ANSWERS AND EXPLANATIONS

EXERCISE 1

1. (a) Required average

$$= \frac{965 + 362 + 189 + 248 + 461 + 825 + 524 + 234}{8}$$

$$= \frac{3808}{8} = 476$$

2. (c) Average score

$$= \frac{1}{6}[221 + 231 + 441 + 359 + 665 + 525]$$

$$= \frac{1}{6}[2442] = 407$$

3. (a) Required average

$$= \frac{(341 + 292 + 254 + 375 + 505 + 639)}{6}$$

$$= \frac{2406}{6} = 401$$

4. (e) Required average

$$= \frac{118 + 186 + 138 + 204 + 175 + 229}{6}$$

$$= \frac{1050}{6} = 175$$

5. (d) Required average

$$= \frac{178 + 863 + 441 + 626 + 205 + 349 + 462 + 820}{8}$$

$$= \frac{3944}{8} = 493$$

6. (e) Required average

$$= \frac{361 + 188 + 547 + 296 + 656 + 132 + 263}{7}$$

$$= \frac{2443}{7} = 349$$

7. (a) Required average

$$= \frac{191 + 257 + 384 + 466 + 525 + 631}{6}$$

$$= \frac{2454}{6} = 409$$

8. (e) Average $= \frac{38 + 92 + 45 + 25 + 60}{5} = 52$

9. (e) $25a + 25b = 115$

$$a + b = \frac{115}{25} = 4.6$$

$\therefore$ Average of a and b $= \frac{4.6}{2} = 2.3$

10. (b) $21a + 21b = 1134$

or, $21(a + b) = 1134$

$a + b = \frac{1134}{21} = 54$

$\therefore$ Required average $= \frac{a+b}{2} = \frac{54}{2} = 27$

11. (b) $16a + 16b = 672$

or, $16(a + b) = 672$

$\therefore a + b = \frac{672}{16} = 42$

Required average $= \frac{a+b}{2} = \frac{42}{2} = 21$

12. (c) $37a + 37b = 5661$

or, $37(a + b) = 5661$

or, $a + b = \frac{5661}{37} = 153$

$\therefore$ Average $= \frac{a+b}{2} = \frac{153}{2} = 76.5$

13. (a) Assume the third number $= x$

According to question

$2 \times 280 + x + 178.5 \times 2 = 281 \times 5$

or, $560 + x + 357 = 1405$

or, $x + 917 = 1405$

or, $x = 1405 - 917 = 488$

14. (b) Age of the fourth friend $= 31 \times 4 - 32 \times 3$

$= 124 - 96 = 28$ years

15. (e) Let the first number be = 6x

∴ Second number = 3x

and the third number = 2x

According to the question,

6x + 3x + 2x = 154 × 3

or, 11x = 154 × 3

∴ x = $\dfrac{154 \times 3}{11} = 42$

∴ Required difference

= 6x – 2x = 4x = 4 × 42 = 168

16. (d) Let the five consecutive even numbers be x, $x + 2$, $x + 4$, $x + 6$ and $x + 8$ respectively.

According to the question,

$x + x + 2 + x + 4 + x + 6 + x + 8 = 5 \times 52$

or $5x + 20 = 260$

or $5x = 260 – 20$

or $x = \dfrac{240}{5} = 48$

∴ B = x + 2 = 48 + 2 = 50 and

E = x + 8 = 48 + 8 = 56

∴ B × E = 50 × 56 = 2800

17. (e) Let the A = x

According to the question

$x + x + 1 + x + 2 + x + 3 + x + 4$

= 5 × 48

⇒ 5x + 10 = 240

⇒ 5x = 230

∴ x = 46

∴ E = 46 + 4 = 50

∴ A × E = 46 × 50 = 2300

18. (a) Let the third number be = x

∴ First number = 3x and second number = $\dfrac{3x}{2}$

According to the question.

or, $3x + \dfrac{3x}{2} + x = 3 \times 121$

or, $\dfrac{6x + 3x + 2x}{2} = 3 \times 121$

or, $\dfrac{11x}{2} = 3 \times 121$

∴ x = $\dfrac{3 \times 121 \times 2}{11} = 66$

∴ Third number = 66

Required difference = 3x – x = 2x = 2 × 66 = 132

19. (c) Let the consecutive odd numbers be

x, x + 2, x + 4, x + 6 and   x + 8

According to the question.

