

Arithmetic (Level 2)

Question Paper, Set 08

Time: 1 hour 30 minutes

Maximum marks: 50

Name: _____ Class: _____ Date: _____

1. Answer all 20 questions. The marks for each question are shown in brackets.
2. Show your working for the 2, 3 and 5 mark questions.
3. The key sheet and worked solutions are at the end of this paper.

1. If A can finish a piece of work in 46 days, find A's 1 day's work. [1 mark]
2. A is twice as good a workman as B. A can finish a piece of work in 11 days. How many days will B take to finish it? [1 mark]
3. A piece of work is done by 14 men. If 16 men do the same work instead, find the ratio of the time taken by the 14 men to the time taken by the 16 men. [1 mark]
4. 27 men can finish a piece of work in 40 days. In how many days can 36 men finish the same work? [2 marks]
5. A can do a piece of work in 38 days and B can do it in 57 days. Find (A + B)'s 1 day's work. [1 mark]
6. A and B together can finish a piece of work in 15 days. A alone can do it in 24 days. In how many days can B alone do it? [2 marks]
7. A can do a piece of work in 12 days while B alone can do it in 42 days. With the help of C they can finish it in 4 days. If they are paid ₹1470 for the whole work, how should the money be divided among them? [5 marks]
8. A is thrice as good a workman as B and is therefore able to finish a piece of work in 16 days less than B. Find the time in which they can do it working together. [3 marks]
9. A and B together can do a piece of work in 57 days. B and C together can do it in 76 days. If A is twice as good a workman as C, find in what time B alone can do it. [3 marks]
10. A certain number of men complete a piece of work in 25 days. If there were 20 men more, the work could be finished in 10 days less. How many men were there originally? [2 marks]
11. If 3 men or 15 boys can finish a piece of work in 21 days, in how many days can 5 men and 20 boys finish it? [2 marks]
12. If 3 men with 6 boys can earn ₹2880 in 6 days and 9 men with 5 boys can earn ₹13695 in 11 days, in what time will 6 men with 7 boys earn ₹11505? [5 marks]
13. 48 men are employed to do a piece of work which they could finish in 25 days, but the men drop off by 6 at the end of every 8 days. In what time will the work be completed? [5 marks]

14. A can do half as much again as B can do in the same time. A alone can do a piece of work in 14 days. In how many days can both together finish it? [3 marks]
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15. The speed of a boat in still water is 14.5 km/hr and the speed of the stream is 1 km/hr. Find the speed of the boat upstream. [1 mark]
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16. A man can row downstream at the rate of 12 km/hr and upstream at 10 km/hr. Find the man's rate in still water and the rate of the current. [2 marks]
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17. A boat goes 11 km downstream in 4 hours. Find its speed downstream. [1 mark]
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18. A man rows upstream 35 km and downstream 37 km, taking 5 hours each time. What is the velocity of the current? [2 marks]
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19. A man can row 15 km/hr in still water. If the river is running at 3.5 km/hr, it takes him 3 hours to row to a place and back. How far is the place? [3 marks]
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20. The current of a stream runs at the rate of 2 km/hr. A motor boat goes 4 km upstream and back again to the starting point in 1 hour 30 minutes. Find the speed of the motor boat in still water. [5 marks]
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Key sheet

Q	Answer
1	$\frac{1}{46}$
2	22 days
3	8 : 7
4	30 days
5	$\frac{5}{114}$
6	40 days
7	A ₹490, B ₹140, C ₹840
8	6 days
9	114 days
10	30 men
11	7 days
12	13 days
13	$30\frac{2}{5}$ days
14	$8\frac{2}{5}$ days
15	13.5 km/hr
16	Rate in still water 11 km/hr, rate of current 1 km/hr
17	2.75 km/hr
18	0.2 km/hr
19	21.275 km
20	6 km/hr

Solutions

1. If A can finish a piece of work in 46 days, find A's 1 day's work. [1]

A finishes the whole work in 46 days.

