Miscellaneous

Career Launcher

LRDI - 14

CEX-D-0286/18

Number of Questions : 25

Directions for questions 1 to 6: Answer the questions on the basis of the information given below.

Kaplan Ltd. is one of the premier industries that manufactures fan belts for automobiles. If a belt is not sold in the year of production, it becomes defective and has to be scrapped. The following estimates reveal all the costs of Kaplan Ltd.

If P(n) = Production cost of the nth unit, then
P(n) = Rs. 20 for $0 < n < 40001$
= Rs. 25 for $n > 40000$.
Total salary cost for Kaplan Ltd.
Rs. 1.5 lakh per annum
Maintenance cost
Rs. 30,000 per annum
Fuel supply and electricity cost
Rs. 20,000 per annum

1. What is the total cost for Kaplan Ltd., when it sold 55,000 units of fan belts in the market in a particular year?
(1) Rs. 15 lakh (2) Rs. 13.75 lakh
(3) Rs. 13.05 lakh (4) Rs. 12.20 lakh

2. At what volume would the sales revenue be sufficient to meet the total cost per annum, given that the selling price is Rs. 30 per belt?
(1) 30,000 (2) 35,000
(3) 20,000 (4) 40,000

3. In a year, if the selling price of a belt is Rs. 25, at what production level will Kaplan make maximum profit?
(1) 40,000 (2) 50,000
(3) 60,000 (4) Any of the above

4. In one of the years, Kaplan produced 70,000 belts, but due to slump in the market, it could sell only 80% of its production. In spite of this, it made a profit of Rs. 1,50,000 for the year. What was the selling price of a belt sold?
(1) Rs. 29.20 (2) Rs. 32.30
(3) Rs. 33.90 (4) Rs. 31.25

5. In one of the years, Kaplan produced 55,000 belts, but managed to sell only 45,000 belts at a price of Rs. 31.50 per belt. Find its net gain or loss.
(1) Gain, Rs. 42,500 (2) Loss, Rs. 17,500
(3) Gain Rs. 17,500 (4) Loss, Rs. 43,500

6. In a particular year, Kaplan produced 75,000 belts. It first sold 40% of the production at a price of Rs. 24 per belt. At what price should it sell the rest of the belts so that it makes no profit no loss?
(1) Rs. 21.9 (2) Rs. 22.3
(3) Rs. 23.1 (4) Rs. 25.66

Directions for questions 7 to 11: Answer the questions on the basis of the information given below.

There are 21 employees working in a division, out of whom 10 are special-skilled employees (SE) and the remaining are regular-skilled employees (RE). During the next five months, the division has to complete five projects every month. Out of the 25 projects, 5 projects are "challenging", while the remaining ones are "standard". Each of the challenging projects has to be completed in different months. Every month, five teams - T1, T2, T3, T4 and T5, work on one project each. T1, T2, T3, T4 and T5 are allotted the challenging project in the first, second, third, fourth and fifth month, respectively. The team assigned the challenging project has one more employee than the rest.

In the first month, T1 has one more SE than T2, T2 has one more SE than T3, T3 has one more SE than T4, and T4 has one more SE than T5. Between two successive months, the composition of the teams changes as follows:

a. The team allotted the challenging project, gets two SE from the team which was allotted the challenging project in the previous month. In exchange, one RE is shifted from the former team to the latter team.

b. After the above exchange, if T1 has any SE and T5 has any RE, then one SE is shifted from T1 to T5, and one RE is shifted fromT5 to T1. Also, if T2 has any SE and T4 has any RE, then one SE is shifted fromT2 to T4, and one RE is shifted from T4 to T2.

Each standard project has a total of 100 credit points, while each challenging project has 200 credit points. The credit points are equally shared between the employees included in that team.

