QUANTITATIVE APTITUDE

FOR COMPETITIVE EXAMINATIONS

(FULLY SOLVED)

AS PER NEW EXAMINATION PATTERN

An ideal book for:

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Dr. R. S. AGGARWAL

S. CHAND

1. NUMBERS

[illegible] FACTS AND FORMULAE

1. **Natural** : In Hindu Sys [illegible]
   [illegible]
   [illegible]
   [illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

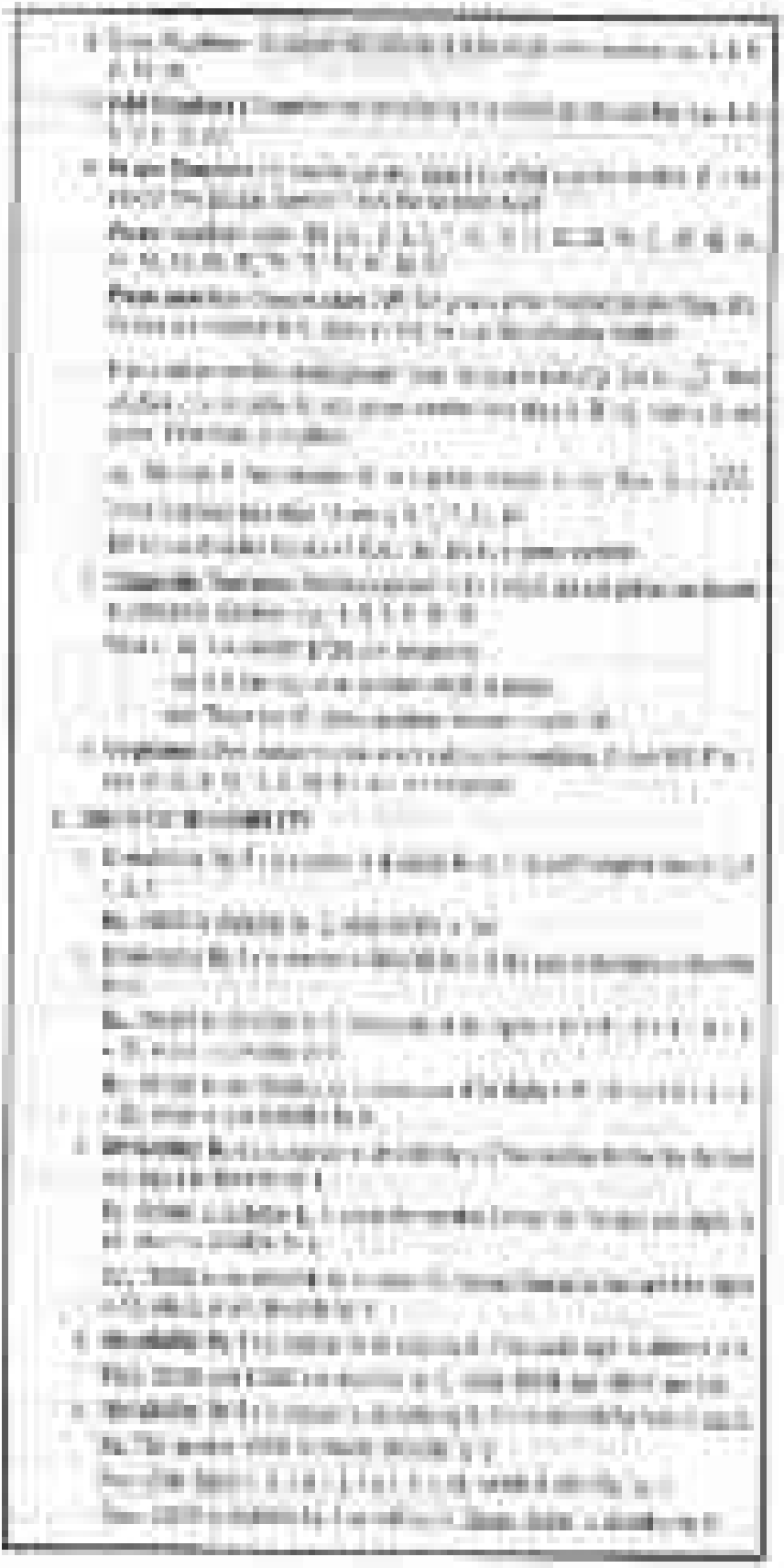
   [illegible]

2. **[illegible]** : [illegible]
   [illegible]
   [illegible]
   [illegible]

3. **[illegible]** : [illegible]

4. **TYPES OF NUMBERS**

   1. **Natural Numbers** : [illegible]
   2. **Whole Numbers** : [illegible]
      (i) [illegible]
      (ii) [illegible]
   3. **Integers** : [illegible]
      (i) **Positive Integers** : [illegible]
      (ii) **Negative Integers** : [illegible]
      (iii) **Non-Positive and Non-Negative Integers** : [illegible]



1. **Mixed solubility** (Ag+) is a solution of a mixture of Ag+ and another metal ion M2+ in which both form precipitates. Let [Ag+] = x and [M2+] = y. Write the Ksp's.

   Sol. [illegible]

   Ans. Typical mixed solubility problem. Ag+ forms AgCl, M2+ forms MCl2. Both share Cl−. Solve simultaneously.

2. **Mixed solubility** (Ag+) Ag+ forms AgCl (Ksp = 1.8 × 10⁻¹⁰) and AgI (Ksp = 8.5 × 10⁻¹⁷). Which salt precipitates first?

   Sol. [illegible]

   Ans. [illegible]

3. **Common ion effect** (Ag+) Calculate the solubility of AgCl in 0.10 M NaCl. Ksp = 1.8 × 10⁻¹⁰.

   Sol. [illegible]

4. **Common ion effect** (Ag+) Calculate the solubility of AgCl in 0.10 M AgNO3. Ksp = 1.8 × 10⁻¹⁰.

   Sol. [illegible]

5. **Common ion effect** (Ag+) Calculate the solubility of AgCl in 0.10 M NaCl and 0.10 M AgNO3. Ksp = 1.8 × 10⁻¹⁰.

   Sol. [illegible]

6. **Complex ion** (Ag+) Calculate the solubility of AgCl in 1.0 M NH3. Ksp = 1.8 × 10⁻¹⁰, Kf = 1.7 × 10⁷.

   Sol. [illegible]

7. **Complex ion** (Ag+) Calculate the solubility of AgCl in 0.10 M NaCN. Ksp = 1.8 × 10⁻¹⁰, Kf = 2.5 × 10²⁰.

   Sol. [illegible]

8. **Complex ion** (Ag+) Calculate the solubility of AgCl in 0.10 M Na2S2O3. Ksp = 1.8 × 10⁻¹⁰, Kf = 2.8 × 10¹³.

   Sol. [illegible]

9. **Complex ion** (Ag+) Calculate the solubility of AgCl in 0.10 M NaCl and 0.10 M NH3. Ksp = 1.8 × 10⁻¹⁰, Kf = 1.7 × 10⁷.

   Sol. [illegible]

10. **Complex ion** (Ag+) Calculate the solubility of AgCl in 0.10 M NaCl and 0.10 M NaCN. Ksp = 1.8 × 10⁻¹⁰, Kf = 2.5 × 10²⁰.

    Sol. [illegible]

11. **Complex ion** (Ag+) Calculate the solubility of AgCl in 0.10 M NaCl and 0.10 M Na2S2O3. Ksp = 1.8 × 10⁻¹⁰, Kf = 2.8 × 10¹³.

    Sol. [illegible]

12. **Complex ion** (Ag+) Calculate the solubility of AgCl in 0.10 M NH3 and 0.10 M NaCN. Ksp = 1.8 × 10⁻¹⁰, Kf1 = 1.7 × 10⁷, Kf2 = 2.5 × 10²⁰.

    Sol. [illegible]

OBJECTIVE GENERAL ENGLISH

FOR COMPETITIONS

[illegible]

[illegible]

[illegible] SUMMARY

[illegible]

Sol. [illegible]

Ans. [illegible]

Sol. [illegible]

Ans. [illegible]

Sol. [illegible]

Ans. [

[illegible]

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Sol. [illegible]

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[illegible] [illegible] **[illegible]**

Sol. [illegible]

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Sol. [illegible]

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Sol. [illegible]

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Sol. [illegible]

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Sol. [illegible]

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[illegible] [illegible]

Sol. [illegible]

[illegible]

[illegible]

(a) [illegible] (b) [illegible]

Sol: (a) [illegible]

(b) [illegible]

Ex. 9. [illegible]

Sol: [illegible]

Ex. 10. [illegible]

Sol: [illegible]

Ex. 11. [illegible]

Sol: [illegible]

Ex. 12. [illegible]

Sol: [illegible]

Ex. 13. [illegible]

Sol: [illegible]

Ex. 14. [illegible]

Sol: [illegible]

Ex. 15. [illegible]

Sol: [illegible]

Ex. 16. [illegible]

Sol: [illegible]

**Ex.

Ex. 25. [illegible]

Sol. [illegible]

Ex. 26. [illegible]

Sol. [illegible]

Ex. 27. [illegible]

Sol. [illegible]

Ex. 28. [illegible]

Sol. [illegible]

Ex. 29. [illegible]

Sol. [illegible]

Ex. 30. [illegible]

Sol. [illegible]

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6. [illegible]
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7. [illegible]
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8. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
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14. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
15. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

৭৭. 'Time' is similar to the word which is given in the following options? **B.A.L.T.E. 2020**

(a) Hour (b) Year (c) Clock (d) Watch

(a) 9 (b) 6 (c) 7 (d) 3

৭৮. 2 বছর 5 মাসের এক ছেলে 1 বছরের 10 মাসের এক মেয়ে এদের বয়সের অনুপাত কত? **S.A.L. 2020**

(a) 1 : 2 (b) 1 : 3 (c) 1 : 4 (d) 1 : 5

৭৯. 2020 এর 1/2 এর 1/4 =

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

৮০. 0.01 : 0.1 =

(a) 0.01 (b) 0.1 (c) 1 (d) 10

৮১. (0.1)² : 0.01 = ? **S.B.L. 2020**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

৮২. [illegible] = [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

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৮৪. [illegible] **S.B.L. 2020**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

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(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

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(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

৮৭. [illegible] = [illegible]

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(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

৯০. [illegible] = [illegible] **Civil Engineers 2020**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

৯১. [illegible] **S.A.C. 2020**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

৯২. The sum of double digits of 2 is the sum of digits of which

$$\begin{array}{r} 2\,2\,2 \\ \times\ 2 \\ \hline 2\,2\,2 \\ \hline 4\,4\,4 \\ \hline \end{array}$$

Civil Engineers 2020

(a) 6 (b) 2 (c) 4 (d) 3

৯৩. [illegible] **B.A.T. 2020**

(a) 1 (b) 2 (c) 3 (d) 4

৯৪. [illegible] = [illegible] **Civil Engineers 2020**

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(c) [illegible] (d) [illegible]

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SOLUTIONS

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(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

(j) [illegible]

(k) [illegible]

(l) [illegible]

(m) [illegible]

(n) [illegible]

(o) [illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

(j) [illegible]

(k) [illegible]

(l) [illegible]

(m) [illegible]

(n) [illegible]

(o) [illegible]

(p) [illegible]

(q) [illegible]

(r) [illegible]

(s) [illegible]

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(187) [illegible]

(188) [illegible]

(189) [illegible]

(190) [illegible]

(191) [illegible]

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2. H.C.F. AND L.C.M. OF NUMBERS

IMPORTANT FACTS AND FORMULAE

[illegible]

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[illegible]

SOLVED EXAMPLES

Ex. 1. [illegible]

Sol.: [illegible]

Ex. 2. [illegible]

Sol.: [illegible]

Ex. 3. [illegible]

Sol.: [illegible]

Ex. 4. [illegible]

Sol.: [illegible]

Ex. 5. [illegible]

Sol.: [illegible]

Ex. 6. [illegible]

Sol.: [illegible]

Ex. 7. [illegible]

Sol.: [illegible]

Ex. 8. [illegible]

Sol.: [illegible]

[illegible]

(b) [illegible]

[illegible]

[illegible] [illegible]

(a) [illegible]

[illegible]

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[illegible] [illegible]

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(a) [illegible]

[illegible]

(b) [illegible]

[illegible]

[illegible]. [illegible] $\{1, 2, 3\}$ and $\{2, 3\}$.

(a) Provided counties: $\{1, 2, 3\}$, $\{2, 3\}$, $\{3\}$, $\{1\}$, $\{2\}$

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

→ [illegible] $\{1, 2, 3\}$ [illegible] $\{1, 2, 3\}$ [illegible]

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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**ᐁᑭᑲᓂᐧᐃᑲᓂᐧᐃᑲᓂᐧᐃ

ATTENTION COMPETITORS !

S. CHAND & CO.

NOW BRINGS TO YOU THE MOST UNIQUE

COMPETITION SERIES

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3. [illegible] — [illegible]
4. [illegible] — [illegible]
5. [illegible] — [illegible]
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[illegible] FOMPLEX

[illegible]

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[illegible]

[illegible] Find the equation.

[illegible]

Sol. [illegible]

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[illegible] 1

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1. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

2. [illegible]

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3. [illegible]

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4. [illegible]

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(h) [illegible]

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87. The value of $\left(\frac{1}{2}\right)^{-1}$ is

(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$ (c) $\frac{1}{4}$ (d) None of these

88. The value of $(-1)^{-1}$ is (Kerala PET, 2009)

(a) $\frac{1}{100}$ (b) $\frac{1}{10}$ (c) $-\frac{1}{10}$ (d) None of these

89. The value of $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}+\left(\frac{1}{5}\right)^{-1}+\left(\frac{1}{6}\right)^{-1}$ is (Kerala, 2007)

(a) $\frac{137}{60}$ (b) $\frac{137}{12}$ (c) $\frac{1}{4}$ (d) $\frac{137}{4}$

90. $\sqrt{27}\cdot\sqrt{243}\div\sqrt{3}$ = (Kerala, 2008; Delhi, 2009)

(a) 243 (b) 81 (c) $\sqrt{27}$ (d) 27

91. The simplified form of $\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{5}\right)^{-1}+\left(\frac{1}{7}\right)^{-1}$ equals (AIEEE, 2006)

(a) 15 (b) 11 (c) 71 (d) 176

92. $\sqrt{\frac{1}{3}}\div\sqrt{\frac{1}{27}}$ = (AIEEE, 2006)

(a) $\frac{1}{27}$ (b) $\frac{1}{3}$ (c) 3 (d) $\sqrt{3}$

93. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Delhi, 2008)

(a) 9 (b) 13 (c) 15 (d) None of these

94. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

95. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

96. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

97. The value of $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ is (Kerala PET, 2009)

(a) 13 (b) 15 (c) 9 (d) None of these

98. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

99. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

100. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

101. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

102. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

103. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

104. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

105. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

106. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

107. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

108. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

109. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

110. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

111. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

112. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

113. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

114. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

115. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

116. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

117. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

118. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

119. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

120. $\left(\frac{1}{2}\right)^{-1}+\left(\frac{1}{3}\right)^{-1}+\left(\frac{1}{4}\right)^{-1}$ = (Kerala, 2008)

(a) 13 (b) 15 (c) 9 (d) None of these

[illegible]

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116. The cross product of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ and $\left(\begin{array}{l}\text{[illegible]}\end{array}\right)$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

117. The equation $\left(\begin{array}{l}\text{[illegible]}\end{array}\right)$ is a quadratic equation in $\left(\begin{array}{l}\text{[illegible]}\end{array}\right)$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

118. The value of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

119. The value of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

120. The value of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

121. The value of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

122. The value of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

123. The value of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

124. The value of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

125. The value of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

126. The value of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

127. The value of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

128. The value of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

129. The value of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

130. The value of $\dfrac{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}{\left(\begin{array}{l}\text{[illegible]}\end{array}\right)}$ is

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

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4. SIMPLIFICATION

[illegible] CONCEPTS

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

[illegible] EXAMPLES

Ex. 1. [illegible]

Sol. [illegible]

Ex. 2. [illegible] Sol. [illegible]

Ex. 3. [illegible]

Ex. 4. [illegible]

Sol. [illegible]

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(iv) [illegible]

(v) [illegible]

(vi) [illegible]

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(১) Analysis [illegible] (2010)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

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(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(৫) Analysis [illegible] (2009)

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(৬) [illegible] (2009) [illegible] (a) [illegible]

Note Management, [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(৭) [illegible] (2008)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(৮) [illegible] **Note [illegible], [illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(৯) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(১০) [illegible] **Statement [illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(১১) [illegible] **[illegible]** (2008)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(১২) [illegible] **[illegible]** (2008)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(১৩) [illegible] **[illegible]** (2008)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

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(84) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(85) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(86) [illegible] **(U.P.C.S. 2002)**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(87) [illegible] **(U.P.C.S. 2003)**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(88) [illegible] **(R.A.S. P.C. 1998)**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

If [illegible] is [illegible] [illegible]

(89) [illegible] **(R.A.S. Rajasthan 1996)**

(a) [illegible] (b) [illegible] (c) [illegible] (d) Indeterminate

(90) The complete [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(91) [illegible] **(U.P.C.S. 2005)**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(92) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) Indeterminate

(93) [illegible] **(R.A.S. Rajasthan 1999)**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] **(A.A.S. Exam, [illegible])**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) None of these

[illegible] The [illegible] **(A.B.E., [illegible])**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] The [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] **(A.B.E., [illegible])**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] **(A.A.S. [illegible])**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] **(A.A.S. [illegible])**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] **(A.B.E., [illegible])**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

2.2. The nth term of a sequence is $n(n-1)$. Which of the following is a term of the sequence?
Mark the correct option. (A to D)

(A) 110 (B) 132 (C) 156 (D) None of the above

2.3. x is a positive integer. Three x x x

小数四则运算

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(a) [illegible]

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(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) **Case 2: [illegible]** [illegible]

[illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

(j) [illegible]

(k) [illegible]

(l) [illegible]

(m) [illegible]

(n) [illegible]

18. [illegible]

19. Let the number be x. Then,

[illegible]

20. [illegible]

21. [illegible]

22. [illegible]

23. (a) [illegible] Now

[illegible]

(b) [illegible]

24. (a) [illegible] Now,

[illegible]

25. [illegible]

26. (a) [illegible] Now,

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27. [illegible]

28. [illegible]

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14. (a) [illegible]

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15. [illegible]

16. (a) [illegible]

(b) [illegible]

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(118) [illegible]

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[illegible] Let the [illegible] be [illegible]. Then [illegible] of [illegible] [illegible] $\left[\frac{[illegible]}{[illegible]}\right]$ [illegible]

$$[illegible] = \left[\frac{[illegible]}{[illegible]}\right] = \frac{[illegible]}{[illegible]} = [illegible] = [illegible]$$

[illegible] [illegible] [illegible] [illegible] $\int [illegible]\,dx = [illegible]$

[illegible] [illegible] [illegible] [illegible]

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(6) Let [illegible]

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(10b) [illegible]

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(10c) [illegible]

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(10e) [illegible]

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(10g) [illegible]

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(10h) [illegible]

[illegible]

(10i) [illegible]

[illegible]

(10j) [illegible]

[illegible]

(10k) [illegible]

[illegible]

(10l) [illegible]

[illegible]

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6. SQUARE ROOTS AND CUBE ROOTS

IMPORTANT FACTS AND FORMULAE

[illegible]

SOLVED EXAMPLES

[illegible]

[illegible]

[illegible]

Ex 6. If x and y are $\left(\frac{[illegible]}{[illegible]}\right)$, then find the value of the [illegible]

Ans: [illegible]

Ex 7. Find the value of $\left(\frac{[illegible]}{[illegible]}\right)$

Ans: [illegible]

Ex 8. Which is the largest one of [illegible]?

