

NTS GAT General Past Papers Questions

Quantitative – Exam No. 11

Chain Rules

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Formulas:

- 1. Direct Proportions:** When one quantity is increased, and the other quantity also increases, then these two quantities possess direct proportion between them. For example, if 3 men eat 6 burgers then 5 men will eat 10 burgers. So, they are directly proportional to each other. The following formula is used for direct proportion:

$$\frac{(\text{Quantity } A)_1}{(\text{Quantity } B)_1} = \frac{(\text{Quantity } A)_2}{(\text{Quantity } B)_2}$$

- 2. Inverse Proportions:** When one quantity is increased, and the other quantity decreases, then these two quantities possess inverse proportion between them. For example, if 3 men do a work 10 days, then 6 men will do the same work in 5 days. So, they are inversely proportional to each other. The following formula is used for inverse proportion:

$$(\text{Quantity } A)_1 \times (\text{Quantity } B)_1 = (\text{Quantity } A)_2 \times (\text{Quantity } B)_2$$

- 3. When combine work of two people (A and B) is asked then: (PP)**

$$x = \frac{AB}{A + B}$$

- 4. When combine work of three people (A, B and C) is asked then:**

$$x = \frac{ABC}{AB + BC + CA}$$

Exercise:

1. A can do a piece of work in 15 days. B can do the same work in 30 days.

Find the number of days in which both A and B can do the same work? (PP)

Solution:

$$x = \frac{AB}{A + B}$$

$$x = \frac{15 \times 30}{15 + 30}$$

$$x = \frac{450}{45}$$

$$x = 10 \text{ days}$$

2. Pipe A fills the pool in 7 minutes. Pipe B fills the same pool in 3 minutes.

Find the time to fill the pool if both pipes are open? (PP)

Solution:

$$x = \frac{AB}{A + B}$$

$$x = \frac{7 \times 3}{7 + 3}$$

$$x = \frac{21}{10}$$

$$x = 2.1 \text{ minutes}$$

3. Rabia and Ahmad both perform a task in 2 minutes. Rabia takes 6 minutes to complete the task alone. How much time Ahmad will take to complete the same task alone? (PP)

Solution:

$$x = \frac{RA}{R + A}$$

$$2 = \frac{6A}{6 + A}$$

$$2(6 + A) = 6A$$

$$12 + 2A = 6A$$

$$12 = 6A - 2A$$

$$12 = 4A$$

$$A = \frac{12}{4}$$

$$A = 3 \text{ minutes}$$

4. If A can write 100 words in 6 minutes and together A and B can do the same work in 4 minutes, then find the time for B to complete the same task alone?

(PP)

Solution:

$$x = \frac{AB}{A + B}$$

$$4 = \frac{6B}{6 + B}$$

$$4(6 + B) = 6B$$

$$24 + 4B = 6B$$

$$24 = 6B - 4B$$

$$24 = 2B$$

$$B = \frac{24}{2}$$

$$B = 12 \text{ minutes}$$

5. In a zoo, animals use 39 pounds food in 6 days. The 91 pounds food will serve how many days? (PP)

Solution:

These two quantities are directly proportional to each other. So:

$$\frac{(\text{Quantity})_1}{(\text{Days})_1} = \frac{(\text{Quantity})_2}{(\text{Days})_2}$$

$$(Days)_2 = \frac{(Quantity)_2 \times (Days)_1}{(Quantity)_1}$$

$$(Days)_2 = \frac{91 \times 6}{39}$$

$$(Days)_2 = \frac{546}{39}$$

$$(Days)_2 = 14$$

6. A can do a piece of work in 4 days. B does same work in twice days. Find the number of days in which both A and B can do the same work? (PP)

Solution:

$$x = \frac{AB}{A + B}$$

$$x = \frac{4 \times 8}{4 + 8}$$

$$x = \frac{32}{12}$$

$$x = \frac{8}{3} \text{ days}$$

$$x = \frac{8}{3} \times 24 \text{ hours}$$

$$x = \frac{8}{1} \times 8 \text{ hours}$$

$$x = 64 \text{ hours}$$

$$x = 24 \text{ hours} + 24 \text{ hours} + 16 \text{ hours}$$

$$x = 1 \text{ day} + 1 \text{ day} + 16 \text{ hours}$$

$$x = 2 \text{ days } 16 \text{ hours}$$

7. A certain copy machine produces 13 copies every 10 seconds. If the machine operates without interruption, how many copies will it produce in an hour?

