

The logo for CET King, featuring the text 'CET' in white on a blue background and 'king' in blue on a yellow background, with a crown icon above the 'king' text.

IIMs or Nothing

The QA section was easy as it was in CAT 2014. Earlier CAT used to be known for its tough Quant Section, but looking at last two CAT Papers we can safely assume that CAT is trying to balance out in favour of Non-Engineers, which is a good sign. The Quant section had 15 subjective questions. Interestingly, most subjective questions were those, which would have been very easy even with options.

Overall, in the Quant Section there was a representation of almost all the areas. Commercial Math (Percentage, Profit & Loss & Ratio) had good number of questions. Surprisingly, there was not a single question on probability. However, there was a one question on Permutation and Combination. Time and Distance also had very few questions but otherwise traditional areas like Number System, Algebra & Geometry were present in a good number.

Students who were amongst the toppers of our Test Series reported attempt of 29 to 34 in this Section. However, the students who did not attempt subjective questions with guess work, for them attempt of 26+ should be considered good in this section.

Topic	Number of questions
Arithmetic	10
Geometry	9
Modern Mathematics	7
Algebra	4
Numbers	4

Out of 34 questions in the section, 15 were TITA questions and the remaining 19 were MCQ questions. This section was marked by easy to medium level of difficulty question. In general, the level of difficulty of this section was slightly higher than the level of difficulty of CAT-2014 QA section. This section was dominated by questions on Arithmetic and Geometry. Questions from all the different topics in Arithmetic were tested.

A number of questions combined concepts across areas (such as Geometry and Progressions). We have classified these questions based on the topic of more important concept required to solve the question.

Overall Strategy		
Correct	Percentile	Time / set
8	70	7.5
12	80	5
16	90	3.8
20	99	3.0
24	99.5	2.5
28	99.99	2.1

1. A person who has a certain amount with him goes to market. He can buy 50 oranges or 40 mangoes. He retains 10% of the amount for taxi fares and buys 20 mangoes and of the balance he purchases oranges. Number of oranges he can purchase is
 a. 36 b. 40 c. 15 d. 20

2. $\frac{2}{5}$ of the voters promise to vote for P and the rest promised to vote for Q. Of these, on the last day 15% of the voters went back of their promise to vote for P and 25% of voters went back of their promise to vote for Q, and P lost by 2 votes. Then the total number of voters is

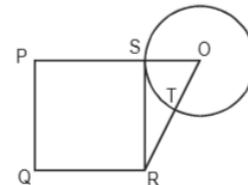
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3. A stockist wants to make some profit by selling sugar. He contemplates about various methods. Which of the following would maximise his profit?
 I. Sell sugar at 10% profit.
 II. Use 900 g of weight instead of 1 kg.
 III. Mix 10% impurities in sugar and selling sugar at cost price.
 IV. Increase the price by 5% and reduce weights by 5%.
 a. I or III b. II c. II, III and IV d. Profits are same

4. For the product $n(n + 1)(2n + 1)$, $n \in \mathbb{N}$, which one of the following is not necessarily true?
 a. It is even b. Divisible by 3
 c. Divisible by the sum of the square of first n natural numbers d. Never divisible by 237

5. ABCD is a square of area 4 with diagonals AC and BD, dividing square into 4 congruent triangles. Break them into four non-overlapping triangles. Then the sum of the perimeters of the triangles is
 a. $8(2 + \sqrt{2})$ b. $8(1 + \sqrt{2})$
 c. $4(1 + \sqrt{2})$ d. $4(2 + \sqrt{2})$

6. PQRS is a square. SR is a tangent (at point S) to the circle with centre O and TR = OS. Then the ratio of area of the circle to the area of the square is
 a. $\pi/3$ b. $11/7$
 c. $3/\pi$ d. $7/11$



