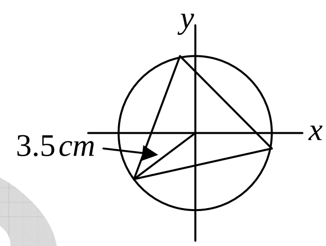
PART A
(Previous Year's Questions and Solutions)

NET JUNE-2013

Q1. There is an equilateral triangle in the XY plane with its centre at the origin. The distance of its vertices from the origin is 3.5 cm. The area of its circumcircle in cm^2 is

(a) 38.5 (b) 49 (c) 63.65 (d) 154

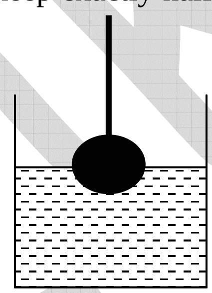
Ans. : (a)



Solution: From the figure, we see that the radius of the circumcircle is $3.5\ cm$.

Hence area of the circle $=\pi(3.5)^2 = 38.5\ cm^2$

Q2. A sphere of iron of radius $R/2$ fixed to one end of a string where lowered into water in a cylindrical container of base radius R to keep exactly half the sphere dipped. The rise in the level of water in the container will be



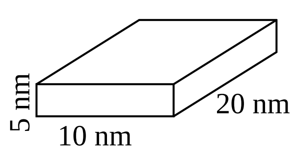
(a) R/3 (b) R/4 (c) R/8 (d) R/12

Ans. : (d)

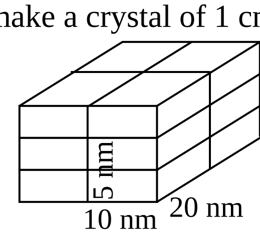
Solution: The volume of water displaced by the sphere $=\frac{1}{2}.\frac{4}{3}\pi\left(\frac{R}{2}\right)^3 = \frac{1}{12}\pi R^3$

The rise in water level $=\frac{\text{volume of water displaced}}{\text{area of base of cylinder}} = \frac{\frac{1}{12}\pi R^3}{\pi R^2} = \frac{R}{12}$

Q3. A crystal grows by stacking of unit cells of 10 × 20 × 5 $10\times20\times5\ nm^3$ size as shown in the diagram given below. How many unit cells will make a crystal of 1 cm^3 volume?



Unit Cell (not to scale)



Crystal (not to scale)

(a) 10^6 (b) 10^9 (c) 10^{12} (d) 10^{18}

Ans. : (d)

Solution: The volume of a unit cell $(10\ nm \times 20\ nm \times 5\ nm) = 1000 \times 10^{-27}\ m^3 = 10^{-24\,m^3}$

The volume of crystal $= (10^{-2}\ m)^3 = 10^{-6}\ m^3$

Hence the number of unit cells required $= \dfrac{\text{size of crystal}}{\text{size of a unit cell}} = \dfrac{10^{-6}\ m^3}{10^{-24}\ m^3} = 10^{18}$

Q4. What is the value of $\dfrac{1}{1\times 2} + \dfrac{1}{2\times 3} + \dfrac{1}{3\times 4} + ...$ to ∞?

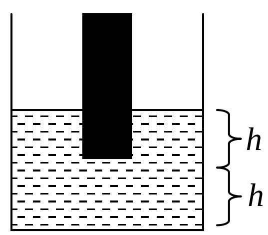
(a) $2/3$ (b) 1 (c) 2 (d) ∞

Ans. : (b)

Solution: The sum of n term of the series $S = 1 - \dfrac{1}{(n+1)} = 1 - \dfrac{\left(\frac{1}{n}\right)}{1+\frac{1}{n}}$

Hence the sum of terms upto infinity $S_\infty = 1 - \dfrac{0}{1+0} = 1$

Q5. A solid cylinder of basal area A was held dipped in water in a cylindrical vessel of basal area $2A$ vertically such that a length h of the cylinder is immersed. The lower tip of the cylinder is at a height h from the base of the vessel. What will be the height of water in the vessel when the cylinder is taken out?



(a) $2h$ (b) $\dfrac{3}{2}h$

(c) $\dfrac{4}{3}h$ (d) $\dfrac{5}{4}h$

Ans. : (b)

Solution: The volume of water displaced when a height h is inside water $= Ah$

Hence increase in the water level $= \dfrac{\text{volume of water displaced}}{\text{Area of base}} = \dfrac{Ah}{2A} = \dfrac{h}{2}$

Since due to immersion of solid cylinder height of water level has increased by $\dfrac{h}{2}$, upon taking out the cylinder the water level will decrease by the same amount.

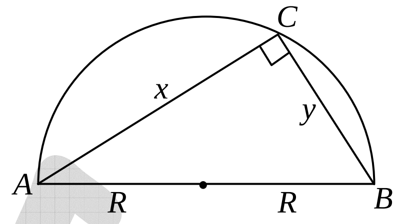
Hence, height of water level $= h + \dfrac{h}{2} = \dfrac{3}{2}h$

Q6. Of all the triangles that can be inscribed in a semicircle of radius R with the diameter as one side, the biggest one has the area

(a) R^2 (b) $R^2\sqrt{2}$ (c) $R^2\sqrt{3}$ (d) $2R^2$

Ans. : (a)

Solution: The area of the triangle formed $=\frac{1}{2}\times x\times y$



Here we have used the fact that angle in a semi-circle is a right angle.

Now it can be proved using calculus that for the area ABC to be longest $x=y$.

Hence $x^2+x^2=(2R)^2$ or $x=\sqrt{2}R$. Hence Area $=\frac{1}{2}.\sqrt{2}R.\sqrt{2}R=R^2$

Q7. Choose the largest number:

(a) 2^{500} (b) 3^{400} (c) 4^{300} (d) 5^{200}

Ans. : (b)

Solution: $2^{500}=\left(2^5\right)^{100}=(32)^{100}$, $3^{400}=\left(3^4\right)^{100}=(81)^{100}$

$4^{300}=\left(4^3\right)^{100}=(64)^{100}$, $5^{200}=\left(5^2\right)^{100}=(25)^{100}$

thus we see that out of the given numbers 3^{400} is the longest.

Q8. A daily sheet calendar of the year 2013 contains sheets of 10×10 cm size. All the sheets of the calendar are spread over the floor of a room of 5m × 7.3 m size. What percentage of the floor will be covered by these sheets?

(a) 0.1 (b) 1 (c) 10 (d) 100

Ans. : (c)

Solution: Area of each sheet $=10\ cm\times 10\ cm=0.01\ m^2$

Area of the floor $=5\ m\times 7.3\ m=36.5\ m^2$

Area of all sheets of the calendar year 2013 is $365\times 0.01\ m^2=3.65\ m^2$

Hence if the sheets are placed on the floor in non-overlapping way, the percentage of floor covered

$$=\frac{\text{area of all sheets}}{\text{area of floor}}\times 100=\frac{3.65}{36.5}\times 100=10\%$$

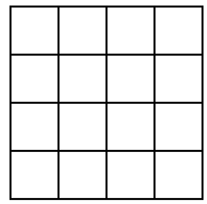
Q9. How many rectangles (which are not squares) are there in the following figure?

(a) 56

(b) 70

(c) 86

(d) 100



Ans. : (b)

Q10. Define $a \otimes b = lcm(a,b) + \gcd(a,b)$ and $a \oplus b = a^b + b^a$. What is the value of $(1 \oplus 2) \otimes (3 \oplus 4)$? Here lcm = least common multiple and gcd = greatest common divisor.

(a) 145 (b) 286 (c) 436 (d) 572

Ans. : (c)

Solution: Given $a \otimes b = lcm(a,b) + \gcd(a,b)$; $a \otimes b = a^b + b^a$

Hence $(1 \oplus 2) \otimes (3 \oplus 4) = (1^2 + 2^1) \otimes (3^4 + 4^3)$

$(3) \otimes (145) = l\ cm(3,145) + \gcd(3,145) = 435 + 1 = 436$

Q11. A square pyramid is to be made using a wire such that only one strand of wire is used for each edge. What is the minimum number of times that the wire has to be cut in order to make the pyramid?

(a) 3 (b) 7 (c) 2 (d) 1

Ans. : (b)

Solution: The total number of edges in a pyramid with a square base is equal to 8. So, two form 8 edges from a single wire, we need to cut it seven times.

Q12. A crow is flying along a horizontal circle of radius R at a height R above the horizontal ground. Each of a number of men on the ground found that the angular height of the crow was a fixed angle $\theta(< 45^{\circ})$ when it was closest to him. Then all these men must be on a circle on the ground with a radius

(a) $R + R\sin\theta$ (b) $R + R\cos\theta$ (c) $R + R\tan\theta$ (d) $R + R\cot\theta$

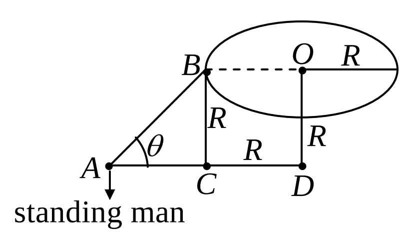
Ans. : (d)

Solution: From triangle ABC

$$AC = \frac{BC}{\tan\theta} = R\cot\theta$$

Hence radius of the circle in which men are standing is

$$AC + CD = R + R\cot\theta$$



Q13. How many pairs of positive integers have gcd 20 and lcm 600?

(gcd = greatest common divisor; lcm = least common multiple)

(a) 4 (b) 0 (c) 1 (d) 7

Ans. : (a)

Solution: Since 20 is the gcd, hence two numbers of the pair are $20x$ and $20y$, where x and y have no common factor other than one.

Now $20x \times 20y = 20 \times 600$

(Since $lcm \times \text{gcd} = \text{product of numbers}$)

$\therefore \quad xy = 30$, where x and y have no common factor other than 1.

Now, this equation is satisfied by the pairs $(1,30),(2,15),(3,10),(5,6)$

Hence, in all there are four numbers.

Q14. During an evening party, when Ms. Black, Ms. Brown and Ms. White met, Ms. Brown remarked, "it is interesting that our dresses are white, black or brown, but for each of us the name does not match the colour of the dress!". Ms. White replied, "But your white dress does not suit you!". Pick the correct answer

(a) Ms. White's dress was brown (b) Ms. Black's dress was white

(c) Ms. White's dress was black (d) Ms. Black's dress was black

Ans. : (a)

Solution: According to white's Remark, the dress of "Ms. Brown" was "White". According to Brown's statement name does not match the colors of the dress, hence "Ms. Black" wears "Brown" while "Ms. White" wears "Black"

Q15. Two integers are picked at random from the first 15 positive integers without replacement. What is the probability that the sum of the two numbers is 20?

(a) $\frac{3}{4}$ (b) $\frac{1}{21}$ (c) $\frac{1}{105}$ (d) $\frac{1}{20}$

Ans. : (b)

Solution: In the first drawing any of the 15 numbers can appear and in the second drawing any of the remaining 14 number can appear. Hence the total no. of ways of drawing 2 integers is 15×14.

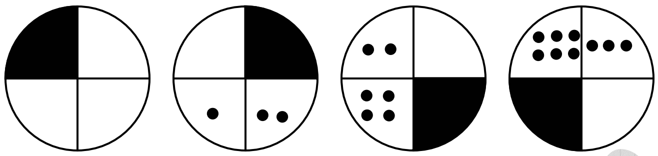
Now for the sum to be 20 these combinations are possible

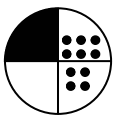
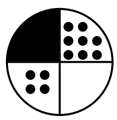
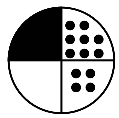
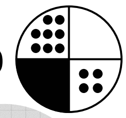
$(5,15),(15,5),(6,14),(14,6),(7,13),(13,7),(8,12),(12,8),(9,11),(11,9)$

Thus there are ten combinations.

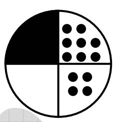
Thus the probability that the sum is $20 = \frac{10}{15 \times 14} = \frac{1}{21}$

Q16. Identify the next figure in the sequence



(a)  (b)  (c)  (d) 

Ans. : (c)

Solution: The shaded portion rotates by 90^{o} clockwise. The number of dots opposite to the shaded portion increases by 1 in each figure. The number of dots adjacent to shaded region is double the number of dots opposite to shaded region, hence the next figure should be 

Q17. In a customer survey conducted during Monday to Friday, of the customers who asked for child care facilities in super markets, 23% were men and the rest, women. Among them 19.9% of the women and 8.8% of the men were willing to pay for the facilities.

A. What is the ratio of the men to women customers who wanted child care facilities?

B. If the survey had been conducted during the weekend instead, how will the result change?

With the above data,

(a) Only A can be answered (b) Only B can be answered

(c) Both A and B can be answered (d) Neither A nor B can be answered

Ans. : (a)

Solution: The ratio of men to women customers who wanted child case facility is $\frac{23}{77}$. Hence A can be answered. We cannot expect the response of customers during weekend hence B cannot be answered.

Q18. During a summer vacation, of 20 friends from a hostel, each wrote a letter to each of all others. The total number of letters written was

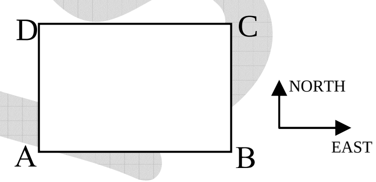
(a) 20 (b) 400 (c) 200 (d) 380

Ans. : (d)

Solution: This is a problem on permutation since the letter written by any one person A to B is different from letter written by B to A. Thus the total number of letters written is

$$^{20}P_2 = \frac{20\,!}{(20-2)!} = 19\times 20 = 380$$

Q19. A person has to cross a square field by going from A to C. The person is only allowed to move towards the east or towards the north or use a combination of these movements. The total distance traveled by the person



(a) depends on the length of each step

(b) depends on the total number of steps

(c) is different for different paths

(d) is the same for all paths

Ans. : (d)

Solution: Since the person is allowed to travel only along north and east. The person has to cover the same distance $AD(=BC)$ and the same distance $AB=(DC)$ to reach from A to C. Hence, the total distance is the `same for all paths.

NET DEC-2013

Q20. A cylinder of radius 1 cm and height 1 cm is broken into three pieces. Which of the following MUST be true?

(a) At least one piece has volume equal to 1 cm^3

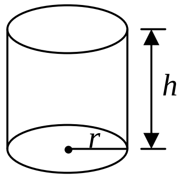
(b) At least two pieces have equal volumes.

(c) At least one piece has volume less than 1 cm^3

(d) At least one piece has volume greater than 1 cm^3

Ans. : (d)

Solution: The total volume of cylinder is



$$V = \pi r^2 h \text{ or } V = \pi \ cm^3 > 3$$

Now, $V_1 + V_2 + V_3 = \pi > 3$

This implies that at least one of the pieces has volume greater than 1 cm. Otherwise the total volume will be less than or equal to 3, which contradicts the question.

Q21. For real numbers x and y, $x^2 + (y-4)^2 = 0$. Then the value of $x + y$ is

(a) 0 (b) 2 (c) $\sqrt{2}$ (d) 4

Ans. : (d)

Solution: The sum of the squares of two real numbers is zero if and only if each of the numbers themselves are zero

This means $x = 0$ and $y - 4 = 0$ or $y = 4$

Thus $x + y = 0 + 4 = 4$

Q22. Every time a ball falls to ground, it bounces back to half the height it fell from. A ball is dropped from a height of 1024 cm. The maximum height from the ground to which it can rise after the tenth bounce is

(a) 102.4 cm (b) 1.24 cm (c) 1 cm (d) 2 cm

Ans. : (c)

Solution: The ball rises to a height of $1024\left(\frac{1}{2}\right)^n$ after the n^{th} bounce. Hence the ball rises to a height of $1024\left(\frac{1}{2}\right)^{10} = 1\ cm$ after the tenth bounce

Q23. A farmer gives 7 full, 7 half-full and 7 empty bottles of honey to his three sons and asks them to share these among themselves such that each of them gets the same amount of honey and the same number of bottles. In how many ways can this be done? (bottles cannot be distinguished otherwise, they are sealed and cannot be broken).

(a) 0 (b) 1 (c) 2 (d) 3

Ans. : (d)

Solution: Since each son has to get equal number of bottles hence

$$x + y + z = 7 \qquad \text{(i)}$$

where x, y and z are number of full, half-full and empty bottles

since each son has to get equal amount of honey and the honey is available in full and half-full bottles only, we obtain $xt+\frac{y}{2}t=3.5t$, where t is the amount of honey in full bottle.

This gives $2x+y=7 \Rightarrow x=\frac{7-y}{2}$ (ii)

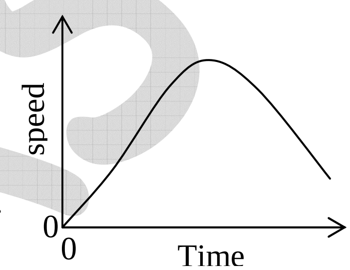
when $y=1, x=3$ and from equation (i) $z=3$.

when $y=3, x=2$ and from equation (i) $z=2$

when $y=5, x=1$ and from equation (i) $z=1$

These are the only combinations possible.

Q24. A car is moving along a straight track. Its speed is changing with time as shown below. Which of the following statements is correct?



(a) The speed is never zero.

(b) The acceleration is zero once on the path.

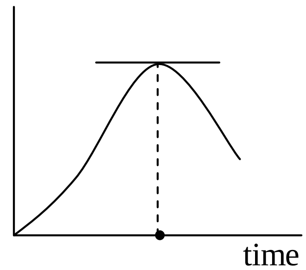
(c) The distance covered initially increases and then decreases.

(d) The car comes back to its initial position once.

Ans. : (b)

Solution: From the group, it is seen that speed is zero at time $t=0$.

From the group It is seen that the slope of the speed-time graph is horizontal of a certain time. Hence acceleration at that time is zero.



Q25. If $a+b+c+d+e=10$ (all positive numbers), then the maximum value of $a\times b\times c\times d\times e$ is

(a) 12 (b) 32 (c) 48 (d) 72

Ans. : (b)

Solution: If the sum of n positive numbers is X then for the maximum value of their product each of the numbers must be $\frac{X}{n}$.

In our case $X=10$, $n=5$. Hence for the maximum value of the product $a\times b\times c\times d\times e$, each number must be equal to $\frac{10}{5}=2$.

Hence the maximum value $=(2)^5=32$.

Q26. How many nine-digit positive integers are there, the sum of squares of whose digits is 2?

(a) 8 (b) 9 (c) 10 (d) 11

Ans. : (a)

Solution: For the sum of squares of digits to be 2 in a nine digit numbers, two digits should be equal to one and seven digits should be equal to zero. Now the first digit must equal 1, otherwise we cannot form a nine digit number under the given condition. Another 1......

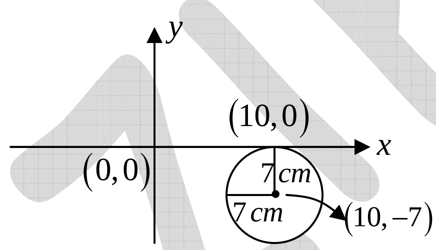
1, can occupy any of the 8 places, hence the total number of nine-digit position integers is 8.

Q27. A circle of radius 7 units lying in the fourth quadrant touches the x-axis at $(10,\ 0)$. The centre of the circle has coordinates

(a) $(7,\ 7)$ (b) $(-10,\ 7)$ (c) $(10,\ -7)$ (d) $(7,\ -7)$

Ans. : (c)

Solution: The circle is located as shown in the figure.



From the diagram the co-ordinates of centre are 10 and -7.

Q28. One of the four A, B, C and D committed a crime. A said, "I did it", B said, "I didn't", C said, "B did it', D said, 'A did it". Who is lying?

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

Ans. : (c)

Solution: According to A, A committed the crime. According to B either A, C or D committed the crime.

According to C, B committed the crime

According to D, A committed the crime.

Thus according to three persons A, B and D the crime was commited by A. But according to C, B committed the crime. Hence C is lying.

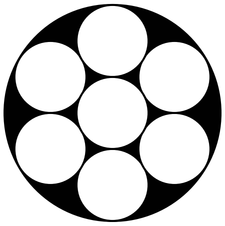
Q29. A circle circumscribes identical, close-packed circles of unit diameter as shown in the figure. What is the total area of the shaded portion?

(a) 2

(b) 2π

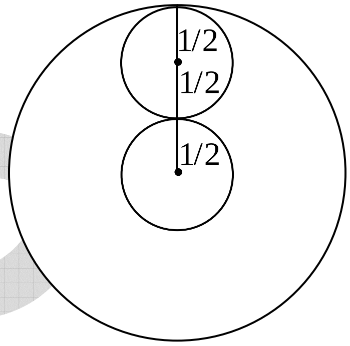
(c) $1/2$

(d) $\pi/2$



Ans. : (d)

Solution: The radius of the bigger circle is $\frac{3}{2}$ unit as seen from the figure.

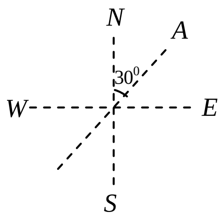


Hence the area of the bigger circle $= \pi\left(\frac{3}{2}\right)^2 = \frac{9\pi}{4}$ unit.

Area of each smaller circle is $\pi\left(\frac{1}{2}\right)^2 = \frac{\pi}{4}$ unit. Hence total area of 7 smaller circles is $\frac{7\pi}{4}$.

Thus area of the shaded portion $= \frac{9\pi}{4} - \frac{7\pi}{4} = \frac{\pi}{2}$ units.

Q30. There are 2 hills, A and B, in a region. If hill A is located $N30^\circ E$ of hill B, what will be the direction of hill B when observed from hill A? ($N30^\circ E$ means 30° from north towards east).



(a) $S30^\circ W$ (b) $S60^\circ W$

(c) $S30^\circ E$ (d) $S60^\circ E$

Ans. : (a)

Q31. What is the next number in the following sequence?

39, 42, 46, 50,….

(a) 52 (b) 53 (c) 54 (d) 55

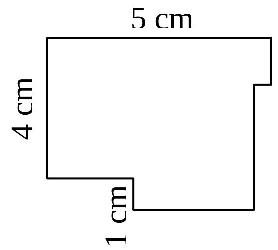
Ans. : (c)

Solution: we see that

$42 = 39 + 3;\ 46 = 39 + 7;\ 50 = 39 + 11$

Hence the next number should be $39 + 15 = 54$

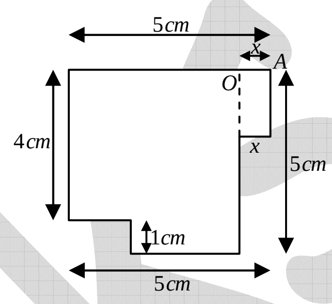
Q32. What is the perimeter of the given figure, where adjacent sides are at right angles to each other?



