Special Test AVERAGE + Mathemtical Enequality By Alok Sir

1. There were 35 students in a hostel. If the number of students is increased by 7 the expenditure on food increases by Rs. 42 per day while the average expenditure of students is reduced by Rs. 1. What was the initial expenditure on food per day?
किसी छात्रावास में 35 विद्यार्थी थे। यदि विद्यार्थियों की संख्या 7 बढ़ जाती है, तो भोजन पर प्रतिदिन खर्चा रु० 42 बढ़ जाता है, जबकि प्रत्येक छात्र का औसत खर्चा रु० 1 कम हो जाता है। छात्रावास का प्रति दिन प्रारभिंक खर्चा कितना था?
(a) Rs. 400 (b) Rs. 432 (c) Rs. 442 (d) Rs. 420

2. Out of nine persons, 8 persons spent Rs. 30 each for their meals. The ninth one spent Rs. 20 more than the average expenditure of all the nine. The toal money spent by all of them was :
9 व्यक्तियों में से 8 व्यक्ति प्रत्येक खाने पर रु० 30 खर्च करता है। 9 वां व्यक्ति औसत की अपेक्षा रु० 20 अधिक खर्च करता है। सभी व्यक्तियों द्वारा खर्च कुल धन ज्ञात करें?
(a) Rs. 260 (b) Rs. 290
(c) Rs. 292.50 (d) Rs. 400.50

3. A cricketer has a mean score of 60 runs in 10 innings. Find out how many runs are to be scored in the eleventh innings to raise the mean score to 62?
एक बल्लेबाज का 10 पारियों का औसत 60 रन है। 11वीं पारी में व्यक्ति को कितने रन बनाना चाहिये, जिससे उसका औसत 62 हो जाये?
(a) 83 (b) 82 (c) 80 (d) 81

4. The batting average for 40 innings of a cricket player is 50 runs. His highest score exceeds his lowest socre by 172 runs. If these two innings are excluded, teh average of the remaining 38 innings is 48 runs. The highest score of the players of
किसी बल्लेबाज का 40 पारियों का औसत 50 रन है। बल्लेबाज का अधिकतम स्कोर, न्यूनतम स्कोर से 172 रन अधिक है। यदि इन दो पारियों को निकाल दिया जाये, तो बाकी 38 पारियों का औसत 48 रन हो जाता है। बल्लेबाज का अधिकतम स्कोर ज्ञात करें?
(a) 165 runs (b) 170 runs
(c) 172 runs (d) 174 runs

5. The average of six numbers is 3.95. The average of two of them is 3.4, while the average of the other two is 3.85. The average of the remaining two numbers is
छह संख्याओं का औसत 3.95 है। उनमें से दो का औसत 3.4 है। जबकि अन्य दो संख्याओं का औसत 3.4 है। शेष दो संख्याओं का औसत कितना है?
(a) 4.6 (b) 4.8 (c) 4.5 (d) 4.7

6. The average of six numbers, is 20. If one number is removed, the average becomes 15. What is the number removed ?
6 संख्याओं का औसत 20 है। यदि एक संख्या को हटा लिया जाए, नया औसत 15 हो जाता है। हटाई गयी संख्या ज्ञात करें?
(a) 5 (b) 35 (c) 112 (d) 45

7. The average of nine number is 50. The average of first five numbers is 54 and that of the last three numbers is 52. Then the sixth number is :
9 संख्याओं का औसत 50 है। प्रथम 5 संख्याओं का औसत 54 तथा अंतिम 3 संख्याओं का औसत 52 हो, तो 6 संख्या ज्ञात करें?
(a) 30 (b) 34 (c) 24 (d) 44

8. The average of 30 numbers is 40 and that of other 40 numbers is 30. The average of all the number is :
30 संख्याओं का औसत 40 तथा अन्य 40 संख्याआं का औसत 30 है। सभी संख्याओं का औसत ज्ञात करें?
(a) $34\frac{2}{7}$ (b) 35 (c) 34 (d) 34.5

