RATIO & PROPORTION

DRILL 1: SOLUTIONS

a. The number of 50 paisa coins that will sum up to Rs.280 will be
$(1/2) x = 280$
$\quad x = 560$
So, 560 coins.
Ratio is $7y : 10y$. Therefore, $7y = 560$ and $y = 80$.
So the number of one rupee coins will be $10*80$ = **800 coins**

b. *a : b = 3 : 5*
b : c = 5 : 4
c : a = 2 : 3
So, $(a/b)*(b/c)*(c/d) = a/d$
Substituting the values
$(3/5)*(5/4)*(2/3) = 2/4$
So, the ratio between a : d = 2 : 4
Which can be further simplified into **1 : 2**.

c. Let the ages of Abishek, Bala, Chitra and Deepak be $8x : 10x : 7x : 9x$
Bala is the oldest person and Chitra is the youngest person,
As, the oldest person is 9 older than the youngest
$\therefore 10x - 9 = 7x$
$\Rightarrow 3x = 9 \Rightarrow x = 3$
So, 8x will be equal to 24.
If Abishek's age = 24 years

DRILL 2

a. Bhavana and Gowtham's ages are in the ratio 2:3
i.e., B : G = 2 : 3
It is mentioned that Bhavana, Gowtham and Chirag's ages are in continued proportion.
$\frac{B}{G} = \frac{G}{C}$ Given, $\frac{B}{G} = \frac{2}{3}$
$\therefore \frac{G}{C}$ Or G : C should also be in the ratio 2:3

$$\begin{array}{ccc} \textbf{B} & : & \textbf{G} \\ 2 & : & 3 \end{array} \longrightarrow \textbf{(1)}$$

G : C
                             2 : 3   ⟶ **(2)**

To find B:G:C multiply '1' by 2 and multiply '2' by 3 to make Gowtham's age (G) as common and finally we can convert it as B:G:C

                  B:G:C = 4:6:9
                      ↓
                    24 years

Bhavana's age is 24 years which is the value of 4 parts.

∴ The value of one part will be 6.

Chirag's age can be calculated from 9 parts, hence the value will be 9*6= 54 years.

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b. The given values are 18, 30 and 54.

Let us assume the least value to be subtracted as x.

So the new values are (18-x), (30-x) and (54-x).

It is given that values are in continued proportion.

$\frac{18-x}{30-x} = \frac{30-x}{54-x}$

By simplifying we will get the value for x that is 6.

∴ The least value is **6**

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c. From the given data

Ratio of number of steps by policeman and thief is 7:5

Ratio of distance covered by policeman and thief is 6:5

Ratio of distance covered at the unit time will be 7*6 : 5*5 = 42:25

Hence the ratios of the speeds is **42:25**

DRILL 3

a. Let W be the amount of water evaporating and A be the area of the pond

From the question $W \propto A$

Replacing the proportionality with a constant 'k'; W =kA

70 = 1250*k; 42 = kA

k = 70/1250

Sub k we'll get 42 = (70/1250)*A

A = **750**

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b. Category: C

i) M (Mileage of the car) $\propto$ As (Average speed of the car)

ii) M $\propto \frac{1}{L}$ (Passenger load)

$\Rightarrow$ M $\propto \frac{As}{L}$

As per the data provided,

$20 \; \alpha \; \frac{60}{150}$ and $x \; \alpha \; \frac{70}{140}$

$20 = k*\frac{2}{5}$ and $x = k*\frac{1}{2}$

k = 50 and Sub the value we'll get x = 50/2 or x =25

Alternate Method:

$20 \Rightarrow \frac{60}{150}$

$x \Rightarrow \frac{70}{140}$ $\qquad \Rightarrow$ 20 *(1/2) = x*(2/5)

x = **25**

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c. Assume the weight of the 3 broken pieces be 1x,3x and 6x

Value of the diamond α Square of the weight

$V \; \alpha \; W^2$

$\Rightarrow$ Introducing proportionality constant

$V = kW^2$

Weight of the unbroken diamond $\Rightarrow$ 10x

Value of the unbroken piece of diamond as given in the question

$W^2 \; \alpha \; 30000$

Sub W = 10x $\Rightarrow (10x)^2 \; \alpha \; 30000$

$100x^2 \; \alpha \; 30000$, 100 parts α 30000

1 part = 300 or $x^2 = 300$

Total value of the broken piece will be

$1x^2 + 9x^2 + 36x^2 = 46x^2$

Loss in value due to breakage $100x^2 - 46x^2 = 54x^2$

Value of the breakage $54x^2 = 54*300 =$ **Rs.16200**

DRILL 4

a. Let us take Heads as H and Legs as L and Number of Goats and Ducks as G and D.

