COMMERCE MATHEMATICS AND STATISTICS

(PART - II)

STD. XII

MATHEMATICS OF MONEY

Mr. Vinod Singh
M.Sc. (Mathematics)

Ms. Shweta Pawar
B.E. (Computer)

Target Publications Pvt. Ltd.

Std. XII Commerce

Mathematics & Statistics - II

Third Edition: April 2016

Salient Features

- Precise Theory for every Topic.
- Exhaustive coverage of entire syllabus.
- Topic-wise distribution of all textual questions and practice problems at the beginning of every chapter.
- Relevant and important formulae wherever required.
- Covers answers to all Textual Questions.
- Practice problems based on Textual Exercises and Board Questions (March 08 – March 16) included for better preparation and self evaluation.
- Multiple Choice Questions at the end of every chapter.
- Two Model Question papers based on the latest paper pattern.
- Includes Board Question Papers of March and October 2014, 2015 and March 2016.

Preface

Mathematics is not just a subject that is restricted to the four walls of a classroom. Its philosophy and applications are to be looked for in the daily course of our life. The knowledge of mathematics forms the backbone of all sciences and it is an inseparable part of human life.

With the same thought in mind, we present to you "**Std. XII Commerce: Mathematics and Statistics Part - II**" a complete and thorough book with a revolutionary fresh approach towards content and thus laying a platform for an   in depth understanding of the subject. This book has been written according to the latest syllabus and includes two model question papers based on the latest paper pattern.

At the beginning of every chapter, topic-wise distribution of all textual questions including practice problems have been provided for simpler understanding of various types of questions. Every topic included in the book is divided into sub-topics, each of which are precisely explained with the associated theories. Also, practice problems based upon solved exercises are included which not only aid students in self evaluation but also provide them with plenty of practice. We've also ensured that each chapter ends with a set of Multiple Choice Questions so as to prepare students for competitive examinations.

We are sure this study material will turn out to be a powerful resource for students and facilitate them in understanding the concepts of Mathematics in the most simple way.

The journey to create a complete book is strewn with triumphs, failures and near misses. If you think we've nearly missed something or want to applaud us for our triumphs, we'd love to hear from you.

Please write to us on: *mail@targetpublications.org*

Best of luck to all the aspirants!

Yours faithfully,
Publisher

BOARD PAPER PATTERN

Time: 3 Hours	**Total Marks: 80**

> **1.** One theory question paper of 80 marks and duration for this paper will be 3 hours.
> **2.** For Mathematics and Statistics, (Commerce) there will be only one question paper and two answer papers. Question paper will contain two sections viz. Section I and Section II. Students should solve each section on separate answer books.

Section - I

Q.1. This Question will have 8 sub-questions, each carring two marks. **[12 Marks]**
Students will have to attempt any 6 out of the given 8 sub-questions.

Q.2. This Question carries 14 marks and consists of two sub parts (A) and (B) as follows: **[14 Marks]**
(A) It contains 3 sub-questions of 3 marks each.
Students will have to attempt any 2 out of the given 3 sub-questions.
(B) It contains 3 sub-questions of 4 marks each.
Students will have to attempt any 2 out of the given 3 sub-questions.

Q.3. This Question carries 14 marks and consists of two sub parts (A) and (B)as follows: **[14 Marks]**
(A) It contains 3 sub-questions of 3 marks each.
Students will have to attempt any 2 out of the given 3 sub-questions
(B) It contains 3 sub-questions of 4 marks each.
Students will have to attempt any 2 out of the given 3 sub-questions.

Section - II

Q.4. This Question will have 8 sub-questions, each carring two marks.   **[12 Marks]**
Students will have to attempt any 6 out of the given 8 sub-questions.

Q.5. This Question carries 14 marks and consists of two sub parts (A) and (B)
as follows: **[14 Marks]**
(A) It contains 3 sub-questions of 3 marks each.
Students will have to attempt any 2 out of the given 3 sub-questions.
(B) It contains 3 sub-questions of 4 marks each.
Students will have to attempt any 2 out of the given 3 sub-questions.

Q.6. This Question carries 14 marks and consists of two sub parts (A) and (B)
as follows: **[14 Marks]**
(A) It contains 3 sub-questions of 3 marks each.
Students will have to attempt any 2 out of the given 3 sub-questions
(B) It contains 3 sub-questions of 4 marks each.
Students will have to attempt any 2 out of the given 3 sub-questions.

Evaluation Scheme for Practical	
i.	Duration for practical examination for each batch will be one hour.
ii.	Total marks : 20

MARKWISE DISTRIBUTION

Unitwise Distribution of Marks
Section - I

Sr. No.	Units	Marks with Option
1.	Mathematical Logic	08
2.	Matrices	08
3.	Continuity	08
4.	Differentiation	08
5.	Application of Derivative	10
6.	Integration	08
7.	Definite Integrals	08
	Total	**58**

Unitwise Distribution of Marks
Section - II

Sr. No.	Units	Marks with Option
1.	Commercial Arithmetic: − Ratio, Proportion, Partnership − Commission, Brokerage, Discount − Insurance, Annuity	13
2.	Demography	08
3.	Bivariate Data Correlation	08
4.	Regression Analysis	07
5.	Random Variable and Probability Distribution	08
6.	Management Mathematics	14
	Total	**58**

Weightage of Objectives

Sr. No.	Objectives	Marks	Marks with Option	Percentage
1.	Knowledge	08	13	10.00
2.	Understanding	22	32	27.50
3.	Application	32	45	40.00
4.	Skill	18	26	22.50
	Total	**80**	**116**	**100.00**

Weightage of Types of Questions

Sr. No.	Types of Questions	Marks	Marks with Option	Percentage
1.	Objective Type	24	32	30
2.	Short Answer	24	36	30
3.	Long Answer	32	48	40
	Total	**80**	**116**	**100.00**

Contents

01 Ratio, Proportion and Partnership

Type of Problems	Exercise	Q. Nos.
Ratio and Proportion	1.1	Q.1 to 10
	Practice Problems (Based on Exercise 1.1)	Q.1 to 7
	Miscellaneous	Q.1 to 9
	Practice Problems (Based on Miscellaneous)	Q.1, 2, 3, 4
Partnership	1.2	Q.1 to 10
	Practice Problems (Based on Exercise 1.2)	Q.1 to 7
	Miscellaneous	Q.10 to 20
	Practice Problems (Based on Miscellaneous)	Q.5, 6, 7, 8

Syllabus:

1.1   Ratio

1.2   Proportion

1.3   Partnership

Introduction

Ratio is the comparative relationship between two quantities of same kind, expressed in same unit.

i.e., the ratio of two quantities a and b of the same kind and measured in the same units is the fraction

$\dfrac{a}{b}$ and is written as a : b, read as 'a' is to 'b'.

For example, If height of a person 'a' is 4ft and that of another person 'b' is 6ft, then a = 4ft and b = 6ft. Here, the quantity concerned (height) is of same kind and is measured in the same unit.

$\therefore \quad \dfrac{a}{b} = \dfrac{4}{6} = \dfrac{2}{3}$

1.1   Ratio

Definition:

If a, b and k are non-zero real numbers such that

a = bk i.e., $\dfrac{a}{b} = k,$ then k is the ratio of a to b.

Terms of a ratio:

In the ratio a : b, a is called as first term or antecedent and b is called as second term or consequent.

Ratio in the simplest form:

The ratio a : b is said to be in the simplest form if H.C.F. of a and b is 1 i.e., there is no common factor other than 1.

Properties of ratio:

1.   If both the terms of the ratio are multiplied or divided by same non-zero number, then the ratio remains unchanged.

   i.e., $\dfrac{a}{b} = \dfrac{ak}{bk}$, where $k \neq 0$

   and $\dfrac{a}{b} = \dfrac{a/k}{b/k}$, where $k \neq 0$

2.   **Order relation between the ratios**

   Let $\dfrac{a}{b}$ and $\dfrac{c}{d}$ be two given ratios,

   where b > 0, d > 0

   i.   If ad > bc, then $\dfrac{a}{b} > \dfrac{c}{d}$ i.e., a : b > c : d

   ii.   If ad < bc, then $\dfrac{a}{b} < \dfrac{c}{d}$ i.e., a : b < c : d

   iii.   If ad = bc, then $\dfrac{a}{b} = \dfrac{c}{d}$ i.e., a : b = c : d

Properties of equal ratios:

1.   **Invertendo:** If $\dfrac{a}{b} = \dfrac{c}{d}$, then $\dfrac{b}{a} = \dfrac{d}{c}$

2.   **Alternendo:** If $\dfrac{a}{b} = \dfrac{c}{d}$, then $\dfrac{a}{c} = \dfrac{b}{d}$

3.   **Componendo:** If $\dfrac{a}{b} = \dfrac{c}{d}$, then $\dfrac{a+b}{b} = \dfrac{c+d}{d}$

   This property is generalized as

   If $\dfrac{a}{b} = \dfrac{c}{d}$, then $\dfrac{a+mb}{b} = \dfrac{c+md}{d}$

   Where, m is a positive integer.

4.   **Dividendo:**

   If $\dfrac{a}{b} = \dfrac{c}{d}$, then $\dfrac{a-b}{b} = \dfrac{c-d}{d}$

   This property is generalized as

   If $\dfrac{a}{b} = \dfrac{c}{d}$, then $\dfrac{a-mb}{b} = \dfrac{c-md}{d}$

   Where, m is a positive integer.

5.   **Componendo-Dividendo:**

   If $\dfrac{a}{b} = \dfrac{c}{d}$, then $\dfrac{a+b}{a-b} = \dfrac{c+d}{c-d}$

   This property is generalized as

   If $\dfrac{a}{b} = \dfrac{c}{d}$, then $\dfrac{a+mb}{a-mb} = \dfrac{c+md}{c-md}$

   Where, m is a positive integer.

Theorem on Equal ratios:

   If $\dfrac{a}{b} = \dfrac{c}{d}$, then $\dfrac{a}{b} = \dfrac{c}{d} = \dfrac{a+c}{b+d}$

   In general this theorem is written as

   If $\dfrac{a}{b} = \dfrac{c}{d} = \dfrac{e}{f} = $ …………

   and if l, m, n ……… are non-zero numbers such that $lb + md + nf + …. \neq 0$, then

   $\dfrac{a}{b} = \dfrac{c}{d} = \dfrac{e}{f} = ….= \dfrac{la + mc + ne + ...}{lb + md + nf + ...}$

Percentage (%):

It is the numerator of the ratio of two numbers, where the denominator is always 100.

Percent means per hundred (cent).

For example,

$$\frac{40}{100} = 40\%$$

i.e., 40 percent (40%) means 40 per 100.

Note: A fraction can be converted into percentage on multiplication by 100.

e.g., $\frac{4}{5}$ means $\frac{4}{5} \times 100 = 80\%$

1.2 Proportion

An equality of two ratios is called a proportion.
i.e., if two ratios are equal then the terms are said to be in proportion.

If $\frac{a}{b} = \frac{c}{d}$, then the terms a, b, c and d are in

proportion and it is expressed as a : b :: c : d

For example,

If $\frac{2}{6} = \frac{3}{9}$, then 2, 6, 3 and 9 are in proportion and it is

expressed as 2 : 6 :: 3 : 9

Note:

Here,
1. a and d are called extremes.
2. b and c are called means or middle terms.
3. If a, b, c, d are in proportion, then ad = bc

Continued Proportion:

Three numbers say a, b, c are said to be in continued proportion if a : b = b : c.