9. The average of five numbers is 7. When three new numbers are included, the average of the eight numbers becomes 8.5. The average of the three new numbers is :
पाँच संख्याओं का औसत 7 है। जब तीन संख्याओं को सम्मलित किया जाता है, आठ संख्याओं का औसत 8.5 हो जाता है। नयी तीन संख्याओं का औसत ज्ञात करें
(a) 9 (b) 10.5 (c) 11 (d) 11.5

10. The average age of mother and her six children is 12 yrs, which is reduced by 5 yrs if the age of mother is excluded. The age of the mohter (in yrs) is :
मां और उसके 6 बच्चों की औसत आयु 12 वर्ष है जो मां की आयु की शामिल न करने पर 5 वर्ष कम हो जाती है। मां की आयु कितनी (वर्षो में) है?
(a) 40 (b) 50 (c) 42 (d) 48

11. Average age of seven persons in a group is 30 yrs, the average age of five persons of this group is 31 yrs. What is the average age of the other two persons in the group?
एक ग्रुप में सात व्यक्तियों की औसत आयु 30 वर्ष है, उस ग्रुप के पाँच व्यक्तियों की औसत आयु 31 वर्ष है। ग्रुप के अन्य दो व्यक्तियों की औसत आयु कितनी है?
(a) 55 yrs (b) 26 yrs
(c) none of these (d) 15 yrs

12. In a family of 5 members, the average are at persent is 33 yrs. The youngest memebr is 9 yrs old. The average age of the family just before the birth of the youngest member was:
5 सदस्यों के परिवार की वर्तमान औसत आयु 33 वर्ष है। सबसे छोटे सदस्य की आयु 9 वर्ष है। सबसे छोटे सदस्य के जन्म के समय परिवार की औसत आयु ज्ञात करें?
(a) 30 yrs (b) 29 yrs (c) 25 yrs (d) 24 yrs

13. Two yrs ago the average age of a family of 8 members was 18 yrs After the addition of a baby, the average age of the family is same today. What is the age of the baby?
2 वर्ष पूर्व परिवार की औसत आयु 18 वर्ष थी, जिसमें 8 सदस्य थे। एक बच्चे के सम्मिलित हो जाने के बाद, परिवार की वर्तमान आयु समान है। बच्चें की वर्तमान आयु ज्ञात करें?
(a) 2 yrs (b) $1\frac{1}{2}$ yrs (c) 1 yrs (d) $2\frac{1}{2}$ yrs

14. **5 yrs ago, the average age of P and Q was 15 yrs. Average age of P, Q adn R today is 20 yrs. How old will R be after 10 yrs?**
5 साल पहले, P एवं Q की औसत आयु 15 वर्ष है। P, Q एवं R की औसत आयु 20 वर्ष है। 10 वर्ष बाद R की आयु ज्ञात करें?
(a) 35 yrs (b) 40 yrs (c) 30 yrs (d) 50 yrs

15. **The average marks of 50 students in a class is 72. The average marks of boys and girls in that subject are 70 and 75 respectively. The number of boys in the class is :**
50 विद्यार्थियों की एक कक्षा में औसत अंक 72 हैं। उस विषय में लड़कों और लड़कियों के औसत अंक क्रमशः 70 और 75 हों, तो लड़कों की संख्या बताइए।
(a) 30 (b) 20 (c) 35 (d) 25

Directions (16-20) : In each of the following questions two equations are given. You have to solve them and give answer

(A) If $p < q$
(B) If $p > q$
(C) If $p \le q$
(D) If $p \ge q$
(E) If $p = q$ or the relationship can't be established.