Ans: [illegible]

Ex 9. [illegible]

Ans: [illegible]

Ex 10. [illegible]

Ans: [illegible]

Ex 11. [illegible]

Ans: [illegible]

Ex 12. Find the value of $\left(\frac{[illegible]}{[illegible]}\right)$

Ans: [illegible]

Ex 13. If $\left(\frac{[illegible]}{[illegible]}\right)$ then find the value of [illegible]

(iii) [illegible]

Sol. 15. Find the value of [illegible] (iv) [illegible]

Sol. [illegible]

Sol. 16. If [illegible] find the value of [illegible] correct to 3 places of decimal.

(B.Sc. Hons.)

Sol. [illegible]

Ex. 17. Evaluate [illegible]

Sol. [illegible]

Ex. 18. [illegible] (B.A.L.L.B.)

Sol. [illegible]

Ex. 19. If [illegible] find the value of [illegible]

Sol. [illegible]

Ex. 20. Evaluate [illegible] upto 3 places of decimal. (B.E. 2002)

Sol. [illegible]

Ex. [illegible] [illegible] **Find the sum of** $\frac{[illegible]}{[illegible]}$ [illegible]

Sol. [illegible]

Ex. [illegible] **Find the [illegible] number [illegible] [illegible] [illegible]**

Sol. [illegible]

[illegible]

[illegible]

Ex. [illegible] **Find the greatest number of [illegible] digits [illegible] [illegible]** [illegible]

Sol. [illegible]

[illegible]

Ex. [illegible] **Find the smallest number [illegible] [illegible] [illegible] [illegible]** [illegible]

Sol. [illegible]

[illegible]

Ex. [illegible] **Find the value of** $\frac{[illegible]}{[illegible]}$

Sol. [illegible]

Ex. [illegible] **[illegible]** $\frac{[illegible]}{[illegible]}$ **and** $\frac{[illegible]}{[illegible]}$ **[illegible] [illegible]**

Sol. [illegible]

[illegible]

[illegible]

Sol: [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

2. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

3. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

4. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

5. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

6. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

7. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

8. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

9. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

10. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

11. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) $\frac{[illegible]}{[illegible]}$ (b) $\frac{[illegible]}{[illegible]}$ (c) $\frac{[illegible]}{[illegible]}$ (d) $\frac{[illegible]}{[illegible]}$

[illegible]

(a) $\frac{[illegible]}{[illegible]}$ (b) $\frac{[illegible]}{[illegible]}$ (c) $\frac{[illegible]}{[illegible]}$ (d) $\frac{[illegible]}{[illegible]}$

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

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(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] The [illegible] (2001) is [illegible] the [illegible] quintile equals [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] (2010)

[illegible] The parameter [illegible] [illegible] (2006)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] The [illegible] $y = [illegible]$ [illegible] is a pattern [illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] (2006)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] (2006)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] (2002)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] (2006)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] (2011)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] (2006)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] (2006)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] (2006)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] (2006)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] (2006)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible] (2006)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

18) [illegible]

19) [illegible]

20) [illegible]

21) [illegible]

22) [illegible]

23) [illegible]

24) [illegible]

25) [illegible]

26) [illegible]

27) [illegible]

28) [illegible]

29) [illegible]

30) [illegible]

31) [illegible]

32) [illegible]

33) [illegible]

34) [illegible]

35) [illegible]

[illegible]

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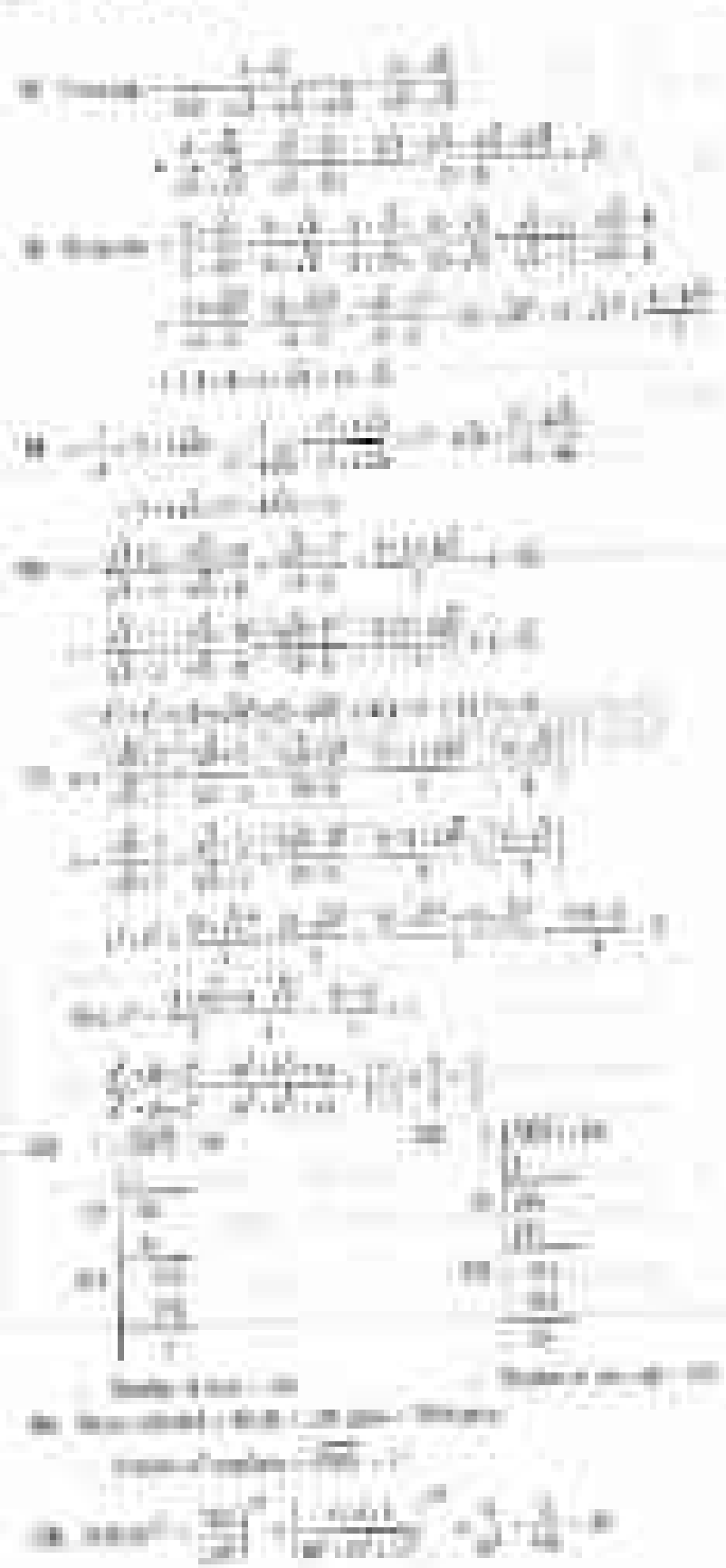

[illegible]

OBJECTIVE GENERAL KNOWLEDGE

FOR COMPETITIVES

[illegible]

[illegible]

6. AVERAGE

IMPORTANT FACTS AND FORMULAE

1) Average = $\frac{\text{Sum of observations}}{\text{Number of observations}}$

2) Suppose a car travels a distance of x km at a speed of y km/hr and another distance of z km at a speed of w km/hr. Then, the average speed during the entire journey is $\frac{(x+z)}{\left(\frac{x}{y}+\frac{z}{w}\right)}$ km/hr.

SOLVED EXAMPLES

Ex. 1. Find the average of the first four prime numbers (2, 3, 5, 7).

Sol. The sum of the first four prime numbers = (2 + 3 + 5 + 7) = 17.

$\therefore$ Required average = $\left(\frac{17}{4}\right) = 4\frac{1}{4}$.

Ex. 2. Find the average of first 50 even numbers.

Sol. Sum of the 50 even numbers = $(2+4+6+\ldots+100) = 2(1+2+3+\ldots+50)$

$= 2 \times \frac{50 \times 51}{2} = 2550$.

$\therefore$ Required average = $\left(\frac{2550}{50}\right) = 51$.

Ex. 3. Find the average of first 50 multiples of 4.

Sol. Sum of 50 multiples of 4 = $(4+8+12+\ldots+200) = 4(1+2+3+\ldots+50)$

$= 4 \times \frac{50 \times 51}{2} = 4 \times 25 \times 51 = 5100$.

$\therefore$ Required average = $\left(\frac{5100}{50}\right) = 102$.

Ex. 4. The average of first 50 odd numbers is 51. Find the sum of first 50 odd numbers.

Sol. Sum of 50 odd numbers = (Average) × (No. of odd numbers) = $51 \times 50 = 2550$.

Ex. 5. The average of first 50 consecutive natural numbers is 25. Find the sum of first 50 natural numbers.

Sol. Sum of 50 consecutive natural numbers = (Average) × (No. of natural numbers) = $25 \times 50 = 1250$.

Ex. 6. The average weight of 8 persons increased by 2.5 kg when a new person comes in place of one of them weighing 65 kg. What might be the weight of the new person?

Sol. Total weight increased = (2.5 × 8) kg = 20 kg.

$\therefore$ Weight of the new person = (65 + 20) kg = 85 kg.

[illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

[illegible]

(a) [illegible]

(b) [illegible]

[illegible]

(a) [illegible]

(b) [illegible]

[illegible]

(a) [illegible]

(b) [illegible]

[illegible]

(a) [illegible]

(b) [illegible]

[illegible]

(a) [illegible]

(b) [illegible]

[illegible]

(a) [illegible]

(b) [illegible]

[illegible]

(a) [illegible]

(b) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible] **[illegible]**

   (a) [illegible] (b) [illegible] (c) [illegible]

   (d) [illegible] (e) None of these

2. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible]

   (d) [illegible] (e) None of these

3. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

4. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

5. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

6. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

7. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

8. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

9. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

16. Determine the number $\dfrac{\left(\left(\left(

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

(j) [illegible]

(k) [illegible]

(l) [illegible]

(m) [illegible]

(n) [illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

DATA SUFFICIENCY TYPE QUESTIONS

[illegible]

[illegible]

[illegible]

[illegible]

Exercise 4.1 [illegible]

[illegible]

Exercise 4.2 [illegible]

[illegible]

Exercise 4.3 [illegible]

[illegible]

Exercise 4.4 [illegible]

[illegible]

Exercise 4.5 [illegible]

[illegible]

Exercise 4.6 [illegible]

[illegible]

Exercise 4.7 [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]
   [illegible]
   [illegible]

[illegible]

10 [illegible]

11 [illegible]

12 [illegible]

[illegible]

7. PROBLEMS ON NUMBERS

[illegible]

SELECT EXAMPLES

Ex. 1. A number is a six-digit number. If the digit [illegible] is [illegible] times of the digit [illegible] and the digit [illegible] is [illegible] times the digit [illegible], then [illegible]

Sol.: [illegible]

Ex. 2. If [illegible] is a three-digit number [illegible] (Hint: [illegible] is a prime) (Hint: [illegible]) (Hint: [illegible])

Sol.: [illegible]

Ex. 3. The sum of [illegible] consecutive odd integers is $\frac{17}{3}$. Find the number. (S.S.C. 2006)

Sol.: Let the number be x.

Then, $\left(x - \frac{17}{3}\right) + \left(x + \frac{17}{3}\right) = x^2$, [illegible]

$\Rightarrow$ [illegible]

$\Rightarrow$ [illegible]

$\Rightarrow$ [illegible]

Hence, the number [illegible] is $\frac{17}{3}$ or $-\frac{17}{3}$.

Ex. 4. The sum of two numbers is 100. If one of them is [illegible] times the other, find the numbers.

Sol.: Let the numbers be x and y. Then,

[illegible]

So, the numbers are [illegible] and [illegible] (Hint: [illegible]).

Ex. 5. The difference of two numbers is [illegible] and one of them is [illegible] times the other. Find the numbers.

Sol.: Let the numbers be x and y. Then,

[illegible]

[illegible]

Ex. 6. The sum of the digits of two digits is [illegible]. Find the number. (S.S.C. 2001)

Sol.: Let the number be x. Then, $x = [illegible]$ (as $x \geq 0$).

[illegible]

[illegible]

Ex. 2. [illegible]

Sol. [illegible]

Ex. 3. [illegible]

Sol. [illegible]

Ex. 4. [illegible]

Sol. [illegible]

Ex. 5. [illegible]

Sol. [illegible]

Ex. 6. [illegible]

Sol. [illegible]

Ex. 7. [illegible]

Sol. [illegible]

Ex. 8. [illegible]

Sol. [illegible]

[illegible]

EXERCISE 7A

(GAUCESE TYPE QUESTIONS)

[illegible]

Mark (4) (CBSE)

Mark (4) (CBSE)

(4 L.P.S. 2003)

(4 L.C. 2009)

Mark (4) (CBSE)

7. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

8. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

9. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

10. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

11. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

12. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

13. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

14. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

15. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

16. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

17. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

18. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

19. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

20. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] The value of x satisfying the equation $\frac{[illegible]}{[illegible]}$ is [illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] The product of two irreducible polynomials is [illegible] Then, the sum of the coefficients of the polynomial is [illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] If [illegible] is a factor of a quadratic equation [illegible] [illegible] is a factor of the equation and [illegible] [illegible] [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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(b, c) Bangalore, 2010

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible], 1985

The [illegible] is

(a) 0 (b) 1 (c) 11 (d) 21

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible], 2004

[illegible]

[illegible], 2007

(a) 1 (b) 0 (c) 2

(d) None of these (e) None of these

[illegible]

Bihar Engineering, 2009

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) 24 (b) 11 (c) 27 (d) 18

[illegible], 2010

[illegible]

(a) 1 (b) 11 (c) 14 (d) 18

[illegible]

[illegible], 2002

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) 1 (b) 2 (c) 4 (d) 1

[illegible]

Bihar PET, 2009

(a) 14 (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible], 2007

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible], 2010

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible], 2010

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible], 2010

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

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[illegible]

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(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

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(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(e) [illegible] (f) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d

[illegible]

[illegible]

(1)	①	(2)	(3)	(4)	(5)	②	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)
(39)	(40)	(41)	(42)	(43)	(44)	(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(53)	(54)	(55)	(56)	(57)	(58)
(59)	(60)	(61)	(62)	(63)	(64)	(65)	(66)	(67)	(68)	(69)	(70)	(71)	(72)	(73)	(74)	(75)	(76)	(77)	(78)
(79)	(80)	(81)	(82)	(83)	(84)	(85)	(86)	(87)	(88)	(89)	(90)	(91)	(92)	(93)	(94)	(95)	(96)	(97)	(98)
(99)	(100)	(101)	(102)	(103)	(104)	(105)	(106)	(107)	(108)	(109)	(110)	(111)	(112)	(113)	(114)	(115)	(116)	(117)	(118)
(119)	(120)	(121)	(122)	(123)	(124)	(125)	(126)												

解説と解答

1) [illegible]

2) [illegible]

3) [illegible]

4) [illegible]

5) [illegible]

6) [illegible]

7) [illegible]

8) [illegible]

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13) [illegible]

14) [illegible]

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[illegible]

[illegible]

[illegible]

(8) (a) Use coordinates in $\mathbb{R}^3$ to show that $\begin{vmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{vmatrix} = 1$ where $\mathbf{a} = (1,0,0)$, $\mathbf{b} = (1,1,0)$, $\mathbf{c} = (1,1,1)$.

(b) Compute $\mathbf{a} \times (\mathbf{b} \times \mathbf{c})$.

(9) (a) Use coordinates in $\mathbb{R}^3$ to show that $\mathbf{a} \times (\mathbf{b} \times \mathbf{c}) = (\mathbf{a} \cdot \mathbf{c})\mathbf{b} - (\mathbf{a} \cdot \mathbf{b})\mathbf{c}$.

(b) $\mathbf{a} = (1,0,0)$, $\mathbf{b} = (1,1,0)$, $\mathbf{c} = (1,1,1)$, $\mathbf{d} = (1,2,3)$.

(10) (a) Use coordinates in $\mathbb{R}^3$ to show that $(\mathbf{a} \times \mathbf{b}) \times (\mathbf{c} \times \mathbf{d}) = (\mathbf{a} \cdot \mathbf{c})(\mathbf{b} \cdot \mathbf{d}) - (\mathbf{a} \cdot \mathbf{d})(\mathbf{b} \cdot \mathbf{c})$.

(b) Show that this identity holds in $\mathbb{R}^4$ with $\times$ defined as in Exercise 6.

(11) Let the coordinates be (x,y,z). Show that $\begin{vmatrix} x & y & z \\ 1 & 1 & 1 \\ 0 & 1 & 2 \end{vmatrix} = x - 2y + z$.

Hence $x - 2y + z = 0$ is a plane in $\mathbb{R}^3$ with $\begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$ and $\begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix}$ as basis vectors.

