Chapter : 13. TIME AND WORK

Exercise : 13A

Question: 1

Rajan can do a pi

Solution:

Number of days Rajan required do a piece of work : 24

Number of days Amit required do a piece of work : 30

Work done by Rajan in one day: $\frac{1}{24}$

Work done by Amit in one day: $\frac{1}{30}$

Work done by Rajan and Amit together in one day: $\frac{1}{24}+\frac{1}{30}=\frac{54}{720}=\frac{3}{40}$

$\therefore$ They can do the work together in $\frac{40}{3}$ days = $13\frac{1}{3}$ days

Question: 2

Ravi can do a pie

Solution:

Number of hours Ravi required do a piece of work : 15 hours

Number of hours Raman required do a piece of work : 12 hours

Work done by Ravi in one hour: $\frac{1}{15}$

Work done by Raman in one hour: $\frac{1}{12}$

Work done by Ravi and Raman together in one hour: $\frac{1}{15}+\frac{1}{12}=\frac{9}{60}=\frac{3}{20}$

$\therefore$ They can do the work together in $\frac{20}{3}$ hours = $6\frac{2}{3}$ = 6 hours 40 min

Question: 3

A and B, working

Solution:

Number of days A required do a piece of work : 9 days

Let number of days B required do a piece of work : X days

Number of hours required by A and B together to do a piece of work : 6 days

Work done by A in one day: $\frac{1}{9}$

Work done by B in one day: $\frac{1}{X}$

Work done by A and B together in a day : $\frac{1}{6}$

Work done by A and B together in one day : $\frac{1}{9}+\frac{1}{X}=\frac{X+9}{9X}=\frac{1}{6}$

$\therefore \frac{X+9}{9X}=\frac{1}{6}$

$\Rightarrow$ 6X + 54 = 9X

⇒ 3X = 54

⇒ X = 54/3 = 18

∴ B can do the work 18 days

Question: 4

Two motor mechani

Solution:

Number of hours Raju required to overhaul a scooter : 15 hours

Let number of hours siraj required to overhaul a scooter : X hours

Number of hours required by Raju and Siraj together to do a piece of work : 6 hours

Work done by Raju in one hour: $\frac{1}{15}$

Work done by Siraj in one hour: $\frac{1}{X}$

Work done by Raju and Siraj together in a one hour : $\frac{1}{6}$

Work done by Raju and Siraj together in one hour : $\frac{1}{15}+\frac{1}{X}=\frac{X+15}{15X}=\frac{1}{6}$

∴ $\frac{X+15}{15X}=\frac{1}{6}$

⇒ 6X +90 = 15X

⇒ 9X = 90

⇒ X = $\frac{90}{9}$ = 10 hours

∴ Siraj can do the work 10 hours.

Question: 5

A, B and C can do

Solution:

Number of days A required do a piece of work : 10

Number of days B required do a piece of work : 12

Number of days C required do a piece of work : 15

Work done by A in one day: $\frac{1}{10}$

Work done by B in one day: $\frac{1}{12}$

Work done by C in one day: $\frac{1}{15}$

Work done by A, B and C together in one day: $\frac{1}{10}+\frac{1}{12}+\frac{1}{15}=\frac{15}{60}=\frac{1}{4}$

∴ They can do the work together in 4 days .

Question: 6

A can do a piece

Solution:

Number of hours A required do a piece of work : 24 hours

Number of hours B required do a piece of work : 16 hours

Let number of hours C required to do a piece of work : X hours

Number of hours required by A, B and C together to do a piece of work : 8 hours

Work done by A in one hour: $\frac{1}{24}$

Work done by B in one hour: $\frac{1}{16}$

Work done by C in one hour: $\frac{1}{X}$

Work done by A, B and C together in a one hour : $\frac{1}{8}$

Work done by A, B and C together in one hour : $\frac{1}{24}+\frac{1}{16}+\frac{1}{X}=\frac{5}{48}+\frac{1}{X}=\frac{5X+48}{48X}=\frac{1}{8}$

$\therefore \frac{5X+48}{48X}=\frac{1}{8}$

$\Rightarrow$ 40X +384 = 48X

$\Rightarrow$ 8X = 384

$\Rightarrow$ X = $\frac{384}{8}$ = 48 hours

$\therefore$ Siraj can do the work 48 hours.