$$\therefore \text{A's 1 day's work} = \frac{1}{46}$$

Ans: $\frac{1}{46}$

2. A is twice as good a workman as B. A can finish a piece of work in 11 days. How many days will B take to finish it? [1]

$$\text{Time taken by A} = \frac{1}{2} \times (\text{Time taken by B})$$

$$11 = \frac{1}{2} \times (\text{Time taken by B})$$

$$\therefore \text{Time taken by B} = 2 \times 11 = 22 \text{ days}$$

Ans: 22 days

3. A piece of work is done by 14 men. If 16 men do the same work instead, find the ratio of the time taken by the 14 men to the time taken by the 16 men. [1]

$$\text{No. of men} \propto \frac{1}{\text{Time taken}}$$

$$\frac{T_1}{T_2} = \frac{M_2}{M_1} = \frac{16}{14} = \frac{8}{7}$$

$$\therefore T_1 : T_2 = 8 : 7$$

Ans: 8 : 7

4. 27 men can finish a piece of work in 40 days. In how many days can 36 men finish the same work? [2]

$$\text{No. of men} \propto \frac{1}{\text{Time taken}}$$

$$27 \times 40 = 36 \times x$$

$$x = \frac{27 \times 40}{36} = 30 \text{ days}$$

Ans: 30 days

5. A can do a piece of work in 38 days and B can do it in 57 days. Find (A + B)'s 1 day's work. [1]

$$(A + B)\text{'s 1 day's work} = \frac{1}{38} + \frac{1}{57} = \frac{3+2}{114} = \frac{5}{114}$$

Ans: $\frac{5}{114}$

6. A and B together can finish a piece of work in 15 days. A alone can do it in 24 days. In how many days can B alone do it? [2]

$$(A + B)\text{'s 1 day's work} = \frac{1}{15}$$

$$\text{A's 1 day's work} = \frac{1}{24}$$

$$\Rightarrow \text{B's 1 day's work} = \frac{1}{15} - \frac{1}{24} = \frac{8-5}{120} = \frac{3}{120} = \frac{1}{40}$$

$\therefore$ B alone can finish the work in 40 days.

Ans: 40 days

7. A can do a piece of work in 12 days while B alone can do it in 42 days. With the help of C they can finish it in 4 days. If they are paid ₹1470 for the whole work, how should the money be divided among them? [5]

$$\text{A's 1 day's work} = \frac{1}{12}$$

$$\text{B's 1 day's work} = \frac{1}{42}$$

$$(\text{A} + \text{B})\text{'s 1 day's work} = \frac{1}{12} + \frac{1}{42} = \frac{7+2}{84} = \frac{9}{84} = \frac{3}{28}$$

$$\text{Given } (\text{A} + \text{B} + \text{C})\text{'s 1 day's work} = \frac{1}{4}$$

$$\text{C's 1 day's work} = \frac{1}{4} - \frac{3}{28} = \frac{7-3}{28} = \frac{4}{28} = \frac{1}{7}$$

$$\text{Consider } \frac{1}{12} : \frac{1}{42} : \frac{1}{7} = \frac{7}{84} : \frac{2}{84} : \frac{12}{84} = 7 : 2 : 12$$

∴ ₹1470 must be divided in the ratio 7 : 2 : 12 (7 + 2 + 12 = 21)

$$\text{A's share} = 1470 \times \frac{7}{21} = 490, \text{ i.e. ₹490}$$

$$\text{B's share} = 1470 \times \frac{2}{21} = 140, \text{ i.e. ₹140}$$

$$\text{C's share} = 1470 \times \frac{12}{21} = 840, \text{ i.e. ₹840}$$

Ans: A ₹490, B ₹140, C ₹840

8. A is thrice as good a workman as B and is therefore able to finish a piece of work in 16 days less than B. Find the time in which they can do it working together. [3]

Suppose B finishes the work in x days

⇒ A is able to finish it in $(x - 16)$ days

Time taken by A = $\frac{1}{3}$ (Time taken by B)

$$\therefore x - 16 = \frac{1}{3}x$$

$$\Rightarrow 3x - 48 = x \Rightarrow 2x = 48 \Rightarrow x = 24$$

∴ Time taken by B = 24 days, time taken by A = 8 days

$$\text{A's 1 day's work} = \frac{1}{8}, \text{ B's 1 day's work} = \frac{1}{24}$$

$$(\text{A} + \text{B})\text{'s 1 day's work} = \frac{1}{8} + \frac{1}{24} = \frac{3+1}{24} = \frac{4}{24} = \frac{1}{6}$$