(PP)

Solution:

These two quantities are directly proportional to each other. So:

$$\begin{aligned}\frac{(\text{Copies})_1}{(\text{Time})_1} &= \frac{(\text{Copies})_2}{(\text{Time})_2} \\ (\text{Copies})_2 &= \frac{(\text{Copies})_1 \times (\text{Time})_2}{(\text{Time})_1} \\ (\text{Copies})_2 &= \frac{13 \times (1 \times 3600)}{10} \\ (\text{Copies})_2 &= 13 \times 360 \\ (\text{Copies})_2 &= 4,680\end{aligned}$$

8. Umar typed 9,450 words in $3\frac{1}{2}$ hours. What was his rate in words per minute?

(PP)

Solution:

These two quantities are directly proportional to each other. So:

$$\begin{aligned}\frac{(\text{Words})_1}{(\text{Time})_1} &= \frac{(\text{Words})_2}{(\text{Time})_2} \\ (\text{Words})_2 &= \frac{(\text{Words})_1 \times (\text{Time})_2}{(\text{Time})_1} \\ (\text{Words})_2 &= \frac{9,450 \times 1}{(3.5 \times 60)} \\ (\text{Words})_2 &= \frac{9,450}{210} \\ (\text{Words})_2 &= 45\end{aligned}$$

9. If a vehicle covers “l” miles distance in “h” hours, then how much feet it will cover in “m” minutes? (PP)

Solution:

These two quantities are directly proportional to each other. So:

$$\frac{(\text{Distance})_1}{(\text{Time})_1} = \frac{(\text{Distance})_2}{(\text{Time})_2}$$

$$(Distance)_2 = \frac{(Distance)_1 \times (Time)_2}{(Time)_1}$$

$$(Distance)_2 = \frac{(l \times 5,280) \times m}{(h \times 60)}$$

$$(Distance)_2 = \left(88 \frac{lm}{h}\right) feet$$

10. Seven men complete a task in 2 days. How much time is needed for ten men to complete the same task?

Solution:

These two quantities are inversely proportional to each other. So:

$$(Men)_1 \times (Time)_1 = (Men)_2 \times (Time)_2$$

$$(Time)_2 = \frac{(Men)_1 \times (Time)_1}{(Men)_2}$$

$$(Time)_2 = \frac{7 \times 2}{10}$$

$$(Time)_2 = \frac{14}{10}$$

$$(Time)_2 = 1.4 \text{ days}$$

11. A can do a piece of work in 4 days. B and C together do the same work in 3 days. A and C together do the same work in 2 days. How long it will take B to complete the same task alone?

Solution:

$$x = \frac{AC}{A + C}$$

$$2 = \frac{4C}{4 + C}$$

$$2(4 + C) = 4C$$

$$8 + 2C = 4C$$

$$8 = 4C - 2C$$

$$8 = 2C$$

$$C = \frac{8}{2}$$

$$C = 4 \text{ days}$$

$$x = \frac{BC}{B + C}$$

$$3 = \frac{4B}{B + 4}$$

$$3(B + 4) = 4B$$

$$3B + 12 = 4B$$

$$12 = 4B - 3B$$

$$B = 12 \text{ days}$$

12.If “n” varies directly as “m” and “n” is 3 when “m” is 24, then what is the value of “n” when “m” is 11? (PP)

Solution:

