Chapter-11

Time and work

Exercise 11.1

Q.1 Rakesh can do a piece of work in 20 days. How much work can he do in 4 days?

Solution: Time taken to finish a work = 20 days.

∴ portion of work completed in 1 day $= \frac{1}{20}$

Hence work done in 4 days $= \frac{1}{20} \times 4 = \frac{1}{5}$

∴ $\frac{1}{5}$th of work done in 4 days.

Q2 Rohan can paint $\frac{1}{3}$ of a painting in 6 days. How many days will he take to complete the painting?

Sol: ∵ Time taken to complete $\frac{1}{3}$rd painting = 6 days

∴ Time taken to complete the work $= 6 \times 3 = 18$ days.

Q.3 Anil can do a piece of work in 5 days and Ankur in 4 days. How long will they take to do the same work, if they work together.

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Sol: Time taken by Anil to complete the work = 5 days

$\therefore$ Anil's 1 day work = $\frac{1}{5}$

Time taken by Ankur to complete the work = 4 day

$\therefore$ Ankur's 1 day work = $\frac{1}{4}$

Thus, work done by both in 1 day = $\frac{1}{5}+\frac{1}{4}$

$= \frac{4+5}{20} = \frac{9}{20}$.

$\therefore$ Time taken to complete the job = $\frac{20}{9} = 2\frac{2}{9}$ days.

Q.4 Mohan takes 9 hours to mow a large lawn. He and Sohan together can mow it in 4 hours. How long will Sohan take to mow the lawn if he works alone?

Sol: Time taken by Mohan to mow the lawn = 9 hours.

portion of lawn mowed in 1 hour = $\frac{1}{9}$

also, Mohan and Sohan together mow the lawn = 4 hours.

portion of work done by both in 1 hour = $\frac{1}{4}$

$\therefore$ Portion of work done by Sohan in 1 hour

$= \frac{1}{4}-\frac{1}{9} = \frac{9-4}{36} = \frac{5}{36}$

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∴ Time taken by Sohan Alone to finish the work
$= \frac{36}{5}$ hours.

Q5 Sita can finish typing a 100 page document in 9 hours. Mita in 6 hours and Rita in 12 hours. How long will they take to type it if they work together.

Sol: Time taken by Sita = 9 hours.

∴ Sita's 1 hour work = $\frac{1}{9}$

Time taken by Rita = 12 hours.

∴ Rita's 1 hour work = $\frac{1}{12}$

also Time taken by Mita = 6 hours

Mita's one hour work = $\frac{1}{6}$

Now (Sita + Mita + Rita)'s 1 hour work = $\frac{1}{9} + \frac{1}{12} + \frac{1}{6}$

$= \frac{4+3+6}{36}$

$= \frac{13}{36}$ hours.

∴ Total time taken by them $= \frac{36}{13}$ hours.

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Q6 A, B and C working together can do a piece of work in 8 hours. A alone can do it in 20 hours and B alone can do it in 24 hours. In how many hours will C alone do the same work?

Sol: Time taken by (A+B+C) to finish a work = 8 hours

Time taken by A = 20 hours, Time taken by B = 24 hours

$\therefore$ (A+B+C)'s one hour work = $\frac{1}{8}$

A's one hour work = $\frac{1}{20}$

B's one hour work = $\frac{1}{24}$

$\therefore$ C's one hour work = $\frac{1}{8} - \left(\frac{1}{20} + \frac{1}{24}\right)$

$= \frac{1}{8} - \left(\frac{6+5}{120}\right)$

$= \frac{1}{8} - \frac{11}{120} = \frac{15-11}{120}$

$= \frac{4}{120} = \frac{1}{30}$

$\therefore$ Time taken by C alone to finish the work = 30 days.

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Q.7 A and B can do a piece of work in 18 days, B and C in 24 days and A and C in 36 days. In what time can they do it, all working together.

Sol: (A+B) Can finish the work = 18 days

(B+C) can finish work = 24 days.