7. The number of times in which the composition of team T2 and the number of times in which composition of team T4 remained unchanged in two successive months are:
(1) (2,1) (2) (1,0)
(3) (0,0) (4) (1,1)

8. The number of SE in T1 and T5 for the projects in the third month are, respectively:
(1) (0,2) (2) (0,3)
(3) (1,2) (4) (1,3)

9. Which of the following CANNOT be the total credit points earned by any employee from the projects?
(1) 140 (2) 150
(3) 170 (4) 200

10. One of the employees named Aneek scored 185 points. Which of the following CANNOT be true?
(1) Aneek worked only in teams T1, T2, T3, and T4.
(2) Aneek worked only in teams T1, T2, T4, and T5.
(3) Aneek worked only in teams T2, T3, T4, and T5.
(4) Aneek worked only in teams T1, T3, T4, and T5.

11. If Amit is in T1 in first and second month, and in T3 in all the three remaining months, then total how many credit points are scored by him?
(1) 140 (2) 155
(3) 170 (4) 200

Directions for questions 12 to 16: Answer the questions on the basis of the information given below.

An old woman had the following assets:
(a) Rs.70 lakh in bank deposits
(b) 1 house worth Rs.50 lakh
(c) 3 flats, each worth Rs.30 lakh
(d) Certain number of gold coins, each worth Rs.1 lakh

She wanted to distribute her assets among her three children; Neeta, Seeta and Geeta.
The house, any of the flats or any of the coins were not to be split. That is, the house went entirely to one child; a flat went to one child and similarly, a gold coin went to one child.

12. Among the three, Neeta received the least amount in bank deposits, while Geeta received the highest. The value of the assets was distributed equally among the children, as were the gold coins.
How much did Seeta receive in bank deposits (in lakhs of rupees)?
(1) 30 (2) 40
(3) 20 (4) 10

13. Among the three, Neeta received the least amount in bank deposits, while Geeta received the highest. The value of the assets was distributed equally among the children, as were the gold coins.
How many flats did Neeta receive?

Additional information for questions 14 to 16: The value of the assets distributed among Neeta, Seeta and Geeta was in the ratio of 1 : 2 : 3, while the gold coins were distributed among them in the ratio of 2 : 3 : 4. One child got all three flats and she did not get the house. One child, other than Geeta, got Rs.30 lakh in bank deposits.

14. How many gold coins did the old woman have?
(1) 72 (2) 90
(3) 180 (4) 216

15. How much did Geeta get in bank deposits (in lakhs of rupees)?

16. What is the ratio of the amount Neeta, Seeta and Geeta get in their bank deposits?
(1) 2 : 2 : 3
(2) 2 : 3 : 2
(3) 3 : 2 : 2
(4) Cannot be determined

Directions for questions 17 to 20: Answer the questions on the basis of the information given below.

A high security research lab requires the researchers to set a pass key sequence Passed on the scan of the five fingers of their left hands. When an employee first joins the lab, her fingers are scanned in an order of her choice, and then when she wants to re-enter the facility, she has to scan the five fingers in the same sequence.

The lab authorities are considering some relaxations of the scan order requirements, since it is observed that some employees often get locked-out because they forget the sequence.

17. The lab has decided to allow a variation in the sequence of scans of the five fingers so that at most two scans (out of five) are out of place. For example, if the original sequence is Thumb (T), index finger (I), middle finger (M), ring finger (R) and little finger (L) then TLMRI is also allowed, but TMRLI is not.

How many different sequences of scans are allowed for any given person's original scan?

18. The lab has decided to allow variations of the original sequence so that input of the scanned sequence of five fingers is allowed to vary from the original sequence by one place for any of the fingers. Thus, for example, if TIMRL is the original sequence, then ITRML is also allowed, but LIMRT is not.

How many different sequences are allowed for any given person's original scan?
(1) 7 (2) 5
(3) 8 (4) 13

19. The lab has now decided to require six scans in the pass key sequence, where exactly one finger is scanned twice, and the other fingers are scanned exactly once, which can be done in any order. For example, a possible sequence is TIMTRL.

Suppose the lab allows a variation of the original sequence (of six inputs) where at most two scans (out of six) are out of place, as long as the finger originally scanned twice is scanned twice and other fingers are scanned once.

How many different sequences of scans are allowed for any given person's original scan?

20. The lab has now decided to require six scans in the pass key sequence, where exactly one finger is scanned twice, and the other fingers are scanned exactly once, which can be done in any order. For example, a possible sequence is TIMTRL.