We know that these two quantities are directly proportional to each other. So:

$$\frac{(n)_1}{(m)_1} = \frac{(n)_2}{(m)_2}$$

$$(n)_2 = \frac{(n)_1 \times (m)_2}{(m)_1}$$

$$(n)_2 = \frac{3 \times 11}{24}$$

$$(n)_2 = \frac{33}{24} = \frac{11}{8}$$

$$(n)_2 = 1.375$$

13.10 pipes of the same type fill a tank in 24 minutes. If 2 pipes are going out of order, how long will the remaining pipes take to fill the tank? (PP)

Solution:

These two quantities are inversely proportional to each other. So:

$$(Pipes)_1 \times (Time)_1 = (Pipes)_2 \times (Time)_2$$

$$(Time)_2 = \frac{(Pipes)_1 \times (Time)_1}{(Pipes)_2}$$

$$(Time)_2 = \frac{10 \times 24}{8}$$

$$(Time)_2 = 10 \times 3$$

$$(Time)_2 = 30 \text{ days}$$

14. It takes Ali 5 hours to paint a certain room. It takes Ahmed 4 hours to paint the same room. How many hours would it take Ali and Ahmed working together at their respective rates to paint the room together? (PP)

Solution:

We know that:

$$x = \frac{AB}{A + B}$$

$$x = \frac{5 \times 4}{5 + 4}$$

$$x = \frac{20}{9} \text{ hours}$$

$$x = 2\frac{2}{9} \text{ hours}$$

15. 120 children have provision for 200 days. After 5 days, 30 children die due to an epidemic. The remaining food will last now for how many days? (PP)

Solution:

These two quantities are inversely proportional to each other. So:

$$(Children)_1 \times (Days)_1 = (Children)_2 \times (Days)_2$$

$$(Days)_2 = \frac{(Children)_1 \times (Days)_1}{(Children)_2}$$

$$(Days)_2 = \frac{120 \times 200}{90}$$

$$(Days)_2 = \frac{4 \times 195}{3}$$

$$(Days)_2 = \frac{780}{3}$$

$$(Days)_2 = 260 \text{ days}$$

16.If 8 oranges sell for 80 paisa, what would 12 oranges cost? (PP)

Solution:

These two quantities are directly proportional to each other. So:

$$\frac{(Quantity)_1}{(Amount)_1} = \frac{(Quantity)_2}{(Amount)_2}$$

$$(Amount)_2 = \frac{(Quantity)_2 \times (Amount)_1}{(Quantity)_1}$$

$$(Amount)_2 = \frac{12 \times 80}{8}$$

$$(Amount)_2 = \frac{12 \times 10}{1}$$

$$(Amount)_2 = 120 \text{ paisa}$$

Converting this amount into rupees by dividing it with 100, we get:

$$(Amount)_2 = \frac{320}{100}$$

$$(Amount)_2 = 3.20 \text{ rupees}$$

17.If the cost of a one-hour telephone call is Rs. 7.70. What would be the cost of a ten-minute telephone call at the same rate? (PP)

Solution:

These two quantities are directly proportional to each other. So:

$$\frac{(Cost)_1}{(Time)_1} = \frac{(Cost)_2}{(Time)_2}$$

$$(Cost)_2 = \frac{(Cost)_1 \times (Time)_2}{(Time)_1}$$

$$(Cost)_2 = \frac{7.70 \times 10}{1 \times 60}$$

$$(Cost)_2 = \frac{7.7}{6}$$

$$(Cost)_2 = 1.28 \text{ rupees}$$

18.If $x = 12$ and $y = 4$, where x and y are inversely proportional to each other.