(A+C) can finish work = 36 days.

$\therefore$ (A+B)'s 1 day work $= \frac{1}{18}$

(B+C)'s 1 day work $= \frac{1}{24}$

(A+C)'s 1 day work $= \frac{1}{36}$

By Adding, we get

2(A+B+C)'s 1 day work $= \frac{1}{18} + \frac{1}{24} + \frac{1}{36}$

$= \frac{4+3+2}{72} = \frac{9}{72} = \frac{1}{8}$

$\therefore$ (A+B+C)'s 1 day work $= \frac{1}{2\times 8} = \frac{1}{16}$

$\therefore$ A, B and C together can finish the work in 16 days.

Q.8 A and B can do a piece of work in 12 days, B and C in 15 days, C and A in 20 days. How much time will A alone take to finish the work?

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Solution : (A+B) can finish the work = 12 days

(B+C) can finish the work = 15 days.

(A+C) can finish the work = 20 days.

$\therefore$ (A+B)'s one day work $= \frac{1}{12}$

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

(A+C)'s one day work $= \frac{1}{20}$

Therefore

$2(A+B+C)'s \text{ 1 day work} = \frac{1}{12} + \frac{1}{15} + \frac{1}{20}$

$= \frac{5+4+3}{60}$

$= \frac{12}{60}$

$= \frac{1}{5}$

$\Rightarrow (A+B+C)'s \text{ one day work} = \frac{1}{2\times 5} = \frac{1}{10}$

Now A's one day work = (A+B+C)'s 1 day work
$-$ (B+C)'s 1 day work

$= \frac{1}{10} - \frac{1}{15} = \frac{6-4}{60}$

$= \frac{2}{60} = \frac{1}{30}$

$\therefore$ Time taken by A alone to finish the work
$= 30$ days.

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Q.9 A, B and C can reap a field in $15\frac{3}{4}$ days. B, C and D in 14 days; C, D and A in 18 days; D, A and B in 21 days. In what time can A, B, C and D together reap it?

Sol: Time taken by (A+B+C) = $15\frac{3}{4}$ days = $\frac{63}{4}$ days

$\therefore$ (A+B+C)'s one day work = $\frac{4}{63}$

Time taken by (B+C+D) = 14 days

$\therefore$ (B+C+D)' 1 day work = $\frac{1}{14}$

Time taken by (C+D+A) = 18 days

$\therefore$ (C+D+A)'s 1 day work = $\frac{1}{18}$

also, Time taken by (D+A+B) = 21 days

$\therefore$ (D+A+B)'s 1 day work = $\frac{1}{21}$

By Adding

3 (A+B+C+D)'s one day work

$= \frac{4}{63} + \frac{1}{14} + \frac{1}{18} + \frac{1}{21}$

$= \frac{8+9+7+6}{126} = \frac{30}{126}$

$= \frac{15}{63} = \frac{5}{21}$

$\Rightarrow$ (A+B+C+D)'s one day $= \frac{5}{21\times3} = \frac{5}{63}$

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$\therefore$ Time taken by (A+B+C+D) to finish the job

$$= \frac{63}{5} = 12\frac{3}{5} \text{ days.}$$

Q10 A and B can polish the floors of a building in 10 days. A alone can do $\frac{1}{4}$th of it in 12 days. In how many days can B alone do it?

Sol: (A+B) can polish the floor = 10 days

(A+B)'s one day work $= \frac{1}{10}$

Time taken by A to do $\frac{1}{4}$th work = 12 days

$\therefore$ Time taken by A = $12 \times 4 = 48$ days

$\Rightarrow$ A's one day work $= \frac{1}{48}$

$\therefore$ B's one day work $= \frac{1}{10} - \frac{1}{48} = \frac{24-5}{240} = \frac{19}{240}$

$\therefore$ Time taken By B alone to do the work

$$= \frac{240}{19} = 12\frac{12}{19} \text{ days.}$$

Q.11 A and B can finish a work in 20 days. A alone can do $\frac{1}{5}$th of the work in 12 days. In how many days can B alone do it?