(a) 20 cm (b) 18 cm (c) 21 cm (d) cannot be determined

Ans. : (a)

Solution: Let $OA = x$, then total perimeter



$$\left(5-x\right)+5+2x+\left(5-x\right)+5=20\ cm$$

Q33. Three fishermen caught fishes and went to sleep. One of them woke up, took away one fish and $1/3^{rd}$ of the remainder as his share, without others' knowledge. Later, the three of them divided the remainder equally. How many fishes were caught?

(a) 58 (b) 19 (c) 76 (d) 88

Ans. : (b)

Solution: Let the number of fishes received by three persons finally be x. Then the total fishes before division $=3x$.

Number of fished before B takes up $\frac{1}{3}rd = 3\left(3x\right)=9x$. B also takes 1 fish initially.

Hence the total number of fishes $=9x+1$.

Thus $9x+1=$ Total number of fishes

$$\therefore \quad x=\frac{\text{Total no. of fishes}-1}{9}$$

Thus (Total no. of fishes -1) should be divisible by 9. Only option (b) satisfies this condition.

Q34. What is the arithmetic mean of $\frac{1}{1\times 2}, \frac{1}{2\times 3}, \frac{1}{3\times 4}, \frac{1}{4\times 5}, ..., \frac{1}{100\times 101}$?

(a) 0.01 (b) $\frac{1}{101}$ (c) 0.00111.... (d) $\frac{\frac{1}{49\times 50}+\frac{1}{50\times 51}}{2}$

Ans. : (b)

Solution: Arithmetic mean of

$$\frac{1}{1\times 2}, \frac{1}{2\times 3}, \frac{1}{3\times 4}, \frac{1}{4\times 5} ... \frac{1}{100\times 101} \text{ is}$$

$$A.M = \frac{\frac{1}{1\times 2}+\frac{1}{2\times 3}+...\frac{1}{100\times 101}}{100}$$

$$= \frac{\frac{1}{1}-\frac{1}{2}+\frac{1}{2}-\frac{1}{3}+...\frac{1}{99}-\frac{1}{100}+\frac{1}{100}-\frac{1}{101}}{100} = \frac{1-\frac{1}{101}}{100} = \frac{100}{101\times 100} = \frac{1}{101}$$

Q35. $(25\div 5+3-2\times 4)+(16\times 4-3)=$

(a) 61 (b) 22 (c) 41/24 (d) 16

Ans. : (a)

Solution: $(25\div 5+3-2\times 4)+(16\times 4-3) = (5+3-8)+(64-3) = 0+61=61$

Q36. Consider the sequence of ordered sets of natural numbers:

$$\{1\}, \{2, 3\}, \{4, 5, 6\},....$$

What is the last number in the 10^{th} set?

(a) 10 (b) 19 (c) 55 (d) 67

Ans. : (c)

Solution: The number of numbers is $1+2+3+...+10=\frac{10\times 11}{2}=55$

Q37. A student buys a book from an online shop at 20% discount. His friend buys another copy of the same book in a book fair for Rs. 192 paying 20% less than his friend. What is the full price of the book?

(a) Rs. 275 (b) Rs. 300 (c) Rs. 320 (d) Rs. 392

Ans. : (b)

Solution: Let the full price of the book be x.

Price paid by first student $= 80\%$ of $x = \frac{4x}{5}$. Hence, $\frac{4x}{5} - \frac{4x}{25} = 192$

$\Rightarrow \frac{16x}{25} = 192 \Rightarrow x = 300$

Q38. 366 players participate in a knock-out tournament. In each round all competing players pair together and play a match, the winner of each match moving to the next round. If at the end of a round there is an odd number of winners, the unpaired one moves to the next round without playing a match. What is the total number of matches played?

(a) 366 (b) 282 (c) 365 (d) 416

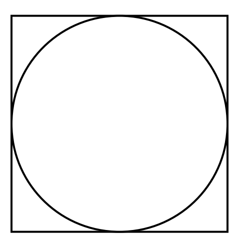
Ans. : (c)

Solution: In the first round there will be 183 matches. In the second round there will be 91 matches and one player will move to the third round. In the third round there will be $\frac{(91+1)}{2} = 46$ matches. In the fourth round there will be 23 matches. In the fifth round there will be 11 matches and one player will move to the sixth round. In the sixth round there will be $\frac{(11+1)}{2} = 6$ matches. In the seventh round there will be 3 matches. In the eighth round there will be 1 match and one player will move to the ninth (and the last round). In the ninth round there will be 1 match. Hence in all there will be

$$183 + 91 + 46 + 23 + 11 + 6 + 3 + 1 + 1 = 365 \text{ matches}$$

Q39. What does the diagram below establish?

Note: The diagram is a circle inside a square.



(a) $\pi > 3$ (b) $\pi \geq 2\sqrt{2}$

(c) $\pi < 4$ (d) π is closer to 3 and 4.

Ans. : (c)

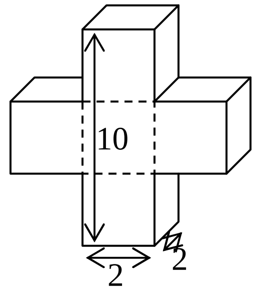
Solution: The diagram establishes that the area of circle is less than the area of square. Let a be the side of the square, then the radius of the circle is $\frac{a}{2}$.

Hence area of circle < area of square

or $\pi\left(\frac{a}{2}\right)^2 < a^2 \Rightarrow \frac{\pi a^2}{4} < a^2 \quad \Rightarrow \pi < 4$

NET JUNE-2014

Q40. The following diagram shows 2 perpendicularly inter-grown prismatic crystals (twins) of identical shape and size. What is the volume of the object shown (units are arbitrary)?



(a) 60 (b) 65 (c) 72 (d) 80

Ans. : (c)

Solution: If we closely look at the figure we see that the common volume to the horizontal and erect cuboids are $2\times2\times2=8$ cubic unit.

Hence the total volume of the prismatic crystal

= sum of volume of erect and horizontal crystals – the common volume to two crystals

$=2(2\times2\times10)-8=80-8=72$ cubic unit

Q41. Suppose in a box there are 20 red , 30 black, 40 blue and 50 white balls. What is the minimum number of balls to be drawn, without replacement, so that you are certain about getting 4 red, 5 black, 6 blue and 7 white balls?

(a) 140 (b) 97 (c) 104 (d) 124

Ans. : (d)

Solution: It is certain that even if we draw 120 balls, we can not be sure about 4 reds because these 120 balls may consist of 30 black, 40 blue and 50 white balls. Drawing 4 more balls will ensure that we have the desired combination. Hence we need to draw at least 124 balls.

Q42. Students in group A obtained the following marks: 40, 80, 70, 50, 60, 90, 30. Students in group B obtained 40, 80, 35, 70, 85, 45, 50, 75, 60 marks. Define dispersion (D) = (maximum marks – minimum marks) and Relative dispresion $(\text{RD})=\dfrac{\text{dispersion}}{\text{mean}}$. Then,

(a) RD of group A = RD of group B (b) RD of group A > RD of group B

(c) RD of group A < RD of group B (d) D of group A < D of group B

Ans. : (b)

Solution: Dispersion of group $A = 90 - 30 = 60$

Mean of Group $A = 60$

Relative dispersion of Group $A = \frac{60}{60} = 1$

Dispersion of Group $B = 85 - 35 = 50$

Mean of Group $B = 60$

Relative dispersion of Group $B = \frac{50}{60} = \frac{5}{6}$

Q43. In 450 g of pure coffee powder, 50 g of chichory is added. A person buys 100 g of this mixture and adds 5 g of chichory to that. What would be the rounded-off percentage of chicory in this final mixture?

(a) 10 (b) 5 (c) 14 (d) 15

Ans. : (c)

Solution: In $(450+50)g$ of initial mixture there is $50g$ of chichory.

Hence in $100g$ of mixture, chichory is $= \frac{50}{500} \times 100 = 10g$

when $5g$ of chichory is added, the amount of chichory in the final mixture becomes

$\frac{15}{105} \times 100 = 14.28\%$

Q44. The time gap between the two instants, one before and one after 12.00 noon, when the angle between the hour hand and the minute hand is 66, is

(a) 12 min (b) 16 min (c) 18 min (d) 24 min

Ans. : (d)

Solution: The hour hand travels 0.5^0 per minute and the minute hand travels 6^0 per minute. Hence the angle between the two after t minutes from 12.00 noon

$|0.5t - 6t| = 66 \Rightarrow 0.5|t| = 66 \quad \Rightarrow t = \pm 12$ minutes

Thus 12 minutes before and 12 minutes after the 12.00 noon the angles between the hour hand and the minute hand is 66^0. Hence the difference in time between the two instants is 24 minutes.

Q45. Suppose $x\Delta y = (x-y)^2;\ \ x\,o\,y = (x+y)^2$

$x * y = (x\times y)^{-1};\ x\cdot y = x\times y$

+, – and × have their usual meanings. What is the value of

$\{(197o315)-(197\Delta315)\}\cdot(197*315)$?

(a) 118 (b) 512 (c) 2 (d) 4

Ans. : (d)

Solution: $\{(197o315)-(197\Delta315)\}\cdot(197*315)$

$$=\left[(197+315)^2-(197-315)^2\right]\cdot(197\times315)^{-1}=\left[(512)^2-(-118)^2\right]\times\frac{1}{197\times315}=4$$

Q46. If $A\times B=24, B\times C=32, C\times D=48$ then $A\times D$

(a) cannot be found (b) is a perfect square

(c) is a perfect cube (d) is odd

Ans. : (b)

Solution: $A\times B=24,\ B\times C=32,\ C\times D=48$

Hence, $A\times B\times B\times C\times C\times D=24\times32\times48 \Rightarrow (A\times D)\times(B\times C)^2=24\times32\times48$

$$\Rightarrow A\times D\times(32)^2=24\times32\times48 \Rightarrow A\times D=\frac{24\times32\times48}{(32)^2}=36=6^2$$

we see that $A\times D$ can be found and it is a perfect square.

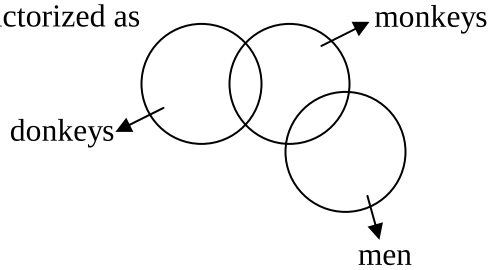
Q47. If all horses are donkeys, some donkeys are monkeys, and some monkeys are men, then which statement must be true?

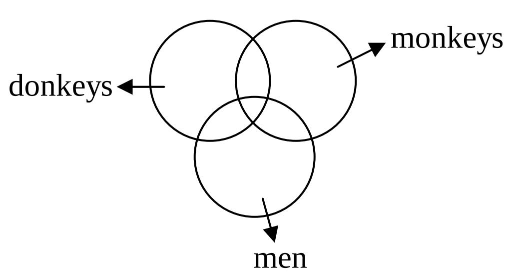
(a) All donkeys are men (b) Some donkeys may be men

(c) Some horses are men (d) All horses are also monkeys

Ans. : (b)

Solution: The statement "some donkeys are monkeys" and some monkeys are men can be pictorized as





From the two figures we conclude that "some donkeys may be men".

Q48. A rectangular area of sides 9 and 6 units is to be covered by square tiles of sides 1, 2, and 5 units. The minimum number of tiles needed for this is

(a) 3 (b) 11 (c) 12 (d) 15

Ans. : (c)

Solution: In order to obtain the minimum number of tiles should be such that the tile with longest side length occupies the largest area.

Hence there should be 1 tile of 5 units, 6 tiles with 2 units and 5 tiles with 1 units

We see that

$$1\times(5)^2+6\times(2)^4+5\times(1)^2=54$$

we also see that the area of rectangular area is $9\times6=54$.

thus total number of tiles $=1+6+5=12$

Q49. Suppose n is a positive integer. Then $(n^2+n)(2n+1)$

(a) may not be divisible by 2

(b) is always divisible by 2 but may not be divisible by 3

(c) is always divisible by 3 but may not be divisible by 6

(d) is always divisible by 6

Ans. : (d)

Solution: Any number a is said to be divisible by another number b if their exists a third number c such that $a=bc$, where a, b and c are integers.

Now $(n^2+n)(2n+1)=n(n+1)(2n+1)$

We also have $\dfrac{n(n+1)(2n+1)}{6}=\sum n^2$

Thus $n(n+1)(2n+1)=6\left(\sum n^2\right)$

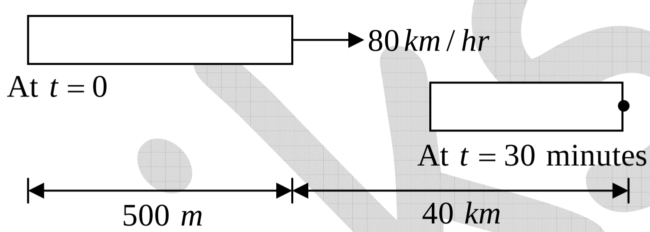
We see that $n(n+1)(2n+1)$ is an integer and $\sum n^2$ is also an integer. Hence $(n^2+n)(2n+1)$ is always divisible by 6.

Q50. There is a train of length 500 m, in which a man is standing at the rear end. At the instant the rear end crosses a stationary observer on a platform, the man starts walking from the rear to the front and the front to the rear of the train at a constant speed of 3 km/hr. The speed of the train is 80 km/hr. The distance of the man from the observer at the end of 30 minutes is

(a) 41.5 km (b) 40.5 km (c) 40.0 km (d) 41.0 km

Ans. : (b)

Solution: In 30 minutes the distance covered by the person $=1.5\,km$. Thus at the end of 30 minutes the person is at the front end of the train.



The front end is initially at a distance of $0.5\,km$ from the observer. In 30 minutes the front end covers a distance of $40\,km$ from its initial position.

Hence the distance of the man from the observer is $40+0.5=40.5\,km$

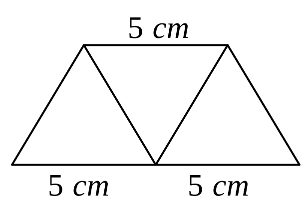
Q51. Three identical flat equilateral-triangular plates of side 5 cm each are placed together such that they form a trapezium. The length of the longer of the two parallel sides of this trapezium is

(a) $5\sqrt{\frac{3}{4}}$ cm (b) $5\sqrt{2}$ cm (c) 10 cm (d) $10\sqrt{3}$ cm

Ans. : (c)

Solution: The three plates will be placed in such a way that they form a trapezium. This will be done as shown in the figure.

From the figure we see that the length of the longer of two sides of the trapezium is $10\ cm$.

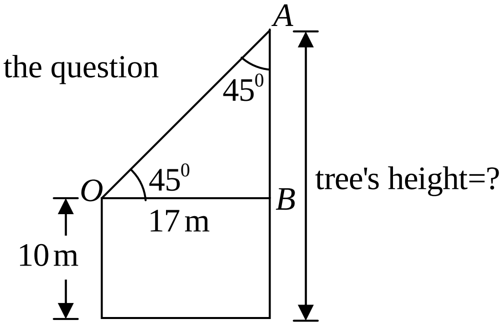


Q52. An archer climbs to the top of a 10 m high building and aims at a bird atop a tree 17 m away. The line of sight from the archer to the bird makes an angle of 45 to the horizontal. What is the height of the tree?

(a) 17 m (b) 27 m (c) 37 m (d) 47 m

Ans. : (b)

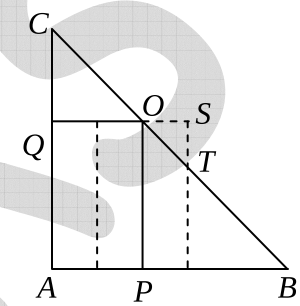
Solution: The diagram shows the various quantities involved in the question



Since $\angle AOB = \angle OAB$. Hence $OB = AB = 17\,m$

Hence height of tree $= 10 + 17 = 27\,m$

Q53. Consider a right-angled triangle ABC where AB = AC = 3. A rectangle APOQ is drawn inside it, as shown, such that the height of the rectangle is twice its width. The rectangle is moved horizontally by a distance 0.2 as shown schematically in the diagram (not to scale). What is the value of the ratio $\dfrac{\text{area of } \Delta\,\text{ABC}}{\text{area of } \Delta\,\text{OST}}$



(a) 625

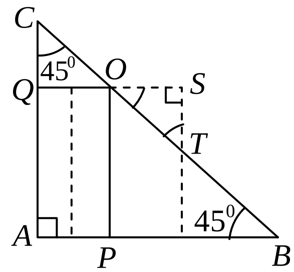
(b) 400

(c) 225

(d) 125

Ans. : (c)

Solution: The triangle, rectangle and angles are shown below. Since the rectangle is shifted by 0.2 units, the length OS is 0.2 units. In triangle OST



$$\angle SOT = \angle STO$$

Hence $ST = OS$.

Area of triangle $ABC = \frac{1}{2}\times 3\times 3$

Area of triangle $OST = \frac{1}{2}\times 0.2\times 0.2$

Hence $$\frac{\text{Area of triangle } ABC}{\text{Area of triangle } OST} = \frac{\frac{1}{2}\times 3\times 3}{\frac{1}{2}\times 0.2\times 0.2} = 225$$

Q54. 80 gsm paper is cut into sheets of 200 mm × 300 mm size and assembled in packets of 500 sheets. What will be the weight of a packet? (gsm = g/m^2)

(a) 1.2 kg (b) 2.4 kg (c) 3.6 kg (d) 4.8 kg

Ans. : (b)

Solution: The area of one sheet $=\left(200\times10^{-3}\,m\right)\times\left(300\times10^{-3}\,m\right)=0.06\ m^2$

Area of 500 sheets $=500\times0.06\ m^2=30\ m^2$

Since the mass of $1\ m^2$ is $80\ gm$. Hence the area of

$$30\ m^2=\left(80\,g/m^2\right)\left(30\,m^2\right)=2400\,g=2.4\,kg$$

Q55. Find the missing letter

A	B	C	D
F	I	L	O
K	P	U	Z
P	W	D	?

(a) P (b) K (c) J (d) L

Ans. : (b)

Solution: The first column each letter below a letter is the fifth letter after the above letter. In the second column each letter below a letter is the seventh letter after the above letter. In the third column each letter below a letter is the ninth letter after the above letter. The pattern of the fourth column suggest that each letter below is the eleventh letter after the above letter. Hence the missing letter is the eleventh letter after z. Thus it is K.

Q56. A merchant buys equal numbers of shirts and trousers and pays Rs 38000. If the cost of 3 shirts is Rs. 800 and that of a trouser is Rs. 1000, then how many shirts were bought?

(a) 60 (b) 30 (c) 15 (d) 10

Ans. : (b)

Solution: The price of a shirt $=\text{Rs.}\frac{800}{3}$; The price of trouser $=\text{Rs.}1000$

Let n be the number of shirts and trouser each.

Then $n\left(\frac{800}{3}+1000\right)=38000\Rightarrow n\left(\frac{3800}{3}\right)=38000\Rightarrow n=30$

Q57. Consider the set of numbers $\left\{17^1,17^2,.....17^{300}\right\}$. How many of these numbers end with the digit 3?

(a) 60 (b) 75 (c) 100 (d) 150

Ans. : (b)

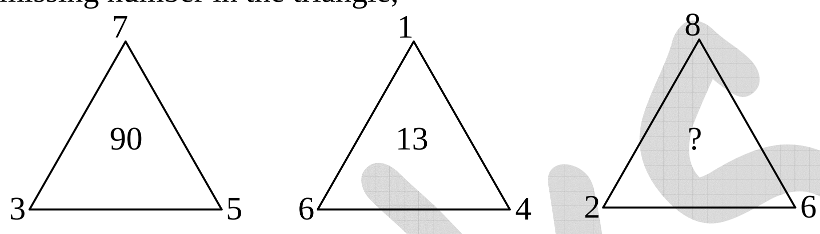
Solution: When the power of 17 is either $3, 7, 11, 15$ etc. we obtain a number ending with 3. The last number having 3 as the end digit is 17^{299}. Thus we have the arithmetic series.

3, 7, 11, 15,....., 299

first term 3, common difference $=4$

Hence $3+(n-1)\times 4=299 \Rightarrow n-1=\frac{299-3}{4}=74 \Rightarrow n=75$

Q58. Find the missing number in the triangle,



(a) 16 (b) 96 (c) 50 (d) 80

Ans. : (d)

Solution: The number inside the triangle is obtained by the difference of product of numbers of the three vertices and the sum of numbers of the three vertices.

First triangle: $(3\times 5\times 7)-(3+5+7)=90$

Second triangle: $(6\times 4\times 1)-(6+4+1)=13$

Third triangle: $(2\times 6\times 8)-(1+6+8)=80$

NET DEC-2014

Q59. Two locomotives are running towards each other with speeds of 60 and 40 km/h. An object keeps on flying to and fro from the front tip of one locomotive to the front tip of the other with a speed of 70 km/h. After 30 minutes, the two locomotives collide and the object is crushed. What distance did the object cover before being crushed?

(a) 50 km (b) 45 km (c) 35 km (d) 10 km

Ans. : (c)

Solution: Since the fly is continuously in motion for 30 minutes with a speed of $70\,km/hr$, hence the distance covered by the fly $=70\times\frac{1}{2}=35\,km$

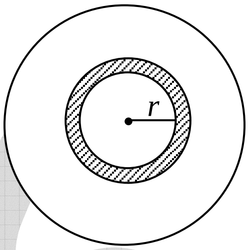
Q60. A sphere is made up of very thin concentric shells of increasing radii (leaving no gaps). The mass of an arbitrarily chosen shell is

(a) equal to the mass of the preceding shell (b) proportional to its volume

(c) proportional to its radius (d) proportional to its surface area

Ans. : (b)

Solution: The mass of arbitrarily chosen shell is



$$dM = \rho dV$$

If density of the sphere is constant, then $dM \propto dV$

Hence, the mass is proportional to its volume.

Q61. Find the missing letter:

A	?	Q	E
C	M	S	C
E	K	U	A
G	I	W	Y

(a) L (b) Q (c) N (d) O

Ans. : (d)

Solution: In fourth column, each letter is the second letter if counted from bottom to top. In the third column, each letter is the second letter if counted from top to bottom. In the first column each letter is the second letter if counted from top to bottom. Hence in the second column, each letter should be the second letter if counted from bottom to top.

Q62. A person sells two objects at Rs. 1035/- each. On the first object he suffers a loss of 10% while on the second he gains 15%. What is his net loss/gain percentage?