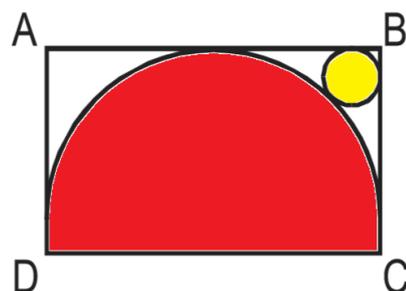
7. From a circular sheet of paper with a radius 20 cm, four circles of radius 5 cm each are cut out. What is the ratio of the uncut to the cut portion?
 a. 1 : 3 b. 4 : 1 c. 3 : 1 d. 4 : 3

8. A wooden box (open at the top) of thickness 0.5 cm, length 21 cm, width 11 cm and height 6 cm is painted on the inside. The expenses of painting are Rs. 70. What is the rate of painting per square centimetres?
 a. Re 0.7 b. Re 0.5 c. Re 0.1 d. Re 0.2

9. The cost of diamond varies directly as the square of its weight. Once, this diamond broke into four pieces with weights in the ratio 1 : 2 : 3 : 4. When the pieces were sold, the merchant got Rs. 70,000 less. Find the original price of the diamond.

Type in the answer here: _____

10. The figure shows the rectangle ABCD with a semicircle and a circle inscribed inside in it as shown. What is the ratio of the area of the circle to that of the semicircle?
 a. $(\sqrt{2} - 1)^2 : 1$ b. $2(\sqrt{2} - 1)^2 : 1$
 c. $(\sqrt{2} - 1)^2 : 2$ d. None of these



11. In a mile race, Akshay can be given a start of 128 m by Bhairav. If Bhairav can give Chinmay a start of 4 m in a 100 m dash, then who out of Akshay and Chinmay will win a race of one and half

miles, and what will be the final lead given by the winner to the loser? (One mile is 1,600 m.)

- a. Akshay, $\frac{1}{12}$ mile b. Chinmay, $\frac{1}{32}$ mile c. Akshay, $\frac{1}{24}$ mile d. Chinmay, $\frac{1}{16}$ mile

12. Two liquids A and B are in the ratio 5 : 1 in container 1 and 1 : 3 in container 2. In what ratio should the contents of the two containers be mixed so as to obtain a mixture of A and B in the ratio 1 : 1?

- a. 2 : 3 b. 4 : 3 c. 3 : 2 d. 3 : 4

13. If $x^2 + y^2 = 0.1$ and $|x - y| = 0.2$, then $|x| + |y|$ is equal to

- a. 0.3 b. 0.4 c. 0.2 d. 0.6

14. ABCD is a rhombus with the diagonals AC and BD intersecting at the origin on the x-y plane. The equation of the straight line AD is $x + y = 1$. What is the equation of BC?

- a. $x + y = -1$ b. $x - y = -1$ c. $x + y = 1$ d. None of these

15. The set of all positive integers is the union of two disjoint subsets: $\{f(1), f(2), \dots, f(n), \dots\}$ and $\{g(1), g(2), \dots, g(n), \dots\}$, where $f(1) < f(2) < \dots < f(n) \dots$, and $g(1) < g(2) < \dots < g(n) \dots$, and $g(n) = f(f(n)) + 1$ for all $n \geq 1$. What is the value of $g(1)$?

Type in the answer here: _____

16. For all non-negative integers x and y, $f(x, y)$ is defined as below.

$f(0, y) = y + 1$; $f(x + 1, 0) = f(x, 1)$; $f(x + 1, y + 1) = f(x, f(x + 1, y))$.

Then what is the value of $f(1, 2)$?

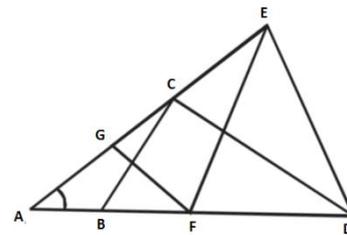
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17.

In the figure above, $AB = BC = CD = DE = EF = FG = GA$.

Then $\angle DAE$ is approximately _____

Type in the answer here: _____



18. A water tank has three taps A, B, and C. A fills four buckets in 24 mins, B fills 8 buckets in 1 hour and C fills 2 buckets in 20 minutes. If all the taps are opened together a full tank is emptied in 2 hours. If a bucket can hold 5 litres of water, what is the capacity of the tank in litres?