16. **I.** $p^2 - 7p = -12$ **II.** $q^2 - 3q + 2 = 0$

17. **I.** $12p^2 - 7p = -1$ **II.** $6q^2 - 7q + 2 = 0$

18. **I.** $p^2 + 12p + 35 = 0$ **II.** $2q^2 + 22q + 56 = 0$

19. **I.** $p^2 - 8p + 15 = 0$ **II.** $q^2 - 5q = -6$

20. **I.** $2p^2 + 20p + 50 = 0$ **II.** $q^2 = 25$

Directions (21-25) In each questions below one or more equations(s) is/are provided. On the basis of these, you have to find out relation between p and q. Given your answer as (a), (b), (c), (d), (e) as per the following options :

(A) If $p = q$
(B) If $p > q$
(C) If $q > p$
(D) If $p \ge q$
(E) If $q \ge p$

21. **I.** $p^2 - 9p + 14 = 0$ **II.** $q^2 - q - 2 = 0$

22. **I.** $p^2 = 9$ **II.** $q^2 + 6q + 9 = 0$

23. **I.** $p(p+1)(p+2) = 0$ **II.** $q^2 + 8q + 15 = 0$

24. **I.** $p^2 - 19p + 88 = 0$ **II.** $q^2 - 48q + 576 = 0$

25. **I.** $3p + 12 = 4p + 6$ **II.** $q^2 + 17q + 72 = 0$

Directions (26-30) In each question below one or more equation (s) is/are given. ON the basis of these, you have to find out the relatinship between 'P' and 'Q'. Give answer.

(A) If $P = Q$
(B) If $P > Q$
(C) If $P < Q$
(D) If $P \le Q$
(E) If $P \ge Q$

26. **I.** $4P^2(P^{-1}) = 16$ **II.** $2Q^3.(Q^{-1}) = 18$

27. **I.** $P(P + 25) + 156 = 0$ **II.** $Q^2 - 144 = 0$

28. **I.** $6P^2 - 25P + 21 = 0$ **II.** $42Q^2 - 13Q = 42$

29. **I.** $5P + 2Q - 14 = 0$ **II.** $2P + 3Q = 10$

30. **I.** $P^2 + 23P + 132 = 0$ **II.** $Q^2 + 21Q + 110 = 0$

J ANSWER KEY

1. (d)	**2.** (c)	**3.** (b)	**4.** (d)	**5.** (a)	**6.** (d)	**7.** (c)	**8.** (a)	**9.** (c)	**10.** (c)
11. (c)	**12.** (a)	**13.** (a)	**14.** (d)	**15.** (b)	**16.** (b)	**17.** (a)	**18.** (e)	**19.** (d)	**20.** (c)
21. (d)	**22.** (d)	**23.** (b)	**24.** (c)	**25.** (b)	**26.** (b)	**27.** (d)	**28.** (d)	**29.** (a)	**30.** (d)

HINT & SOLUTIONS

1. **Let the average expenditure = Rs. x**
Accrding to question,

$$35 \times x + 42 = 42(x-1)$$
$$35x + 42 = 42x - 42$$
$$7x = 84$$
$$x = 12$$
$$\text{Initial expenditure} = 35 \times 12 = \text{Rs. } 420$$

2. **Let the average of 9 people expenditure = Rs. x**
According to the question

$$\frac{30 \times 8 + x + 20}{9} = x$$
$$240 + 20 + x = 9x$$
$$260 = 8x$$
$$x = \frac{260}{8}$$
$$x = 32.5$$

Total expenditure are $= 32.5 \times 9 =$ Rs. 292.5

3. **Let the scored in the eleventh innings = x**
According to the question

$$\frac{60 \times 10 + x}{11} = 62$$
$$600 + x = 682$$
$$x = 82$$

4. **Let the score of highest innings = x**
the score of lowest innings = y
According to the question
Average of 40 innings of Cricket player = 50 runs
sum of 40 innings runs $= 50 \times 40 = 2000$
Average of 38 innings runs = 48
Sum of 38 innings runs $= 48 \times 38 = 1824$
$\therefore$ $x + y = 2000 - 1824$

$$x + y = 176 \quad \ldots(i)$$
$$x - y = 172 \quad \ldots(ii)\ (\text{given})$$

Solve equaltion (i) and (ii) $x = 174$ $y = 2$
$\therefore$ Highest Scores = 174

5. **Let the six number are a, b, c, d, e, f**
According to the question,

$$\frac{a+b+c+d+e+f}{6} = 3.95$$
$$a + b + c + d + e + f = 237 \quad \ldots(i)$$
$$\frac{a+b}{2} = 3.4$$
$$a + b = 6.8 \quad \ldots(ii)$$
$$\frac{c+d}{2} = 3.85$$
$$c + d = 7.7 \quad \ldots(iii)$$