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Sol: Time taken by (A+B) to finish the work
= 20 days.

∴ (A+B)'s one day work = $\frac{1}{20}$

Time taken by A to do $\frac{1}{5}$th work = 12 days

∴ Time taken by A to finish the work
= 12×5 = 60 days

A's one day work = $\frac{1}{60}$

∴ B's one day work = $\frac{1}{20} - \frac{1}{60} = \frac{3-1}{60}$

$= \frac{2}{60} = \frac{1}{30}$

Therefore B will finish the work in 30 days.

Q.12 A and B can do a piece of work in 20 days and B in 15 days. They work together for 2 days and then A goes away. In how many days will B finish the remaing work?

Sol: Time taken by (A+B) to finish work = 20 days
also, By B to finish the work = 15 days.

(A+B)'s one day work = $\frac{1}{20}$

B's one day work = $\frac{1}{15}$

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Then (A+B)'s 2 days work $= 2 \times \frac{1}{20} = \frac{1}{10}$

Remaining work $= 1 - \frac{1}{10}$

$= \frac{9}{10}$

Now, Time taken by B to do remaining work

$= \frac{9}{10} \div \frac{1}{15}$

$= \frac{9}{10} \times 15 = \frac{27}{2} = 13\frac{1}{2}$ days.

Q.13 A can do a piece of work in 40 days and B in 45 days. They work together for 10 days and then B goes away. In how many days will A finish the remaining work.

Solution: Time taken by A to finish the work = 40 days

Time taken by B to finish the work = 45 days.

$\therefore$ A's 1 day work $= \frac{1}{40}$

B's 1 day work $= \frac{1}{45}$

(A+B)'s one day work $= \frac{1}{40} + \frac{1}{45}$

$= \frac{9+8}{360} = \frac{17}{360}$

$\therefore$ (A+B)'s 10 days work $= \frac{17}{360} \times 10$

$= \frac{17}{36}$

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Remaining work $= 1 - \frac{17}{36}$

$= \frac{36-17}{36} = \frac{19}{36}$

∴ Time taken by A to finish this work

$= \frac{19}{36} \div \frac{1}{40}$

$= \frac{19}{36} \times 40 = \frac{190}{9} = 21\frac{1}{9}$ days.

Q.14 Aasheesh can paint his doll in 20 minutes and his sister Chinki can do so in 25 minutes. They paint the doll together for five minutes. At this juncture they have a quarrel and Chinki withdraws from painting. In how many minutes will Aasheesh finish the painting of the remaining doll?

Sol: Time taken by Ashish to paint a doll = 20 minutes.

Time taken by Chinki to paint a doll = 25 min

Then portion of doll painted by Ashish in 1 min $= \frac{1}{20}$

by Chinki in 1 min $= \frac{1}{25}$

∴ (Ashish + Chinki)'s 1 min work $= \frac{1}{20} + \frac{1}{25}$

$= \frac{5+4}{100}$

$= \frac{9}{100}$

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$\therefore$ (Ashish + chiranji)'s 5 min work $= \frac{9}{100} \times 5$

$= \frac{9}{20}$

Remaining work $= 1 - \frac{9}{20}$

$= \frac{11}{20}$

$\therefore$ Time taken by Ashish to paint remaining doll

$= \frac{11}{20} \div \frac{1}{20} = \frac{11}{20} \times 20$

$= 11$ Minutes.

Q.15 A and B can do a piece of work in 6 days and 4 days respectively. A started the work; worked at it for 2 days and then was joined By B. Find the total time taken to complete the work.