(a) 5% gain (b) < 1% gain (c) < 1% loss (d) no loss, no gain

Ans. : (b)

Solution: Let the cost price of first object be x. For the first object

$$x - 10\% \text{ of } x = 1035$$

$$\Rightarrow \quad \frac{9x}{10} = 1035 \qquad \Rightarrow x = 1150$$

Hence loss on first object $= 1150 - 1035 = \text{Rs.}115$

For the second object, let cost price be y

$y + 15\%\text{ of } y = 1035 \Rightarrow \quad \frac{23y}{20} = 1035 \quad \Rightarrow y = 900$

Hence gain on second object $= 1035 - 900 = \text{Rs.}135$

Hence net gain $= 135 - 115 = 20$

Hence gain % $= \frac{\text{total gain} \times 100}{\text{total cost price}} = \frac{20 \times 100}{1150 + 900} = \frac{20 \times 100}{2050} = 0.97\% < 1\%$

Q63. A bank offers a scheme wherein deposits made for 1600 days are doubled in value, the interest being compounded daily. The interest accrued on a deposit of Rs. 1000/- over the first 400 days would be Rs.

(a) 250 (b) 183 (c) 148 (d) 190

Ans. : (d)

Solution: Let r be the rate of interest per day

Then according to question

$$2p = p\left\{1 + \frac{r}{100}\right\}^{1600} \Rightarrow \left(1 + \frac{r}{100}\right)^{1600} = \left[\left\{1 + \frac{r}{100}\right\}^{400}\right]^4 = 2 \Rightarrow \left(1 + \frac{r}{100}\right)^{400} = 2^{1/4}$$

Now the amount for Rs. 1000 after 400 days would be

$$1000\left\{1 + \frac{r}{100}\right\}^{400} = 1000 \times 2^{1/4}$$

Hence interest $= 190$

Q64. What is the next number of the following sequence?

2, 3, 4, 7, 6, 11, 8, 15, 10, ……

(a) 12 (b) 13 (c) 17 (d) 19

Ans. : (d)

Solution: The given series is a mixture of two arithmetic series

2 4 6 8 10..... and 3 7 11 15 19.....

Hence the next number is 19

Q65. 20% of students of a particular course get jobs within one year of passing. 20% of the remaining students get jobs by the end of second year of passing. If 16 students are still jobless, how many students had passed the course?

(a) 32 (b) 64 (c) 25 (d) 100

Ans. : (c)

Solution: Let x be the total number of students.

Then number of students getting job in the first year $= 20\%$ of $x = \dfrac{x}{5}$

Number of students getting job in the second year 20% of $\left(x - \dfrac{x}{5}\right) = \dfrac{4x}{25}$

The total number of students getting job

$$= \frac{x}{5} + \frac{4x}{25} = \frac{9x}{25}$$

Number of students not getting jobs $= x - \dfrac{9x}{25} = \dfrac{16x}{25}$

According to question

$$\frac{16x}{25} = 16 \Rightarrow x = 25$$

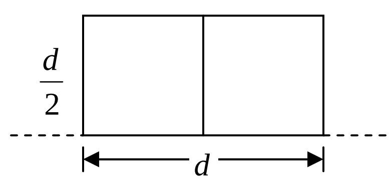
Q66. A rectangle of length d and breadth $d/2$ is revolved once completely around its length and once around its breadth. The ratio of volumes swept in the two cases is

(a) 1:1 (b) 1:2 (c) 1:3 (d) 1:4

Ans. : (b)

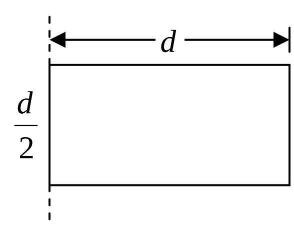
Solution: When the rectangle is revolved around its length the volume of the cylinder formed is

$V_1 = \pi\left(\dfrac{d}{2}\right)^2 d$, where the radius of the cylinder formed is $\dfrac{d}{2}$ and d is its height.



Hence $V_1 = \dfrac{\pi d^3}{4}$

When the rectangle is revolved around its breath, the volume of cylinder formed is

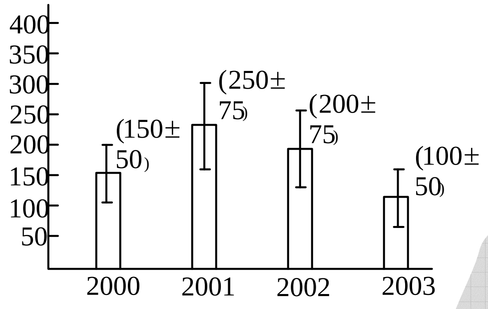


$$V_2 = \pi(d)^2\left(\frac{d}{2}\right) = \frac{\pi d^3}{2}$$

Here d is the radius of cylinder formed and $\dfrac{d}{2}$ is its height.

$$\therefore \qquad \frac{V_1}{V_2} = \frac{\frac{\pi d^3}{4}}{\frac{\pi d^3}{2}} = 1:2$$

Q67. Average yield of a product in different years is shown in the histogram. If the vertical bars indicate variability during the year, then during which year was the percent variability over the average of that year the least?



(a) 2000 (b) 2001 (c) 2002 (d) 2003

Ans. : (b)

Solution: Percentage variability for a year is calculated by

$$\% \text{variability} = \frac{\text{variability} \times 100}{\text{Average yield}}$$

For 2000 $\quad \% \text{variability} = \frac{50}{150} \times 100 = 33.33\%$

For 2001 $\quad \% \text{variability} = \frac{75}{250} \times 100 = 30.00\%$

For 2002 $\quad \% \text{variability} = \frac{75}{200} \times 100 = 37.50\%$

For 2003 $\quad \% \text{variability} = \frac{50}{100} \times 100 = 50.00\%$

Thus percentage variability over the average is least for the year 2001.

Q68. A long ribbon is wound around a spool up to a radius R. Holding the tip of the ribbon, a boy runs away from the spool with a constant speed maintaining the unwound portion of the ribbon horizontal. In 4 minutes, the radius of the wound portion becomes $\frac{R}{\sqrt{2}}$. In what further time, it will become $R/2$?

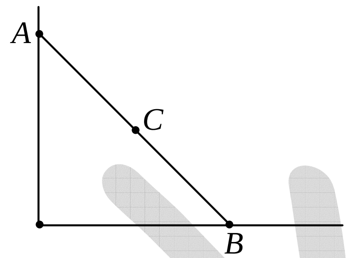
(a) $\sqrt{2}$ min (b) 2 min (c) $2\sqrt{2}$ min (d) 4 min

Ans. : (c)

Solution: Radius is proportional to time. Let x be the time in which radius becomes $\frac{R}{2}$,

therefore, $\frac{R/2}{R/\sqrt{2}} = \frac{x}{4} \Rightarrow x = 2\sqrt{2}$ min.

Q69. A ladder rests against a wall as shown. The top and the bottom ends of the ladder are marked A and B. The base B slips. The central point C of the ladder falls along



(a) a parabola
(b) the arc of a circle
(c) a straight line
(d) a hyperbola

Ans. : (b)

Solution: Let h, k be the coordinate of point C, then

$$h^2 + k^2 = \frac{x^2}{4} + \frac{y^2}{4} = \frac{AB^2}{4}$$

Since AB is a constant, hence

$$x^2 + y^2 = \left(\frac{AB}{2}\right)^2$$, this represents a circle.

Q70. Binomial theorem in algebra gives $(1+x)^n = a_0 + a_1 x + a_2 x^2 + ... + a_n x^n$ where $a_0, a_1, ..., a_n$ are constants depending on n. What is the sum $a_0 + a_1 + a_2 + ... + a_n$?

(a) 2^n
(b) n
(c) n^2
(d) $n^2 + n$

Ans. : (a)

Solution: Given $(1+x)^n = a_0 + a_1 x + a_2 x^2 + ...a_n x^n$ putting $x = 1$, this becomes

$$(1+1)^n = a_0 + a_1 + a_2 .... + a_n$$

Thus $a_0 + a_1 + a_2 + ... + a_n = 2^n$

Q71. Continue the sequence

$$2, 5, 10, 17, 28, 41, \_, \_, \_$$

(a) 58, 77, 100 (b) 64, 81, 100 (c) 43, 47, 53 (d) 55, 89, 113

Ans. : (a)

Solution: $5-2=3,\ 10-5=5,\ 17-10=7,\ 28-17=11,\ 41-28=13$.

Here we see that difference between consecutive term is a prime number. Hence the next three number are obtained by adding 17, 19 and 23 to the preceding term respectively.

$$41+17=58; \qquad 58+19=77; \qquad 77+23=100$$

Q72. A code consists of at most two identical letters followed by at most four identical digits. The code must have at least one letter and one digit. How many distinct codes can be generated using letters A to Z and digits 1 to 9?

(a) 936 (b) 1148 (c) 1872 (d) 2574

Ans. : (c)

Solution: The number of codes will be

One letter one digit $=26\times 9$

One letter two digit $=26\times 9$

One letter three digit $=26\times 9$

One letter four digit $=26\times 9$

One letter one digit $=26\times 9$

One letter two digit $=26\times 9$

One letter three digit $=26\times 9$

One letter four digit $=26\times 9$

1872

Q73. Two solid iron spheres are heated to $100^0 C$ and then allowed to cool. One has size of a football; the other has the size of a pea. Which sphere will attain the room temperature (constant) first?

(a) The bigger sphere (b) The smaller sphere

(c) Both spheres will take the same time (d) It will depend on the room temperature

Ans. : (a)

Solution: According to Newton's law of cooling the rate of cooling of body is directly proportional to the surface area exposed. Hence the bigger sphere will attain the room temperature at first.

Q74. Weights (in kg) of 13 persons are given below:

70, 72, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94

Two new persons having weights 100 kg and 79 kg join the group. The average weight of the group increases by

(a) 0 kg (b) 1 kg (c) 1.6 kg (d) 1.8 kg

Ans. : (b)

Solution: The initial average weight

$$= \frac{70+72+74+76+78+80+82+84+86+88+90+92+94}{13} = 82\,kg$$

Final average weight

$$= \frac{82\times 13+79+100}{15} = 83\,kg$$

Thus the average weight increases by $83-82=1kg$

Q75. If n is a positive integer, then

$$n(n+1)(n+2)(n+3)(n+4)(n+5)(n+6)$$

is divisible by

(a) 3 but not 7 (b) 3 and 7 (c) 7 but not 3 (d) neither 3 nor 7

Ans. : (b)

Solution: The product of n consecutive numbers is always divisible by $n!$.

Q76. The area (in m^2) of a triangular park of dimensions 50 m, 120 m and 130 m is

(a) 3000 (b) 3250 (c) 5550 (d) 7800

Ans. : (a)

Solution: The semiperimeter of the triangle is $s = \frac{50+120+130}{2} = 150\,m$

Hence the area of the triangle

$$\Delta = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{150(150-50)(150-120)(150-130)} = \sqrt{150\times 100\times 30\times 20} = 3000\,m^2$$

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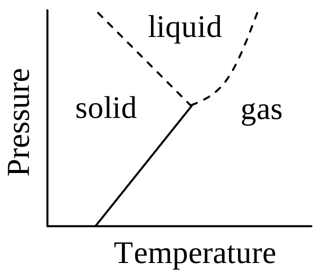
Q77. By reading the accompanying graph, determine the INCORRECT statement out of the following.



(a) Melting point increases with pressure

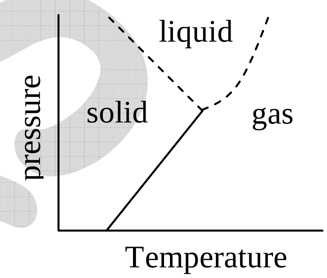
(b) Melting point decreases with pressure

(c) Boiling point increases with pressure

(d) Solid, liquid and gas can co-exist at the same pressure and temperature

Ans. : (a)

Solution: From the graph we see that the dashed line to the left shows melting point at different temperatures and pressures. Thus as the pressure increasing, melting point decreases. The dashed line to the right shows boiling point increases. From the graph, we also see that there is a value of temperature and pressure at which all three phases can co-exist.



Q78. A float is drifting in a river $10\ m$ downstream of a boat that can be rowed at a speed of $10\ \mathrm{m/minute}$ in still water. If the boat is rowed downstream, the time taken to catch up with the float

(a) will be 1 minute

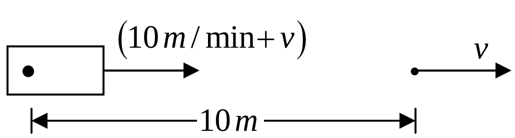
(b) will be more than 1 minute

(c) will be less than 1 minute

(d) can be determined only if the speed of the river is known

Ans. : (a)

Solution: Let v be the speed of the river. Then the speed of the boat downstream is $\left(10\,m/\min + v\right)$. The speed of the boat will be the same as the speed of the river. Hence speed of the float is v. Let t be the time taken by the boat to catch up with the float.



Hence $\left(10\,m/\min + v\right)t = 10\,m + vt \Rightarrow t = 1\min$

Q79. Consider a series of letters placed in the following way:

$$U\_G\_C\_C\_S\_I\_R$$

Each letter moves one step to its right and the extreme right letter takes the first position, completing one operation. After which of the following numbers of operations do the Cs not sit side by side?

(a) 3 (b) 10 (c) 19 (d) 25

Ans. : (b)

Solution: After 10 operations we get C S I R G C. Here we see that C's do not sit side by side.

Q80. If you change only one observation from a set of 10 observations, which of the following will definitely change?

(a) Mean (b) Median (c) Mode (d) Standard deviation

Ans. : (a)

Solution: Let $x_1, x_2, x_3, ..., x_{10}$ be 10 observations.

Then, mean $= \dfrac{x_1 + x_2 + ... + x_{10}}{10}$. If any one of $x_1, x_2, x_3, ..., x_{10}$ is changed, mean would definitely change.

Median is the middle value, hence it may or may not change.

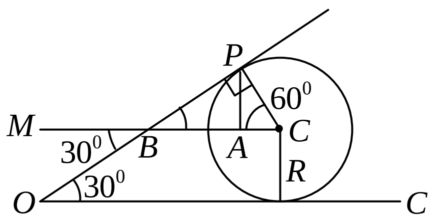
Mode is the observation that occurs with maximum frequency. Hence it may or may not change.

Q81. An inclined plane rests against a horizontal cylinder of radius R. If the plane makes an angle of 30^0 with the ground, the point of contact of the plane with the cylinder is at a height of

(a) 1.500 R (b) 1.866 R (c) 1.414 R (d) 1.000 R

Ans. : (b)

Solution: Consider a cross section of the circle and inclined plane all lying in the same plane. Draw a line parallel to OC and passing through centre. From geometry $\angle PCA = 60^0$. Hence in triangle PCA



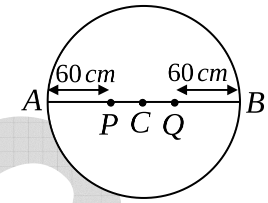
$$h = R\sin 60^0 = \frac{\sqrt{3}}{2}R = 0.866R.$$

Hence the height of the point of contact of the cylinder with the ground is at a height $(R+0.866R)=1.866R$.

Q82. What is the maximum number of parallel, non-overlapping cricket pitches (length $24\ m$, width $3m$) that can be laid in a field of diameter $140\ m$, if the boundary is required to be at least $60\ m$ from the centre of any pitch?

(a) 6 (b) 7 (c) 12 (d) 4

Ans. : (b)



Solution: From the condition given in the problem the center of any pitch will lie between P and Q. Thus the center of the pitch can be at a distance of $60m, 63m, 66m, 69m, 72m,\ 75m, 78m$ from A.

Q83. The product of the perimeter of a triangle, the radius of its in-circle, and a number gives the area of the triangle. The number is

(a) $\frac{1}{4}$ (b) $\frac{1}{3}$ (c) $\frac{1}{2}$ (d) 1

Ans. : (c)

Solution: If a, b and c be the length of the sides of a triangle and r be the radius of its incircle,

then area of triangle $ABC = \frac{1}{2}(a+b+c)r = \frac{1}{2}\times \text{perimeter}\times \text{radius of incircle}$.

Thus we conclude that the number is $\frac{1}{2}$

Q84. The maximum number of points formed by intersection of all pairs of diagonals of convex octagon is

(a) 70 (b) 400 (c) 120 (d) 190

Ans. : (d)

Solution: The number of diagonals of a polygon is given by $\frac{n(n-3)}{2}$, where n is the number of sides of polygon. Hence there are $\frac{8(8-3)}{2}=20$ diagonals of an octagon. When two diagonals intersect we obtain a required point. Hence the maximum number of points is obtained by intersection of these 20 diagonals with each other. Since the intersection of any two diagonals (say 2 and 3 or 3 and 2) gives us the same point, hence maximum number of points formed by intersection $= {}^{20}C_2 = \dfrac{20\times19}{2} = 190$.

Q85. Each of the following pairs of words hides a number, based on which you can arrange them in ascending order. Pick the correct answer:

I. Cloth reel J. Silent wonder

K. Good tone L. Bronze rod

(a) L, K, J, I (b) I, J, K, L (c) K, L, J, I (d) K, J, I, L

Ans. 86: (a)

Solution: Here we see that if we pick some letters from the given pairs of words we obtain a number.

I. Cloth reel = three

J. Silent wonder = two

K. Good tone = one

L. Bronze rod = zero

Hence the ascending order is L, K, J, I.

Q87. Which of the following values is same as $2^{2^{2^2}}$?

(a) 2^6 (b) 2^8 (c) 2^{16} (d) 2^{222}

Ans. : (c)

Solution: Working from top to bottom $2^{2^{2^2}} = 2^{2^4} = 2^{16}$

Q88. If

$$\begin{array}{r} 2a \\ \times\ \ b2 \\ \hline c6 \\ 84 \\ \hline 8d6 \\ \hline \end{array}$$

Here a, b, c and d are digits. Then $a+b=$

(a) 4 (b) 9 (c) 11 (d) 16

Ans. : (c)

Solution:

$$\begin{array}{r} 2\,a \\ \underline{\times\; b\,2} \\ c\;6 \\ \underline{8\,4\;\;} \\ \underline{8\,d\;6} \end{array}$$

From the given multiplication, we see that the unit digit of the product $a \times 2$ is 6.

Thus, a can be 3 or 8.

If $a = 3$, then $2a \times b = 23 \times b = 84$

$\Rightarrow b$ is not a digit but it is a fraction. Hence $a = 8$.

This implies $b = 3$. Thus $a + b = 8 + 3 = 11$

Q89. A $12\ m \times 4\ m$ rectangular roof is resting on $4\ m$ tall thin poles. Sunlight falls on the roof at an angle of 45^0 from the east, creating a shadow on the ground. What will be the area of the shadow?

(a) $24\ m^2$ (b) $36\ m^2$ (c) $48\ m^2$ (d) $60\ m^2$

Ans. : (a)

Solution: Suppose the length of the rod lies in the east-west direction. Since the sunlight strikes then the shadow will be parallelogram with base length $12m$ and height $4m$. Hence the shadow will have an area

$$= \frac{1}{2} \times \text{base} \times \text{height} = \frac{1}{2} \times 12 \times 4 = 24\,m^2$$

Q90. Find the height of a box of base area $24\ cm \times 48\ cm$, in which the longest stick that can be kept is $56\ cm$ long.

(a) $8\ cm$ (b) $32\ cm$ (c) $37.5\ cm$ (d) $16\ cm$

Ans. : (d)

Solution: The longest length connecting any two points of the cuboids is the diagonal of the cuboids. Since the length of the longest stick that can be kept is $56\,cm$, hence the diagonal of the cuboid is $56\,cm$.

Now the diagonal of the cuboids is given by $d = \sqrt{l^2 + b^2 + h^2}$

where l, b and h are respectively the length, breadth and height.

Hence $56 = \sqrt{(24)^2 + (48)^2 + h^2}$, which gives $h = 16\,cm$

Q91. An infinite row of boxes is arranged. Each box has half the volume of the previous box. If the largest box has volume of $20\ cc$, what is the total volume of all the boxes?

(a) Infinite (b) $400\ cc$ (c) $40\ cc$ (d) $80\ cc$

Ans. : (c)

Solution: Let the volume of the largest box be V_0.

Then the volumes of other box are $\frac{V_0}{2}, \frac{V_0}{4}, \frac{V_0}{8}$ and so on.

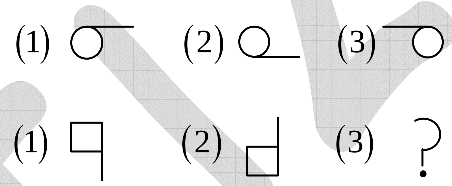
Hence the total volume of all the boxes $V = V_0 + \frac{V_0}{2} + \frac{V_0}{8} + ...$

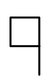
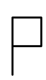
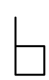
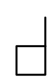
We see that this is a geometric series with common ratio $\frac{1}{2}$.

We know that the sum of an infinite geometric series is $S = \frac{a}{1-r}$, where a is the first term and r is the common ratio.

Hence $V = \frac{V_0}{1-\frac{1}{2}} = 2V_0$. Now, given $V_0 = 20\,cc$. Hence $V = 40\,cc$

Q92. Find the missing element based on the given pattern



(a)  (b)  (c)  (d) 

Ans. : (b)

Solution: The ellipse rotates by 180^0 and the line moves down and then up. Similarly the rectangle rotates by 180^0 and the bar moves up and then down. Hence the rectangle should again rotate by 180^0 and line should go up.

Q93. A man starts his journey at 0100 Hrs local time to reach another country at 0900 Hrs local time on the same date. He starts a return journey on the same night at 2100 hrs local time to his original place, taking the same time to travel back. If the time zone of his country of visit lags by 10 hours, the duration for which the man was away from his place is

(a) 48 hours (b) 20 hours (c) 25 hours (d) 36 hours

Ans. : (a)

Solution: The man starts his journey at 0100 hrs his country local time. He reaches another country of 0900 hrs that country local time. This means the man reaches another country at 1900 hrs according to his country local time. Thus time of travel from his place to another country $=1900-0100=1800$ hrs. He stays in that country for 12 hrs. According to question time of return journey is also 18 hrs. Thus the total time for which the man is away from his place $=18+12+18=48$ hrs.