Question: 7

A, B and C workin

Solution:

Number of hours A required do a piece of work : 20 hours

Number of hours B required do a piece of work : 24 hours

Let number of hours C required to do a piece of work : X hours

Number of hours required by A, B and C together to do a piece of work : 8 hours

Work done by A in one hour: $\frac{1}{20}$

Work done by B in one hour: $\frac{1}{24}$

Work done by C in one hour: $\frac{1}{X}$

Work done by A, B and C together in a one hour : $\frac{1}{8}$

Work done by A, B and C together in one hour : $\frac{1}{20}+\frac{1}{24}+\frac{1}{X}=\frac{11}{120}+\frac{1}{X}=\frac{11X+120}{120X}=\frac{1}{8}$

$\therefore \frac{11X+120}{120X}=\frac{1}{8}$

$\Rightarrow$ 88X +960 = 120X

$\Rightarrow$ 32X = 960

$\Rightarrow$ X = $\frac{960}{32}$ = 30 hours

$\therefore$ C can do the work 30 hours.

Question: 8

A and B can finis

Solution:

Number of days A required do a piece of work : 16

Number of days B required do a piece of work : 12

Work done by A in one day: $\frac{1}{16}$

Work done by B in one day: $\frac{1}{12}$

A works alone for 2 days, so work completed by A in 2 days : $2\ X \frac{1}{16} = \frac{1}{8}$

Work left = $1 - \frac{1}{8} = \frac{7}{8}$

Work done by A and B together in one day: $\frac{1}{16} + \frac{1}{12} = \frac{7}{48}$

They can do the work together in $\frac{48}{7}$ days .

But $\frac{7}{8}$ th of the work is done by both A and B

∴ Time required to complete $\frac{7}{8}$th of the work together by A and B : $\frac{7}{8}\ X\ \frac{48}{7} = 6$ days

∴ Time taken to finish the work 6 + 2 = 8days (here 2 is added because $\frac{1}{8}$ work is done by A alone).

∴ Total time taken to finish the work: 8days

Question: 9

A can do a piece

Solution:

Number of days A required do a piece of work : 14 days

Number of days B required do a piece of work : 21 days

Work done by A in one day: $\frac{1}{14}$

Work done by B in one day: $\frac{1}{21}$

Work done by A and B together in one day: $\frac{1}{14} + \frac{1}{21} = \frac{5}{42}$

They can do the work together in $\frac{42}{5}$ days .

A and B worked together for 6 days, so work completed by A and B in 6 days : $6 \times \frac{5}{42} = \frac{5}{7}$

Work left = $1 - \frac{5}{7} = \frac{2}{7}$

Number of days taken by B to complete the left over work : $\frac{2}{7} \times 21 = 6$ (here 21 is days required by B to complete a piece of work).

∴ Time taken to finish the work: 6 + 6 = 12 days.

∴ Total time taken to finish the work: 12 days

Question: 10

A can do

Solution:

A can do $\frac{2}{3}$ *of a work in 16 days*

B can do $\frac{1}{4}$ *of a work in 3 days*

Work done by A in one day: $\frac{2}{3} X \frac{1}{16} = \frac{1}{24}$

Work done by B in one day: $\frac{1}{4} X \frac{1}{3} = \frac{1}{12}$

Work done by A and B together in one day: $\frac{1}{24} + \frac{1}{12} = \frac{3}{24} = \frac{1}{8}$

∴ They can do the work together in 8 days.

Question: 11

A, B and C can do

Solution:

Number of days A required do a piece of work : 15 days

Number of days B required do a piece of work : 12 days

Number of days C required do a piece of work : 20 days

Work done by A in one day: $\frac{1}{15}$

Work done by B in one day: $\frac{1}{12}$

Work done by C in one day: $\frac{1}{20}$

Work done by A, B and C together in one day: $\frac{1}{15} + \frac{1}{12} + \frac{1}{20} = \frac{1}{5}$

They can do the work together in 5 days.