Suppose the lab allows a variation of the original sequence (of six inputs) so that input in the form of scanned sequence of six fingers is allowed to vary from the original sequence by one place for any of the fingers, as long as the finger originally scanned twice is scanned twice and other fingers are scanned once.

How many different sequences of scans are allowed if the original scan sequence is LRLTIM?

(1) 8 (2) 11
(3) 13 (4) 14

Directions for questions 21 to 25: Answer the questions on the basis of the information given below.

Mathematicians are assigned a number called Erdös number (named after the famous mathematician, Paul Erdös). Only Paul Erdös himself has an Erdös number of zero. Any mathematician who has written a research paper with Erdös has an Erdös number of 1. For other mathematicians, the calculation of his/her Erdös number is illustrated below:

Suppose that a mathematician X has co-authored papers with several other mathematicians. From among them, mathematician Y has the smallest Erdös number. Let the Erdös number of Y be y. Then X has an Erdös number of y+1 . Hence any mathematician with no co-authorship chain connected to Erdös has an Erdös number of infinity.

In a seven day long mini-conference organized in memory of Paul Erdös, a close group of eight mathematicians, call them A, B, C, D, E, F, G and H, discussed some research problems. At the beginning of the conference, A was the only participant who had an infinite Erdös number. Nobody had an Erdös number less than that of F.

1. On the third day of the conference F co-authored a paper jointly with A and C. This reduced the average Erdös number of the group of eight mathematicians to 3. The Erdös numbers of B, D, E, G and H remained unchanged with the writing of this paper. Further, no other co-authorship among any three members would have reduced the average Erdös number of the group of eight to as low as 3.
2. At the end of the third day, five members of this group had identical Erdös numbers while the other three had Erdös numbers distinct from each other.
3. On the fifth day, E co-authored a paper with F which reduced the group's average Erdös number by 0.5. The Erdös numbers of the remaining six were unchanged with the writing of this paper.
4. No other paper was written during the conference.

21. How many participants in the conference did not change their Erdös number during the conference?

(1) 2 (2) 3
(3) 4 (4) 5

22. The person having the largest Erdös number at the end of the conference must have had Erdös number (at that time):

(1) 5 (2) 7
(3) 9 (4) 14

23. How many participants had the same Erdös number at the beginning of the conference?

(1) 2 (2) 3
(3) 4 (4) 5

24. The Erdös number of C at the end of the conference was:

(1) 1 (2) 2
(3) 3 (4) 4

25. The Erdös number of E at the beginning of the conference was:

(1) 2 (2) 5
(3) 6 (4) 7

LRDI - 14
Answers and Explanations

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1	2	**2**	3	**3**	4	**4**	3	**5**	1	**6**	4	**7**	2	**8**	1	**9**	2	**10**	4
11	2	**12**	3	**13**	–	**14**	–	**15**	–	**16**	3	**17**	–	**18**	3	**19**	–	**20**	3
21	4	**22**	2	**23**	2	**24**	2	**25**	3										

1. 2 Fixed cost = 1.5 lakh + 0.5 lakh = Rs. 2 lakh
Manufacturing cost = 40,000 × 20 + 15,000 × 25
= Rs. 8 lakh + Rs. 3.75 lakh = Rs. 11.75 lakh
∴ Total cost = 2 + 11.75 = 13.75 lakh

2. 3 Let x be the volume of belts sold.
$\therefore \quad 30x = 2{,}00{,}000 + 20x$
$x = 20{,}000$ units

3. 4 Fixed cost = Rs. 2 lakh
Profit per unit till a production of 40000 = Rs. 5
Hence, profit generated = Rs. 2 lakh.
So, the total production cost, including fixed cost, is equal to the total revenue at a production of 40,000 units. For every subsequent unit produced the selling price is equal to the cost price. So any production above 40,000 units would also give a zero profit scenario.