Remark:

Since, a : b = b : c

∴ $\frac{a}{b} = \frac{b}{c}$

∴ $b^2 = ac$

∴ $b = \sqrt{ac}$

∴ the numbers $a, \sqrt{ac}, c$ are always in continued proportion.

In general the numbers a, b, c, d, e, f, …. are in continued proportion,

if $\frac{a}{b} = \frac{b}{c} = \frac{c}{d} = \frac{d}{e} = \frac{e}{f} = ……$

Note:

1. If a : b :: c : d then a, b, c and d are called first, second, third and fourth proportions respectively.
2. If a, b, c, are in continued proportion, then

$b = \sqrt{ac}$ is called geometric mean of a and c.

b is also called mean proportion of a and c.

1. **The ratio of number of boys and girls in a school is 3 : 2. If 20% of the boys and 30% of the girls are scholarship holders. Find the percentage of students who are not scholarship holders.** **[Mar 15]**

Solution:

Let x be the proportionality constant.
Since, the ratio of number of boys and girls in the school is 3 : 2.

∴ the number of boys and girls are $3x$ and $2x$ respectively.

∴ total number of students = $3x + 2x = 5x$
Now, 20% of the boys are scholarship holders.

∴ the number of boys who are scholarship holders = 20% of $3x$

$$= \frac{20}{100} \times 3x = \frac{3x}{5}$$

Also, 30% of the girls are scholarship holders.

∴ the number of girls who are scholarship holders = 30% of $2x$

$$= \frac{30}{100} \times 2x = \frac{3x}{5}$$

∴ The number of students who are not scholarship holders

$$= \begin{matrix} \text{Total number} \\ \text{of students} \end{matrix} - \begin{matrix} \text{Number of students who} \\ \text{are scholarship holders} \end{matrix}$$

$$= 5x - \left(\frac{3x}{5} + \frac{3x}{5}\right) = 5x - \frac{6x}{5} = \frac{19x}{5}$$

Now, percentage of students who are not scholarship holders

$$= \frac{\begin{matrix}\text{Number of students who are} \\ \text{not scholarship holders}\end{matrix}}{\text{Total number of students}} \times 100$$

$$= \frac{\frac{19x}{5}}{5x} \times 100 = \frac{19x}{25x} \times 100 = 76\%$$

2. **If the numerator of a fraction is increased by 20% and its denominator be diminished by 10%, the value of the fraction is $\frac{16}{21}$. Find the original fraction.**
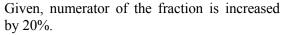
Solution:

Let the numerator of the fraction be x and the denominator be y.

∴ the fraction is $\frac{x}{y}$

Given, numerator of the fraction is increased by 20%.

∴ numerator becomes $x + 20\%$ of x

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

$$= x + \frac{1}{5}x = \frac{6x}{5}$$

and denominator of the fraction is diminished by 10%.

∴ denominator becomes $y - 10\%$ of y

$$= y - \frac{10}{100} \times y$$

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

Also, value of the new fraction is given to be $\frac{16}{21}$

i.e. $\dfrac{\dfrac{6x}{5}}{\dfrac{9y}{10}} = \dfrac{16}{21}$

∴ $\dfrac{6x}{5} \times \dfrac{10}{9y} = \dfrac{16}{21}$

∴ $\dfrac{4x}{3y} = \dfrac{16}{21}$

∴ $\dfrac{x}{y} = \dfrac{16}{21} \times \dfrac{3}{4}$

∴ $\dfrac{x}{y} = \dfrac{4}{7}$

∴ the original fraction is $\dfrac{4}{7}$.

---

3. **The ratio of incomes of Salim and Jawed was 20:11. Three years later income of Salim has increased by 20% and income of Jawed was increased by ₹ 500. Now ratio of their incomes become 3:2. Find original incomes of Salim and Jawed.**

Solution:

Let x be the proportionality constant.

Since, the ratio of incomes of Salim and Jawed was 20:11.

∴ The original incomes of Salim and Jawed were ₹ $20x$ and ₹ $11x$ respectively.

Given, three years later, income of Salim has increased by 20%.

∴ income of Salim becomes $20x + 20\%$ of $20x$

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

$$= 20x + 4x = ₹\ 24x$$

and income of Jawed was increased by ₹ 500.

∴ income of Jawed becomes ₹ $(11x + 500)$.

Also, the ratio of their new incomes is given to be 3:2

∴ $\dfrac{24x}{11x + 500} = \dfrac{3}{2}$

∴ $2 \times 24x = 3(11x + 500)$

∴ $48x = 33x + 1500$

∴ $48x - 33x = 1500$

∴ $15x = 1500$

∴ $x = \dfrac{1500}{15} = 100$

∴ Original income of Salim = ₹ $20x$ = ₹ 20×100
= ₹ 2000.

and Original income of Jawed = ₹ $11x$ = ₹ 11×100
= ₹ 1100.

---

4. **In a class, 60% students are boys and 40% are girls. By admitting 16 boys and 8 girls, the ratio of number of boys and girls becomes 8:5. What must be the number of boys and number of girls originally in the class?**

Solution:

Let the total number of students be x.

Given, 60% of the students are boys.

∴ total number of boys = 60% of $x = \dfrac{60}{100} \times x = \dfrac{3x}{5}$

and 40% of the students are girls.

∴ total number of girls = 40% of $x = \dfrac{40}{100} \times x = \dfrac{2x}{5}$

Now, 16 boys and 8 girls are admitted in the class.

∴ total number of boys in the class becomes

$$\frac{3x}{5} + 16 = \frac{3x + 80}{5}$$

and total number of girls in the class becomes

$$\frac{2x}{5} + 8 = \frac{2x + 40}{5}$$

Also, after the admission the ratio of number of boys to number of girls becomes 8 : 5.

∴ $\dfrac{\dfrac{3x + 80}{5}}{\dfrac{2x + 40}{5}} = \dfrac{8}{5}$

∴ $\dfrac{3x + 80}{2x + 40} = \dfrac{8}{5}$

∴ $5(3x + 80) = 8(2x + 40)$

∴ $15x + 400 = 16x + 320$

∴ $400 – 320 = 16x – 15x$

∴ $x = 80$

∴   total number of boys that were originally present

in the class $= 60\% \text{ of } 80 = \dfrac{60}{100} \times 80 = 48$

and total number of girls that were originally

present in the class $= 40\% \text{ of } 80 = \dfrac{40}{100} \times 80 = 32$

∴   48 boys and 32 girls were originally present in the class.

---

5.   Incomes of Mr. Shah, Mr. Patel and Mr. Mehta are in the ratio 1:2:3, while their expenditure are in the ratio 2:3:4. If Mr. Shah saves 20% of his income, find the ratio of their savings.   [Oct 14]

Solution:

Let x and y be the proportionality constants.

Since, incomes of Mr. Shah, Mr. Patel and Mr. Mehta are in the ratio 1:2:3.

∴   their incomes are ₹ x, ₹ $2x$ and ₹ $3x$ respectively. Also, their expenditures are in the ratio 2:3:4.

∴   their expenditures are ₹ $2y$, ₹ $3y$ and ₹ $4y$ respectively.

∴   the savings of Mr. Shah is ₹ $(x – 2y)$, Mr. Patel is ₹ $(2x – 3y)$ and that of Mr. Mehta is ₹ $(3x – 4y)$

Given, Mr. Shah saves 20% of his income.

∴ $x – 2y = 20\% \text{ of } x$

∴ $x – 2y = \dfrac{20}{100} \times x$

∴ $x – 2y = \dfrac{x}{5}$ ∴ $x – \dfrac{x}{5} = 2y$

∴ $\dfrac{4x}{5} = 2y$

∴ $y = \dfrac{2x}{5}$ ….(i)

Now, saving of Mr. Shah $= x – 2y$

$= x – 2\left(\dfrac{2x}{5}\right)$ ….[From (i)]

$= x – \dfrac{4x}{5} = ₹\, \dfrac{x}{5}$

Saving of Mr. Patel $= 2x – 3y$

$= 2x – 3\left(\dfrac{2x}{5}\right)$ ….[From (i)]

$= 2x – \dfrac{6x}{5} = ₹\, \dfrac{4x}{5}$

and Saving of Mr. Mehta $= 3x – 4y$

$= 3x – 4\left(\dfrac{2x}{5}\right)$

….[From (i)]

$= 3x – \dfrac{8x}{5} = ₹\, \dfrac{7x}{5}$

∴   The ratio of their savings is $\dfrac{x}{5} : \dfrac{4x}{5} : \dfrac{7x}{5}$

i.e., in the ratio $x : 4x : 7x$

i.e., in the ratio $1 : 4 : 7$.

---

6.   What must be subtracted from each of the numbers 5, 7 and 10, so that the resulting numbers are in continued proportion?

Solution:

Let x be the number which is to be subtracted from each of the numbers 5, 7 and 10.

∴   the required numbers are $5 – x$, $7 – x$, $10 – x$

Since these numbers are in continued proportion.

∴ $\dfrac{5 – x}{7 – x} = \dfrac{7 – x}{10 – x}$

∴ $(7 – x)^2 = (5 – x)\,(10 – x)$

∴ $49 – 14x + x^2 = 50 – 5x – 10x + x^2$

∴ $49 – 14x = 50 – 15x$

∴ $15x – 14x = 50 – 49$

∴ $x = 1$

∴   1 must be subtracted from each of the numbers 5, 7 and 10, so that the resulting numbers are in continued proportion.

---

7.   The employees of a firm have maintained their standard of living in such a manner, that they all have identical percentage of saving from their salaries. Amina and Sabina are two employees of the firm. Amina spends ₹ 12,800 per month from her salary of ₹ 35,000 per month. What would be Sabina's saving per month from her salary of ₹ 48,000 per month?

Solution:

Given, Amina's expenditure = ₹ 12,800 p.m. and her salary = ₹ 35,000 p.m.

∴   Amina's saving $= 35,000 – 12,800$
$= ₹\, 22,200 \text{ p.m.}$

∴   Percentage of Amina's savings

$= \dfrac{\text{Amina's Saving}}{\text{Amina's Total salary}} \times 100$

$= \dfrac{22,200}{35,000} \times 100 = \dfrac{444}{7}\,\%$

Since, Amina and Sabina have identical percentage of saving from their salaries.

∴   Percentage of Sabina's savings $= \dfrac{444}{7}$ %

∴   Sabina's saving per month $= \dfrac{444}{7}$ % of her salary

$$= \dfrac{\dfrac{444}{7}}{100} \times 48{,}000$$

$$= \dfrac{444 \times 48{,}000}{7 \times 100}$$

$$= \dfrac{2{,}13{,}120}{7}$$

$$= 30{,}445.71$$

$$\approx ₹\ 30{,}446 \text{ p.m.}$$

∴   Sabina's saving per month is ₹ 30,446.

---

8.   A certain job can be performed by 10 men in 24 days working 8 hours a day. How many days would be needed to perform the same job by 8 men working 12 hours a day?

Solution:

It is given that the job can be performed by 10 men in 24 days by working 8 hours a day.

∴ $\begin{array}{l}\text{Time required} \\ \text{by one man to} \\ \text{perform the job}\end{array} = \begin{array}{l}\text{No. of} \\ \text{working} \\ \text{days}\end{array} \times \begin{array}{l}\text{No. of} \\ \text{working} \\ \text{hours} \\ \text{per day}\end{array}$

$$= 24 \times 8$$
$$= 192 \text{ hours.}$$

and $\begin{array}{l}\text{Time required to} \\ \text{perform the same} \\ \text{job by 10 men}\end{array} = 10 \times 192$

$$= 1920 \text{ hours.}$$

Let x be the number of days required by 8 men to perform the same job working 12 hours a day.

