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Qs Analysis (QsAnalysis.jsp?sid=aaaN5tjtX0b7WgArBjowySun Jan 08 23:26:18 IST  
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## Section-1

### Sec 1

#### Q.1 [11831809]

Dhruv scored 150% more than Guru in the Math test. Kamal's score was 120% of Sonia's score in the Math test. Sonia scored 25% more than Guru. Dhruv's score is what percentage more than Kamal's score?

1 ☐ 75%

2 ☐ 66.67%

3 ☐ 90%

4 ☐ 33.33%

**Solution:**

**Correct Answer : 2**

If Sonia's score is 100, Kamal's score is = 120

Guru's score =  $100/1.25 = 80$

Dhruv's score =  $80 \times 2.5 = 200$

We can see that Dhruv's score is 80 more than Kamal's score(120).

Hence, required percentage =  $80/120 \times 100 = 66.67\%$ .

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[🔍 Answer key/Solution](#)

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### Q.2 [11831809]

Find the area (in sq. cm) of a  $\triangle AED$  drawn in a regular hexagon ABCDEF of side 8 cm.

1 ☐  $8\sqrt{3}$

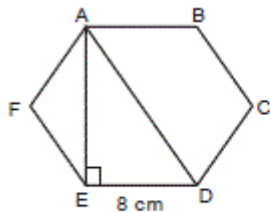
2 ☐  $16\sqrt{3}$

3 ☐  $32\sqrt{3}$

4 ☐  $64\sqrt{3}$

**Solution:**

**Correct Answer : 3**



$AE = \sqrt{3} \times 8 = 8\sqrt{3}$  cm

Hence, area of triangle AED =  $\frac{1}{2} \times 8\sqrt{3} \times 8 = 32\sqrt{3}$  sq. cm.

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### Q.3 [11831809]

Let  $f(x + y) = f(x) \times f(y)$  and  $f(1) = 3$ , then what is the value of  $\frac{f(2)}{f(1)} + \frac{f(3)}{f(2)} + \dots + \frac{f(2022)}{f(2021)}$ ?

**Solution:**

**Correct Answer : 6063**

**Note:**  $f(2) = f(1) \times f(1)$ .

$\Rightarrow f(2)/f(1) = f(1)$

**And,**  $f(3) = f(2) \times f(1)$ .

$\Rightarrow f(3)/f(2) = f(1)$

**And so on, ...,  $f(2022)/f(2021) = f(1)$**

**Hence, sum of all these values =  $2021 \times f(1) = 6063$ .**

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 Answer key/Solution

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#### **Q.4 [11831809]**

In an election contested by 5 candidates 1 lakh votes were cast. At a point, during the counting the 5 candidates had polled 9,000, 18,000, 21,000, 22,100 and 25,400 votes. How many of these 5 people could emerge as winners when all votes are counted?

**Solution:**

**Correct Answer : 3**

**Out of 1 lakh votes polled, 95,500 votes were counted. So,  $1,00,000 - 95,500 = 4,500$  more votes are yet to be counted.**

**This means, there could be three possible candidates who could emerge as the winner, the ones who polled 21,000, 22,100 and 25,400 votes.**

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#### **Q.5 [11831809]**

A bookseller sells books at a discount of 30%. Additionally, if a customer purchases 3 books at a time, he gives a pen, which costs him Rs.50, free apart from the discount. One day, only three customers visit his shop - one of them buys 3 books and the other two buy one book each. The profit earned by the bookseller on that day is 20%. If each book costs Rs. 200 to the bookseller, then what is the mark-up percentage?

**Solution:**

**Correct Answer : 80**

**The total cost of five books and a pen to the bookseller =  $5 \times 200 + 50 = \text{Rs. } 1,050$**

**Let the marked price of each book be Rs.  $x$ .**

**The total selling price of 5 books after the discount of 30% on each =  $(5x) \times 0.7$**

**The bookseller makes a profit of 20% on the whole transaction.**

**$(5x) \times 0.7 = 1.2 \times 1050$**

$\Rightarrow 3.5x = 1260$

$\Rightarrow x = 360$

**Hence, the mark-up percentage =  $(360 - 200)/200 \times 100 = 80\%$ .**

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 Answer key/Solution

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**Q.6 [11831809]**

If  $a, b, c$  are positive integers, what is the maximum value of  $a^2bc$  if  $a + b + c = 12$ ?