The normal vector is $\begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix} \times \begin{pmatrix} 1 \\ 1 \\ 1 \end{pmatrix}$.

(12) Let the coordinates be (x,y,z). Show $x + y + z = 0$ and $x - y - 2z = 0$ are planes in $\mathbb{R}^3$.

Find a basis for the intersection of these planes.

(13) (a) Use coordinates in $\mathbb{R}^3$ and $\times$.

Show $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 6 \end{vmatrix} = 1$.

Hence $\{\mathbf{a}, \mathbf{b}, \mathbf{c}\}$ is a basis for $\mathbb{R}^3$ where $\mathbf{a} = (1,1,1)$, $\mathbf{b} = (1,2,3)$, $\mathbf{c} = (1,3,6)$.

The dual basis $\{\mathbf{a}^*, \mathbf{b}^*, \mathbf{c}^*\}$ is $\{\mathbf{b} \times \mathbf{c}, \mathbf{c} \times \mathbf{a}, \mathbf{a} \times \mathbf{b}\}$.

(14) (a) Use coordinates in $\mathbb{R}^3$ and $\times$. Show

$$\begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 6 \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ 0 & 1 & 2 \\ 0 & 2 & 5 \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{vmatrix} = 1.$$

(15) Let $\{\mathbf{a}, \mathbf{b}, \mathbf{c}\}$ be a basis for $\mathbb{R}^3$ and $\{\mathbf{a}^*, \mathbf{b}^*, \mathbf{c}^*\}$ be the dual basis.

Show $\mathbf{a}^* = (\mathbf{b} \times \mathbf{c})/\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c})$, $\mathbf{b}^* = (\mathbf{c} \times \mathbf{a})/\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c})$, $\mathbf{c}^* = (\mathbf{a} \times \mathbf{b})/\mathbf{a} \cdot (\mathbf{b} \times \mathbf{c})$.

(16) Let $\{\mathbf{a}, \mathbf{b}, \mathbf{c}\}$ be a basis for $\mathbb{R}^3$ and $\{\mathbf{a}^*, \mathbf{b}^*, \mathbf{c}^*\}$ be the dual basis.

Show $\mathbf{a} = (\mathbf{b}^* \times \mathbf{c}^*)/\mathbf{a}^* \cdot (\mathbf{b}^* \times \mathbf{c}^*)$, $\mathbf{b} = (\mathbf{c}^* \times \mathbf{a}^*)/\mathbf{a}^* \cdot (\mathbf{b}^* \times \mathbf{c}^*)$, $\mathbf{c} = (\mathbf{a}^* \times \mathbf{b}^*)/\mathbf{a}^* \cdot (\mathbf{b}^* \times \mathbf{c}^*)$.

(17) (a) Use coordinates in $\mathbb{R}^3$ and $\times$. Show $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 6 \end{vmatrix} = 1$.

Hence $\{\mathbf{a}, \mathbf{b}, \mathbf{c}\}$ is a basis for $\mathbb{R}^3$ where $\mathbf{a} = (1,1,1)$, $\mathbf{b} = (1,2,3)$, $\mathbf{c} = (1,3,6)$.

The dual basis $\{\mathbf{a}^*, \mathbf{b}^*, \mathbf{c}^*\}$ is $\{\mathbf{b} \times \mathbf{c}, \mathbf{c} \times \mathbf{a}, \mathbf{a} \times \mathbf{b}\}$.

(18) (a) Use coordinates in $\mathbb{R}^3$ and $\times$. Show $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 6 \end{vmatrix} = 1$.

Hence $\{\mathbf{a}, \mathbf{b}, \mathbf{c}\}$ is a basis for $\mathbb{R}^3$ where $\mathbf{a} = (1,1,1)$, $\mathbf{b} = (1,2,3)$, $\mathbf{c} = (1,3,6)$.

The dual basis $\{\mathbf{a}^*, \mathbf{b}^*, \mathbf{c}^*\}$ is $\{\mathbf{b} \times \mathbf{c}, \mathbf{c} \times \mathbf{a}, \mathbf{a} \times \mathbf{b}\}$.

[illegible]

[illegible]

10. [illegible]

Then, [illegible]

11. [illegible]

Then, [illegible]

The [illegible] are [illegible]

12. [illegible]

Then [illegible]

Then, [illegible]

13. [illegible]

Then [illegible]

Then, [illegible]

14. [illegible]

[illegible]

[illegible]

15. [illegible]

Let [illegible]

Then, [illegible]

[illegible]

16. [illegible]

Then, [illegible]

[illegible]

17. [illegible]

Then, [illegible]

[illegible]

18. [illegible]

[illegible]

[illegible]

19. [illegible]

Then, [illegible]

[illegible]

20. [illegible]

Then, [illegible]

[illegible]

[illegible]. Let [illegible] be [illegible] $\left\{\frac{[illegible]}{[illegible]}\right\}$ [illegible]

Then, [illegible]

[illegible]

[illegible]. Let [illegible] be [illegible] $\left\{\frac{[illegible]}{[illegible]}\right\}$

[illegible]

Hence [illegible]

[illegible]. [illegible]

[illegible]. [illegible] $\left\{\frac{[illegible]}{[illegible]}\right\}$ [illegible]

[illegible]

[illegible]. [illegible] $\left\{\frac{[illegible]}{[illegible]}\right\}$

[illegible]

[illegible]. [illegible] $\left\{\frac{[illegible]}{[illegible]}\right\}$

[illegible]

[illegible]. [illegible] $\left\{\frac{[illegible]}{[illegible]}\right\}$

[illegible]

[illegible]. [illegible] $\left\{\frac{[illegible]}{[illegible]}\right\}$

[illegible]

[illegible]. [illegible] $\left\{\frac{[illegible]}{[illegible]}\right\}$

[illegible]

[illegible]. [illegible] $\left\{\frac{[illegible]}{[illegible]}\right\}$

[illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

EXERCISE 16

(MCQs SUPERIORITY TYPE QUESTIONS)

- Directions: Directions: [illegible] [illegible] [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

8. PROBLEMS ON AGES

SOLVED EXAMPLES

Ex. 1. [illegible] (S.S.C. [illegible])

Sol.: [illegible]

Ex. 2. [illegible] (S.S.C. [illegible])

Sol.: [illegible]

Ex. 3. [illegible] (S.S.C. [illegible])

Sol.: [illegible]

Ex. 4. [illegible] (S.S.C. [illegible])

Sol.: [illegible]

Ex. 5. [illegible] (S.S.C. [illegible])

Sol.: [illegible]

Ex. 6. [illegible] (S.S.C. [illegible])

Sol.: [illegible]

Ex. 7. [illegible] (S.S.C. [illegible])

Sol.: [illegible]

Ex. 8. [illegible] (S.S.C. [illegible])

Sol.: [illegible]

Ex.

Ex.

EXERCISE 6J

OBJECTIVE (TPT) QUESTIONS

Directions : Mark (✓) against the correct answer :

1. [illegible] **Mark (C), 2000**

   (a) [illegible] (b) [illegible] (c) [illegible]

   (d) [illegible] (e) [illegible]

2. [illegible] **[illegible], 2000**

   (a) [illegible] (b) [illegible] (c) [illegible]

   (d) [illegible] (e) [illegible]

3. [illegible] **Mark (C), 1999**

   (a) [illegible] (b) [illegible] (c) [illegible]

   (d) [illegible] (e) [illegible]

4. [illegible] **[illegible], 1999**

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

5. [illegible] **Mark (C), 1999**

   (a) [illegible] (b) [illegible] (c) [illegible]

   (d) [illegible] (e) [illegible]

6. [illegible] **[illegible], 1997**

   (a) [illegible] (b) [illegible] (c) [illegible]

   (d) [illegible] (e) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

11. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

12. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

13. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

14. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

15. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

16. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

17. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

18. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

19. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

20. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

21. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

22. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

23. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

(b) Let $f(x) = \dfrac{x^2 - 1}{x - 1}$ and $g(x) = x + 1$.

Then $f(x) = g(x)$ for all $x \neq 1$.

∴ The graph of $y = f(x)$ is $\{(x, y) : y = x + 1\} \setminus \{(1, 2)\}$.

(c) Let the common angle of $\triangle ABC$ and $\triangle DEF$ be θ. Let $\triangle ABC$ have sides a, b, c and $\triangle DEF$ have sides d, e, f.

Then $\dfrac{a}{d} = \dfrac{b}{e} = \dfrac{c}{f} = k$ for some $k > 0$.

∴ The area of $\triangle ABC$ is $\frac{1}{2}ab\sin\theta = \frac{1}{2}(kd)(ke)\sin\theta = k^2 \cdot \frac{1}{2}de\sin\theta$, which is k^2 times the area of $\triangle DEF$.

(d) Let the standard basis of $\mathbb{R}^3$ be $\{e_1, e_2, e_3\}$. Let $\{f_1, f_2, f_3\}$ be a basis of $\mathbb{R}^3$ such that $f_1 = e_1$, $f_2 = e_2$, $f_3 = e_3$.

Then $\det\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} = 1$ $\Rightarrow$ $\det(f_1, f_2, f_3) = 1$ $\Rightarrow$ $\det(e_1, e_2, e_3) = 1$.

∴ (f_1, f_2, f_3) is a positively oriented basis of $\mathbb{R}^3$.

(e) Let the standard basis of $\mathbb{R}^3$ be $\{e_1, e_2, e_3\}$. Let $\{f_1, f_2, f_3\}$ be a basis of $\mathbb{R}^3$ such that $f_1 = e_1$, $f_2 = e_2$, $f_3 = -e_3$.

Then $\det\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{pmatrix} = -1$ $\Rightarrow$ $\det(f_1, f_2, f_3) = -1$ $\Rightarrow$ $\det(e_1, e_2, e_3) = 1$.

∴ (f_1, f_2, f_3) is a negatively oriented basis of $\mathbb{R}^3$.

(f) Let A be an $n \times n$ matrix with entries $a_{ij} = \min(i, j)$ and let B be the $n \times n$ matrix with entries $b_{ij} = \max(i, j)$.

Then $\begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & 2 \\ 1 & 2 & 3 \end{pmatrix}\begin{pmatrix} 3 & 2 & 1 \\ 2 & 2 & 1 \\ 1 & 1 & 1 \end{pmatrix} = \begin{pmatrix} 6 & 5 & 3 \\ 9 & 8 & 4 \\ 14 & 12 & 6 \end{pmatrix}$ $\neq$ $\begin{pmatrix} 3 & 2 & 1 \\ 2 & 2 & 1 \\ 1 & 1 & 1 \end{pmatrix}\begin{pmatrix} 1 & 1 & 1 \\ 1 & 2 & 2 \\ 1 & 2 & 3 \end{pmatrix} = \begin{pmatrix} 6 & 9 & 14 \\ 5 & 8 & 12 \\ 3 & 4 & 6 \end{pmatrix}$.

∴ Neither product equals the other.

(g) Let V be a finite-dimensional vector space over $\mathbb{R}$ and let $T : V \to V$ be a linear map. Let $\{v_1, v_2, \ldots, v_n\}$ be a basis of V such that $T(v_i) = \lambda_i v_i$ for some $\lambda_1, \lambda_2, \ldots, \lambda_n \in \mathbb{R}$.

Then $\det(T - \lambda I) = \det\begin{pmatrix} \lambda_1 - \lambda & & \\ & \ddots & \\ & & \lambda_n - \lambda \end{pmatrix} = (\lambda_1 - \lambda)\cdots(\lambda_n - \lambda)$ $\Rightarrow$ $\det(T - \lambda I) = 0$ $\Leftrightarrow$ $\lambda = \lambda_i$ for some i.

∴ The eigenvalues of T are $\lambda_1, \lambda_2, \ldots, \lambda_n$.

(h) Let $f(x) = \dfrac{x^2 - 1}{x - 1}$ and $g(x) = x + 1$.

Then $\lim_{x \to 1} f(x) = \lim_{x \to 1} \dfrac{x^2 - 1}{x - 1} = \lim_{x \to 1} \dfrac{(x - 1)(x + 1)}{x - 1} = \lim_{x \to 1} (x + 1) = 2$ $\neq$ $f(1) = 0$.

∴ f is not continuous at $x = 1$.

(i) Let $\{a_n\}_{n=1}^{\infty}$ be a sequence of real numbers. Let $\{b_n\}_{n=1}^{\infty}$ be the sequence of arithmetic means of $\{a_n\}_{n=1}^{\infty}$, defined by $b_n = \frac{a_1 + a_2 + \cdots + a_n}{n}$.

Then $\lim_{n \to \infty} a_n = L$ $\Rightarrow$ $\lim_{n \to \infty} b_n = L$.

∴ If $\{a_n\}_{n=1}^{\infty}$ converges to L, then $\{b_n\}_{n=1}^{\infty}$ converges to L.

(j) Let $f : \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = \begin{cases} x^2 & \text{if } x \text{ is rational} \\ 0 & \text{if } x \text{ is irrational} \end{cases}$.

Then f is continuous at $x = 0$ and discontinuous at every $x \neq 0$.

∴ f is continuous at exactly one point.

(k) Let $f : \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = \begin{cases} x^2 & \text{if } x \text{ is rational} \\ -x^2 & \text{if } x \text{ is irrational} \end{cases}$.

Then f is continuous at $x = 0$ and discontinuous at every $x \neq 0$.

∴ f is continuous at exactly one point.

(l) Let $f : \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = \begin{cases} x^2 & \text{if } x \text{ is rational} \\ x^3 & \text{if } x \text{ is irrational} \end{cases}$.

Then f is continuous at $x = 0$ and $x = 1$ and discontinuous at every $x \neq 0, 1$.

∴ f is continuous at exactly two points.

(m) Let $f : \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = \begin{cases} x^2 & \text{if } x \text{ is rational} \\ x^3 & \text{if } x \text{ is irrational} \end{cases}$.

Then f is continuous at $x = 0$ and $x = 1$ and discontinuous at every $x \neq 0, 1$.

∴ f is continuous at exactly two points.

(n) Let $f : \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = \begin{cases} \sin x & \text{if } x \text{ is rational} \\ \cos x & \text{if } x \text{ is irrational} \end{cases}$.

Then f is continuous at $x = 0$ and $x = \frac{\pi}{2}$ and discontinuous at every $x \neq 0, \frac{\pi}{2}$.

∴ f is continuous at exactly two points.

(o) Let $f : \mathbb{R} \to \mathbb{R}$ be defined by $f(x) = \begin{cases} \sin x & \text{if } x \text{ is rational} \\ \cos x & \text{if } x \text{ is irrational} \end{cases}$.

Then f is continuous at $x = \frac{\pi}{4}$ and $x = \frac{3\pi}{4}$ and discontinuous at every $x \neq \frac{\pi}{4}, \frac{3\pi}{4}$.

∴ f is continuous at exactly two points.

(1) [illegible]

(2) [illegible]

(3) [illegible]

(4) [illegible]

(5) [illegible]

(6) [illegible]

(7) [illegible]

(8) [illegible]

(9) [illegible]

(10) [illegible]

(11) [illegible]

(12) [illegible]

(13) [illegible]

(14) [illegible]

(15) [illegible]

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EXERCISE III

[illegible] (MULTIPLE CHOICE QUESTIONS)

[illegible]

[illegible]

[illegible]

[illegible]

(a) [illegible]
(b) [illegible]
(c) [illegible]

10. [illegible] **(Bank PO 2016)**

1. [illegible]
2. [illegible]
3. [illegible]
(a) [illegible] (b) [illegible]
(c) [illegible] (d) [illegible]

[illegible]

1. [illegible]
2. [illegible]
3. [illegible]
(a) [illegible] (b) [illegible]
(c) [illegible] (d) [illegible]

11. [illegible] **(SSC CGL 2015)**

1. [illegible]
2. [illegible]
3. [illegible]
(a) [illegible] (b) [illegible]
(c) [illegible] (d) [illegible]

12. [illegible] **(SSC CGL 2016)**

1. [illegible]
2. [illegible]
3. [illegible]
(a) [illegible] (b) [illegible]
(c) [illegible] (d) [illegible]

Directions (Questions 13 to 16): Read the passage carefully and answer the following questions. [illegible]

13. [illegible]

1. [illegible]
2. [illegible]
3. [illegible]
(a) [illegible] (b) [illegible]
(c) [illegible] (d) [illegible]

14. [illegible] **(Bank PO 2016)**

1. [illegible]
2. [illegible]
3. [illegible]
(a) [illegible] (b) [illegible]
(c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

SOLUTIONS

[illegible]

11. [illegible]

12. [illegible]

13. [illegible]

14. [illegible]

15. [illegible]

16. [illegible]

17. [illegible]

18. [illegible]

19. [illegible]

20. [illegible]

[illegible]

9. SURDS AND INDICES

IMPORTANT FACTS AND FORMULAE

1. Laws of Indices:

[illegible]

2. [illegible]

3. Laws of Surds:

[illegible]

SOLVED EXAMPLES

Ex. 1. [illegible]

Sol. [illegible]

Ex. 2. [illegible]

Sol. [illegible]

Ex. 5. [illegible]

Sol. [illegible]

[illegible]

Ex. 6. [illegible]

Sol. [illegible]

[illegible]

Ex. 7. [illegible]

Sol. [illegible]

Ex. 8. [illegible]

Sol. [illegible]

Ex. 9. [illegible]

Sol. [illegible]

Ex. 10. [illegible]

Sol. [illegible]

Ex. 11. [illegible]

Sol. [illegible]

Ex. 12. [illegible]

Sol. [illegible]

Ex. 13. [illegible]

Sol. [illegible]

Ex. 14. [illegible]

Sol. [illegible]

Ex. 15. [illegible]

Sol. [illegible]

Ex. 16. [illegible]

Sol. [illegible]

Ex. 17. [illegible]

Sol. [illegible]

Ex. 18. [illegible]

Sol. [illegible]

Ex. 19. [illegible]

Sol. [illegible]

Ex. 20. [illegible]

Sol. [illegible]

Ex. 21. [illegible]

Sol. [illegible]

Ex. 22. [illegible]

Sol. [illegible]

Ex. 23. [illegible]

Sol. [illegible]

Ex. 24. [illegible]

Sol. [illegible]

Ex. 25. [illegible]

Sol. [illegible]

Ex. 26. [illegible]

Sol. [illegible]

Ex. 27. [illegible]