Sol: A can do the work in 6 days

B can do $= 4$ days

A's one day work $= \frac{1}{6}$

B's one day work $= \frac{1}{4}$

Now A's two days work $= \frac{1}{6} \times 2 = \frac{1}{3}$

Remaining work $= 1 - \frac{1}{3} = \frac{2}{3}$

(A+B)'s one day work $= \frac{1}{6} + \frac{1}{4} = \frac{2+3}{12}$

$= \frac{5}{12}$

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∴ Time taken by (A+B) to do the remaing work

$$= \frac{2}{3} \div \frac{5}{12} = \frac{2}{3} \times \frac{\overset{4}{12}}{5}$$

$$= \frac{8}{5} \text{ days.}$$

hence Total time taken

$$= 2 + \frac{8}{5} = \frac{10+8}{5}$$

$$= \frac{18}{5} = 3\frac{3}{5} \text{ days.}$$

Q.16 6 men can complete the electric fitting in a building in 7 days. How many days will it take if 21 men do the job?

Sol: 6 Men can complete the job = 7 days.

1 man can complete the job = $7 \times 6 = 42$ days.

∴ 21 men can do it = $\frac{42}{21} = 2$ days

Q.17 8 men can do a piece of work in 9 days. In how many days will 6 men do it?

Sol: 8 Men can Complete the work = 9 days

∴ 1 man can complete = $9 \times 8 = 72$ days.

∴ 6 men can finish the job = $\frac{72}{6} = 12$ days.

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Q.18 Reema weaves 35 baskets in 25 days. In how many days will she weave 55 baskets?

Sol. Reema weaves 35 baskets in = 25 days.

Time taken to weave 1 basket $= \frac{25}{35}$

∴ Time taken to weave 55 basket

$= \frac{25}{\cancel{35}_{7}} \times \overset{11}{\cancel{55}} = \frac{275}{7}$

$= 39\frac{2}{7}$ days.

Q.19 Neha types 75 pages in 14 hours, How many pages will she type in 20 hours.

Sol: No. of pages 75 x

Time 14 20

∴ It is direct variation

$\Rightarrow \frac{75}{14} = \frac{x}{20}$

$\Rightarrow x = \frac{75}{14} \times 20 = \frac{750}{7} = 107\frac{1}{7}$

Q.20 If 12 boys earn Rs 840 in 7 days, what will 15 boys earn in 6 days?

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Sol: Earning of 12 boys in 7 days = Rs 840.

Earning of 12 boys in 1 day = $\frac{840}{7}$

= Rs 120

∴ Earning of 1 boy in 1 day = $\frac{120}{12}$ = Rs 10.

∴ Earning of 1 boy in 6 days = 10 × 6

= Rs 60

∴ Earning of 15 boys in 6 days = 60 × 15

= Rs 900

Q.21 If 25 men earn Rs 1000 in 10 days, how much will 15 men earn in 15 days?

Sol: In 10 days 25 men can earn = Rs 1000.

in 1 day 25 men can earn = $\frac{1000}{10}$ = Rs 100

1 day 1 man earning = $\frac{Rs\ 100}{25}$ = Rs 4

∴ 15 days 1 man earning = 15 × 4 = Rs 60.

15 days 15 man earning = 60 × 15

= Rs 900

Q.22 Working 8 hours a day, Ashu can copy a book in 18 days. How many hours a day should he work so as to finish the work in 12 days?

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Sol: ~~working~~ 8 hours

working hrs. 8 x

Time taken 18 12

∴ It is inverse variation

$8 \times 18 = x \times 12$

$\Rightarrow \frac{144}{12} = x \Rightarrow x = 12$

∴ Time taken = 12 hours.

Q.23 If 9 girls can prepare 135 garlands in 3 hours, how many girls are needed to prepare 270 garlands in 1 hr.

Sol: In 3 hours, 9 girls can prepare = 135 garlands

In 1 hr, 9 girls can prepare = $\frac{135}{3} = 45$ garlands

∴ In 1 hr, 1 girl can prepare = $\frac{45}{9} = 5$ garlands

∴ In 1 hr no. of girls required to prepare 270 garlands = $\frac{270}{5} = 54$ girls

Q.24 A cistern can be filled by one tap in 8 hours, and by another in 4 hours. How long will it take to fill the cistern if both taps are opened together.