Type in the answer here: _____

19. Shyam went from Delhi to Shimla via Chandigarh by car. The distance from Delhi to Chandigarh is $\frac{3}{4}$ times the distance from Chandigarh to Shimla. The average speed from Delhi to Chandigarh was half as much again as that from Chandigarh to Shimla. If the average speed for the entire journey was 49 kmph. What was the average speed from Chandigarh to Shimla?

- (a) 39.2 kmph (b) 63 kmph (c) 42 kmph (d) None of these

20. Fourth term of an arithmetic progression is 8. What is the sum of the first 7 terms of the arithmetic progression?

- (a) 7 (b) 64 (c) 56 (d) Cannot be determined

21. Two towns A and B are 100 km apart. A school is to be built for 100 students of town B and 30 students of Town A. Expenditure on transport is Rs. 1.20 per km per student. If the total expenditure on transport by all 130 students is to be as small as possible, then the school should be built at

- (a) 33 km from Town A (b) 33 km from Town B (c) Town A (d) Town B

22. In a bag, there are coins of 25 p, 10 p and 5 p in the ratio of 1 : 2 : 3. If there is Rs. 30 in all, how many 5 p coins are there?

- A. 50 B. 100 C. 150 D. 200

23. Let $u_{n+1} = 2u_n + 1 (n=0,1,2,\dots)$ and $u_0 = 0$. Then u_{10} nearest to

Type in the answer here: _____

24. Let $x < 0.50$, $0 < y < 1$, $z > 1$. Given a set of numbers, the middle number, when they are arranged in ascending order, is called the median. So the median of the numbers x , y , and z would be
(a) less than one (b) between 0 and 1 (c) greater than 1 (d) cannot say

25. The price of Maruti car rises by 30 percent while the sales of the car come down by 20%. What is the percentage change in the total revenue?
A. - 4% B. - 2% C. + 4% D. + 2%

26. Let $x < 0$, $0 < y < 1$, $z > 1$. Which of the following may be false?
(a) $(x^2 - z^2)$ has to be positive. (b) yz can be less than one.
(c) xy can never be zero. (d) $(y^2 - z^2)$ is always negative.

27. A young girl counted in the following way on the fingers of her left hand. She started calling the thumb 1, the index finger 2, middle finger 3, ring finger 4, little finger 5, then reversed direction, calling the ring finger 6, middle finger 7, index finger 8, thumb 9, then back to the index finger for 10, middle finger for 11, and so on. She counted up to 1994. She ended on her.
(a) thumb (b) index finger (c) middle finger (d) ring finger

28. In a mixture 60 litres, the ratio of milk and water 2 : 1. If this ratio is to be 1 : 2, then the quantity of water to be further added is:
A. 20 litres B. 30 litres C. 40 litres D. 60 litres

29. The number of solutions of the equation $2x + y = 40$ where both x and y are positive integers and $x \leq y$ is:

Type in the answer here: _____

30. If $\log_y x = (a \cdot \log_2 y) = (b \cdot \log_x z) = ab$, then which of the following pairs of values for (a, b) is not possible?
(1) $(-2, 1/2)$ (2) $(1, 1)$ (3) $(\pi, 1/\pi)$ (4) $(2, 2)$

31. When you reverse the digits of the number 13, the number increases by 18. How many other two digit numbers increase by 18 when their digits are reversed?

Type in the answer here: _____

32. The salaries A, B, C are in the ratio 2 : 3 : 5. If the increments of 15%, 10% and 20% are allowed respectively in their salaries, then what will be new ratio of their salaries?
A. 3 : 3 : 10 B. 10 : 11 : 20 C. 23 : 33 : 60 D. Cannot be determined

33. Amol was asked to calculate the arithmetic mean of 10 positive integers, each of which had 2 digits. By mistake, he interchanged the 2 digits, say a and b , in one of these 10 integers. As a result, his answer for the arithmetic mean was 1.8 more than what it should have been. Then $b - a$ equals 1