Here, $\begin{array}{l}\text{Time required} \\ \text{by one man to} \\ \text{perform the job}\end{array} = \begin{array}{l}\text{No. of} \\ \text{working} \\ \text{days}\end{array} \times \begin{array}{l}\text{No. of} \\ \text{working} \\ \text{hours} \\ \text{per day}\end{array}$

$$= x \times 12$$
$$= 12x \text{ hours.}$$

and $\begin{array}{l}\text{Time required to} \\ \text{perform the same} \\ \text{job by 8 men}\end{array} = 8 \times 12x = 96x \text{ hours.}$

Since, the total time required to perform the job in both the cases is same.

∴ $1920 = 96x$

∴ $x = \dfrac{1920}{96}$

i.e., $x = 20$

∴   8 men would require 20 days to perform the same job working 12 hours a day.

---

9.   Two metals X and Y are to be used for making two different alloys. If the ratio by weight of X : Y in the first alloy is 6 : 5 and that in the second is 7 : 13. How many kgs of X metal must be melted along with 11 kgs of first alloy and 20 kg of second alloy so as to produce a new alloy containing 40% of metal Y?

Solution:

Let x and y be the proportionality constants.

Since, the ratio by weight of X : Y in the first alloy is 6 : 5.

∴   Weight of metals X and Y in the first alloy is $6x$ kg and $5x$ kg respectively.

Also, the ratio by weight of X : Y in the second alloy is 7 : 13.

∴   Weight of metals X and Y in the second alloy is $7y$ kg and $13y$ kg respectively.

Now, weight of the first alloy is 11 kg.

∴ $6x + 5x = 11$

∴ $11x = 11$ ∴ $x = 1$

∴   first alloy has $6x = 6 \times 1 = 6$ kg of X metal.

Also, weight of the second alloy is 20 kg.

∴ $7y + 13y = 20$

∴ $20y = 20$

∴ $y = 1$

∴   second alloy has $7y = 7 \times 1 = 7$ kg of Y metal.

Suppose z kg of metal X is melted so as to produce the new alloy.

∴   Total weight of X metal in the new alloy

$$= \begin{array}{l}\text{Weight of} \\ \text{X metal in} \\ \text{first alloy}\end{array} + \begin{array}{l}\text{Weight of} \\ \text{X metal in} \\ \text{second alloy}\end{array} + z$$

$$= 6 + 7 + z$$
$$= (13 + z) \text{ kg}$$

and, total weight of new alloy

$$= \begin{array}{l}\text{Weight of} \\ \text{first alloy}\end{array} + \begin{array}{l}\text{Weight of} \\ \text{second alloy}\end{array} + z$$

$$= 11 + 20 + z$$
$$= (31 + z) \text{ kg}$$

Now, the new alloy contains 40% of metal Y i.e., it contains 60% of metal X

$$\therefore \quad \frac{13+z}{31+z} = \frac{60}{100} \qquad \therefore \quad \frac{13+z}{31+z} = \frac{3}{5}$$

$\therefore \quad 5(13+z) = 3(31+z)$

$\therefore \quad 65 + 5z = 93 + 3z$

$\therefore \quad 5z - 3z = 93 - 65$

$\therefore \quad 2z = 28$

$\therefore \quad z = 14$ kg

$\therefore \quad$ 14 kg of metal X must be melted to produce a new alloy containing 40% of metal Y.

10. A, B and C are three persons whose salaries together amount to ₹ 21,000. Their savings are 20%, 30% and 40% of their salaries respectively. If their expenditures are in the ratio 8 : 14 : 3, find their respective salaries.

Solution:

Given the savings of persons A, B and C from their respective salaries is 20%, 30% and 40%.

Hence, their corresponding expenditures are 80%, 70% and 60%.

However, it is given that the expenditures are in the ratio 8 : 14 : 3.

$\therefore \quad$ 80% of A's salary : 70% of B's salary : 60% of C's salary = 8:14:3

Now, 80% of A's salary : 70% of B's salary = 8:14

$\therefore \quad \frac{80}{100}$ of A's salary : $\frac{70}{100}$ of B's salary = 8 : 14

$\therefore \quad \frac{\frac{8}{10} \text{ of A's salary}}{\frac{7}{10} \text{ of B's salary}} = \frac{8}{14}$

$\therefore \quad \frac{\text{A's salary}}{\text{B's salary}} = \frac{8}{14} \times \frac{7}{8}$

$\therefore \quad \frac{\text{A's salary}}{\text{B's salary}} = \frac{1}{2} = \frac{2}{4}$ ....(i)

Also, 70% of B's salary: 60% of C's salary = 14 : 3

$\frac{70}{100}$ of B's salary: $\frac{60}{100}$ of C's salary = 14 : 3

$\therefore \quad \frac{\frac{7}{10} \text{ of B's salary}}{\frac{6}{10} \text{ of C's salary}} = \frac{14}{3}$

$\therefore \quad \frac{\text{B's salary}}{\text{C's salary}} = \frac{14}{3} \times \frac{6}{7} = \frac{4}{1}$ ....(ii)

From (i) and (ii), we get

A's salary : B's salary : C's salary = 2 : 4 : 1

Now, 2 + 4 + 1 = 7

Since, their total salary is ₹ 21,000

$\therefore \quad$ A's salary = $\frac{2}{7} \times 21,000$ = ₹ 6,000

B's salary = $\frac{4}{7} \times 21,000$ = ₹ 12,000

and C's salary = $\frac{1}{7} \times 21,000$ = ₹ 3,000

$\therefore \quad$ salaries of persons A, B and C are ₹ 6,000, ₹ 12,000 and ₹ 3,000 respectively.

1.3 Partnership

The business carried out by more than one person providing the capital and sharing the profits and losses at an agreed proportion is called **'Partnership'**.

The following rules are followed in the distribution of profits and losses among the partners.
1. If the periods of investment is same for all the partners, then profits and losses are shared by the partners in proportion to their capitals invested.
2. If the capitals invested by all the partners are same, then profits and losses are shared by the partners in proportion to their periods of investment of capitals.
3. If the periods of investment and capitals invested by the partners are different, then profits and losses are shared by the partners in proportion to the products of the capitals and their respective periods.

Exercise 1.2

1. Ajay, Atul and Anil started a business in partnership by investing ₹ 12,000, ₹ 18,000 and ₹ 30,000 respectively. At the end of the year, they earned a profit of ₹ 15,200 in the business. Find the share of each in the profit.

Solution:

Since, period of investment is same for all the three partners.

$\therefore \quad$ profit will be shared in proportion to the capitals invested by each of them.

i.e., in the proportion 12,000 : 18,000 : 30,000

i.e., in the proportion 12 : 18 : 30

i.e., in the proportion 2 : 3 : 5

Now, 2 + 3 + 5 = 10

Given, profit earned = ₹ 15,200

∴   Ajay's share in the profit $= \dfrac{2}{10} \times 15{,}200$

$= ₹ \ 3{,}040$

Atul's share in the profit $= \dfrac{3}{10} \times 15{,}200$

$= ₹ \ 4{,}560$

and   Anil's share in the profit $= \dfrac{5}{10} \times 15{,}200$

$= ₹ \ 7{,}600$

∴   the share of Ajay, Atul and Anil in the profit are ₹ 3,040, ₹ 4,560 and ₹ 7,600 respectively.

---

2.   Raghu, Madhu and Ramu started a business in partnership by investing ₹ 60,000, ₹ 40,000 and ₹ 75,000 respectively. At the end of the year they found that they have incurred a loss of ₹ 24,500. Find the loss each one had to bear.   [Oct 14]

Solution:

Since the period of investment is same for all the three partners.

∴   loss will be shared in proportion to the capitals invested by each of them.

i.e., in the proportion 60,000 : 40,000 : 75,000

i.e., in the proportion 60 : 40 : 75

i.e., in the proportion 12 : 8 : 15

Now, 12 + 8 + 15 = 35

Given, loss incurred = ₹ 24,500

∴   Raghu's share in the loss $= \dfrac{12}{35} \times 24{,}500$

$= ₹ \ 8{,}400$

Madhu's share in the loss $= \dfrac{8}{35} \times 24{,}500$

$= ₹ \ 5{,}600$

and   Ramu's share in the loss $= \dfrac{15}{35} \times 24{,}500$

$= ₹ \ 10{,}500$

∴   Raghu, Madhu and Ramu had to bear loss of ₹ 8,400, ₹ 5,600 and ₹ 10,500 respectively.

---

3.   A, B and C are in the partnership. A's capital was ₹ 65,000 and C's capital was ₹ 50,000. The total profit is ₹ 38,000, out of which B's profit was ₹ 15,000. What was B's capital?   [Oct 15]

Solution:

Let B's capital be ₹ x.

The period of investment is same for all the three partners.

∴   profit will be shared in proportion to the capitals invested by each of them.

i.e., in the proportion 65,000 : x : 50,000

Now, 65,000 + x + 50,000 = 1,15,000 + x

Since, total profit = ₹ 38,000 out of which

B's profit = ₹ 15,000

∴   B's share in the profit $= \dfrac{x}{1{,}15{,}000 + x} \times 38{,}000$

∴ $15{,}000 = \dfrac{x}{1{,}15{,}000 + x} \times 38{,}000$

∴ $\dfrac{15{,}000}{38{,}000} = \dfrac{x}{1{,}15{,}000 + x}$

∴ $\dfrac{15}{38} = \dfrac{x}{1{,}15{,}000 + x}$

∴ $15 \ (1{,}15{,}000 + x) = 38x$

∴ $17{,}25{,}000 + 15x = 38x$

∴ $17{,}25{,}000 = 38x - 15x$

∴ $23x = 17{,}25{,}000$

∴ $x = \dfrac{17{,}25{,}000}{23}$

∴ $x = ₹ \ 75{,}000$

∴   B's capital was ₹ 75,000.

---

4.   Paul and Qasim started a business with equal amount of capital. After 8 months Paul withdrew his amount and Raja entered in the business with same amount of capital. At the end of the year they found that they have incurred a loss of ₹ 24,500. Find the loss each one had to bear.

Solution:

Since, the capitals invested by Paul, Qasim and Raja are same.

∴   loss will be shared in proportion to the time period for which capitals are invested.

Here, Paul invested his capital for 8 months, Qasim invested his capital for one year i.e., for 12 months and Raja invested his capital at the time Paul withdrew his amount i.e., for the remaining 4 months.

∴   loss will be shared in the proportion 8 : 12 : 4

i.e., in the proportion 2 : 3 : 1

Now, 2 + 3 + 1 = 6

Given, loss incurred = ₹ 24,500

∴   Paul's share in the loss $= \dfrac{2}{6} \times 24{,}500 = ₹ \ 8166.67$

Qasim's share in the loss $= \dfrac{3}{6} \times 24{,}500 = ₹ \ 12{,}250$

Raja's share in the loss = $\frac{1}{6} \times 24,500 = ₹\,4083.33$

∴ Paul, Qasim and Raja had to bear the loss of ₹ 8,166.67, ₹ 12,250 and ₹ 4,083.33 respectively.

---

5. Amit and Rohit started a business by investing ₹ 20,000 each. After 3 months Amit withdrew ₹ 5,000 and Rohit put in the same amount additionally. How should a profit of ₹ 12,800 be divided between them at the end of the year? [Mar 14]

Solution:

Since, the period of investment is same for the two partners.