Sol. [illegible]

Ex. 28. [illegible]

Sol. [illegible]

Ex. 29. [illegible]

Sol. [illegible]

Ex. 30. [illegible]

Sol. [illegible]

Ex. 31. [illegible]

Sol. [illegible]

Ex. 32. [illegible]

Sol. [illegible]

Ex. 33. [illegible]

Sol. [illegible]

Ex. 34. [illegible]

Sol. [illegible]

Ex. 35. [illegible]

Sol. [illegible]

Ex. 36. [illegible]

Sol. [illegible]

Ex. 37. [illegible]

Sol. [illegible]

Ex. 38. [illegible]

Sol. [illegible]

Ex. 39. [illegible]

Sol. [illegible]

Ex. 40. [illegible]

Sol. [illegible]

Ex. 41. [illegible]

Sol. [illegible]

Ex. 42. [illegible]

Sol. [illegible]

Ex. 43. [illegible]

Sol. [illegible]

Ex. 44. [illegible]

Sol. [illegible]

Ex. 45. [illegible]

Sol. [illegible]

Ex. 46. [illegible]

Sol. [illegible]

Ex. 47. [illegible]

Sol. [illegible]

Ex. 48. [illegible]

Sol. [illegible]

Ex. 49. [illegible]

Sol. [illegible]

Ex. 50. [illegible]

Sol. [illegible]

Ex. 51. [illegible]

Sol. [illegible]

Ex. 52. [illegible]

Sol. [illegible]

Ex. 53. [illegible]

Sol. [illegible]

Ex. 54. [illegible]

Sol. [illegible]

Ex. 55. [illegible]

Sol. [illegible]

Ex. 56. [illegible]

Sol. [illegible]

Ex. 57. [illegible]

Sol. [illegible]

Ex. 58. [illegible]

Sol. [illegible]

Ex. 59. [illegible]

Sol. [illegible]

Ex. 60. [illegible]

Sol. [illegible]

Ex. 61. [illegible]

Sol. [illegible]

Ex. 62. [illegible]

Sol. [illegible]

Ex. 63. [illegible]

Sol. [illegible]

Ex. 64. [illegible]

Sol. [illegible]

Ex. 65. [illegible]

Sol. [illegible]

Ex. 66. [illegible]

Sol. [illegible]

Ex. 67. [illegible]

Sol. [illegible]

Ex. 68. [illegible]

Sol. [illegible]

Ex. 69. [illegible]

Sol. [illegible]

Ex. 70. [illegible]

Sol. [illegible]

Ex. 71. [illegible]

Sol. [illegible]

Ex. 72. [illegible]

Sol. [illegible]

Ex. 73. [illegible]

Sol. [illegible]

Ex. 74. [illegible]

Sol. [illegible]

Ex. 75. [illegible]

Sol. [illegible]

Ex. 76. [illegible]

Sol. [illegible]

Ex. 77. [illegible]

Sol. [illegible]

Ex. 78. [illegible]

Sol. [illegible]

Ex. 79. [illegible]

Sol. [illegible]

Ex. 80. [illegible]

Sol. [illegible]

Ex. 81. [illegible]

Sol. [illegible]

Ex. 82. [illegible]

Sol. [illegible]

Ex. 83. [illegible]

Sol. [illegible]

Ex. 84. [illegible]

Sol. [illegible]

Ex. 85. [illegible]

Sol. [illegible]

Ex. 86. [illegible]

Sol. [illegible]

Ex. 87. [illegible]

Sol. [illegible]

Ex. 88. [illegible]

Sol. [illegible]

Ex. 89. [illegible]

Sol. [illegible]

Ex. 90. [illegible]

Sol. [illegible]

Ex. 91. [illegible]

Sol. [illegible]

Ex. 92. [illegible]

Sol. [illegible]

Ex. 93. [illegible]

Sol. [illegible]

Ex. 94. [illegible]

Sol. [illegible]

Ex. 95. [illegible]

Sol. [illegible]

Ex. 96. [illegible]

Sol. [illegible]

Ex. 97. [illegible]

Sol. [illegible]

Ex. 98. [illegible]

Sol. [illegible]

Ex. 99. [illegible]

Sol. [illegible]

Ex. 100. [illegible]

Sol. [illegible]

Ans. [illegible]

Ex. 9. Find the value of $\frac{[illegible]}{[illegible]}$

Ans. [illegible]

Ex. 10. If $[illegible]$ **and** $[illegible]$ **then find the value of** $[illegible]$

Ans. [illegible]

Ex. 11. Simplify [illegible]

Ans. [illegible]

Ex. 12. If $[illegible]$ **then**

Ans. [illegible]

Ex. 13. Find the length from using [illegible] **and** [illegible]

Ans. [illegible]

[illegible]

[illegible] 4

[illegible]

1. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

2. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

3. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

4. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

5. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

6. [illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

7. [illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

8. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

9. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

ANSWER

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

SOLUTION

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

10. PERCENTAGE

IMPORTANT FACTS AND FORMULAE

1. **Concept of Percentage:** The percentage denotes the number of parts for every hundred parts. Thus, 1 means 1 part out of 100 parts.

   To express x% as a fraction: We have: $x\% = \frac{x}{100}$

   Thus, $1\% = \frac{1}{100} = \frac{1}{2}$ (50) $= \frac{1}{25} = \frac{1}{4}$ (25)

   To express $\frac{p}{q}$ as a percentage: We have $\frac{p}{q} = \left(\frac{p}{q} \times 100\right)\%$ (per 100)

   Thus, $\frac{1}{2} = \left(\frac{1}{2} \times 100\right)\% = 50\%$ and $\frac{3}{4} = \left(\frac{3}{4} \times 100\right)\% = 75\%$ etc.

2. If the population of a town is P and it increases at the rate of R% per annum, then:

   (i) Population after n years $= P\left(1 + \frac{R}{100}\right)^n$

   (ii) Population n years ago $= \frac{P}{\left(1 + \frac{R}{100}\right)^n}$

3. If the population of a town is P and it decreases at the rate of R% per annum, then:

   (i) Population after n years $= P\left(1 - \frac{R}{100}\right)^n$

   (ii) Population n years ago $= \frac{P}{\left(1 - \frac{R}{100}\right)^n}$

4. If the price of a commodity increases by R%, then the reduction in consumption so as not to increase the expenditure is:

   $$\frac{R}{(100 + R)} \times 100\%$$

5. If the price of a commodity decreases by R%, then the increase in consumption so as not to decrease the expenditure is:

   $$\frac{R}{(100 - R)} \times 100\%$$

6. **Value of a Fraction:** If the numerator of a fraction is increased by x% and the denominator of the fraction is increased by x%, then:

   (i) Numerator after increase $= N\left(1 + \frac{x}{100}\right)$

   (ii) Denominator after increase $= D\left(1 + \frac{x}{100}\right)$

   (iii) Value of the fraction after increase $= \frac{N\left(1 + \frac{x}{100}\right)}{D\left(1 + \frac{x}{100}\right)}$

7. **Value of a Fraction:** If the numerator of a fraction is increased by x% and the denominator of the fraction is decreased by x%, then:

   (i) Value of the numerator after increase $= N\left(1 + \frac{x}{100}\right)$

   (ii) Value of the denominator after increase $= D\left(1 - \frac{x}{100}\right)$

   (iii) Value of the fraction after increase $= \frac{N\left(1 + \frac{x}{100}\right)}{D\left(1 - \frac{x}{100}\right)}$

8. If A is R% more than B, then B is less than A by:

   $$\left(\frac{R}{100 + R}\right) \times 100\%$$

   If A is R% less than B, then B is more than A by:

   $$\left(\frac{R}{100 - R}\right) \times 100\%$$

[illegible]

Ex. 1. Express each of the following as a decimal:

(i) [illegible] (ii) [illegible] (iii) [illegible] (iv) [illegible]

Ans. (i) [illegible] (ii) [illegible]

(iii) [illegible] (iv) [illegible]

Ex. 2. Express each of the following as a fraction:

(i) [illegible] (ii) [illegible] (iii) [illegible] (iv) [illegible]

Ans. (i) [illegible] (ii) [illegible]

(iii) [illegible] (iv) [illegible]

Ex. 3. Express each of the following as a percent:

(i) [illegible] (ii) [illegible] (iii) [illegible]

Ans. [illegible]

(iii) [illegible]

(iv) [illegible]

Ex. 4. Find the:

(i) [illegible] (ii) [illegible] (iii) [illegible]

(iv) [illegible]

Ans. (i) [illegible] (ii) [illegible]

(iii) [illegible]

(iv) [illegible]

Ex. 5. (i) [illegible] (ii) [illegible]

(iii) [illegible]

(iv) [illegible]

Ans. (i) [illegible]

(ii) [illegible]

(iii) [illegible]

(iv) [illegible]

[illegible]

[illegible]

[illegible]

[illegible] [illegible]

(a) [illegible]

Sol. [illegible]

(b) [illegible]

(c) [illegible]

[illegible] [illegible]

Sol. [illegible]

[illegible] [illegible]

Sol. [illegible]

[illegible] [illegible]

Sol. [illegible]

[illegible] [illegible]

Sol. [illegible]

[illegible] [illegible]

Sol. [illegible]

[illegible] [illegible]

Sol. [illegible]

[illegible] [illegible]

Sol. [illegible]

[illegible] [illegible]

Sol. [illegible]

[illegible] [illegible]

Sol. [illegible]

[illegible] [illegible]

Sol. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Thus, $\int_{[illegible]}^{[illegible]} [illegible]\,dx = [illegible]$

$\Rightarrow$ [illegible]

Ex. 17. [illegible] of a village has [illegible] [illegible] the village. The [illegible] is [illegible] [illegible] [illegible]

[illegible]. [illegible] [illegible] **[illegible]**

[illegible]. [illegible]

[illegible]

[illegible]

[illegible]. [illegible] [illegible] **[illegible]**

[illegible]

[illegible]. [illegible] [illegible] **[illegible]**

[illegible]

[illegible]. [illegible] [illegible] **[illegible]**

[illegible]

[illegible]. [illegible] [illegible] **[illegible]**

[illegible]

[illegible]

(b) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Homotopy 에서 $\pi_1(S^1)$ 의 생성자는 $\left[\frac{1}{2}\right]$

또한 $\frac{1}{2}$ 는 $\pi_1(S^1)$ 의 생성자이다. 따라서 $\pi_1(S^1)$ 의 원소는 $\left[\frac{1}{2}\right]^n$ 꼴이다.

연습문제 6.1

다음 [1]~[12]의 기약 군을 구하시오 (단, 모든 $\mathbb{Z}$ 는 $\mathbb{Z}$ 에 대한 군이다)

[1] $\langle a \mid a^2 = 1 \rangle$ (서울대 2010)

① $\{1, a\}$ ② $\{a, a^2\}$ ③ $\{a\}$ ④ $\{1, a^2\}$

[2] $\langle a, b \mid a^2 = b^2 = (ab)^2 = 1 \rangle$ (경북대 2010)

① $\{1, a, b\}$ ② $\{1, a\}$ ③ $\{a, b\}$ ④ $\{a, b^2\}$

[3] $\langle a, b \mid a^2 = b^2 = (ab)^2 = 1, a \neq b \rangle$ (한국교원대 2010)

① $\{1, a, b\}$ ② $\{1, a\}$ ③ $\{1, b\}$ ④ $\{a, b\}$

[4] $\langle a, b \mid a^2 = b^2 = (ab)^2 = 1, a \neq b \rangle$ (경북대 2010)

① $\{1, a, b\}$ ② $\{1, a\}$ ③ $\{a, b\}$ ④ $\{1, b\}$

[5] $\langle a \mid a^2 = 1 \rangle$

① $\{1\}$ ② $\{1, a\}$ ③ $\{a\}$ ④ $\{a^2\}$

[6] $\langle a \mid a^3 = 1 \rangle$ (Bank 2010)

① $\{1\}$ ② $\{1, a, a^2\}$ ③ $\{1, a\}$ ④ $\{a, a^2\}$

[7] $\langle a, b \mid a^2 = b^2 = (ab)^2 = 1 \rangle$ (서울대 2010)

① $\{1\}$ ② $\{a\}$ ③ $\{a, b\}$ ④ $\{1, a, b\}$

[8] $\langle a, b \mid a^2 = b^3 = 1 \rangle$

① $\{1\}$ ② $\{1, a\}$ ③ $\{a\}$ ④ $\{1, a, b, b^2\}$

[9] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1 \rangle$ (Bank 2010)

① $\{1, a, b\}$ ② $\{1, a, b, b^2\}$ ③ $\{1, a, b, ab\}$ ④ $\{1, a, b, ab, b^2\}$

[10] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1 \rangle$

① 10개 ② $\{1, a, b\}$ ③ $\{1, a, b, b^2\}$ ④ $\{1, a, b, ab, b^2, ab^2\}$

[11] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1, a \neq b \rangle$ (Bank Economic 2010)

① $\{1, a, b\}$ ② $\{1, a, b, b^2\}$ ③ $\{1, a, b, ab, b^2\}$ ④ $\{1, a, b, ab, b^2, ab^2\}$

[12] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1, a \neq b \rangle$ 에서 $\{1, a, b, ab, b^2, ab^2\}$ 의 원소 x 에 대하여 x^2 의 값은

① 1개 ② $\{1, a\}$ ③ $\{1, b, b^2\}$ ④ $\{1, ab, ab^2\}$

[13] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1, a \neq b \rangle$ 에서 $\{1, a, b, ab, b^2, ab^2\}$ 의 원소 x 에 대하여 x^3 의 값은

① $\frac{1}{2}$ ② $\frac{1}{3}$ ③ $-\frac{1}{2}$ ④ $-\frac{1}{3}$

[14] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1, a \neq b \rangle$ 에서 $\{1, a, b, ab, b^2, ab^2\}$ 의 원소 x 에 대하여 x^4 의 값은

① $\frac{1}{2}$ ② $\frac{1}{3}$ ③ $-\frac{1}{2}$ ④ $-\frac{1}{3}$

[15] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1, a \neq b \rangle$ 에서 $\{1, a, b, ab, b^2, ab^2\}$ 의 원소 x 에 대하여 x^5 의 값은

① $\frac{1}{2}$ ② $\frac{1}{3}$ ③ $-\frac{1}{2}$ ④ $-\frac{1}{3}$

[16] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1, a \neq b \rangle$ 에서 $\{1, a, b, ab, b^2, ab^2\}$ 의 원소 x 에 대하여 x^6 의 값은

① $\frac{1}{2}$ ② $\frac{1}{3}$ ③ $-\frac{1}{2}$ ④ $-\frac{1}{3}$

[17] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1, a \neq b \rangle$ 에서 $\{1, a, b, ab, b^2, ab^2\}$ 의 원소 x 에 대하여 x^7 의 값은

① $\frac{1}{2}$ ② $\frac{1}{3}$ ③ $-\frac{1}{2}$ ④ $-\frac{1}{3}$

[18] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1, a \neq b \rangle$ 에서 $\{1, a, b, ab, b^2, ab^2\}$ 의 원소 x 에 대하여 x^8 의 값은

① $\frac{1}{2}$ ② $\frac{1}{3}$ ③ $-\frac{1}{2}$ ④ $-\frac{1}{3}$

[19] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1, a \neq b \rangle$ 에서 $\{1, a, b, ab, b^2, ab^2\}$ 의 원소 x 에 대하여 x^9 의 값은

① $\frac{1}{2}$ ② $\frac{1}{3}$ ③ $-\frac{1}{2}$ ④ $-\frac{1}{3}$

[20] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1, a \neq b \rangle$ 에서 $\{1, a, b, ab, b^2, ab^2\}$ 의 원소 x 에 대하여 x^{10} 의 값은

① $\frac{1}{2}$ ② $\frac{1}{3}$ ③ $-\frac{1}{2}$ ④ $-\frac{1}{3}$

[21] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1, a \neq b \rangle$ 에서 $\{1, a, b, ab, b^2, ab^2\}$ 의 원소 x 에 대하여 x^{11} 의 값은

① $\frac{1}{2}$ ② $\frac{1}{3}$ ③ $-\frac{1}{2}$ ④ $-\frac{1}{3}$

[22] $\langle a, b \mid a^2 = b^3 = (ab)^2 = 1, a \neq b \rangle$ 에서 $\{1, a, b, ab, b^2, ab^2\}$ 의 원소 x 에 대하여 x^{12} 의 값은

① $\frac{1}{2}$ ② $\frac{1}{3}$ ③ $-\frac{1}{2}$ ④ $-\frac{1}{3}$

17. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

18. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

19. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

20. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

21. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

22. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

23. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

24. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

25. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

26. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

27. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

28. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

29. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

30. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

31. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

32. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

33. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

34. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

35. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

36. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

37. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

38. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

39. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

40. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

41. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

42. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

43. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

44. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

45. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

46. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

47. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

48. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

49. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

50. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

11. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(a) Suppose a random sample of size n is taken from a population having mean μ. Let $\bar{X}_n$ denote the sample mean. Which of the following statements is true?

(a) $\bar{X}_n \to \mu$ in probability (b) $\bar{X}_n \to \mu$ in distribution (c) $\bar{X}_n \to \mu$ in mean square (d) $\bar{X}_n \to \mu$ almost surely

(b) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(0, n)$. Which of the following statements is true?

(a) $\frac{X_n}{n} \to 1$ in probability (b) $\frac{X_n}{n} \to 1$ in distribution (c) $\frac{X_n}{n} \to 1$ almost surely (d) $\frac{X_n}{n} \to 1$ in mean square

(c) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(-n, n)$. Which of the following statements is true?

(a) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in probability (b) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in distribution (c) $\frac{X_1 + \cdots + X_n}{n} \to 0$ almost surely (d) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in mean square

(d) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(0, n)$. Which of the following statements is true?

(a) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in probability (b) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in distribution (c) $\frac{X_1 + \cdots + X_n}{n} \to 1$ almost surely (d) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in mean square

(e) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(-n, n)$. Which of the following statements is true?

(a) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in probability (b) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in distribution (c) $\frac{X_1 + \cdots + X_n}{n} \to 0$ almost surely (d) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in mean square

(f) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(0, n)$. Which of the following statements is true?

(a) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in probability (b) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in distribution (c) $\frac{X_1 + \cdots + X_n}{n} \to 1$ almost surely (d) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in mean square

(g) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(-n, n)$. Which of the following statements is true?