Type in the answer here: _____

34. The angle of elevation of the top of a tower 30 m high, from two points on the level ground on its opposite sides are 45 degrees and 60 degrees. What is the distance between the two points?
(1) 30 (2) 51.96 (3) 47.32 (4) 81.96

Solution

1. d Let us assume that he has Rs. 100. In this he can buy 50 oranges or 40 mangoes. In other words, the price of an orange is Rs. 2 and that of a mango is Rs. 2.50. Now if he decides to keep 10% of his money for taxi fares, he would be left with Rs. 90. Now if he buys 20 mangoes, he would spend Rs. 50 and will be left with Rs. 40, in which he can buy 20 oranges.

2. a Let there be 100 voters in all. So initially there were 40 of these who promised to vote for P, while 60 of them promised to vote for Q. On the last day, (15% of 40) = 6 voters shifted their interest from P to Q and (25% of 60) = 15 voters shifted their interest from Q to P. So finally, P would end up getting (40 – 6 + 15) = 49 votes and Q would end up getting (60 – 15 + 6) = 51 votes. Hence, margin of victory for Q = (51 – 49) = 2, which matches the data given in the question. Hence, there were 100 voters in all.

3. b Profit percentage in each case is

(i) 10%

(ii) $(100 \times 100) / 900 = 100/9\%$

(iii) $(100 - 100 / 1.1) / (100/1.1) = 10\%$

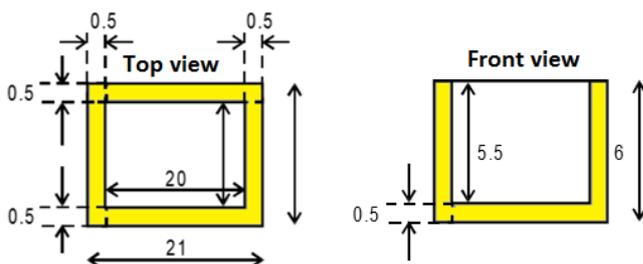
(iv) $(100 \times 100) / 9 = 200/19\%$

4. d Since $n(n + 1)$ forms two consecutive integers, one of them will be even and hence the product will always be even. Also the sum of the squares of first n natural numbers is given by $n(n+1)(2n+1)/6$. Hence, our product will always be divisible by this. Also you will find that the product is always divisible by 3 (you can use any value of n to verify this). However, we can find that the option (d) is not necessarily true. Only under certain situation does it hold good. e.g. if $n = 118$, $(2n + 1) = 237$ or if $n = 236$, then $(n + 1) = 237$ or if n itself is 237, etc.

5. The sum of the perimeters of the triangles = (Perimeter of the square) + 2 × (Sum of its diagonals). This is so because the bases of each triangle will be counted once. But since each of the other two sides of the triangles is common to two triangles, it will be counted twice. Since area of the square = 4, its side = 2 and perimeter = 8. Also its diagonal = $2\sqrt{2}$. So the required perimeter = $(8 + 2 \times 4\sqrt{2}) = 8(1 + \sqrt{2})$.

6. a In the given figure, the area of the circle = πr^2 . To find the area of the circle, we need to find the length of the side of the square. We know that $OR = OT + TR = OT + OS = 2r$. So in the right-angled triangle ORS , we have $OR = 2r$, $OS = r$. So $SR^2 = OR^2 - OS^2$. But $SR^2 = \text{Area of the square} = 4r^2 - r^2 = 3r^2$. So the required ratio = $\pi/3$.

7. Area of the original paper = $\pi(20)^2 = 400\pi \text{ cm}^2$. The total cut portion area = $4(\pi)(5)^2 = 100\pi \text{ cm}^2$. Therefore, area of the uncut (shaded) portion = $(400 - 100) = 300\pi \text{ cm}^2$. Hence, the required ratio = $300\pi : 100\pi = 3 : 1$.