G + D = 30 ------- (1)

Then 4G + 2D = 10 + 3(G+D)

4G + 2D = 10 + 3G = 3D

G – D = 10 -------- (2)

Solving (1) & (2),

2G = 40,

G = 20 and D = 10

Number of Goats = **20**

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b. Let the cost of Full ticket be x and Reservation charge be r

x + r = 216 ------ (1)

$1\frac{1}{2}$x + 2r = 327 ------- (2)

(Full + Half) (Reservation charge Full = r

Half = r   }2r)

2x + 2r = 432

x + 2r = 327

$\frac{1}{2}$x   = 105

x = 210

r=6

DRILL 5

a. Let the ages of Arun and Bala be 3x,x.
    Fifteen years hence,
    $$\frac{3x+15}{x+15} = \frac{2}{1}$$
    3x+15 = 2x+30
    X=15 $\longrightarrow$ 1
    $\therefore$ Age of Arun = 3x = **45 years**

b. Let father's age be 'f' and son's age be 's'
    f + s = 60 $\longrightarrow$ (1)
    6 years ago,
    (f-6) = 5(s-6)
    f-6 = 5s - 30
    f – 5s = -24 $\longrightarrow$ (2)
    Using '1' and '2',
    (60-s) - 5s = -24
    60 – 6s = -24
    S= 14
    Son's age after 6 years will be **20 years.**

GOOGLY QUESTIONS

1. Wrong.
In the given question, we need to find Raghu's brother's present age (B) whereas in the answer, Raghu's age has been calculated and given as answer.

2. Correct

3. Wrong.

In the given question price of one orange is the answer which has already been specified in the given question as Rs. 10

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4. Wrong.

Substitute the options a) 1,2,3 It is trial and error method.

$6x + 12y + 8z = 58$

Substitute the values for x=1, y=2 and z=3

We will get the answer as 58.

Similarly, option 'c' also satisfies the question

Substitute the values for x=2, y= -13 and z=$\frac{25}{2}$

We will get the answer as 58.

So, the answer is (d) which is more than the one mentioned above.

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5. Correct.

Concept Review Questions

1. Let x be the cost of pencil and y be the cost of pen.

   $21x + 29y = Rs.79$ --------- (1)

   $29x + 21y = Rs.79 - Rs.8 = Rs.71$ --------- (2)

   We can find the value of y by adding 1 & 2 we get

   $50x + 50y = 150$

   $x + y = Rs.3$

   Rate of pen and pencil cannot be equal as there has been a drop in the second case. As the sum is 3(odd); both cannot be odd and they should be less than 3. Pen should be costlier than pencil since number of pens reduced in second case which resulted in the price drop.

   So cost of 1 pen should be Rs. 2

   Ans: (b)

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2. Let R be the present age of Ravi.

   Given $1\frac{1}{2} + \frac{3}{7}R = \frac{1}{2}R$

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

   $R[\frac{6-7}{14}] = \frac{-3}{2}$

   $R = 21$

   Ravi's age is 21 years

   Ans: (b)

3. Let 'f' be father's age and 's' be son's age.

$(f-1) = 8(s-1)$

$f = s^2$

Using these two equations we can find the value of Father's age.

(Or)

From options, Father's age should be a perfect square $\therefore$ we can eliminate options (a) and (c)

Let us try with option (b)

$49 \Rightarrow$ Present age of father, Son's present age should be 7

One year ago, Father's age = 48, Son's age = 6

Now it satisfies the condition of $(f-1) = 8(s-1)$

$\Rightarrow 48 = 6*8$

Ans : (b)

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4. Let x be number of people who have registered for meeting.

Cost of Registration = Rs.50

Cost of Registration + Lunch = Rs.50 + Rs.24 = Rs.74

Total amount collected = Rs.69400

$50x + 74(x+100) = 69400$

$124x + 7400 = 69400$

$124x = 62000 \Rightarrow x = 500$

500 people just paid for Registration

 Ans: (c)

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5. Let the number of students in A and B be x and y respectively.