$\dfrac{x + x + 2 + x + 4 + x + 6 + x + 8}{5} = 41$

or, 5x + 20 = 41 × 5 = 205

or, 5x = 205 – 20 = 185

∴ x = $\dfrac{185}{5} = 37$

∴ A = 37 and E = 37 + 8 = 45

Required product = 37 × 45 = 1665

20. (d) Let A = x,

According to the question,

∵ A + B + C + D + E

= x + (x + 2) + (x + 4) + (x + 6) + (x 8)

⇒ 5x + 20 = 34 × 5 = 170

⇒ B × D = 32 × 36 = 1152

21. (c) Let the other number is N.

Then, $\dfrac{X + N}{2} = XY \Rightarrow N = 2XY - X$

22. (a) Let the four consecutive odd nos. be $2x - 3$, $2x - 1$, $2x + 1$ and $2x + 3$.

Now, $2x = 12$ or, $x = 6$

Lowest odd no. = 2 × 6 – 3 = 9

23. (c) $\dfrac{E \quad H \quad G \quad M}{4} - \dfrac{E \quad S \quad M \quad H}{4}$ 15

$G - S = 60$

24. (c) Age of the CT = 25 × 16 – 24 × 15 = 400 – 360 = 40 yrs.

25. (c) Here one boy is excluded and final average of the group decreases.

∴ change in average is (–)ve = – 0.1 kg.

Using the formula

Sum of the quantities excluded

= $\begin{pmatrix} \text{Change in no. of quantities} \\ \times \\ \text{Original average} \end{pmatrix} + \begin{pmatrix} \text{Change in average} \\ \times \\ \text{Final no. of quantities} \end{pmatrix}$

⇒ weight of the boy who left = (1 × 45) – (– 0.1 × 49)

= 49.9 kg

∴ weight of the boy who left the class is 49.9 kg.

26. (c) Age of the teacher = (37 × 15 – 36 × 14) years

= 51 years.

27. (b) total weight increases = 8 × 1.5

= 12 kg

so the weight of new person = 65 + 12 = 77 kg

28. (e) Required persons $=\dfrac{325000-300000}{50}=500$

29. (e) Set the first, second and third no be F, S and T Respectively $\dfrac{F+S}{2}=\dfrac{S+T}{2}+15$. Solving, we get F – T = 30.

30. (c) $E + H = (55 \times 2 =) 110$;
$E + S = (65 \times 2 =) 130$
∴ Reqd difference = 130 – 110 = 20

31. (b) Let the four consecutive even nos. be
$2x$, $2x + 2$, $2x + 4$ and $2x + 6$ respectively.
Reqd difference = $2x + 6 – 2x = 6$

32. (d) Let the three consecutive odd numbers be
$x – 2$, x, $x + 2$ respectively.
According to question,

$x \dfrac{x\;2}{3}\;14$

$3x – x + 2 = 42 \Rightarrow 2x = 40$

$x = 20$ = an even number, which goes against our supposition.

33. (d) Correct average $=\dfrac{35\times 72 +(86-36)}{35}$

$\approx 72 + 1.43 = 73.43$

34. (a) Suppose the consecutive odd numbers are : x,
x + 2,
$x + 4$, $x + 6$ and $x + 8$
Therefore, the required difference = $x + 8 – x$ = 8

Note that answering the above question does not require the average of the five consecutive odd numbers.

35. (b) Let the average expenditure of all the nine be ₹ x.
Then, $12 \times 8 + (x + 8) = 9x$ or $8x = 104$ or $x = 13$.
∴ Total money spent = $9x = ₹ (9 × 13) = ₹ 117$.