Put the value of eq (ii) & (iii) in eq

$$e + f = 23.7 - 7.7 - 6.8$$
$$e + f = 9.2$$
$$\text{Average} = \frac{9.2}{2} = 4.6$$

6. **According to the question**
Average of six number is = 20
Sum of six number is $= 20 \times 6 = 120$
one number is removed then
Averatge of five number is = 15
Sum of five number is $= 15 \times 5 = 75$
$\therefore$ removed number $= 120 - 75 = 45$

8. **According to the question**
Average of 30 numbers is = 40
Sum of 30 number is $= 40 \times 30 = 1200$
Average of 40 numbers is = 30
sum of 40 numbers is $= 40 \times 30 = 1200$

$$\text{Total average} = \frac{1200 + 1200}{70}$$
$$= \frac{2400}{70}$$
$$= 34\frac{2}{7}$$

9. **According to the question**
Average of five number is = 7
Sum of five numbers
are $= 7 \times 5 = 35$
Average of eight number is = 8.5
sum of eight numbers are $= 8 \times 8.5 = 68$
$\therefore$ Avg. if three new numbers $= \frac{33}{3} = 11$

10. **Mother + 6 children $= 12 \times 7 \Rightarrow 84$**
6 Children $= 6 \times 7 \Rightarrow 42$

11. **According to the question,**
Average age of 7 persons = 30 yrs
Sum of age of 7 persons
$= 30 \times 7 = 210$ yrs
Average age of 5 persons $= 31 \times 5 = 155$ yrs
$\therefore$ Sum of age of remaining two persons $= 210 - 155$
$= 55$ yrs
$\therefore$ Average of remaining two is $= \frac{55}{2}$

$$= 27\frac{1}{2} \text{ yrs.}$$

12. **According to the question**
Average age of 5 memebrs today = 33 yrs
Sum of age of 5 members today
$= 33 \times 5 = 165$ yrs

If the youngest member is 9 yrs old

$\therefore$ Sum of the age of 4 memebrs before the birth of youngest child

$= 165 - 9 - 4 \times 9$

$= 120$ yrs

$\therefore$ Average $= \frac{120}{4} = 30$ yrs

13. According to the question

Average age of 8 memebrs two yrs ago = 18 yrs

Sum of age of 8 memebrs two yrs ago = 144 yrs

After the addtion of a baby the average age of the family is same today.

i.e., Average age of 9 memebrs today = 18 yrs

Sum of age of 9 memeber today = 162 yrs

In these 2 yrs the age of 8 memebrs is also increase in age of 8 memeber $= 8 \times 2 = 16$ yrs

$\therefore$ Sum of age of a 8 memebrs today

$= 144 + 16 = 160$ yrs

$\therefore$ Age of child $= 162 - 160 = 2$ yrs

14. According to the question

$$\frac{P+Q}{2} = 15 \text{ yrs}$$

$P + Q = 30$ yrs (5 yrs ago)

$$\frac{P+Q+R}{3} = 20$$

$P + Q + R = 60$ (Present ago)