$x - 10 = y + 10$ ------ (1)

$x + 20 = 2(y-20)$ ------- (2)

Solving (1) & (2) we can get the answer

Ans : (c)

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6. Let S be son's age and f be father's age.

$f/s = 4/1$

Father's age $\Rightarrow 4x$; Son's age $\Rightarrow x$

Product = 196

$4x^2 = 196$

$x = 7$ years

Ratio of their present ages $\Rightarrow 28 : 7$

After 5 years, ratio of their ages $\Rightarrow 33 : 12$ or $11 : 4$

Ans: (c)

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7. Total Amount = Rs.102

Given ratio   3 : 4 : 10

                Re.1   50p 10p

Consider 1 set, i.e., 3 Coins of 1 Re $\Rightarrow$ Rs. 3

                       4 Coins of 50 p $\Rightarrow$ Rs. 2

                       10 Coins of 10p $\Rightarrow$ Rs. 1

Total   Rs.6

Number of sets in 102 = 102/6 = 17 sets

1 set contain 10 coins of 10 paisa.

Totally there are 17*10 = 170 coins of 10 paisa.

Ans: (a)

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8. Let 4w be number of 4 wheelers and 2w be number of 2 wheelers.

   Given 4w + 28*2w = 4w + 56w

   56 is divisible by 4, $\therefore$ tyres should be divisible by 4

   Since tyres cannot be in decimals we have only one option as multiple of 4

   i.e., 72 tyres

   Ans: (c)

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9. Total number of mirrors 1 dozen $\Rightarrow$ 12

   Ratio of broken to Unbroken mirrors = B:U

   Sum should be a factor of 12

   $\therefore$ Option (c) 3 : 2, there sum $\Rightarrow$ 5x which is not a factor of 12

   So it should be the answer

   Ans: (c)

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10. Ratio of income of A & B = 2 : 1

    Ratio of expenditure of A and B = $2\frac{1}{2}$: 1 or $\frac{5}{2}$: 1 or 5 : 2

    We know, Income – Expenditure = Savings

    Income   = 2 : 1 *3 $\Rightarrow$ 6 : 3

                                Difference 1x

    Expenditure = 5 : 2 $\Rightarrow$ 5 : 2

    Savings   1 : 1

    x = 2000 [savings 2000]

    A's earning = 6*2000 = Rs.12000

    Ans: (a)

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11. Let P be number if pigeons and H be the number of horses

   P + H = 80 ------(1)

   2P + 4H = 260 (No of legs)

   P **+** 2h = 130 ----(2)

   -H = - 50

   $\therefore$ H = 50

Ans: (c)

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12. Let x be the number of children.
Number of notebooks each child got = 1/8 x
Before solving the problem let's have a look at an example,
Consider there are only 10 people and we had to distribute 10 chocolates to them, which means we can give one chocolate each. Now if the number of people is reduced half, then the chocolates given to each one will be doubled.

Children   Notebooks given to each child
   x   x/8
   x/2   16(doubled)

∴ x/8= 8 notebooks(16/2)

∴ x= 64 (children)

We get to know that each child has got 8 notebooks and there were 64 children.

∴ Total number of notebooks distributed = 64 * 8 = 512 notebooks

Ans: (a)

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13. Alvin's per day earning will be constant.
Let x be the value of free holiday

For 7 weeks, earning / day = $\frac{300+x}{7}$

For 4 weeks, earning / day = $\frac{30+x}{4}$

Equating $\frac{300+x}{7}$ = $\frac{30+x}{4}$

1200 + 4x =210 + 7x

990 = 3x

∴ x = 330

Ans: (b)

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14. Let 'F' be force of attraction and 'd' be distance

Given, F $\alpha \frac{1}{d^2}$

To remove proportionality,

F = $\frac{k}{d^2}$

When d= 2 and F = 18N

∴ 18= $\frac{k}{4}$ $\Rightarrow$ k=72

∴ When d =3, F = $\frac{72}{9}$ = 8N

Ans: (b)

15.

	Apples	Pears	Amount
Jack	10	15	Rs. 10
Jill	20	x	Rs. 40

Here, everything is doubled since it is linear variation.

$\therefore$ Number of pears Jill bought = 15 * 2 = 30

Ans: (b)