(a) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in probability (b) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in distribution (c) $\frac{X_1 + \cdots + X_n}{n} \to 0$ almost surely (d) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in mean square

(h) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(0, n)$. Which of the following statements is true?

(a) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in probability (b) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in distribution (c) $\frac{X_1 + \cdots + X_n}{n} \to 1$ almost surely (d) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in mean square

(i) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(-n, n)$. Which of the following statements is true?

(a) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in probability (b) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in distribution (c) $\frac{X_1 + \cdots + X_n}{n} \to 0$ almost surely (d) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in mean square

(j) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(0, n)$. Which of the following statements is true?

(a) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in probability (b) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in distribution (c) $\frac{X_1 + \cdots + X_n}{n} \to 1$ almost surely (d) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in mean square

(k) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(-n, n)$. Which of the following statements is true?

(a) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in probability (b) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in distribution (c) $\frac{X_1 + \cdots + X_n}{n} \to 0$ almost surely (d) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in mean square

(l) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(0, n)$. Which of the following statements is true?

(a) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in probability (b) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in distribution (c) $\frac{X_1 + \cdots + X_n}{n} \to 1$ almost surely (d) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in mean square

(m) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(-n, n)$. Which of the following statements is true?

(a) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in probability (b) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in distribution (c) $\frac{X_1 + \cdots + X_n}{n} \to 0$ almost surely (d) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in mean square

(n) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(0, n)$. Which of the following statements is true?

(a) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in probability (b) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in distribution (c) $\frac{X_1 + \cdots + X_n}{n} \to 1$ almost surely (d) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in mean square

(o) Let $X_1, X_2, \ldots$ be independent random variables with $X_n \sim \text{Uniform}(-n, n)$. Which of the following statements is true?

(a) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in probability (b) $\frac{X_1 + \cdots + X_n}{n} \to 0$ in distribution (c) $\frac{X_1 + \cdots + X_n}{n} \to 0$ almost surely (d) $\frac{X_1 + \cdots + X_n}{n} \to 1$ in mean square

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

78. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

79. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

80. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

81. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

Direction for questions 82 to 84: [illegible]

82. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

83. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

84. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

Direction for questions 85 to 87: [illegible]

85. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

86. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

87. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

88. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

89. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(26) [illegible]

(27) [illegible]

(28) [illegible]

(29) [illegible]

(30) [illegible]

(31) [illegible]

(32) [illegible]

(33) [illegible]

(34) [illegible]

(35) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

5. [illegible]

6. [illegible]

7. [illegible]

8. [illegible]

9. [illegible]

10. [illegible]

11. [illegible]

12. [illegible]

13. [illegible]

14. [illegible]

15. [illegible]

16. [illegible]

17. [illegible]

18. [illegible]

19. [illegible]

20. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(ii) [illegible]

[illegible]

(iii) [illegible]

[illegible]

(iv) [illegible]

[illegible]

(v) [illegible]

[illegible]

(vi) [illegible]

[illegible]

(vii) [illegible]

[illegible]

(viii) [illegible]

[illegible]

(ix) [illegible]

[illegible]

(x) [illegible]

[illegible]

(xi) [illegible]

[illegible]

(xii) [illegible]

[illegible]

(xiii) [illegible]

[illegible]

(xiv) [illegible]

[illegible]

(xv) [illegible]

[illegible]

(xvi) [illegible]

[illegible]

(xvii) [illegible]

[illegible]

(xviii) [illegible]

[illegible]

46. (a) [illegible]

[illegible]

47. (a) [illegible]

[illegible]

48. (a) [illegible]

[illegible]

49. [illegible]

[illegible]

50. [illegible]

[illegible]

51. [illegible]

[illegible]

52. [illegible]

[illegible]

53. [illegible]

[illegible]

54. [illegible]

[illegible]

55. [illegible]

[illegible]

56. [illegible]

[illegible]

57. [illegible]

[illegible]

(a) [illegible]

[illegible]

(b) [illegible]

[illegible]

[illegible]

(c) [illegible]

[illegible]

(d) [illegible]

[illegible]

(e) [illegible]

[illegible]

(f) [illegible]

[illegible]

(g) [illegible]

[illegible]

(h) [illegible]

[illegible]

(i) [illegible]

[illegible]

(j) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]. [illegible]

[illegible]. [illegible]

[illegible]

[illegible]. [illegible]

[illegible]. [illegible]

[illegible]. [illegible]

[illegible]. [illegible]

[illegible]. [illegible]

[illegible]. [illegible]

[illegible]. [illegible]

[illegible]. [illegible]

[illegible]. [illegible]

[illegible]. [illegible]

40. [illegible]

41. [illegible]

42. [illegible]

43. [illegible]

[illegible]

44. [illegible]

[illegible]

45. [illegible]

46. [illegible]

[illegible]

47. [illegible]

48. [illegible]

49. [illegible]

[illegible]

50. [illegible]

[illegible]

51. [illegible]

[illegible]

52. [illegible]

[illegible]

53. [illegible]

54. [illegible]

[illegible]

Exercises 13.1–13.10

13.1 [illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

13.2 [illegible]

13.3 [illegible]

13.4 [illegible]

13.5 [illegible]

13.6 [illegible]

13.7 [illegible]

13.8 [illegible]

13.9 [illegible]

13.10 [illegible]

13.11 [illegible]

13.12 [illegible]

13.13 [illegible]

13.14 [illegible]

[illegible]

[illegible]

[illegible]

128. Let the cost price of 1 kg of rice be x. Then

$\therefore$ Equivalent cost of 1 kg of rice = [illegible]

$\therefore$ Increased cost per kg = [illegible]

129. Let the cost price of 1 kg of sugar be x. Then

Cost of 1 kg of sugar = [illegible]

Selling price of 1 kg of sugar = [illegible]

Selling price of 1 kg of sugar = [illegible]

$\therefore$ Required percentage = [illegible]

130. Number of students = [illegible]. Number of students [illegible]

Number of students [illegible]

Number of students [illegible]

Number of students [illegible]

$\therefore$ Required percentage = [illegible]

131. Let the cost price of 1 metre of cloth be x. Then, [illegible]

$\therefore$ [illegible]

Number of cows [illegible]

[illegible]

132. Let the quantity be x. Then, [illegible]

Required Ratio = [illegible]

Required percentage = [illegible]

$\therefore$ Required percentage = [illegible]

133. Required [illegible] = [illegible]

[illegible]

[illegible]

[illegible]

$\therefore$ [illegible]

$$= \left(\frac{[illegible]}{[illegible]}\right) + [illegible] + \left(\frac{[illegible]}{[illegible]}\right) + [illegible] + \left(\frac{[illegible]}{[illegible]}\right) + [illegible]$$

$$= [illegible] + [illegible] + [illegible] + [illegible]$$

(ii) Let the coordinates of [illegible] be [illegible]. Then,

[illegible]

$\therefore$ [illegible]

(iii) [illegible]

$\therefore$ [illegible]

(iv) [illegible]

Then [illegible]

$\therefore$ [illegible]

$\therefore$ [illegible]

(v) [illegible]

$\therefore$ [illegible]

(vi) [illegible]

$\therefore$ [illegible]

(vii) [illegible]

$\therefore$ [illegible]

(viii) [illegible]

$\therefore$ [illegible]

(ix) [illegible]

$\therefore$ [illegible]

(x) [illegible]

$\therefore$ [illegible]

(xi) [illegible]

$\therefore$ [illegible]

(xii) [illegible]

$\therefore$ [illegible]

(xiii) [illegible]

$\therefore$ [illegible]

(xiv) [illegible]

$\therefore$ [illegible]

(xv) [illegible]

$\therefore$ [illegible]

(iii) [illegible]

[illegible]

(iv) [illegible]

[illegible]

(v) [illegible]

[illegible]

(vi) [illegible]

[illegible]

(vii) [illegible]

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(viii) [illegible]

[illegible]

(ix) [illegible]

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(x) [illegible]

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(xi) [illegible]

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(xii) [illegible]

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(12) [illegible]

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(13) [illegible]

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(14) [illegible]

[illegible]

(15) [illegible]

[illegible]

(16) [illegible]

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(17) [illegible]

[illegible]

(18) [illegible]

[illegible]

[illegible] Let the [illegible] be x. Then, [illegible] $\left(\frac{[illegible]}{[illegible]}\right) = x$, [illegible]

[illegible] $\left(\frac{[illegible]}{[illegible]}\right) = \frac{[illegible]}{[illegible]}$

Now, [illegible] $\left(\frac{[illegible]}{[illegible]}\right) = \frac{[illegible]}{[illegible]}$. Now, [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$

$\therefore$ [illegible] $= \frac{\left(\frac{[illegible]}{[illegible]} - \frac{[illegible]}{[illegible]}\right)}{\left(\frac{[illegible]}{[illegible]} + \frac{[illegible]}{[illegible]}\right)} = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

[illegible] Let the length of the [illegible] be x [illegible]

[illegible] after [illegible] [illegible] of [illegible] $= [illegible]$ [illegible]

[illegible] after [illegible] [illegible] of [illegible] $= [illegible]$ [illegible]

[illegible] after [illegible] [illegible] of [illegible] $= [illegible]$ [illegible]

$\therefore$ [illegible] $= [illegible]$ [illegible]

[illegible] Let the [illegible] of the [illegible] be x. Then

Initially: [illegible] $= [illegible]$ [illegible]

After [illegible] [illegible]:

[illegible] $= \left(\frac{[illegible]}{[illegible]}\right) = [illegible]$ [illegible] [illegible]

After [illegible] [illegible]:

[illegible] $= \left(\frac{[illegible]}{[illegible]}\right) = [illegible]$ [illegible] $\left(\frac{[illegible]}{[illegible]}\right) = [illegible]$ [illegible]

After [illegible] [illegible]:

[illegible] $= \left(\frac{[illegible]}{[illegible]}\right) = [illegible]$ [illegible] [illegible] $\left(\frac{[illegible]}{[illegible]}\right) = [illegible]$ [illegible]

$\therefore$ [illegible] $= [illegible]$ %.

[illegible] Total [illegible] $= [illegible]$ [illegible] $\left(\frac{[illegible]}{[illegible]}\right) = [illegible]$ %.

[illegible] $\left(\frac{[illegible]}{[illegible]} - [illegible]\right) = [illegible]$.

[illegible] $\left(\frac{[illegible]}{[illegible]} - [illegible]\right) = [illegible]$.

Now, [illegible] $= \frac{[illegible]}{[illegible]} \times [illegible] = \frac{[illegible]}{[illegible]} = [illegible]$ [illegible]

$\therefore$ [illegible] $= \left(\frac{[illegible]}{[illegible]} - [illegible]\right) = [illegible]$

[illegible] Let [illegible] be [illegible] [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] [illegible] [illegible] [illegible]

$\therefore$ [illegible] $= \frac{[illegible]}{[illegible]} \times [illegible] = [illegible]$ [illegible]

(28) $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$ is equal to (a) $\frac{\pi}{6}$ (b) $\frac{\pi}{3}$

(c) $\frac{5\pi}{6}$ (d) $\frac{\pi}{2}$

$\therefore$ $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right) = \cos^{-1}\left(\cos\frac{\pi}{6}\right) = \frac{\pi}{6}$

$\cos^{-1}\left(\frac{\sqrt{3}}{2}\right) = \frac{\pi}{6}$

$\therefore$ Statement given in (a) is correct. Hence, option (a) is correct.

(29) Let $\cos^{-1}x = \theta$. Then, $\sin^{-1}x$ is equal to (a) $\frac{\pi}{2} - \theta$ (b) $\frac{\pi}{2} + \theta$

(c) $\pi - \theta$ (d) $\theta - \frac{\pi}{2}$

$\therefore$ $\cos^{-1}x = \theta \Rightarrow x = \cos\theta$

$\therefore$ $\sin^{-1}x = \sin^{-1}(\cos\theta) = \sin^{-1}\left(\sin\left(\frac{\pi}{2} - \theta\right)\right) = \frac{\pi}{2} - \theta$

$\therefore$ Correct option is (a).

(30) $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$, for all $x \in [-1, 1]$. Then, $\sin^{-1}\left(\frac{1}{x}\right)$ is equal to

(a) $\cos^{-1}x$ (b) $\sin^{-1}x$

(c) $\tan^{-1}x$ (d) $\frac{\pi}{2} - \sin^{-1}x$

$\therefore$ $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$

$\therefore$ $\sin^{-1}\left(\frac{1}{x}\right) = \frac{\pi}{2} - \cos^{-1}\left(\frac{1}{x}\right)$

$\therefore$ Correct option is (d).

(31) $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$, for all $x \in [-1, 1]$. Then, $\sin^{-1}x - \cos^{-1}x$ is equal to

(a) $\sin^{-1}(2x\sqrt{1-x^2})$ (b) $\cos^{-1}(2x\sqrt{1-x^2})$

(c) $\sin^{-1}(2x\sqrt{1+x^2})$ (d) $\cos^{-1}(2x\sqrt{1+x^2})$

$\therefore$ Correct option is (a).

(32) $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$, for all $x \in [-1, 1]$. Then, $\sin^{-1}x - \cos^{-1}x$ is equal to

(a) $\sin^{-1}(2x\sqrt{1-x^2})$ (b) $\cos^{-1}(2x\sqrt{1-x^2})$

(c) $\sin^{-1}(2x\sqrt{1+x^2})$ (d) $\cos^{-1}(2x\sqrt{1+x^2})$

$\therefore$ Correct option is (a).

(33) $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$, for all $x \in [-1, 1]$. Then, $\sin^{-1}x - \cos^{-1}x$ is equal to

(a) $\sin^{-1}(2x\sqrt{1-x^2})$ (b) $\cos^{-1}(2x\sqrt{1-x^2})$

(c) $\sin^{-1}(2x\sqrt{1+x^2})$ (d) $\cos^{-1}(2x\sqrt{1+x^2})$

$\therefore$ Correct option is (a).

(34) $\tan^{-1}\left(\frac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right) = \frac{\pi}{4} + \frac{1}{2}\cos^{-1}x^2$, $x \in \left[\frac{1}{\sqrt{2}}, 1\right]$

$\therefore$ $\tan^{-1}\left(\frac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right) = \frac{\pi}{4} + \frac{1}{2}\cos^{-1}x^2$

$\therefore$ $\tan^{-1}\left(\frac{\sqrt{1+x^2}+\sqrt{1-x^2}}{\sqrt{1+x^2}-\sqrt{1-x^2}}\right) = \frac{\pi}{4} + \frac{1}{2}\cos^{-1}x^2$, $x \in \left[\frac{1}{\sqrt{2}}, 1\right]$

$\therefore$ Correct option is (a).

(35) $\tan^{-1}x + \cot^{-1}x = \frac{\pi}{2}$, for all $x \in R$. Then, $\tan^{-1}x - \cot^{-1}x$ is equal to

(a) $\sin^{-1}(2x\sqrt{1-x^2})$ (b) $\cos^{-1}(2x\sqrt{1-x^2})$

(c) $\sin^{-1}(2x\sqrt{1+x^2})$ (d) $\cos^{-1}(2x\sqrt{1+x^2})$

$\therefore$ $\tan^{-1}x + \cot^{-1}x = \frac{\pi}{2}$

$\therefore$ $\tan^{-1}x - \cot^{-1}x = \tan^{-1}x - \left(\frac{\pi}{2} - \tan^{-1}x\right) = 2\tan^{-1}x = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$

$\therefore$ Correct option is (c).

(36) $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$, for all $x \in [-1, 1]$. Then, $\sin^{-1}x - \cos^{-1}x$ is equal to

(a) $\sin^{-1}(2x\sqrt{1-x^2})$ (b) $\cos^{-1}(2x\sqrt{1-x^2})$

(c) $\sin^{-1}(2x\sqrt{1+x^2})$ (d) $\cos^{-1}(2x\sqrt{1+x^2})$

$\therefore$ Correct option is (a).

(37) $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$, for all $x \in [-1, 1]$. Then, $\sin^{-1}x - \cos^{-1}x$ is equal to

(a) $\sin^{-1}(2x\sqrt{1-x^2})$ (b) $\cos^{-1}(2x\sqrt{1-x^2})$

(c) $\sin^{-1}(2x\sqrt{1+x^2})$ (d) $\cos^{-1}(2x\sqrt{1+x^2})$

$\therefore$ Correct option is (a).

(38) $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$, for all $x \in [-1, 1]$. Then, $\sin^{-1}x - \cos^{-1}x$ is equal to

(a) $\sin^{-1}(2x\sqrt{1-x^2})$ (b) $\cos^{-1}(2x\sqrt{1-x^2})$

(c) $\sin^{-1}(2x\sqrt{1+x^2})$ (d) $\cos^{-1}(2x\sqrt{1+x^2})$

$\therefore$ Correct option is (a).

[illegible]

(ii) [illegible]

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[illegible]

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11. PROFIT AND LOSS

IMPORTANT FACTS

[illegible]

FORMULAE

[illegible]

SOLVED EXAMPLES

[illegible]

(b, c) Fix α such that $\alpha \in \{\alpha_1, \alpha_2\}$. Let $\mathcal{M}$ denote the set of all $\mathbf{x} \in \mathbb{R}^n$ satisfying $\mathbf{x} \geq \mathbf{0}$ and $\mathbf{x}^\top \mathbf{1} = \alpha$. Show that $\mathbf{x} \in \mathcal{M}$ is a local minimizer of $f(\mathbf{x}) = \sum_{i=1}^{n} x_i^2$ if and only if $\mathbf{x} = \frac{\alpha}{n}\mathbf{1}$.

Sol: (a) $\mathbf{x} \in \mathbb{R}^n$ is a local minimizer of $f(\mathbf{x}) = \sum_{i=1}^{n} x_i^2$ if and only if $\mathbf{x} = \frac{\alpha}{n}\mathbf{1}$.

