1. A boat goes downstream and covers the distance between two ports in 4 hrs while it covers the same

distance upstream in 5 hrs. If the speed of the stream is 2 kmph, find the speed of the boat in still water.

ANS:

Let the distance between two port be ′x ′ km.

And speed of boat in still water be ′ S ′ km/hr.

According to question,

In downstream,

$x=(S+2)x4$ ....(1) as, (Distance= Speed x Time)

Similarly,

In upstream,

$x=(S-2)x5$ ....(2)

From (1) & (2),

$(S+2)4=(S-2)5$

=> $4S+8=5S-10$

=> $S=18$ km/hr.

2. A number consists of two digits whose sum is 8. If 18 is added to the number, its digits are interchanged.

Find the number.

Solution

Let us assume that one of the digit of the two digit number is X, then problem the other number will be (8 - X)

From problem we get that, if we add 27 to the number the digits get interchanged and also since the number is a two digit number then X will in tens place (7 - X) will be in ones place.

So the equation we get

10X + (8 - X) + 18 = 10(8 - X) + X

10X + 8 - X + 18 = 80 -10X + X

9X + 26 = 80 - 9X

9X + 9X = 80 - 26

18X = 54

X = 54/18

X = 3,

So the digit in tens place = 3 the digit in ones place is (8 - 3 = 5) , then the number is 35 and when 18 is added the result is 53, the digits interchange their position in the new number.

Ans: 35.

3. How much pure alcohol should be added to 400 ml of a 15% to make its strength 32%?

Let the required number of milliliters of alcohols be x ml.
Given: 15% of 400 ml should be added with 100% of pure alcohol.
According to the question, we have
400(15%)+x(100%)=(400+x)(32%)
⇒(400×15/100)+(x×100/100)=(400+x)×32/100
⇒60+x=128+8x25
⇒x−8x25=128−60
⇒17x25=68
⇒x=68×25/17
⇒x=1700/17
∴x=100 ml
Hence, 100 ml must be added to 400 ml of a 15% solution to make its strength 32%

4. X and Y together can do a piece of work in 8 days, which X alone can do in 12 days. In how many days can Y do the same work alone?

X's one day's work = 1/12
Let, Y work for x days
∴Y's one day's work = 1/x
One day work by X and Y together
1/12 +1/x = 1/8
1/x = 1/8 – 1/12 = 24
∴ x=24 days
∴Y can complete work alone in 24 days.

5. A man can row at 8 kmph in still water. If the river is running at 2 kmph, it takes him 48 minutes to row to a place and back. How far is the place?

Speed of the man in still water $=8$ kmph.

Speed of the river $=2$ kmph

Downstream $=8+2=10$ kmph

Upstream $=8-2=6$ kmph

$\Rightarrow x/10 + x/6 = 48/60$

$\Rightarrow 8x=24$

$\Rightarrow x=3$ km

6. A man is 5 years older than his wife and the wife is now thrice as old as their daughter, who is 10 years old. How old was the man when his daughter was born?

Given that, man is 5 years older than his wife and wife is thrice as old as daughter.

Daughter is 10 years old.

Let the man's age be M, wife's age be W and daughter's age be D.

Thus according to given condition, we have

$M=W+5$ ....(1),

$W=3D$ ....(2)

and $D=10$ ....(3)

Putting $d=10$ in equation (2), we get

$W=3D=3\times10=30$

Put $W=30$ in equation (1), we get

$M=W+5=30+5=35$

So, man's age when his daughter was born will be $35-10=25$ years.

7. A 100 litres solution of acid and water contains 20 liters of acid. How much water must be added to make the solution 16% acidic?