8. As it can be seen from the diagram, because of the thickness of the wall, the dimensions of the inside of the box is as follows: length = $(21 - 0.5 - 0.5) = 20$ cm, width = $(11 - 0.5 - 0.5) = 10$ cm and height = $(6 - 0.5) = 5.5$. Total number of faces to be painted = 4 walls + one base (as it is open from the top). The dimensions of two of the walls = (10×5.5) , that of the remaining two walls = (20×5.5) and that of the base = (20×10) . So the total area to be painted = $2 \times (10 \times 5.5) + 2 \times (20 \times 5.5) + (20 \times 10) = 530$ cm². Since the total expense of painting this area is Rs. 70, the rate of painting = $70/530 = 0.13 = \text{Re } 0.1$ per sq. cm.

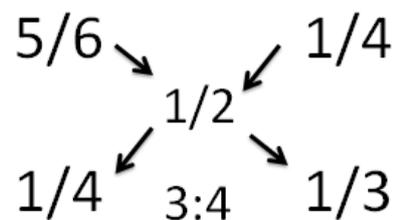
9. c Let the original weight of the diamond be $10x$. Hence, its original price will be $k(100x^2) \dots$ where k is a constant. The weights of the pieces after breaking are $x, 2x, 3x$ and $4x$. Therefore, their prices will be $kx^2, 4kx^2, 9kx^2$ and $16kx^2$. So the total price of the pieces = $(1 + 4 + 9 + 16)kx^2 = 30kx^2$. Hence, the difference in the price of the original diamond and its pieces = $100kx^2 - 30kx^2 = 70kx^2 = 70000$. Hence, $kx^2 = 1000$ and the original price = $100kx^2 = 100 \times 1000 = 100000 = \text{Rs. } 1$ lakh.

10. Let radius of the semicircle be R and radius of the circle be r . Let P be the centre of semicircle and Q be the centre of the circle. Draw QS parallel to BC . Now, $\Delta PQS \sim PBC$

$$\begin{aligned} \therefore PQ / PB &= QS / BC \\ \Rightarrow (R + r) / \sqrt{2}R &= (R - r) / R \\ \Rightarrow R + r &= \sqrt{2}R - \sqrt{2}r \\ \Rightarrow r(1 + \sqrt{2}) &= R(\sqrt{2} - 1) \\ \Rightarrow r &= R(\sqrt{2} - 1) / (\sqrt{2} + 1) \times (\sqrt{2} - 1) / (\sqrt{2} - 1) \\ \Rightarrow r &= R(\sqrt{2} - 1)^2 \\ \text{Required Ratio} &= \pi r^2 / \pi R^2 \times 2 \\ &= \pi R^2 (\sqrt{2} - 1)^4 / \pi R^2 \times 2 \\ &= 2(\sqrt{2} - 1)^4 : 1 \end{aligned}$$

11.. d In a mile race, Akshay can be given a start of 128 m by Bhairav. This means that Bhairav can afford to start after Akshay has travelled 128 m and still complete one mile with him. In other words, Bhairav can travel one mile, i.e. 1,600 m in the same time as Akshay can travel $(1600 - 128) = 1,472$ m. Hence, the ratio of the speeds of Bhairav and Akshay = Ratio of the distances travelled by them in the same time = $1900/1472 = 25 : 23$. Bhairav can give Chinmay a start of 4 miles. This means that in the time Bhairav runs 100 m, Chinmay only runs 96 m. So the ratio of the speeds of Bhairav and Chinmay = $100/96 = 25 : 24$. Hence, we have $B : A = 25 : 23$ and $B : C = 25 : 24$. So $A : B : C = 23 : 25 : 24$. This means that in the time Chinmay covers 24 m, Akshay only covers 23 m. In other words, Chinmay is faster than Akshay. So if they race for $1 \frac{1}{2}$ miles = 2,400 m, Chinmay will complete the race first and by this time Akshay would only complete 2,300 m. In other words, Chinmay would beat Akshay by 100 m = $1/16$ mile.

