largest fraction of the wood by volume that can be fruitfully utilized as the beam is approximately **64%**.

Correct Option:(b) 64%.

S18. Ans.(a)
Sol. Given:
- Tokens numbered from 1 to 25 are mixed.
- We need to find the probability that the number on the token drawn is divisible by 4 or 6.

Step 1: Identify numbers divisible by 4 or 6.
Numbers divisible by 4: The numbers divisible by 4 in the range from 1 to 25 are:
4, 8, 12, 16, 20, 24.
So, there are 6 numbers divisible by 4.
Numbers divisible by 6: The numbers divisible by 6 in the range from 1 to 25 are:
6, 12, 18, 24.
So, there are **4 numbers** divisible by 6.
Numbers divisible by both 4 and 6 (i.e., divisible by 12): The numbers divisible by 12 in the range from 1 to 25 are:
12, 24.
So, there are **2 numbers** divisible by both 4 and 6.
Step 2: Apply the principle of inclusion and exclusion.
The number of tokens that are divisible by **either 4 or 6** can be calculated as:
Total = (Divisible by 4) + (Divisible by 6) - (Divisible by both 4 and 6)
Substituting the values:
Total = 6 + 4 - 2 = 8.
So, there are **8 favorable outcomes** (numbers divisible by 4 or 6).
Step 3: Calculate the probability.
The total number of possible outcomes is 25 (since the tokens are numbered from 1 to 25).
The probability is given by:
Probability = (Number of favorable outcomes) / (Total number of outcomes) = 8 / 25.
Final Answer:
The probability that the number on the token drawn is divisible either by 4 or by 6 is **8/25**.
Correct Option: (a) 8/25.

S19. Ans.(d)
Sol. Solution:
In the given text, we can identify the capital and lowercase letters:
The capital letters are: A, B, H, K, S, T, L, N, E.
So, we have **9 capital letters**. The lowercase letters are: c, r, u, v, x, d, w.
So, we have **7 lowercase letters.**
The product of the number of capital letters and the number of lowercase letters is 9 (capital letters) * 7 (lowercase letters) = 63
Conclusion:
So, the product of the number of capital letters and the number of small letters of the English alphabet in the given text is **63**

S20. Ans.(c)
Sol. To determine the probability of drawing the same letter from each word, let's break down the problem step-by-step.
Step 1: Total Possible Outcomes
- The word **CAUSE** has 5 unique letters: C, A, U, S, and E.
- The word **EFFECT** has 6 letters: E, F, F, E, C, and T, with the letters E and F appearing twice.

When we draw one letter from each word, the total possible combinations are: 5 letters from **CAUSE** multiplied by 6 letters from **EFFECT**, which equals 30 possible outcomes.

Step 2: Favorable Outcomes (Matching Letters)

To achieve a favorable outcome, the letters drawn from each word must match. Let's identify the common letters between **CAUSE** and **EFFECT**:

1. The letter **C** appears in both words.
2. The letter **E** also appears in both words.

Case 1: Drawing the Letter "C"

- There is 1 **C** in **CAUSE** and 1 **C** in **EFFECT**.
- This provides **1 favorable outcome** for drawing "C" from both words.

Case 2: Drawing the Letter "E"

- There is 1 **E** in **CAUSE** and 2 **E's** in **EFFECT**.
- This provides **2 favorable outcomes** for drawing "E" from both words.

Step 3: Total Favorable Outcomes

Adding up the favorable outcomes from both cases: 1 (for C) + 2 (for E) = 3 favorable outcomes.

Step 4: Calculate the Probability

The probability of drawing the same letter from both words is: Favorable Outcomes / Total Outcomes = 3 / 30 = 1/10.

S21. Ans.(a)

Sol. To determine the **maximum relative change** in the viral load, we need to calculate the relative change between the measurements for each consecutive day.

The relative change is calculated using the following formula:

$$\text{Relative Change} = \frac{\text{New Value} - \text{Old Value}}{\text{Old Value}}$$

Given viral load measurements on days 1 to 7:

Viral Load=[15,25,50,200,300,150,30]\text{Viral Load} = [15, 25, 50, 200, 300, 150, 30]Viral Load=[15,25,50,200,300,150,30]

Let's calculate the relative change for each consecutive pair of days:

1. From Day 1 to Day 2:

Relative Change=25−1515=1015=0.6667(66.67%)

Relative Change=1525−15=1510=0.6667(66.67%)

2. From Day 2 to Day 3:

Relative Change=50−2525=2525=1.0(100%)

Relative Change=2550−25=2525=1.0(100%)

3. From Day 3 to Day 4:

Relative Change=200−5050=15050=3.0(300%)

Relative Change=50200−50=50150=3.0(300%)

4. From Day 4 to Day 5:

Relative Change=300−200200=100200=0.5(50%)

Relative Change=200300−200=200100=0.5(50%)

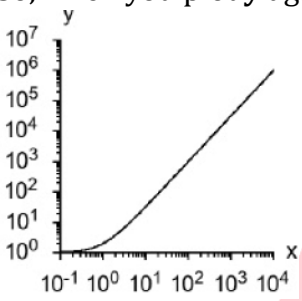
5. From Day 5 to Day 6:

Relative Change=150−300300=−150300=−0.5(−50%)

Relative Change=300150−300=300−150=−0.5(−50%)

6. From Day 6 to Day 7:
Relative Change=30−150150=−120150=−0.8(−80%)
Relative Change=15030−150=150−120=−0.8(−80%)
Maximum Relative Change took place between Day 3 and Day 4:300%
Maximum Relative Change took place between Day 3 and Day 4: 300%
Conclusion:
The **maximum relative change** occurred between **Day 3 and Day 4**, where the viral load increased from 50 to 200. This represents a **300%** increase.
Thus, the maximum relative change took place between **Day 3 and Day 4**.
Relative Change=New Value−Old ValueOld Value\text{Relative Change} = \frac{\text{New Value} - \text{Old Value}}{\text{Old Value}}

S22. Ans.(a)
Sol. The given figure shows a plot of $\log_{10}(y)$ against $\log_{10}(x)$, which is a straight line.
This indicates a **logarithmic relationship** between **y** and **x**.
When you plot **y** against **x** directly (i.e., removing the logarithms), you expect a **power law relationship**.
Given that the plot of $\log_{10}(y)$ vs $\log_{10}(x)$ is a straight line, this implies that: $\log_{10}y = m\log_{10}x+c$
which translates to:
$y = 10_c.x_m$
So, when you plot **y** against **x** directly, it will follow a **power law curve**,



which typically starts with a steep rise and gradually becomes less steep as **x** increases.
Answer:
The correct plot when **y** is plotted against **x** is **(a)**.

S23. Ans.(b)
Sol. Given:
- **Mango** costs Rs. 10 each.
- **Lemon** costs Rs. 1 each.
- **8 chillies** cost Rs. 1, which means each chilli costs Rs. 1/8.

We need to buy exactly 100 items for Rs. 100. Let's define:
- **x** as the number of mangoes.
- **y** as the number of lemons.
- **z** as the number of chillies.

Solution:
We have two conditions:
1. The total number of items must be 100:x + y + z = 100
2. The total cost must be Rs. 100:10x + y + (z / 8) = 100

Eliminate the fraction
To get rid of the fraction, multiply the second equation by 8:
8 * (10x + y + z / 8) = 8 * 10080x + 8y + z = 800
So, now we have the system:
1. x + y + z = 100
2. 80x + 8y + z = 800

Solve the system of equations
Subtract the first equation from the second:
(80x + 8y + z) - (x + y + z) = 800 - 10079x + 7y = 700
Solve for y in terms of x
Now, solve for y:
7y = 700 - 79xy = (700 - 79x) / 7
For y to be an integer, the numerator (700 - 79x) must be divisible by 7. Let's check when 700 - 79x is divisible by 7.
Check for integer solutions
We know that 700 is divisible by 7. Also, 79 mod 7 gives a remainder of 2. Therefore, we need:
700 - 79x ≡ 0 (mod 7)or2x ≡ 0 (mod 7)
Since 2 and 7 are coprime, x must be a multiple of 7. Let's try different multiples of 7 for x.
Try x = 7
Substitute x = 7 into the equation for y:
y = (700 - 79 * 7) / 7 = (700 - 553) / 7 = 147 / 7 = 21
So, y = 21.
Now, substitute x = 7 and y = 21 into the first equation:
x + y + z = 1007 + 21 + z = 100z = 100 - 28 = 72
Verify the solution
Finally, check the total cost:
- Mangoes: 7 * 10 = 70
- Lemons: 21 * 1 = 21
- Chillies: 72 / 8 = 9

The total cost is 70 + 21 + 9 = 100, which satisfies the requirement.
Final Answer:
To get a mix of 100 items for exactly Rs. 100, you need to buy:
- **7 mangoes**
- **21 lemons**
- **72 chillies**.

