

Logical Quant Workbook

Special Equations II

Directions for questions 1 to 11: Select the correct alternative from the given choices.

- Supriya asked Rajesh "What is the date of your birth"? Rajesh replied, "25 times the date of my birth added to 9 times the month of my birth is 563". In which month was Rajesh born?
(A) September (B) July (C) February (D) November
- The "Friends Club" purchased some shuttlecocks and cricket balls. Each shuttlecock cost Rs.8 and each cricket ball cost Rs.15. In how many different ways could the club have bought the items if it spent a total amount of Rs.769?
(A) 6 (B) 4 (C) 5 (D) 3
- Kushal takes up an assignment, wherein each working day he is given a target. For each day he meets the target he is paid Rs. 1.05 and for each day he does not meet the target he is paid Rs.18. less. If by the end of a month, he is paid a total of Rs.2988, then for how many days does he meet the target?
(A) 21 (B) 9 (C) 18 (D) 19
- John and Rosy have a collection of less than 90 coins together. If Rosy gives John a certain number of coins; then John would have 4 times as many coins as Rosy. Instead if John gives the same number of coins to Rosy, then John would have 3 times as many coins as Rosy. The number of coins With John and Rosy together can be:
(A) 80 (B) 29 (C) 35 (D) 85
- The average weight of a certain group of n men is 72 kg. When two men whose weights are 73 kg and 67 kg join the group, and one man whose weight is more than 58 kg leaves the group, the average goes up by 3 kg. If the initial number of men in the group is an even number, then the weight of the man who left the group is
(A) 59 kg (B) 61 kg (C) 62 kg (D) 63 kg
- The number 284 has to be divided into two Positive parts such that one part is a multiple of 9 and the other is a multiple of 17. In how many ways can the number be divided?
(A) 4 (B) 3 (C) 2 (D) 1
- Gurmeet wants to buy some apples, oranges and jack fruits. Each apple costs Rs.8, each orange costs Rs.3 and each jack fruit costs Rs.13. If she wants to spend an amount of Rs.112 and if she wants to buy a minimum of 4 fruits of each variety, then in how many different combinations can she buy the fruits?
(A) 1 (B) 2 (C) 3 (D) 4
- Rajesh purchased some scales and charts. Each scale cost him Rs. 7 and each chart cost Rs. 5. If he has spent a total amount of Rs. 42, then how many items did he purchase?
(A) 8 (B) 7 (C) 9 (D) Cannot be determined
- On a certain Winter day, Manish sold Some wollen jackets, sweaters and gloves. He sold each jacket at Rs.300, each at Rs.175 and each pair of gloves at Rs. 100. If Manish sold at least one piece of each variety and made a total collection of Rs. 1175 by the end of the day, then how many sweaters did he sell?
(A) 1 (B) 5 (C) 4 (D) 2
- An organization has 14 employees belonging to three different sections A, B and C. The monthly salaries of each of the employees of the sections A, B and C are respectively Rs.11000, Rs.6000 and Rs.2000. If the total salary paid to the employees of all the three sections is Rs.84000, then the number of employees in the section A is
(A) 4 (B) 2 (C) 9 (D) 5
- Kashyap purchased some cricket balls and shuttlecocks. The price of each cricket ball is Rs. 10 and the price of each cork is Rs. 11. If Kashyap spends a total amount of Rs. 130, then how many corks did he purchase?
(A) 2 (B) 8 (C) 10 (D) 12

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Abhay spent an amount of Rs. 1 000 for buying black boards and white chalk boxes for his school. Each black board cost him Rs. 25 and each chalk box cost him RS.5. He noted that if he had bought as many chalk boxes as the black boards and as many black boards as the chalk boxes he had actually purchased, he would have spend less than half of what he actually spent.

12. In how many different combinations could he have bought the items?

- (A) 1 (B) 2 (C) 3 (D) 4

13. If Abhay bought at least 10 of each of the items, then how many black boards did he purchase?

- (A) 38 (B) 39 (C) 40 (D) 37

14. NULL

15. NULL

16. How many 3-digit numbers are there which leave a remainder of 5 when divided by 17 and a remainder of 6 when divided .by 11?

- (A) 8 (B) 5 (C) 6 (D) 7

17. Meghana bought packs of ice-cream in two flavours - vanilla and straw-berry - spending a total of Rs.710. If each vanilla pack costs RS.55 and each straw-berry pack costs Rs.80, then how many packs did she buy in all?