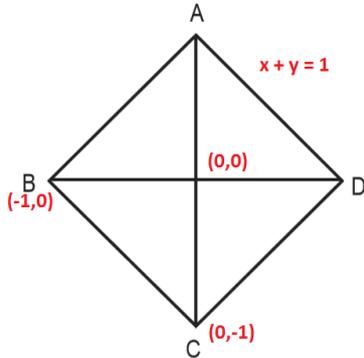
12.d We can solve this by alligation. But while we alligate, we have to be careful that it has to be done with respect to any one of the two liquids, viz. either A or B. We can verify that in both cases, we get the same result. e.g. the proportion of A in the first vessel is $5/6$ and that in the second vessel is $1/4$, and we finally require $1/2$ parts of A. Similarly, the proportion of B in the first vessel is $1/6$ that in the second vessel is $3/4$ and finally we want it to be $1/2$. With respect to liquid A.



13.b $x^2 + y^2 = 0.1$
 $|x - y|^2 = x^2 + y^2 - 2xy$

$(0.2)^2 = 0.1 - 2xy$ or $2xy = 0.06$ or $xy = 0.03$
 Now $|x| + |y| = \sqrt{x^2 + y^2 - 2xy} = \sqrt{0.1 + 0.06}$
 $|x| + |y| = 0.40$
 Hence, $x = 0.3, y = 0.1$ or vice versa.

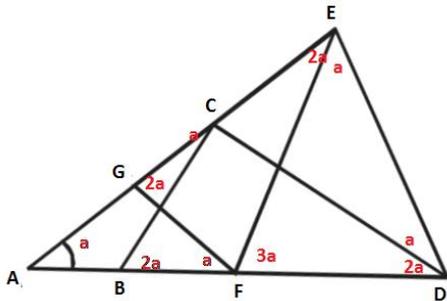
14. The gradient of the line AD is -1 . Coordinates of B are $(-1, 0)$. Equation of line BC is $x + y = -1$.



15. b $g(1) = f[f(1)] + 1 = 2$. Since $f(1)$ has to be 1, else all the integers will not be covered. $f(n)$ is the set of odd numbers and $g(n)$ is the set of even numbers.

16. b $f(1, 2) = f(0, f(1, 1))$; Now $f(1, 1) = f[0, f(1, 0)] = f[0, f(0, 1)] = f[0, 2] = 3$ Hence, $f(1, 2) = f(0, 3) = 4$

17. Let $\angle EAD = a$. Then $\angle AFG = a$ and also $\angle ACB = a$. Therefore, $\angle CBD = 2a$ (exterior angle to $\triangle ABC$). Also $\angle CDB = 2a$ (since $CB = CD$). Further, $\angle FGC = 2a$ (exterior angle to $\triangle AFG$). Since $GF = EF$, $\angle FEG = 2a$. Now $\angle DCE = \angle DEC = b$ (say). Then $\angle DEF = b - 2a$. Note that $\angle DCB = 180 - (a + b)$. Therefore, in $\triangle DCB$, $180 - (a + b) + 2a + 2a = 180$ or $b = 3a$. Further $\angle EFD = \angle EDF = \gamma$ (say). Then $\angle EDC = \gamma - 2a$. If CD and EF meet at P , then $\angle FPD = 180 - 5a$ (because $b = 3a$). Now in $\triangle PFD$, $180 - 5a + \gamma + 2a = 180$ or $\gamma = 3a$. Therefore, in $\triangle EFD$, $a + 2\gamma = 180$ or $a + 6a = 180$ or $a = 26$ or approximately 25.



18. b Since a bucket holds 5 litres of water, Tap A discharges 20 litres of water in 24 min or $5/6$ litres of water in 1 minute. Tap B discharges 40 litres in 1 hours or $2/3$ litres in 1 minute. Tap C discharges 10 litres in 20 min. or $1/2$ litres in 1 minute. If A, B & C are all opened simultaneously, total discharge = $(5/6 + 2/3 + 1/2) = 2$ litres in 1 minute. So in 2 hours, the discharge would be 240 litres, which should be the capacity of the tank.