36. (c) Since average price of a pencil = ₹ 2
∴ Price of 75 pencils = ₹ 150
∴ Price of 30 pens = ₹ (510 – 150) = ₹ 360

∴ Average price of a pen $\dfrac{360}{30}$ ₹ 12

37. (b) Required average marks

$=\dfrac{40\times 50+35\times 60+45\times 55+42\times 45}{40+35+45+42}$

$=\dfrac{2000+2100+2475+1890}{162}$

$=\dfrac{8465}{162}=52.25$

38. (d) Average of 20 numbers = 0.
∴ Sum of 20 numbers = $(0 \times 20) = 0$.
It is quite possible that 19 of these numbers may be positive and if their sum is a, then 20th number is (– a).

39. (b) Sum of the remaining two numbers
= $(3.95 \times 6) – [(3.4 \times 2) + (3.85 \times 2)]$
= 23.70 – (6.8 + 7.7) = 23.70 – 14.5 = 9.20

∴ Required average = $\left(\dfrac{9.2}{2}\right)=4.6$.

40. (c) Total marks = 45 × 50 = 2250

EXERCISE 2

1. (a) Given $A + B = 40$ …(i)
$C + B = 38$ … (ii)
$A + C = 42$ … (iii)
(i) + (ii) + (iii) $\Rightarrow A + B + C = 60$ …(iv)
from (i) and (iv), we get
C = 20 years
∴ B = 18 years and A = 22 years

2. (b) Sum of present ages of the six members
= (17 × 6) years = 102 years.
Sum of present ages of the 5 members (excluding baby) = 5 × (17 + 3) years = 100 years.
∴ Age of the baby = 102 – 100 = 2 years

3. (a) Let the number of persons, initially going for Picnic = x
∴ Sum of their ages = 16x

Also, $\dfrac{16x+15\times 20}{x+20}=15.5$

$\Rightarrow 0.5x = 10 \Rightarrow x = 20$ years

4. (b) Let 'x' be the average score after 12 th innings
$\Rightarrow 12 x = 11 \times (x – 2) + 65$
∴ x = 43

5. (c) Let there be x pupils in the class.

Total increase in marks = $\left(x\times\dfrac{1}{2}\right)=\dfrac{x}{2}$.

∴ $\dfrac{x}{2}=(83-63)\Rightarrow \dfrac{x}{2}=20\Rightarrow x=40$.

6. (a) Total runs in the first 10 overs
= 10 × 3.2 = 32
Run rate required in the remaining 40 overs

$=\dfrac{282-32}{40}=\dfrac{250}{40}=6.25$ runs per over

7. (b) Remaining pages = 512 – 302 = 210
   Let average printing error in remaining pages = x

   Then, $\dfrac{1208 + 210 \times x}{512} = 4$

   $\Rightarrow 210x = 840 \Rightarrow x = 4$

8. (b) Attendance on the fifth day = 32 × 5 – 30 × 4
   = 160 – 120 = 40

9. (d) Income of 6 months = ₹ (6 × 85) – debt
   = ₹ 510 – debt
   Income of the man for next 4 months
   = ₹ 4 × 60 + debt + ₹ 30
   = ₹ 270 + debt
   ∴ Income of 10 months = ₹ 780
   Average monthly income = ₹ 780 ÷ 10 = ₹ 78

10. (c) Total runs = 40 × 50 = 2000
    Let his highest score be = x
    Then his lowest score = x – 172

    Now $\dfrac{2000 - x - (x - 172)}{38} = 48$

    $\Rightarrow 2x = 2172 - 1824$
    $\Rightarrow x = 174$

11. (b) $\dfrac{(x+2) \times 60 + x \times 120 + (x-2) \times 180}{(x+2) + x + (x-2)} = 100$

    $\Rightarrow \dfrac{360x - 240}{3x} = 100$

    $\Rightarrow 60x = 240 \Rightarrow x = 4$

12. (b) Required average marks

    $= \dfrac{40 \times 50 + 35 \times 60 + 45 \times 55 + 42 \times 45}{40 + 35 + 45 + 42}$

    $= \dfrac{2000 + 2100 + 2475 + 1890}{162}$

    $= \dfrac{8465}{162} = 52.25$

13. (c) Let the average expenditure of all the nine be ₹ x
    Then, 3 × 8 + x + 2 = 9x ⇒ x = 3.25
    ∴ Total money spent = 9x = 9 × 3.25 = ₹. 29.25