- (A) 14 (B) 10 (C) 12 (D) 13

Directions for questions 18 and 19: These questions are based on the data given below:

In a certain cricket match, Mithali Raj scored 130 runs. She scored all the runs only in sixes, twos and singles. The total number of scoring shots was 42 . The number of sixes hit is at least 8 more than the number of twos taken and the number of singles taken is at most 10 more than the number of twos taken.

18. How many sixes did Mithali Raj hit in the match?

- (A) 16 (B) 18 (C) 8 (D) 17

19. Which of the following statements is/are true?

- (A) The number of sixes hit is twice the number of twos taken and the total number of runs scored in sixers is 96.
(B) The number of singles taken is 2 more than the number of sixers hit. .
(C) The total number of runs scored in twos and singles is eight less than the number of scoring shots.
(D) All the above.

Directions for questions 20 and 21: Select the correct alternative from the given choices.

20. Abhijeet, a potter makes more than 100 but less than 300 pots and arranges them in rows, with each row consisting of the same number of pots, for drying. He finds that if he places 6 pots more per row, he can arrange the pots in 10 less rows. How many pots does the potter make?

- (A) 180 (B) 120 (e) 164 (D) 225

21. Preet has some coins in the denominations of five rupees, two-rupees and one rupee The number of two-rupee coins is four times the number of one rupee coins and the total amount with Pallavi is RS.135. If Preet has at least 10 five-rupee coins, then how many coins does she have in all?

- (A) 29 (B) 68 (C) 43 (D) 32

Directions for questions 22 and 23: These questions are based on the data given below.

Preet of Anmol Jewelers purchased three types of precious stones – diamonds, rubies and sapphires spending a total of Rs75000. The price of each diamond, ruby and sapphires was respectively Rs.1800, RS.2700 and Rs.1200 He purchased a total of 42 stones and a minimum of 5 stones of each variety.

22. If Preet purchased two varieties of stones in equal number, then how many rubies did he buy?

- (A) 12 (B) 10 (C) 8 (D) 6

23. If the number of sapphires bought was more than the number of diamonds and rubies together, then how many diamonds did he buy?

- (A) 6 (B) 12 (C) 14 (D) 10

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Directions for questions 24 - 25: Select the correct alternative from the given choices

24. There are two kinds of insects living in a certain anthill. The number of insects of the first kind triples every day while that of the second kind becomes 6 times every day. Initially, there are more than 25 of the first kind and more than 2 of the second kind. After 4 days the total number of insects is 6804. Find the total insects at the beginning.

- (A) 54 (B) 24 (C) 39 (D) 69

25. Arpitha goes to a stationary shop to buy some pens, rulers and refills. She decides to buy twice as many refills as pens and at least 10 pens more than rulers. She finds that refills are at half the price of pens and rulers are twice as expensive as refills. If each refill costs Rs 5 and Arpitha spends a total of Rs.350, then how items did she purchase in all?

- (A) 50 (B) 45 (C) 48 (D) 36

Solutions

1. Let O be the date of birth and M be the month of the birth of Rajesh.

Then, $250 + 9M = 563$ ----- (1) Dividing the equation by 9, we get

$$\text{Rem}(250 + 9M)/9 = \text{Rem}(563/9)$$

(where Rem is the remainder when x is $\Rightarrow \text{Rem}(7D/9) = 5$

By trial, $O = 2$ satisfies the above condition and the other values of O can be obtained by adding 9 successively. ... $D = 2, 11, 20$

The corresponding values of M are 57, 32, 7 -18,

As $0 < M \leq 12$, $M = 7$. Choice (B)

2. Let x, y be the number of shuttlecocks and cricket balls purchased. Then, $8x + 15y = 769$

Dividing the equation by 8, we get

$$\text{Rem}(8X+15Y)/8 = \text{Rem}(769/8) = \text{Rem}(7Y/8) = 1$$

By trial, $y = 7$ satisfies the above condition, and the other values of y can be obtained by adding 8 successively.

$$\therefore y = 7, 15, 23, 31, 39, 47, 55,$$

But for $y \geq 55$, $15y > 769$. So, $y < 55$.