Total amount of solution = 100

acid = 20

water = solution - acid

= 100 - 20 = 8

percentages of concentration =

$\frac{20}{100} \times 100 = 40$

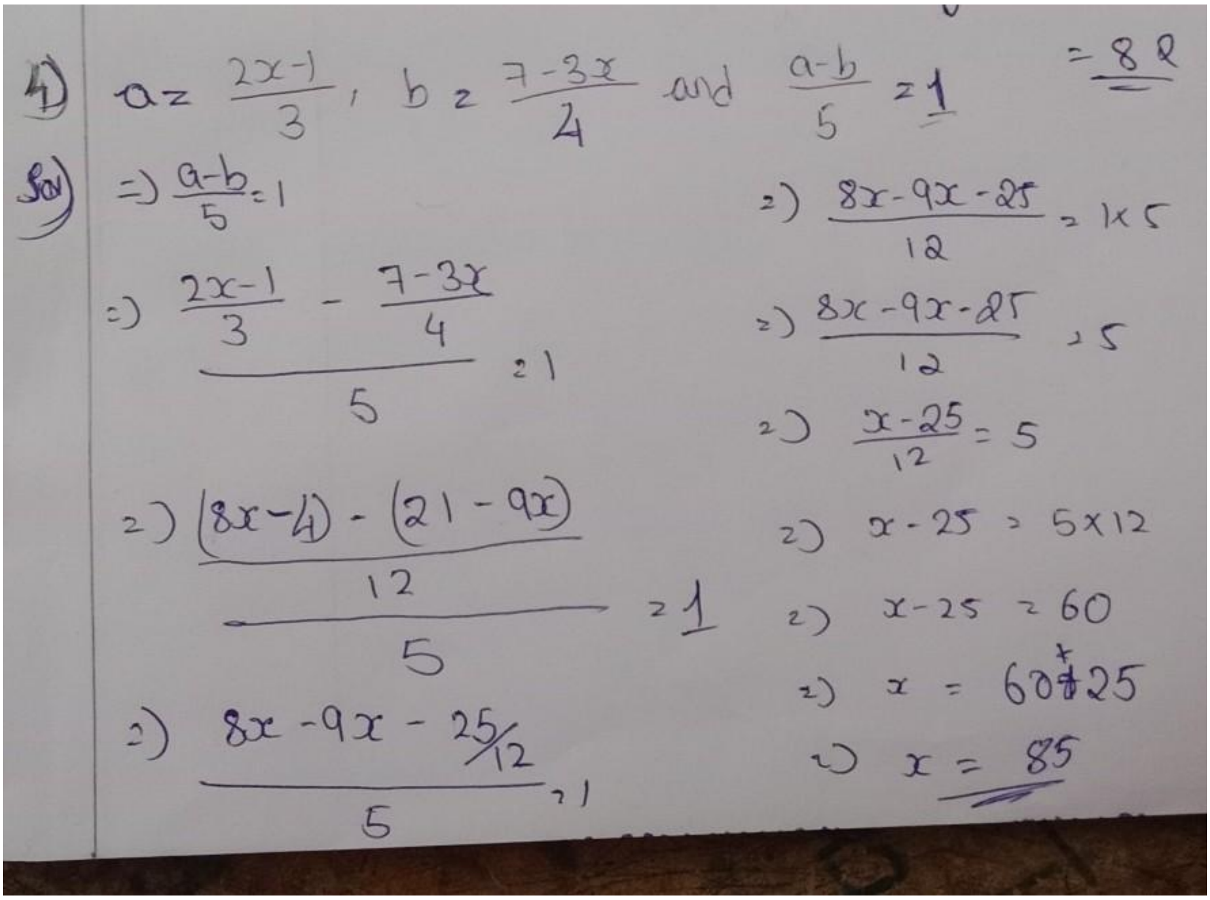
required concentration = 16%

therefore =)

$\frac{20}{100} + x = \frac{10}{100}$

100 ml of water should be added

8. when a = 2x - 1/3 , b = 7-3x/4 and a-b/5 = 1 then what is the value of x.



9. If Dennis is 1/3 rd the age of his father Keith now, and was1/4 th the age of his father 5 years

Let keith's age now be x **years. Then**

Dennis's age now =3x **years**

Keith's age 5 **years ago** =(x−5) **years**

Dennis's age 5 years ago =(x/3−5) **years**

Given, =(x/3−5) = 1/4(x−5)

⇒(x−15)/3=(x−5)/4

⇒4x−60=3x−15

⇒x=45

∴ **Keith's age** 5 **years from now** =(45+5) **years** =50 **years**

10. A person spends 1/3 of the money with him on clothes, 1/5 of the remaining on food and 1/4 of the remaining on travel. Now, he is left with Rs. 100. How much did he have with him in the beginning?

Assume that initially he had Rs. X

He spent 1/3 for cloths = $1/3 \times X$

Remaining money = $2/3 \times X$

He spent 1/5 of remaining money for food $=1/5\times 2x/3=2x/15$

Remaining money $=2x/3-2x/15=8x/15$

Again, he spent 1/4 of remaining money for travel $=1/4\times 8x/15=2x/15$

Remaining money $=8x/15-2x/15=6x/15$

But after spending for travel he is left with Rs. 100. So,

$6x/15=100$

x=Rs.250

11.