A, B and C worked together for 2 days, so work completed by A, B and C in 2 days : $2 X \frac{1}{5} = \frac{2}{5}$

Work left = $1 - \frac{2}{5} = \frac{3}{5}$

Work done by A and B together in one day: $\frac{1}{15} + \frac{1}{12} = \frac{3}{20}$

∴ They can do the work together in $\frac{20}{3}$ *days.*

Number of days taken by A and B to complete the left over work : $\frac{3}{5} X \frac{20}{3} = 4$ *(here* $\frac{20}{3}$ *is days required by A and B to complete the work).*

∴ Time taken to finish the left over work: 4 days.

Question: 12

A and B can do a

Solution:

Number of days required by A and B to finish the work : 18 days

Number of days required by A and B to finish the work : 24 days

Number of days required by A and B to finish the work : 36 days

Work done by A and B in one day: $\frac{1}{18}$

Work done by B and C in one day: $\frac{1}{24}$

Work done by C and A in one day: $\frac{1}{36}$

Work done by (A and B) , (B and C) and (C and A) in one day that is work done by

(A +B) + (B + C) + (C + A) = 2(A+B+C) = $\frac{1}{18} + \frac{1}{24} + \frac{1}{36} = \frac{9}{72} = \frac{1}{8}$

Work done by A, B and C $= \frac{1}{2} X \frac{1}{8} = \frac{1}{16}$

∴ *They can do the work in 16 days*

Question: 13

A and B can do a

Solution:

Number of days required by A and B to finish the work : 12 days

Number of days required by A and B to finish the work : 15 days

Number of days required by A and B to finish the work : 20 days

Work done by A and B in one day: $\frac{1}{12}$

Work done by B and C in one day: $\frac{1}{15}$

Work done by C and A in one day: $\frac{1}{20}$

Work done by (A and B) , (B and C) and (C and A) in one day that is work done by

(A +B) + (B + C) + (C + A) = 2(A+B+C) $= \frac{1}{12} + \frac{1}{15} + \frac{1}{20} = \frac{12}{60} = \frac{1}{5}$

∴ *Work done by A, B and C* $= \frac{1}{2} X \frac{1}{5} = \frac{1}{10}$

A 's one day work = (A +B + C) 's one day work – (B + C) 's one day work $= \frac{1}{10} - \frac{1}{15} = \frac{1}{30}$

∴ *A alone can complete the work in 30 days.*

Question: 14

Pipes A and B can

Solution:

Number of hours Pipe A requires to fill an empty tank : 10 hours

Number of hours Pipe B requires to fill an empty tank : 15 hours

Amount of water filled by Pipe A in empty tank in one hour: $\frac{1}{10}$

Amount of water filled by Pipe B in one hour: $\frac{1}{15}$

Amount of water filled by Pipe A and Pipe B together in one hour: $\frac{1}{10} + \frac{1}{15} = \frac{5}{30} = \frac{1}{6}$

∴ *They can fill the tank together in 6 hours.*

Question: 15

Pipe A can fill a

Solution:

Number of hours Pipe A requires to fill an empty tank : 5 hours

Number of hours Pipe B requires to empty the full tank : 6 hours

Amount of water filled by Pipe A in empty tank in one hour: $\frac{1}{5}$

Amount of water Pipe B empties in one hour: $\frac{1}{6}$

Amount of water filled by Pipe A and Pipe B together in one hour: $\frac{1}{5} - \frac{1}{6} = \frac{1}{30} = \frac{1}{30}$

∴ *They can fill the tank together in 30 hours.*

Question: 16

Three taps A, B a

Solution:

Number of hours tap A requires to fill the tank : 6

Number of hours tap B requires to fill the tank : 8

Number of hours tap C requires to fill the tank : 12

Amount of water filled by tap A in one hour: $\frac{1}{6}$

Amount of water filled by tap B in one hour: $\frac{1}{8}$

Amount of water filled by tap C in one hour: $\frac{1}{12}$

Amount of water filled by taps A, B and C together in one hour: $\frac{1}{6}+\frac{1}{8}+\frac{1}{12}=\frac{9}{24}=\frac{3}{8}$

∴ *They can fill the tank together in* $\frac{8}{3}$ *hours* $=2\frac{2}{3}$ *hours = 2 hours 40 min.*

Question: 17

A cistern has two

Solution:

Number of hours inlet A requires to fill the cistern : 12 min $=\frac{12}{60}=\frac{1}{5}$ *hours*

Number of hours inlet B requires to fill the cistern : 15 min $=\frac{15}{60}=\frac{1}{4}$ *hours*