The corresponding values of x are 83, 68, 53, 38, 23, 8. Hence, the items can be purchased in 6 different combinations. Choice (A)

3. Let the number of days on which Kushal met the target be x and the number of days on which he did not meet the targets be y .

$$\text{Then, } 105x + 87y = 2988 = 35x + 29y = 996$$

$$= \text{Rem}(6X/29) = \text{Rem}(996/29) = 10 = 6x = 29x1 + 10$$

$$\Rightarrow \text{Rem}(5:1) = 2 = 5X1 = 6xz + 2$$

$$\Rightarrow \text{Rem}(\cdot) = 3 \therefore X2 = 3, 8, 13 \text{ etc.}$$

$$X2 = 3 \Rightarrow X1 = 4 \Rightarrow x = 21 \Rightarrow y = 996 - (35)(21) = 9$$

29

\therefore Other values of x are obtained by adding 29 successively while those of y are obtained by adding 35 successively. But as $x \leq 31$, $y \leq 31$, $(x, y) = (21, 9)$

$(x, y) = (21, 9)$

i.e. Kushal met the target on 21 days. Choice (A)

4. Let the number of coins with John and Rosy be x and y respectively. Then, $x + k = 4(y - k)$

$$\Rightarrow x - 4y = -5k \quad (1)$$

$$\text{and } x - k = 3(y + k)$$

$$\Rightarrow x - 3y = 4k \quad (2)$$

Eliminating k from (A) and (B), we get $9x - 31Y = 0$

$$\Rightarrow x = 31y/9 \Rightarrow y = 9, 18, 27, 36,$$

and the corresponding values of x are 31, 62, 93, 124,

But $x + Y < 90$ (given).

\therefore The possible number of coins with John and Rosy

1. together is $9 + 31, 18 + 62$. i.e. 40 or 80. Choice (A)

5. Let the weight of the man who left the group be k kg. Then,

$$72n + (140 - k) = 75(n + 1) \Rightarrow k = 65 - 3n$$

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when $n = 2$, $k = 59$, and when $n = 3$, $k = 56$.

But $k > 58$. $\therefore k = 59$. Choice (A)

6. Let m , n be the two parts such that $m = 9p$ and $n = 17q$, where $p, q \in \mathbb{N}$. Then, $9p + 17q = 284$.

Dividing the equation throughout by 9, we get

$$\text{Rem}(9p+17q/9) = \text{Rem}(284/9) \Rightarrow \text{Rem}(8q/9) = 5$$

By trial, $q = 4$ satisfies the above equation, and the other values of q can be obtained by adding 9 successively.

$\therefore q = 4, 13, 22$, But for q greater than $22 = 17q \geq 284$.

So, $q = 4, 13$ and the corresponding values of p are 24, 7. Hence, the required number of ways of dividing the number 284 is 2.

Choice (C)

7. Let x , y and z be the number of apples, oranges and jack fruits respectively bought by Gurmeet.

$$\text{Then, } 8x + 3y + 13z = 112$$

$$\text{Put } x = X + 4, Y = Y + 4 \text{ and } z = Z + 4$$

$$\text{We get, } 8(X + 4) + 3(Y + 4) + 13(Z + 4) = 112. \Rightarrow 8X + 3Y + 13Z = 16.$$

By trial and error, we can find that the solutions of the above equation are $X = 0, Y = 1, Z = 1$; $X = 2, Y = 0, Z = 0$. Hence, Gurmeet can buy the fruits in two different combinations. Choice (B)

8. Let x , y and z be the number of 10 marks, 5 marks and 2 marks questions respectively.

$$\text{Then, } x + y + z = 35 \text{ ---- (1)}$$

$$\text{and } 10x + 5y + 2z = 100 \text{ ---- (2)}$$

$$(2) - 2 \cdot (1) \text{ gives, } 8x + 3y = 30.$$

Since, $3y$ and 30 are multiples of 3, $8x$ must be a multiple of 3.

$$\Rightarrow x = 3, 6, 9, 12, \dots \text{ But for } x \leq 6, 8x \leq 30. \therefore x = 3$$

$\Rightarrow Y = 2$ and $z = 30$. Hence, the number of 5 marks questions in the paper is 2. Choice (B)

9. Let x , y and z be the number of woolen jackets, sweaters and gloves respectively sold by the Manish. Then, $300x + 175y + 100z = 1175$

$$\Rightarrow 12x + 7y + 4z = 47.$$

Dividing the equation by 4, we get

$$\text{Rem } (12x + 7y + 4z) = \text{Rem } (47) \Rightarrow \text{Rem } (7y) = 3.$$

By trial, $y = 1$ satisfies the above equation, and the other values of y can be obtained at by adding 4 successively.

$$y = 1, 5, 9, 13, \dots \text{ but for } y \leq 4, 7y \leq 47. \therefore Y = 1, 5 \text{ when } y = 5, 12x + 3y = 12$$

This equation does not have positive integral solutions. $\therefore y = 1$. Hence, only one sweater is sold by the Manish. Choice (A)