1 ☐ 81

2 ☐ 64

3 ☐ 256

4 ☐ 324

**Solution:**

**Correct Answer : 4**

$$a + b + c = 12$$

$$\Rightarrow \frac{a}{2} + \frac{a}{2} + b + c = 12$$

The maximum value of  $\left(\frac{a}{2}\right)\left(\frac{a}{2}\right)(b)(c) = 3^4$ .

So the maximum value of  $a^2bc = 81 \times 4 = 324$ .

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**Q.7 [11831809]**

A five-digit number is divisible by the sum of its digits. Also, the sum of these five digits equals the product of the digits. What could be the product of the digits of such a number?

1 ☐ 4

2 ☐ 6

3 ☐ 8

4 ☐ 10

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**Solution:**

**Correct Answer : 3**

[Answer key/Solution](#)

**Option (1):** If the product of the digits is 4, then the factors of 4 are 1, 2, and 4.

There is no combination of digits which satisfies the given conditions. So it is not the answer.

**Option (2):** If the product of the digits is 6, then the factors of 6 are 1, 2, 3 and 6.

There is no combination of digits which satisfies the given conditions. So it is not the answer.

**Option (3):** If the product of the digits is 8, then the factors of 8 are 1, 2, 4 and 8. So only possible combination is 1, 1, 2, 2, 2. The possible number is 22112.

**Option (4):** If the product of the digits is 6, then the factors of 10 are 1, 2, 5, and 10.

There is no combination of digits which satisfies the given conditions.

So it is not the answer.

Hence, option (3) is the correct answer.

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#### Q.8 [11831809]

A date shown in DD/MM/YY format has a peculiarity: DD, MM and YY, in that order, form a Geometric Progression. If  $1 < DD < 9$  and  $DD \neq MM \neq YY$ , then how many such dates are possible?

1 ☐ 15

2 ☐ 12

3 ☐ 16

4 ☐ 22

**Solution:**

**Correct Answer : 1**

[Answer key/Solution](#)

The observations made on the basis of the information given in the question can be tabulated as shown below.

Value of DD	The possible values of common ratio	Number of dates
2	2, 3, 4, 5, 6	5
3	2, 3 and 4	3
4	0.5, 1.5, 2, 2.5 and 3	5
5	2	1
6	2	1
7	Not possible	0
8	0.5 and 1.5	2

Hence, the number of dates =  $5 + 3 + 5 + 1 + 1 + 2 = 17$ .

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**Q.9 [11831809]**

At a hospital all elective surgical procedures are insured. One-sixth of insured surgical procedures at the hospital are elective and one-fourth of all child births are insured. On a particular day there are exactly 12 elective surgical procedures that are also child births and there are 78 child births that are not insured. If there are a total of 156 surgical procedures that are insured, then how many of these surgical procedures are neither child births nor elective but are insured?

**Solution:**

**Correct Answer : 116**

 Answer key/Solution

**There are a total of 156 surgical procedures that are insured.**

**Number of elective surgical procedures that are insured =  $\frac{1}{6} \times 156 = 26$**

**Let the number of child births be  $x$ .**

**Then, number of child births that are insured =  $\frac{x}{4}$**

**Number of child births that are not insured =  $\frac{3x}{4}$**

**So  $\frac{3x}{4} = 78 \Rightarrow x = 104$**

**Out of 26 elective surgical procedures, 12 are child births too.**

**Number of surgical procedures that are either child births and insured or elective and insured**

**=  $26 + 26 - 12 = 40$**

**Hence, number of surgical procedures that are neither elective nor child births but are insured**

**=  $156 - 40 = 116$ .**

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**Q.10 [11831809]**

In a dairy farm, Jay has three different varieties of milk namely Paras, Amol and Desi with him. The quantity of Paras, Amol and Desi is 465 litres, 651 litres and 496 litres respectively. What is the minimum possible number of bottles of equal capacity (to be completely filled with milk) required by him to store all varieties of milk without mixing any two or more of the three varieties of milk?