14. (d) Let the number of wickets taken till the last match be x. Then,

    $\dfrac{12.4x + 26}{x + 5} = 12 \Rightarrow 12.4x + 26 = 12x + 60$

    $\Rightarrow 0.4x = 34 \Rightarrow x = \dfrac{34}{0.4} = \dfrac{340}{4} = 85.$

15. (c) Let the number of innings played in England be x.
    ∴ Total runs scored in England = 46 x

Total runs scored for innings played in India
= 55 × 4 = 220
(∵ the number of innings played in India = 4)

Also, $\dfrac{46x + 220}{x + 4} = 48$

$\Rightarrow 46x + 220 = 48x + 192$
$\Rightarrow 2x = 28 \Rightarrow x = 14$

16. (b) Let the original average expenditure be ₹. x. Then,
    42(x – 1) – 35x = 42 ⇔ 7x = 84 ⇒ x = 12.
    ∴ Original expenditure = ₹. (35 × 12) = ₹. 420.

17. (b) Required average $= \left(\dfrac{67 \times 2 + 35 \times 2 + 6 \times 3}{2 + 2 + 3} \right)$

    $= \left(\dfrac{134 + 70 + 18}{7} \right) = \dfrac{222}{7}$

    $= 31\dfrac{5}{7}$ years.

18. (d) Let Arun's weight be X kg.
    According to Arun, 65 < X < 72.
    According to Arun's brother, 60 < X < 70.
    According to Arun's mother, X < 68.
    The values satisfying all the above conditions are 66 and 67.
    ∴ Required average

    $= \left(\dfrac{66 + 67}{2} \right) = \left(\dfrac{133}{2} \right) = 66.5$ kg.

19. (a) Let the new man was younger than the director = x years and 3 years ago, the sum of ages of board of directors = S – 8 × 3 = S – 24
    Then, 3 years ago, average age of board of directors

    $= \dfrac{S - 24}{8}$

    Now, $\dfrac{S - 24}{8} = \dfrac{S - x}{8}$

    $\Rightarrow x = 24$ years
    Shortcut Method : If the new young director would have been not substituted, then total age would have increased at present by 8 × 3 = 24 years.
    Therefore, the new man is 24 years younger keeping the average at present same as 3 years ago.

20. (a) Sum of 10 numbers = 402
    Corrected sum of 10 numbers
    = 402 – 13 + 31 – 18 = 402

    Hence, new average $= \dfrac{402}{10} = 40.2$

21. (a) Let 'x' be the increase in the average

$\Rightarrow \quad x = \dfrac{(73-64)8}{n-8} \Rightarrow x = \dfrac{9 \times 8}{n-8}$

For 'x' to be a whole number 72 (= 9 × 8) should be divisible by (n + 8)

From the choices it can be said that 36 and 72 are two such factors. But 72 does not lie within the range.

∴ number of students in class are 36.

22. (c) If you assume the first number to be a, naturally next number would be 2 more than a and so on

$\Rightarrow$ The numbers are : a, a + 2, a + 4, a + 6, a + 8.

Hence, their average = Sum/5 = (a + 4)

23. (d) Sprouts 600 gms + Potatoes 1000 gms + Cauliflower 500 gms + Meat 700 gms = 2800 gms.

Hence total cooked food = 2100 gms and is served among 4 people.

Thus average weight is 525 gms.

24. (c) Total = mX, Sum of n numbers = nY

Average of remaining no. = (mX – nY) / (m – n)

25. (a) Let the ages of P, Q and R are a, b, c

$\Rightarrow$ a + b = 40, b + c = 38 and c + a = 42

$\Rightarrow \quad a + b + c = \dfrac{40 + 38 + 42}{2} = 60$

$\Rightarrow \quad a = 22, b = 18$ and c = 20

26. (d) The total age of the family at the birth of first child

= 18 × 3 = 53

While the total age of the couple at marriage = 25 × 2 = 50.