Sum of increased age of P and Q are $= 30 + 10 = 40$ yrs

$\therefore$ Present age of R $= 60 - 40 = 20$ yrs

$\therefore$ Age of R after 10 yrs $= 20 + 10 = 30$ yrs

15. From alligation method

$3R + 2R = 5R$

$5R = 50, \quad 1\text{ R} = 10$

Therefore number of boys in the class $= 3R$

$= 3 \times 10 = 30$

16. I. $p^2 - 7p = -12$

or, $p^2 - 7p + 12 = 0$

or, $(p-3)(p-4) = 0$

or, $p = 3$ or 4

II. $q^2 - 3q + 2 = 0$

or, $(q-2)(q-1) = 0$

or, $q = 1$ or 2

Hene, $p > q$

17. I. $12p^2 - 7p = -1$

or, $12p^2 - 7p + 1 = 0$

or, $(3p-1)(4p-1) = 0$

or, $p = \frac{1}{4}$ or $\frac{1}{3}$

II. $6q^2 - 7q + 2 = 0$

or, $(3q-2)(2q-1) = 0$

or, $q = \frac{1}{2}$ or $\frac{2}{3}$

Hence, $q > p$ or $p < q$

18. I. $p^2 + 12p + 35 = 0$

or, $(p+7)(p+5) = 0$

or, $p = -7$ or, -5

II. $2q^2 + 22q + 56 = 0$

or, $q^2 + 11q + 28 = 0$

or, $(q+7)(q+4) = 0$

or, $q = -7$ or -4

From the above values, we are unable to find the relationship between p and q.

19. I. $q^2 + 11q + 28 = 0$

or, $(p-3)(p-5) = 0$

or, $p = 3$ or 5

II. $q^2 - 5q + 6 = 0$

or, $(q-2)(q-3) = 0$

or, $q = 2$ or 3

Hence, $p \geq q$

20. I. $2p^2 + 20p + 50 = 0$

or, $p^2 + 10p + 25 = 0$

or, $(p+5)^2 = 0$

or, $p = -5$

II. $q^2 = 25$

or, $q = \pm 5$

Hence, $p \leq q$.

21. I. $(p-7)(p-2) = 0 \Rightarrow p = 2, 7$

II. $(q-2)(q+1) = 0 \Rightarrow q = 2, -1$

$\therefore p \geq q$

22. I. $p^2 = 9 \Rightarrow p = +3, -3$

II. $(q+3)^2 = 0 \Rightarrow q = -3$

$\therefore p \geq q$

23. I. $p = 0, -1, -2$

II. $(q+5)(q+3) = 0 \Rightarrow q = -5, -3$

$\therefore p > q$

24. I. $(p-11)(p-8 = 0 \Rightarrow p = 11, 8$

II. $(q-24)^2 = 0 \Rightarrow q = 24$

$\therefore p > q$

25. I. $p = 6$

II. $(q+8)(q+9) = 0 \Rightarrow q = -8, -9$

$\therefore p > q$

26. I. $4P^2(P^{-1}) = 16$

or $4P^2 . \frac{1}{P} = 16$

or, $4P = 16$

$\therefore P = 4$

II. $2Q^3(Q^{-1}) = 18$

or, $2Q^3 . \frac{1}{Q} = 18$

or, $Q^2 = 9$

or, $Q = \pm 3$

Hence, $P > Q$

27. I. $P^2 + 25P + 156 = 0$

or, $(P+12)(P+13) = 0$

$\therefore \quad P = -12, -13$

II. $Q^2 - 144 = 0$

or, $Q^2 = 144$

$\therefore \quad Q = \pm 12$

Hence, $Q \geq P$

28. **I.** $6P^2 - 25P + 21 = 0$

or, $6P^2 - 18P - 7P + 21 = 0$

or, $(P - 3)(6P - 7) = 0$

$\therefore \quad P = 3, \frac{7}{6}$

II. $42Q^2 - 13Q - 42 = 0$

or, $42Q^2 - 49Q + 36Q - 42 = 0$

or, $(7Q + 6)(6Q - 7) = 0$

$\therefore \quad Q = \frac{7}{6}, \frac{6}{7}$

Hence, $P \geq Q$

29. $P = Q$

30. $Q \geq P$

I. $P^2 + 23P + 132 = 0$

or, $P^2 + 11P + 12P + 132 = 0$

or, $(P + 11)(P + 12) = 0$

$\therefore \quad P = -11, -12$

II. $Q^2 + 21Q + 110 = 0$

or, $Q^2 + 11Q + 10Q + 110 = 0$

or, $(Q + 11)(Q + 10) = 0$

$\therefore \quad Q = -10, -11$

Hence, $Q \geq P$