Q94. Let r be a positive number satisfying $r^{\left(\frac{1}{1234}\right)}+r^{\left(\frac{-1}{1234}\right)}=2$. Then

$$r^{4321}+r^{-4321}=?$$

(a) 2 (b) $2^{\left(\frac{4321}{1234}\right)}$ (c) 2^{3087} (d) 2^{1234}

Ans. : (a)

Solution: $r^{1/1234}+r^{-(1/1234)}=2$

Let $r^{1/1234}=a$, then $a+\dfrac{1}{a}=2$

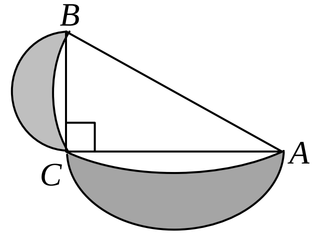
$\Rightarrow a^2-2a+1=0\Rightarrow (a-1)^2=0\Rightarrow a=1$

Thus $r^{1/1234}=1\Rightarrow r=1$

Thus $r=1$, hence any power of r will also be 1

Thus $r^{4321}+r^{-4321}=(1)^{-4321}+(1)^{-4321}=1+1=2$

Q95. ABC is right angled triangle inscribed in a semicircle. Smaller semicircles are drawn on sides BC and AC. If the area of the triangle is a, what is the total area of the shaded lumes?

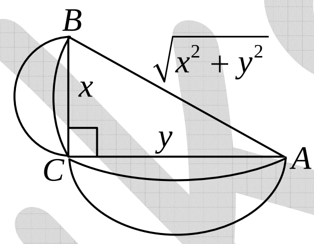


(a) a (b) $\frac{\pi}{a}$ (c) $\frac{a}{\pi}$ (d) $\frac{a}{2\pi}$

Ans. : (a)

Solution: Let $BC = x$ and $AC = y$, then area of semicircle having AB as diameter is

$$\frac{\pi\left(\frac{\sqrt{x^2+y^2}}{2}\right)^2}{2} = \frac{\pi\left(x^2+y^2\right)}{8}$$



Area of triangle is a, hence the area of the semicircle excluding the area of triangle is

$$\frac{\pi\left(x^2+y^2\right)}{8} - a$$

Now the area of semicircle with AB as diameter $= \dfrac{\pi\left(\frac{x}{2}\right)^2}{2} = \dfrac{\pi x^2}{8}$

Area of semicircle with BC as diameter $= \dfrac{\pi\left(\frac{y}{2}\right)^2}{2} = \dfrac{\pi y^2}{8}$

Hence area of shaded portion $= \dfrac{\pi x^2}{8} + \dfrac{\pi y^2}{8} - \left\{\dfrac{\pi x^2}{8} + \dfrac{\pi y^2}{8}\right\} + a = a$

Q96. An ant can lift another ant of its size whereas an elephant cannot lift another elephant of its size, because

(a) ant muscle fibres are stronger than elephant muscle fibres

(b) ant has proportionately thicker legs than elephant

(c) strength scales as the square of the size while weight scales as cube of the size

(d) ants work cooperatively, whereas elephants work as individuals

Ans. : (c)

Solution: The square-cube law which holds in many physical cases states that the strength scale varies as the square of the size while weight scale varies as cube of the size. Hence on strength scale an ant scores over an elephant. Thus an ant can lift another ant of the same size while an elephant can not lift another elephant of its size.

NET DEC-2015

Q97. In each of the following groups of words is a hidden number, based on which you should arrange them in descending order. Pick the correct answer:

E. Papers I Xeroxed

F. Wi-Fi veteran

G. Yourself ourselves

H. Breaks even

(a) H, F, G, H (b) E, G, F, H (c) H, F, G, E (d) H, E, F, G

Ans. : (b)

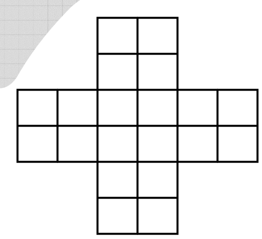
Solution: E.Paper I Yeroxed

F.Wi-Fi Veteran

G. Yourself ourselves

H. Breaks even

Q98. The number of squares in the figure is



(a) 30

(b) 29

(c) 25

(d) 20

Ans. : (b)

Solution: Squares are formed by small squares and when four adjoining squares are connected. Hence number of squares $= 29$

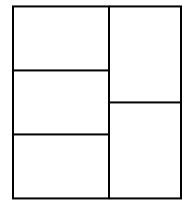
Q99. A shopkeeper purchases a product for Rs. 100 and sells it making a profit of 10%. The customer resells it to the same shopkeeper incurring a loss of10%. In these dealings the shopkeeper makes

(a) no profit, no loss (b) Rs. 11 (c) Re. 1 (d) Rs. 20

Ans. : (b)

Solution: At the end, the product is with the customer. When he sells it, he gets Rs. 110 and purchase it at Rs, 99. Hence, profit in the transaction is Rs. 11.

Q100. Five congruent rectangles are drawn inside a big rectangle of perimeter 165 as shown. What is the perimeter of one of the five rectangles?



(a) 37

(b) 75

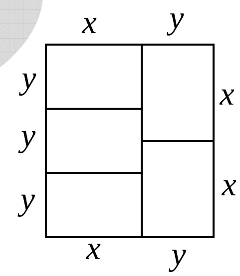
(c) 15

(d) 165

Ans. : (b)

Solution: since the rectangles are congruent the length and breadth of each rectangle are the same.

From the question

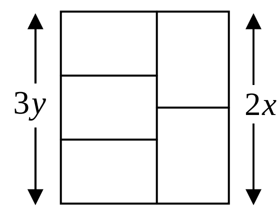


$$4x+5y=165 \qquad \text{(i)}$$

The area of five rectangles should be equal to area of the bigger rectangle.

Hence $5xy=(x+y)2x$

or $\quad x=\dfrac{3}{2}y \qquad$ (ii)



putting this value in equation (i) gives

$11y=165 \quad$ or $\; y=15 \quad \therefore \; x=22.5$

Hence perimeter of single rectangle

$2(x+y)=2(15+22.5)=75$

Alternatively equation (ii) can also be obtained as seen from the figure $2x=3y$

Q101. A person walks downhill at $10\,km/h$, uphill at $6\,km/h$ and on the plane at $7.5\,km/h$. If the person takes 3 hours to go from a place A to another place B, and 1 hour on the way back, the distance between A and B is

(a) $15\,km$

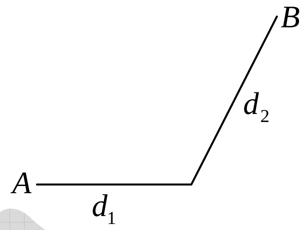
(b) $23.5\,km$

(c) $16\,km$

(d) Given data is insufficient to calculate distance.

Ans. : (d)

Solution: The distance A to B does not lie entire on the plane. Similarly A to B does not lie entirely on the incline as $6\times 3\neq 10\times 1$. Hence, we can assume that one part of the distance lie on the plane and rest part on the hill.



Now, from the question

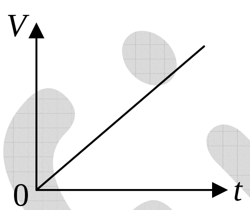
$$\frac{d_1}{7.5}+\frac{d_2}{6}=3 \quad \Rightarrow \quad 4d_1+5d_2=90 \qquad \text{(i)}$$

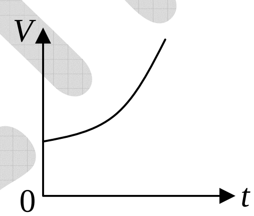
and $$\frac{d_1}{7.5}+\frac{d_2}{10}=1 \Rightarrow \quad 4d_1+3d_2=30 \qquad \text{(ii)}$$

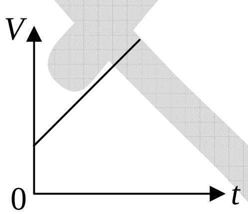
Subtracting (ii) from (i) gives $d_2=30$

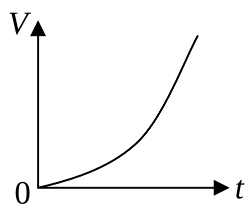
Putting this value in any equation gives $d_1=-15$, which is impossible

Q102. A vessel is partially filled with water. More water is added to it at a rate directly proportional to time $\left[\text{i.e.,} \dfrac{dV}{dt}\propto t\right]$. Which of the following graphs depicts correctly the variation of total volume V of water with time t?

(a)


(b)


(c)


(d)


Ans. : (b)

Solution: since $\dfrac{dV}{dt}\propto t$, hence $\dfrac{dV}{dt}=kt$ or $V=\dfrac{kt^2}{2}+C$

Now this equation represents a quadratic equation. Hence the graph will be a parabola. Now at $t=0$, the vessel is partially filled hence out of option (b) and (d) option (b) is correct.

Q103. At one instant, the hour hand and the minute hand of a clock are one over the other in between the markings for 5 and 6 on the dial. At this instant, the tip of the minute hand

(a) is closer to the marking for 6

(b) is equidistant from the markings for 5 and 6

(c) is closer to marking for 5

(d) is equidistant from the markings for 11 and 12

Ans. : (c)

Solution: Let x hours after 5 the minute and hour hand coincide.

In $(5+x)hr$, the angle rotated by hour hand $(5+x)\times 30 = 150+30x$ degree

In $(5+x)$ hours, the angle rotated by minute hand

$5\times 360+60x\times 6$ which is equivalent to $360x$ degree.

Thus $150+30x = 360x$

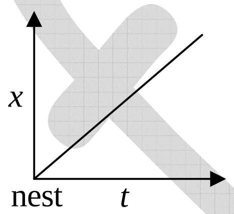
$\Rightarrow 30(5+x) = 30(12x)$

$\Rightarrow x = \frac{5}{11}hr \Rightarrow x = 27.27$ minutes.

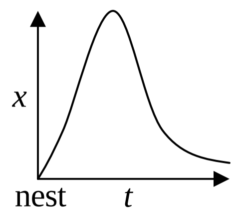
Thus the tip of minute hand is closer to the marking for 5.

Q104. A bird leaves its nest and flies away. Its distance x from the nest is plotted as a function of time t. Which of the following plots cannot be right?

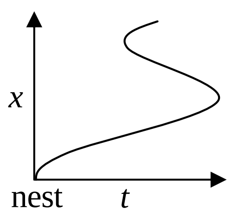
(a)



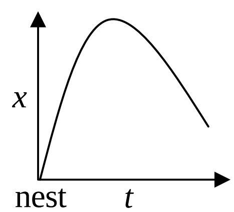
(b)



(c)

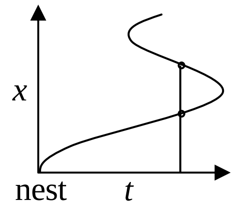


(d)



Ans. : (c)

Solution: The bird can not be at two distances at the same time. Hence (c) cannot be right

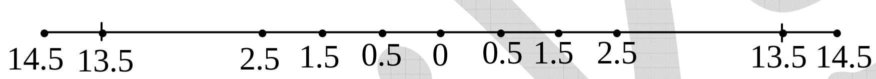


Q105. A cubical cardboard box made of $1cm$ thick card board has outer side of $29\,cm$. A tight-fitting cubical box of the same thickness is placed inside it, then another one inside it and so on. How many cubical boxes will be there in the entire set?

(a) 29 (b) 28 (c) 15 (d) 14

Ans. : (d)

Solution:



The first box will be of a distance of $0.5\ cm$ form the centre of the box and $1\ cm$. The second box will be at a distance of $1.5\ cm$ from the centre of the box and $1\ cm$ thick. Similarly the 13^{th} box will be at a distance of $12\ cm$ from the centre and $1\ cm$ thick. Thus there will be a total of 13 boxes inside the given box. Including the given box there will be a total of 14 boxes.

Q106. Secondary colours are made by a mixture of three primary colours, Red, Green and Blue, in different proportions; each of the primary colours comes in 8 possible levels. Grey corresponds to equal proportions of Red, Green and Blue. How many shades of grey exist ii this scheme?

(a) 8^3 (b) 8 (c) 3^8 (d) 8×3

Ans. : (a)

Solution: Grey corresponds to equal proportions of Red, Green and Blue. Now there are 8 possible levels for each of the colors. Hence grey can be formed in

$8\times 8\times 8$ ways $=8^3$ ways

Red	Blue	Green
8	8	8

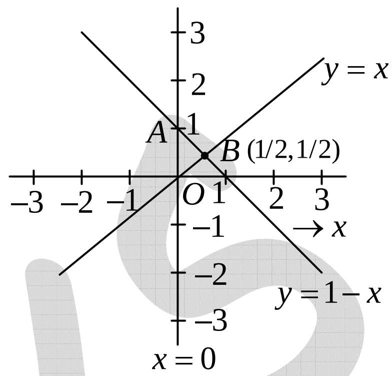
Q107. The triangle formed by the lines $y = x, y = 1 - x$ and $x = 0$ in a two dimensional plane is (x and y axes have the same scale)

(a) isosceles and right-angled (b) isosceles but not right-angled

(c) right-angled but not isosceles (d) neither isosceles nor right angled

Ans. : (a)

Solution: The lines $y = 1 - x$ and $y = x$ intersect at



$$1 - x = x \Rightarrow x = \frac{1}{2}, \quad \therefore \quad y = \frac{1}{2}$$

$$AB = \sqrt{\left(0 - \frac{1}{2}\right)^2 + \left(1 - \frac{1}{2}\right)^2} = \frac{1}{\sqrt{2}}$$

$$OB = \sqrt{\left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^2} = \frac{1}{\sqrt{2}}$$

$$(AB)^2 + (OB)^2 = 1 = (OA)^2$$

Thus the triangle formed is isosceles and right angled.

Q108. There are two buckets A and B. Initially A has 2 liters of water and B is empty. At every hour 1 liter of water is transferred from A to B followed by returning $\frac{1}{2}$ liter back to A from B half an hour later. The earliest A will get empty is in:

(a) $5h$ (b) $4h$ (c) $3h$ (d) $2h$

Ans. : (b)

Solution: The amount of water after different hours for bucket A is shown below

After 1 hr.	after 1.5 hr.	After 2.5 hr	After 3 hr	after 4 hr
$(2-1)$	$(1+0.5)$	$(1.5-1)$	$(0.5+0.5)$	$(1-1)$
1	1.5	0.5	1	0

Hence the bucket A will be emptied earliest after 4 hours.

Q109. Statement A: The following statement is true

Statement B: The preceding statement is false

Choose the correct inference from the following:

(a) Statements A and B are always true

(b) Statements A and B can be true if there is at least one statement between A and B

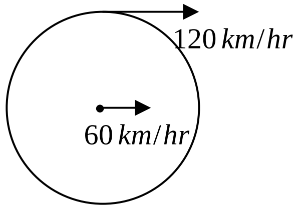
(c) Statements A and B can be true if there are at least two statements between A and B

(d) Statements A and B can never be true, independently

Ans. : (c)

Solution: If there is no sentence between A and B then they are mutually inconsistent. If there is only one statement between A and B, then again they are mutually inconsistent. If there are two or more statements between A and B, then they can be true independent of each other.

Q110. A car is moving at 60 km/h. The instantaneous velocity of the upper most points of its wheels is



(a) 60 km/h forward (b) 120 km/h forward

(c) 60 km/h backward (d) 120 km/h backward

Ans. : (b)

Solution: Assuming that car is rolling without slipping, the instantaneous speed of the top most point is twice the speed of the car.

Q111. If $D+I+M=1501$

$C+I+V+I+L=157$

$L+I+V+I+D=557$

$C+I+V+I+C=207$

What is $V+I+M=?$

(a) Cannot be found (b) 1009 (c) 1006 (d) 509

Ans. : (a)

Solution: when we calculate the values of $V+I+M$, the result comes out to be an expression which involves one of the unknowns. For example in terms of unknown L, the answer is

$$V+I+M=-944-L$$

Hence the value of $V+I+M$ cannot be found

Q112. Density of a rice grain is 1.5 g/cc and bulk density of rice heap is 0.80 g/cc. If a 1 litre container is completely filled with rice, what will be the approximate volume of pore space in the container?

(a) 350 cc (b) 465 cc (c) 550 cc (d) 665 cc

Ans. : (b)

Solution: The mass of 1 litre of rice $=(1000\ cc)(0.80\ g/cc)=800\ g$

Let n be the total numbers of rice grains and V be the value of a rice grain

Then $nV\times$density of rice grain =800 g $\Rightarrow V'\times 1.5\ g/cc=800\ g$

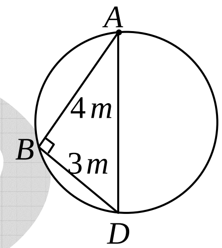
where V' is the total volume actually occupied by the rice grains. Hence $V' = 533.33\ cc$.

Hence volume of pore space in the contains $= 1000\ cc - 533.33 = 466\ cc \approx 465\ cc$

Q113. A turtle starts swimming from a point A located on the circumference of a circular pond. After swimming for 4 meters in a straight line it hits point B on the circumference or the pond. From there it changes direction and swims for 3 meters in a straight line and arrives at point D diametrically opposite to point A. How far is point D from A?

(a) $3\ m$ (b) $4\ m$ (c) $7\ m$ (d) $5\ m$

Ans. : (d)



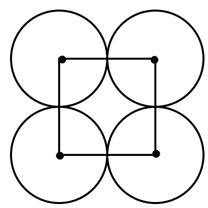
Solution: The location of the turtle at different times is shown in the figure.

The triangle ABD formed is a right angle because angle in a semi-circle is a right angle. Hence $AD = \sqrt{(AB)^2 + (BD)^2} = \sqrt{16+9} = 5\ m$

Q114. Four circles of unit radius each are drawn such that each one touches two others and their centres lie on the vertices of a square. The area of the region enclosed between the circles is

(a) $\pi - 1$ (b) $\pi - 2$ (c) $3 - \pi$ (d) $4 - \pi$

Ans. : (d)



Solution: If we join the centres of the four circles we get a square of side 2 units. The area of the square formed is 4 square units. The area of four circular portions enclosed within the square

$$= 4\left[\frac{\pi(1)^2}{4}\right] = \pi$$

Hence area enclosed within the circles $= 4 - \pi$ units.

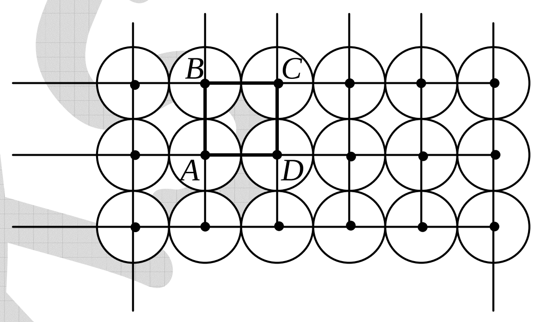
NET JUNE 2016

Q115. An infinite number of identical circular discs, each of radius $\frac{1}{2}$ are tightly packed such that the centers of the discs are at integer values of coordinates x and y. The ratio of the area of the uncovered patches to the total area is

(a) $1-\frac{\pi}{4}$ (b) $\frac{\pi}{4}$ (c) $1-\pi$ (d) π

Ans. : (a)

Solution: The whole region can be divided into mutually exclusive squares. One of the representative square is darkened in the figure. The area of uncovered region of this square $=4r^2-\pi r^2=\left(4-\pi\right)r^2$



The area of the square $=4r^2$

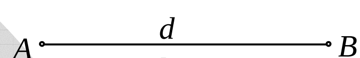
Hence the ratio of area of uncovered patch to the total area $=\frac{\left(4-\pi\right)r^2}{4r^2}=1-\frac{\pi}{4}$

Q116. It takes 5 days for a steamboat to travel from A to B along a river. It takes 7 days to return from B to A. How many days will it take for a raft to drift from A to B (all speeds stay constant)?

(a) 13 (b) 35 (c) 6 (d) 12

Ans. : (b)

Solution: Let u be the speed of the steamboat and v be the speed of the stream. Then



$\frac{d}{u+v}=5$ (i) and $\frac{d}{u-v}=7$ (ii)

From (i) and (ii) $u=6v$; Putting this value in either equation gives $\frac{d}{v}=35$

Q117. "My friend Raju has more than 1000 books" said Ram "Oh no, he has less than 1000 books", said Shyam. "Well Raju certainly has at least one book" said Geeta. If only one of these statements is true, how many books does Raju have?

(a) 1 (b) 1000 (c) 999 (d) 1001

Ans. : (b)

Solution: Only Gita statement can be correct. In that case Raju will have exactly 1000 books

Q118. Of the following, which is the odd one out?

(a) Cone (b) Torus (c) Sphere (d) Ellipsoid

Ans. : (b)

Solution: In torus, there is an empty space while other are completely closed figures.

Q119. A student appearing for an exam is declared to have failed the exam if his/her score is less than half the median score. This implies

(a) $\frac{1}{4}$ of the students appearing for the exam always fail.

(b) if a student scores less than $\frac{1}{4}$ of the maximum score, he/she always fails.

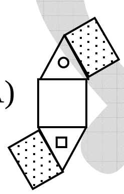
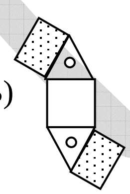
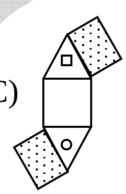
(c) if a student score more than $\frac{1}{2}$ of the maximum score, he/she always passes

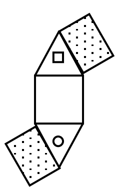
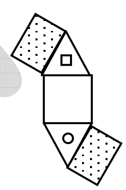
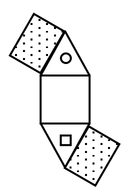
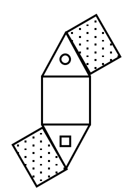
(d) it is possible that no one fails

Ans. : (d)

Solution: Suppose each of the students scored equal marks X, then the median is also X. Since no student scores less than half of the median score, hence it is possible that no one fails. Hence the correct option is (d)

Q120. Find the next figure "D"

(A)  (B)  (C)  (D) ?

(a)  (b)  (c)  (d) 

Ans. : (b)

Q121. N is a four digit number. If the leftmost digit is removed, the resulting three digit number is $\frac{1}{9}$th of N. How many such N are possible?