**Solution:**

**Correct Answer : 52**

 Answer key/Solution

**Since minimum number of bottles are required, the capacity of the bottles required should be maximum.**

**So capacity of each bottle will be the H. C. F of 465, 651 and 496, which is 31. Also, the bottles should be of equal capacity.**

**Hence, the total number of bottles required for storing the milk =  $(465 + 651 + 496)/31 = 52$ .**

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**Q.11 [11831809]**

Six identical hemispheres are scooped out of each face of a cube of edge length 4 cm. All the hemispheres have their midpoints of the circular base coinciding with the midpoints of the faces, on which they are drawn. The hemispheres touch hemispheres drawn on the adjacent faces at exactly one point. What is the diameter (in cm) of the spheres?

1 ☐  $\sqrt{2}$

2 ☐  $2\sqrt{2}$

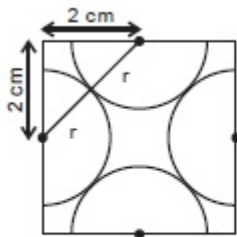
3 ☐  $4\sqrt{2}$

4 ☐  $1/\sqrt{2}$

**Solution:**

**Correct Answer : 2**

A two dimensional view through the face of the cube will look like this.



$$4r^2 = 8$$

$$\Rightarrow r = \sqrt{2} \text{ cm}$$

Hence, diameter of the sphere =  $2\sqrt{2}$  cm.

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[Answer key/Solution](#)

**Q.12 [11831809]**

Shami gave a test that consists of two sections A and B comprising of 32 and 40 questions respectively. For every correct answer in section A and B, the Shami is rewarded with 3 and 4 marks respectively. For every wrong answer in section A and B, 2 marks and 3 marks are deducted and for every unattempted question in section A and B, 1 mark and 0 marks are deducted respectively. If Shami got 200 marks in the test and he got the maximum possible marks in section B, then the maximum number of questions left unattempted by him can be

1 ☐ 12

2 ☐ 13

3 ☐ 14

4 ☐ 15

**Solution:**

**Correct Answer : 3**

 Answer key/Solution

Let number of questions answered correctly be denoted by  $a_1$  and  $a_2$  in section A and section B respectively. Let number of questions answered wrongly be denoted by  $b_1$  and  $b_2$  in section A and section B respectively. Similarly,  $c_1$  and  $c_2$  denote number of questions unattempted in section A and section B respectively.

Maximum possible marks that Shami can get in section B is 160, when all questions are answered correctly.

$$\therefore 3a_1 - 2b_1 - c_1 = 200 - 160 = 40 \text{ and, } a_1 + b_1 + c_1 = 32$$

$$\text{So } 4a_1 = 72 + b_1$$

Minimum possible value of  $a_1$  is 18 when  $b_1 = 0$ .

So maximum possible value of  $c_1 = 32 - 18 = 14$  and  $c_2 = 0$ .

Hence, maximum possible number of questions left unattempted can be  $c_1 + c_2 = 14$ .

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**Q.13 [11831809]**

In a 100 m race, Asha beats Bina by 10 m even if she gives Bina a head start of 5 seconds. If Asha gives Bina a head start of 10 seconds in the same race, then Bina beats Asha by 20 m. What is the speed (in m/s) of Bina?

1 ☐ 4

2 ☐  $14/3$

3 ☐  $13/3$

4 ☐ 5

**Solution:**

**Correct Answer : 2**

 Answer key/Solution

Let the speeds of Asha and Bina be  $a$  m/s and  $b$  m/s respectively.

When Asha gives Bina a head start of 5 seconds, we get

$$\Rightarrow a : b = 100 : (90 - 5b) \dots(i)$$

When Asha gives Bina a head start of 10 seconds, we get:

$$\Rightarrow a : b = 80 : (100 - 10b) \dots(ii)$$

From (i) and (ii), we get

$$100/(90 - 5b) = 80/(100 - 10b)$$

$$\Rightarrow 500 - 50b = 360 - 20b$$

$$\Rightarrow b = 14/3 \text{ m/s}$$

Hence, the speed of Bina is  $14/3$  m/s.