A and B together can finish the work in 6 days

Ans: 6 days

9. A and B together can do a piece of work in 57 days. B and C together can do it in 76 days. If A is twice as good a workman as C, find in what time B alone can do it. [3]

$$(\text{A} + \text{B})\text{'s 1 day's work} = \frac{1}{57}, (\text{B} + \text{C})\text{'s 1 day's work} = \frac{1}{76}$$

A's 1 day's work = C's 2 days' work

$$\text{C's 2 days' work} + \text{B's 1 day's work} = \frac{1}{57}$$

$$\Rightarrow \text{C's 1 day's work} + (\text{B} + \text{C})\text{'s 1 day's work} = \frac{1}{57}$$

$$\Rightarrow \text{C's 1 day's work} + \frac{1}{76} = \frac{1}{57}$$

$$\text{C's 1 day's work} = \frac{1}{57} - \frac{1}{76} = \frac{4-3}{228} = \frac{1}{228}$$

$$\text{B's 1 day's work} = \frac{1}{76} - \frac{1}{228} = \frac{3-1}{228} = \frac{2}{228} = \frac{1}{114}$$

∴ B alone can finish the work in 114 days

Ans: 114 days

10. A certain number of men complete a piece of work in 25 days. If there were 20 men more, the work could be finished in 10 days less. How many men were there originally? [2]

Let the original number of men be x

$$\text{No. of men} \propto \frac{1}{\text{No. of days}}$$

$$x \times 25 = (x + 20) \times 15$$

$$25x = 15x + 300$$

$$10x = 300 \Rightarrow x = 30$$

Ans: 30 men

11. If 3 men or 15 boys can finish a piece of work in 21 days, in how many days can 5 men and 20 boys finish it? [2]

$$3 \text{ men} = 15 \text{ boys}$$

$$5 \text{ men} = \frac{15}{3} \times 5 = 25 \text{ boys}$$

$$5 \text{ men} + 20 \text{ boys} = 25 \text{ boys} + 20 \text{ boys} = 45 \text{ boys}$$

$$\text{No. of boys} \propto \frac{1}{\text{No. of days}}$$

$$15 \times 21 = 45 \times x \Rightarrow x = 7 \text{ days}$$

Ans: 7 days

12. If 3 men with 6 boys can earn ₹2880 in 6 days and 9 men with 5 boys can earn ₹13695 in 11 days, in what time will 6 men with 7 boys earn ₹11505? [5]

Let 1 man earn ₹ x and 1 boy earn ₹ y in 1 day.

$$(3x + 6y) \times 6 = 2880 \Rightarrow 3x + 6y = 480 \quad \dots (1)$$

$$(9x + 5y) \times 11 = 13695 \Rightarrow 9x + 5y = 1245 \quad \dots (2)$$

$$(1) \times 3 \Rightarrow 9x + 18y = 1440$$

$$(1) \times 3 - (2) \Rightarrow 13y = 195 \Rightarrow y = 15$$

$$\text{From (1): } 3x = 480 - 90 = 390 \Rightarrow x = 130$$

$$(6x + 7y)n = 11505$$

$$\Rightarrow (780 + 105)n = 11505 \Rightarrow 885n = 11505$$

$$\Rightarrow n = 13 \text{ days}$$

Ans: 13 days

13. 48 men are employed to do a piece of work which they could finish in 25 days, but the men drop off by 6 at the end of every 8 days. In what time will the work be completed? [5]

$$\text{Work done by 48 men in 8 days} = 8 \times \frac{1}{25} = \frac{8}{25}$$

$$\text{So 1 man's work in 8 days} = \frac{8}{25} \div 48 = \frac{1}{150}$$

$$\text{Remaining work} = \frac{17}{25}, \text{ remaining men} = 42; \text{ work done by 42 men in 8 days} = 42 \times \frac{1}{150} = \frac{7}{25}$$

$$\text{Remaining work} = \frac{2}{5}, \text{ remaining men} = 36; \text{ work done by 36 men in 8 days} = 36 \times \frac{1}{150} = \frac{6}{25}$$

$$\text{Remaining work} = \frac{4}{25}, \text{ remaining men} = 30; \text{ work done by 30 men in 8 days} = \frac{1}{5}$$

$$\frac{4}{25} \text{ work is done by 30 men in } \frac{4}{25} \div \frac{1}{5} \times 8 = 6\frac{2}{5} \text{ days}$$

$$\text{Total time} = 8 + 8 + 8 + 6\frac{2}{5} = 30\frac{2}{5} \text{ days}$$

Ans: $30\frac{2}{5}$ days

14. A can do half as much again as B can do in the same time. A alone can do a piece of work in 14 days. In how many days can both together finish it? [3]