Number of hours outlet C requires to empty the cistern : 10 min $=\frac{10}{60}=\frac{1}{6}$ *hours*

Part of the cistern filled by inlet A in one hour: 5

Part of the cistern filled by inlet B in one hour: 4

Part of the cistern emptied by outlet C in one hour: 6

Work done by pipes A, B and C together in one hour: 5 + 4 – 6 = 3

∴ *They can fill the cistern together in* $\frac{1}{3}$ *hours = 20 min*

Question: 18

A pipe can fill a

Solution:

A pipe can fill a cistern in: 9 hours

Let a leak empty the cistern in: X hours

Due to the leak time taken to fill the cistern : 10 hours

Part of the cistern filled by pipe in one hour: $\frac{1}{9}$

Part of the cistern emptied by leak in one hour: $\frac{1}{X}$

$\therefore \frac{1}{9}-\frac{1}{X}=\frac{1}{10}$

$\frac{1}{X}=\frac{1}{9}-\frac{1}{10}$

$\frac{1}{X} = \frac{10-9}{90}$

X = 90 hours

Therefore the leak will empty the cistern in 90 hours.

Question: 19

Pipe A can fill a

Solution:

Pipe A can fill the cistern in : 6 hours

Pipe B can fill the cistern in : 8 hours

Part of cistern filled by pipe A in one hour: $\frac{1}{6}$

Part of cistern filled by pipe B in one hour: $\frac{1}{8}$

Part of cistern filled by pipe A and pipe B together in one hour: $\frac{1}{6} + \frac{1}{8} = \frac{7}{24}$

They can fill the cistern together in $\frac{24}{7}$ *hours.*

Pipes A and B filled cistern together for 2 hours,

So part of the cistern filled pipes by A and B in 2 hours : $2 \times \frac{7}{24} = \frac{7}{12}$

Part of cistern which is empty = $1 - \frac{7}{12} = \frac{5}{12}$

Number of hours taken by pipe B to fill left over part of cistern : $\frac{5}{12} \times 8 = \frac{10}{3}$ *(here 8 is hours required by pipe B to fill the remaining part of the cistern).*

∴ *Time taken by pipe B to fill the remaining part of the cistern:* $\frac{10}{3} = 3\frac{1}{3}$ *= 3 hours 20 min*

Exercise : 13B

Question: 1

A alone can do a

Solution:

Number of days A required do a piece of work : 10 days

Number of days B required do a piece of work : 15 days

Work done by A in one day: $\frac{1}{10}$

Work done by B in one day: $\frac{1}{15}$

Work done by A and B together in one day: $\frac{1}{10} + \frac{1}{15} = \frac{10}{60} = \frac{1}{6}$

∴ *They can do the work together in 6 days*

Question: 2

A man can do a pi

Solution:

Number of days the man requires to do a piece of work : 5 days

Let Number of days his son requires to do a piece of work : X days

Number of days required by the man and his son together to do a piece of work : 3 days

Work done by the man in one hour: $\frac{1}{5}$

Work done by his son in one hour: $\frac{1}{X}$

Work done by the man and his Son together in a one hour : $\frac{1}{3}$

Work done by the man and his son together in one hour : $\frac{1}{5}+\frac{1}{X}=\frac{X+5}{5X}=\frac{1}{3}$

$\therefore \frac{X+5}{5X}=\frac{1}{3}$

$\Rightarrow 3X + 15 = 5X$

$\Rightarrow 2X = 15$

$\Rightarrow X=\frac{15}{2}=7\frac{1}{2}$ *days*

$\therefore$ *Son alone can do the work* $7\frac{1}{2}$ *days.*

Question: 3

A can do a job in

Solution:

Number of days A required do a piece of work : 16 days

Number of days B required do a piece of work : 12 days

Let number of days C required to do a piece of work : X days

Number of days required by A, B and C together to do a piece of work: 6 days

Work done by A in one day: $\frac{1}{16}$

Work done by B in one day: $\frac{1}{12}$

Work done by C in one day: $\frac{1}{X}$

Work done by A, B and C together in a one day: $\frac{1}{6}$

Work done by A, B and C together in one hour : $\frac{1}{16}+\frac{1}{12}+\frac{1}{X}=\frac{7}{48}+\frac{1}{X}=\frac{7X+48}{48X}=\frac{1}{6}$