(a) 10 (b) 9 (c) 8 (d) 7

Ans. : (d)

Solution: Let the four digit number be $xyzw$. Then $9(yzw)=1000x+yzw \Rightarrow yzw=125x$

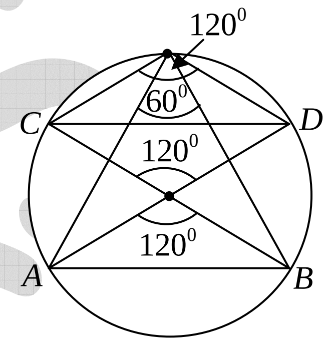
Now, yzw is a three digit number and x can take values from 1 to 9. But $x=8$ or $x=9$ is not possible because in that case yzw will be a four digit number

Q122. AB and CD are two chords of a circle subtending 60^o and 120^o respectively at the same point on the circumference of the circle. Then $AB:CD$ is

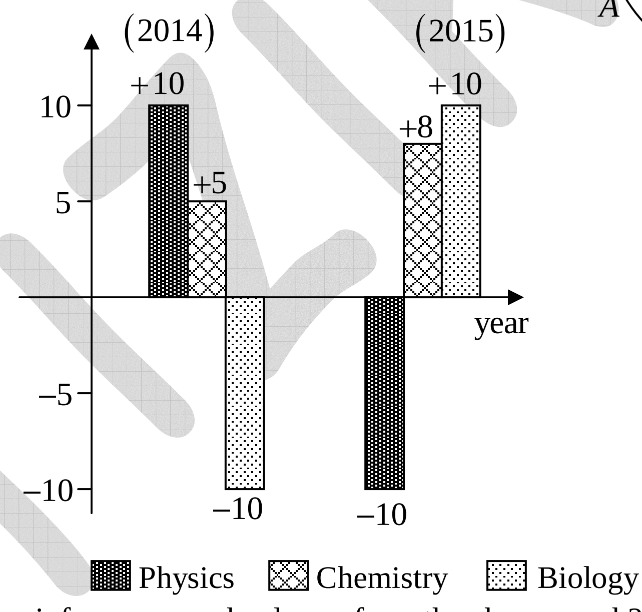
(a) $\sqrt{3}:1$ (b) $\sqrt{2}:1$ (c) $1:1$ (d) $\sqrt{3}:\sqrt{2}$

Ans. : (c)

Solution: From the diagram we can conclude that both chords AB and CD make an angle of 120^o at the centre. We know that if two chords of a circle make equal angles at the centre, they are equal. Hence the ratio $AB:CD=1:1$



Q123.



Which of the following inferences can be drawn from the above graph?

(a) The total number of students qualifying in physics in 2015 and 2014 is the same

(b) The number of students qualifying in Biology in 2015 is less than in 2013

(c) The number of Chemistry students qualifying in 2015 must be more than the number of students who qualified in Biology in 2014

(d) The number of students qualifying in physics in 2015 is equal to the number of students in Biology that qualified in 2014

Ans. : (b)

Solution: Suppose the number of students qualifying in Biology in 2013 is 100, then the number of students qualifying in 2014 is 90 and the number of students qualifying in 2015 is 99.

Q124. What is the minimum number of moves required to transform figure 1 to figure 2 ? A move is defined as removing a coin and placing it such that it touches two other coins in its new position

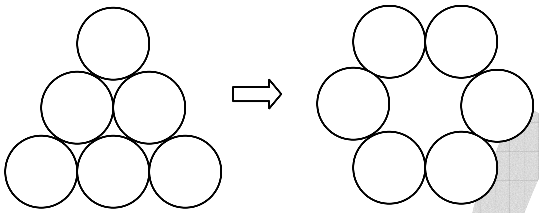
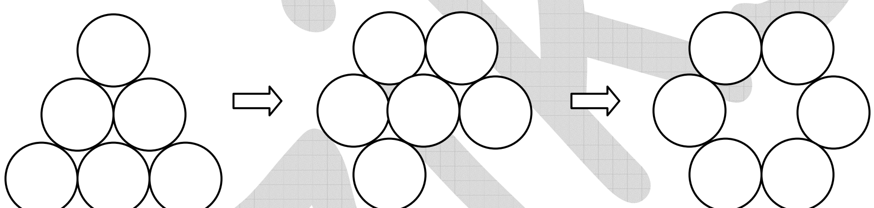


Fig -1 Fig -2

(a) 1 (b) 2 (c) 3 (d) 4

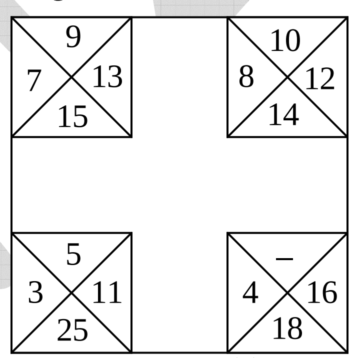
Ans. : (b)

Solution:



Thus two moves are required

Q125. The relationship among the numbers in each corner square is the same as that in the other corner squares. Find the missing number.



(a) 10 (b) 8 (c) 6 (d) 12

Ans. : (c)

Solution: The sum of numbers at each corner is 44. Hence the missing number is $44-(4+16+18)=6$

Q126. Which of the following best approximates $\sin\left(0.5^0\right)$?

(a) 0.5 (b) $0.5\times\frac{\pi}{90}$ (c) $0.5\times\frac{\pi}{180}$ (d) $0.5\times\frac{\pi}{360}$

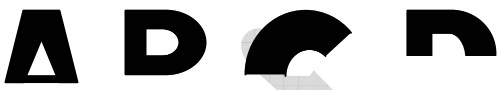
Ans. : (c)

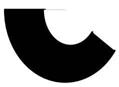
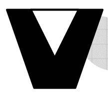
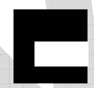
Solution: $\sin\theta\approx\theta$ when θ is small and in radians.

Thus $\sin 0.5^0=\sin\left(0.5\times\frac{\pi}{180}\right)=0.5\times\frac{\pi}{180}$

Thus the correct option is (c)

Q127. What comes next in the sequence?



(a)  (b)  (c)  (d) 

Ans. : (c)

Solution: Each figure is half of alphabets starting from A. Thus the next figure will be half of E

Q128. Which of the following statements is logically incorrect?

(a) I always speak the truth (b) I occasionally lie

(c) I occasionally speak the truth (d) I always lie

Ans. : (d)

Solution: The statement (d) is logically incorrect because it can not be inferred whether he is lying or not.

Q129. How many times starting at 1.00 pm would the minute and hour hands of a clock make an angle of 40^0 with each other in the next 6 hours?

(a) 6 (b) 7 (c) 11 (d) 12

Ans. : (c)

Solution: An angle of 40^0 is equivalent to a difference of $\frac{1}{6}\times 40=\frac{20}{3}$ minutes.

Between 1 pm and 2 pm the minute and hour hand will differ by $\frac{20}{3}$ minute once.

In each of the intervals 2 pm - 3Pm, 3Pm – 4Pm, 4Pm-5Pm, 5Pm - 6Pm, 6Pm-7Pm, the minute hand and hour hand will differ by $\frac{20}{3}$ minutes two time. In each of the same intervals the minute hand will be once behind the hour hand by $\frac{20}{3}$ minutes and once ahead of the hour hand by $\frac{20}{3}$ minutes. Thus the total number of times, the angles between the hour hand and the minute hand is 40^0 is, $1+2+2+2+2+2=11$ times

Q130. Brother Santa and Chris walk to school from their house. The former takes 40 minutes while the latter, 30 minutes. One day Santa started 5 minutes earlier than Chris. In how many minutes would Chris overtake Santa?

(a) 5 (b) 15 (c) 20 (d) 25

Ans. : (b)

Solution: Let d be the distance between the house and the school. Then the speeds of Santa and Chris are $\frac{d}{40}$ and $\frac{d}{30}$ respectively.

Now from the question $\frac{d}{30}.t = \frac{d}{40}(t+5)$

$$\Rightarrow \quad \frac{t}{3}-\frac{t}{4}=\frac{5}{4} \Rightarrow \frac{t}{12}=\frac{5}{4} \Rightarrow t=15 \text{ minutes}$$

Q131. The set of numbers $(5,6,7,m,6,7,8,n)$ has an arithmetic mean of 6 and mode (most frequently occurring number) of 7. Then $m \times n =$

(a) 18 (b) 35 (c) 28 (d) 14

Ans. : (d)

Solution: By definition

$$\frac{5+6+7+m+6+7+8+n}{8}=6 \Rightarrow m+n=9$$

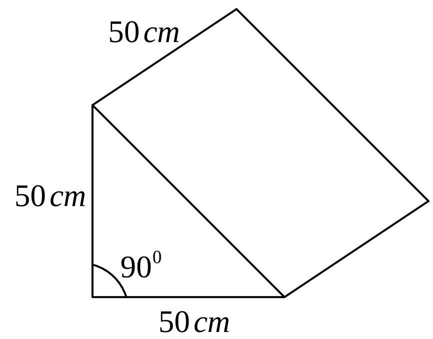
Since the mode is 7, then either m or n or both are 7. But both m and n can not be 7 because then $m+n$ would be greater than 9.

Thus either $m=7$ or $n=2$

or $m=2$ or $n=7$

Thus $mn = 7 \times 2 = 2 \times 7 = 14$

Q132. The diagram shows a block of marble having the shape of a triangular prism. What is the maximum number of slabs of $10\times10\times5\ cm^3$ size that can be cut parallel to the face on which the block is resting?



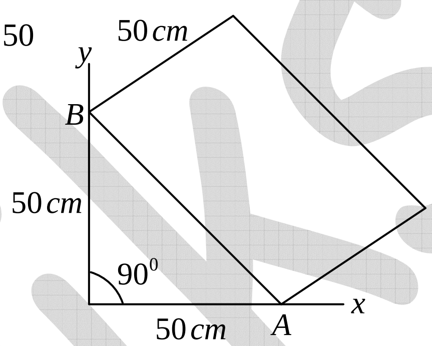
(a) 50 (b) 100

(c) 125 (d) 250

Ans. : (b)

Solution: First consider squares of side $10\ cm$ that can be placed in the triangular $50\ cm$ region.

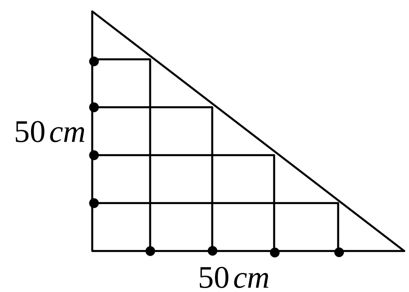
The equation of line AB is $y=-x+50$



From this equation we see that only those squares can be placed whose y coordinates are less than or equal to that given by the above equation.

Thus a total of $4+3+2+1=10$ squares can be placed. The thickness of each square is $5\ cm$. Thus the number of slabs

$$=10\times\frac{50}{5}=10\times10=100$$

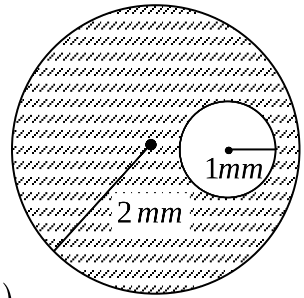


Q133. A solid contains a spherical cavity. The cavity is filled with a liquid and includes a spherical bubble of gas. The radii of cavity and gas bubble are $2\ mm$ and $1\ mm$, respectively. What proportion of the cavity is filled with liquid?

(a) $\frac{1}{8}$ (b) $\frac{3}{8}$ (c) $\frac{5}{8}$ (d) $\frac{7}{8}$

Ans. : (d)

Solution: The cavity and the air bubble are shown in the figure.



The volume of cavity (including that of air bubble) $= \frac{4\pi}{3}\left(8mm^3\right)$

The volume of air bubble $= \frac{4\pi}{3}\left(1\ mm^3\right)$

The proportion of cavity that is filled with the liquid $= \dfrac{\frac{4\pi}{3}\left(7\ mm^3\right)}{\frac{4\pi}{3}\left(8\ mm^3\right)} = \frac{7}{8}$

Q134. Fill in the blank: $F2, \_\_\_, D8, C16, B32, A64$

(a) $C4$ (b) $E4$ (c) $C2$ (d) $G16$

Ans. : (b)

Solution: The alphabet decreases by one and the number becomes two times.

Q135. Fill in the blank: $F2, \_\_\_, D8, C16, B32, A64$

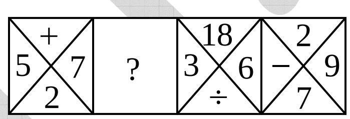
(a) $C4$ (b) $E4$ (c) $C2$ (d) $G16$

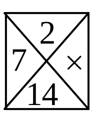
Ans. : (b)

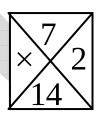
Solution: The alphabet decreases by one and the number becomes two times.

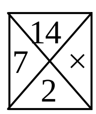
NET DEC 2016

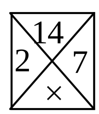
Q136. Find out the missing pattern.



(a) 

(b) 

(c) 

(d) 

Ans. : (a)

Solution: From the figure it is clear that mathematical sign changed clockwise in the adjacent triangle and the third number has been given on the addiacation of the same mathematical sign.

Q137. Seeds when soaked in water gain about 20% by weight and 10% by volume. By what factor does the density increase?

(a) 1.20 (b) 1.10 (c) 1.11 (d) 1.09

Ans. : (d)

Solution: Let the volume of the seed is V and weight is W, so that the density of the seed is

$$D = \frac{W}{V} \qquad \text{(i)}$$

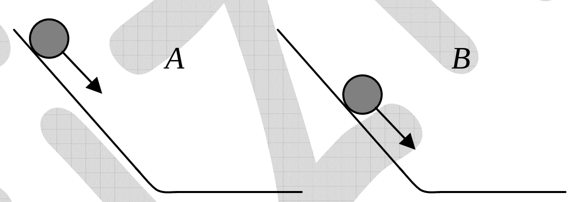
According to the question, the new volume and the weight of the seed is $\frac{11V}{10}$ and $\frac{6W}{5}$

Hence the new density of the seed is

$$D = \frac{6W}{5} \div \frac{11V}{10} = \left(\frac{12}{11}\right)\frac{W}{V} \qquad \text{(ii)}$$

Here, the nearest value of $\frac{12}{11} = 1.09$, hence the option (d) is the right option.

Q138. Retarding frictional force, f, on a moving ball, is proportional to its velocity, V. Two identical balls roll down identical slopes $(A \& B)$ from different heights. Compare the retarding forces and the velocities of the balls at the bases of the slopes.



(a) $f_A > f_B; V_A > V_B$ (b) $f_A > f_B; V_B > V_A$

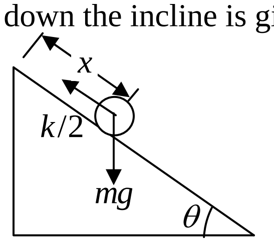
(c) $f_B > f_A; V_B > V_A$ (d) $f_B > f_A; V_A > V_B$

Ans. : (a)

Solution: When a body moves down an incline under the influence of a resistive force $F_R = -kv$.

Then its velocity as a function of distance down the incline is given by

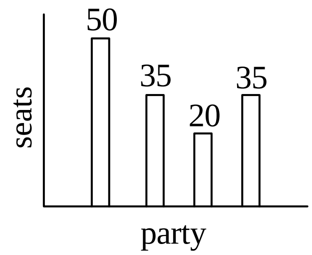
$$v = \frac{mg\sin\theta}{k}\left[1 - e^{\left(\frac{-k}{m}\right)x}\right]$$



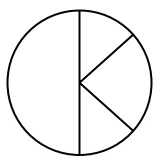
where m is the mass of the body and θ is the angle of incline.

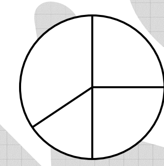
Both balls have the same mass and the same angle of incline, but the ball A travels more distance hence its speed at the bottom of the incline will be more. Hence the force acting on the ball A at the bottom of the incline will also be greater.

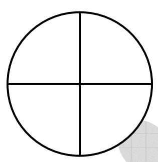
Q139. The bar chart shows number of seats won by four political parties in a state legislative assembly.

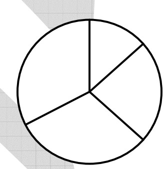


Which of the following pie-charts correctly depicts this information?

(a)


(b)


(c)


(d)


Ans. : (b)

Solution: From the figure, total number of seats

$= 50 + 35 + 20 + 35 = 140$

now we change the state into π chart

(i) $\frac{50}{140} \times 360^0 = 128.57^0$

(ii) $\frac{35}{140} \times 360^0 = 90^0$

(iii) $\frac{20}{140} \times 360^0 = 51.42^0$

(iv) $\frac{35}{140} \times 360^0 = 90^0$

Hence the pie-chart which has two right angles and an obtuse angle correctly depicts the given information. So option (b) is the right option

Q140. In how many distinguishable ways can the letters of the word CHANCE be arranged?

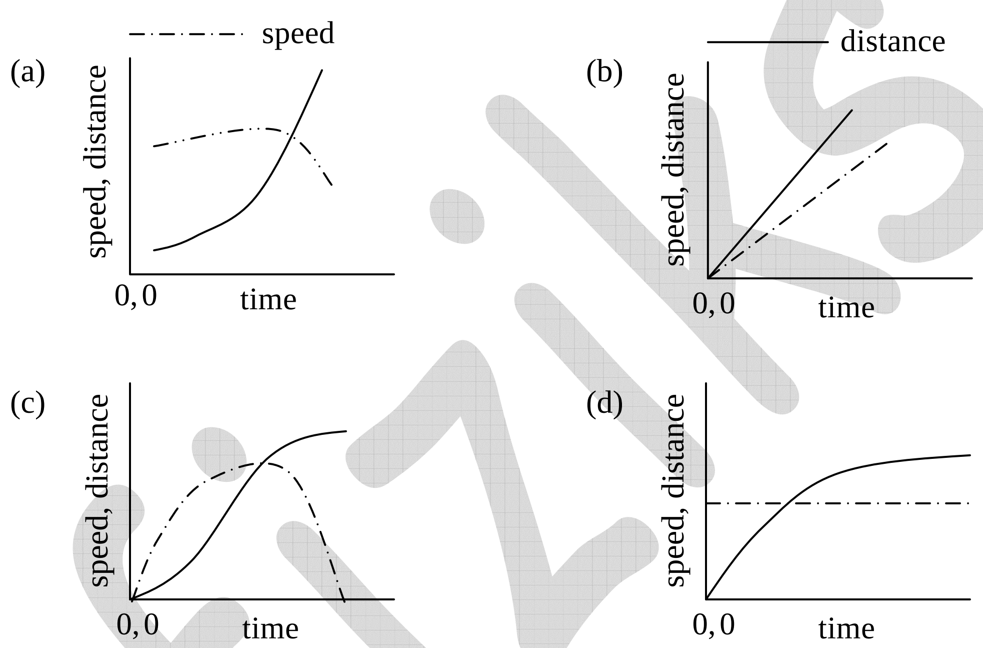
(a) 120 (b) 720 (c) 360 (d) 240

Ans. : (c)

Solution: Total number of distinguishable words made by the word “CHANCE” is:-

$$\frac{np_r}{2!}=\frac{6p_6}{2!}=\frac{6!}{2!}=360$$

Q141. Which of the following graphs correctly shows the speed and the corresponding distance covered by an object moving along a straight line?



Ans. : (a)

Q142. A normal TV screen has a width to height ratio of $4:3$, while a high definition TV screen has a ratio of $16:9$. What is the approximate ratio of their diagonals, if the heights of the two types of screens are the same?

(a) $5:9$ (b) $5:18$ (c) $5:15$ (d) $5:6$

Ans. : (d)

Solution: The width and the height of normal TV are $4x$ and $3x$

While the width and height of a high definition TV are $16y$ and $9y$

From the question

$3x=9y$ or $x=3y$

so, diagonal of normal TV $=\sqrt{(4x)^2+(3x)^2}=5x$

The diagonal of high definition TV is $=\sqrt{(16y)^2+(9y)^2}=\sqrt{256y^2+81y^2}$

$$=\sqrt{337y^2}=\sqrt{337\times\frac{x}{3}\times\frac{x}{3}}=\sqrt{\frac{337}{9}}x=6.12x \text{ (approx)}$$

so, the right answer will be (d)

Q143. Comparing numerical values, which of the following is different from the rest?

(a) The ratio of the circumference of a circle to its diameter.

(b) The sum of the three angles of a plane triangle expressed in radians.

(c) $\frac{22}{7}$

(d) The net volume of a hemisphere of unit radius, and a cone of unit radius and unit height

Ans. : (c)

Solution: From the choice (a), $2\pi r:2r=\pi:1=\pi$

From the choice (b), $180=\pi$ radian

From the choice (c), $\frac{22}{7}$, a number

From the choice (d), $\frac{2}{3}\pi r^3+\frac{1}{3}\pi r^3=\pi r^3=\pi(1)^3=\pi$ (where $r=1$ unit)

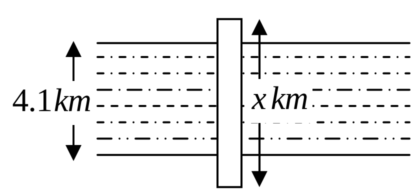
So, the option (c) is the right answer

Q144. A river is $4.1km$ wide. A bridge built across it has $\frac{1}{7}$ of its length on one-bank and $\frac{1}{8}$ of its length on the other bank. What is the total length of the bridge?

(a) $5.1km$ (b) $4.9km$ (c) $5.6\ km$ (d) $5.4km$

Ans. : (c)

Solution: Let the length of bridge is $x\ km$

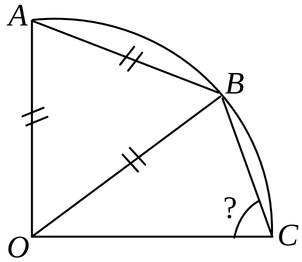


According to question

$$\frac{x}{7}km+4.1\ km+\frac{x}{8}\ km=x\ km \text{ or } \left(x-\frac{x}{7}-\frac{x}{8}\right)km=4.1$$

or $\frac{41x}{56}=4.1$ or $x=5.6\ km$

Q145. OA, OB, and OC are radii of the quarter circle shown in the figure. AB is also equal to the radius.



what is angle OCB?