∴ Profit will be shared in proportion to the capitals invested.

Here, Amit invested ₹ 20,000 for first 3 months.
After 3 months he withdrew ₹ 5,000.
i.e., he invested ₹ (20,000 – 5,000) = ₹ 15,000 for remaining 9 months.
Rohit invested ₹ 20,000 for first 3 months.
After 3 months he added ₹ 5,000.
i.e., he invested ₹ (20,000 + 5,000) = ₹ 25,000 for remaining 9 months.

∴ Profit will be divided in the proportion
$(20,000 \times 3 + 15,000 \times 9) : (20,000 \times 3 + 25,000 \times 9)$
i.e., in the proportion
(60,000 + 1,35,000) : (60,000 + 2,25,000)
i.e., in the proportion 1,95,000 : 2,85,000
i.e., in the proportion 195 : 285
i.e., in the proportion 13 : 19
Now, 13 + 19 = 32
Given, profit earned = ₹ 12,800

∴ Amit's share in the profit $= \frac{13}{32} \times 12,800 = ₹5,200$

Rohit's share in the profit $= \frac{19}{32} \times 12,800$
$= ₹\,7,600$

∴ the shares of Amit and Rohit in the profit are ₹ 5,200 and ₹ 7,600 respectively.

---

6. John and Mathew started a business with their capitals in the ratio 8:5. After 8 months John added 25% of his earlier capital as further investments. At the same time Mathew withdrew 20% of his earlier capital. At the end of the year they earned ₹ 52,000 as profit. How should they divide it between them?

Solution:

Let x be the proportionality constant.
Since, capitals invested by John and Mathew are in the ratio 8:5.

∴ The capital invested by John and Mathew are ₹ 8x and ₹ 5x respectively.
After 8 months John added 25% of his initial capital.
i.e., he invested ₹ (8x + 25% of 8x)
$= 8x + \frac{25}{100} \times 8x$
$= 8x + 2x = ₹\,10x$ for remaining 4 months.
and Mathew withdrew 20% of his initial capital i.e., he invested ₹ (5x – 20% of 5x)
$= 5x - \frac{20}{100} \times 5x = 5x - x$
$= ₹\,4x$ for remaining 4 months.
Since, the period of investment is same for both the partners.

∴ Profit will be shared in proportion to the capitals invested.
i.e., in the proportion
$(8x \times 8 + 10x \times 4) : (5x \times 8 + 4x \times 4)$
i.e., in the proportion (64x + 40x) : (40x + 16x)
i.e., in the proportion 104x : 56x
i.e., in the proportion 13:7
Now, 13 + 7 = 20
Given, profit earned = ₹ 52,000

∴ John's share in the profit $= \frac{13}{20} \times 52,000$
$= ₹\,33,800$

Mathew's share in the profit $= \frac{7}{20} \times 52,000$
$= ₹\,18,200$

∴ the profit should be divided among John and Mathew as ₹ 33,800 and ₹ 18,200 respectively.

---

7. Ramesh, Vivek and Sunil started a business by investing the capitals in the ratio 4:5:6. After 3 months Vivek removed all his capital and after 6 months Sunil removed all his capital from the business. At the end of the year Ramesh received ₹ 6,400 as profit. Find the profit earned by Vivek and Sunil.

Solution:

Let x be the proportionality constant.
Since, capitals invested by Ramesh, Vivek and Sunil are in the ratio 4:5:6.

∴ The capital invested by Ramesh is ₹ 4x for 12 months, by Vivek is ₹ 5x for 3 months and that by Sunil is ₹ 6x for 6 months.

10. **A, B and C are three partners with their capitals in the ratio 4:3:3. They decide to dissolve the partnership. The assets of the company are sold for ₹ 4,00,000 and liabilities (other than capital) of ₹ 60,000. They incur realisation expenses of ₹ 4,000. What is the amount that each partner gets as final settlement after dissolution?**

Solution:

Net amount realized

$$= \begin{matrix} \text{Sale value} \\ \text{of the assets} \end{matrix} - \begin{matrix} \text{Payment of} \\ \text{liabilities} \end{matrix} - \begin{matrix} \text{Realisation} \\ \text{expenses} \end{matrix}$$

= 4,00,000 – 60,000 – 4,000

= ₹ 3,36,000

Net amount realized is distributed among the three partners in proportion of their capitals.

i.e., in the proportion 4 : 3 : 3

Now, 4 + 3 + 3 = 10

∴ A's share in the final settlement

$$= \frac{4}{10} \times 3,36,000 = ₹ 1,34,400$$

B's share in the final settlement

$$= \frac{3}{10} \times 3,36,000 = ₹ 1,00,800$$

C's share in the final settlement

$$= \frac{3}{10} \times 3,36,000 = ₹ 1,00,800$$

∴ Partners A, B and C get ₹ 1,34,400, ₹ 1,00,800 and ₹ 1,00,800 respectively as final settlement after dissolution.

Miscellaneous Exercise – 1

1. **Oliver spends 30% of his income on food items and 15% on conveyance. If in a particular month he spent ₹ 1,800 on conveyance, find his expenditure on food items during the same month.**

Solution:

Let the income of Oliver for the particular month be ₹ x.

Given, Oliver spends 15% of his salary on conveyance and in the particular month he spend ₹ 1,800 on conveyance.

∴ conveyance = 15% of x

∴ $1800 = \frac{15}{100} \times x$

∴ $x = \frac{1,800 \times 100}{15}$

∴ $x = ₹ 12,000$

∴ Oliver's salary for the given month is ₹ 12,000.

Also, oliver spends 30% of his salary on food items.

∴ expenditure on food items = 30% of salary

$$= \frac{30}{100} \times 12,000$$

$$= ₹ 3,600$$

∴ Oliver's expenditure on food items during the same month is ₹ 3,600.

2. **The ratio of prices of two houses was 2:3. Two years later when price of first house has increased by 30% and that of second by ₹ 90,000, the ratio of prices becomes 5:7, find the original prices of two houses.**

Solution:

Let x be the proportionality constant.

Since, the ratio of prices of two houses was 2:3.

∴ Price of the first house is ₹ $2x$ and that of the second house is ₹ $3x$.

Given, two years later price of the first house increased by 30%.

∴ price of first house becomes $2x$ + 30% of $2x$

$$= 2x + \frac{30}{100} \times 2x = 2x + 0.6x = ₹ 2.6x$$

and price of second house increased by ₹ 90,000.

∴ Price of second house becomes ₹ $(3x + 90,000)$

Also, ratio of their new prices is given to be 5:7

∴ $\frac{2.6x}{3x + 90,000} = \frac{5}{7}$

∴ $2.6x \times 7 = 5(3x + 90,000)$

∴ $18.2x = 15x + 4,50,000$

∴ $18.2x - 15x = 4,50,000$

∴ $3.2x = 4,50,000$

∴ $x = \frac{4,50,000}{3.2} = 1,40,625$

∴ Original price of first house = ₹ $2x$

$$= 2 \times 1,40,625$$

$$= ₹ 2,81,250$$

and original price of second house = ₹ $3x$

$$= 3 \times 1,40,625$$

$$= ₹ 4,21,875$$

3. **In a class, 60% of students are girls and 40% are boys. By admitting 20 girls and 30 boys, the ratio of girls to boys becomes 8:7. What must be the number of girls and number of boys originally in the class?**

Solution:

Let the total number of students be x.

Given, 60% of students are girls.

∴   total number of girls = 60% of x

$$= \frac{60}{100} \times x = \frac{3x}{5}$$

and 40% of students are boys.

∴   total number of boys = 40% of x

$$= \frac{40}{100} \times x = \frac{2x}{5}$$

Given, 20 girls and 30 boys are admitted in the class.

∴   total number of girls becomes $= \frac{3x}{5} + 20$

$$= \frac{3x + 100}{5}$$

and total number of boys becomes $= \frac{2x}{5} + 30$

$$= \frac{2x + 150}{5}$$

Also, the ratio of girls to boys becomes 8:7.

∴ $\dfrac{\dfrac{3x+100}{5}}{\dfrac{2x+150}{5}} = \dfrac{8}{7}$

∴ $\dfrac{3x+100}{2x+150} = \dfrac{8}{7}$

∴ $7(3x + 100) = 8(2x + 150)$

∴ $21x + 700 = 16x + 1200$

∴ $21x - 16x = 1200 - 700$

∴ $5x = 500$

∴ $x = 100$

∴   total number of girls originally present
= 60% of 100

$$= \frac{60}{100} \times 100 = 60$$

and total number of boys originally present
= 40% of 100

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

∴   60 girls and 40 boys were originally present in the class.

---

4.   **An alloy of copper and bronze contains 25% copper by weight. Find the weight of copper which must be added to 500 kg of this alloy if the final percentage of copper is to be 60.**

Solution:
Let x kg of copper be added to the alloy.
According to the given condition, we get

$$\frac{25\% \text{ of } 500 + x}{500 + x} = \frac{60}{100}$$

∴ $\dfrac{\dfrac{25}{100} \times 500 + x}{500 + x} = \dfrac{3}{5}$

∴ $\dfrac{125 + x}{500 + x} = \dfrac{3}{5}$

∴ $5(125 + x) = 3(500 + x)$

∴ $625 + 5x = 1500 + 3x$

∴ $5x - 3x = 1500 - 625$

∴ $2x = 875$

∴ $x = \dfrac{875}{2}$

∴ $x = 437.5$

∴   437.5 kg of copper is added to 500 kg of the alloy.

---

5.   **Three persons Amar, Akbar and Anthony whose monthly salaries together amount to ₹ 66,000, spend 90%, 80% and 70% respectively of their salaries. If their savings are in the ratio 3 : 4 : 7, find their respective monthly salaries.**

Solution:
Amar, Akbar and Anthony spend 90%, 80% and 70% of their salaries i.e. their corresponding savings are 10%, 20% and 30% respectively.
However, their savings are given to be in the ratio 3 : 4 : 7.

∴   10% of Amar's salary : 20% of Akbar's salary : 30% of Anthony's salary = 3 : 4 : 7
Now, 10% of Amar's salary: 20% of Akbar's salary = 3 : 4

∴ $\dfrac{10}{100}$ of Amar's salary : $\dfrac{20}{100}$ of Akbar's salary
= 3 : 4

∴ $\dfrac{\dfrac{1}{10}\text{ of Amar's salary}}{\dfrac{2}{10}\text{ of Akbar's salary}} = \dfrac{3}{4}$

∴ $\dfrac{\text{Amar's salary}}{\text{Akbar's salary}} = \dfrac{3}{4} \times \dfrac{2}{1}$

∴ $\dfrac{\text{Amar's salary}}{\text{Akbar's salary}} = \dfrac{3}{2} = \dfrac{9}{6}$ ….(i)

Also, 20% of Akbar's salary = 30% of Anthony's salary = 4 : 7

$\dfrac{20}{100}$ of Akbar's salary : $\dfrac{30}{100}$ of Anthony's salary
= 4 : 7

$$\therefore \quad \frac{\frac{2}{10}\text{ of Akbar's salary}}{\frac{3}{10}\text{ of Anthony's salary}} = \frac{4}{7}$$

$$\therefore \quad \frac{\text{Akbar's salary}}{\text{Anthony's salary}} = \frac{4}{7} \times \frac{3}{2} = \frac{6}{7} \quad ….(ii)$$

From (i) and (ii), we get
Amar's salary : Akbar's salary : Anthony's salary = 9 : 6 : 7
Now, 9 + 6 + 7 = 22
Also, their total salary is ₹ 66,000.

$$\therefore \quad \text{Amar's salary} = \frac{9}{22} \times 66,000 = ₹\,27,000$$

$$\text{Akbar's salary} = \frac{6}{22} \times 66,000 = ₹\,18,000$$

$$\text{and Anthony's salary} = \frac{7}{22} \times 66,000 = ₹\,21,000$$

∴ The monthly salaries of Amar, Akbar and Anthony are ₹ 27,000, ₹ 18,000 and ₹ 21,000 respectively.