$\Rightarrow$ The years from marriage till the first child's birth

$= \dfrac{54 - 50}{2} = 2$ years.

The total age of family at the birth of the second child.

= 15 × 4 = 60 years.

$\Rightarrow$ Second child was born $= \dfrac{60 - 54}{3} = 2$ years after the first.

Similarly the twins were born $= \dfrac{(12-6) \times 60}{4} = 3$ years.

After the second child and today the twins are 4 years old.

(∵ average age of the family became 16 years from 12 years)

∴ Age of eldest son = 4 + 3 + 2 = 9 years.

Let p, m, r, s and b be the weights of boxers P, M, R, S and B respectively.

From data :

p = r + 14   .... (1)

b = s – 10   ... (2)

4m = p + b + r + s   ... (3)

p + b = m + s   ..... (4)

p + b + m + r + s = 520 ..... (5)

From (3) and (5); 5m = 520 $\Rightarrow$ m = 104 lb

From (1) and (2); p + b = r + s + 4   ... (6)

From (4) and (6) : r + s + 4 = m + s

$\Rightarrow$ r = m – 4 = 100 lb

From (1) : p = r + 14 = 114 lb

From (5) : 114 + b + 104 + s + 100 = 520

$\Rightarrow$ b + s = 202   ... (7)

From (7) and (2); b – s = 10

and b + s = 202 $\Rightarrow$ b $= \dfrac{192}{2} = 96$ lb and s = 106 lb

∴ Average of the weights of M and R

$= \dfrac{104 + 100}{2} = 102$ lb

Average of the weights of P, S and B

$= \dfrac{114 + 106 + 96}{3} = 105.3$ lb.

27. (b) Let the lowest marks be x

Then, $(x + 92) + 81 \times 8 = 800$

$\Rightarrow$ x + 92 = 152   ∴   x = 60

28. (b) Let no. of students in classes X, Y and Z = x, y and z respectively.

$\dfrac{83x + 76y}{x + y} = 79 \qquad ....(i)$

and $\quad \dfrac{76y + 85z}{y + z} = 81 \quad ....(ii)$

We have to find $\dfrac{83x + 76y + 85z}{x + y + z}$

From (i)   4x = 3y   or $y = \dfrac{4x}{3}$;

From (ii)   5y = 4z or $z = \dfrac{5}{4} y = \dfrac{5}{4} \times \dfrac{4}{3} x = \dfrac{5}{3} x$

∴ Required average $= \dfrac{83x + 76 \times \dfrac{4x}{3} + 85 \times \dfrac{5}{3} x}{\dfrac{3x}{3} + \dfrac{4x}{3} + \dfrac{5x}{3}}$

$$= \frac{83 + \frac{729}{3}}{4} = 81.5$$

29. (d) Average weight of the students in group D cannot be determined since we do not know the average weight of each student. The given data is insufficient to compare its average with other groups.

30. (c) If one student from group A is shifted to group B, still there is no effect on the whole class. In any case, the no. of students inside the class is same. Hence the average weight of the class remains same.

31. (c) Since all the students of the class have the same weight, then the average of weight of any group of any no. of students will be the same as that of each students weight. Hence, the average weight of D cannot be greater than average weight of A.

EXERCISE 3

1. (c) Let the number of Mechanical engineering graduates be M and Electronic engineering graduates be E. Then

$$\frac{2.45M + 3.56E}{M + E} = 3.12$$

$\Rightarrow 2.45M + 3.56E = 3.12M + 3.12E$

$\Rightarrow 0.44E = 0.67M$

$\Rightarrow E = \frac{0.67}{0.44}M = \frac{67}{44}M$

For E to be an integer, the least value will be 67.