19. c It is clear that the ratio of the distances between (Delhi-Chandigarh) : (Chandigarh-Shimla) = 3 : 4. The ratio of the speeds between (Delhi-Chandigarh) : (Chandigarh-Shimla) = 3 : 2. Let the distances be $3x$ & $4x$ respectively and speeds be $3y$ and $2y$. So the time taken will be (x/y) and $(2x/y)$ respectively. Since average speed is given as $(\text{Total Distance}) / (\text{Total Time}) = (7x)/(x/y + 2x/y) = 7y/3 = 49$. Hence $y = 21$. So the average speed from Chandigarh to Shimla = $2y = 42$ kmph.

20.c HINT : Students please note that you need not apply any formula in this case. The middle term of an AP is always the average of all the terms. Hence, if we multiply the middle term by the number of terms, we should get the sum of all the terms of that AP. In our problem, we have to find the sum of first 7 terms and we have been given the 4th term (which is the middle term). Hence the required answer is $8 \times 7 = 56$.

21.d

Option	Location	Expenditure of Town A students	Expenditure of Town B students	Total Expenditure
(a)	33 km from A	$33 \times 1.2 \times 30 = 1188$	$67 \times 1.2 \times 100 = 8040$	$1188 + 8040 = 9228$
(b)	33 km from B	$67 \times 1.2 \times 30 = 2412$	$33 \times 1.2 \times 100 = 3960$	$2412 + 3960 = 6372$
(c)	Town A	0	$100 \times 100 \times 1.2 = 12000$ 12000	12000
(d)	Town B	$30 \times 100 \times 1.2 = 3600$	0	3600

Hence we find that the least expenditure will be incurred if the school is located in town B. HINT : Students please note that since there are more number of students from Town B, to minimise the total expenditure the school should be located as closer to town B as possible.

22.C.

Let the number of 25 p, 10 p and 5 p coins be x , $2x$, $3x$ respectively.

Then, sum of their values = Rs. $\left(\frac{25x}{100} + \frac{10 \times 2x}{100} + \frac{5 \times 3x}{100} \right) = \text{Rs. } \frac{60x}{100}$

$$\therefore \frac{60x}{100} = 30 \quad \Leftrightarrow \quad x = \frac{30 \times 100}{60} = 50.$$

Hence, the number of 5 p coins = $(3 \times 50) = 150$.

$$23.a \quad U_0 = 2^0 - 1 = 0$$

$$U_1 = 2^1 - 1 = 1$$

$$U_2 = 2^2 - 1 = 3$$

$$U_3 = 2^3 - 1 = 7 \text{ and so on.}$$

$$\therefore U_{10} = 2^{10} - 1 = 1023.$$

24.b Since there are two numbers which are < 1 (viz. x & y), it is obvious that the median will be less than 1. Hence (c) cannot be the answer. Since $x < 0.5$ and $0 < y < 1$, the median will not be < 0 . Hence the answer is (b) between 0 and 1.

25.C. Let initial price of Maruti Car be Rs. 100.

As price increases 30%, price of car will become, $(100 + 30\% \text{ of } 100) = \text{Rs. } 130$.

Due to increase in price, sales is down by 20%. It means, it is going to make 20% less revenue as expected after increment of price.

So, New revenue = $(130 - 20\% \text{ of } 130) = \text{Rs. } 104$.

The initial revenue was Rs. 100 which becomes Rs. 104 at the end. It means there is 4% increment in the total revenue.

Mind Calculation Method:

$$100 \xrightarrow{+30\% \text{ (price effect)}} 130 \xrightarrow{-20\% \text{ (sales effects)}} 104.$$

Hence, 4% rises.

26.a Let us evaluate each option. (b) since $0 < y < 1$ and $z > 1$, yz will always be < 1 . (c) Since both x & y are not equal to 0, xy will never be 0. (d) y is a positive number < 1 and z is a positive number > 1 , hence $(y^2 - z^2)$ is always negative. Since, (b), (c) and (d) are always true, the answer has to be (a). And this can be verified. For eg. If $x = -2$ and $z = 3$, then $(x^2 - z^2) = 4 - 9 = -5$, not a positive number.