6. **The incomes of X, Y and Z are in the ratio 3:5:4, while their expenditures are in the ratio 2:1:3. If X saves 40% of his income, find the ratio of their savings.**

Solution:
Let x and y be the proportionality constant.
Since, incomes of X, Y and Z are in the ratio 3:5:4.

∴ their incomes are ₹ $3x$, ₹ $5x$ and ₹ $4x$ respectively.
Also, their expenditures are in the ratio 2:1:3.
∴ their expenditures are ₹ $2y$, ₹ y and ₹ $3y$ respectively.
∴ The savings of X is ₹ $(3x – 2y)$, Y is ₹ $(5x – y)$ and that of Z is ₹ $(4x – 3y)$.
But, X saves 40% of his income.

$$\therefore \quad 3x – 2y = 40\% \text{ of } 3x$$
$$\therefore \quad 3x – 2y = \frac{40}{100} \times 3x$$
$$\therefore \quad 3x – 2y = \frac{6x}{5}$$
$$\therefore \quad 3x – \frac{6x}{5} = 2y$$
$$\therefore \quad \frac{9x}{5} = 2y$$
$$\therefore \quad y = \frac{9x}{10} \quad ….(i)$$

Now, savings of X = $3x – 2y$
$$= 3x – 2\left(\frac{9x}{10}\right) \quad ….[\text{From(i)}]$$
$$= 3x – \frac{18x}{10}$$
$$= ₹\,\frac{12x}{10}$$

savings of Y = $5x – y = 5x – \frac{9x}{10}$ ….[From(i)]
$$= ₹\,\frac{41x}{10}$$

and savings of Z = $4x – 3y$
$$= 4x – 3\left(\frac{9x}{10}\right)$$
….[From (i)]
$$= 4x – \frac{27x}{10} = ₹\,\frac{13x}{10}$$

∴ Ratio of their savings is $\frac{12x}{10} : \frac{41x}{10} : \frac{13x}{10}$
i.e., in the ratio $12x : 41x : 13x$
i.e., in the ratio 12 : 41 : 13.

7. **In an examination, 70% candidates passed in English, 65% passed in Mathematics and 27% failed in both the subjects and 248 passed in both the subjects. Find the total number of candidates who appeared for the exam.**

Solution:
Let the total number of candidates who appeared for the exam be x.
Since, 70% of the candidates passed in English.
∴ number of candidates who passed in English
= 70% of x
$$= \frac{70}{100} \times x = \frac{70x}{100}$$
Also, 65% of the candidates passed in Mathematics.
∴ number of candidates who passed in Mathematics = 65% of x
$$= \frac{65}{100} \times x = \frac{65x}{100}$$
and 27% of the candidates failed in both the subjects.
∴ number of candidates who failed in both the subjects = 27% of x
$$= \frac{27}{100} \times x = \frac{27x}{100}$$
Given, number of candidates who passed in both the subjects = 248.

∴ Total number of candidates

$$= \begin{matrix} \text{Candidates} \\ \text{passed in English} \end{matrix} + \begin{matrix} \text{Candidates} \\ \text{passed in} \\ \text{Mathematics} \end{matrix}$$

$$+ \begin{matrix} \text{Candidates} \\ \text{failed in} \\ \text{both subjects} \end{matrix} - \begin{matrix} \text{Candidates} \\ \text{passed in} \\ \text{both subjects} \end{matrix}$$

∴ $x = \dfrac{70x}{100} + \dfrac{65x}{100} + \dfrac{27x}{100} - 248$

∴ $x = \dfrac{162x}{100} - 248$

∴ $248 = \dfrac{162x}{100} - x$

∴ $248 = \dfrac{62x}{100}$

∴ $x = \dfrac{248 \times 100}{62}$

∴ $x = 400$

∴ In total 400 candidates appeared for the exam.

---

8. **A manufacturer sells his product to a wholeseller at 20% return on cost. The wholeseller in turn makes a profit of 20% on his cost while selling it to a retailer. The retailer prices the product so that he gets a 28% margin on retail selling prices. Calculate the percentage increase in value from the manufacturer to the consumer.**

Solution:

Let cost price of the product for the manufacturer be ₹ x.

Since, the manufacturer sells his product to the wholeseller at 20% return on cost.

∴ $\begin{matrix} \text{selling price of} \\ \text{the product for} \\ \text{the manufacturer} \end{matrix} = \text{cost price} + \begin{matrix} 20\% \text{ of} \\ \text{cost price} \end{matrix}$

$= x + 20\%$ of ₹ x

$= x + \dfrac{20}{100} \times x$

$= x + \dfrac{1}{5} x$

$= \dfrac{5x + x}{5} = ₹ \dfrac{6x}{5}$

But, this is the cost price for the wholeseller.

∴ cost price for the wholeseller = ₹ $\dfrac{6x}{5}$

Now, wholeseller makes 20% profit on his cost price.

∴ $\begin{matrix} \text{selling price} \\ \text{of the product} \\ \text{for wholeseller} \end{matrix} = \text{cost price} + \begin{matrix} 20\% \text{ of} \\ \text{cost price} \end{matrix}$

$= \dfrac{6x}{5} + 20\%$ of $\dfrac{6x}{5}$

$= \dfrac{6x}{5} + \dfrac{20}{100} \times \dfrac{6x}{5}$

$= \dfrac{6x}{5} + \dfrac{6x}{25} = \dfrac{30x}{25} + \dfrac{6x}{25}$

$= ₹ \dfrac{36x}{25}$

But, this is the cost price for the retailer.

∴ cost price for the retailer = ₹ $\dfrac{36x}{25}$

Given retailer makes 28% margin on retail selling prices.

∴ $\begin{matrix} \text{selling price} \\ \text{of the product} \\ \text{for retailer} \end{matrix} = \text{cost price} + \begin{matrix} 28\% \text{ of} \\ \text{cost price} \end{matrix}$

$= \dfrac{36x}{25} + 28\%$ of ₹ $\dfrac{36x}{25}$

$= \dfrac{36x}{25} + \dfrac{28}{100} \times \dfrac{36x}{25}$

$= \dfrac{36x}{25} + \dfrac{1008x}{2500} = \dfrac{3600x}{2500} + \dfrac{1008x}{2500}$

$= \dfrac{4608x}{2500} = ₹ \dfrac{1152x}{625}$

∴ $\begin{matrix} \text{Increase} \\ \text{in the value of} \\ \text{the product} \\ \text{from the} \\ \text{manufacturer} \\ \text{to the consumer} \end{matrix} = \begin{matrix} \text{Selling price} \\ \text{of the product} \\ \text{for retailer} \end{matrix} - \begin{matrix} \text{Cost price} \\ \text{of the} \\ \text{product for} \\ \text{manufacturer} \end{matrix}$

$= \dfrac{1152x}{625} - x$

$= \dfrac{1152x - 625x}{625} = ₹ \dfrac{527x}{625}$

∴ $\begin{matrix} \text{percentage} \\ \text{increase in} \\ \text{the value} \\ \text{of the product} \end{matrix} = \dfrac{\text{Increase in value}}{\text{Original value}} \times 100$

$= \dfrac{\dfrac{527x}{625}}{x} \times 100 = \dfrac{52700}{625}$

$= 84.32\%$

∴ The percentage increase in the value of the product from the manufacturer to the consumer is 84.32%.

9. **The ratio of boys and girls in a college is 3:2. If 20% of boys and 30% of the girls are members of the Student's Council. Find the percentage of students who are not members of the Student's Council?**

Solution:

Let x be the proportionality constant.

Since, the ratio of number of boys and girls in the college is 3:2.

∴ the number of boys and girls in the college are $3x$ and $2x$ respectively.

∴ Total number of students $= 3x + 2x = 5x$

Given, 20% of the boys are members of the Student's Council.

∴ number of boys who are members of the Student's Council = 20% of $3x$

$$= \frac{20}{100} \times 3x = \frac{3x}{5}$$

and 30% of the girls are members of the Student's Council.

∴ number of girls who are members of the Student's Council = 30% of $2x$

$$= \frac{30}{100} \times 2x = \frac{3x}{5}$$

∴ The number of students who are not members of Student's Council

$$= \begin{matrix} \text{Total number} \\ \text{of students} \end{matrix} - \begin{matrix} \text{Number of students} \\ \text{who are members} \\ \text{of the Student's Council} \end{matrix}$$

$$= 5x - \left(\frac{3x}{5} + \frac{3x}{5} \right) = 5x - \frac{6x}{5} = \frac{19x}{5}$$

∴ Percentage of students who are not members of the Student's Council

$$= \frac{\text{Number of students who are not}}{\text{Total number of students}} \times 100$$

$$= \frac{\frac{19x}{5}}{5x} \times 100 = \frac{19x}{25x} \times 100 = 76\%$$

10. **Three persons X, Y and Z started a business in partnership by investing ₹ 24,000, ₹ 52,000 and ₹ 80,000 respectively. At the end of the year, they earned a profit of ₹ 7,800 in the business. Find the share of each in the profit.**

Solution:

Since, the period of investment is same for all the three partners.

∴ Profit will be shared in proportion to the capitals invested.

i.e., in the proportion 24,000 : 52,000 : 80,000

i.e., in the proportion 24 : 52 : 80

i.e., in the proportion 6 : 13 : 20

Now, $6 + 13 + 20 = 39$

Given, profit earned = ₹ 7,800

∴ X's share in the profit $= \frac{6}{39} \times 7,800 = ₹\ 1,200$

Y's share in the profit $= \frac{13}{39} \times 7,800 = ₹\ 2,600$

Z's share in the profit $= \frac{20}{39} \times 7,800 = ₹\ 4,000$

∴ The shares of X, Y and Z in the profit are ₹ 1,200, ₹ 2,600 and ₹ 4,000 respectively.

11. **Amit, Sumit and Satish started a grocery shop. Amit and Sumit contributed ₹ 1,00,000 and ₹ 1,40,000 respectively as capital. At the end of the year the total profit is ₹ 42,630. Satish received ₹ 18,270 as his share in the profit. What was Satish's capital in the business?**

Solution:

Let Satish's capital in the business be ₹ x.

Since, the period of investment is same for all the three partners.

∴ Profit will be shared in proportion to the capitals invested.

i.e., in the proportion 1,00,000 : 1,40,000 : x

Now, $1,00,000 + 1,40,000 + x = 2,40,000 + x$

Since, total profit earned = ₹ 42,630 out of which Satish's profit = ₹ 18,270

∴ Satish's share in the profit

$$= \frac{x}{2,40,000 + x} \times 42,630$$

∴ $18,270 = \frac{x}{2,40,000 + x} \times 42,630$

∴ $\frac{18,270}{42,630} = \frac{x}{2,40,000 + x}$

∴ $\frac{3}{7} = \frac{x}{2,40,000 + x}$

∴ $3(2,40,000 + x) = 7x$

∴ $7,20,000 + 3x = 7x$

∴ $7,20,000 = 7x - 3x$

∴ $7,20,000 = 4x$

$\therefore \quad x = \dfrac{7,20,000}{4}$

$\therefore \quad x = ₹\ 1,80,000$

$\therefore$ Satish's capital in the business was ₹ 1,80,000.