$\therefore \frac{7X+48}{48X}=\frac{1}{6}$

$\Rightarrow 42X +288 = 48X$

$\Rightarrow 6X = 288$

$\Rightarrow X=\frac{288}{6}=48$ *days*

$\therefore$ *C alone can do the work 48 days.*

Question: 4

To complete a wor

Solution:

Let number of days B required a work be x

Then number of days A takes to complete the work is : $\left(x+\frac{50}{100}x\right)=1.5x$

Work done by A in one day: $\frac{1}{1.5x}=\frac{2}{3x}$

Work done by B in one day: $\frac{1}{x}$

Number of days taken by A and B to do the work together: 18 days

Work done by A and B together in one day: $\frac{1}{18}$

That is : $\frac{1}{18} = \frac{2}{3x} + \frac{1}{x}$

$\frac{1}{18} = \frac{5}{3x}$

$X = \frac{5\ X\ 18}{3} = 30$

∴ *B alone will take 30 days to complete the work.*

Question: 5

A works twice as

Solution:

Work done by A in one day: 2x

Work done by B in one day: x

Number of days taken by A and B to do the work together: 12 days

Work done by A and B together in one day: $\frac{1}{12}$

$\frac{1}{12} = 2x + x$

$\frac{1}{12} = 3x$

$X = \frac{1}{36}$

Here X is Work done by B in one day

∴ *B alone will take 36 days to complete the work.*

Question: 6

A alone can finis

Solution:

Number of days A required do a piece of work : 10 days

Number of days B required do a piece of work : 15 days

Work done by A in one day: $\frac{1}{10}$

Work done by B in one day: $\frac{1}{15}$

Work done by A and B together in a one day: $\frac{1}{10} + \frac{1}{15} = \frac{5}{30} = \frac{1}{6}$

∴ *A and B together take 6 days to complete the work.*

A's share of work is : $\frac{1}{10}\ X\ 6 = \frac{3}{5}$

We know that wages are divided on basis of the share of the work

∴ *A's wage is* $\frac{3}{5}\ X\ 3000 = 1800$

Question: 7

The rates of work

Solution:

We know that number of days taken to work is reciprocal of the rate of the work.

∴ Work done by A: $\frac{1}{3}$

Work done by B: $\frac{1}{4}$

∴ Ratio of work done is $\frac{1}{3}:\frac{1}{4}=4:3$

Question: 8

A and B together

Solution:

Number of days required by A and B to finish the work : 12 days

Number of days required by A and B to finish the work : 20 days

Number of days required by A and B to finish the work : 15 days

Work done by A and B in one day: $\frac{1}{12}$

Work done by B and C in one day: $\frac{1}{20}$

Work done by C and A in one day: $\frac{1}{15}$

Work done by (A and B) , (B and C) and (C and A) in one day that is work done by

(A +B) + (B + C) + (C + A) = 2(A+B+C) = $\frac{1}{12}+\frac{1}{20}+\frac{1}{15}=\frac{12}{60}=\frac{1}{5}$

Work done by A, B and C = $\frac{1}{2}\ X\ \frac{1}{5}=\frac{1}{10}$

∴ They can do the work in 10 days

Question: 9

3 men or 5 women

Solution:

Number of days required by 3 men to finish the work : 12 days

Number of days required by 5 women to finish the work : 12 days

Number of days required by 1 man to finish the work : 3 x 12 = 36 days

Number of days required by 1 woman to finish the work : 5 x 12 = 60 days

Work done by a man in one day: $\frac{1}{36}$

Work done by a woman in one day: $\frac{1}{60}$

Work done by 6 men in one day: 6 x $\frac{1}{36}=\frac{1}{6}$

Work done by 5 women in one day: 5 x $\frac{1}{60}=\frac{1}{12}$

Work done by 6 men and 5 women together in one day: $\frac{1}{6}+\frac{1}{12}=\frac{3}{12}=\frac{1}{4}$

∴ 6 men and 5 women together take 4 days to complete the work.

Question: 10

A can do a piece

Solution:

Number of days required by A to finish the work : 15 days

Work done by A in one day: $\frac{1}{15}$

B can work 50% more efficiently than A,

∴B's one day work = 150% of $\frac{1}{15} = \frac{150}{100} \times \frac{1}{15} = \frac{1}{10}$

∴ B alone can complete the work in 10 days.