(a) 60^0 (b) 75^0 (c) 55^0 (d) 65^0

Ans. : (b)

Solution: From the figure: $\angle AOC = 90^0$

From the above figure, ΔOAB is an equilateral triangle, hence

$\angle AOC = \angle AOB + \angle BOC$

or $\angle BOC = \angle AOC - \angle AOB = 90^0 - 60^0 = 30^0$

From the figure $OB = OC$ (Radius of a circle)

Hence, ΔOBC is isosceles triangle

So $\angle OBC = \angle OCB = x^0$ (Property of isosceles triangle)

In ΔOBC,

$\angle BOC + \angle OBC + \angle OCB = 180^0$

$30^0 + x^0 + x^0 = 180^0$ or $x = 75^0$

Q146. Intravenous (IV) fluid has to be administered to a child of $12\,kg$ with dehydration, at a dose of $20\,mg$ of fluid per kg of body weight, in 1 hour. What should be the drip rate (in drops/min of IV fluid? ($1mg = 20$ drops)

(a) 7 (b) 80 (c) 120 (d) 4

Ans. : (b)

Solution: According to question, total Intravenous (IV) fluid administered to the child

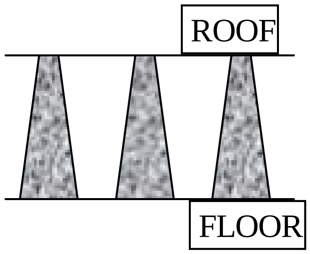
$= 20\,mg \times 12 = 240\,mg$

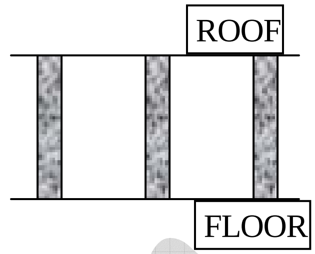
In a 60 minute, $240\,mg$ of intravenous (IV) went to the body of child

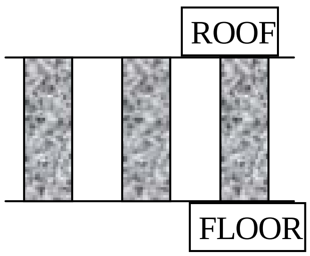
Therefore, in a one minute, $\dfrac{240}{60} = 4\,mg$ of intravenous (IV) went to the body of child

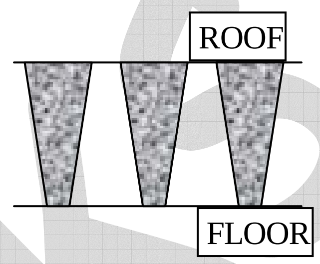
As $1mg = 20$ drops. So $4\,mg = 4 \times 20 = 80$ drops.

Q147. A hall with a high roof is supported by an array of identical columns such that, to a person lying on the floor and looking at the ceiling, the columns appear parallel to each other. Which of the following designs conforms to this?

(a) 

(b) 

(c) 

(d) 

Q148. The sum of digits of a two-digit number is 9. If the fraction formed by taking 9 less than the number as numerator and 9 more than the number as denominator is $\frac{3}{4}$, what is the number?

(a) 36 (b) 63 (c) 45 (d) 54

Ans. : (b)

Solution: Let the two digit number be:

$$10y + x$$

and from the question

$$x + y = 9 \qquad \text{(i)}$$

According to the second part of the question:

$$\frac{10y + x - 9}{10y + x + 9} = \frac{3}{4} \Rightarrow \frac{9y + y + x - 9}{9y + y + x + 9} = \frac{3}{4} \Rightarrow \frac{9y + 9 - 9}{9y + 9 + 9} = \frac{3}{4}$$

or $\quad \frac{9y}{9y + 18} = \frac{3}{4}$ or $36y = 27y + 54$ or $4y = 3y + 6 \Rightarrow y = 6$

So, $x = 3$

Therefore, the number $= 10y + x = 60 + 3 = 63$

Q149. The distance between X and Y is $1000\,km$. A person flies from X at 8 A.M. local time and reaches Y at 10 A.M. local time. He flies back after a halt of 4 hours at Y and reaches X at 4 P.M. local time on the same day. What is his average speed for the duration he is in the air?

(a) 500 km/hour

(b) 250 km/hour

(c) 750 km/hour

(d) cannot be calculated with the given information

Ans. : (a)

Solution: The average speed of the person

$$= \frac{\text{Total distance travelled by the person in the air}}{\text{Total time taken by him in air}}$$

$$= \frac{1000\,km + 1000\,km}{4\,hrs.} = \frac{2000\,km}{4hrs.} = 500\,km$$

Total time = 8 A.M. to 4 P.M. = 8 hrs.

In his 8 hrs. he took 4 hrs. rest, so he only travelled 4 hrs. in the air.

Q150. If a person travels $x\%$ faster than normal, he reaches y minutes earlier than normal. What is his normal time of travel?

(a) $\left(\frac{100}{x}+1\right)y$ minutes

(b) $\left(\frac{x}{100}+1\right)y$ minutes

(c) $\left(\frac{y}{100}+1\right)x$ minutes

(d) $\left(\frac{100}{y}+1\right)x$ minutes

Ans. : (a)

Solution: Let the normal time of travel is T and the normal speed is P km/minute.

According to question:

Distance $= PT$

$$PT = \left(P + \frac{Px}{100}\right)[T - y] \qquad \text{or,} \qquad PT = PT - Py + \frac{PTx}{100} - \frac{Pxy}{100}$$

$$\text{or,} \qquad \frac{Tx}{100} - \frac{xy}{100} = y \Rightarrow T = y\left(1 + \frac{x}{100}\right)\frac{100}{x} = y\left(1 + \frac{100}{x}\right) \text{ minute}$$

Hence option (a) is the right choice

Q151. A and B walk up an escalator one step at a time, while the escalator itself moves up at a constant speed. A walks twice as fast as B. A reaches the top in 40 steps and B in 30 steps. How many steps of the escalator can be seen when it is not moving?

(a) 30 (b) 40 (c) 50 (d) 60

Ans. : (c)

Solution: Let the speed of escalator is x step/second. The speed of A is $2y$ step/second while from the question, the speed of B is y step/second.

Let the total steps of escalator, when it is not moving is z steps.

Let A takes $\frac{P}{2}$ seconds to reach the top while B will take P seconds to reach the top (according to their speed)

$$\left(z-\frac{Px}{2}\right)\text{steps}=40 \qquad \text{(i)}$$

$$\left(z-Px\right)\text{steps}=30 \qquad \text{(ii)}$$

or $\frac{Px}{2}=10$ or $Px=20$. So, $z=30+20=50$

Q152. Two iron spheres of radii $12\,\text{cm}$ and $1\,\text{cm}$ are melted and fused. Two new spheres are made without any loss of iron. Their possible radii could be

(a) 9 and $4\,\text{cm}$ (b) 9 and $10\,\text{cm}$

(c) 8 and $5\,\text{cm}$ (d) 2 and $11\,\text{cm}$

Ans. : (b)

Solution: Total volume of two iron spheres

$$=\frac{4}{3}\pi\left[12cm^3+\left(1cm\right)^3\right]=\frac{4}{3}\pi\left[1728+1\right]cm^3=\frac{4}{3}\pi\times 1729\,cm^3$$

Now from the option (b), we get

$$\frac{4}{3}\pi\left[9^3+10^3\right]cm^3=\frac{4\pi}{3}\left[729+1000\right]cm^3=\frac{4\pi}{3}\times 1729\,cm^3$$

Q153. A man buys alcohol at Rs $75/cL$, adds water, and sells it at Rs. $75/cL$ making a profit of 50%. What is the ratio of alcohol to water?

(a) $2:1$ (b) $1:2$ (c) $3:2$ (d) $2:3$

Ans. : (a)

Solution: Let the price of $1CL = 1000\,ml$ is Rs 75, so, the price of $2CL$ is Rs. 150

To sell the alcohol at the profit of 50%, the price of $2000\,ml$ should be Rs. 225

But for the profit of 50%, we must mix water of Rs. 75,

So, In a Rupees 225 we get $2000\ ml$ of mixed alcohol,

So, In a Rs. 75, we get $\frac{2000}{225}\times 75 = \frac{2000}{3}ml$ of alcohol; so, this, $\frac{2000}{3}ml$ must be water in the mixture.

In $2000\,ml$ of the mixture amount of alcohol $= 2000 - \frac{2000}{3} = \frac{4000}{3}ml$

So the ratio is $\frac{4000}{3}:\frac{2000}{3} = 4:2$ or $2:1$

NET JUNE 2017

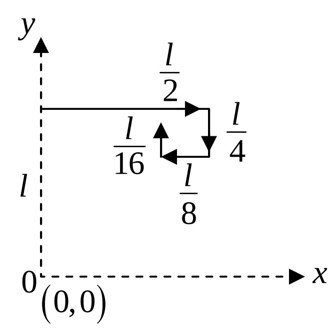
Q154. An ant starts at the origin and moves along the y-axis and covers a distance l. This is its first stage in its journey. Every subsequent stage requires the ant to turn right and move a distance which is half of its previous stage. What would be its coordinates at the end of its 5^{th} stage?

(a) $\left(\frac{3l}{8},\frac{13l}{16}\right)$ (b) $\left(\frac{13l}{16},\frac{3l}{8}\right)$ (c) $\left(\frac{13l}{8},\frac{3l}{16}\right)$ (d) $\left(\frac{3l}{16},\frac{13l}{8}\right)$

Ans. : (a)

Solution: y - coordinate at 5^{th} stage $l - \frac{l}{4} + \frac{l}{16} = \frac{13l}{16}$

x - coordinate $= \frac{l}{2} - \frac{l}{8} = \frac{3l}{8}$



Q155. In a group of siblings there are seven sisters and each sister has one brother. How many siblings are there in total?

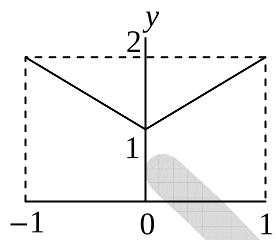
(a) 15 (b) 14 (c) 8 (d) 7

Ans. : (c)

Solution: All 7 sisters are siblings, so brother of one sister will be brother of all sisters.

So, total siblings $7+1=8$

Q156. What is the average value of y for the range of x shown in the following plot?

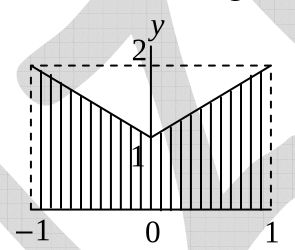


(a) 0 (b) 1 (c) 1.5 (d) 2

Ans. : (c)

Solution: Total y is equal to the area of shaded region, which is equal to 3.

Range of $x=2$



So, any value of y for the range of $x=\frac{3}{2}=1.5$

Q157. A bread contains 40% (by volume) edible matter and the remaining space is filled with air. If the density of edible matter is 2 g/cc, what will be the bulk density of the bread (in g/cc)?

(a) 0.4 (b) 0.8 (c) 1.2 (d) 1.6

Ans. : (b)

Solution: Let volume of bread $=1000\ cc$

Volume of edible matter $=400\ cc$

Weight of edible matter $=400\times 2=800\ gm$

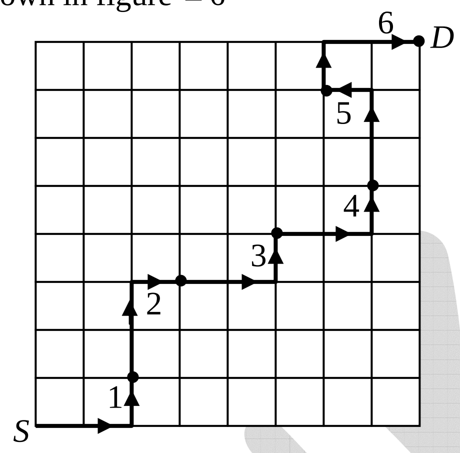
So, bulk density $=\frac{800\,gm}{1000\,cc}=0.8\ gm/cc$

Q158. A board has 8 rows and 8 columns. A move is defined as two steps along a column followed by one step along a row or vice-versa. What is the minimum number of moves needed to go from one corner to the diagonally opposite corner?

(a) 5 (b) 6 (c) 7 (d) 9

Ans. : (b)

Solution: Total moves as shown in figure $= 6$



Q159. A job interview is taking place with 21 male and 17 female candidates. Candidates are called randomly. What is the minimum number of candidates to be called to ensure that at least two males or two females have been interviewed?

(a) 17 (b) 2 (c) 3 (d) 21

Ans. : (c)

Solution: Total male $= 21$, total female $= 17$

Even in worst case, if two selected individuals are from either of two groups, third selection will always ensure interview of two males or females.

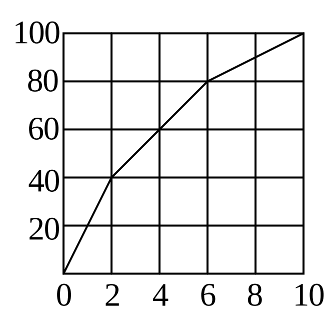
Q160. The graph shows cumulative frequency % of research scholars and the number of papers published by them. Which of the following statements is true?

(a) Majority of the scholars published more than 4 papers.

(b) 60 % of the scholars published at least 2 papers.

(c) 80 % of the scholars published at least 6 papers.

(d) 30% of scholar's have not published any paper.



Ans. : (b)

Solution: No. of Persons	Paper Published
20	1
20	2
20	4
20	6
10	8
10	10

It is obvious from table that option (b) is correct.

Q161. A tells only lies on Monday, Tuesday and Wednesday and speaks only the truth for the rest of the week. B tells only lies on Thursday; Friday and Saturday and speaks only the truth for the rest of the week. If today both of them state that they have lied yesterday, what day is it today?

(a) Monday (b) Thursday (c) Sunday (d) Tuesday

Ans. : (b)

Solution:

	M	T	W	T	F	S
A	L	L	L	T	T	T
B	T	T	T	L	L	L

If today both state that they lied yesterday. It means one is telling truth and other one telling a lie today.

Suppose A is telling truth today i.e. on Thursday, it means A lied yesterday. Also, B is telling a lie on Thursday, and say he lied yesterday, it means he spoke truth yesterday. This implies today is Thursday.

Q162. A fair die was thrown three times and the outcome was repeatedly six. If the die is thrown again, what is the probability of getting six?

(a) $1/6$ (b) $1/216$ (c) $1/1296$ (d) 1

Ans. : (a)

Solution: 4^{th} throw is independent of the outcomes of all previous three outcomes. So probability of getting six in 4^{th} thrown $=\frac{1}{6}$.

Q163. Which is the odd one out based on a divisibility test?

154, 286, 363, 474, 572, 682

(a) 474 (b) 572 (c) 682 (d) 154

Ans. : (a)

Solution: All are divisible by eleven except 474.

Q164. My birthday is in January. What would be a sufficient number of questions with 'Yes/No' answers that will enable one to find my birth date?

(a) 6 (b) 3 (c) 5 (d) 2

Ans. : (c)

Solution: January has total 31 days. 31 days can be bisected in 5 ways to ensure the exact date of birth.

1 $\downarrow^{5th}$ 2 $\downarrow^{4th}$ 3 4 $\downarrow^{3rd}$ 5 6 7 $\downarrow^{2nd}$ 8 9 10 11 12

13 14 15 $\downarrow^{1st}$ 16 17 18 19 20 21 22 23 24

25 26 27 28 29 30 31

at every $\downarrow$, we can ask – Does your birth-date fall on the right part, and we get answer – No, doing so we could, for example, ensure his birth-date is 1st of January.

1 2 3….. 15 $\downarrow$ 16…………….30 31

No

1 2 3….. 7 $\downarrow$ 8……………..15

No

1 2 3 4 $\downarrow$ 5 6 7

No

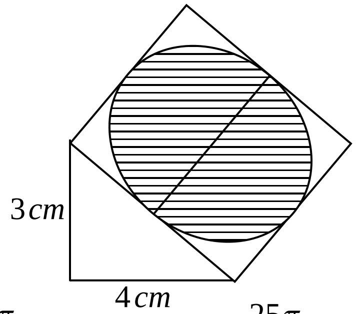
1 2 $\downarrow$ 3 4

No

1 $\downarrow$ 2

No

Q165. A square is drawn with one of its sides as the hypotenuse of a right angled triangle as shown in the figure. What is the area of the shaded circle?



(a) $\frac{25\pi}{1} cm^2$ (b) $\frac{25\pi}{2} cm^2$ (c) $\frac{25\pi}{3} cm^2$ (d) $\frac{25\pi}{4} cm^2$

Ans. : (d)

Solution: Radius of circle $= \frac{5}{2} cm$

Area of circle $= \pi\left(\frac{5}{2}\right)^2 = \frac{25}{4}\pi\, cm^2$

Q166. What should be added to the product of the two numbers 983713 and 983719 to make it a perfect square?

(a) 9 (b) 13 (c) 19 (d) 27

Ans. : (a)

Solution: 983713 = 983716 – 3

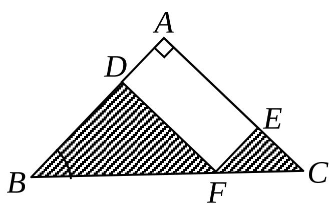
983719 = 983716 + 3

$983713 \times 983719 = (983716-3)(983716+3)$

$= 983716^2 - 3^2$

so, adding $3^2 = 9$, we get a perfect square.

Q167. In ΔABC, $AB = AC$ and $\angle BAC = 90^0$; $EF \parallel AB$ and $DF \parallel AC$. The total area of the shaded region is



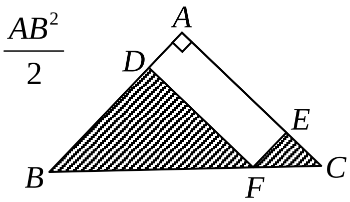
(a) $AF^2/2$ (b) AF^2 (c) $BC^2/2$ (d) BC^2

Ans. : (a)

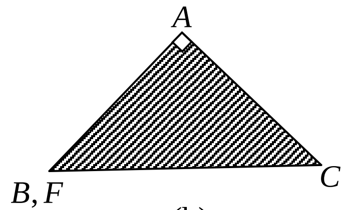
Solution: F is variable point on BC, such that $DF \parallel AC$ and $EF \parallel AB$.

In a limiting case when F merges to B, area of total shaded region (b) will be equal to area of ΔABC i.e. $\dfrac{AB^2}{2}$

If $F \to B$



(a)



(b)

$\dfrac{AF^2}{2} \to \dfrac{AB^2}{2}$, so option (a) is correct.

Q168. Consider a circle of radius r. Fit the largest possible square inside it and the largest possible circle inside the square. What is the radius of the innermost circle?

(a) $r/\sqrt{2}$ (b) $\pi r/\sqrt{2}$ (c) $\dfrac{r}{2\pi\sqrt{2}}$ (d) $r/2$

Ans. : (a)

Solution: Side of square $=\dfrac{2r}{\sqrt{2}}=\sqrt{2}\,r$

Radius of inner-circle $=\dfrac{\sqrt{2}\,r}{2}=\dfrac{r}{\sqrt{2}}$

Q169. In how many ways can you place N coins on a board with N rows and N columns such that every row and every column contains exactly one coin?

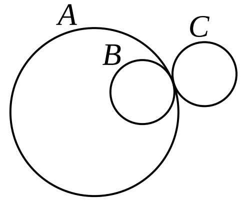
(a) N (b) $N(N-1)(N-2)....2\times 1$

(c) N^2 (d) N^N

Ans. : (b)

Solution: We can place N - coins along diagonal, by doing so each row and each column will have exactly one coin. So, number of ways of doing it $= N(N-1)(N-2)....2\times 1$.

Q170. Two identical wheels B and C move on the periphery of circle A. Both start at the same point on A and return to it, B moving inside A and C outside it. Which is the correct statement?



(a) B wears out π times C

(b) C wears out π times B

(c) B and C wear out about equally

(d) C wears out two times B

Ans. : (c)

Solution: Both wheels B and C will revolve same number of times while reaching their starting point. So, B and C will wear out equally.

Q171. Which of the following is the odd one out?

(a) Isosceles triangle (b) Square

(c) Regular hexagon (d) Rectangle

Ans. : (c)

Solution: Except isosceles triangle, all shapes have all internal angles either 90^0 or greater than 90^0, besides all internal angles are equal except in case of isosceles triangle.

Q172. Find the missing word: $A, AB, \ldots\ldots, ABBABAAB$

(a) $AABB$ (b) $ABAB$ (c) $ABBA$ (d) $BAAB$

Ans. : (c)

Solution: A AB $\underline{ABBA}$ $ABBA$ $BAAB$

Q173. A 100 m long train crosses a bridge 200 m long and 20 m wide bridge in 20 seconds. What is the speed of the train in km/hr?

(a) 45 (b) 36 (c) 54 (d) 57.6

Ans. : (c)

Solution: Speed of train $=\dfrac{(100+200)}{20}\times\dfrac{3600}{1000}\,km/hr$

$=54\ km/hr$

NET DEC-2017

Q174. A leaf appears green in daylight. If this leaf were observed in red light, what colour would it appear to have?

(a) Green (b) Black-Brown (c) Red (d) Blue

Ans. : (b)

Solution: We know that no object have their own colour, the colour reflected by any object appears its own colour. An object which is black in colour does not reflect any colour of the sun light.

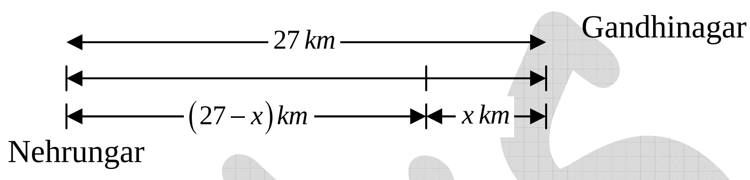
So, the leaf which appears green in day light will be observed in red light would be black in colour.

Q175. The distance from Nehrunagar to Gandhinagar is $27\,km$. A and B start walking from Nehrunagar towards Gandhinagar at speeds of $5\,km/hr$ and $7\,km/hr$, respectively. B reaches Gandhinagar, returns immediately, and meets A at Indiranagar. What is the distance between Nehrunagar and Indiranagar? (Assume all three cities to be in one straight line)

(a) $12.5\,km$ (b) $22.5\,km$ (c) $4.5\,km$ (d) $13.5\,km$

Ans. : (b)

Solution:



Total distance covered by B to reach Indiranagar after reaching Gandhinagar from Nehrunagar $= 27\,km + x\,km$

The time taken by B to cover this distance: $\left(\frac{27+x}{7}\right)$ hour

The time taken by A to reach Indiranagar from Nehrunagar $= \left(\frac{27-x}{5}\right)$ hour

According to question:

$\frac{27+x}{7} = \frac{27-x}{5}$, or $135 + 5x = 189 - 7x$

or, $12x = 189 - 135 \Rightarrow x = \frac{54}{12} = 4.5\ km$

Hence, the distance between Nehrunagar and Indiranagar is $27 - 4.5 = 22.5\,km$

Q176. A sphere G of radius b is fixed mid-air and several spheres identical to the first one are shot at it with their velocities parallel to each other. If the shot spheres fall within an imaginary cylinder of radius $a\,(b << a)$, then the fraction of spheres that will hit G is

(a) $2b/a$ (b) $4b^2/a^2$ (c) $(a-b)/(a+b)$ (d) $8b^3/a^3$

Ans. : (b)

Solution: The area of sphere G of radius $b = 4\pi b^2$

Let, the number of sphere shot, which is similar to sphere G be N, then total

Area of N space $= N.4\pi b^2$

As, the shot sphere fall in an imaginary cylinder of radius a, then

Area of cylinder $= \pi a^2$

The fraction of spheres that will hit

$$G = \frac{\text{Area of total sphere falling in cylinder}}{N.\text{Area of cylinder}} = \frac{N \cdot 4\pi b^2}{N \cdot \pi a^2}$$

$$\text{Fraction} = \frac{4b^2}{a^2}$$

Q177. Five persons A, B, C, D and E are sifting in a row with C in the middle of the group. If D is at an extreme end and there are at least two persons between B and E, then which of the following statements is incorrect?