S24. Ans.(b)
Sol. The correct analogy would be:
CHEF : RECIPE
A **chef** is responsible for the **recipe**, just as a **director** is responsible for the **script**.
Thus, the correct option is:
CHEF : RECIPE

S25. Ans.(a)
Sol. Given:
We have a magic square where the sum of numbers in each row, column, and diagonal is the same. We need to find the value of x.
Solution:
The numbers in the magic square are arranged as follows:
Row 1: x, x - 5, and 8
Row 2: x + 1, y, and y - 2
Row 3: 2, 9, and 4
From Row 3, we can calculate the "magic sum" since all values in this row are known:
The sum of Row 3 is:
2 + 9 + 4 = 15
Therefore, each row, column, and diagonal must add up to 15.
Calculate Row 1 Using the Magic Sum:
For Row 1, we have the expression:
x + (x - 5) + 8 = 15
Simplify by combining like terms:
2x + 3 = 15
Subtract 3 from both sides:
2x = 12
Divide by 2:
x = 6
Verification with x = 6:
Row 1: With x = 6, the entries become 6, 1 (since x - 5 = 1), and 8.
Sum = 6 + 1 + 8 = 15, which matches the magic sum.
Row 2: Substitute x = 6 to get the entries 7 (since x + 1 = 7), y, and y - 2.
Since the sum must be 15, set up the equation:
7 + y + (y - 2) = 15
Simplify to get:
2y + 5 = 15
Subtract 5 from both sides:
2y = 10
Divide by 2 to find y:
y = 5
Row 3: This row already sums to 15 (2 + 9 + 4 = 15).
Verification of Columns and Diagonals:
Column 1: Entries are 6, 7, and 2.
Sum: 6 + 7 + 2 = 15
Column 2: Entries are 1, 5, and 9.
Sum: 1 + 5 + 9 = 15
Column 3: Entries are 8, 3, and 4.
Sum: 8 + 3 + 4 = 15
Diagonal 1 (top left to bottom right): Entries are 6, 5, and 4.
Sum: 6 + 5 + 4 = 15
Diagonal 2 (top right to bottom left): Entries are 8, 5, and 2.
Sum: 8 + 5 + 2 = 15
Since all rows, columns, and diagonals sum to 15 when x = 6 and y = 5, this confirms the solution.
Answer: The correct value of x is 6.

S26. Ans.(c)

Sol. We are given a fully filled 8-litre can and ungraduated empty 5-litre and 3-litre cans. We need to get exactly 4 litres of milk, without wasting any.

To solve this, we will follow a step-by-step procedure using the minimum number of pourings.

Step-by-step process:

1. **Fill the 5-litre can from the 8-litre can**:
   - Now the 5-litre can has 5 litres, and the 8-litre can has 3 litres remaining.
   - Pouring count: 1
2. **Pour the 5 litres from the 5-litre can into the 3-litre can**:
   - The 3-litre can is now full, and 2 litres remain in the 5-litre can.
   - Pouring count: 2
3. **Empty the 3-litre can**:
   - Now the 3-litre can is empty.
   - Pouring count: 3
4. **Pour the 2 litres from the 5-litre can into the 3-litre can**:
   - The 3-litre can now contains 2 litres.
   - Pouring count: 4
5. **Fill the 5-litre can again from the 8-litre can**:
   - Now the 5-litre can contains 5 litres, and the 8-litre can has 0 litres remaining.
   - Pouring count: 5
6. **Pour from the 5-litre can into the 3-litre can (which already contains 2 litres)**:
   - The 3-litre can will take 1 litre to become full, leaving 4 litres in the 5-litre can.
   - Pouring count: 6

Now we have 4 litres in the 5-litre can.

Conclusion:

The minimum number of pourings required to get exactly 4 litres is **6**.

Thus, the correct answer is **(c) 6**.

S27. Ans.(a)

Sol. Analysis of Population Pyramids:

Pyramid A: It has a wide base and a narrow top, indicating a high birth rate and a high death rate, which is typical of a growing population. This shape suggests a less stable population with a youthful age structure.

Pyramid B: Similar to Pyramid A, it has a triangular shape with a broad base. This also reflects a young population with high birth and death rates, indicative of a less stable and growing population.

Pyramid C: This pyramid has a more rectangular shape, with a relatively even distribution across age groups, suggesting lower birth and death rates. A rectangular shape typically indicates a stable population with slow growth, as each age group is nearly the same size.

Pyramid D: This pyramid has a narrow base and a slightly wider top, which might indicate a declining birth rate and an aging population. However, it does not represent a stable population, as it suggests a population potentially declining over time.

Conclusion: The most stable population is shown by Pyramid C because it has a rectangular shape, indicating a balanced population with low birth and death rates and an even distribution across age groups.

Answer: (1) C

S28. Ans.(c)

Sol. Given:

- **RameshSuresh**For every 5 chocolates that gets, gets 3 chocolates.
- **GeetaSuresh** gets 3 chocolates for every 2 chocolates that gets.
- Geeta has 18 chocolates.

Step 1: Relationship between Geeta and Suresh

We know that for every 2 chocolates that Suresh gets, Geeta gets 3 chocolates. Since Geeta has 18 chocolates, we can set up the proportion:

- If Suresh gets 2 chocolates, Geeta gets 3 chocolates.
- If Suresh gets "x" chocolates, Geeta gets 18 chocolates.

So, we can write the proportion as:

(2 / 3) = (x / 18)

Now, solve for "x":

x = (2 * 18) / 3 = 36 / 3 = 12

So, Suresh gets 12 chocolates.

Step 2: Relationship between Suresh and Ramesh

Next, we know that for every 3 chocolates Suresh gets, Ramesh gets 5 chocolates. Since Suresh has 12 chocolates, we can use this information to determine how many chocolates Ramesh gets.

- If Suresh gets 3 chocolates, Ramesh gets 5 chocolates.
- If Suresh gets 12 chocolates, Ramesh gets "y" chocolates.

So, we can set up the proportion:

(3 / 5) = (12 / y)

Now, solve for "y":

y = (5 * 12) / 3 = 60 / 3 = 20

So, Ramesh gets 20 chocolates.

Step 3: Total chocolates with Ramesh and Suresh

Now, to find the total number of chocolates with Ramesh and Suresh, we add the chocolates they each have:

20 (Ramesh) + 12 (Suresh) = 32 chocolates.

Final Answer:

The sum of chocolates with Ramesh and Suresh is **32 chocolates**.

S29. Ans.(c)

Sol. When looking at the time displayed on a **mirror** reflection of an analog clock, the positions of the hour and minute hands appear reversed. To find the correct time, we need to account for this reversal.

Step-by-step process:

1. **Given time in the mirror**: 4 hours 55 minutes.
   - In the mirror, the time looks like 4:55.
2. **Reflecting the hands across the vertical axis**:
   - To correct for the mirror image, we need to "reverse" the clock. This involves subtracting the time shown in the mirror from 12:00.
3. **Calculate the correct time**:
   - The time in the mirror is 4:55.
   - The time on the actual clock can be found by subtracting the time in the mirror from 12:00.

12:00−4:55=7:0512:00 - 4:55 = 7:0512:00−4:55 = 7:05

So, the correct time is approximately **7:05**.

Explanation:

- When you look at a mirror reflection of a clock, the hour hand that was on 4 will appear as if it is on 8, and
- the minute hand that was on 55 will look like it's on 5. The time is essentially the "reverse" of 4:55, which leads us to 7:05.

S30. Ans.(a)

Sol. Observations:

1. **Country P (Graph)**:
   - A **pyramid-shaped population structure** with a very broad base indicates a high birth rate and rapid population growth in younger age groups.
   - The population sharply declines in older age groups, indicating lower life expectancy.
   - This is typical of developing countries where healthcare and other social support systems may not be as advanced.
2. **Country Q (Graph)**:
   - A **more balanced age distribution** compared to Country P, with a larger proportion of the population in older age groups.
   - This suggests higher life expectancy and possibly better healthcare, education, and economic development.

Analysis of Statements:

1. **(a) Country Q has higher life expectancy**:
   - This is supported by the balanced population pyramid of Country Q, where a larger percentage of people survive into older age groups.
   - **LIKELY TRUE**.
2. **(b) Country P has higher per-capita income**:
   - A high birth rate and a young population generally indicate a developing economy with lower per-capita income.
   - **UNLIKELY TRUE**.
3. **(c) The population of Country P is decreasing more rapidly than Q**:
   - Country P's broad base indicates rapid population growth in younger groups, not a population decrease.
   - **FALSE**.
4. **(d) Country P has better health facilities**:
   - Country Q's population pyramid reflects better longevity and distribution, which likely indicates better healthcare in Country Q, not Country P.
   - **FALSE**.

Final Answer:

(a) **Country Q has higher life expectancy.**

S31. Ans.(d)

Sol. To find the uncertainty in the volume of a sphere based on the uncertainty in its radius, we can use the concept of **propagation of uncertainty**.

The formula for the volume VVV of a sphere is:$V=43\pi r3V=34\pi r3$

Where:

- VVV is the volume of the sphere,
- rrr is the radius of the sphere.