2. (d) Total attendance for Day 1, 2, and 3 = 38 × 3 = 114

Total for Day 2, 3 and 4 = 126
Total for Day 2 and 3 = 126 − 42 = 84
Hence attendance on Day
1 = 114 − 84 = 30

3. (a) Given,

$$82 = \frac{(27 + x) + (31 + x) + (89 + x) + (107 + x) + (156 + x)}{5}$$

$\Rightarrow 82 \times 5 = 410 + 5x \Rightarrow 410 - 410 = 5x \Rightarrow x = 0$

∴ Required mean is,

$$\bar{x} = \frac{(130 + x) + (126 + x) + (68 + x) + (50 + x) + (1 + x)}{5}$$

$$\bar{x} = \frac{375 + 5x}{5} = \frac{375 + 0}{5} = \frac{375}{5} = 75$$

4. (b) $\frac{x_1 + x_2 + ... + x_{10}}{10} = 4.5$

$x_1 + x_2 + ... + x_{10} = 45$

and $x_{11} + x_{12} + ... + x_{40} = 105$

∴ $x_1 + x_2 + ... + x_{40} = 150$

∴ $\frac{x_1 + x_2 + ... + x_{40}}{40} = \frac{150}{40} = \frac{15}{4}$

5. (b) Sum of temp. for Monday, Tuesday and Wednesday

= 55 × 3 = 165°

Sum of temp. for Tuesday, Wednesday, an Thursday

= 60 × 3 = 180°

Since temp. on Thursday = 56°
⇒ Temp for Tue and Wed = 180 − 56 = 124°
⇒ Temp of Monday = 165 − 124 = 41°

6. (d) $\frac{42 \times 12 + 20 \times 10}{12 + 10} = \frac{504 + 200}{22} = \frac{704}{22} = 32$

7. (b) Let average of team = x years
Then, 25 + 28 + S₉ = 11x
… (i)
where S_9 is the sum of ages of remaining players
Also, Np + S₉ = 11(x − 2) ,
… (ii)
where Np is the sum of ages of new players
(i) − (ii) ⇒ 53 − Np = 22
⇒ Np = 31
∴ Average age of new two players

$= \frac{31}{2} = 15.5$ years

8. (b) Let the average after 17th inning = x.
Then, average after 16th inning = (x − 3).
∴ 16(x − 3) + 87 = 17x or x = (87 − 48) = 39.

9. (a) Corrected mean $= \frac{150 \times 30 - 135 + 165}{30}$

$= \frac{4500 - 135 + 165}{30} = \frac{4530}{30} = 151$

10. (d) Let the number of papers be x. Then, 63x + 20 + 2 = 65x or 2x = 22 or x = 11.

11. (c) Let average cost of petrol per litre be ₹ x

Then $x = \frac{12000}{\frac{4000}{7.5} + \frac{4000}{8} + \frac{4000}{8.5}}$

$= \frac{3}{\frac{2}{15} + \frac{1}{8} + \frac{2}{17}} = \frac{6120}{767} = Rs 7.98$ per litre

12. (d) Let the average score of 19 innings be x.

Then, $\frac{18x + 98}{19} = x + 4$

The average score after 20th innings
= x + 4 = 22 + 4 = 26

13. (b) Total weight of 45 students
= 45 × 52 = 2340 kg
Total weight of 5 students who leave
= 5 × 48 = 240 kg
Total weight of 5 students who join
= 5 × 54 = 270 kg
Therefore, new total weight of 45 students
= 2340 – 240 + 270 = 2370

$\Rightarrow$ New average weight $= \dfrac{2370}{45} = 52\dfrac{2}{3}$ kg

14. (c) Here one boy is excluded and final average of the group decreases.
∴ change in average is (–)ve = – 0.1 kg.
Using the formula
Sum of the quantities excluded

$$= \begin{pmatrix} \text{Change in no. of quantities} \\ \times \\ \text{Original average} \end{pmatrix} + \begin{pmatrix} \text{Change in average} \\ \times \\ \text{Final no. of quantities} \end{pmatrix}$$

$\Rightarrow$ weight of the boy who left = (1 × 45) – (– 0.1 × 49)

= 49.9 kg

∴ weight of the boy who left the class is 49.9 kg.

15. (d) Total sales for the first eleven months
= 12,000 × 11 = ₹.132000

Total sales for the whole year = ₹.11375 × 12 = ₹.136500

∴ Value of sales during the last month
= 136500 – 132000 = ₹.4500.

21. (a), 22. (c)