10. Let x , y and z be the number of employees in the sections A, B and C respectively.

$$\text{Then, } x + y + z = 14. \text{ (1)}$$

$$\text{and } 11000x + 6000y + 2000z = 84000 \Rightarrow 11x + 6y + 2z = 84 \text{ (2)}$$

$$(2) - 2(1) \text{ gives, } 9x + 4y = 56.$$

Clearly $x = 4$ and $y = 5$ satisfy the above equation and there is no other solution for the equation. Hence, the number of employees in the section A is 4. Choice (A)

11. Let A, B and C be the angles of the triangle such that $13A = 17B \Rightarrow A = 17B/13$

As A, B and C are integers, B must be a multiple of 13. So, the possible values of A, B and C are listed below:

B	13	26	39	52	65	78
A	17	34	51	68	85	X
C	X	X	X	60	30	X

\therefore The least possible angle in the triangle is 30° .

Choice (D)

Solutions for questions 12 and 13:

Let x , y be the number of black boards and white chalk boxes

$$\text{bought. Then, } 25x + 5y = 1000 \Rightarrow 5x + y = 200 \text{ ---- (1)}$$

$$\text{and } 25y + 5x < 500 \Rightarrow 5y + x < 100$$

$$= 5(200 - 5x) + x < 100 \text{ (using (1))}$$

$$225 - 24x < 100$$

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$\Rightarrow 900 < 24x$ (or) $x > 225/6 \Rightarrow x = 38, 39, 40, 41, \dots$

But for $X \geq 40, 25x \geq 1000$.

$\therefore x = 38, 39$ and the corresponding values of y are 10, 5.

12. Abhay can buy the items in two different combinations. Choice (B)

13. If he bought at least 1° of each, he bought 10 chalk boxes and 38 black boards. Choice (A)

Solutions for questions 14 and 15:

Let x, y and z be the number of CDs, DVDs and cassettes

purchased. Then, $x + y + z = 38$ ---- (1)

and $80x + 150y + 30z = 354$ ----- (2)

(2) - 3(1) gives, $5x + 12y = 240$.

As 12y, 240 are multiples of 12, 5x must be a multiple of 12. so, $x = 12, 24, 36, 48, 60, \dots$

But $x + y + z = 38$. so, $x = 12, 24, 36$.

The corresponding values of y are 15, 10, 5. But $x + y + z = 38$.

$\therefore x = 36$ and $y = 5$ is not possible.

So, $x = 12, 24$ and $y = 15, 10$, and the corresponding values of z are 11, 4.

14. When x is maximum, $y + z = 10 + 4 = 14$. Choice (C)

15. When y is minimum, $Z = 4$. Choice (A)

Solutions for questions 16 and 17:

16. Let N be the required number. Then, $N = 17p + 5$ and $N = 11q + 6$. so, $17p + 5 = 11q + 6$

$\Rightarrow 17p - 11q = 1$.

Dividing the equation by 11, we get

$\text{Rem}(11x + 16y)/11 = \text{Rem}(142/11) \Rightarrow \text{Rem}(5y/11) = 10$

By trial, $p = 2$ satisfies the above condition, and the corresponding values of p can be obtained by adding 11 successively. $\therefore p = 2, 13, 24, 35, 46, 57, \dots$

But for $p = 2$: $68, N > 1000$. so, $P = 2, 13, 24, 35, 46, 57$. Hence, the required number of 3 digit number is 6.

Choice (C)

17. Let x, y be the number of pack of ice - cream of vanilla and strawberry flavors respectively purchased by Meghana. Then,

$55x + 80y = 710. \Rightarrow 11x + 16y = 142$

Dividing the equation throughout by 11, we get

$\text{Rem}(11x + 16y) = \text{Rem}(142/11) \Rightarrow \text{Rem}(4y/11) = 10$

By trial, $y = 2$ satisfies the above condition, and the other values of y can be obtained by adding 11 successively.

$\therefore y = 2, 11, 13, 24, \dots$

But for $y \geq 13, 11y \geq 142$

$\therefore y = 2$ which in turn gives $x = 10$. The total number of packs purchased is $2 + 10$ or 12. Choice (C)

Solutions for questions 18 and 19:

Let x be the number of sixers hit, y be the number of two's taker and z be the number of singles taken.