Step 1: Uncertainty Propagation
The uncertainty in the volume can be related to the uncertainty in the radius using the following formula:ΔVV=3·ΔrrVΔV=3·rΔr
Where:

- ΔV\Delta VΔV is the uncertainty in the volume,
- VVV is the volume of the sphere,
- Δr\Delta rΔr is the uncertainty in the radius,
- rrr is the radius of the sphere.

Step 2: Given Uncertainty in Radius
The problem states that the uncertainty in the radius is 5%, which means:Δrr=0.05rΔr=0.05
Step 3: Calculate Uncertainty in Volume
Using the formula for propagation of uncertainty:ΔVV=3·0.05=0.15VΔV=3·0.05=0.15
Thus, the uncertainty in the volume of the sphere is 15%.
Final Answer: The uncertainty in the volume of the sphere is **15%**.

S32. Ans.(b)
Sol. Option Analysis:

1. **Option a:** y = (a - x) / (b + a)
   - For a < x < b, the term (a - x) would be negative because x is greater than a.
   - Therefore, y would be negative, which does not satisfy 0 < y < 1.
   - This option does not work.
2. **Option b:** y = (x - a) / (b - a)
   - For a < x < b, the term (x - a) is positive and less than (b - a).
   - Dividing by (b - a), which is positive, gives 0 < y < 1.
   - This option satisfies the condition 0 < y < 1.
3. **Option c:** y = (x - b) / (b - a)
   - For a < x < b, the term (x - b) would be negative because x is less than b.
   - Therefore, y would be negative, which does not satisfy 0 < y < 1.
   - This option does not work.
4. **Option d:** y = (b - x) / (a + b)
   - For a < x < b, the term (b - x) is positive, but we need to check if this keeps y within 0 < y < 1.
   - However, the denominator (a + b) does not necessarily ensure that y falls between 0 and 1, as it is not directly related to the range (b - a).
   - This option does not consistently satisfy 0 < y < 1.

Conclusion
The only option that ensures 0 < y < 1 for a < x < b is:
Answer: Option b, y = (x - a) / (b - a)

S33. Ans.(c)
Sol. Given:
The string of letters is:
R A M U K Y A J N A S
The total number of letters in the string is **11**.
We are asked to find the probability that a randomly drawn letter is **NOT a vowel**.

Step 1: Identify the vowels in the string.
The vowels in the English alphabet are **A, E, I, O, U**.
From the given string, the vowels are:

- **A, A, A** (3 occurrences of 'A')
- **U** (1 occurrence of 'U')

Thus, there are **4 vowels** in the string.
Step 2: Identify the total number of letters.
The total number of letters in the string is **11**:

- **R, A, M, U, K, Y, A, J, N, A, S** (This is a total of 11 letters).

Step 3: Find the number of letters that are NOT vowels.
The number of letters that are **NOT vowels** is:

- Total letters = 11
- Vowels = 4
- Non-vowels = 11 - 4 = 7 (These are the consonants).

Step 4: Calculate the probability.
The probability of drawing a letter that is **NOT a vowel** is:
P(Not a vowel) = (Number of non-vowel letters) / (Total number of letters) = 7 / 11
P(Not a vowel)=Number of non-vowel lettersTotal number of letters=711P(\text{Not a vowel}) = \frac{\text{Number of non-vowel letters}}{\text{Total number of letters}} = \frac{7}{11}
Final Answer:
The probability that the letter drawn is **NOT a vowel** is **7/11**.
Correct Option:(c) 7/11.

S34. Ans.(c)
Sol. Given: Four children have a total of 27 apples. Each child has at least 5 apples, and no two children have the same number of apples.
Solution: We need four distinct numbers, each at least 5, that add up to 27.
Let's try the smallest set of distinct numbers that meet these criteria:
Suppose the children have 5, 6, 7, and 9 apples.
Calculating the sum: 5 + 6 + 7 + 9 = 27
This combination works and meets the conditions: all numbers are distinct, each child has at least 5 apples, and the sum is 27.
Step 2: Analyzing the Options
The question asks which number could NOT be the number of apples a child had. Since we found a valid combination with children having 5, 6, 7, and 9 apples, it's clear that:
8 apples cannot be the number of apples any child has, as it would disrupt the distinctness or fail to sum to 27.
Conclusion: The number of apples a child could NOT have is 8.
Answer: 8

S35. Ans.(d)
Sol. Given:
There are four entries in column A that must be matched with entries in column B. Each correctly matched option scores one mark, while no marks are awarded for incorrect matches. We need to determine which of the following marks cannot be scored.

Solution:
Since there are four entries in column A and four entries in column B, we have the following possible outcomes:
If all four matches are correct, the score is 4.
If three matches are correct, the score is 3.
If two matches are correct, the score is 2.
If one match is correct, the score is 1.
If none are correct, the score is 0.
Each of these scores (0, 1, 2, 3, and 4) represents all possible scores that can be achieved based on correct or incorrect matches.
However, the question specifically asks which mark cannot be scored. Since we have covered all possible scores from 0 to 4, it appears all these scores can be achieved under different matching scenarios.
Thus, the answer is (d) 4 because all marks from 0 to 4 are possible scores, meaning there is no mark that cannot be scored.

S36. Ans.(d)
Sol. Given:
The plane lands ahead of schedule, and the post is transported by a rickshaw.
The rickshaw meets the truck 30 minutes after the plane's arrival.
The truck, after meeting the rickshaw, returns to the post office 20 minutes early compared to its usual schedule.
Solution:
Let:
"T" represent the scheduled round-trip time for the truck to go to the plane and return to the post office.
Since the truck saved 20 minutes by meeting the rickshaw halfway, the total time taken by the truck in this new scenario is "T - 20" minutes.
Step 1: Analyze the Time Saved
If the truck saved a total of 20 minutes, it means it saved 10 minutes on each leg of the journey (going and returning). Therefore, the truck avoided traveling 10 minutes' worth of distance each way because it met the rickshaw partway.
Step 2: Calculate the Early Arrival of the Plane
Since the rickshaw met the truck 30 minutes after the plane landed, this 30 minutes includes the time saved by the truck. Therefore, the early arrival time of the plane is the time it took for the truck to save each leg of travel (10 minutes) plus the 30 minutes after the plane's landing when the rickshaw met the truck.
So, the plane arrived: 30 minutes + 10 minutes = 40 minutes early.
Answer: The plane arrived **40 minutes** early.

S37. Ans.(c)
Sol. Given:
- In 1979, Ramesh's age was equal to the sum of the digits of his year of birth.
- We need to determine his age in 2017.

Concept:
1. Let Ramesh's year of birth be x.
2. His age in 1979 is calculated as 1979 - x, which is equal to the sum of the digits of x.
3. Using this, we can solve for x and then calculate his age in 2017.

Solution:
Assume the year of birth is x = 1900 + 10a + b, where a and b are the last two digits of the year.
The sum of the digits of x is 1 + 9 + a + b, which equals 10 + a + b.
Given 1979 - x = 10 + a + b, substitute x = 1900 + 10a + b into the equation:1979 - (1900 + 10a + b) = 10 + a + b.
Simplify:79 - 10a - b = 10 + a + b.
Combine terms:69 = 11a + 2b.
Solve for a and b:
Let a = 5. Substitute into 11a + 2b = 69:
11(5) + 2b = 69,55 + 2b = 69,2b = 14, so b = 7.
The year of birth is 1900 + 10(5) + 7 = 1957.
Calculate Ramesh's age in 2017: 2017 - 1957 = 60
Final Answer:
Ramesh's age in 2017 was 60 years.

S38. Ans.(c)
Sol. Given:
We need to find which of the following numbers **cannot** divide the product of two integers whose sum is 14:
Step 1: List the pairs of integers whose sum is 14:
The possible pairs of positive integers xxx and yyy where x+y=14x + y = 14x+y=14 are:

- (1, 13)
- (2, 12)
- (3, 11)
- (4, 10)
- (5, 9)
- (6, 8)
- (7, 7)

Step 2: Calculate the product for each pair:

1. **1 × 13 = 13**
2. **2 × 12 = 24**
3. **3 × 11 = 33**
4. **4 × 10 = 40**
5. **5 × 9 = 45**
6. **6 × 8 = 48**
7. **7 × 7 = 49**

Step 3: Check divisibility by each number (12, 13, 14, 49):
(a) Divisibility by 12:

- **24** is divisible by 12.
- **48** is divisible by 12.
- The other products (13, 33, 40, 45, and 49) are not divisible by 12. But, since 2**4** and 48are divisible by 12, it's possible for the product to be divisible by 12.

(b) Divisibility by 13:

- **13** is divisible by 13.
- The other products (24, 33, 40, 45, 48, and 49) are not divisible by 13. But, since 13 is divisible by 13, it is possible for the product to be divisible by 13.

(c) Divisibility by 14:

- **24** is not divisible by 14.
- **33** is not divisible by 14.
- **40** is not divisible by 14.
- **45** is not divisible by 14.
- **48** is not divisible by 14.
- **49** is not divisible by 14.

Thus, **none** of the products are divisible by 14. Therefore, the product **cannot** be divisible by 14.