Question: 11

A does 20% less w

Solution:

Number of hours taken by A to finish the work = $7\frac{1}{2}$ *hours =* $\frac{15}{2}$ *hours*

Work done by A in one hour : $\frac{2}{15}$

Let number of hours taken by B to finish the work : $\frac{1}{x}$

A can work 20% less than B that is $\frac{20}{100} = \frac{4}{5}$ *times of B's work.*

Here , $\frac{4}{5} : 1 = \frac{2}{15} : \frac{1}{x}$

$\frac{4}{5} = \frac{2x}{15}$

$X = \frac{15 X 4}{5 X 2}$ *= 6 hours.*

Question: 12

A can do a piece

Solution:

Number of days A required do a piece of work : 20

Number of days B required do a piece of work : 12

Work done by A in one day: $\frac{1}{20}$

Work done by B in one day: $\frac{1}{12}$

B works alone for 9 days, so work completed by B in 9 days : $9 X \frac{1}{12} = \frac{3}{4}$

Work left = $1 - \frac{3}{4} = \frac{1}{4}$

But $\frac{3}{4}$ *th of the work is already done by B*

∴ Time required to complete the remaining $\frac{1}{4}$*th of the work by A :* $\frac{1}{4} X 20 = 5$ *days*

∴ Time taken to finish the work 9 + 5 = 14 days

∴ A can finish the remaining work in : 5 days

Question: 13

A can do a piece

Solution:

Number of hours A required do a piece of work : 25

Number of hours B required do a piece of work : 20

Work done by A in one hour: $\frac{1}{25}$

Work done by B in one hour: $\frac{1}{20}$

A works alone for 10 hours, so work completed by A in 10 hours : $10\,X\,\frac{1}{25} = \frac{2}{5}$

Work left $= 1 - \frac{2}{5} = \frac{3}{5}$

Work done by A and B together in one hour: $\frac{1}{25} + \frac{1}{20} = \frac{9}{100}$

They can do the work together in $\frac{100}{9}$ *hours.*

But $\frac{3}{5}$ *th of the work is done by both A and B*

∴ *Time required to complete* $\frac{3}{5}$*th of the work together by A and B :* $\frac{3}{5}\,X\,\frac{100}{9} = \frac{20}{3}$ *hours*

∴ *Time taken to finish the work:* $\frac{20}{3} = \frac{2}{3}$ *hours*

Question: 14

Two pipes can fil

Solution:

Number of minutes Pipe A requires to fill an empty tank : 20 minutes

Number of minutes Pipe B requires to fill an empty tank : 30 minutes

Amount of water filled by Pipe A in empty tank in one minute: $\frac{1}{20}$

Amount of water filled by Pipe B in one minute: $\frac{1}{30}$

Amount of water filled by Pipe A and Pipe B together in one minute: $\frac{1}{20} + \frac{1}{30} = \frac{5}{60} = \frac{1}{12}$

∴ *They can fill the tank together in 12 minutes.*

Question: 15

A tap can fill a

Solution:

Number of hours Tap A requires to fill an empty tank : 8 hours

Number of hours Tap B requires to empty the full tank : 16 hours

Amount of water filled by Tap A in empty tank in one hour: $\frac{1}{8}$

Amount of water Tap B empties in one hour: $\frac{1}{16}$

Amount of water filled by Tap A and Tap B together in one hour: $\frac{1}{8} - \frac{1}{16} = \frac{1}{16}$

∴ *They can fill the tank together in 16 hours.*

Question: 16

A pump can fill a

Solution:

A pipe can fill a cistern in: 2 hours

Let a leak empty the cistern in: X hours

Due to the leak time taken to fill the cistern : $2\frac{1}{3} = \frac{7}{3}$ *hours*

Part of the cistern filled by pipe in one hour: $\frac{1}{2}$

Part of the cistern emptied by leak in one hour: $\frac{1}{X}$

$\therefore \frac{1}{2} - \frac{1}{X} = \frac{3}{7}$

$\frac{1}{X} = \frac{1}{2} - \frac{3}{7}$

$\frac{1}{X} = \frac{7-6}{14}$

X = 14 hours

Therefore the leak will empty the cistern in 14 hours.