11. 5 books and 7 pens together cost Rs. 79 whereas 7 books and 5 pens together cost Rs. 77. Find the total cost of 1 book and 2 pens.

ANS: Let the cost of 1 book =x

And the cost of 1 pen =y

$\Rightarrow 5x+7y=79$

$\Rightarrow 7x+5y=77$

Equation (1) × **7 :** $35x+49y=79\times 7$

Equation (2) × **5 :** $35x+25y=77\times 5$

Subtract two equations ;

$\Rightarrow 24y=168$

$\Rightarrow y=7$

$\Rightarrow x=6$

Total cost of 1 book and 2 pens $=x+2y=6+14=20$

12. The sum of a two digit number and the number formed by interchanging its digits is 110. If 10 is subtracted from the first number, the new number is 4 more than 5 times the sum of its digits in the first number. Find the first number

let the unit place digit be x and tens place digit be y
then the two-digit number will be 10y + x
and the number formed by interchanging the unit place and tens place digits will be 10x + y
according to the first condition given in the qs i.e, the sum of two numbers is 110 that is
$10y + x + 10x + y = 110$
=> $11x + 11y = 110$
divide the above equation by 11 we get
$x + y = 10$
$x = 10 - y$ ....(i)
now according to the second equation,
if 10 is subtracted from the first number i.e, the new number is $10y + x - 10$
given that the new number is 4 more than 5 time the sum of its digits in the first number i.e
the sum of its digits in the first number is $x + y$, now 5 times of its, $5(x + y)$, and now 4 more that is, $4 + 5(x + y)$
therefore new number = $4 + 5(x + y)$
$10y + x - 10 = 4 + 5(x + y)$
$10y - 5y + x = 4 + 10 + 5x$
$5y = 14 + 4x$.....(ii)
substitute the value of x from eq(i) to eq (ii)
we get , $5y = 14 + 4(10 - y)$
$5y = 14 + 40 - 4y$
$y = 6$
and from eq(i)
$x = 4$
then the first number $10y + x = 10x6 + 4 = 64$
first number is 64.

13. The denominator of a fraction is 4 more than twice the numerator. When both the numerator and denominator are decreased by 6, then the denominator becomes 12 times the numerator. Determine the fraction.

Let the numerator and denominator of the fraction be x and y respectively. Then,

Fraction $=x/y$

It is given that

Denominator $=2$ **(Numerator)** $+4$

$\Rightarrow y=2x+4$

$\Rightarrow 2x-y+4=0$

According to the given condition, we have

$y-6=12(x-6)$

$\Rightarrow y-6=12x-72$

$\Rightarrow 12x-y-66=0$

Thus, we have the following system of equations

$2x-y+4=0$ **.(i)**

$12x-y-66=0$ **..(ii)**

Subtracting equation (i) from equation (ii), we get

$10x-70=0$

$\Rightarrow x=7$

Putting $x=7$ **in equation (i), we get**

$14-y+4=0$

$\Rightarrow y=18$

Hence, required fraction $=7/18$

14. A fraction becomes 1/3 if 1 is subtracted from both its numerator and denominator. If 1 is added to both the numerator and denominator, it becomes 1/2. Find the fraction.

Let the numerator be x and the denominator be y.

From the given information, we have,

x-1/y-1 – 1/3 and x-1/y-1 – ½

Let the numerator be x and the denominator be y.

From the given information, we have,

$\frac{x-1}{y-1} = \frac{1}{3}$ and $\frac{x+3}{y+3} = \frac{1}{2}$

or, $3(x-1) = 1(y-1)$

$\Rightarrow 3x - 3 = y - 1$

$\Rightarrow 3x - y - 2 = 0$

Also, $2(x+3) = 1(y+3)$

$\Rightarrow 2x + 6 = y + 3$

$\Rightarrow 2x - y + 3 = 0$\\\\

Using cross-multiplication method,

$$\frac{x}{(-1)(3)-(-1)(-2)} = \frac{y}{(-2)(2)-(3)(3)} = \frac{1}{(3)(-1)-(2)(-1)}$$

$$\frac{x}{-3-2} = \frac{y}{-4-9} = \frac{1}{-3+2}$$

$$\frac{x}{-5} = \frac{y}{-13} = \frac{1}{-1}$$

$\Rightarrow \frac{x}{-5} = \frac{1}{-1}$ or, $x = 5$

$\Rightarrow \frac{y}{-13} = \frac{1}{-1}$ or, $y = 13$

Thus, the original fraction is $\frac{x}{y} = \frac{5}{13}$

15. Five years hence, father's age will be three times the age of his son. Five years ago, father was seven times as old as his son. Find their present ages.