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**Q.14 [11831809]**

For how many integral values of  $x$ ,  $\sqrt{x+2\sqrt{x-1}} + \sqrt{x-2\sqrt{x-1}} = 2$ ?

**Solution:**

**Correct Answer : 2**

$$\sqrt{x+2\sqrt{x-1}} + \sqrt{x-2\sqrt{x-1}} = 2$$

Let  $x-1=t^2$

So  $\sqrt{t^2+1+2t} + \sqrt{t^2+1-2t} = 2$

$$\Rightarrow \sqrt{(t+1)^2} + \sqrt{(t-1)^2} = 2$$

$$\Rightarrow |t+1| + |t-1| = 2$$

$$\Rightarrow |\sqrt{x-1}+1| + |\sqrt{x-1}-1| = 2$$

$$\Rightarrow x = 1, 2.$$

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 Answer key/Solution

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**Q.15 [11831809]**

$N$  is a positive integer. How many integers are there between  $\sqrt{N^2+N+1}$  and  $\sqrt{16N^2+8N-2}$ ?

1 ☐  $3N$

2 ☐  $3N - 1$

3 ☐  $2N$

4 ☐ Depends on the value of  $N$ .

**Solution:**

**Correct Answer : 1**

$(N^2 + N + 1)$  lies between  $N^2$  and  $(N + 1)^2$ .

$(16N^2 + 8N - 2)$  lies between  $(4N)^2$  and  $(4N + 1)^2$ .

So the number of integers would be  $N + 1, N + 2, \dots, 4N$  i.e.,  $3N$  numbers.

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 Answer key/Solution

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**Q.16 [11831809]**

Raman and Raju were playing an interesting game. There were 7 numbers written on the board 7, 8, 13, 15, 16, 24 and 25. Each one took turns to erase one of the numbers, till only one number remained on the board. The numbers erased by Raman and Raju respectively were neither a factor nor a multiple of a number erased earlier by them. The sum of the numbers erased by Raman was twice that of Raju's. Which was the number that was left on the board finally?

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1 ☐ 13

2 ☐ 15

3 ☐ 16

4 ☐ 24

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**Solution:**

**Correct Answer : 4**

**Sum of the numbers = 108.**

**Let Raman's sum =  $2k$**

**Raju's sum =  $k$  and  $R$  = remaining number**

**So,  $3k + R = 108$**

**$R = 15$  or  $24$  (Since  $108 - R$  must be divisible by 3)**

**$R = 15$ , ( $2k = 62$ ,  $k = 31$ ) → only one combination (13, 24, 25) and (7, 8, 16).**

**This case is not valid as 16 is a multiple of 8.**

**$R = 24$ , ( $2k = 56$ ,  $k = 28$ ) → only one combination (15, 16, 25) and (7, 8, 13).**

**This case is valid.**

**Hence, remaining number is 24.**

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 Answer key/Solution

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**Q.17 [11831809]**

If  $y = |x - 2.5| + |x - 3.6| + |x - 4.7| + \dots + |x - 16.8|$ , for how many real values of  $x$  does  $y$  attain its minimum possible value?

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1 ☐ 1

2 ☐ 2

3 ☐ 18

4 ☐ Infinite

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**Solution:**

**Correct Answer : 4**

[Answer key/Solution](#)

$$y = |x - 2.5| + |x - 3.6| + |x - 4.7| + \dots + |x - 16.8|.$$

Where the terms represent the absolute deviation of  $x$  with respect to 2.5, 3.6, 4.7, ... 16.8.

And the sum of absolute deviations is minimum about the median.

We can see that 2.5, 3.6, 4.7, ..., 16.8 form an AP with  $a = 2.5$  and  $d = 1.1$  and  $n = 14$  terms.

So the median will lie between the 7th and 8th terms.

In this case the median can be any element such that  $9.1 \leq x \leq 10.2$ .

Hence,  $x$  can take infinite real values.

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### Q.18 [11831809]

Nine civil engineers are working on a certain number of projects, with exactly four engineers working on each project. If no pair of projects has more than one engineer working on both the projects, what is the maximum possible number of projects that are being handled by the nine engineers?