(d) Divisibility by 49:

- **49** is divisible by 49.
- The other products (13, 24, 33, 40, 45, and 48) are not divisible by 49. But, since49 is divisible by 49, it is possible for the product to be divisible by 49.

Conclusion:

The correct answer is that the product **cannot** be divisible by **14**.

Final Answer:

The correct answer is **(c) 14**.

S39. Ans.(d)

Sol. Given:

- There are 5 dishes available.
- We need to create a menu containing either 3 or 4 dishes.

We are to find the number of ways to make a menu containing either 3 or 4 dishes.

Solution:

Step 1: Number of ways to choose 3 dishes out of 5

To choose 3 dishes from 5, we use the combination formula:

Combination Formula:(nr)=n!r!(n−r)!(rn)=r!(n−r)!n!

For 3 dishes out of 5:

(53)=5!3!(5−3)!=5×42×1=10(35)=3!(5−3)!5!=2×15×4=10

So, there are 10 ways to choose 3 dishes.

Step 2: Number of ways to choose 4 dishes out of 5

To choose 4 dishes from 5:

(54)=5!4!(5−4)!=51=5(45)=4!(5−4)!5!=15=5

So, there are 5 ways to choose 4 dishes.

Step 3: Total number of ways

The total number of ways to form the menu is the sum of the two possibilities:

Totalways = (53)+(54)=10+5=15Total ways=(35)+(45)=10+5=15

Thus, the total number of ways to create a menu with either 3 or 4 dishes is 15.

Final Answer:

The correct option is (d) 15.

S40. Ans.(a)

Sol. Given:

1. Speed of the bird = 20 km/h
2. The bird keeps flying continuously between the two trains for 1 hour.

The distance covered by the bird is independent of the relative speeds of the trains. Since the bird flies continuously for 1 hour at a constant speed of 20 km/h, the total distance covered by the bird in this time is:

Formula Used:
Distance=Speed×Time
Calculation:
Distance=20km/h×1hour=20kmDistance=20km/h×1hour=20km
Final Answer:
(a) **20 km**

S41. Ans.(a)
Sol. Given:
- Total students = 70,
- 20% of girls have spectacles,
- 40% of boys have spectacles,
- Total students with spectacles = 23.

Solution:
Let the number of boys in the class be x.
Then, the number of girls in the class is 70 - x.
Calculate the number of boys with spectacles:
Since 40% of boys have spectacles, the number of boys with spectacles is:
0.4 × x.
Calculate the number of girls with spectacles:
Since 20% of girls have spectacles, the number of girls with spectacles is:
0.2 × (70 - x).
Total students with spectacles:
The sum of boys and girls with spectacles is given as 23. So:
0.4x + 0.2(70 - x) = 23.
Simplify the equation:
Expanding the terms:
0.4x + 14 - 0.2x = 23,
0.2x + 14 = 23,
0.2x = 9,
x = 45.
Thus, the number of boys in the class is **45**.

S42. Ans.(b)
Sol. Given:
- Dimensions of the tray: 30 cm × 60 cm.
- Diameter of each biscuit before baking: 3 cm.
- Diameter increases by 10% after baking.
- The biscuits need to fit into the tray without overlapping, with their bases in contact with the tray.

Solution:
1. **Calculate the diameter of each biscuit after baking:**
   - Increase in diameter = 10% of 3 cm = 0.3 cm.
   - Diameter after baking = 3 cm + 0.3 cm = 3.3 cm.
2. **Calculate the number of biscuits that can fit along the length and width of the tray:**
   - Along the **length (60 cm):** Each biscuit occupies a space of 3.3 cm.
     Number of biscuits along the length = Floor of (60 / 3.3) ≈ 18 biscuits.
   - Along the **width (30 cm):** Each biscuit occupies a space of 3.3 cm.
     Number of biscuits along the width = Floor of (30 / 3.3) ≈ 9 biscuits.

3. **Calculate the total number of biscuits that can fit in the tray:**
   - Total number of biscuits = Number along the length × Number along the width = 18 × 9 = 162 biscuits.

Conclusion:

The maximum number of biscuits that can fit in the tray is **(b) 162**.

S43. Ans.(a)

Sol. Solution:

To determine the probability that the random walker is again at x=1 at time t=3, we need to consider the possible sequences of steps it can take after the first step. The random walker starts at x=0 at time t=0 and moves to x=1at time t = 1. From x = 1at time t = 1, the random walker can take the following steps:

1. Right, Left, Right (R, L, R)
2. Right, Right, Left (R, R, L)
3. Left, Right, Right (L, R, R)
4. Left, Left, Right (L, L, R)

However, since the random walker repeats the direction taken in the previous step with probability p, and changes direction with probability 1−p, we need to consider the probabilities of each sequence.

Let's analyze each sequence:

1. **Sequence R, L, R:**
   - The probability of the first step being Right is 1 (since it is given).
   - The probability of the second step being Left is 1−p (since it changes direction).
   - The probability of the third step being Right is 1−p (since it changes direction).
   - Therefore, the total probability for this sequence is $1\times(1-p)\times(1-p)=(1-p)^2$.
2. **Sequence R, R, L:**
   - The probability of the first step being Right is 1.
   - The probability of the second step being Right is p (since it repeats direction).
   - The probability of the third step being Left is 1−p (since it changes direction).
   - Therefore, the total probability for this sequence is $1\times p\times(1-p)=p(1-p)$.
3. **Sequence L, R, R:**
   - The probability of the first step being Right is 1.
   - The probability of the second step being Left is 1−p (since it changes direction).
   - The probability of the third step being Right is p (since it repeats direction).
   - Therefore, the total probability for this sequence is $1\times(1-p)\times p = p(1-p)$.
4. **Sequence L, L, R:**
   - The probability of the first step being Right is 1.
   - The probability of the second step being Left is 1−p (since it changes direction).
   - The probability of the third step being Left is p (since it repeats direction).
   - The probability of the fourth step being Right is 1−p (since it changes direction).
   - Therefore, the total probability for this sequence is $1\times(1-p)\times p\times(1-p)=p(1-p)^2$.

However, we only need to consider the sequences that bring the random walker back tox=1at timet=3. The only sequences that satisfy this condition are R, L, R and R, R, L.

Therefore, the total probability is the sum of the probabilities of these two sequences:

$(1-p)^2 + p(1-p) = (1-p)(1-p+p) = (1-p)\times 1 = 1-p$

Thus, the probability that the random walker is again at x = 1 at time t = 3 is **1−p** .

S44. Ans.(d)

Sol. Given:

- 50% of birds belong to species A, and 50% belong to species B,
- A random sample of 5 birds is taken,
- Find the probability that at least one bird is from species A.

Solution:

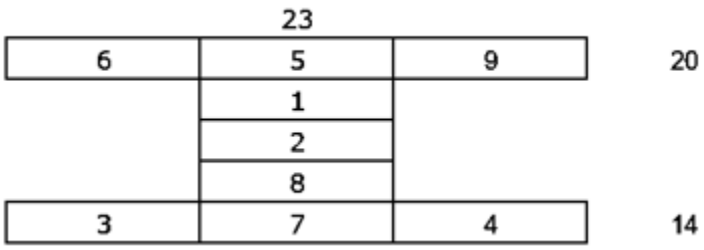
1. Probability of selecting a bird from species A = 0.5,
   Probability of selecting a bird from species B = 0.5.
2. Probability that all 5 birds are from species B:
   P (all 5 from B) = $(0.5)^5$ = 0.03125.
3. Probability that at least one bird is from species A:
   P (at least one from A) = 1 - P(all 5 from B),
   P (at least one from A) = 1 - 0.03125 = 0.96875.

Thus, the probability that at least one bird is from species A is **0.96875**.

S45. Ans.(c)

Sol. Givena) 3 × 3 grid with numbers 1 to 9 filled without repetition. The top row sums to 20, the bottom row sums to 14, and the column sums to 23. Find the value of A.

Solution:



1. Analyze the constraints:
   - The sum of numbers in the top row is 20.
   - The sum of numbers in the bottom row is 14.
   - The column sum is 23.
2. Deduce the placement of numbers:
   - Place numbers systematically, ensuring the given constraints are satisfied.
   - After assigning values, the grid configuration leads to the value of A being 7.

Thus, the value of A is **7**.

S46. Ans.(a)

Sol. Given:

Population and area of four states (S1, S2, S3, S4).

Solution:

1. Population density is defined as the number of people per unit area. It is calculated as:
   Population density = Population / Area.
2. Calculate the population density for each state:
   - S1: Population = P1, Area = A1, Density = P1/A1,
   - S2: Population = P2, Area = A2, Density = P2/A2,
   - S3: Population = P3, Area = A3, Density = P3/A3,
   - S4: Population = P4, Area = A4, Density = P4/A4.

3. Arrange the states in decreasing order of population density.
   From the calculations, the correct order is: S4 > S3 > S1 > S2.
   Thus, the correct arrangement is **S4, S3, S1, S2**.

S47. Ans.(c)
Sol. Given:
- Graphs showing the weekly price changes of two commodities, C1 and C2, over 8 weeks.
- Analyze the graphs to determine which statement is correct.