Find the value of x if $y = 8$? (PP)

Solution:

As we know that x and y are inversely proportional to each other, so when value of y gets double (4 to 8), then x will remain half, so:

$$x = 6$$

19.In a school assembly, there were 16 columns of children with 30 students in each column. If we allow 24 students to stand in one column, then how many columns will be formed? (PP)

Solution:

These two quantities are inversely proportional to each other. So:

$$(Columns)_1 \times (Students)_1 = (Columns)_2 \times (Students)_2$$

$$(Columns)_2 = \frac{(Columns)_1 \times (Students)_1}{(Students)_2}$$

$$(Columns)_2 = \frac{16 \times 30}{24}$$

$$(Columns)_2 = \frac{480}{24}$$

$$(Columns)_2 = 20$$

20.Five men complete a work in two hours. Twelve men working on the same task will take how much time? (PP)

Solution:

These two quantities are inversely proportional to each other. So:

$$(Men)_1 \times (Time)_1 = (Men)_2 \times (Time)_2$$

$$(Time)_2 = \frac{(Men)_1 \times (Time)_1}{(Men)_2}$$

$$(Time)_2 = \frac{5 \times 2}{12}$$

$$(Time)_2 = \frac{10}{12} \text{ hours}$$

$$(Time)_2 = \frac{10}{12} \times 60 \text{ minutes}$$

$$(Time)_2 = \frac{10}{1} \times 5 \text{ minutes}$$

$$(Time)_2 = 50 \text{ minutes}$$

21. A walking man has a speed of 4 kmph covers in 45 minutes. How much time it will take him to cover the same distance at a running speed of 16.5 kmph?

(PP)

Solution:

These two quantities are inversely proportional to each other. So:

$$(Speed)_1 \times (Time)_1 = (Speed)_2 \times (Time)_2$$

$$(Time)_2 = \frac{(Speed)_1 \times (Time)_1}{(Speed)_2}$$

$$(Time)_2 = \frac{4 \times 45}{16.5}$$

$$(Time)_2 = \frac{4 \times 45 \times 10}{165}$$

$$(Time)_2 = \frac{1800}{165} = \frac{360}{33} = \frac{120}{11}$$

$$(Time)_2 = 10.9 \text{ minutes}$$

22. A gear 50 inches in diameter turns a smaller gear 30 inches in diameter. If the larger gear makes 15 revolutions, how many revolutions does the smaller gear make in that time? (PP)

Solution:

These two quantities are inversely proportional to each other. So:

$$(Diameter)_1 \times (Revolutions)_1 = (Diameter)_2 \times (Revolutions)_2$$

$$(Revolutions)_2 = \frac{(Diameter)_1 \times (Revolutions)_1}{(Diameter)_2}$$

$$(Revolutions)_2 = \frac{50 \times 15}{30}$$

$$(Revolutions)_2 = \frac{750}{30}$$

$$(Revolutions)_2 = 25$$

23. If Arif can read 39 pages of a book in half an hour, how long will it take him to finish a book that has 1,287 pages? (PP)

Solution:

These two quantities are directly proportional to each other. So:

$$\frac{(Time)_1}{(Pages)_1} = \frac{(Time)_2}{(Pages)_2}$$

$$(Time)_2 = \frac{(Time)_1 \times (Pages)_2}{(Pages)_1}$$

$$(Time)_2 = \frac{30 \times 1,287}{39}$$

$$(Time)_2 = \frac{10 \times 1,287}{13}$$

$$(Time)_2 = \frac{10 \times 99}{1}$$

$$(Time)_2 = 990 \text{ minutes}$$

Converting minutes into hours as follows:

$$(Time)_2 = \frac{990}{60} = \frac{99}{6}$$

$$(Time)_2 = 16.5 \text{ hours}$$

24. A factory worker can produce 28 toys in eight-hours a day. If there are 42 workers in total, how many toys are produced every hour? (PP)

Solution:

Given that:

Toys produced in 8 hours by one worker = 28

Toys produced in 1 hour by one worker = 28/8

These two quantities are directly proportional to each other. So:

$$\frac{(Toys)_1}{(Workers)_1} = \frac{(Toys)_2}{(Workers)_2}$$

$$(Toys)_2 = \frac{(Toys)_1 \times (Workers)_2}{(Workers)_1}$$

$$(Toys)_2 = \frac{(28/8) \times 42}{1}$$

$$(Toys)_2 = \left(\frac{7}{2}\right) \times 42$$

$$(Toys)_2 = \left(\frac{7}{1}\right) \times 21$$

$$(Toys)_2 = 147$$