Question: 17

Two pipes can fil

Solution:

Number of hours inlet A requires to fill the cistern : 10 hours

Number of hours inlet B requires to fill the cistern : 12 hours

Number of hours outlet C requires to empty the cistern : 20 hours

Part of the cistern filled by inlet A in one hour: $\frac{1}{10}$

Part of the cistern filled by inlet B in one hour: $\frac{1}{12}$

Part of the cistern emptied by outlet C in one hour: $\frac{1}{20}$

Work done by pipes A, B and C together in one hour: $\frac{1}{10} + \frac{1}{12} - \frac{1}{20} = \frac{8}{60} = \frac{2}{15}$

$\therefore$ *They can fill the cistern together in* $\frac{15}{2}$ *hours = 7 hrs 30 min*

Exercise : CCE TEST PAPER-13

Question: 1

A can do a piece

Solution:

Number of days A required do a piece of work : 10

Number of days B required do a piece of work : 15

Work done by A in one day: $\frac{1}{10}$

Work done by B in one day: $\frac{1}{15}$

Work done by A and B together in one day: $\frac{1}{10} + \frac{1}{15} = \frac{5}{30} = \frac{1}{6}$

$\therefore$ *They can do the work together in 6 days.*

Question: 2

A and B can do a

Solution:

Number of days required by A and B to finish the work : 15 days

Number of days required by A and B to finish the work : 12 days

Number of days required by A and B to finish the work : 20 days

Work done by A and B in one day: $\frac{1}{15}$

Work done by B and C in one day: $\frac{1}{12}$

Work done by C and A in one day: $\frac{1}{20}$

Work done by (A and B) , (B and C) and (C and A) in one day that is work done by

$(A + B) + (B + C) + (C + A) = 2(A+B+C) = \frac{1}{12} + \frac{1}{12} + \frac{1}{20} = \frac{12}{60} = \frac{1}{5}$

Work done by A, B and C $= \frac{1}{2} X \frac{1}{5} = \frac{1}{10}$

∴ *They can do the work in 10 days*

Question: 3

Tap A can fill a

Solution:

Number of hours Tap A requires to fill an empty tank : 8 hours

Number of hours Tap B requires to empty the full tank : 12 hours

Amount of water filled by Tap A in empty tank in one hour: $\frac{1}{8}$

Amount of water Tap B empties in one hour: $\frac{1}{12}$

Amount of water filled by Tap A and Tap B together in one hour: $\frac{1}{8} - \frac{1}{12} = \frac{1}{24}$

∴ *They can fill the tank together in 24 hours.*

Question: 4

2 men or 3 women

Solution:

Number of days required by 2 men to finish the work : 16 days

Number of days required by 3 women to finish the work : 16 days

Number of days required by 1 man to finish the work : 2 x 16 = 32 days

Number of days required by 1 woman to finish the work : 3 x 16 = 48 days

Work done by a man in one day: $\frac{1}{32}$

Work done by a woman in one day: $\frac{1}{48}$

Work done by 4 men in one day: 4 x $\frac{1}{32} = \frac{1}{8}$

Work done by 6 women in one day: 6 x $\frac{1}{48} = \frac{1}{8}$

Work done by 4 men and 6 women together in one day: $\frac{1}{8} + \frac{1}{8} = \frac{2}{8} = \frac{1}{4}$

∴ *4 men and 6 women together take 4 days to complete the work.*

Question: 5

A pipe can fill a

Solution:

A pipe can fill a cistern in: 9 hours

Let a leak empty the cistern in: X hours

Due to the leak time taken to fill the cistern : 10 hours

Part of the cistern filled by pipe in one hour: $\frac{1}{9}$

Part of the cistern emptied by leak in one hour: $\frac{1}{X}$

∴ $\frac{1}{9} - \frac{1}{X} = \frac{1}{10}$

$\frac{1}{X} = \frac{1}{9} - \frac{1}{10}$

$\frac{1}{X} = \frac{10-9}{90}$

X = 90 hours

Therefore the leak will empty the cistern in 90 hours.

Question: 6

The rates of work

Solution:

We know that number of days taken to work is reciprocal of the rate of the work.