Solution:
1. **Fluctuation:**
   - The fluctuation refers to how much the prices vary over the 8 weeks.
   - From the graph, both commodities show fluctuations, but C2 has slightly smaller fluctuations than C1. Therefore, C1 does not have higher fluctuation than C2.
2. **Average Price Comparison:**
   - The average price is calculated as the sum of prices over 8 weeks divided by 8.
   - By visual inspection, the average price of C1 is not consistently lower than that of C2.
3. **Largest Weekly Change:**
   - The largest weekly change is identified by observing the steepest slope in the graph.
   - From the graph, the largest single-week change is for C2 (between week 4 and week 5).
4. **Tendency for Reduction:**
   - C1 does not show a consistent tendency for reduction, as the prices increase and decrease variably over the 8 weeks.

Conclusion:
The correct statement is: **(c) The largest change in a week is shown by C2.**

S48. Ans.(c)
S49. Ans.(b)
S50. Ans.(d)

S51. Ans.(a)
Sol. A three-digit number can be represented as ABCABCABC, where AAA is the hundreds digit, BBB is the tens digit, and CCC is the units digit. The condition given is that the first digit (AAA) and the last digit (CCC) must sum up to 9.
1. Possible values for AAA (hundreds digit) are 1,2,3,...,91, 2, 3, ..., 91,2,3,...,9, as AAA must be a non-zero digit in a three-digit number.
2. For each AAA, the corresponding CCC is calculated as C=9−AC = 9 - AC=9−A. Hence, valid pairs of AAA and CCC are:
   - (1,8),(2,7),(3,6),(4,5),(5,4),(6,3),(7,2),(8,1),(9,0)(1, 8), (2, 7), (3, 6), (4, 5), (5, 4), (6, 3), (7, 2), (8, 1), (9, 0)(1,8),(2,7),(3,6),(4,5),(5,4),(6,3),(7,2),(8,1),(9,0).
   - This gives 9 pairs of (A,C)(A, C)(A,C).
3. The tens digit BBB can be any digit from 000 to 999 (10 choices for each pair (A,C)(A, C)(A,C)).

Thus, the total number of such three-digit numbers is:
9×10=90
Final Answer: Thus the correct answer is option (A) 90

S52. Ans.(d)
S53. Ans.(d)
S54. Ans.(d)
S55. Ans.(c)
S56. Ans.(c)
S57. Ans.(a)

S58. Ans.(a)
Sol. Given:
- **semi-circular cross-sections**Canals A, B, and C have .
- Radii of A, B, and C are in the ratio 3:4:53:4:53:4:5.
- Speed of water in canals A and B is sss.

We need to find the speed of water in canal C.
Concept:
The flow rate (QQQ) of water is conserved and is given by:
Flow rate = Cross-sectional area × Speed of water
For a semi-circular cross-sectiona)**rea = (1/2) × π × r²**
Step 1: Calculate the flow rates for canals A and B
1. **Canal A**:
   - Radius = 3k3k3k
   - Flow rate = $(1/2) \times \pi \times (3k)^2 \times sss$
   - Flow rate = $(1/2) \times \pi \times 9k^2 \times sss$
1. **Canal B**:
   - Radius = 4k4k4k
   - Flow rate = $(1/2) \times \pi \times (4k)^2 \times sss$
   - Flow rate = $(1/2) \times \pi \times 16k^2 \times sss$

Step 2: Total flow rate in canal C
The total flow rate in canal C is the sum of the flow rates in canals A and B:
Total flow rate = Flow rate of A + Flow rate of B
$= (1/2) \times \pi \times 9k^2 \times sss + (1/2) \times \pi \times 16k^2 \times sss$
Factor out common terms:
Total flow rate = $(1/2) \times \pi \times k^2 \times sss \times (9 + 16)$
Total flow rate = $(1/2) \times \pi \times k^2 \times sss \times 25$
Step 3: Flow rate in canal C
For canal C:
- Radius = 5k5k5k
- Flow rate = $(1/2) \times \pi \times (5k)^2 \times v_C$vCv_C

where v_C vCv_C
is the speed of water in C.
Simplify:
Flow rate in C = $(1/2) \times \pi \times 25k^2 \times v_C$vCv_C
Step 4: Equate total flow rate and flow rate in canal C
Equating both expressions for the flow rate:
$(1/2) \times \pi \times k^2 \times sss \times 25 = (1/2) \times \pi \times 25k^2 \times$ vCv_Cv_C
Cancel out common terms:
k2k^{2}k$_2$, πππ, and 252525:
s=vCs = v_Cs=v_C

Final Answer:
The speed of water in canal C is equal to sss.
Correct Option: (a) sss

S59. Ans.(c)

S60. Ans.(c)

S61. Ans.(b)
Sol. Given:
A's ratio: 3:2:2:1 for Re. 1, Rs. 2, Rs. 5, and Rs. 10 coins.
B's ratio: 4:3:2:1 for Re. 1, Rs. 2, Rs. 5, and Rs. 10 coins.
Value of A's coins = Rs. 270.
Formula:
Value of coins = (Re. 1 coins × 1) + (Rs. 2 coins × 2) + (Rs. 5 coins × 5) + (Rs. 10 coins × 10).
Solution:
Let the total number of coins with A be x. Using the ratio 3:2:2:1, the number of each type of coin is:
Re. 1 coins = (3/8) × x.
Rs. 2 coins = (2/8) × x.
Rs. 5 coins = (2/8) × x.
Rs. 10 coins = (1/8) × x.
Total value of coins:
(3/8)x × 1 + (2/8)x × 2 + (2/8)x × 5 + (1/8)x × 10 = 270.
Simplify:
(3x + 4x + 10x + 10x) / 8 = 270.
27x / 8 = 270.
x = 80.
Now, for B, using the ratio 4:3:2:1, the number of each type of coin is:
Re. 1 coins = (4/10) × 80 = 32.
Rs. 2 coins = (3/10) × 80 = 24.
Rs. 5 coins = (2/10) × 80 = 16.
Rs. 10 coins = (1/10) × 80 = 8.
Total value of coins:
32 × 1 + 24 × 2 + 16 × 5 + 8 × 10.
= 32 + 48 + 80 + 80 = 240.
Final Answer:
(b) 240

S62. Ans.(b)
Sol. Given:
Speed increases by 20%, and time reduces by 2 hours.
Speed decreases by 20%, and time increases by 3 hours.
Formula: Time = Distance / Speed.
Solution: Let the normal speed of the train be x and the normal time be t.
The distance between the stations is D = x × t.
With a 20% increase in speed: t - 2 = D / 1.2x

Substituting D = x × t: t - 2 = t / 1.2
Simplify: 1.2(t - 2) = t 1.2t - 2.4 = t 0.2t = 2.4 t = 12
Verifying with a 20% decrease in speed: t + 3 = D / 0.8x
Substituting D = x × t: t + 3 = t / 0.8
Simplify: 0.8(t + 3) = t
0.8t + 2.4 = t
0.2t = 2.4
t = 12
Final Answer: (b) 12.0

S63. Ans.(c)
Sol. Given:
Probability of A telling the truth = 0.3.
Probability of B telling the truth = 0.4.
Formula: The probability of contradiction = P(A truth and B lie) + P(A lie and B truth).
Solution:
1. Probability that A tells the truth and B lies:
P(A truth and B lie) = 0.3 × (1 - 0.4) = 0.3 × 0.6 = 0.18
2. Probability that A lies and B tells the truth:
P(A lie and B truth) = (1 - 0.3) × 0.4 = 0.7 × 0.4 = 0.28
3. Total probability of contradiction:
P(contradiction) = 0.18 + 0.28 = 0.46
Final Answer: (c) 0.46

S64. Ans.(a)
Sol. Given:
Original standard deviation = σ.
Formula: If data is scaled by a factor k, the new standard deviation is k × σ.
Solution: The data is scaled by 3 and shifted by 2.
Shifting does not affect the standard deviation, so
the new standard deviation is: 3 × σ = 3σ
Final Answer: (a) 3σ

S65. Ans.(b)
Sol. Given:
- Each battery lasts 2 days.
- The device needs 4 batteries to run.
- Total batteries = 6.

Formula:
Maximum runtime = Total battery-days ÷ 4 (number of batteries used at once).
Solution:
1. Each battery lasts for 2 days, so total battery-days:
6 × 2 = 12 battery-days
2. Divide the total battery-days by the number of batteries required at once:
Maximum runtime = 12 ÷ 4 = 3 days
Final Answer: (b) 3

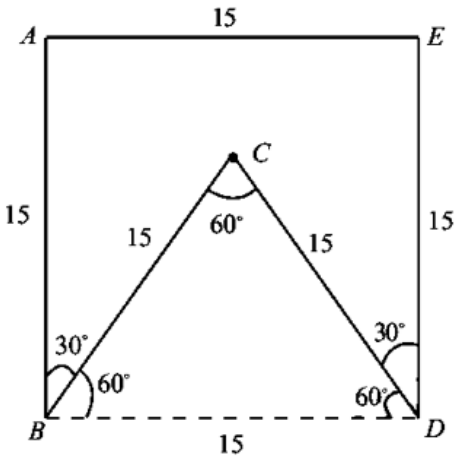
S66. Ans.(d)
Sol. Given:
- Two numbers: 10a + b and 10b + a, where a and b are the digits.