---

12. Maya and Jaya started a business by investing equal amount. After 8 months Jaya withdrew her amount and Priya entered the business with same amount of capital. At the end of the year there was a profit of ₹ 13,200. How should it be divided among Maya, Jaya and Priya?

Solution:

Since, the capital invested by Maya, Jaya and Priya are same.

$\therefore$ Profit will be shared in proportion to the time period for which capitals are invested.

Here, Maya invested her capital for whole year i.e., for 12 months, Jaya invested her capital for 8 months and Priya invested her capital when Jaya withdrew her amount i.e., for 4 months.

$\therefore$ Profit will be shared in the proportion 12:8:4
i.e., in the proportion 3:2:1
Now, $3 + 2 + 1 = 6$
Given, profit earned = ₹ 13,200

$\therefore$ Maya's share in the profit $= \dfrac{3}{6} \times 13,200$

$\qquad\qquad\qquad\qquad\qquad = ₹\ 6,600$

Jaya's share in the profit $= \dfrac{2}{6} \times 13,200$

$\qquad\qquad\qquad\qquad\qquad = ₹\ 4,400$

Priya's share in the profit $= \dfrac{1}{6} \times 13,200$

$\qquad\qquad\qquad\qquad\qquad = ₹\ 2,200$

$\therefore$ the profit should be divided amongst Maya, Jaya and Priya as ₹ 6,600, ₹ 4,400 and ₹ 2,200 respectively.

---

13. Arun and Varun started a transport business by investing ₹ 2 lakhs and ₹ 3,20,000 respectively. After 3 months both put in an additional ₹ 40,000 each as capital. At the end of the year they earned ₹ 60,000 as profit. How should it be distributed between them?

Solution:

Since, the period of investment is same for the two partners.

$\therefore$ Profit will be shared in proportion to the capitals invested.

Here, Arun invested ₹ 2 lakhs and Varun invested ₹ 3,20,000 for 3 months.

After 3 months both of them invested an additional amount of ₹ 40,000.

$\therefore$ Arun invested ₹ (2,00,000 + 40,000)
= ₹ 2,40,000 for 9 months.
and Varun invested ₹ (3,20,000 + 40,000)
= ₹ 3,60,000 for 9 months.

$\therefore$ Profit will be distributed in the proportion
$(2,00,000 \times 3 + 2,40,000 \times 9) : (3,20,000 \times 3 + 3,60,000 \times 9)$
i.e., in the proportion
$(6,00,000 + 21,60,000) : (9,60,000 + 32,40,000)$
i.e., in the proportion 27,60,000 : 42,00,000
i.e., in the proportion 276 : 420
i.e., in the proportion 23 : 35

Now, $23 + 35 = 58$
Given, profit earned = ₹ 60,000

$\therefore$ Arun's share in the profit $= \dfrac{23}{58} \times 60,000$

$\qquad\qquad\qquad\qquad\qquad = ₹\ 23793.10$

Varun's share in the profit $= \dfrac{35}{58} \times 60,000$

$\qquad\qquad\qquad\qquad\qquad = ₹\ 36206.90$

$\therefore$ The profit should be divided between Arun and Varun as ₹ 23793.10 and ₹ 36206.90 respectively.

---

14. Rohit and Rohan started a business with investing capitals in the ratio 4:3. After 4 months Rohit withdrew 25% of his capital and Rohan invested an equal amount in addition to his earlier investment. At the end of the year total earned profit was ₹ 42,000. Find Rohit's and Rohan's share in the profit.

Solution:

Let x be the proportionality constant.

Since, capitals invested by Rohit and Rohan are in the ratio 4:3.

$\therefore$ Rohit's and Rohan's capitals for 4 months are ₹ $4x$ and ₹ $3x$ respectively.

After 4 months, Rohit withdrew 25% of his capital.

i.e. 25% of $4x = \dfrac{25}{100} \times 4x = ₹\ x$

$\therefore$ Rohit invested ₹ $(4x - x) = ₹\ 3x$ for 8 months

Also, Rohan added same amount in addition to his capital.

i.e. Rohan invested ₹ $(3x + x) = ₹\ 4x$ for 8 months.

Since, the period of investment is same for both the partners.

∴ Profit will be shared in proportion to the capitals invested.
i.e., in the proportion
$(4x \times 4 + 3x \times 8) : (3x \times 4 + 4x \times 8)$
i.e., in the proportion $(16x + 24x) : (12x + 32x)$
i.e., in the proportion $40x : 44x$
i.e., in the proportion $10 : 11$

Now, $10 + 11 = 21$
Given, profit earned = ₹ 42,000

∴ Rohit's share in the profit $= \dfrac{10}{21} \times 42{,}000$
$= ₹ 20{,}000$

Rohan's share in the profit $= \dfrac{11}{21} \times 42{,}000$
$= ₹ 22{,}000$

∴ the shares of Rohit and Rohan in the profit are ₹ 20,000 and ₹ 22,000 respectively.

---

15. A, B and C started a business by investing capitals in the ratio 4:5:6. After 3 months B removed all his capital and after 6 months C removed all his capital from the business. At the end of the year A got ₹ 48,000 as profit. Find share of B and C in the profit.

Solution:
Let x be the proportionality constant.
Since, capitals invested by A, B and C are in the ratio 4:5:6.

∴ A's capital is ₹ $4x$ for 12 months.
B's capital is ₹ $5x$ for 3 months.
and C's capital is ₹ $6x$ for 6 months.
Since, capitals and periods of investment both are different for the three partners.

∴ profit is distributed in proportion to the product of the capitals and their respective periods.
i.e., in the proportion
$(4x \times 12) : (5x \times 3) : (6x \times 6)$
i.e., in the proportion $48x : 15x : 36x$
i.e., in the proportion $16 : 5 : 12$
Now, $16 + 5 + 12 = 33$
Given, A's profit is ₹ 48,000

∴ A's share in the profit $= \dfrac{16}{33} \times$ total profit

∴ $48{,}000 = \dfrac{16}{33} \times$ total profit

∴ total profit $= \dfrac{48{,}000 \times 33}{16} = ₹\ 99{,}000$

Now, B's share in the profit $= \dfrac{5}{33} \times 99{,}000$
$= ₹ 15{,}000$

and C's share in the profit $= \dfrac{12}{33} \times 99{,}000$
$= ₹ 36{,}000$

∴ the shares of B and C in the profit are ₹ 15,000 and ₹ 36,000 respectively.

---

16. Nilesh, Mahesh and Rakesh are partners in the business with their capitals in the ratio 4:3:3. They decide to dissolve the partnership. The assets of the company are sold for ₹ 8 lakhs and the liabilities (other than capital) of ₹ 2 lakhs are settled fully. They incur realisation expenses of ₹ 50,000. What is the amount that each partner could get as the final settlement after the dissolution?

Solution:

$$\begin{array}{l} \text{Net amount} \\ \text{realized} \end{array} = \begin{array}{l} \text{Sale value} \\ \text{of the assets} \end{array} - \begin{array}{l} \text{Payment of} \\ \text{other liabilities} \end{array}$$

$$- \begin{array}{l} \text{Realisation} \\ \text{of expenses} \end{array}$$

$= 8{,}00{,}000 - 2{,}00{,}000 - 50{,}000$
$= ₹ 5{,}50{,}000$

Net amount realized is distributed to three partners in proportion of their capitals.
i.e., in the proportion 4:3:3
Now, $4 + 3 + 3 = 10$

∴ Nilesh's share in the final settlement
$= \dfrac{4}{10} \times 5{,}50{,}000 = ₹\ 2{,}20{,}000$

Mahesh's share in the final settlement
$= \dfrac{3}{10} \times 5{,}50{,}000 = ₹\ 1{,}65{,}000$

Rakesh's share in the final settlement
$= \dfrac{3}{10} \times 5{,}50{,}000 = ₹\ 1{,}65{,}000$

∴ Nilesh, Mahesh and Rakesh get ₹ 2,20,000, ₹ 1,65,000 and 1,65,000 respectively as the final settlement after the dissolution.

---

17. P, Q and R start a business by investing ₹ 1,20,000, ₹ 60,000 and ₹ 80,000 respectively. P used to get a monthly salary of ₹ 3,000. Q and R are to get interest on their capitals at 4%. At the end of the year there is a gross profit of ₹ 50,100 from which salary and interest due to the partners is to be settled, before distributing net profit. Find the gross income of each partner.

Solution:
Since, P's monthly salary = ₹ 3,000
∴ Total salary of P = $3000 \times 12 = ₹\ 36{,}000$

Q and R get 4% interest on their capitals.

$\therefore$ Q's interest = 4% of 60,000 = $\dfrac{4}{100} \times 60{,}000$

$= ₹ 2{,}400$

R's interest = 4% of 80,000 = $\dfrac{4}{100} \times 80{,}000$

$= ₹ 3{,}200$

$\therefore$ Total interest = Q's interest + R's interest

$= 2{,}400 + 3{,}200 = ₹ 5{,}600$

$\therefore$ net profit = Gross profit − Total interest

− Salary

$= 50{,}100 - 5{,}600 - 36{,}000 = ₹ 8{,}500$

Net profit is distributed in proportion to the capitals invested.

i.e., in the proportion 1,20,000 : 60,000 : 80,000

i.e., in the proportion 12 : 6 : 8

i.e., in the proportion 6 : 3 : 4

Now, 6 + 3 + 4 = 13

$\therefore$ P's share in the net profit = $\dfrac{6}{13} \times 8{,}500$

$= ₹ 3923.08$

Q's share in the net profit = $\dfrac{3}{13} \times 8{,}500$

$= ₹ 1961.54$

R's share in the net profit = $\dfrac{4}{13} \times 8{,}500$

$= ₹ 2615.38$

Now, gross income of P = P's net profit + Salary

$= 3923.08 + 36{,}000$

$= ₹ 39923.08$

Gross income of Q = Q's net profit + Interest

$= 1961.54 + 2{,}400$

$= ₹ 4361.54$

Gross income of R = R's net profit + Interest

$= 2615.38 + 3{,}200$

$= ₹ 5815.38$

$\therefore$ gross income of P, Q and R are ₹ 39923.08, ₹ 4361.54 and ₹ 5815.38 respectively.

---

18. X and Y are partners in a business with their capitals ₹ 2 lakhs and ₹ 3 lakhs respectively. Z wishes to join the business with a capital of ₹ 3 lakhs at the beginning of the financial year. They agree that goodwill will be taken as twice the average annual profits for the last three years. Last three years profits are ₹ 60,000, ₹ 90,000 and ₹ 90,000 respectively. Find the goodwill amount that Z would be required to pay X and Y separately.

Solution:

Since, the profit of last three years are ₹ 60,000, ₹ 90,000 and ₹ 90,000 respectively.