Then, $6x + 2y + z = 130$ ---- (1)

and $x + y + z = 42$ ---- (2)

Also, $x - Y \geq 8$ ---- (1)

and $z - y \geq 10$ ---- (2)

(1) - (2) gives, $5x + y = 88$ ---- (3)

from (1) and (3), we have $x - (88 - 5x) \geq 8$

$\Rightarrow 6x \geq 96 \Rightarrow x \geq 16$ ---- (4)

from (2) and (1), we have $(42 - x - y) - y \geq 10$

$\Rightarrow 42 - x - 2(88 - 5x) \geq 10 \Rightarrow 9x \geq 144 \Rightarrow x \geq 16$ ---- (5) \therefore from (4) and (5), we get $x = 16$

$\Rightarrow Y = 88 - 5(16) = 8$ and $z = 18$.

18. Number of sixers hit is 16.

19. All the given options are true.

Choice (A) Choice (D)

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Solutions for questions 20 and 21:

20. Let y pots be arranged per row and let x be the numbers of rows.

Then, $xy < 300$ and $(x - 10)(y + 6) = xy \Rightarrow xy + 6x - 10y - 60 = xy$

$$\Rightarrow 6x - 10y = 60 \Rightarrow 3x - 5y = 30$$

We see that y is a multiple of 3 and x of 5.

By trial, $x = 10, Y = 0$ is a solution. The other solutions can be obtained by subtracting the coefficient of y (i.e. -5) successively to the value of x and adding the coefficient of x (i.e. 3) successively to the value of y .

i.e. $(x, y) = (10, 0), (15, 3), (20, 6), (25, 9), (30, 12)$ etc.

But as $x > 0, y > 0$ and $xy < 300$, only $(15, 3), (20, 6)$ and $(25, 9)$ are possible values of (x, y)

\therefore The required number of pots = $25 \times 9 = 225$.

Choice (D)

21. Let $x, 4y, y$ be the number of Rs.5, RS.2 and Re.1 coins respectively with Patlavi. Then, $Bx + 8y + Y = 135$

$\Rightarrow 5x + 9y = 135$. As $9y$ and 189 are multiples of 9, $5x$ must be a multiple of 9.

$\Rightarrow x = 9, 18, 27, \dots$ But $x \leq 27$ and for $x = 27, 5x = 135$. $\therefore x = 18$ which in turn gives $y = 5$. Hence, the number of coins with Preet is $x + 5y = 18 + 25 = 43$. Choice (C)

Solutions for questions 22 and 23:

Let x, y and z be the number of diamonds, rubies and sapphires purchased. Then, $x + y + z = 42$ ----- (1)

and $1800x + 2700y + 1200z = 75000$

$$\Rightarrow 18x + 27y + 12z = 750$$

$$\Rightarrow 6x + 9y + 4z = 250$$
 ----- (2)

(2) - 4(1) gives,

$$2x + 5y = 82$$

$\Rightarrow Y = 2, 4, 6, 8, 10, 12, 14, 16, \dots$ But $Y \leq 16$. So, $y = 6, 8, 10, 12, 14, 16, 18, \dots$

The corresponding values of x are 26, 21, 16, 11, 6, 1, ..

But $x \geq 5$. \therefore The possible values of x, y and z are tabulated below:

X	26	21	16	11	6
Y	6	8	10	12	14
Z	10	13	16	19	22

22. The number of rubies purchased is 10. Choice (B)

23. The number of diamonds purchased in this case is 6. Choice (A)

Solutions for questions 24 and 25:

24. Let the number of insects of the first and second kind be a and b respectively. After 4 days, the total number is $81a + 1296b$

$$\Rightarrow 81a + 1296b = 6804$$

$$A + 16b = 84 \text{ As Rem } (84/16) = 4, \text{ Rem } (a/16) = 4$$

$(a, b) = (4, 5), (20, 4), (36, 3), (52, 2)$ and $(68, 1)$ As $a > 25$ and $b > 2$, $(a, b) = (36, 3)$ or $a + b = 39$

25. Let x, y and $2x$ be the number of pens, rulers and refills purchased. Then, $10x + 15y + 10x = 350$

$$\Rightarrow 4x + 3y = 70. \text{ Dividing the equation by 3, we get Rem } (4x + 3y)/3 = \text{Rem } (70/3) = \text{Rem } (x/3) = 1.$$

By trial, $x = 1$ satisfies the above equation, and the other values of x can be obtained by adding 3 successively .. $x = 1, 4, 7, 10, 13, 16, 19, \dots$

But for $x \geq 19, 4x > 70$. So, $x = 1, 4, 7, 10, 13, 16$ and the corresponding values of y are $22, 18, 14, 10, 6, 2$.

But the number of pens purchased is at least 10 more than the number of pencils. So, $x = 16$ and $y = 2$. Hence, the total number of items purchased by Arpitha is $3x + Y = 48 + 2 = 50$. Choice (A)