Formula:
Difference of squares = $(10a + b)^2 - (10b + a)^2$.
Solution:
1. ^{22}
Expand: (10a + b) - (10b + a) = [(10a + b) + (10b + a)] × [(10a + b) - (10b + a)] = (11a + 11b) × (9a - 9b)
2. Factor out common terms: = 11 × 9 × (a + b) × (a - b)
3. Clearly, the result is always divisible by 11.
Final Answer: (d) 11

S67. Ans.(d)
Sol. Given:
- Principal = Rs. 1,50,000.
- Rate = 10% per annum.
- Time = 3 years.

Formula:
Compound Interest = Principal × $[(1 + r)^t - 1]$, where r = rate and t = time.
Solution:
1. Calculate the total amount to be paid:
$A = 1,50,000 \times (1 + 0.1)^3$
$A = 1,50,000 \times (1.1)^3$
A = 1,50,000 × 1.331 = Rs. 1,99,650
2. Total interest = Amount - Principal:
Interest = 1,99,650 - 1,50,000 = Rs. 49,650
Final Answer: (d) 49,650

S68. Ans.(b)
Sol. Given:
BCD is an equilateral triangle, so BC = CD = DB = 15 m.
AB = DE = AE = 15 m.



Formula: The perimeter of the field = AE + ED + DC + CB + BA.
Solution: Substitute The given values: Perimeter = 15 + 15 + 15 + 15 + 15 = 75 m.
Final Answer: (b) 75 m

S69. Ans.(a)
Sol. Given:
- Present age ratio of mother and daughter = 14:1.
- After 4 years, the ratio of their ages = 16:3.

Formula:
Present age of mother = 14x, present age of daughter = x.
Solution:
1. After 4 years:

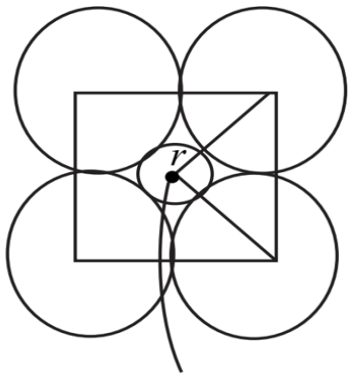
Mother's age = 14x + 4, Daughter's age = x + 4.
Given, the ratio after 4 years:
(14x + 4) / (x + 4) = 16 / 3.
2. Cross-multiply and simplify:

3(14x + 4) = 16(x + 4)
42x + 12 = 16x + 64
42x - 16x = 64 - 12
26x = 52
x = 2.
3. Present ages:

Mother's age = 14x = 14 × 2 = 28.
Daughter's age = x = 2.
4. Age of mother when daughter was born:

Mother's age = 28 - 2 = 26.
Final Answer: (a) 26

S70. Ans.(a)
Sol. Given:
Radius of each sphere = 1 unit.
Five spheres are stacked in a pyramidal structure.



Formula: The total height of the structure = Diameter of the bottom sphere + Radius of the cavity between the lower and upper spheres + Radius of the top sphere.
Solution:
1. The diameter of the bottom sphere is 2 units.
2. The radius of the cavity between the lower and upper spheres is calculated as:

$(1 + r)^2 + (1 + r)^2 = (1 + 1)^2$

Simplifying: $2(1 + r)^2 = 4$ $(1 + r)^2 = 2$
$1 + r = \sqrt{2}$
$r = \sqrt{2} - 1$.
3. Adding all contributions to the height:
Height = 2 (diameter of the bottom sphere) + 1 (radius of the lower sphere) + $(\sqrt{2} - 1)$ (radius of the cavity)
Height = $2 + \sqrt{2}$.
Final Answer: (a) $2 + \sqrt{2}$

S71. Ans.(a)

S72. Ans.(a)

S73. Ans.(a)

S74. Ans.(a)

S75. Ans.(a)

S76. Ans.(d)
Sol. Given :-
The house has 28 windows, and their sizes are 2, 3, 4, or 5 feet.
The number of windows is proportional to their sizes.
The boy can escape through windows of size at least 4 feet.
Solution:-
Let the number of windows of size 2, 3, 4, and 5 feet be in the ratio 2:3:4:5.
Let the constant of proportionality be
Number of 2-foot windows =2x
Number of 3-foot windows =3x
Number of 4-foot windows =4x
Number of 5-foot windows =5x
The total number of windows is 28
2x+3x+4x+5x=28
14x=28
x=2
By putting value
Number of 2-foot windows =2x=4
Number of 3-foot windows =3x=6
Number of 4-foot windows =4x=8
Number of 5-foot windows =5x=10
The boy can escape through the 4-foot and 5-foot windows, so the total number of windows available for escape is:
8+10=**18**
Thus, the correct answer is option (D) 18

S77. Ans.(a)

S78. Ans.(d)
Sol. Here are the counts of E
THE -1 ABILITY-0 TO-0
REASON-1 ACCURATELY-1 IS-0
VERY-1 IMPORTANT-0 AS-0
IS-0 THE-1 ABILITY-0
TO-0 COUNT-0 AS-0
AN-0 EXERCISE-3 IN-0
BOTH-0 LET-1 US-0
COUNT-0 HOW-0 MANY-0
TIMES-1 THE-1 LETTER-2
"E" -1 OCCURS-0 IN-0
THIS-0 PARAGRAPH-0 THE-1
CORRECT-1
So here number of "E" is 16
(a) SIXTEEN
here number "E" is 2 so total 16 + 2 = 18
So (1) is not correct
(b) SEVENTEEN
here number "E" is 4 so total 16 + 4 = 20
So (2) is not correct
(c) EIGHTEEN
here number "E" is 3 so total 16 + 3 = 19
So (3) is not correct
(d) NINETEEN
here number "E" is 3 so total 16 + 3 = 19 = NINETEEN
So (d) is correct

S79. Ans.(a)

S80. Ans.(a)

S81. Ans.(c)
Sol. Given:
- Total number of people to be seated = 540.
- The number of people in each row decreases by 4 compared to the previous row.
- We need to find which of the given numbers of rows nnn is not possible.

Formula:
The total number of people is modeled as an arithmetic progression (AP), where:
- First term (aaa) = xxx (number of people in the first row),
- Common difference (ddd) = −4-4−4,
- Number of terms (nnn) = number of rows.

The sum of an AP is given by:
$S_n = n/2\ [2a+(n-1)d]$

Here:

- Sn=540S_n = 540Sn=540,
- a=xa = xa = x,
- d=−4d = -4d = −4.

Derivation:

Substitute the values into the formula:

540 = n/2 [2x+(n−1)(−4)]

Simplify:

1080=n[2x−4n+4]1080 = n [2x - 4n + 4]1080=n(2x−4n+4)

Checking Each Option

1. **Option 1: n=5n = 5n=5**

1080=5(2x−4(5)+4)1080=5(2x−20+4)1080 = 5 (2x - 20 + 4)
1080=5(2x−20+4)1080=5(2x−16)1080 = 5 (2x - 16)1080=5(2x−16)216=2x−16216 = 2x - 16216=2x−162x=216+16=2322x = 216 + 16 = 2322x=216+16=232x=116x = 116x=116

This is valid. **5 rows is possible**.

1. **Option 2: n=6n = 6n=6**

1080=6(2x−4(6)+4)
1080=6(2x−24+4)1080 = 6 (2x - 24 + 4)1080=6(2x−24+4)1080=6(2x−20)1080 = 6 (2x - 20)1080=6(2x−20)180=2x−20180 = 2x - 20180=2x−202x=180+20=2002x = 180 + 20 = 2002x=180+20=200x=100x = 100x=100

This is valid. **6 rows is possible**.

1. **Option 3: n=8n = 8n=8**

1080=8(2x−4(8)+4)1080=8(2x−32+4)1080 = 8 (2x - 32 + 4)
1080=8(2x−32+4)1080=8(2x−28)1080 = 8 (2x - 28)1080=8(2x−28)135=2x−28135 = 2x - 28135=2x−282x=135+28=1632x = 135 + 28 = 1632x=135+28=163x=81.5x = 81.5x=81.5

This is not valid because xxx is not an integer. **8 rows is not possible**.

1. **Option 4: n=9n = 9n=9**

1080=9(2x−4(9)+4)1080=9(2x−36+4)1080 = 9 (2x - 36 + 4)
1080=9(2x−36+4)1080=9(2x−32)1080 = 9 (2x - 32)1080=9(2x−32)120=2x−32120 = 2x - 32120=2x−322x=120+32=1522x = 120 + 32 = 1522x=120+32=152x=76x = 76x=76

This is valid. **9 rows is possible**.

Final Answer

The number of rows that is **not possible** is:

Option c: 8 rows.

S82. Ans.(b)

Sol. Concept:

Translational Motion: The center of the ring moves forward in a straight line, maintaining a constant speed. This is because the ring is moving along a flat surface.