$\therefore$ average of last three years profit

$= \dfrac{60{,}000 + 90{,}000 + 90{,}000}{3}$

$= \dfrac{2{,}40{,}000}{3} = ₹ 80{,}000$

Since, goodwill = 2× average of last three years profit

$= 2 \times 80{,}000 = ₹ 1{,}60{,}000$

Share's of X, Y and Z in the goodwill will be in the proportion to their capitals.

i.e., in the proportion

2,00,000 : 3,00,000 : 3,00,000

i.e., in the proportion 2 : 3 : 3

Now, 2 + 3 + 3 = 8

Also, Z's share of goodwill at the time of joining

$= \dfrac{3}{8} \times 1{,}60{,}000 = ₹ 60{,}000$

Thus, Z should pay goodwill of ₹ 60,000 to X and Y in the proportion 2 : 3

$\therefore$ goodwill paid by Z to X $= \dfrac{2}{5} \times 60{,}000$

$= ₹ 24{,}000$

and goodwill paid by Z to Y $= \dfrac{3}{5} \times 60{,}000 = ₹ 36{,}000$

$\therefore$ goodwill amounts to be paid by Z to X and Y are ₹ 24,000 and ₹ 36,000 respectively.

---

19. A puts in ₹ 600 more in a business than B, but B has invested his capital for 5 months while A has invested his capital for 4 months. If share of A is ₹ 48 more than B, out of total profits of ₹ 528. Find the capital contributed by each.

Solution:

Let the capital invested by B be ₹ x.

Since, A invested ₹ 600 more than B.

$\therefore$ capital invested by A is ₹ $(x + 600)$

Now, B invested his capital i.e., ₹ x for 5 months and A invested his capital i.e., ₹ $(x + 600)$ for 4 months.

Since the capitals and periods of investment both are different for the two partners.

$\therefore$ profit is distributed in the ratio of the product of the capitals and respective period.

i.e., in the proportion $(x \times 5) : (x + 600) \times 4$

Now, $5x + (x + 600)4 = 5x + 4x + 2{,}400 = 9x + 2400$

Given, total profit = ₹ 528

∴   B's share in the profit $= \dfrac{5x}{9x+2400} \times 528$

A's share in the profit $= \dfrac{4x+2400}{9x+2400} \times 528$

But, share of A is ₹ 48 more than B   ....(given)

∴ $\dfrac{\text{A's share}}{\text{in the profit}} = \dfrac{\text{B's share}}{\text{in the profit}} + 48$

∴ $\dfrac{4x+2400}{9x+2400} \times 528 = \dfrac{5x}{9x+2400} \times 528 + 48$

∴ $\dfrac{4x+2400}{9x+2400} \times 528 - \dfrac{5x}{9x+2400} \times 528 = 48$

∴ $\dfrac{528}{9x+2400}(4x+2400-5x) = 48$

∴ $\dfrac{528}{9x+2400}(-x+2400) = 48$

∴ $\dfrac{2400-x}{9x+2400} = \dfrac{48}{528}$ ∴ $\dfrac{2400-x}{9x+2400} = \dfrac{1}{11}$

∴ $11(2400-x) = 9x+2400$

∴ $26,400 - 11x = 9x + 2400$

∴ $26,400 - 2400 = 9x + 11x$

∴ $24,000 = 20x$ ∴ $x = 1,200$

∴   capital contributed by B is ₹ 1200 and capital contributed by A is ₹ $(x+600)$
= ₹ $(1,200+600)$ = ₹ 1,800

∴   capitals contributed by A and B are ₹ 1,800 and ₹ 1,200 respectively.

---

20. A and B are partners in business. A puts in ₹ 5,000 and B puts in ₹ 6,000. A receives 12.5% of the profits for managing the business and rest is divided in proportion to their capitals. What does each get out of profit of ₹ 880?

Solution:

Given, profit = ₹ 880.

A receives 12.5% of the profits for managing the business.

∴   amount received by A for managing the business = 12.5% of 880.

$= \dfrac{12.5}{100} \times 880 = ₹\ 110$

Since, the period of investment is same for the two partners.

∴   profit will be shared in proportion to the capitals invested.

∴   profit of ₹ (880 – 110) = ₹ 770 is distributed among the two partners in the proportion 5,000 : 6,000

i.e. in the proportion 5 : 6

Now, 5 + 6 = 11

∴   A's share in the profit $= \dfrac{5}{11} \times 770 = ₹\ 350$

B's share in the profit $= \dfrac{6}{11} \times 770 = ₹\ 420$

∴   the amount received by A is ₹ (350 + 110) = ₹ 460 and amount received by B is ₹ 420

∴   partners A and B get ₹ 460 and ₹ 420 respectively out of profit of ₹ 880.

Additional Problems for Practice

Based on Exercise 1.1

1. Ramesh spends 30% of his pocketmoney on playing games and 40% on food. If for a particular month he spent ₹ 300 on games, find his total expenditure during the same month.

2. What must be subtracted from each of the numbers 7, 9 and 12, so that the resulting numbers are in continued proportion?

3. The ratio of sales of two shops A and B was 7:12. Two years later sale of shop A has increased by ₹ 1,500 and sale of shop B decreased by 25%. New ratio of their sales are 4:3. Find original sale of shop B.

4. If the numerator of a fraction is decreased by 15% , then the value of the fraction is $\dfrac{9}{5}$. Find the original fraction.

5. Expenditure of three persons A, B and C are in the ratio 2 : 4 : 5 and their savings are in the ratio 4 : 5 : 6. If A saves 50% of his income, find the ratio of their salaries.

6. An alloy of chromium and nickel contains 40% chromium by weight. Find the weight of chromium that must be added to 550 kg of this alloy if the final percentage of chromium is to be 65.

7. Alex spends 20% of his income on food items and 12% on conveyance, If for the month of June 2010, he spent ₹ 900 on conveyance, find his expenditure on food items during the same month.   **[Mar 14; Oct 15]**

Based on Exercise 1.2

1. If A, B and C are partners in a business. Their respective capitals are ₹ 10,000, ₹ 15,000 and ₹ 12,000. If profit at the end of the year amounts to ₹ 7,400. Find the share of each partner in the profit.

2. Sagar started a cloth business by investing ₹ 20,000. After 4 months he admitted Raju as a partner who invested ₹ 35,000. Finding the need for more capital they invited Ganesh into the partnership after 4 month with ₹ 30,000. At the end of the year profit was ₹ 12,800. How much was the share of each partner in the profit?

3. A person started a business by investing certain amount. After 2 months, second person entered into the business with the same capital. Finding the need for more capital they invited third person into partnership after 5 months with same capital as they had, if the share of first person in the profit was ₹ 6,000, find the share of other two partners.

4. P and Q started a business with a capital investment of ₹ 30,000 and ₹ 40,000 respectively. After 4 months P withdrew ₹ 5,000 from his existing capital, while Q put in ₹ 10,000 more as capital. If at the end of the year P receive profit of ₹ 55,000, find the total profit and share of Q in the profit.

5. Rashmi and Jaya started a business with capitals of ₹ 7,000 and ₹ 9,000 respectively. After 10 months Rashmi put 20% of her capital additionally and Jaya withdrew the same percent of her capital. If at end of the year, Rashmi's share in the profit was ₹ 1,736. Find the total profit.

6. Pooja and Reshma are partners in a business with their capitals as ₹ 3,00,000 and ₹ 2,00,000 respectively. Riddhima wishes to join the business with a capital of ₹ 3,00,000 at the beginning of the financial year. They agree that the goodwill be taken as twice the average annual profit for the last three years. Last three years profits are ₹ 30,000, ₹ 40,000 and ₹ 26,000 respectively. Find the goodwill amount that Riddhima would be required to pay Pooja and Reshma separately.

7. Anandi and Rutuja invested ₹ 10,000 each in a business. Anandi withdrew her capital after 7 months. Rutuja continued for the year. After one year, the profit earned by them was ₹ 5,700. Find the profit earned by each person.
[Mar 16]

Based on Miscellaneous Exercise – 1

1. The ratio of number of men and women in a community is 4:5. If 30% of the men and 10% of the women are working, find the total percentage of
   i. working persons
   ii. not working persons

2. A and B have incomes in the ratio 3 : 5. The savings of A and B are in the ratio 2 : 3. If A saves ₹ 500 and B spends ₹ 1,000. Find expenditure of A.

3. An ornament weighs 20 gms of which 3.5 gm is pure gold and rest alloy. Find the percentage of alloy present. Also find the ratio of alloy to pure gold.

4. Three persons P, Q, R whose salaries together amount to ₹ 15,700, spend 70%, 75% and 80% of their salaries respectively. If their savings are in the ratio 7 : 5 : 8, find their salaries.

5. Sunil and Sachin are partners in the company having their capitals in the ratio 4 : 5 and the profits received by them are in the ratio 2 : 3. If Sunil invested the capital in the company for 15 months, determine the period of Sachin's investment.

6. Two businessmen started a business with capitals in the ratio 5 : 4. After 5 months first person withdrew 20% of his capital and second person put 25% of his capital. If at the end of the year total profit was ₹ 2,052. Find the profit's of businessmens.

7. Mr. Kapoor, Mr. Oberoi and Mr. Singh are in a partnership with their capitals of ₹ 35,000, ₹ 40,000 and ₹ 55,000 respectively. The assets of the company are sold for ₹ 7,79,000 and liabilities of ₹ 1,20,000 are paid in full. They incur realisation expenses of ₹ 9,000. What is the amount that each partner would get as the final settlement after the dissolution?

8. Roland, Kadir and Ryan started a business by investing ₹ 50,000, ₹ 80,000 and ₹ 90,000 respectively. Roland and Kadir take 6% interest on the capital and Ryan gets 9% interest on his capital. Kadir and Ryan practically manages the business on day to day basis, hence salary of ₹ 6,000 per month given to them. Profit is shared in the proportion of their capitals. The gross profit at the end of the year is ₹ 2,00,500 find
   i. net profit
   ii. share of each partner in the profit
   iii. gross amount received by them

Multiple Choice Questions

1. Ratio a:b is called ratio of
    (A) second term : first term
    (B) first term : second term
    (C) antecedent : consequent
    (D) (B) and (C)

2. In case of proportion product of means is always equal to _____.
    (A) value of extremes
    (B) value of mean
    (C) product of extremes
    (D) none of these

3. If ad < bc, where b > 0, d > 0, then
    (A) $\dfrac{a}{b} > \dfrac{c}{d}$ (B) $\dfrac{a}{b} = \dfrac{c}{d}$
    (C) $\dfrac{a}{b} \le \dfrac{c}{d}$ (D) $\dfrac{a}{b} < \dfrac{c}{d}$

4. If the periods of investment is same for all the partners, then profit is distributed among them in the proportion to their _____.
    (A) capitals
    (B) time periods
    (C) goodwill
    (D) product of capitals and periods.