(b, c) Fix

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(a) [illegible]

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No. 2. [illegible]

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No. 4. [illegible]

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ANSWERS

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

SOLUTIONS

1. [illegible]

2. [illegible]

[illegible]

[illegible]

[illegible]

(ii) [illegible] $\int_{[illegible]} \frac{[illegible]}{[illegible]} \, dx$, [illegible]

$= [illegible] \, \left| \frac{[illegible]}{[illegible]} \right| + [illegible]$, [illegible]

(4) Total Investment: $\int_{[illegible]} [illegible] \, dx$ [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

$= [illegible]$ [illegible] $[illegible] + [illegible] = [illegible]$ [illegible]

(5) [illegible] $\int_{[illegible]} [illegible] \, dx$ [illegible]

$= [illegible] \, \left| \frac{[illegible]}{[illegible]} \right| + [illegible]$

(6) [illegible] $\int_{[illegible]} [illegible] \, dx$ [illegible]

$= \frac{[illegible]}{[illegible]} [illegible] + [illegible]$

(7) [illegible] $\int_{[illegible]} [illegible] \, dx$ [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

(8) [illegible]

[illegible] $\int_{[illegible]} [illegible] \, dx$ [illegible]

$= [illegible]$ [illegible]

(9) [illegible] $\int_{[illegible]} \frac{[illegible]}{[illegible]} \, dx$

$= [illegible] \, \left| \frac{[illegible]}{[illegible]} \right| + [illegible]$

(10) [illegible] $\int_{[illegible]} \frac{[illegible]}{[illegible]} \, dx$ [illegible]

$= [illegible] \, \left| \frac{[illegible]}{[illegible]} \right| + [illegible]$

(11) [illegible] $\int_{[illegible]} \frac{[illegible]}{[illegible]} \, dx$ [illegible]

$= [illegible] \, \left| \frac{[illegible]}{[illegible]} \right| + [illegible]$

(12) [illegible] $\int_{[illegible]} \frac{[illegible]}{[illegible]} \, dx$ [illegible]

$= [illegible] \, \left| \frac{[illegible]}{[illegible]} \right| + [illegible]$

(13) [illegible] $\int_{[illegible]} \frac{[illegible]}{[illegible]} \, dx$ [illegible]

$= [illegible] \, \left| \frac{[illegible]}{[illegible]} \right| + [illegible]$

(14) [illegible] $\int_{[illegible]} \frac{[illegible]}{[illegible]} \, dx$ [illegible]

$= [illegible] \, \left| \frac{[illegible]}{[illegible]} \right| + [illegible]$

[illegible]

[illegible]

[illegible]

[illegible]. Let [illegible] be [illegible] [illegible] [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(8) [illegible]

(9) [illegible]

(10) [illegible]

(11) [illegible]

(12) [illegible]

(13) [illegible]

(14) [illegible]

(15) [illegible]

(16) [illegible]

(17) [illegible]

(18) [illegible]

[illegible] Let [illegible] be [illegible]. Then [illegible]

[illegible]

[illegible]

[

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible] [illegible]

(i) [illegible]

(ii) [illegible]

(iii) [illegible]

9a [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

9b [illegible]

[illegible]

[illegible]

[illegible]

10 [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

10 [illegible]

[illegible]

[illegible]

[illegible]

10 [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] Let the [illegible] prime be the [illegible]

$$\therefore \text{[illegible]} \quad \left[\frac{\text{[illegible]}}{\text{[illegible]}}\right] \text{[illegible]} \quad \left[\frac{\text{[illegible]}}{\text{[illegible]}}\right]$$

[illegible] Let the [illegible] [illegible] be [illegible] Then

$$\text{[illegible]} \quad \text{[illegible]} \quad \text{[illegible]} \quad \text{[illegible]}$$

[illegible] Let [illegible] prime be [illegible] [illegible]

$$\text{[illegible]} \quad \left[\frac{\text{[illegible]}}{\text{[illegible]}} - \frac{\text{[illegible]}}{\text{[illegible]}}\right] \text{[illegible]}$$

$\therefore$ [illegible]

[illegible] Let [illegible] prime be [illegible]

$$\text{[illegible]} \quad \left[\frac{\text{[illegible]}}{\text{[illegible]}} + \frac{\text{[illegible]}}{\text{[illegible]}} + \frac{\text{[illegible]}}{\text{[illegible]}}\right] \text{[illegible]}$$

$\therefore$ [illegible]

[illegible] [illegible] [illegible] [illegible]

$$\text{[illegible]} \quad \left[\frac{\text{[illegible]}}{\text{[illegible]}} - \frac{\text{[illegible]}}{\text{[illegible]}}\right] \text{[illegible]}$$

[illegible] [illegible] [illegible] [illegible]

$$\text{[illegible]} \quad \left[\frac{\text{[illegible]}}{\text{[illegible]}} + \frac{\text{[illegible]}}{\text{[illegible]}}\right] \text{[illegible]}$$

[illegible] [illegible] [illegible] [illegible]

$$\text{[illegible]} \quad \left[\frac{\text{[illegible]}}{\text{[illegible]}} + \frac{\text{[illegible]}}{\text{[illegible]}} + \frac{\text{[illegible]}}{\text{[illegible]}}\right] \text{[illegible]}$$

[illegible] [illegible] [illegible] [illegible]

$$\text{[illegible]} \quad \left[\frac{\text{[illegible]}}{\text{[illegible]}} - \frac{\text{[illegible]}}{\text{[illegible]}}\right] \text{[illegible]}$$

[illegible] [illegible] [illegible] [illegible]

$$\text{[illegible]} \quad \left[\frac{\text{[illegible]}}{\text{[illegible]}} + \frac{\text{[illegible]}}{\text{[illegible]}} + \frac{\text{[illegible]}}{\text{[illegible]}}\right] \text{[illegible]}$$

[illegible] [illegible] [illegible] [illegible]

$$\text{[illegible]} \quad \left[\frac{\text{[illegible]}}{\text{[illegible]}} + \frac{\text{[illegible]}}{\text{[illegible]}} + \frac{\text{[illegible]}}{\text{[illegible]}}\right] \text{[illegible]}$$

[illegible] [illegible] [illegible] [illegible]

$$\text{[illegible]} \quad \left[\frac{\text{[illegible]}}{\text{[illegible]}} - \frac{\text{[illegible]}}{\text{[illegible]}}\right] \text{[illegible]}$$

[illegible] [illegible] [illegible] [illegible]

$$\text{[illegible]} \quad \left[\frac{\text{[illegible]}}{\text{[illegible]}} + \frac{\text{[illegible]}}{\text{[illegible]}} +

(38) [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$

[illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

∴ [illegible]

(39) [illegible] [illegible] [illegible]

[illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

∴ [illegible]

(40) [illegible] [illegible] [illegible]

[illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

∴ [illegible]

(41) [illegible] [illegible] [illegible]

[illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

∴ [illegible]

(42) [illegible] [illegible] [illegible]

[illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

∴ [illegible]

(43) [illegible] [illegible] [illegible]

[illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

∴ [illegible]

(44) [illegible] [illegible] [illegible]

[illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

∴ [illegible]

(45) [illegible] [illegible] [illegible]

[illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

∴ [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] 18

[illegible] (TYPE [illegible])

[illegible]

(1) [illegible]

(2) [illegible]

(3) [illegible]

(4) [illegible]

(5) None of these

(2) [illegible]

(1) [illegible]

(2) [illegible]

(3) [illegible]

(4) [illegible]

(5) None of these

[illegible]

[illegible]

[illegible]

[illegible]

(a) [illegible]

(i) [illegible]

(ii) [illegible]

(b) [illegible] [illegible]

(i) [illegible]

(ii) [illegible]

(c) [illegible]

(i) [illegible]

(ii) [illegible]

(d) [illegible] [illegible]

(i) [illegible]

(ii) [illegible]

(e) [illegible] [illegible]

(i) [illegible]

(ii) [illegible]

(f) [illegible] [illegible]

(i) [illegible]

(ii) [illegible]

(g) [illegible] [illegible]

(i) [illegible]

(ii) [illegible]

(h) [illegible] [illegible]

(i) [illegible]

(ii) [illegible]

(i) [illegible] [illegible]

(i) [illegible]

(ii) [illegible]

[illegible]

(a) [illegible] [illegible]

(i) [illegible]

(ii) [illegible]

(iii) [illegible]

(iv) [illegible] [illegible]

(v) [illegible] [illegible]

(b) [illegible] [illegible]

(i) [illegible]

(ii) [illegible]

[illegible]

(a) [illegible] (b) [illegible]

(c) [illegible] (d) [illegible]

(e) [illegible]

16. What is the marked angle in the following?

(a) [illegible] (b) [illegible]

(c) [illegible] (d) [illegible]

(e) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible]

(d) [illegible] (e) [illegible] (f) [illegible]

解答解説

1. (b)	2. (d)	3. (b)	4. (a)	5. (d)	6. (d)	7. (c)	8. (c)	9. (c)	10. (a)	11. (d)	12. (c)
13. (a)	14. (b)	15. (c)	16. (b)	17. (d)	18. (c)	19. (c)	20. (c)	21. (c)	22. (c)	23. (c)	24. (c)
25. (d)	26. (a)	27. (c)	28. (c)	29. (c)	30. (c)	31. (c)	32. (c)				

説明と解答

1. [illegible] (b)

2. [illegible] (d)

3. [illegible] (b)

4. [illegible] (a)

5. [illegible] (d)

6. [illegible] (d)

7. [illegible] (c)

8. [illegible] (c)

9. [illegible] (c)

10. [illegible] (a)

11. [illegible] (d)

12. [illegible] (c)

13. [illegible] (a)

14. [illegible] (b)

15. [illegible] (c)

16. [illegible] (b)

17. [illegible] (d)

18. [illegible] (c)

19. [illegible] (c)

20. [illegible] (c)

21. [illegible] (c)

22. [illegible] (c)

23. [illegible] (c)

24. [illegible] (c)

25. [illegible] (d)

26. [illegible] (a)

27. [illegible] (c)

28. [illegible] (c)

29. [illegible] (c)

30. [illegible] (c)

31. [illegible] (c)

32. [illegible] (c)

[illegible]

[illegible]

[illegible]

10. [illegible]

(i) If the [illegible] [illegible]

[illegible]

Since [illegible] and [illegible] [illegible]

Thus, [illegible] given by the matrix

[illegible]

[illegible]

Since [illegible] [illegible]

Thus, [illegible]

[illegible]

11. [illegible] [illegible]

[illegible]

[illegible]

Since [illegible] and [illegible] [illegible]

[illegible]

12. [illegible]

[illegible]

[illegible]

Thus, [illegible]

[illegible]

13. [illegible]

[illegible]

[illegible]

[illegible]

Thus, [illegible]

[illegible]

14. [illegible]

[illegible]

[illegible]

[illegible]

Thus, [illegible]

[illegible]

15. [illegible]

[illegible]

[illegible]

[illegible]

Thus, [illegible]

[illegible]

B. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

C. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

D. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

E. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

12. RATIO AND PROPORTION

IMPORTANT FACTS AND FORMULAE

1. **Ratio:** [illegible]

   (i) [illegible]

   Note: [illegible]

   (ii) [illegible]

2. **COMPARISON:** [illegible]

   (i) [illegible]

   Note: [illegible]

   (ii) [illegible]

   (iii) [illegible]

3. (i) [illegible]

   (ii) [illegible]

   (iii) [illegible]

4. (i) [illegible]

   [illegible]

   (ii) [illegible]

   [illegible]

5. (i) [illegible]

   [illegible]

   (ii) [illegible]

   [illegible]

   (iii) [illegible]

6. **Mixture:** [illegible]

   (i) [illegible]

   (ii) [illegible]

[illegible] FORMULAS

Eg. 1. [illegible]

Sol. [illegible]

$$[illegible]$$

Eg. 2. [illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

Sol. (a) [illegible]

$$[illegible]$$

(b) [illegible]

$$[illegible]$$

(c) [illegible]

$$[illegible]$$

Eg. 3. [illegible]

Sol. [illegible]

$$[illegible]$$

Eg. 4. [illegible]

Sol. [illegible]

$$[illegible]$$

Eg. 5. [illegible]

Sol. [illegible]

$$[illegible]$$

Eg. 6. [illegible]

Sol. [illegible]

$$[illegible]$$

Eg. 7. [illegible]

Sol. [illegible]

$$[illegible]$$

[illegible]

$$[illegible]$$

[illegible]

$$[illegible]$$

[illegible]

[illegible] II

[illegible] (YYY [illegible])

[illegible]

1. [illegible]
   (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]
2. [illegible]
   (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]
3. [illegible]
   (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]
4. [illegible]
   (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]
5. [illegible]
   (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]
6. [illegible]
   (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]
7. [illegible]
   (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]
8. [illegible]
   (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]
9. [illegible]
   (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]
10. [illegible]
    (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]
11. [illegible]
    (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]
12. [illegible]
    (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]
13. [illegible]
    (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]
14. [illegible]
    (1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible]

[illegible]

[illegible]

[illegible]

12. Which of the following is an example of a mixture? (1) Water (2) Sugar (3) Salt (4) Air

(1) Water (2) Sugar (3) Salt (4) Air

13. Which of the following measurements is the most precise? (1) 0.0 g (2) 0.00 g (3) 0.000 g (4) 0.0000 g

(1) 0.0 g (2) 0.00 g (3) 0.000 g (4) 0.0000 g

14. The number of significant figures in 0.0030 is

(1) 1 (2) 2 (3) 3 (4) 4

15. The number of significant figures in 1.0 × 10⁻³ is

(1) 1 (2) 2 (3) 3 (4) 4

16. The number of significant figures in 0.0010 is

(1) 1 (2) 2 (3) 3 (4) 4

17. The density of a substance is 0.8 g/cm³. The density in kg/m³ is

(1) 0.8 (2) 8 (3) 800 (4) 8000

18. The density of a substance is 0.8 g/cm³. The density in g/L is

(1) 0.8 (2) 8 (3) 800 (4) 8000

19. The density of a substance is 0.8 g/cm³. The density in g/mL is

(1) 0.8 (2) 8 (3) 800 (4) 8000

20. The density of a substance is 0.8 g/cm³. The density in g/dm³ is

(1) 0.8 (2) 8 (3) 800 (4) 8000

21. The density of a substance is 0.8 g/cm³. The density in g/m³ is

(1) 0.8 (2) 8 (3) 800 (4) 8000

22. The density of a substance is 0.8 g/cm³. The density in g/μL is

(1) 0.8 (2) 8 (3) 800 (4) 8000

23. The density of a substance is 0.8 g/cm³. The density in g/nL is

(1) 0.8 (2) 8 (3) 800 (4) 8000

24. The density of a substance is 0.8 g/cm³. The density in g/pL is

(1) 0.8 (2) 8 (3) 800 (4) 8000

25. The density of a substance is 0.8 g/cm³. The density in g/fL is

(1) 0.8 (2) 8 (3) 800 (4) 8000

26. The density of a substance is 0.8 g/cm³. The density in g/aL is

(1) 0.8 (2) 8 (3) 800 (4) 8000

27. The density of a substance is 0.8 g/cm³. The density in g/zL is

(1) 0.8 (2) 8 (3) 800 (4) 8000

28. The density of a substance is 0.8 g/cm³. The density in g/yL is

(1) 0.8 (2) 8 (3) 800 (4) 8000

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

79. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

80. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

81. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

82. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

83. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

84. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

85. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

86. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

87. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

88. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

89. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

(j) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Hence $\lim_{x\to 0} f(x) = \lim_{x\to 0} \frac{\sin x}{x} = \lim_{x\to 0} \frac{\sin x}{x}$ [illegible]

Hence $\int_{-\infty}^{\infty} \frac{\sin x}{x}\,dx = \int_{-\infty}^{\infty} \frac{\sin x}{x}\,dx$ [illegible]

Hence $\int_{-\infty}^{\infty} \frac{\sin x}{x}\,dx = \int_{-\infty}^{\infty} \frac{\sin x}{x}\,dx$ [illegible]

Hence $\int_{-\infty}^{\infty} \frac{\sin x}{x}\,dx = \

(8) Let $\mathcal{C}$ be [illegible]. Then:

$$\frac{\int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega}}{\int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega}} = \frac{\int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega}}{\int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega}} = \frac{\int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega}}{\int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega}} = \frac{\int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega}}{\int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega}} = \frac{\int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega}}{\int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega}} = \frac{\int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega}}{\int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega}}$$

$\therefore$ [illegible]

(9) [illegible] $\int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega} = \int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega} = \int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega} = \int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega} = \int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega} = \int_{\mathcal{C}} \frac{\partial \Gamma}{\partial \Omega}$

$\therefore$ [illegible] Answer: $\frac{\partial \Gamma}{\partial \Omega} = \frac{\partial \Gamma}{\partial \Omega} = \frac{\partial \Gamma}{\partial \Omega}$

(10) $\frac{\partial \Gamma}{\partial \Omega} = \frac{\partial \Gamma}{\partial \Omega} = \frac{\partial \Gamma}{\partial \Omega} = \frac{\partial \Gamma}{\partial \Omega} = \frac{\partial \Gamma}{\partial \Omega} = \frac{\partial \Gamma}{\partial \Omega}$

Hence, if $\mathcal{C}_{\mathbb{R}}$ is [illegible] and [illegible] $\mathcal{C}_{\mathbb{R}}$ [illegible]

(11) [illegible]

[illegible]

(12) Assume [illegible] $\mathcal{C}_{\mathbb{R}}$ [illegible]

Then [illegible]

$\therefore$ [illegible]

(13) [illegible] Then:

$$\frac{\partial \Gamma}{\partial \Omega} = \frac{\partial \Gamma}{\partial \Omega} = \frac{\partial \Gamma}{\partial \Omega} = \frac{\partial \Gamma}{\partial \Omega} = \frac{\partial \Gamma}{\partial \Omega} = \frac{\partial \Gamma}{\partial \Omega}$$

$\therefore$ [illegible]

13. PARTNERSHIP

IMPORTANT FACTS AND FORMULAE

1. **Partnership:** [illegible]
2. **Ratio of Time and Sum of Profits:**
   (i) [illegible]
   (ii) [illegible]
   (iii) [illegible]
3. [illegible]

SOLVED EXAMPLES

Ex. 1. [illegible]

Sol. [illegible]

$$[illegible] = \left[illegible\right] = [illegible]$$

$$[illegible] = \left[illegible\right] = [illegible]$$

$$[illegible] = \left[illegible\right] = [illegible]$$

Ex. 2. [illegible]

