Time And Work Formula

Time= Work done/Efficiency

- **When work is same.**

Time∝1/Efficiency

- **If A can do a piece of work in n days.**

Then, per day working efficiency of A = 1/n

- **If working efficiency of A & B is → x : y.**

Then, the time taken by A & B to finish the work is in the ratio → y : x
e.g. If A does three times faster work than 'B', then the ratio of work done by A and B is 3: 1.
Then, Ratio of time taken by A & B = 1 : 3

- If A can do a piece of work is x days and B can do a piece of work in y days, then both of them working together will do the same work in

xy/(x+y) days

Explanation
⇒ A's 1 day's work = 1/x
B's 1 day's work = 1/y
(A + B)'s 1 day work = 1/x+1/y =(x + y)/xy
A + B will complete the work in = xy/(x + y)

Q. A can finish a piece of work by working alone in 6 days and B, while working alone, can finish the same work in 12 days. If both of them work together, then in how many days, the work will be finished?
Sol. x = 6, y = 12
Working together A + B will complete the work in = xy/(x + y)=(6 × 8)/18
= 4 days

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- **If A, B & C will working alone, can complete a work in x, y and z days, respectively, then they will together complete the work in**

xyz/(xy+yz+zx)

Explanation
⇒ A's 1 day work = 1/x
B's 1 day work = 1/y
C's 1 day work = 1/z
(A + B + C)'s 1 day work = 1/x+1/y+1/z =(yz+xz+xy)/xyz
(A + B + C) will complete the work in
=xyz/(yz+xz+xy)

Q. A, B, and C can complete a piece of work in 10, 15 and 18 days, respectively. In how many days would all of them complete the same work working together?
Sol. x = 10 days, y = 15 days & z = 18 days
The work will be completed in
=(10×15×18)/(10×15+15×18+18×10)
=2700/600=4½ days

- **Two persons A & B, working together, can complete a piece of work in x days. If A, working alone, can complete the work in y days, then B, working alone, will complete the work in**

⇒xy/(y-x)

Explanation
⇒ A + B's 1 day work = 1/x
A's 1-day work = 1/y
B's 1 day work = 1/x-1/y
=(y-x)/yx
B will complete the work = yx/(y – x)

Q. A and B working together take 15 days to complete a piece of work. If A alone can do this work in 20 days, how long would B take to complete the same work?
Sol. x = 15, y = 20
B will complete the work in = (15 × 20)/5
= 60 days

- **If A & B working together, can finish a piece of work is x days, B & C in y days, C & A in z days. Then, A + B + C working together will finish the job is**

⇒2xyz/(xy+yz+zx)

Explanation
⇒ A + B's 1 day work = 1/x
B + C's 1 day work = 1/y
C + A's 1 day work = 1/z
[(A + B) + (B + C) + (C + A)]'s 1 day's work
=1/x+1/y+1/z
=(yz+xz+xy)/xyz
2 (A + B + C)'s 1 day work = (xy + yz + xz)/xyz
A + B + C's 1 day work = (xy + yz + xz)/2xyz
A + B + C working together will complete the work in
=2xyz/(xy+yz+xz)

Q. 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 long would they take to complete the full work together?
Sol. x = 12 days, y = 15 days, z = 20 days
A+B+C=(2×12×15×20)/(180+300+240)
=7200/720=10 days

- **If A can finish a work in x days and B is k times efficient than A, then the time taken by both A and B, working together to complete the work is**

x/(1+k)

Explanation
⇒ Ratio of working efficiency, A & B = 1 : k
Ratio of Time taken = k : 1
k → x days
1r → x/k days
A → x days
B → x/k days
1 day work of A = 1/x
1 day work of B = k/x days
(A + B)'s 1 day work = 1/x+k/x=(k + 1)/x
(A + B) will complete the work is = x/(k+1)

Q. Harbans Lal can do a piece of work in 24 days. If Bansi Lal works twice as fast as Harbans Lal, how long would they take to finish the work working together?
Sol. x = 24, k = 2
Working together they will complete the work in = 24/(1 + 2)
=24/3=8 days

- **If A & B working together can finish a work in x days & B is k times efficient than A, then the time taken by,**

A working Alone will take ⇒ (k + 1) x
B working Alone will take ⇒ ((k+1)/k)x

Explanation
⇒ Efficiency Ratio → 1 : k
Time Ratio → k : 1
A's 1 day work = 1/k
B's 1 day work = 1
(A + B)'s 1 day work = 1/x
1/k+1=1/x
(k+1)/k=1/x
k = (k + 1) x
A alone working together will take ⇒ (k + 1) x days
1 ratio = ((k + 1) x)/k
B Alone working Alone will take
⇒((k + 1) x)/k

Q. A and B together can do a piece of work in 3 days. If A does thrice as much work as B in a given time, find how long A alone would take to do the work?
Sol. x = 3, k = 3
Time taken by A, working Alone to complete the work = ((3 + 1)/3) × 3 = 4 days

- **If A working Alone takes a days more than A & B, & B working Alone takes b days more than A & B. Then ,**

Number of days, taken by A & B working together to finish a job is = $\sqrt{ab}$
Explanation :
⇒ Let A + B takes x days
A → x + a days
B → x + b days
$1/(x+a)+1/(x+b)=1/x$
$(2x+a+b)/(x^2+xa+xb+ab)=1/x$
$2x^2 + xa + xb = x^2 + xa + xb + ab$
$x^2 = ab$
$x = \sqrt{ab}$ days

Q. A alone would take 8 hrs more to complete the job than if both A and B worked together. If B worked alone, he took 41/2 hrs more to complete the job than A and B worked together. What time would they take if both A and B worked together?
Sol. a = 8, b = 9/2
A + B will take = $\sqrt{(8\times9/2)}$
$=\sqrt{36}$
= 6 days