Let the father present age =x years and son present age =y years

According to the first condition

5 years later father will be (x+5) years old and son will be (y+5) years old.

$\Rightarrow x+5=3(y+5)$

$\Rightarrow x+5=3y+15 \Rightarrow x=3y+10$....eq1

According to the second condition

5 years ago father was (x−5) years old and son was (y−5) years old.

$\Rightarrow x-5=7(y-5)$

$\Rightarrow x-5=7y-35$

$\Rightarrow x-7y=-30$....eq2

Put the value of x from eq1

$\Rightarrow 3y+10-7y=-30 \Rightarrow -4y=-40 \Rightarrow y=10$

Put y=10 in eq1

$\Rightarrow x=3\times10+10=40$

Hence, Father present age =40 years

Son present age =10 years

16. Points A and B are 90 km apart from each other on a highway. A car starts from A and another from B at the same time. If they go in the same direction they meet in 9 hours and if they go in opposite directions they meet in 9/7 hours. Find their speeds.

Let X and Y be two cars starting from points A and B respectively. Let the speed of car X be x km/hr and that of car Y be y km/hr.
Case I When two cars move in the same directions:
Suppose two cars meet at point Q. Then,
Distance travelled by car X=AQ,
Distance travelled by car Y=BQ
It is given that two cars meet in 9 hours.
∴ Distance travelled by car X in 9 hours =9x km.
$\Rightarrow AQ=9x$
Distance travelled by car y in 9 hours =9y km.
$\Rightarrow BQ=9y$
Clearly, $AQ-BQ=AB$
$\Rightarrow 9x-9y=90$ [∵AB=90km]
$\Rightarrow x-y=10$ (i)
Case II When two cars move in opposite directions:
Suppose two cars meet at point P. Then,
Distance travelled by car X = AP,
Distance travelled by car Y = BP
In this case, two cars meet in 9/7 hours.
∴ Distance travelled by car X in 79 hours =79xkm
$\Rightarrow BP=79y$
Clearly, $AP+BP=AB$
$\Rightarrow 79x+79y=90$

$\Rightarrow 79(x+y)=90$
$\Rightarrow x+y=70$.(ii)
Adding equations (i) and (ii), we get
$2x+0=80 \Rightarrow x=40$
Putting in (ii), we get,
$y=70-40=30$
$\therefore x=40$ and $y=30$.
Hence, the speed of car X is 40 km/hr and speed of car Y is 30 km/hr.

17. A train covered a certain distance at a uniform speed. If the train would have been 6 km/h faster, it would have taken 4 hours less than the scheduled time. And, if the train were slower by 6 km/h, it would have taken 6 hours more than the scheduled time. Find the length of the journey.

Let the actual speed of the train be x km/hr and the actual time taken be y hours. Then,

Distance covered $=(xy)$km ..(i) [∴ Distance = Speed × Time]

If the speed is increased by 6 km/hr, then time of journey is reduced by 4 hours i.e., when speed is $(x+6)$km/hr, time of journey is $(y-4)$ hours.

∴ Distance covered $=(x+6)(y-4)$

$\Rightarrow xy=(x+6)(y-4)$ [Using (i)]

$\Rightarrow -4x+6y-24=0$

$\Rightarrow -2x+3y-12=0$ ..(ii)

When the speed is reduced by 6 km/hr, then the time of journey is increased by 6 hours i.e., when speed is $(x-6)$ km/hr, time of journey is $(y-6)$ hours.

∴ Distance covered $=(x-6)(y+6)$

$\Rightarrow xy=(x-6)(y+6)$ [Using (i)]

$\Rightarrow 6x-6y-36=0$

$\Rightarrow x-y-6=0$ (iii)

Thus, we obtain the following system of equations:

$-2x+3y-12=0$

$x-y-6=0$

By using cross-multiplication, we have,

$x/\ 3\times-6-(-1)\times-12=-y/-2\times-6-1\times-12=1/-2\times-1-1\times3$

$\Rightarrow -30x=24-y=-11$

$\Rightarrow x=30$ and $y=24$

Putting the values of x and y in equation (i), we obtain

Distance $=(30\times24)$km $=720$km.

Hence, the length of the journey is 720km.