Sol. [illegible]

$$[illegible] = \left[illegible\right] = [illegible]$$

$$\text{Total} = \text{Cost of } \left[\begin{array}{c} \text{Table} \\ \text{Chairs} \end{array}\right] = \text{Rs. } 4000$$

$$\text{Total} = \text{Cost} = 0.5 \left[\begin{array}{c} \text{Table} \\ \text{Chairs} \end{array}\right] = \text{Rs. } 1000$$

Ex. 1. [illegible] [illegible] [illegible]

[illegible]

Sol. [illegible]

$$[illegible]$$

$$[illegible]$$

$$[illegible]$$

$$[illegible]$$

$$[illegible]$$

EXERCISE (IA)

(MULTIPLE TYPE CHOICE QUESTIONS)

[illegible]

1. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

   [illegible]

2. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

3. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

   [illegible]

4. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

5. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

6. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(4) [illegible]

(5) [illegible]

(6) [illegible]

解答欄

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

解答・採点基準

1. [illegible]
2. [illegible]

   [illegible]

3. [illegible]

   [illegible]

   [illegible]

   [illegible]

4. [illegible]

   [illegible]

5. [illegible]

   [illegible]

6. [illegible]

   [illegible]

7. [illegible]

   [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(46) [illegible]

[illegible]

(47) [illegible]

[illegible]

(48) [illegible]

[illegible]

(49) [illegible]

[illegible]

(50) [illegible]

[illegible]

(51) [illegible]

[illegible]

(52) [illegible]

[illegible]

(53) [illegible]

[illegible]

(54) [illegible]

[illegible]

(55) [illegible]

[illegible]

(56) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

10. [illegible]

Since [illegible]

Now [illegible]

Now [illegible]

[illegible]

11. [illegible]

[illegible]

[illegible]

[illegible]

12. Suppose a [illegible] [illegible]

[illegible]

[illegible]

13. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

EXERCISE 18

[illegible] (TWO [illegible])

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(2) [illegible]

[illegible]

[illegible]

[

[illegible]

14. CHAIN RULE

IMPORTANT FACTS AND FORMULAE

[illegible]

SOLVED EXAMPLES

[illegible]

[illegible]

[illegible]

[illegible]

Sol: [illegible]

[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Sol: [illegible]

[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Sol: [illegible]

[illegible]

[illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(1) [illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

14. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

15. [illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

16. [illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

17. [illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

18. [illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

19. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

20. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

21. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

22. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

23. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

24. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

25. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

ANSWERS

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

(b) Let the [illegible] [illegible] be as follows:

Price (Rs. per unit) [illegible] Right Hand Side Proportions

[illegible]

(c) [illegible] [illegible] [illegible] [illegible]

[illegible]

(d) [illegible]

Price: [illegible] Proportions

[illegible]

(e) [illegible] [illegible] [illegible] [illegible]

[illegible]

Price: [illegible] [illegible]

[illegible]

(f) [illegible]

[illegible]	[illegible] Proportion
[illegible]	[illegible] Proportion

[illegible]

(g) [illegible]

[illegible]	[illegible] Proportion
[illegible]	[illegible] Proportion

[illegible]

(h) [illegible]

[illegible]	[illegible] Proportion
[illegible]	[illegible] Proportion

[illegible]

(i) [illegible]

[illegible]	[illegible] Proportion
[illegible]	[illegible] Proportion

[illegible]

(a) [illegible]
[illegible] (Indirect Proportion)
[illegible] (Indirect Proportion)
[illegible]
[illegible]
[illegible]

(b) [illegible]
[illegible] (Indirect Proportion)
[illegible] (Indirect Proportion)
[illegible]
[illegible]
[illegible]

(c) [illegible]
[illegible] (Direct Proportion)
[illegible] (Direct Proportion)
[illegible]
[illegible]
[illegible]

20. [illegible]
[illegible] (Indirect Proportion)
[illegible] (Direct Proportion)
[illegible]
[illegible]
[illegible]

21. [illegible]
[illegible] (Direct Proportion)
[illegible] (Direct Proportion)
[illegible]
[illegible]
[illegible]

(f) [illegible]
[illegible] (Direct Proportion)
[illegible] (Direct Proportion)
[illegible] (Direct Proportion)
[illegible]
[illegible]
[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

10. Let the required number of plants be x. Then,

Time required by three plants	Three Proportional
Plants required per day	Inverse Proportional
Plants during 40 days	Inverse Proportional

Equation: [illegible]

Hence put x: [illegible]

Then: [illegible]

[illegible]

∴ Required number of plants = 250.

11. (a) [illegible]

[illegible]

Cost of one pair of leg	Indirect Proportional
Pairs made	Direct Proportional
Cost of one pair of shoes	Indirect Proportional

Hence put x: [illegible]

Then: [illegible]

[illegible]

(b) [illegible]

Earn capital sum	Direct Proportional
Years	Indirect Proportional
Earn interest sum	Direct Proportional

Equation: [illegible]

Then: [illegible]

[illegible]

12. [illegible]

Area length	Direct Proportional
Cost of x	Indirect Proportional
Area breadth	Indirect Proportional

Length: [illegible]

Then: [illegible]

Hence put x: [illegible]

[illegible]

∴ Number of days required = [illegible].

13. Let the total [illegible] = [illegible]. Then, [illegible] = [illegible]

[illegible] (Hint: Proposition)
[illegible] (Hint: Proposition)

[illegible]

[illegible]

[illegible] (Hint: Proposition)

(b) [illegible] (Hint: Proposition)
[illegible] (Hint: Proposition)

[illegible]

[illegible]

(c) [illegible] (Hint: Proposition)

[illegible]

(d) [illegible] (Hint: Proposition)
[illegible] (Hint: Proposition)
[illegible] (Hint: Proposition)

[illegible]

[illegible]

[illegible]

(e) [illegible] (Hint: Proposition)

[illegible]

(f) [illegible] (Hint: Proposition)
[illegible] (Hint: Proposition)
[illegible] (Hint: Proposition)

[illegible]

[illegible]

[illegible]

$$\left[\begin{array}{c} \text{[illegible]} \\ \text{[illegible]} \end{array}\right] \left[\begin{array}{c} \text{[illegible]} \\ \text{[illegible]} \end{array}\right] \left[\begin{array}{c} \text{[illegible]} \\ \text{[illegible]} \end{array}\right] \left[\begin{array}{c} \text{[illegible]} \\ \text{[illegible]} \end{array}\right] \left[\begin{array}{c} \text{[illegible]} \\ \text{[illegible]} \end{array}\right] \quad \text{[illegible]}$$

(b) Let $\{\text{[illegible]}\}$ denote [illegible] $\{\text{[illegible]}\}$.

Exactly, of [illegible] of [illegible] [illegible] [illegible] of [illegible] [illegible] $\left[\begin{array}{c} \text{[illegible]} \\ \text{[illegible]} \end{array}\right]$.

[illegible], [illegible] (Bayes' Factor Rule)
[illegible], [illegible] (Jacobian Propagation)

$$\text{[illegible]} \quad \text{[illegible]}$$

$$\text{Bayes} \left[\begin{array}{c} \text{[illegible]} \\ \text{[illegible]} \end{array}\right]$$

$$\left[\begin{array}{c} \text{[illegible]} \\ \text{[illegible]} \end{array}\right] \left[\begin{array}{c} \text{[illegible]} \\ \text{[illegible]} \end{array}\right] \left[\begin{array}{c} \text{[illegible]} \\ \text{[illegible]} \end{array}\right] \left[\begin{array}{c} \text{[illegible]} \\ \text{[illegible]} \end{array}\right] \quad \text{[illegible]}$$

(c) [illegible] [illegible] [illegible] [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

15. TIME AND WORK

IMPORTANT FACTS AND FORMULAS

[illegible]

SOLVED EXAMPLES

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[illegible]

[illegible]

[illegible]

[illegible]

Dimension of $\mathbb{R}^n$ = n

Thus $\{\ \}$ is a basis of the zero vector space.

Hence every set of n linearly independent vectors in $\mathbb{R}^n$ is a basis.

(a) $\{(1,0,0),(0,1,0),(0,0,1)\}$ is a basis of $\mathbb{R}^3$.

(b) $\{(1,0,0),(0,1,0),(0,0,1),(1,1,1)\}$ is a spanning set for $\mathbb{R}^3$ but not a basis.

Ex. 4. Let $\mathbb{R}$ denote the set of all polynomials in one variable x, with real coefficients. Let $\mathbb{R}_n$ denote the set of all polynomials in x of degree $\leq n$. Show that $\mathbb{R}$ is a vector space over $\mathbb{R}$. Show that $\mathbb{R}_n$ is a subspace of $\mathbb{R}$. Find a basis for $\mathbb{R}_n$. Find a basis for $\mathbb{R}$. Show that $\mathbb{R}$ is not finite-dimensional. Find a basis for the quotient space $\mathbb{R}/\mathbb{R}_n$.

Sol. (a) $\{1, x, x^2, \ldots, x^n\}$ is a basis of $\mathbb{R}_n$.

(b) $\{1, x, x^2, \ldots\}$ is a basis of $\mathbb{R}$.

(c) $\{x^{n+1}, x^{n+2}, \ldots\}$ is a basis of $\mathbb{R}/\mathbb{R}_n$.

Ex. 5. $\mathbb{R}$ and $\mathbb{R}$ denote the complex field and the real field respectively. Show that $\mathbb{R}$ is a vector space over $\mathbb{R}$. Show that $\mathbb{R}$ is a vector space over $\mathbb{R}$. Show that $\mathbb{R}$ is not finite-dimensional. Find a basis for $\mathbb{R}$ over $\mathbb{R}$. Find a basis for $\mathbb{R}$ over $\mathbb{R}$. Show that $\mathbb{R}$ is finite-dimensional. Find a basis for $\mathbb{R}$ over $\mathbb{R}$.

Sol. (a) $\{1, i\}$ is a basis of $\mathbb{R}$ over $\mathbb{R}$.

(b) $\{1\}$ is a basis of $\mathbb{R}$ over $\mathbb{R}$.

(c) $\{1, i, i^2, \ldots\}$ is a basis of $\mathbb{R}$ over $\mathbb{R}$.

(d) $\{1, i\}$ is a basis of $\mathbb{R}$ over $\mathbb{R}$.

Ex. 6. Let $\mathbb{R}$ be the vector space of all functions from $\mathbb{R}$ into $\mathbb{R}$. Let $\mathbb{R}_n$ be the set of all functions f in $\mathbb{R}$ such that $f(x) = 0$ for $x \geq n$. Show that $\mathbb{R}_n$ is a subspace of $\mathbb{R}$. Find a basis for $\mathbb{R}_n$. Find a basis for $\mathbb{R}/\mathbb{R}_n$.

Sol. (a) $\{f_1, f_2, \ldots, f_n\}$ is a basis of $\mathbb{R}_n$.

(b) $\{f_{n+1}, f_{n+2}, \ldots\}$ is a basis of $\mathbb{R}/\mathbb{R}_n$.

Ex. 7. Let $\mathbb{R}$ be the vector space of all functions from $\mathbb{R}$ into $\mathbb{R}$. Let $\mathbb{R}_n$ be the set of all functions f in $\mathbb{R}$ such that $f(x) = 0$ for $x \leq n$. Show that $\mathbb{R}_n$ is a subspace of $\mathbb{R}$. Find a basis for $\mathbb{R}_n$. Find a basis for $\mathbb{R}/\mathbb{R}_n$.

Sol. (a) $\{f_1, f_2, \ldots, f_n\}$ is a basis of $\mathbb{R}_n$.

(b) $\{f_{n+1}, f_{n+2}, \ldots\}$ is a basis of $\mathbb{R}/\mathbb{R}_n$.

[illegible]

Ex. [illegible] [illegible]

Sol. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

EXERCISE (1A)

OBJECTIVE TYPE QUESTIONS

[illegible]

1. [illegible] **[illegible]**

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

2. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

   [illegible]

3. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

   [illegible]

4. [illegible] **[illegible]**

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

5. [illegible]

   (a) [illegible] (b) [illegible]
   (c) [illegible] (d) [illegible]

   [illegible]

6. [illegible] **[illegible]**

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

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(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

(j) [illegible]

(k) [illegible]

(l) [illegible]

(m) [illegible]

(n) [illegible]

(o) [illegible]

(p) [illegible]

(q) [illegible]

(r) [illegible]

(s) [illegible]

(t) [illegible]

(u) [illegible]

(v) [illegible]

(w) [illegible]

(x) [illegible]

(y) [illegible]

(z) [illegible]

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]								

[illegible]

1. [illegible] $\frac{[illegible]}{[illegible]}$ [illegible] $\frac{[illegible]}{[illegible]}$

   [illegible] $\left(\frac{[illegible]}{[illegible]} - \frac{[illegible]}{[illegible]}\right) = \frac{[illegible]}{[illegible]}$

   [illegible]

2. [illegible] $\frac{[illegible]}{[illegible]}$ [illegible] $\frac{[illegible]}{[illegible]}$

   [illegible] $\frac{[illegible]}{[illegible]} - \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

3. [illegible] $\left(\frac{[illegible]}{[illegible]} + \frac{[illegible]}{[illegible]}\right)$

   [illegible] $\frac{[illegible]}{[illegible]} - \frac{[illegible]}{[illegible]}$ [illegible]

4. [illegible] $\left(\frac{[illegible]}{[illegible]} - \frac{[illegible]}{[illegible]}\right)$

   [illegible] $\frac{[illegible]}{[illegible]} - \frac{[illegible]}{[illegible]}$ [illegible]

5. [illegible] $\frac{[illegible]}{[illegible]} - \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

   [illegible]

6. [illegible] $\frac{[illegible]}{[illegible]} - \frac{[illegible]}{[illegible]}$ [illegible]

7. [illegible] $\frac{[illegible]}{[illegible]} - \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$ [illegible] $\frac{[illegible]}{[illegible]}$

   [illegible] $\frac{[illegible]}{[illegible]} - \frac{[illegible]}{[illegible]}$

   [illegible]

[illegible]

[illegible]

[illegible]

Ex. 1. $\int_{-\frac{1}{2}}^{\frac{1}{2}} \frac{dx}{(1-x)\sqrt{1-x^2}}$ (B.U.1992) (Hint: $x = \frac{1}{2}$) 2. $\int_{-1}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}}$ (B.U.1992) (Hint: $x = \frac{1}{2}$)

Solution: (1) Let $I = \int_{-\frac{1}{2}}^{\frac{1}{2}} \frac{dx}{(1-x)\sqrt{1-x^2}}$ Put $x = \cos\theta$ $\therefore I = \int_{\frac{\pi}{3}}^{\frac{2\pi}{3}} \frac{\sin\theta\, d\theta}{(1-\cos\theta)\sqrt{1-\cos^2\theta}} = \int_{\frac{\pi}{3}}^{\frac{2\pi}{3}} \frac{d\theta}{1-\cos\theta} = \int_{\frac{\pi}{3}}^{\frac{2\pi}{3}} \frac{d\theta}{2\sin^2\frac{\theta}{2}}$

$\therefore I = \int_{\frac{\pi}{3}}^{\frac{2\pi}{3}} \operatorname{cosec}^2\frac{\theta}{2}\, d\theta = \left[-\cot\frac{\theta}{2}\right]_{\frac{\pi}{3}}^{\frac{2\pi}{3}} = \left[-\cot\frac{\pi}{6} + \cot\frac{\pi}{3}\right] = \frac{2}{\sqrt{3}}$

Ans. 2. Put $x = \cos\theta$ $\therefore$ $\int_{-1}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}} = \int_{0}^{\pi} \frac{\sin\theta\, d\theta}{(1+\cos\theta)\sqrt{1-\cos^2\theta}} = \int_{0}^{\pi} \frac{d\theta}{1+\cos\theta} = \int_{0}^{\pi} \frac{d\theta}{2\cos^2\frac{\theta}{2}}$

(2) Let $I = \int_{0}^{\pi} \sec^2\frac{\theta}{2}\, d\theta = \left[2\tan\frac{\theta}{2}\right]_{0}^{\pi} = 2\left[\tan\frac{\pi}{2} - \tan 0\right] = \infty$

$\therefore$ (1) $\int_{-1}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}}$ (B.U.1992) (Hint: $x = \frac{1}{2}$) $\int_{-1}^{1} \frac{dx}{(1-x)\sqrt{1-x^2}}$ (B.U.1992) (Hint: $x = \frac{1}{2}$)

Ans. (1) $\frac{2}{\sqrt{3}}$ (2) ∞

Ex. 1. (B.U.1992) $\int_{0}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}}$ 2. $\int_{0}^{1} \frac{dx}{(1-x)\sqrt{1-x^2}}$ (B.U.1992) 3. $\int_{0}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}}$

Solution: (1) $\int_{0}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}}$ Put $x = \cos\theta$ $\therefore \int_{0}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}} = \int_{0}^{\frac{\pi}{2}} \frac{\sin\theta\, d\theta}{(1+\cos\theta)\sqrt{1-\cos^2\theta}} = \int_{0}^{\frac{\pi}{2}} \frac{d\theta}{1+\cos\theta}$

$\therefore \int_{0}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}} = \int_{0}^{\frac{\pi}{2}} \frac{d\theta}{2\cos^2\frac{\theta}{2}}$

Put $\frac{\theta}{2} = t$ $\therefore \int_{0}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}} = \int_{0}^{\frac{\pi}{4}} \frac{2\,dt}{2\cos^2 t} = \int_{0}^{\frac{\pi}{4}} \sec^2 t\, dt = \left[\tan t\right]_{0}^{\frac{\pi}{4}} = \tan\frac{\pi}{4} - \tan 0 = 1$

(2) Let $\int_{0}^{1} \frac{dx}{(1-x)\sqrt{1-x^2}} = \int_{0}^{1} \frac{dx}{(1-x)\sqrt{(1-x)(1+x)}} = \int_{0}^{1} \frac{dx}{(1-x)\sqrt{1+x}}$

Put $1+x = t^2$ $\therefore \int_{0}^{1} \frac{dx}{(1-x)\sqrt{1+x}} = \int_{1}^{\sqrt{2}} \frac{2t\,dt}{(2-t^2)t} = \int_{1}^{\sqrt{2}} \frac{2\,dt}{2-t^2}$

$\therefore \int_{0}^{1} \frac{dx}{(1-x)\sqrt{1+x}} = \int_{1}^{\sqrt{2}} \frac{dt}{\sqrt{2}-t} + \int_{1}^{\sqrt{2}} \frac{dt}{\sqrt{2}+t}$