4. 3 Total cost = 200000 + 20 × 40000 + 25 × 30000
= Rs. 17.5 lakh
Profit = Rs. 1.5 lakh
∴ Sales = Rs. 19 lakh.
∵ only 80% of 70,000 belts were sold,
$\therefore$ Price per belt $= \frac{19{,}00{,}000}{56{,}000} = \text{Rs. } 33.9$

5. 1 Total cost = 200000 + 20 × 40000 + 15,000 × 25
= Rs. 13.75 lakh
Sales = 45,000 × 31.5 = Rs. 14.175 lakh
Gain = (14.175 – 13.75) lakh = Rs. 42,500

6. 4 Total cost = 200000 + 20 × 40000 + 35000 × 25
= Rs. 18.75 lakh
40% of the production = 30000
Revenue of 40% production = 30000 × 24
= Rs. 7.2 lakh
Revenue on account of the remaining production
= Rs. (18.75 – 7.2) = Rs. 11.55 lakh
Hence, selling price per belt for the remaining production
$= \frac{11.55}{45000} \times 10^5 = \text{Rs. } 25.66$

For questions 7 to 11:
In the first month, let SE in T5 be n, then SE in T4, T3, T2 and T1 become n + 1, n + 2, n + 3 and n + 4 respectively. As it is given that there are total of 10 SE,
n + n + 1 + n + 2 + n + 3 + n + 4 = 10
$\Rightarrow$ n = 0
Also, team assigned challenging task has one more employee, therefore, T1 has 5 employees in first months.

	T1	T2	T3	T4	T5
Month 1	SE - 4 RE - 1	SE - 3 RE - 1	SE - 2 RE - 2	SE - 1 RE - 3	SE - 0 RE - 4

Now, using the two statements (a) and (b) given in the question, we can form the following table with the distribution of number of employees:

Month	T1		T2		T3		T4		T5	
	SE	RE	SE	RE	SE	RE	SE	RE	SE	RE
1st	4	1	3	1	2	2	1	3	0	4
2nd	1	3	4	1	2	2	2	2	1	3
3rd	0	4	1	3	4	1	3	1	2	2
4th	0	4	1	3	2	2	5	0	2	2
5th	0	4	0	4	2	2	4	0	4	1

7. 2 From the table above, it can be observed that T2 has same composition in 3rd month and 4th month, while T4 does not have same composition for any consecutive months. Hence answer will be (1, 0).

8. 1 From the table, SE in T1 and T5 in third month is (0, 2).

9. 2 A challenging project earns 200 credits which when distributed equally among 5 team members will mean each employee getting 40 points. A standard project earns 100 credits which when distributed equally between 4 team members will earn 25 points for each employee. Thus total points earned by any employee will have to be some of combinations of five instances of either 40 or 25. Now 200 can be earned as 40 + 40 + 40 + 40 + 40; 140 can be earned as 25 + 25 + 25 + 25 + 40; 150 cannot be earned; 125 can be earned as 25 + 25 + 25 + 25 + 25.

10. 4 Since a total of 185 is possible only when the employee is worked for challenging project in 4 months and standard in 1 month, only T1, T3, T4, T5 is not possible as an employee cannot jump directly from T1 to T3.

11. 2 Since T1 and T3 have challenging projects in first and third months, and standard projects in all other months, Amit's total points = 40 + 25 + 40 + 25 + 25 = 155.

12. 3 Given value of the assets was distributed equally
∴ Neeta, Seeta & Geeta received 70 lakh each each.
Since, neeta received the least amount and Geeta received the highest amount in bank deposits
∴ The only possibility is
Neeta: 2 flats : 30 × 2 = 60 lakh and
70 – 60 = 10 lakh in bank deposit
Seeta: 1 house : 50 lakh and
70 – 50 = 20 lakh in bank deposit
Geeta: 70 – 10 – 20 = 40 lakh in bank deposit
Option (3).

13. Neeta received 2 flats.

14. Total assets is worth Rs = (210 + x) lakhs, where x is the number of Gold coins worth of 1 lakh each.
Given:
Ratio for assets is 1 : 2 : 3 and for gold coins is 2 : 3 : 4

$\therefore$ Seeta has $[210 + x] \times \frac{2}{6}$ lakhs of assets and

$x \times \frac{3}{9}$ gold coins.