27.b If you were to run two of three cycles of how she is counting, you will observe that the number that she counts on thumb are 1, 9, 17, 25 and so on. So it forms a pattern such that all the numbers that are 1 more than the multiples of 8 are counted on thumb. The closest multiple of 8 near 1994 is 1992. In other words she would count 1993 on thumb. So she would count 1994 on the index finger.

28. D. Quantity of milk = $\left(60 \times \frac{2}{3}\right)$ litres = 40 litres.

Quantity of water in it = $(60 - 40)$ litres = 20 litres.

New ratio = 1 : 2

Let quantity of water to be added further be x litres.

Then, milk : water = $\left(\frac{40}{20 + x}\right)$.

Now, $\left(\frac{40}{20 + x}\right) = \frac{1}{2}$

$\Rightarrow 20 + x = 80$

$\Rightarrow x = 60$.

\therefore Quantity of water to be added = 60 litres.

28.2 $2x + y = 40$ $x \leq y \Rightarrow y = 40 - 2x$ Values of x and y that satisfy the equation

X	Y
1	38
2	36
3	34
4	32
5	30
6	28
7	26
8	24
9	22
10	20
11	18
12	16
13	14

\therefore 13 values of (x, y) satisfy the equation such that $x \leq y$

29. 4

$\log_y x = (a \cdot \log_z y) = (b \cdot \log_x z) = ab$

$a = \log_y x / \log_z y$ and similarly $b = \log_y x / \log_x z$

$a \times b = \log_y x / \log_z y \times \log_y x / \log_x z = (\log_y x)^3$

$$\Rightarrow ab - a^3b^3 = 0$$

$$\text{Or, } a \times b (1 - a^2b^2) = 0$$

$$Ab = +- 1$$

Only option (4) does not satisfy. Hence (4).

30.2 Let the number be $10x + y$ so when number is reversed the number because $10y + x$. So, the number increases by 18 Hence $(10y + x) - (10x + y) = 9(y - x) = 18$ $y - x = 2$ So, the possible pairs of (x, y) is $(3, 1)$ $(4, 2)$ $(5, 3)$ $(6, 4)$, $(7, 5)$ $(8, 6)$ $(9, 7)$ But we want the number other than 13 so, there are 6 possible numbers are there i.e. 24, 35, 46, 57, 68, 79. So total possible numbers are 6.

31. So, total people reading the newspaper in consecutive months i.e. July and August and August and Sept. is $2 + 7 = 9$ people.

32. C.

Let $A = 2k$, $B = 3k$ and $C = 5k$.

$$A's \text{ new salary} = \frac{115}{100} \text{ of } 2k = \left(\frac{115}{100} \times 2k \right) = \frac{23k}{10}$$

$$B's \text{ new salary} = \frac{110}{100} \text{ of } 3k = \left(\frac{110}{100} \times 3k \right) = \frac{33k}{10}$$

$$C's \text{ new salary} = \frac{120}{100} \text{ of } 5k = \left(\frac{120}{100} \times 5k \right) = 6k$$

$$\therefore \text{ New ratio } \left(\frac{23k}{10} : \frac{33k}{10} : 6k \right) = 23 : 33 : 60$$

33. Let OT be the tower.

Therefore, Height of tower = OT = 30 m

Let A and B be the two points on the level ground on the opposite side of tower OT.

Then, angle of elevation from A = $\angle TAO = 45^\circ$

and angle of elevation from B = $\angle TBO = 60^\circ$

Distance between AB = AO + OB = x + y (say)

Now, in right triangle ATO,

$$\tan 45^\circ = \frac{OT}{AO} = \frac{30}{x}$$

$$\Rightarrow x = \frac{30}{\tan 45^\circ} = 30 \text{ m}$$

and in right triangle BTO

$$\tan 60^\circ = \frac{OT}{OB} = \frac{30}{y}$$

$$\Rightarrow y = \frac{30}{\tan 60^\circ} = \frac{30}{\sqrt{3}} = \frac{30\sqrt{3}}{3} = 17.32 \text{ m}$$

Hence, the required distance = $x + y = 30 + 17.32 = 47.32 \text{ m}$