1 ☐ 2

2 ☐ 3

3 ☐ 4

4 ☐ 5

**Solution:**

**Correct Answer : 2**

[Answer key/Solution](#)

If engineers are denoted by E1, E2, E3, E4, E5, E6, E7, E8 and E9, then we have to make groups of 4 such that no pair of groups has more than one engineer in common. The possible groups are as follows: (E1, E2, E3, E4), (E1, E5, E6, E7), (E2, E5, E8, E9). There can be three such groups.

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### Q.19 [11831809]

Find the remainder when 5555 .... (upto 33 digits) is divided by 17.

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**Solution:**

**Correct Answer : 5**

 Answer key/Solution

Let the given number 5(1111...) 33 digits be denoted by N.

$$\therefore N = \frac{5}{9}(10^{33} - 1) = \frac{5}{9}(10^{33} - 10 + 10 - 1)$$

$$\Rightarrow \frac{5}{9}(10(10^{32} - 1) + 5) = \frac{5}{9} [10(10^{16} - 1)(10^{16} + 1)] + 5$$

Since  $(10^{17} - 10)$  is divisible by 17,  $(10^{16} - 1)$  is divisible by 17.

[We know that  $(a^p - a)$  is divisible by 'p', where 'p' is prime and a is any natural number  $> 1$ ]

So, remainder is 5 when it is divided by 17.

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### Q.20 [11831809]

In a group, there were 9 children whose weights were 1 kg, 2 kg, 3 kg, ..., 9 kg. They were split into 3 equal groups. The sum of the weights in two of the groups is 23 kg and 15 kg. Which of the following statements is true?

- (i) There are two ways of dividing them into 2 groups.
- (ii) The 8 kg child is in the group weighting 23 kg.
- (iii) There is one group where all the three weights are prime numbers.

1 ☐ (i) & (ii) only

2 ☐ (ii) & (iii) only

3 ☐ (i) & (iii) only

4 ☐ All of them

**Solution:**

**Correct Answer : 2**

 Answer key/Solution

**Group 1: 23 kg**

**Group 2: 15 kg**

**So, Group 3: 7 kg, since the sum of nine of these weights is 45 kg.**

**7 kg has only one possibility (1, 2, 4).**

**23 kg and 15 kg are both odd. This is possible when one of them has 1 odd numbers and the other has all the remaining three odd numbers.**

**So, the only possibility is (3, 5, 7) and (6, 8, 9).**

**Hence, only statements (ii) & (iii) are true.**

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**Q.21 [11831809]**

Three women and two girls can do a piece of work in 8 days and four women and five girls can do the same work in 5 days. In how many days can 8 women and 2 girls do half the work?

1 ☐ 3.5

2 ☐ 4.5

3 ☐ 5.5

4 ☐ 2.5

**Solution:**

**Correct Answer : 1**

From the first condition 3 women and 2 girls can do a piece of work in 8 days.

Hence, 24 women and 16 girls complete it in 1 day. ... (i)

Similarly, from the second condition, 20 women and 25 girls complete it in 1 day. ... (ii)

On equating (i) and (ii), we get 24 women + 16 girls = 20 women + 25 girls  $\Rightarrow$  4 women = 9 girls

From the second condition 4 women and 5 girls can do the work in 5 days.

$\Rightarrow$  (9 + 5) girls in 5 days = 14 girls in 5 days = 1 girl in 70 days.

$\Rightarrow$  8 women + 2 girls = 20 girls

Hence, 20 girls can do the job in  $70/20 = 3.5$  days.

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 Answer key/Solution

**Q.22 [11831809]**

What is the sum to 12 terms of the following series:

1, 4, 7, 12, 21, 38, 71, ... and so on.

**Solution:**

**Correct Answer : 4172**

This series is a combination of an AP and a GP.

1, (2 + 2), (3 + 4), (4 + 8), (5 + 16), (6 + 32), (7 + 64), ....

AP = 1, 2, 3, 4, ... [a = 1, d = 1]

GP = 2, 4, 8, 16, 32, .... [a = 2, r = 2]

Hence, sum up to 12 terms =  $[12 \times 13/2] + [2(2^{11} - 1)/1] = 78 + 2 \times 2047 = 4172$ .

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 Answer key/Solution