5. If $\dfrac{a}{b} = \dfrac{c}{d}$, then $\dfrac{a}{b} = \dfrac{c}{d} =$
    (A) $\dfrac{a + c}{b - d}$ (B) $\dfrac{b + d}{a + c}$
    (C) $\dfrac{a + c}{b + d}$ (D) $\dfrac{a - c}{b + d}$

6. An equality of two ratios is called a _____.
    (A) proportion
    (B) equal ratio
    (C) percentage
    (D) continued proportion

7. If $\dfrac{a}{b} = \dfrac{c}{d}$, then $\dfrac{a + mb}{a - mb} =$
    (A) $\dfrac{c - md}{c + md}$ (B) $\dfrac{a - mb}{a + mb}$
    (C) $\dfrac{c + md}{c - md}$ (D) $\dfrac{a - md}{a + md}$

8. If H.C.F. of a and b is 1, then the ratio a : b is said to be in the _____.
    (A) simplest form
    (B) proportion
    (C) continued proportion
    (D) complex form

9. In ratio, quantities to be compared must have the _____.
    (A) same units
    (B) different units
    (C) same qualities
    (D) different qualities

10. Two sums of money are proportional to 8 : 13. If the first sum be 48, the addition of two sums are
    (A) 126   (B) 124
    (C) 120   (D) 128

11. ₹ 407 are to be divided among A, B and C so that their shares are in the ratio of 45 : 36 : 30. The respective shares of A, B, C are
    (A) ₹ 165, ₹ 132, ₹ 110
    (B) ₹ 165, ₹ 110, ₹ 132
    (C) ₹ 132, ₹ 110, ₹ 165
    (D) ₹ 110, ₹ 132, ₹ 165

12. The third proportional to $(x^2 - y^2)$ and $(x - y)$ is
    (A) $\dfrac{x + y}{x - y}$ (B) $\dfrac{x - y}{x + y}$
    (C) $x + y$ (D) $x - y$

13. If 35% of A's income is equal to 25% of B's income, then the ratio of their incomes is
    (A) 4 : 3   (B) 5 : 7
    (C) 7 : 5   (D) 4 : 7

14. An amount of money is to be distributed among P, Q and R in the ratio 3 : 5 : 7. If Q's share is ₹ 1,500 then the differences between R's share and P's shares is
    (A) ₹ 1,200   (B) ₹ 1,500
    (C) ₹ 1,600   (D) ₹ 1,900

15. If $x : 2\dfrac{1}{3} : : 21 : 50$, then the value of x is
    (A) $\dfrac{27}{50}$ (B) $\dfrac{49}{50}$
    (C) $1\dfrac{1}{50}$ (D) $1\dfrac{1}{49}$

16. The ratio of expenditure and salary of a person is 2 : 5. If salary of a person is ₹ 8,000, then what is his expenditure?
    (A) ₹ 3,000   (B) ₹ 3,200
    (C) ₹ 3,500   (D) ₹ 3,100

17. If $x : y = 3 : 4$, then $(4x + 5y) : (5x - 2y)$ is
    (A) 4 : 5   (B) 32 : 7
    (C) 48 : 15   (D) 10 : 21

18. A and B have incomes in the ratio 5 : 3. The expenses of A, B and C are in the ratio 8 : 5 : 2. If C spends ₹ 2,000 and B saves ₹ 700. What is the saving of A?
    (A) ₹ 2,000   (B) ₹ 1,500
    (C) ₹ 1,900   (D) ₹ 9,500

19. An ornament weights 12.5 gms of which 2.5 gm is pure silver and the rest alloy. What is the ratio of pure silver to alloy?
    (A) 1 : 5   (B) 4 : 1
    (C) 5 : 1   (D) 1 : 4

20. X, Y and Z are three partners in a firm. They decide to dissolve their partnership. The assets of the firm are sold for ₹ 39,70,000 and liabilities of ₹ 10,00,000. They incur realisation expenses of ₹ 9,000. What is the net amount realised?
    (A) ₹ 29,60,000   (B) ₹ 29,61,000
    (C) 29 lakh   (D) ₹ 49,79,000

21. Arun, Salim and Rajesh started a business with their capitals ₹ 12,000, ₹ 20,000 and 25,000 respectively. Arun and Rajesh gets 7% interest on the capital. Salim gets salary of ₹ 3,000 p.m. If gross profit at the end of the year is ₹ 44,000, then what is the net profit?
    (A) ₹ 5,761   (B) ₹ 5,765
    (C) ₹ 5,760   (D) ₹ 5,770

22. Sachin, Rajesh and Ravi are partners in the business and their respective capitals are ₹ 20,000, ₹ 30,000, and ₹ 50,000. If the profit at the end of the year amounts to ₹ 15,000, then the share of Ravi in the profit is
    (A) ₹ 6,000   (B) ₹ 7,500
    (C) ₹ 8,000   (D) ₹ 8,500

23. Radha spends 40% on food items. If for the month of May she spends ₹ 1,000 on food items, then her salary during the same month is
    (A) ₹ 2,500   (B) ₹ 3,500
    (C) ₹ 4,500   (D) ₹ 4,000.

24. Persons P, Q and R are partners in the business and their capitals are in the proportion 3 : 4 : 5. If P's share of profit in the business is ₹ 5,000, then R's share in the profit is
    (A) ₹ 8,000   (B) ₹ 8,300
    (C) ₹ 8,330   (D) ₹ 8,333.33

25. A and B are partners in the company. If they invested same amount of capital for the period of 15 months and 10 months respectively, then their profits are in the proportion
    (A) 2 : 3   (B) 3 : 2
    (C) 3 : 1   (D) 1 : 3.

Answers to Additional Practice Problems

Based on Exercise 1.1

1. ₹ 700   2. 3

3. ₹ 3,600   4. $\dfrac{36}{17}$

5. 8 : 13 : 16   6. 392.86 kg
7. ₹ 1,500

Based on Exercise 1.2

1. ₹ 2,000, ₹ 3,000, ₹ 2,400

2. ₹ 4,800, ₹ 5,600, ₹ 2,400

3. ₹ 5,000, ₹ 3,500

4. ₹ 1,51,250, ₹ 96,250

5. ₹ 3,824

6. ₹ 14,400, ₹ 9,600
7. ₹ 3,600, ₹ 2,100

Based on Miscellaneous Exercise – 1

1. 18.89% ≈ 19%, 81.11% ≈ 81%

2. ₹ 550   3. 82.5%, $\dfrac{33}{7}$

4. ₹ 4,396, ₹ 3,768, ₹ 7,536

5. 18 months

6. ₹ 1,007, ₹ 1,045

7. ₹ 1,75,000, ₹ 2,00,000, ₹ 2,75,000

8. i. ₹ 40,600
   ii. ₹ 9,227.27, ₹ 14,763.64 and ₹ 16,609.09
   iii. ₹ 12227.27, ₹ 91563.64 and ₹ 96709.09

Answers to Multiple Choice Questions

1.	(D)	2.	(C)	3.	(D)	4.	(A)
5.	(C)	6.	(A)	7.	(C)	8.	(A)
9.	(A)	10.	(A)	11.	(A)	12.	(B)
13.	(B)	14.	(A)	15.	(B)	16.	(B)
17.	(B)	18.	(B)	19.	(C)	20.	(B)
21.	(C)	22.	(B)	23.	(A)	24.	(D)
25.	(B)						

BOARD QUESTION PAPER : MARCH 2016

Notes:

i.   All questions are compulsory.
ii.   Figures to the right indicate full marks.
iii.   Answer to every question must be written on a new page.
iv.   L.P.P. problem should be solved on graph paper.
v.   Log table will be provided on request.
vi.   Write answers of Section – I and Section – II in one answer book.

Section – I

*Question 1 to 3 (based on section I) are given in our book **STD XII (COMMERCE) MATHEMATICS AND STATISTICS - I***

Section – II

Q.4. Attempt any SIX of the following: **[12]**

i.   Anandi and Rutuja invested ₹ 10,000 each in a business. Anandi withdrew her capital after 7
       months. Rutuja continued for the year. After one year, the profit earned by them was ₹ 5,700.
       Find the profit earned by each person.   (2)

ii.   Calculate age specific death (A-SDR) rates for the following data:

Age group (in years)	Population ('000)	Number of Deaths
Below 10	25	50
10 – 30	30	90
30 – 45	40	160
45 – 70	20	100

                                                                                                    (2)

iii.   For a bivariate data $b_{YX} = -1 \cdot 2$ and $b_{XY} = -0 \cdot 3$,
       find the correlation coefficient between x and y.   (2)

iv.   A random variable x has the following probability distribution:

x	0	1	2	3	4	5	6
P(X = x)	k	3k	5k	7k	9k	11k	13k

       Find 'k'.   (2)

v.   The probability distribution function of continuous random variable X is given by
       $$f(x) = \frac{x}{4}, \ 0 < x < 2$$
       $$= 0, \quad \text{otherwise}$$
       Find P($x \le 1$).   (2)

vi.   From the two regression equations
       $y = 4x - 5$ and $3x = 2y + 5$ find $\bar{x}$ and $\bar{y}$.   (2)

vii.   Draw scatter diagram for the following data and interpret it:

x	10	20	30	40	50	60	70
y	32	20	24	36	40	28	38

                                                                                                    (2)

viii. If $\Sigma d^2 = 66$ and n = 10 then find the rank correlation coefficient.   (2)

Q.5. (A) Attempt any TWO of the following: **(6)[14]**

i.   Determine l_{92} and l_{93}, given that $l_{91} = 97$, $d_{91} = 38$ and $q_{92} = \dfrac{27}{59}$.   (3)

ii. Calculate CDR for districts A and B and compare them.
Also state which district is more healthy. (3)

Age group (in years)	District A		District B	
	No. of Persons ('000)	No. of Deaths	No. of Persons ('000)	No. of Deaths
0 – 15	1	20	2	50
15 – 60	3	30	7	70
60 and above	2	40	1	25

iii. If for a bivariate data $\bar{x}$ = 10, $\bar{y}$ = 12, Var(X) = 9, σ_Y = 4 and r = 0.6, estimate y when x = 5. (3)

(B) Attempt any TWO of the following: **(8)**

i. Calculate the coefficient of correlation between X and Y series from the following data:
n = 15, $\bar{x}$ = 25, $\bar{y}$ = 18, σ_X = 3.01, σ_Y = 3.03, $\Sigma(x_i - \bar{x})(y_i - \bar{y})$ = 122 (4)

ii. Solve the following minimal assignment problem and hence find minimum time where '–' indicates that job connot be assigned to the machine:

Machines	Processing time in hours				
	A	B	C	D	E
M_1	9	11	15	10	11
M_2	12	9	–	10	9
M_3	–	11	14	11	7
M_4	14	8	12	7	8

(4)

iii. Solve the following maximal assignment problem:

Branch Manager	Monthly Business (₹ lakh)			
	A	B	C	D
P	11	11	9	9
Q	13	16	11	10
R	12	17	13	8
S	16	14	16	12

(4)

Q.6. (A) Attempt any TWO of the following: **(6)[14]**

i. Find the true discount, banker's discount and banker's gain on a bill of ₹ 36,600 due 4 months hence at 5% p.a. (3)

ii. Mr. Anil wants to invest at most ₹ 60,000 in Fixed Deposit (F.D.) and Public Provident Fund (P.P.F.). He wants to invest at least ₹ 20,000 in F.D. and at least ₹ 15,000 in P.P.F. The rate of interest on F.D. is 8% p.a. and that on P.P.F. is 10% p.a. Formulate the above problem as L.P.P. to determine maximum yearly income. (3)

iii. Find graphical solution for the following system of linear inequations:
$3x + 2y \leq 180$; $x + 2y \leq 120$, $x \geq 0$, $y \geq 0$
Hence find co-ordinates of corner points of the common region. (3)

(B) Attempt any TWO of the following: **(8)**

i. Mrs. Menon plans to save for her daughter's marriage. She wants to accumulate a sum of ₹ 4,00,000 at the end of 4 years. How much should she invest at the end of each year from now, if she can get interest compounded at 10% p.a.? [Given : $(1.1)^4$ = 1.4641] (4)

ii. A car valued at ₹ 4,00,000 is insured for ₹ 2,50,000. The rate of premium is 5% less 20%. How much loss does the owner bear including the premium if value of the car is reduced to 60% of its original value? (4)

iii. If a random varibale X has probability distribution function

$f(x) = \dfrac{c}{x}$, $1 < x < 3$, c > 0,

find c, E(X) and Var (X).