Rotational Motion: At the same time, the ring is rotating around its center. Each point on the ring traces a circular path relative to the center of the ring.

Solution:

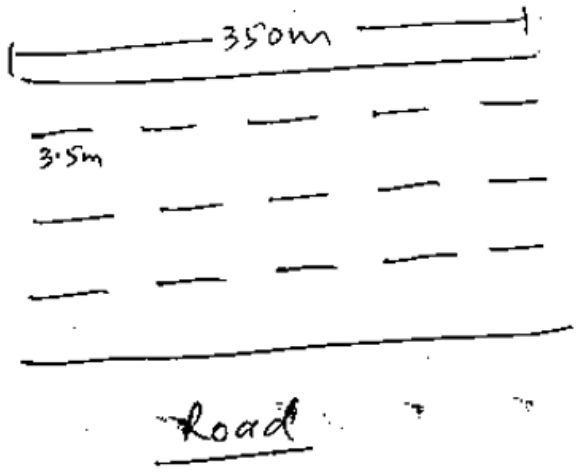
When a ring rolls without slipping, the motion of any point on the ring can be described by a combination of rotational and translational motion. The key observation is that the point that is at the top of the ring will trace a circular arc relative to the center of the ring, while the entire ring itself is moving forward due to the rolling.

As the ring rolls, the topmost point (the marked one) moves forward, downward, and around the circumference of the ring while the entire ring also moves forward along the track.
After some rolling, the marked point will come down as the ring rotates and eventually reach a lower position on the ring compared to its starting point.
Position B shows the correct behavior, where the marked point has moved forward and downward as expected for a rolling motion.
Therefore, Option b is the correct answer.

S83. Ans.(c)
Sol. Concept:
The problem involves calculating the probability of a favorable outcome when tossing four fair coins. A favorable outcome occurs when the number of heads is greater than the number of tails. The probability is calculated as:
Probability = (Number of favorable outcomes) / (Total number of outcomes)
Solution:
Step 1: Total Number of Outcomes
Each coin toss has two possible outcomes: Head (H) or Tail (T). Since four coins are tossed independently, the total number of possible outcomes is:
Total outcomes = $2^4 = 16$.
A favorable outcome occurs when the number of heads is greater than the number of tails.
In 4 coin tosses, we need 3 heads and 1 tail, or 4 heads and 0 tails.
The number of ways to choose 3 heads from 4 tosses is given by (4, 3) = 4 and there is only 1 way to get 4 heads, i.e., HHHH .
Thus, the total number of favorable outcomes is
4 (for 3 heads, 1 tail) + 1 (for 4 heads) = 5 favorable outcomes.
The probability is the ratio of favorable outcomes to total outcomes P(Favorable) = 5/16.
The probability of a favorable outcome is Option **c** .

S84. Ans.(b)
Sol. B is taller than 10 boys and B is shorter than 13 boys.
Therefore, there are a total of 10 + 1 + 13 = 24 boys in the class (including B).
G is taller than 6 girls and G is shorter than 8 girls.
Therefore, there are a total of 6 + 1 + 8 = 15 girls in the class (including G).
Two boys and three girls are shorter than B, but taller than G.
If B is taller than 10 boys, then B's position among the boys is11th in height order
(since B is taller than 10 boys, but shorter than 13).
Among the girls, there are 15 girls, and we know two boys and three girls are shorter than B.
Therefore, 5 students (2 boys + 3 girls) are shorter than B overall.
Total Number of Students:
There are 24 boys and 15 girls, so the total number of students is 39
Since B is taller than 10 boys, and there are 2 boys and 3 girls shorter than B,
B must be taller than 10 +1 + 3 + 6= 20 students.
Therefore, B is taller than 20 students and shorter than 39 - 20-1 = 18 others.
Thus, the correct option is Option b.

S85. Ans.(c)
Sol. The length of the road = 350 m



Each cycle consists of a painted line of 3.5 m and a gap of 3.5 m.
Therefore, the length of one full cycle is 3.5 m + 3.5 m = 7 m
Therefore, number of cycles = 350 / 7 = 50 cycles
Since, each cycle has a painted line of 3.5 m, and there are three painted lines on the road to make 4 lane.
Total painted line length = 50 × 3.5 × 3 = 150 × 3.5 = 525
Thus, the total length of the painted lines over the 350 m stretch of road is 525 meters.
Hence Option (c) is correct.

S86. Ans.(c)
Sol. Concept:
The fundamental formula for motion is, Distance=Speed×TimeDistance=Speed × Time
Solution:
Let d be the length of the track (what we are trying to find), v be her normal speed and t be the time she runs.
At normal speed, the distance covered is d - 10, so v·t = d−10 (Equation 1)
When she increases her speed by 20%, her new speed is 1.2v , and she covers a distance of d + 20, so:
1.2v·t = d+20 (Equation 2)
=> v·t = d−10
=> 1.2v·t = d+20
=> 1.2(d−10) = d+20
=> 1.2d−12 = d+20
=> 1.2d−d = 20+12
=> 0.2d = 32
=> d = 320/2 = 160 meters
Hence, the correct option is c.

S87. Ans.(d)
Sol. Concept:
The flow of water from a hole at the bottom of a container is governed by **Torricelli's Law**, which states that the velocity of efflux of a fluid under gravity through an orifice at the bottom of the container is proportional to the square root of the height of the fluid column.

Solution:

Option A:A straight line shows a constant rate of drainage, which is incorrect.

Option B: Shows no change until the very end, which doesn't match the continuous draining process.

Option C: Shows the wrong pattern of a steep drop does not matching Torricelli's law.

Option D: Shows the right pattern of a steep drop followed by a slower decrease, matching Torricelli's law.

Hence option**(**d**)** is correct.

S88. Ans.(d)

Sol. Concept:

Uniform Distribution: In a uniform distribution, all outcomes within a given range are equally likely. Here, the length

of the fish is uniformly distributed between 2 and 4 inches, meaning every length in that range has the same probability.

Solution:

The length of bristlemouth fish is **uniformly distributed** between 2 and 4 inches.

This means every length between 2 and 4 inches has an equal probability of being selected.

The total range of fish lengths is from 2 to 4 inches, so the range is 4 - 2 = 2 inches.

The range of fish lengths that are 3 inches or longer is from 3 to 4 inches. So the favorable range is 4 - 3 = 1 inch.

The probability of catching a fish that is 3 inches or longer is given by the ratio of the range to the total range:

P(Fish ≥ 3 inches) = 1/2 = 0.5.

The probability of not catching a fish that is 3 inches or longer (i.e., catching a fish shorter than 3 inches) is:

P(Fish < 3 inches) = 1 - 0.5 = 0.5.

If a fisherman catches 5 fish, the probability that none of the 5 fish are 3 inches or longer is:

P(None of the 5 fish ≥ 3 inches) = (0.5)^5 = 0.03125.

The probability that at least one fish is 3 inches or longer is the complement of the probability that none of the fish are 3 inches or longer:

P(At least one fish ≥ 3 inches) = 1 - 0.03125 = 0.96875.

The probability that at least one of the 5 bristlemouth fish is 3 inches or longer is **0.96875**.

S89. Ans.(d)

Sol. There are 30 students in total.

Roll numbers 1 to 20 secure an average of 72% marks, roll numbers 11 to 30 secure an average of 75% marks

and the average marks for the entire class is 70%.

We need to find the average marks of students with roll numbers 11 to 20.

Let the average marks of students with roll numbers 11 to 20 be x.

The average marks for the whole class is 70%, so the total marks for the 30 students is Total marks of the class=30×70=2100(in percentage terms).

The average marks of students with roll numbers 1 to 20 is 72%, so the total marks of these students is = Total marks of roll numbers 1 to 20=20×72=1440. The average marks of students with roll numbers 11 to 30 is 75%, so the total marks of these students is= Total marks of roll numbers 11 to 30=20×75=1500. Let the average marks of students with roll numbers 11 to 20 be x, and the total marks for these 10 students will be Total marks of roll numbers 11 to 20=10×x=10x. The sum of the total marks of all three groups (1 to 10, 11 to 20, and 21 to 30) should equal the total marks of the entire class 1140+10x+1500−10x−10x=2100. ⇒ 10x =1440−600
⇒ 10x = 840 ⇒ x=84.
Hence the correct option is **(d)**.