(a) E can be on extreme left (b) E can be on extreme right

(c) A cannot be on extreme left (d) A is always a neighbour of B or D

Ans. : (d)

Solution: According to the question, there may be two cases, which are:

Case-1 D B C A E

Case -2 E A C B D

E would be either in extreme left or extreme right position. A cannot be on extreme left. A is always neighbour of E and C.

Q178. In a group of students, 30% play only cricket, 20 % play only football and 10 % play only basketball. 20 % of the students play both football and cricket, 15 % play both basketball and cricket, 10 % play both football and basketball. 15 students play no games, while 5 % of the students play all three games. What is the total number of students?

(a) 300 (b) 250 (c) 350 (d) 400

Ans. : (a)

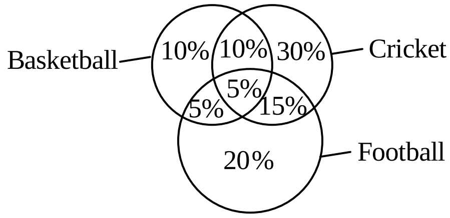
Solution: Total percentage of students, who likes games:

$$= 10\% + 30\% + 20\% + 5\% + 5\% + 10\% + 15\% = 95\%$$

Hence the number of students who do not participate in the games $= 5\%$ of the total number of students

$\therefore$ Total number of students

$\dfrac{15 \times 100}{5} = 300$

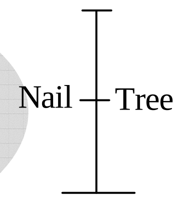


Q179. When Ramesh was at the age of 8 years, he hammered a nail into a large tree to mark his height. If the tree grows 2 cm/year, how much higher would the nail be after 5 years?

(a) $5\,cm$ higher (b) $0\,cm$ higher (c) $10\,cm$ higher (d) $8\,cm$ higher

Ans. (b)

Solution: Even if tree grows upwards, the position of nail will remain same after 5 years



Q180. Find the missing number

17	15	13	12	25	24	41	40
8		5		7		?	

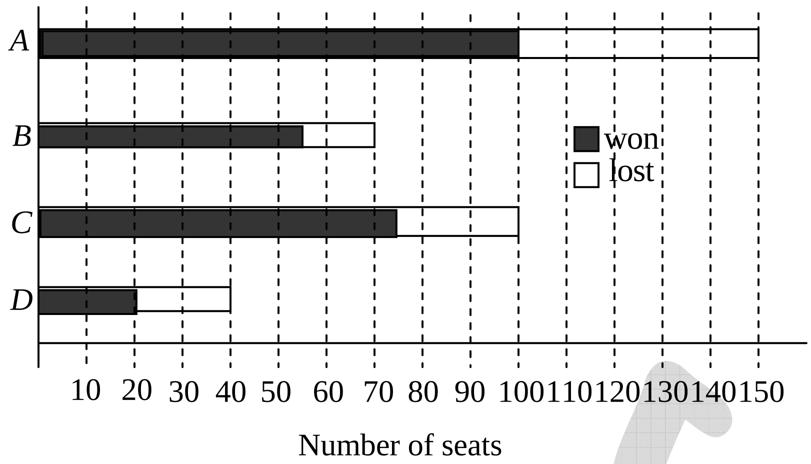
(a) 4 (b) 9 (c) 3 (d) 6

Ans. : (b)

Solution: The number system is based on following patterns:-

$$17^2 - 15^2 = (17+15)(17-15) = 32 \times 2 = 64 = 8^2$$
$$13^2 - 12^2 = (13+12)(13-12) = 25 \times 1 = 25 = 5^2$$
$$25^2 - 24^2 = (25+24)(25-24) = 49 \times 1 = 49 = 7^2$$
$$41^2 - 40^2 = (41+40)(41-40) = 81 \times 1 = 81 = 9^2$$

Q181.



The bar chart above shows number of seats won by four political parties A, B, C and D.

Which party won the largest proportion of seats it contested?

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

Ans. : (b)

Solution: The proportion of seats of party A, out of total number of seats contested by it

$$=\frac{100}{150}$$

The proportion of seats of party B, out of total number of seats contested by it

$$\frac{56}{70}=\frac{8}{10}=\frac{120}{150}$$

The proportion of seats of party C, out of total number of seats contested by it

$$=\frac{72}{100}=\frac{18}{25}=\frac{108}{150}$$

The proportion of seats of party D, out of total number of seats contested by it

$$=\frac{20}{40}=\frac{1}{2}=\frac{75}{150}$$

B wins 120 seats if she will fight on 150 seats, hence, the largest proportion of seats was won by B

Q182. The molar fraction of hydrochloric acid in an extremely dilute' aqueous solution is doubled. The pH of the resulting solution is

(a) approximately doubled (b) approximately halved

(c) increased (d) reduced

Ans. : (d)

Solution: Since PH is defined by the formula $PH = -\log\left[H^+\right]$

Hence the new PH, after doubling the molar fraction, becomes

$(PH)_{new} = -\log\left[2H^+\right] = -\log 2 - \log\left[H^+\right]$

we see that PH is reduced but it does not become half of its previous value.

Q183. Approximately how much blood flows per day through a normal human heart beating 70 times per minute, having a relaxed volume of 110 cc and compressed volume of 70 cc?

(a) 7150 litres (b) 4000 litres (c) 28000 litres (d) 11100 litres

Ans. : (b)

Solution: In question, it is given during heart beating 70 times per minute,

Relaxed volume of blood $= 110\,cc$

And compressed volume of blood $= 70$ cc

Since, during compression of heart, the left blood, flow $= 40$ cc

So, during 70 times beating of heart i.e., in one minute, the quantity of blood flowing $= 70 \times 40\,cc$

Therefore, in 1 day $= 70 \times 40 \times 60 \times 24 = 4032000$ cc

Volume of blood flow ≈ 4000 litre

Q184. The number of three English letter words, having at least one consonant, but not having two consecutive consonants, is

(a) 2205 (b) 3780 (c) 2730 (d) 3360

Ans. : (b)

Solution: Number of vowels $= 5$

Number of consonant $= 21$

Here, our condition is to take atleast one consonant, but not consecutive, so we are left with two cases-

Case I: Only one consonant-

Number of ways $3 \times 21 \times 5 \times 5 = 1575$

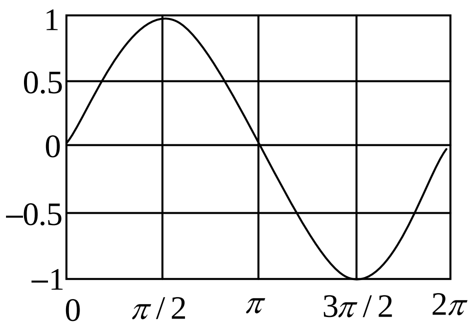
$= 21 \times 5 \times 4 \times 3 = 1260$

Case II: Two consonant, but at alternate position, Number of ways $=21\times 21\times 5=2205$

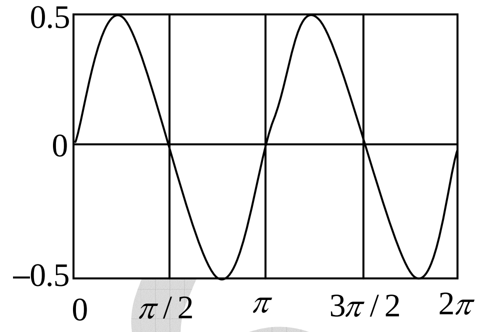
Therefore, total number of ways $=1575+2205=3780$

Q185. Which one of the following graphs represents $f\left(x\right)=\sin x\cos x$?

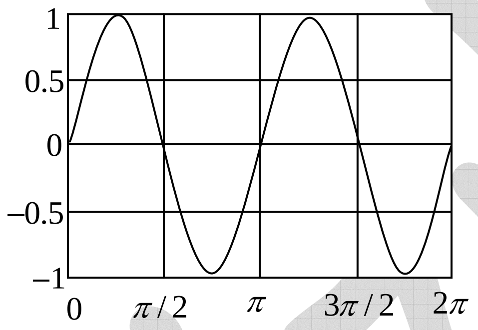
(a)



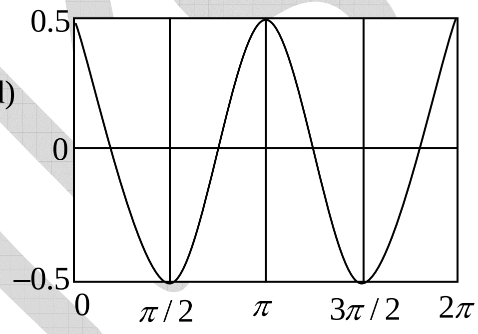
(b)



(c)



(d)



Ans. : (b)

Solution: This is the graph of $\frac{1}{2}\sin 2x$

Now, $-1\le \sin 2x\le 1\Rightarrow -\frac{1}{2}\le \frac{1}{2}\sin 2x\le \frac{1}{2}\Rightarrow -0.5\le \frac{1}{2}\sin 2x\le 0\cdot 5$

Q186. There are two gas parcels of equal volume, A and B at the same temperature and pressure. Parcel A is one mole of water vapour, while parcel B is one mole of dry air. Which of the following is TRUE?

(a) Parcel A is heavier then Parcel B

(b) Parcel B is heavier than Parcel A

(c) Both parcels are equally heavy

(d) Without temperature and pressure data, their relative masses cannot be determined

Ans. : (b)

Solution: Water vapour content $=H_2O$

$\therefore$ Mass of one mole of water vapour $=2\times 1+16=18$

Dry air content $= 79\%$ of $N_2 + 20\%$ of oxygen $+ 1\%$ some other gases

$\therefore$ Mass of one mole of dry air $= 14 + 32 + \text{some quantity} = 46$ (nearly)

Since, mass of one mole of dry air is more than mass of one mole of water vapour, therefore parcel B carrying dry air will be more heavier than parcel A

Q187. For which of the following numbers is its positive square root closest to the number itself'?

(a) 0.33 (b) 0.99 (c) 0.89 (d) 0.10

Ans. : (b)

Solution: Take square root of respective options-

(1) For 0.33, square root value $= 0.57$

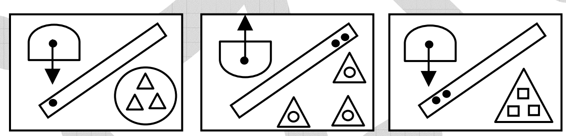
(2) For 0.99, square root value $= 0.99$

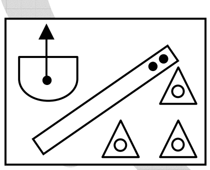
(3) For 0.89, square root value $= 0.94$

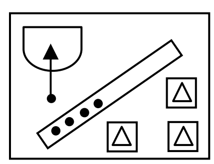
(4) For 0.10, square root value 0.31

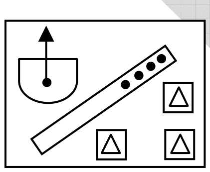
From above, we can see, the square root of $= 0.99$ most closest to the number itself.

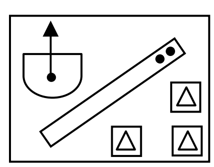
Q188. Find the next pattern in the following sequence:



(a) 

(b) 

(c) 

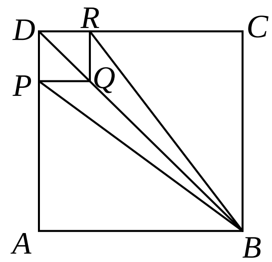
(d) 

Ans. : (c)

Solution: The arrow of first part of the figure changed alternately. The point on rectangular part follow the series of $1, 2, 2, 4$ and changes its position alternately.

The square under triangle comes out and it will be covered by triangle

Q189. DRQP is a small square of side a in the corner of a big square ABCD of side A. What is the ratio of the area of the quadrilateral $PBRQ$ to that of the square $ABCD$, given $A/a = 3$?

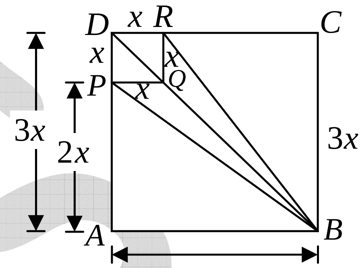


(a) $2/9$ (b) $1/6$

(c) $1/3$ (d) $2/7$

Ans. : (a)

Solution: According to the question, let the side of $AB = 3x = BC = CD = AD$ and the side of $DP = PQ = RQ = DR = x$



The area of the quadrilateral $PBRQ =$ The area of square $ABCD -$ Area of square $PDRQ -$ Area of right angle triangle $ABP -$ Area of Right angle triangle BCR.

$$= 3x \times 3x - x \times x - \frac{1}{2} \times 3x \times 2x - \frac{1}{2} \times 3x \times 2x$$

$$= 9x^2 - x^2 - 3x^2 - 3x^2 = 2x^2$$

The area of the square $= 3x3x = 9x^2$

Hence, the ratio of the area of the quadrilateral $PBRQ$ to that of the square $ABCD$

$$= 2x^2 : 9x^2 = \frac{2}{9}$$

Q190. A 100 m long fence is to be made by fixing a wire mesh on steel poles. Each pole has a 1 m vertical portion and a 1 m portion tilted at 45^0 to the vertical. What will be the area of wire mesh required?

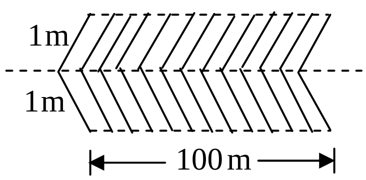
(a) 200 m^2 (b) 241.4 m^2 (c) 400 m^2 (d) 170.7 m^2

Ans. : (a)

Solution: The area of the fence lying on tilted portion $= 100 \times 1 = 100\ m^2$

The area of the fence lying on untilted portion $= 100 \times 1 = 100\ m^2$

Hence total area of fence $100 + 100 = 200\ m^2$



Q191. The average staff salary of a company is Rs. $8000/-$. A new guard and a new manager are recruited with salaries of Rs. $5000/-$ and $20000/-$, respectively. What is the current staff strength if the new average salary is Rs. $4000/-$ more than that of the guard?

(a) 7 (b) 9 (c) 10 (d) 11

Ans. : (b)

Solution: Let the current staff strength be x. Then the total salary of the staff Rs. $8000x$.

After a new managers, the sum of the salary of the staff is new

$$= \text{Rs.}8000x + \text{Rs.}5000 + \text{Rs.}20000 = \text{Rs.}8000x + \text{Rs.}25000$$

The new average of the salary of the staff

$$= \frac{\text{Rs.}8000x + \text{Rs.}25000}{x}$$

According to the question

$$= \frac{\text{Rs.}8000x + \text{Rs.}25000}{x+2} \mp = \text{Rs.}5000 + = \text{Rs.}4000$$

or, $8000x + 25000 = 9000x + 18000$

or, $1000x = 7000$

$\therefore \; x = 7$

And hence, strength of current staff $= 7 + 2 = 9$

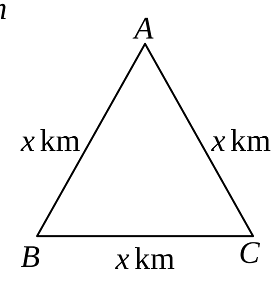
Thus option (b) is correct.

Q192. A bird flies along the three sides of a field in the shape of an equilateral triangle at speeds of $2, 4, 8 \; km/hr$, respectively. The average speed of the bird is

(a) $\frac{24}{7} \; km/hr$ (b) $\frac{14}{3} \; km/hr$ (c) $\frac{22}{7} \; km/hr$ (d) $4 \; km/hr$

Ans. : (a)

Solution: Let the side of a field of in the shape of an equilateral triangle $= x \; km$



Total distance travelled by the bird $= (x + x + x) km = 3x \; km$

Total time to cover $3x \; km$ by the bird $= \left(\frac{x}{2} + \frac{x}{4} + \frac{x}{8}\right) \text{hour} = \frac{7x}{8} \text{hour}$

Hence, the average speed $= \frac{3x}{7x/8} \; km/\text{hour} = \frac{24}{7} \; km/\text{hour}$

Q193. A buys n copies of a book at 20 % discount. B gets the same book at 30 % discount. What is the minimum value of it for which B can buy one extra copy of the book, spending the same amount as A?

(a) 7

(b) 8

(c) 6

(d) This problem cannot be solved unless the marked price of the book is known.

Ans. : (a)

Solution: Let the price on n copies of book is Rs. x. After getting discount of 20%, then

A pay Rs. $\frac{4x}{5}$ for n copies of books. While B after getting discount of 30%, he will pays Rs. $\frac{7x}{10}$ for n copies of books.

B buys n books after paying Rs. $\frac{7x}{10}$

B buys $\frac{10n}{7x}\times\frac{4x}{5}$ books after paying Rs. $\frac{4x}{5}$ (The amount which A spent to buy n copies of books)

According to question

$\frac{8n}{7}-n=1$ (The condition is given in the second part of the question)

or $\frac{n}{7}=1$ or $n=7$

NET JUNE-2018

Q194. When a farmer was asked as to how many animals he had, he replied that all but two were cows, all but two were horses and all but two were pigs. How many animals did he have?

(a) 3 (b) 6 (c) 8 (d) 12

Ans. : (a)

Solution: When the farmer has just 3 animals, then all but two can be cows, all but two can be horses and all but two can be pigs. In this case the farmer has 1 cow, 1 horse and 1 pig. All other options violates the statement of the question.

Q195. Nine eleventh of the members of a parliamentary committee are men. Of the men, two-thirds are from the Rajya Sabha. Further, $7/11$ of the total committee members are from the Rajya Sabha. What fraction of the total number are women from the Lok Sabha?

(a) 1/11 (b) 6/11 (c) 2/11 (d) 3/11

Ans. : (a)

Solution: Let the total number of member in the committee be x.Then

Number of men in the committee $=\frac{9x}{11}$

and, number of women in the committee $=\frac{2x}{11}$

Number of men from Rajya Sabha $=\frac{9x}{11}\times\frac{2}{3}=\frac{6x}{11}$

Number of men from Lok Sabha $=\frac{9x}{11}-\frac{6x}{11}=\frac{3x}{11}$

From the question $\frac{7x}{11}$ members are from Rajya Sabha. Hence the number of committee members from Lok Shabha $=x-\frac{7x}{11}=\frac{4x}{11}$. In the Lok Sabha since $\frac{3x}{11}$ members are men, hence $\frac{4x}{11}-\frac{3x}{11}=\frac{x}{11}$ members are women. Hence the fraction of women from Lok Sabha out of the total members of committee $=\frac{x/11}{x}=\frac{1}{11}$

Q196. A librarian is arranging a thirteen-volume encyclopedia on the shelf from left to right in the following order of volume numbers: $8,11,5,4,9,1,7,6,10,3,12,2$. In this pattern, where should the volume 13 be placed?

(a) Leftmost (b) Rightmost

(c) Between 10 and 3 (d) Between 9 and 1

Ans. : (c)

Q197. Pick the correct statement:

(a) The sky is blue because Sir C.V. Raman gave the correct explanation.

(b) Copernicus believed that the Sun, and not the Earth, was at the centre of the Solar system.

(c) The sky appears blue when seen from the Moon..

(d) No solar eclipse is visible for an astronaut standing on the Moon.

Ans. : (b)

Solution: In Copernician model of the solar system the solar system was considered Heleiocentric which means the Sun being at the centre of the solar system.

Q198. What is the last digit of $(2017)^{2017}$?

(a) 1 (b) 3 (c) 7 (d) 9

Ans. : (c)

Solution: The last digit of 7^4 is 1. Hence $\left[(2017)^4\right]^{504}.2017$ has its last digit $1\times 7=7$. Thus the last digit of $(2017)^{2017}$ is 7

Q199. What is the value of $(1+3+5+7+......+4033)+7983\times 2017$?

(a) 20170000 (b) 20172017 (c) 20171720 (d) 20172020

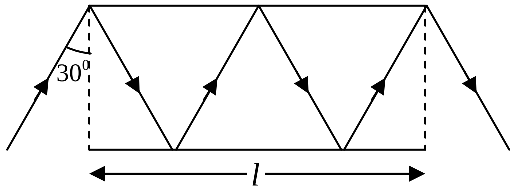
Ans. : (a)

Solution: The number of terms in $1+3+5+7+...4033$ is 2017. Hence

$$(1+3+5+7+...4033)+7983\times 2017$$

$$=\frac{1+4033}{2}\times 2017+7983\times 2017=2017(2017+7983)=20170000$$

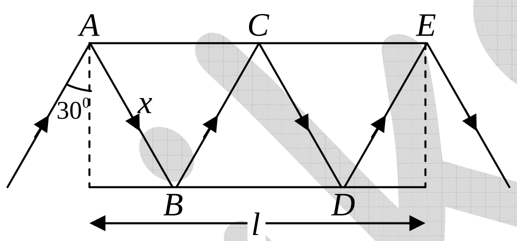
Q200. Path of a ray of light between two mirrors is shown in the diagram. If the length of each mirror is 'l', what is the total path length of the ray between the mirrors?



(a) $\frac{3}{4}l$ (b) $\frac{4}{3}l$ (c) $\frac{3}{2}l$ (d) $2l$

Ans. : (d)

Solution:



If we assume $AB = x$ then it can be proved that BC, CD and DE have the same length x.

From geometry $4x\sin 30^0 = l \Rightarrow 4x = \frac{l}{\sin 30} \Rightarrow 4x = \frac{l}{1/2} = 2l$

Q201. In a group of 11 persons, each shakes hand with every other once and only once. What is the total number of such handshakes?

(a) 110 (b) 121 (c) 55 (d) 66

Ans. : (c)

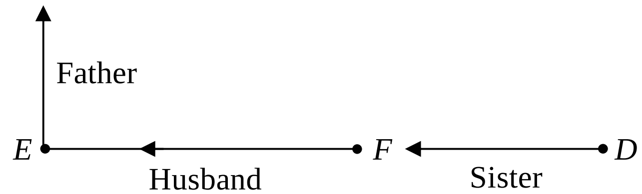
Solution: The total number handshakes is equal to the total number of combinations of 11 objects by taking 2 at a time. Thus total number of handshakes $= {}^{11}C_2 = \frac{11!}{2!9!} = \frac{10\times 11}{2} = 55$

Q202. Suppose (i) "$A * B$" means "A is the father of B", (ii) "$A\Delta B$" means "A is the husband of B", (iii) "$A\nabla B$" means "A is the wife of B", (iv) "$A\square B$" means "A is the sister of B". Which of the following represents "C is the father-in-law of the sister of D"

(a) $C\nabla E * F\square D$ (b) $C * E\nabla F\square D$ (c) $C\Delta E * F\square D$ (d) $C * E\Delta F\square D$

Ans. : (d)

Solution:



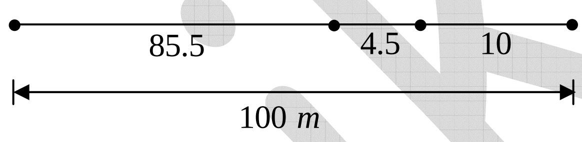
Using the code given in the question we have shown the diagram. Here we see that "C is the father-in-law of sister of D.