$\Rightarrow \left(70 + \frac{x}{3}\right)$ lakhs, where $\frac{x}{3}$ is the gold coins and

70 lakhs (bank deposits, home and flat)
Since, one child got all three flats which costs = 3 × 30 = 90 lakhs
∴ Seeta doesn't get flats
and other than Geeta, one child got 30 lakhs in deposits
⇒ Seeta gets home, i.e. she has (70 – 50) = 20 lakhs in bank deposit.
∴ Neeta gets 30 lakhs indeposits and Geeta gets (70 – 30 – 20) lakhs = 20 lakhs in bank deposits.
Also, Geeta gets 3 flats each of 30 lakhs.
Let the number of gold coins received by Neeta, Seeta and Geeta be 2a, 3a, 4a respectively.

$\Rightarrow \frac{30 + 2a}{70 + 3a} = \frac{1}{2}$

⇒ a = 10
Gold coins (x) = (2 × 10) + 3(10) + 4 × 10 = 90.

15. 20 lakhs from above explanations.

16. 3 Required ratio = 30 : 20 : 20 = 3 : 2 : 2.

17. 11 Let original sequence be abcde.
Therefore, possible combinations could be:

bacde			
cbade	acbde		
dbcae	adcbe	abdce	
ebcda	aecdb	abedc	abced

⇒ 11 sequences.

18. 3 Let original sequence be abcde.
Therefore, possible combinations could be:

bacde			
badce	acbed		
baced	acbde	abdce	abced

⇒ 8 sequences.

19. 15 5 5 + 4 + 3 + 2 + 1
⇒ 15 sequences.

20. 3 Let original sequence be LRLTIM.
Therefore, possible combinations could be:

RLLTIM				
RLTLIM				
RLTLMI	LLRTIM			
RLLITM	LLRITM	LRTLIM		
RLLTMI	LLRTMI	LRTLMI	LRLITM	LRLTMI

For questions 21 to 25:
As only Paul Erdös was having an Erdös number of zero, so the minimum Erdös number among A, B, C, D, E, F, G, H should be 1 or greater than one. At the end of the third day, F co-authored a paper with A and C. F had the minimum Erdös number among the 8 people. So if F's Erdös number is y, then A and C's Erdös number should change to (y + 1) after third day. As A and C decreased the average by maximum possible extent, it means C had the second-height Erdös number among all eight, as A had an Erdös number of infinity. Suppose Erdös numbers of A, B, C, D, E, F, G, H are y + 1, b, y + 1, c, d, e, y, g, h respectively at the end of third day.
∴ (y + 1 + b + y + 1 + c + d + e + y + g + h) = 24 = (3 × 8)
⇒ 3y + 2 + b + d + e + g + h = 24
When E co-authored with F, the average Erdös number reduced again, it means, E's Erdös number was not the same with A & C initially. As at the end of third day, 5 people had same Erdös number, they should be A, C and any 3 out of B, D, G, H. Suppose those 3 people are B, D, G. Then
(3y + 2 + y + 1 + y + 1 + y + 1 + e + h) = 24
⇒ 6y + h + e = 19 …(i)

On the fifth day, E co-authored a paper with F and hence, Erdös number of E changed to (y + 1). Also the average decreased by 0.5 which means the total decreased by 4.
Hence, e – (y + 1) = 4
$\Rightarrow$ e – y = 5
Putting the value of e in equation (i), we get
6y + h + (5 + y) = 19
$\Rightarrow$ 7y + h = 14
Only possible value of y = 1 as h cannot be zero.
So after 3rd round Erdös number of A, C, E, F were 2, 2, 6, 1 respectively.

21. 4 Only A, C, E changed their Erdös number, rest 5 did not change their Erdös number.

22. 2 At the end of conference 6 people including E were having an Erdös number of 2 and F was having 1 as Erdös number. So 8th person was having an Erdös number of [20 – (2 × 6 + 1)] = 7

23. 2 At the end of 3rd round, 5 people were having same Erdös number. A and C changed their Erdös number after coauthoring with F. So, the other 3 will have same Erdös number in the beginning.

24. 2 2

25. 3 After co-authoring with F, E was having Erdös number of 2, which was 4 less than initial Erdös number of E. So answer is 2 + 4 = 6.