If B does x , A does $\frac{x}{2} + x = \frac{3x}{2}$ in the same time

Ratio of working of A and B = $\frac{3}{2} : 1 = 3 : 2$

Ratio of time taken for the same work = $2 : 3$

Time taken by A = $2k = 14 \Rightarrow k = 7$

Time taken by B = $3k = 21$ days

A's 1 day's work = $\frac{1}{14}$, B's 1 day's work = $\frac{1}{21}$

(A + B)'s 1 day's work = $\frac{1}{14} + \frac{1}{21} = \frac{3+2}{42} = \frac{5}{42}$

Time taken by (A + B) to finish the work = $8\frac{2}{5}$ days

Ans: $8\frac{2}{5}$ days

15. The speed of a boat in still water is 14.5 km/hr and the speed of the stream is 1 km/hr. Find the speed of the boat upstream. [1]

Speed upstream = $(x - y)$ km/hr

= $14.5 - 1 = 13.5$ km/hr

Ans: 13.5 km/hr

16. A man can row downstream at the rate of 12 km/hr and upstream at 10 km/hr. Find the man's rate in still water and the rate of the current. [2]

Let the man's rate in still water be x km/hr and the rate of the current be y km/hr.

Given $x + y = 12$ and $x - y = 10$

Adding, $2x = 22 \Rightarrow x = 11$ km/hr

Subtracting, $2y = 2 \Rightarrow y = 1$ km/hr

Ans: Rate in still water 11 km/hr, rate of current 1 km/hr

17. A boat goes 11 km downstream in 4 hours. Find its speed downstream. [1]

Speed = $\frac{\text{Distance}}{\text{Time}}$

= $\frac{11}{4} = 2.75$ km/hr

Ans: 2.75 km/hr

18. A man rows upstream 35 km and downstream 37 km, taking 5 hours each time. What is the velocity of the current? [2]

Speed downstream: $x + y = \frac{37}{5}$ km/hr

Speed upstream: $x - y = \frac{35}{5}$ km/hr

Subtracting, $2y = \frac{37}{5} - \frac{35}{5} = \frac{2}{5}$

$y = \frac{2}{10} = 0.2$ km/hr

Ans: 0.2 km/hr

19. A man can row 15 km/hr in still water. If the river is running at 3.5 km/hr, it takes him 3 hours to row to a place and back. How far is the place? [3]

Let the required distance be d km

Speed downstream = $15 + 3.5 = 18.5$ km/hr

Speed upstream = $15 - 3.5 = 11.5$ km/hr

Time = $\frac{\text{Distance}}{\text{Speed}}$, so $\frac{d}{18.5} + \frac{d}{11.5} = 3$

$$\Rightarrow d \left(\frac{2}{37} + \frac{2}{23} \right) = 3$$

$$\Rightarrow d \times \frac{120}{851} = 3$$

$$\Rightarrow d = 21.275 \text{ km}$$

Ans: 21.275 km

20. The current of a stream runs at the rate of 2 km/hr. A motor boat goes 4 km upstream and back again to the starting point in 1 hour 30 minutes. Find the speed of the motor boat in still water. [5]

Let the speed of the boat in still water be x km/hr

Speed upstream = $(x - 2)$ km/hr, speed downstream = $(x + 2)$ km/hr

Total time = 90 min = $\frac{90}{60}$ hr = $\frac{3}{2}$ hr

$$\frac{4}{x-2} + \frac{4}{x+2} = \frac{3}{2}$$

$$\Rightarrow 4 \left(\frac{(x+2)+(x-2)}{(x-2)(x+2)} \right) = \frac{3}{2}$$

$$\Rightarrow \frac{8x}{x^2-4} = \frac{3}{2}$$

$$\Rightarrow 16x = 3x^2 - 12$$

$$\Rightarrow 3x^2 - 16x - 12 = 0$$

$$\Rightarrow (x - 6)(3x + 2) = 0$$

$$\Rightarrow x = 6 \text{ (or) } x = -\frac{2}{3} \text{ (rejected, a speed cannot be negative)}$$

$\therefore$ Speed of the boat in still water = 6 km/hr

Ans: 6 km/hr