Q203. In a 100 m race A beats B by $10\,m$. B beats C by $5\,m$. By how many meters does A beat C?

(a) $15.0\,m$ (b) 5.5 m (c) 10.5 m (d) 14.5 m

Ans. : (d)

Solution: When A runs $100\,m$, B runs $90\,m$. When B runs $100\,m$, C runs 95 m.



When B runs 90 m, C runs $\frac{95}{100}\times 90 = 85.5$

So in a $100\,m$ race A will be ahead of C by $100-85.5=14.5\,m$

Q204. If all the angles of a triangle are prime numbers, which of the following could be one such angle?

(a) 89^o (b) 79^o (c) 59^o (d) 29^o

Ans. : (a)

Solution: If one angle is 89^0, the other two possible angles are 2^0 and 89^0. No other angles are possible.

If we take possible angle as 79^0 then the sum of other two angles must be 101^0. But we can not find any two prime angles whose sum is 101^0.

Similarly, if we take the possible angle to be 59^0 then the sum of other two angles must be 121^0. But we can not find any two prime angles whose sum is 121^0.

Finally, if we take the possible angle to be 29^0, the sum of other two angles must be 151^0.

Again we cannot find any two prime angles whose sum is 151^0.

Q205. A water tank that is 40% empty holds $40\,L$ more water than when it is 40% full. How much water does it hold when it is full?

(a) $100\,L$ (b) $75\,L$ (c) $120\,L$ (d) $200\,L$

Ans. : (d)

Solution: The water tank is 40% empty means it is 60% full. From the questions

60% of total volume - 40% of total volume $= 40L$

$\Rightarrow 100\%$ of total volume $= 200\,L$

Q206. How much gold and copper (in g), respectively, are required to make a $120\,g$ bar of 22 carat gold?

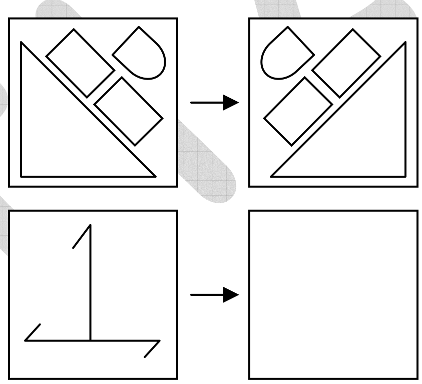
(a) 90 and 30 (b) 100 and 20

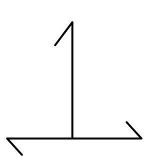
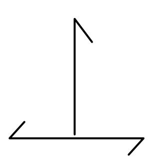
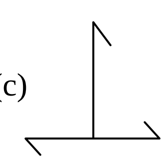
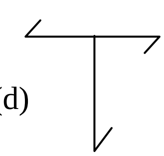
(c) 110 and 10 (d) 120 and 0

Ans. : (c)

Solution: In 22 carat gold, the ratio of the gold and copper is $22:2$, that is $11:1$. Hence in $120\,g$ bar of 22 craft gold, the amount of gold is $\frac{11}{12}\times 120 = 110g$ and $\frac{1}{12}\times 120 = 10g$ is the amount of copper.

Q207. Which of the following be the correct pattern in the empty square?



(a)  (b)  (c)  (d) 

Ans. : (c)

Q208. Areas of the three rectangles inside the full rectangle are given in the diagram

	8
12	4

What is the area of the full rectangle?

(a) 36 (b) 48 (c) 72 (d) 96

Ans. : (b)

Solution: Rectangle B has the same length as rectangle A but its area is twice. Hence width of rectangle B is twice the width of A.

D	B 8
C 12	A 4

From the figure we also see that width of D is twice the width of C. Hence area of rectangle D is $2\times 12 = 24$. Thus the total area of all the rectangles is $24+12+8+4=48$

Q209. The university needs to appoint a new Vice Chancellor which will be based on seniority. Ms. West is less senior to Mr. North but more senior to Ms. East. Mr. South is senior to Ms. West but junior to Mr. North. If the senior most declines the assignment, then who will be the new vice Chancellor of the University?

(a) Mr. North (b) Ms. East (c) Ms. West (d) Mr. South

Ans. : (d)

Solution: Using the seniority statements we can draw the seniority diagram

East $\rightarrow$ West $\rightarrow$ South $\rightarrow$ North

If the senior most declines thee assignment then the next person in thee seniority list will be Mr. south and will be the new vice chancellor.

Q210. The prices of diamonds having a particular colour and clarity are tabulated below:

Weight of diamond (in carats)	**Price of diamond (in rupees / carat)**
0.25	1 lakh
0.5	2 lakh
1	4 lakh
2	8 lakh

How many 0.25 carat diamonds can be purchased for the price of a 2 carat diamond?

(a) 8 (b) 16 (c) 32 (d) 64

Ans. : (d)

Solution: The price of a 2 craft diamond is 0.25×1 lakh $=0.25$lakh

Hence the number of 0.25 carat diamond that can be purchased for the price of a 2 carat diamond $=\dfrac{16\,\text{lakh}}{0.25\,\text{lakh}}=64$

Q211. In a sequence of 24 positive integers, the product of any two consecutive integer is 24. If the 17^{th} member of the sequence is 6, the 7^{th} member is

(a) 24 (b) 4 (c) 6 (d) 17

Ans. : (c)

Solution: The only possible numbers of the sequence can be those integers which are divisors of 24. Thus $1,2,3,4,6,8,12$ and 24 can be members of the series. From the question the 17^{th} member will be 6 hence 16^{th} and 18^{th} member will be 4. Using the same reasoning we see that the sequence is

$$6,4,6,4,6,4,6,4,6,4,6,4,6,4,6,4,6,4,6,4,6,4,6,4$$

Hence, we conclude that the 7^{th} member of the series is 6.

Q212. Mohan lent Geeta as much money as she already had, she then spent Rs. 10. Next day, he again lent as much money as Geeta now had, and she spent Rs. 10 again. On the third day, Mohan again lent as much money as Geeta now had, and she again spent Rs. 10.If Geeta was left with no money at the end of third day, how much money did she have initially?

(a) Rs.11.25 (b) Rs.10 (c) Rs.7.75 (d) Rs.8.75

Ans. : (d)

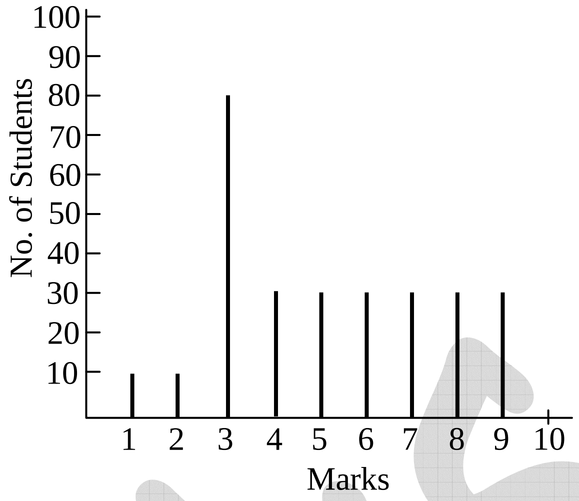
Solution: Let the amount with Geeta be x. When Mohan gives Geeta money for the first time Geeta has $2x$ rupees and after expenditure she has $2x-10$. When Mohan again lents Geeta, she has $4x-20$ and after expenditure she has $4x-30$.

On the third day the amount of money with Geeta is $2\left(4x-30\right)-10=8x-70$

From the question $8x-70=0\Rightarrow x=8.75$

Thus initially Geeta had rupees 8.75

Q213. The distribution of marks of students in a class is given by the following chart:



If 3.30 marks is the passing score in a 10 mark question paper, which of the following is false?

(a) Majority of the students have scored above the pass mark

(b) mode of the distribution is 3

(c) Average marks of passing students is above 55%

(d) Average marks of students who have failed is below 20%

Ans. : (d)

Solution: From the diagram we see that 100 students have scored below the pass marks while 180 students have scored more than 3 marks, hence ,majority of students have scored above pass marks.

There are 80 students who have scored 3 marks hence 3 is the mode of distribution.

The average marks obtained by passing students $=\dfrac{30(4+5+6+7+8+9)}{180}=6.5$

Hence average marks obtained by passing students is above 55%.

Average marks obtained by failed students $=\dfrac{10\times1+10\times2+80\times3}{100}=2.7$

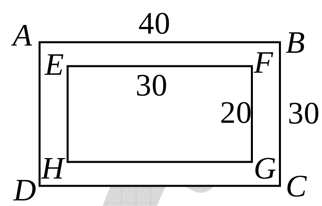
We see that average marks obtained by failed students is above 20%, hence (d) is incorrect.

NET DEC-2018

Q214. A rectangular photo frame of size $30\,cm \times 40\,cm$ has a photograph mounted at the centre leaving a $5\,cm$ border all around. The area of the border is

(a) $600\,cm^2$ (b) $350\,cm^2$ (c) $400\,cm^2$ (d) $700\,cm^2$

Ans. : (a)



Solution: $ar(\square ABCD) = 40 \times 30$

$ar(\square EFGH) = 30 \times 20$

$ar(\text{border}) = 1200 - 600 = 600\ cm^2$

Q215. At a birthday party, every child gets 2 chocolates, every mother gets 1 chocolate, while no father gets a chocolate. In total 69 persons get 70 chocolates. If the number of children is half of the number of mothers and fathers put together, then how many fathers are there?

(a) 22 (b) 23 (c) 24 (d) 69

Ans. : (a)

Solution: Let numbers of child, mother and father be C, M and F respectively.

Given, $C + M + F = 69$

$2C = M + F$

$2C + M = 70$

Solving above we get

$C = 23$ $M = 29$ $F = 22$

Q216. What is the value of $1^2 - 2^2 + 3^2 - 4^2 + 5^2 - .... + 17^2 - 18^2 + 19^2$?

(a) -5 (b) 12 (c) 95 (d) 190

Ans. : (d)

Solution: $S = 1^2 - 2^2 + 3^2 - 4^2 + 5^2 - 6^2 + ... + 17^2 - 18^2 + 19^2$

$$S = (1-2)(1+2) + (3-4) - (3+4) + (5-6)(5+6) + ... + (17-18)(17+18) + 19$$

$$= -[3 + 7 + ... + 35] + 19^2 = -\frac{9}{2}(3+35) + 19^2 = 190$$

Q217. The curves of $y = 2x^2$ and $y = 4x$ intersect each other at

(a) only one point (b) exactly two points

(c) more than two points (d) no point at all

Ans. : (b)

Solution: At the point of intersections

$2x^2 = 4x$

or, $x(2x-4) = 0$

or, $x = 0$, or $x = 2$

so, two points of Intersections.

Q218. The diameters of the pinholes of two otherwise identical cameras A and B are $500\,\mu m$ and $200\,\mu m$, respectively. Then the image in camera A will be

(a) sharper than in B (b) darker than in B

(c) less sharp and brighter than in B (d) sharper and brighter than in B

Ans. : (c)

Solution: smaller the aperture diameter, greater the sharpness of an image.

Q219. If $D = ABC + BCA + CAB$, where A, B and C are decimal digits, then D is divisible by

(a) 37 and 29 (b) 37 but not 29

(c) 29 but not 37 (d) neither 29 nor 37

Ans. : (b)

Solution: $D = (100A + 10B + C) + (100B + 10C + A) + (100C + 10A + B)$

$= 111A + 111B + 111C = 111(A + B + C)$

$= 37 \times 3 \times (A + B + C)$

Q220. For the following set of observed values

$$\{60, 65, 65, 70, 70, 70, 70, 82, 85, 90, 95, 95, 100, 160, 160\}$$

which of the statements is true?

(a) mode < median < mean (b) mode < mean < median

(c) mean < median < mode (d) median < mode < mean

Ans. : (a)

Solution: Given set of observed values is:

$60, 65, 65, 70, 70, 70, 70, 82, 85, 90, 95, 95, 100, 160, 160$

Total observed values $= 15$

Median $= 82$ (21 8^{th} position)

Mode $= 70$ (observed values with highest frequency)

Mean $= \frac{1337}{15} \approx 89$

Q221. A circular running track has six lanes, each $1m$ wide. How far ahead (in meters) should the runner in the outermost lane start from, so as to cover the same distance in one lap as the runner in the innermost lane?

(a) 6π (b) 10π (c) 12π (d) 36π

Ans. : (b)

Solution: Let 1^{st} track radius = $r\,m$

Then last track radius $= r + 5\ m$

So, required lead $= 2\pi(r+5) - 2\pi r\ m = 10\pi$

Q222. In an examination 100 questions of 1 mark each are given. After the examination, 20 questions are deleted from evaluation, leaving 80 questions with a total of 100 marks. Student A had answered 4 of the deleted questions correctly and got 40 marks, whereas student B had answered 10 of the deleted questions correctly and got 35 marks. In this situation

(a) A and B were equally benefited (b) A and B lost equally

(c) B lost more than A (d) A lost more than B

Ans. : (c)

Solution: Out of 80 questions,

A's correct numbers of solutions $= \frac{40}{100} = 32$

B's correct numbers of solution $= \frac{35}{100} = 28$

Had 20 questions not been deleted,

A's total correct solutions $= 32 + 4$

B's total correct solution $= 28 + 10 = 38$

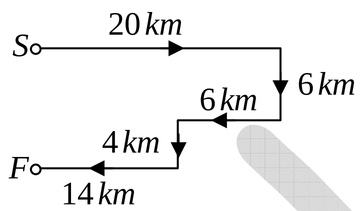
Q223. A tourist drives $20\,km$ towards east, turns right and drives $6\,km$, then drives $6\,km$ towards west. He then turns to his left and drives $4\,km$ and finally turns right and drives $14\,km$. Where is he from his starting point?

(a) $6\,km$ towards east (b) $20\,km$ towards west

(c) $14\,km$ towards north (d) $10\,km$ towards south

Ans. : (d)

Solution: From figure, it is evident that he is 10 km towards south



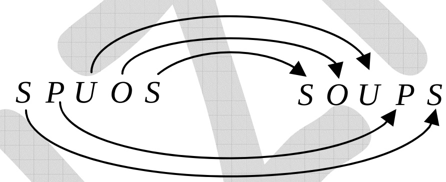
Q224. If 'SELDOON' means 'NOODLES' then what does 'SPUOS' mean?

(a) SALAD (b) SOUPS (c) RASAM (d) ONION

Ans. : (b)

Solution: Interchanging first alphabet with last one, we get NOODLES from SELDOON.

Similarly,



Q225. An ideal pendulum oscillates with angular amplitude of 30^0 from the vertical. If it is observed at a random instant of time, its angular deviation from the vertical is most likely to be

(a) 0^0 (b) $\pm 10^0$ (c) $\pm 20^0$ (d) $\pm 30^0$

Ans. : (d)

Q226. In the context of tiling a plane surface, which of the following polygons is the odd one out?

(a) Equilateral triangle (b) Square

(c) Regular pentagon (d) Regular hexagon

Ans. : (c)

Solution: While tiling a plane surface, there must be n polygons all of item meeting at each vertex point, this implies the interior angle of each of them must be $\frac{2\pi}{n}$, when n is a positive integer

For $n = 5$ (Pentagons)

We have interior angle $= \frac{2\pi}{5}$, which is not possible

For a regular polygon: Not possible.

For $n = 3$ (hexagons)

This will need to have three regular hexagons meeting at each vertex: Possible

For $n = 4$ (squares)

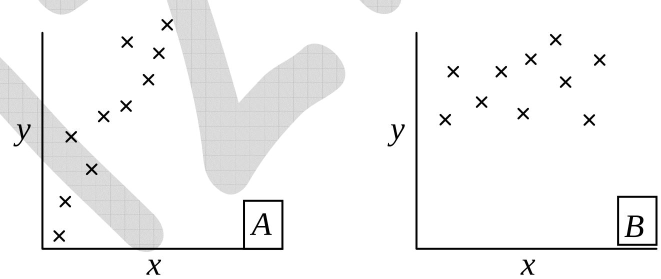
This has four squares meeting at each vertex: Possible

For $n = 6$ (equilateral triangle)

In this case polygons need to have angles $= \frac{2\pi}{6} = \frac{\pi}{3}$

So, this tiling will have six triangles meeting at each vertex.

Q227. Scatter plots for pairs of observations on the variables x and y in samples A and B are shown in the figure.



Which of the following is suggested by the plots?

(a) Correlation between x and y is stronger in A than in B

(b) Correlation between x and y is absent in B

(c) Correlation between x and y is weaker in A than in B

(d) y and x have a cause - effect relationship in A but not in B

Ans. : (a)

Solution: As there is positive correlation in sample A while little or no in sample B.

Q228. Two solutions X and Y containing ingredients A, B and C in proportions $a:b:c$ and $c:b:a$, respectively, are mixed. For the resultant mixture to have A, B and C in equal proportion, it is necessary that

(a) $b=\frac{c-a}{2}$ (b) $c=\frac{a+b}{2}$ (c) $c=\frac{a-b}{2}$ (d) $b=\frac{c+a}{2}$

Ans. : (d)

Solution: Let x unit of X 2^{nd} y units of Y are mixed together.

Then in resultant solution:

$$A=\frac{ax+cy}{a+b+c} \qquad \text{(i)}$$

$$B=\frac{bx+by}{a+b+c} \qquad \text{(ii)}$$

$$C=\frac{cx+ay}{a+b+c} \qquad \text{(iii)}$$

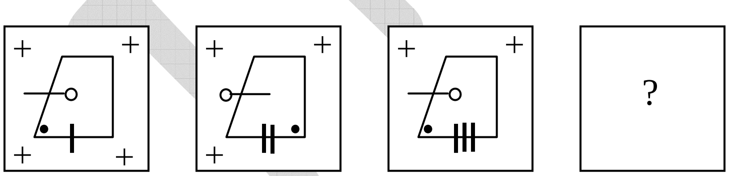
If A, B and C are equal, then solving (i) and (iii), we get $x=y$

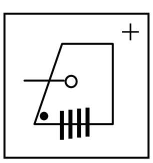
Also, as $A=B=C$, this implies

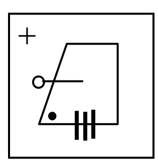
$$\frac{ax+cy}{a+b+c}=\frac{bx+by}{a+b+c}$$

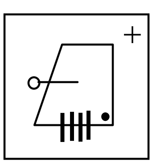
purity $x=\alpha$, we obtain, $a+c=b+b$ or, $b=\frac{a+c}{2}$

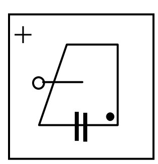
Q229. Find the missing figure in the following sequence.



(a) 

(b) 

(c) 

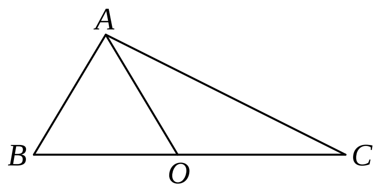
(d) 

Ans. : (c)

Solution: It is obvious from the trend in figures that missing figure will have one '+' and $\circ\!\!-\!\!-$.

So correct choice is (c).

Q230. In triangle ABC, $AB = 11$, $BC = 61$, $AC = 60$, and O is the mid-point of BC. Then AO is



(Not to scale)

(a) 18.5 (b) 24.0 (c) 30.5 (d) 36.0

Ans. : (c)

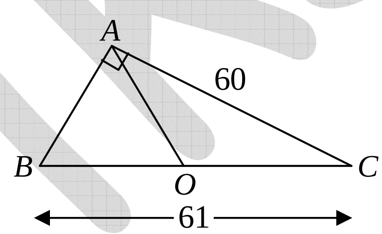
Solution: It is obvious the given triangle is a right triangle as $10^2 + 60^2 = 61^2$, with $\angle A = \frac{\pi}{2}$.

From the property of a right angled triangle:

$AO = OB = OC$

If O is mid-point of hypotenuse.

So, $AO = \frac{61}{2} = 30.5$



Q231. Areas of three parts of a rectangle are given in unit of cm^2. What is the total area of the rectangle?

(a) 18

(b) 24

(c) 36

(d) 108

3	9
6	

Ans. : (c)

Solution: From figure:

$xy = 3$ (i)

$(l - x)y = 9$ (ii)

$(b - y)x = 6$ (iii)

3	9
6	

$(l - x)(b - x) =$ Area of missing portion

Multiply (ii) by (iii) $\Rightarrow (l-x)(b-x)xy = 54$

from (i), $xy = 3$

so, $(l-x)(b-y) = 18$ (Area of missing portion)

So, Total area $= 3+9+6+18 = 36$

2nd method:

$$\frac{3}{6} = \frac{9}{\text{area of missing portion}}$$

or, area of missing portion $= \dfrac{9\times 6}{3} = 18$

So, Total area $= 3+9+6+18 = 36$

Q232. A student is free to choose only Chemistry, only Biology or both. If out of 32 students, Chemistry has been chosen by 16 and Biology by 25, then how many students have chosen Biology but not Chemistry?

(a) 9 (b) 16 (c) 25 (d) 7

Ans. : (b)

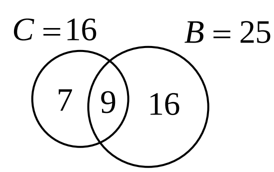
Solution: $n(C) = 16 =$ number of chemistry students

$n(B) = 25 =$ number of biology students

$n(C \cup B) = n(C) + u(a) - n(C \wedge B)$

or $32 = 16 + 25 - n(C \cap B)$

or $n(C \cap B) = 9$



so, number of students with biology but not chemistry

$= n(B) - n(C \cap B) = 25 - 9 = 16$

Q233. The lift (upward force due to air) generated by the wings and engines of an aircraft is

(a) positive (upwards) while landing and negative (downwards) while taking off.

(b) negative (downwards) while landing and positive (upwards) while taking off

(c) negative (downwards) while landing as well as while taking off

(d) positive (upwards) while landing as well as while taking off

Ans. : (d)