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Sol: A cistern can be filled by one tap in 8 hrs

∴ portion of cistern filled in 1 hr $= \frac{1}{8}$.

Another cistern fill in = 4 hours

portion filled by another tap in 1 hr $= \frac{1}{4}$

∴ portion filled by both in 1 hr $= \frac{1}{8} + \frac{1}{4}$

$= \frac{1+2}{8} = \frac{3}{8}$

∴ time taken to fill the cistern $= \frac{8}{3} = 2\frac{2}{3}$ hours.

Q.25 Two taps A and B can fill an overhead tank in 10 hours and 15 hours respectively. Both the taps are opened for 4 hours then B is turned off How much time will A taken to fill the remaining tank.

Sol: Time taken by A to fill the tank = 10 hours

Time taken by B to fill the tank = 15 hours

∴ portion filled by tap A in 1 hr $= \frac{1}{10}$.

portion filled by tap B in 1 hr $= \frac{1}{15}$

Then portion filled by tap (A+B) in 1 hr $= \frac{1}{10} + \frac{1}{15}$

$= \frac{3+2}{30} = \frac{5}{30} = \frac{1}{6}$

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$\therefore$ portion filled by both tap in 4 hrs $= 4 \times \frac{1}{6} = \frac{2}{3}$

$\therefore$ Remaining portion to be filled $= 1 - \frac{2}{3}$

$= \frac{1}{3}$

Therefore, time taken to fill the remaing portion by tap A $= \frac{1}{3} \div \frac{1}{10} = \frac{10}{3} = 3\frac{1}{3}$ hours.

Q.26 A pipe can fill the cistern in 10 hours. Due to a leak in the bottom it is filled in 12 hours. When the cistern is full, in how much time will it be emptied by the leak?

Sol: Time taken by a pipe to fill the cistern $= 10$ hours.

$\therefore$ portion filled in 1 hr $= \frac{1}{10}$

When there is leakage, time taken to fill $= 12$ hours.

$\therefore$ In 1 hour cistern gets filled $= \frac{1}{12}$

$\therefore$ In one hr, due to leakage cistern gets emptied $= \frac{1}{10} - \frac{1}{12} = \frac{12-10}{120} = \frac{2}{120}$

$= \frac{1}{60}$ part.

$\therefore$ due to leakage cistern gets emptied in $= 60$ hours.

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Q.27 A cistern has two inlets A and B which can fill it in 12 hours and 15 hours respectively. An outlet can empty the full cistern in 10 hours. If all the three pipes are opened together in the empty cistern. How much time will they take to fill the cistern completely.

Sol: Time taken by tap A to fill = 12 hours.

tap A can fill in 1 hour = $\frac{1}{12}$

Inlet B can fill the cistern = 15 hours

Inlet B can fill in 1 hour = $\frac{1}{15}$

outlet pipe can empty the cistern = 10 hours.

out let pipe can empty in 1 hr = $\frac{1}{10}$

$\therefore$ we have = $\left(\frac{1}{12}+\frac{1}{15}\right)-\frac{1}{10}$

$= \frac{9}{60}-\frac{1}{10} = \frac{(9-6)}{60} = \frac{3}{60}$

$= \frac{1}{20}$

$\therefore$ If all the three pipes are opened together, then they will take 20 hours to fill the cistern.

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8.28 A cistern can be filled by a tap in 4 hours and emptied by an outlet pipe in 6 hours. How long will it take to fill the cistern if both the tap and the pipe are opened together?

Sol: Time taken to fill the tank = 4 hours.

portion of tank filled in one hr = $\frac{1}{4}$.

Time taken to empty the tank = 6 hours.

tank emptied by pipe in one hr = $\frac{1}{6}$

If both are opened together then amount of water filled in 1 hr = $\frac{1}{4} - \frac{1}{6}$

$= \frac{3-2}{12} = \frac{1}{12}$

∴ Time taken to fill the tank = 12 hours.

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