S90. Ans.(d)
Sol. Concept:
Exponential population growth
$N(t) = N_0e^{rt}$
Here, r represents the intrinsic growth rate.
Solution:
$N(t) = N_0e^{rt}$
where, $N_{(t)}$ is the population at time t, N_0 is the initial population, and r is the intrinsic growth rate.
Population A grows the fastest, showing a steep increase.
Population B grows more moderately, with a gentler curve compared to A.
Population C grows the slowest, with the flattest curve among the three.
Since the growth rate r dictates the steepness of the exponential curve, the following relationship can be inferred based on the graph $r_A > r_B > r_c$
Population A has the highest growth rate r_A because its curve rises the fastest.
Population B has a slower growth rate r_B than A but faster than C.
Population C has the slowest growth rate r_c.
The correct answer is Option **(d).**

S91. Ans.(c)
Sol. Since males and females pair randomly, we assume that the proportion of red, blue, and yellow is the same for both males and females (i.e., 50% of males are red, 30% of males are blue, and 20% of males are yellow and the same proportions apply to females).
To find the expected number of red male–yellow female pairings:
The probability of selecting a red male is 50% = 0.50
The probability of selecting a yellow female is 20% = 0.20.
The expected number of red male–yellow female pairings is the product of these probabilities and
The total number of pairs = Expected number of red male-yellow female pairs=0.50×0.20×10,000=0.10×10,000=1,000 The expected number of pairings between red males and yellow females is 1,000
Pairing is random, meaning the probability of selecting any male or female of a specific color is proportional to their population distribution.
Hence, option **(c)** is correct.

S92. Ans.(b)
Sol. Let C be the total number of teachers who teach chemistry and P be the total number of teachers who teach physics.

Given:

Every second teacher who teaches chemistry also teaches physics, so the number of teachers who teach both subjects from the chemistry group is C/2.

Every third teacher who teaches physics also teaches chemistry, so the number of teachers who teach both subjects from the physics group is P/3.

Let x represent the number of teachers who teach both chemistry and physics. Since these two groups overlap, the number of teachers who teach both chemistry and physics must be the same in both cases.

Therefore, we can set up the equation:

C/2 = P/3

Cross-multiply to find the relationship between C and P :

3C = 2P

=> C = 2/3 P

Now, the number of teachers who only teach chemistry is the total number of chemistry teachers minus those who teach both subjects, which is:

Teachers who only teach chemistry = C - C/2 = C/2

Similarly, the number of teachers who only teach physics is:

Teachers who only teach physics = P - P/3 = 2P/3

To find the ratio of teachers who only teach chemistry to those who only teach physics, we calculate:

Teachers who only teach chemistry / Teachers who only teach physics =

$$\frac{\frac{C}{2}}{\frac{2P}{3}} = \frac{C}{2} \times \frac{3}{2P} = \frac{3C}{4P}$$

Substitute C = 2/3P into the equation:

$$= \frac{3 \times \frac{2}{3}P}{4P} = \frac{2P}{4P} = \frac{1}{2}$$

Thus, the ratio of teachers who only teach chemistry to those who only teach physics is 1/2.

S93. Ans.(c)

Sol. The son was born when the mother was 28 years old, the father is 4 years older than the mother, the current ages of the father and mother are in the ratio 9:8. We need to find the current age of the son.

Let the current age of the mother be 8x years.

Then, the current age of the father will be 9x years (since their ages are in the ratio of 9:8).

From the problem, we know the father is 4 years older than the mother. Therefore,

9x = 8x + 4

⇒ x=4

Mother's current age = 8x = 8×4 = 32 years.

Father's current age = 9x = 9×4 = 36 years.

The son was born when the mother was 28 years old. The mother is currently 32 years old.

The son is currently 4 years old, so the correct answer is Option **(c).**

S94. Ans.(c)

Sol. Concept:

$$\text{Net loss} = \left(\frac{\text{Common gain/loss percentage}}{10}\right)^2\%$$

Solution:

If a person gains x% on one item and loses x% on another item, the net result will always be a loss.

$$\text{Net loss} = \left(\frac{\text{Common gain/loss percentage}}{10}\right)^2\%$$

Here, the common percentage is 20%, so the net loss is

Net loss=$(20/10)^2$= 4%

Therefore, the person incurs a net loss of 4%.

Thus, the correct option is Option **(c)**.

S95. Ans.(c)

Sol. Concept:

Net Displacement: After calculating the movement components, the total displacement is the vector sum of the

horizontal and vertical distances between the current and original positions.

Solution:

Rajesh moves **1 km North-East** (which is at a 45-degree angle) to Sunil's house.

From Sunil's house, he moves **707 meters South** to Arjun's house.

Rajesh's movement to Sunil's house forms a right-angled triangle, where the **horizontal** and **vertical components**

of the movement are equal since it's in the North-East direction.

The horizontal and vertical components of the 1 km (1000 m)

North-East move are 1000 × cos(45) and 1000 × sin(45), respectively.

Both components are equal to

$1000\times1/\sqrt{2}$ = 70meters.

From Sunil's house, Rajesh moves **707 meters South**,

which directly affects the vertical component.

So, he is at the same latitude as his original house.

The horizontal component remains 707 meters to the East.

Since Rajesh is almost at the same latitude (vertical difference is 0.1 meters),

the total distance from his house is

approximately the horizontal displacement = Distance = 707 meters

Thus, the correct answer is Option **(c)**.

S96. Ans.(c)

Sol. Concept:

Mean $\mu(A)$:

$$\mu(A) = \frac{\text{Total number of trees}}{\text{Total number of quadrats}} = \frac{25}{25} = 1$$

Standard Deviation $\sigma(A)$:

$$\sigma(A) = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - \mu(A))^2}$$

Solution:
Forest Patch A:
There are 25 quadrats, each containing exactly 1 tree.
Mean (μA): Total number of trees is 25.
Mean is μ(A)=25/25=1.
Standard deviation (σA): Since all values are the same (1), the standard deviation is σ(A)=0.
Forest Patch B:
Quadrats contain the following numbers of trees: {2,0,0,0,0,0,0,7,0,10,0,0,0,6,0}
Mean (μB): Total number of trees is 2 + 7 + 10 + 6 = 25 .
Mean is $\mu(B) = \frac{25}{15} = 1.67$
Standard deviation (σB): Since values vary greatly, the standard deviation σ(B)>0.
=> μ(A) and μ(B) are not equal.
=> The standard deviation in Patch B is higher due to the large variation in tree numbers.
Thus, Option **(c)** is correct.

S97. Ans.(b)
Sol. Rs. 4849 ÷ 500 = 9 remainder 349.
So, we use 9 Rs. 500 notes, leaving us with Rs. 349 to be accounted for.
Rs. 349 ÷ 50 = 6 remainder 49.
So, we use 6 Rs. 50 notes, leaving us with Rs. 49 to be accounted for.
Rs. 49 ÷ 20 = 2 remainder 9. So, we use 2 Rs. 20 notes, leaving us with Rs. 9 to be accounted for.
Rs. 9 ÷ 5 = 1 remainder 4. So, we use 1 Rs. 5 note, leaving us with Rs. 4 to be accounted for.
Rs. 4 ÷ 2 = 2. So, we use 2 Rs. 2 notes.
Total number of notes used 9 notes of Rs. 500, 6 notes of Rs. 50, 2 notes of Rs. 20, 1 note of Rs. 5 and 2 notes of Rs. 2
Total = 9 + 6 + 2 + 1 + 2 = 20 notes
Thus, the minimum number of notes required is Option **(b)** .

S98. Ans.(b)
Sol. Concept:
Inclusion-Exclusion principle:
If A and B are two sets, the size of their union is given by
|A ∪ B| = |A| + |B| - |A ∩ B|
Solution:
There are 100 students in total.
41 students can speak English and 21 students can speak both English and Hindi.
We need to find how many students can speak only Hindi or Hindi in total.
Let E = Number of students who can speak English = 41, H = Number of students who can speak Hindi (to be found).
B = Number of students who can speak both English and Hindi = 21 and total number of students = 100.
According to the inclusion-exclusion principle, the total number of students who can speak at least one of the two languages (English or Hindi) is E + H - B = 100 ⇒ 41 + H - 21 = 100
⇒ H = 100 - 20
⇒ H = 80
Therefore, 80 students can speak Hindi.
The correct answer is Option **(b)**.

S99. Ans.(b)
Sol. We are given that the hypotenuse of a right triangle is 17 cm, and the sides are integers.
Here the sides of the triangle are integers, so the triangle is a **Pythagorean triplet.**
The Pythagorean triplet involving 17 as the hypotenuse is **(8, 15, 17).**
Now, the area A of a right triangle is given by
$A=1/2\times base\times height$
For the triplet (8, 15, 17);
Base = 8 cm, Height = 15 cm
So, the area is
$A=1/2\times8\times15=1/2\times120=60$sq. cm
Thus, the correct answer is Option **(b).**

S100. Ans.(b)
Sol. Concept:
Functional relationship: Two pairs of words are compared based on how they function or relate to one another.
Solution:
___ is to COLOUR.
Curry is a dish, and **spice** is an essential element that adds flavor to it.
Similarly, the blank should be something that is essentially defined or created by **color**.
Looking at the options:
1. **Canvas**: A surface where colors can be applied, but it is not directly related to color in the way that spice is to curry.
2. **Painting**: A painting is something that is created using colors, just as curry is created with spices. This makes **Painting** the correct analogy, as a painting is defined by its use of color, similar to how curry is defined by the use of spice.
3. **Brush**: This is a tool used to apply colors but is not analogous to spice in this context.
4. **Brightness**: This is a characteristic of color, but not something defined by the use of color in the same way a painting is.
Thus, the correct answer is Option **(b).**