18. A person invested some amount at the rate of 12% simple interest and some other amount at the rate of 10% simple interest. He received yearly interest of Rs. 130. But if he had interchanged the amounts invested, he would have received Rs 4 more as interest. How much amount did he invest at different rates

Suppose the person invested Rs x at the rate of 12% simple interest and Rs y at the rate of 10% simple interest. Then,

Yearly interest = 12/100 +10y/100

∴12/100 +10y/100 = 130

⇒12x+10y=13000

⇒6x+5y=6500 .(i)

In the invested amounts are interchanged, then yearly interest increased by Rs 4.

10x/100 + 12y/100 = 134

⇒10x+12y=13400

⇒5x+6y=6700 ..(ii)

Subtracting equation (ii) from equation (i), we get

x−y=−200 .(iii)

Adding equation (ii) and (i), we get

11x+11y=13200

⇒x+y=1200 ..(iv)

Adding equations (iii) and (iv), we get

2x=1000⇒x=500

Putting x=500 in equation (iii), we get y=700

Thus, the person invested Rs 500 at the rate of 12% per year and Rs 700 at the rate of 10% per year.

19. On selling a tea-set at 5% loss and a lemon-set at 15% gain, a crockery seller gains Rs 7. If he sells the tea-set at 5% gain and the lemon-set at 10% gain, he gains Rs 13. Find the actual price of the tea-set and the lemon-set.

Let the cost price of the tea-set and the lemon-set be Rs x and Rs y respectively.

Casel: **When tea set is sold at 5% loss and lemon-set at 15% gain.**

Loss in tea-set = Rs.5x/100 = Rs. x/20

Gain on lemon-set = Rs. 15y/100 =Rs. 3y/20

∴ Net gain = Rs. 3y/20-x/20

⇒3y/20-x/20 = 7

$\Rightarrow 3y - x = 140$

$\Rightarrow x - 3y + 140 = 0$ **(i)**

Casell**: When tea-set is sold at 5% gain and the lemon-set at 10% gain.**

Gain on tea-set = Rs. 5x/100 = = Rs. x/20

Gain on lemon-set = Rs. 10y / 100 = Rs.y/100

∴ Total gain = Rs. x/20 + y/10

⇒ x/20 + y/10 = 13

$\Rightarrow x + 2y = 260$

$\Rightarrow x + 2y - 260 = 0$.(ii)

Subtracting equation (ii) from equation (i), we get

$-5y + 400 = 0 \Rightarrow y = 80$

Putting $y = 80$ in equation (i), we get

$x - 240 + 140 = 0 \Rightarrow x = 100$

Hence, the cost prices of tea-set and lemon-set are Rs. 100 and Rs. 80 respectively

20 . In a △ABC, ∠C = 3∠B = 2(∠A + ∠B) . Find the three angles

Solution:

According to the angle sum property of a triangle, sum of the measures of all the angles of triangle is 180°.

Let the measurement of ∠A = x

And the measurement of ∠B = y

Using the information given in the question,

∠C = 3∠B = 2 (∠A + ∠B)

⇒ 3∠B = 2 (∠A + ∠B)

⇒ 3y = 2 (x + y)

⇒ $3y = 2x + 2y$

⇒ $2x - y = 0$ ....(1)

We know that the sum of the measures of all angles of a triangle is 180°. Therefore,

$\angle A + \angle B + \angle C = 180°$

⇒ $\angle A + \angle B + 3\angle B = 180°$ [∵ $\angle C = 3\angle B$]

⇒ $\angle A + 4\angle B = 180$

⇒ $x + 4y = 180$ ...(2)

Multiplying equation (1) by 4, we obtain

$8x - 4y = 0$ ....(3)

Adding equations (2) and (3), we obtain

$x + 4y + 8x - 4y = 180 + 0$

$9x = 180$

$x = 20$

Substituting $x = 20$ in equation (1), we obtain

$2 \times 20 - y = 0$

$y = 40$

Therefore,

$\angle A = x = 20°$

$\angle B = y = 40°$

$\angle C = 3\angle B = 3 \times 40° = 120°$

OR

We know that in a △, the sum of all the interior angles is 180°

$\Rightarrow \angle A+\angle B+\angle C=180^\circ$........(1)

Also given that,

$\angle C=3\angle B$ **and** $3\angle B=2\angle A+2\angle B$

$\angle A= \angle B/2$

Substituting values in (1), we get

$\angle B/2$ $+\angle B+3\angle B=180^\circ$

$\therefore \angle B=40^\circ$

$\angle A=20^\circ$

$\angle C=120^\circ$