Rates of working of two taps A and B are in the ratio 2:3

∴ *Work done by A:* $\frac{1}{2}$

Work done by B: $\frac{1}{3}$

∴ *Ratio of work done is* $\frac{1}{2} : \frac{1}{3} = 3:2$

Question: 7

A can finish a pi

Solution:

Number of hours A required do a piece of work: 12

Number of hours B required do a piece of work : 15

Work done by A in one hour: $\frac{1}{12}$

Work done by B in one hour: $\frac{1}{15}$

Work done by A and B together in one hour: $\frac{1}{12} + \frac{1}{15} = \frac{9}{60} = \frac{3}{20}$

∴ *They can do the work together in* $\frac{20}{3}$ *hours =* $6\frac{2}{3}$ *hours.*

Question: 8

A can do a piece

Solution:

Number of days required by A to finish the work : 14 days

Work done by A in one day: $\frac{1}{14}$

B can work 40% more efficiently than A,

∴B's one day work = 140% of $\frac{1}{15} = \left(\frac{140}{100} \times \frac{1}{14}\right) = \frac{1}{10}$

∴ B alone can complete the work in 10 days.

Question: 9

A pump can fill a

Solution:

A pipe can fill a cistern in: 2 hours

Let a leak empty the cistern in: X hours

Due to the leak time taken to fill the cistern : $2\frac{1}{3} = \frac{7}{3}$ *hours*

Part of the cistern filled by pipe in one hour: $\frac{1}{2}$

Part of the cistern emptied by leak in one hour: $\frac{1}{X}$

$\therefore \frac{1}{2} - \frac{1}{X} = \frac{3}{7}$

$\frac{1}{X} = \frac{1}{2} - \frac{3}{7}$

$\frac{1}{X} = \frac{7-6}{14}$

X = 14 hours

Therefore the leak will empty the cistern in 14 hours.

Question: 10

A works twice as

Solution:

Work done by A in one hour: 2x

Work done by B in one hour: x

Number of days taken by A and B to do the work together: 12 hours

Work done by A and B together in one hour: $\frac{1}{12}$

$\frac{1}{12} = 2x + x$

$\frac{1}{12} = 3x$

$X = \frac{1}{36}$

Here X is Work done by B in one hour

∴ B alone will take 36 hours to complete the work.

Question: 11

Fill in the blank

Solution:

(i) $\frac{1}{6}$

If A can do a piece of work in n days, then A can do $\frac{1}{n}$ *of the work in on day*

(ii) 18

Number of hours A required do a piece of work : 9 hours

Let number of hours B required do a piece of work : X hours

Number of hours required by A and B together to do a piece of work : 6 hours

Work done by A in one hour: $\frac{1}{9}$

Work done by B in one hour: $\frac{1}{X}$

Work done by A and B together in a hour: $\frac{1}{6}$

Work done by A and B together in one hour: $\frac{1}{9}+\frac{1}{X}=\frac{X+9}{9X}=\frac{1}{6}$

$\therefore \frac{X+9}{9X}=\frac{1}{6}$

$\Rightarrow 6X+54=9X$

$\Rightarrow 3X=54$

$\Rightarrow X=\frac{54}{3}=18$

$\therefore$ *B can do the work 18 hours*

(iii) 48

Number of hours A required do a piece of work : 16 hours

Number of hours B required do a piece of work : 24 hours

Let number of hours C required to do a piece of work : X hours

Number of hours required by A, B and C together to do a piece of work : 8 hours

Work done by A in one hour: $\frac{1}{16}$

Work done by B in one hour: $\frac{1}{24}$

Work done by C in one hour: $\frac{1}{X}$

Work done by A, B and C together in a one hour : $\frac{1}{8}$

Work done by A, B and C together in one hour : $\frac{1}{16}+\frac{1}{24}+\frac{1}{X}=\frac{5}{48}+\frac{1}{X}=\frac{5X+48}{48X}=\frac{1}{8}$

$\therefore \frac{5X+48}{48X}=\frac{1}{8}$

$\Rightarrow 40X+384=48X$

$\Rightarrow 8X=384$

$\Rightarrow X=\frac{384}{8}=48$ *hours*

$\therefore$ *C can do the work 48 hours.*

(iv) $6\frac{2}{3}$

If A can do a piece of work in n days, then A can do $\frac{1}{n}$ *of the work in on day*

$\therefore \frac{20}{3} = 6\frac{2}{3}$