$\therefore \int_{0}^{1} \frac{dx}{(1-x)\sqrt{1+x}} = \left[\log(\sqrt{2}-t)\right]_{1}^{\sqrt{2}} + \left[\log(\sqrt{2}+t)\right]_{1}^{\sqrt{2}}$

$\therefore \int_{0}^{1} \frac{dx}{(1-x)\sqrt{1+x}} = \log(\sqrt{2}-1) + \log(\sqrt{2}+1) = \log(\sqrt{2}-1)(\sqrt{2}+1) = \log 1 = 0$

Ans. (1) 1 (2) 0

Ex. 1. $\int_{0}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}}$ 2. $\int_{0}^{1} \frac{dx}{(1-x)\sqrt{1-x^2}}$ (B.U.1992) 3. $\int_{0}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}}$ (B.U.1992) (Hint: $x = \frac{1}{2}$)

Solution: (1) $\int_{0}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}}$ Put $x = \cos\theta$ $\therefore \int_{0}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}} = \int_{0}^{\frac{\pi}{2}} \frac{\sin\theta\, d\theta}{(1+\cos\theta)\sqrt{1-\cos^2\theta}} = \int_{0}^{\frac{\pi}{2}} \frac{d\theta}{1+\cos\theta}$

$\therefore \int_{0}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}} = \int_{0}^{\frac{\pi}{2}} \frac{d\theta}{2\cos^2\frac{\theta}{2}}$

Put $\frac{\theta}{2} = t$ $\therefore \int_{0}^{1} \frac{dx}{(1+x)\sqrt{1-x^2}} = \int_{0}^{\frac{\pi}{4}} \frac{2\,dt}{2\cos^2 t} = \int_{0}^{\frac{\pi}{4}} \sec^2 t\, dt = \left[\tan t\right]_{0}^{\frac{\pi}{4}} = \tan\frac{\pi}{4} - \tan 0 = 1$

(2) Let $\int_{0}^{1} \frac{dx}{(1-x)\sqrt{1-x^2}} = \int_{0}^{1} \frac{dx}{(1-x)\sqrt{(1-x)(1+x)}} = \int_{0}^{1} \frac{dx}{(1-x)\sqrt{1+x}}$

Put $1+x = t^2$ $\therefore \int_{0}^{1} \frac{dx}{(1-x)\sqrt{1+x}} = \int_{1}^{\sqrt{2}} \frac{2t\,dt}{(2-t^2)t} = \int_{1}^{\sqrt{2}} \frac{2\,dt}{2-t^2}$

$\therefore \int_{0}^{1} \frac{dx}{(1-x)\sqrt{1+x}} = \int_{1}^{\sqrt{2}} \frac{dt}{\sqrt{2}-t} + \int_{1}^{\sqrt{2}} \frac{dt}{\sqrt{2}+t}$

$\therefore \int_{0}^{1} \frac{dx}{(1-x)\sqrt{1+x}} = \left[\log(\sqrt{2}-t)\right]_{1}^{\sqrt{2}} + \left[\log(\sqrt{2}+t)\right]_{1}^{\sqrt{2}}$

$\therefore \int_{0}^{1} \frac{dx}{(1-x)\sqrt{1+x}} = \log(\sqrt{2}-1) + \log(\sqrt{2}+1) = \log(\sqrt{2}-1)(\sqrt{2}+1) = \log 1 = 0$

Ans. (1) 1 (2) 0

[illegible]

[illegible]

[illegible]

[illegible] [illegible]

[illegible]

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(2) [illegible]

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(3) [illegible]

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(4) [illegible]

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(5) [illegible]

[illegible]

(6) [illegible]

[illegible]

(7) [illegible]

[illegible]

(8) [illegible]

[illegible]

Q6. [illegible] $\left(\frac{\sqrt{[illegible]}}{[illegible]}\right)$

$\therefore$ [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$ Necessary work: $\left(\frac{[illegible]}{[illegible]}\right)$

(b) [illegible] $\frac{[illegible]}{[illegible]}$

Then $\frac{[illegible]}{[illegible]}$ [illegible]

So $\frac{[illegible]}{[illegible]}$ [illegible] $\left|\frac{[illegible]}{[illegible]}\right| = 1$ Hence

Q7. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ Necessary work: $\frac{[illegible]}{[illegible]}$

$\therefore$ [illegible] $\left|\frac{[illegible]}{[illegible]}\right| = \frac{[illegible]}{[illegible]}$

Then $\frac{[illegible]}{[illegible]}$ [illegible]

So $\frac{[illegible]}{[illegible]}$ [illegible] $\left|\frac{[illegible]}{[illegible]}\right| = 1$ Hence

Thus, [illegible] $\frac{[illegible]}{[illegible]}$

Q8. [illegible] $\frac{[illegible]}{[illegible]}$ Necessary work: $\left(\frac{[illegible]}{[illegible]}\right)$

Then $\frac{[illegible]}{[illegible]}$ [illegible]

Without [illegible]

Q9. [illegible] $\frac{[illegible]}{[illegible]}$ Necessary work: $\left(\frac{[illegible]}{[illegible]}\right)$

So $\frac{[illegible]}{[illegible]}$ [illegible]

Without [illegible] $\left[\frac{[illegible]}{[illegible]}\right]$ [illegible]

$\therefore$ [illegible] $\frac{[illegible]}{[illegible]}$ [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$

Hence [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

Q10. [illegible] $\frac{[illegible]}{[illegible]}$ [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible]

(iii) [illegible]

(iv) [illegible]

(v) [illegible]

(vi) [illegible]

(vii) [illegible]

(viii) [illegible]

(ix) [illegible]

(x) [illegible]

(A) [illegible]

(B) [illegible]

[illegible]

[illegible]

(C) [illegible]

[illegible]

(D) [illegible]

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[illegible]

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(E) [illegible]

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(F) [illegible]

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(G) [illegible]

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(H) [illegible]

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[illegible] $\frac{[illegible]}{[illegible]}$

[illegible]

(a) [illegible] $-\frac{[illegible]}{[illegible]}$; [illegible] $-\frac{[illegible]}{[illegible]}$

[illegible] $\left[\frac{[illegible]}{[illegible]}\right]$ [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

(b) [illegible] $\frac{[illegible]}{[illegible]}$; [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\left[\frac{[illegible]}{[illegible]}\right]$ [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$

[illegible]

[illegible]

(c) [illegible] $\frac{[illegible]}{[illegible]}$; [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$

(d) [illegible] $\frac{[illegible]}{[illegible]}$; [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$

(e) [illegible] $\frac{[illegible]}{[illegible]}$; [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$

(f) [illegible] $\frac{[illegible]}{[illegible]}$; [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

EXERCISE 1.10

1.11.1 SUBJECTIVE TYPE QUESTIONS

[illegible]

[illegible]

[illegible]

[illegible]

MARCHE

1	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
2	(a)	(b)	(c)	(d)					

SOLUZIONI

1) [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

$\frac{[illegible]}{[illegible]}$ [illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible]

[illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible] $\frac{[illegible]}{[illegible]}$

[illegible] $\frac{[illegible]}{[illegible]}$

[illegible]

2) [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible]

3) [illegible] [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

16. PIPES AND CISTERNS

IMPORTANT FACTS AND FORMULAS

[illegible]

SOLVED EXAMPLES

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

EXERCISE 9A

OBJECTIVE TYPE QUESTIONS

Directions: Mark (✓) against the correct alternative.

1. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

2. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

3. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

4. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

5. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

6. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

ANSWERS

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]				

MATHS

1. [illegible] $\frac{1}{2}$ [illegible] $-\frac{1}{2}$

[illegible] $\frac{1}{2}$ [illegible] $\frac{1}{2}$

[illegible]

2. [illegible] $-\frac{1}{2}$, $-\frac{1}{2}$, $-\frac{1}{2}$

[illegible] $\sqrt{2}$ [illegible]

3. [illegible]

[illegible] $\sqrt{2}$ [illegible]

[illegible]

[illegible]

[illegible]

4. [illegible] $\frac{1}{2}$

[illegible] $\frac{1}{2}$ [illegible]

[illegible]

[illegible]

5. [illegible] $\frac{1}{2}$ [illegible] $\frac{1}{2}$

[illegible]

6. [illegible] $\frac{1}{2}$ [illegible] $\frac{1}{2}$

[illegible]

7. [illegible] $\frac{1}{2}$ [illegible] $\frac{1}{2}$

[illegible] $\frac{1}{2}$ [illegible]

from $\frac{1}{1+x}$ by $\frac{1}{x}$ to obtain $\frac{1}{x(1+x)}$

$\therefore$ Maclaurin series $\left(\frac{1}{x}-\frac{1}{1+x}\right) = \frac{1}{x}$

8. Write $\frac{1}{x}$ as $\frac{1}{x}$ in the form $a(x-1)$

$$\frac{1}{x} = \frac{1}{1+(x-1)} = \frac{1}{1} - \frac{(x-1)}{1^2} + \frac{(x-1)^2}{1^3} - \frac{(x-1)^3}{1^4} + \cdots \quad \text{(Maclaurin series)}$$

$\therefore$ The Taylor series about $x=1$ is $\sum_{n=0}^{\infty} (-1)^n (x-1)^n$

9. Write $\sin x$ in the form $a(x-\frac{\pi}{2})$ to obtain $\sin x = \frac{\pi}{2} - \frac{x}{1} + \frac{x^3}{3!}$

$\therefore$ Taylor series about $x = \frac{\pi}{2}$ is $\sum_{n=0}^{\infty} (-1)^n (x-\frac{\pi}{2})^n$

10. Write $\frac{1}{x}$ as $\frac{1}{x}$ in the form $\frac{1}{x} = \frac{1}{1+(x-1)} = \frac{1}{1} - \frac{(x-1)}{1^2} + \frac{(x-1)^2}{1^3} - \frac{(x-1)^3}{1^4} + \cdots$

$\therefore$ Taylor series about $x=1$ is $\sum_{n=0}^{\infty} (-1)^n (x-1)^n$

11. Let f = [illegible] $\sin x$, $\sin x$ is [illegible]

Then $f(x) = \sin x$ [illegible] $x = \frac{\pi}{2}$ [illegible]

$\therefore$ [illegible]

$\Rightarrow$ [illegible]

$\Rightarrow$ [illegible] $\quad$ [illegible]

12. Let [illegible] $\sin x$ [illegible]

Then [illegible] $\frac{\pi}{2}$ [illegible]

$\therefore$ [illegible]

13. Consider [illegible] $\sin x$ [illegible]

Then [illegible] $\frac{\pi}{2}$ [illegible] $\sin x$ [illegible]

$\therefore$ [illegible]

14. Consider the [illegible] $\sin x$ [illegible] $\frac{\pi}{2}$ [illegible]

$\therefore$ [illegible]

$\Rightarrow$ [illegible]

$\Rightarrow$ [illegible] $\quad$ [illegible]

15. [illegible] $\sin x$ [illegible] $\frac{\pi}{2}$ [illegible]

Then [illegible] $\frac{\pi}{2}$ [illegible]

Hence [illegible]

(8) [illegible]

[illegible]

Proof [illegible]

(9) [illegible]

Proof [illegible]

[illegible]

[illegible]

(10) [illegible]

Proof [illegible]

[illegible]

[illegible]

(11) [illegible]

Proof [illegible]

[illegible]

[illegible]

(12) [illegible]

Proof [illegible]

[illegible]

[illegible]

(13) [illegible]

Proof [illegible]

[illegible]

[illegible]

(14) [illegible]

Proof [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(2) [illegible]

[illegible]

[illegible]

[

[illegible]

EXERCISE 168

DATA SUFFICIENCY TYPE QUESTIONS

[illegible]

[illegible]

1. [illegible]

(1) [illegible]

(2) [illegible]

(3) [illegible]

(4) [illegible]

(5) [illegible]

(6) [illegible]

2. [illegible]

(1) [illegible]

(2) [illegible]

(3) [illegible]

(4) [illegible]

(5) [illegible]

(6) [illegible]

入門練習問題

(1) [illegible] (2) [illegible] (3) [illegible] (4) [illegible] (5) [illegible] (6) [illegible]

応用練習問題

1. [illegible]

2. [illegible]

(1) [illegible]

(2) [illegible]

(3) [illegible]

(4) [illegible]

(5) [illegible]

(6) [illegible]

(7) [illegible]

(8) [illegible]

(9) [illegible]

(10) [illegible]

(11) [illegible]

(12) [illegible]

(13) [illegible]

(14) [illegible]

(15) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

(j) [illegible]

(k) [illegible]

(l) [illegible]

(m) [illegible]

(n) [illegible]

(o) [illegible]

(p) [illegible]

(q) [illegible]

(r) [illegible]

(s) [illegible]

(t) [illegible]

(u) [illegible]

(v) [illegible]

(w) [illegible]

(x) [illegible]

(y) [illegible]

(z) [illegible]

17. TIME AND DISTANCE

IMPORTANT FACTS AND FORMULAE

[illegible]

SOLVED EXAMPLES

Ex. 1. [illegible] (2000)

Sol. [illegible]

Ex. 2. [illegible] (2000)

Sol. [illegible]

Ex. 3. [illegible] (2000)

Sol. [illegible]

Ex. 4. [illegible] (2000)

Sol. [illegible]

Ex. 5. [illegible] (2000)

Sol. [illegible]

[illegible]

11.8 [illegible]

Sol. Let [illegible] Then

[illegible]

Then [illegible]

11.9 [illegible]

Sol. [illegible]

[illegible]

11.10 [illegible]

Sol. [illegible]

[illegible]

11.11 [illegible]

Sol. [illegible]

[illegible]

11.12 [illegible]

Sol. [illegible]

[illegible]

11.13 [illegible]

Sol. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

17. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible]

(d) [illegible] (e) [illegible] **(Bank PO, [illegible])**

18. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

19. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] **(Bank PO, [illegible])**

20. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

21. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

22. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

23. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

24. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

25. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

26. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

27. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

28. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(b) A cyclist starts from rest and moves along a straight road with a constant acceleration $\frac{1}{2}$ m s^{-2}. After 10 s he continues at the constant speed he has reached. He then applies the brakes and comes to rest in a further 10 s. The average speed of the cyclist during the 20 s for which he was moving is nearest to:

(a) 2.5 m s^{-1} (b) 5 m s^{-1} (c) 7.5 m s^{-1} (d) 10 m s^{-1}

(c) The horizontal range of a projectile is 4 km. If the time of flight is 10 s, the initial velocity of the projectile is (Take acceleration due to gravity = 10 m s^{-2})

(a) 2 km s^{-1} (b) 4 km s^{-1} (c) 8 km s^{-1} (d) 16 km s^{-1}

(d) A ship moving in the direction of the Gulf Stream is a swimmer who swims at a speed of 1 km h^{-1} relative to the water. The Gulf Stream flows at a constant speed of 2 km h^{-1} relative to the shore. The swimmer swims 1 km in the direction of the Gulf Stream and then returns to the starting point. The average speed of the swimmer during the entire journey is:

(a) 1 km h^{-1} (b) 2 km h^{-1} (c) 3 km h^{-1} (d) 4 km h^{-1}

(e) The average speed of a body during the time it travels a distance s is v_1 and a distance $2s$ is v_2. The average speed of the body during the distance $3s$ is v_3. The relation between v_1, v_2 and v_3 is (Assume the motion is in a straight line)

(a) $v_3 = \frac{v_1 + v_2}{2}$ (b) $v_3 = \frac{v_1 v_2}{v_1 + v_2}$ (c) $v_3 = \frac{v_1 v_2}{2v_1 - v_2}$ (d) $v_3 = \frac{v_1 v_2}{2v_2 - v_1}$

(f) A cyclist starts from the centre O of a circular track of radius 1 km. He rides along the track to point P on the circumference and back to O. If the time taken for the journey is 2 min, the average speed of the cyclist is:

(a) $\frac{\pi}{2}$ km min^{-1} (b) π km min^{-1} (c) $\frac{1}{2}$ km min^{-1} (d) $\frac{\pi}{4}$ km min^{-1}

(g) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(h) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(i) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(j) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(k) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(l) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(m) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(n) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(o) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(p) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(q) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(r) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(s) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(t) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(u) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(v) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(w) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(x) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(y) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(z) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(aa) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(bb) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(cc) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(dd) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(ee) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(ff) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(gg) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(hh) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(ii) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(jj) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(kk) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(ll) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(mm) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(nn) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(oo) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(pp) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(qq) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(rr) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

(ss) A car moving with a constant acceleration covers the distance between two points 70 m apart in 5 s. The speed of the car as it passes the second point is 18 m s^{-1}. The speed of the car at the first point is:

(a) 10 m s^{-1} (b) 12 m s^{-1} (c) 14 m s^{-1} (d) 16 m s^{-1}

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(a) Find the indefinite integral $\int \frac{\sqrt{x}}{x+1}\,dx$. Express your answer in terms of the inverse tangent function.

The integral is equal to $\frac{2}{3}$ and

$$\int \frac{\sqrt{x}}{x+1}\,dx = \frac{2}{3}\left[\tan^{-1}(x)\right]_0^1 = \frac{2}{3}\left[\tan^{-1}(1) - \tan^{-1}(0)\right]$$

(b) The integral $\int_0^1 \frac{\sqrt{x}}{x+1}\,dx$ is equal to $\frac{\pi}{6}$ $\frac{\pi}{3}$ $\frac{\pi}{2}$ $\frac{\pi}{4}$

$\therefore$ the integral equals $\frac{\pi}{3}$ $\left(\frac{\pi}{3}\right)\int_0^1 \tan^{-1}(x)\,dx = \frac{\pi}{3}$, so the answer is $\frac{\pi}{3}$.

(c) Find the indefinite integral $\int \sin^2(x)\cos^2(x)\,dx$. Express your answer in terms of $\sin(x)$ and $\cos(x)$.

The integral is equal to $\int \frac{\sin^2(2x)}{4}\,dx = \frac{\sin^2(2x)}{8}$

$\therefore$ the integral equals $\int \sin^2(x)\cos^2(x)\,dx = \frac{\sin^2(2x)}{8}$

(d) The indefinite integral $\int \frac{\sin(x)}{\cos(x)+1}\,dx$ is equal to $\ln(\cos(x)+1)$ $\ln(\cos(x))$ $\ln(\sin(x))$ $\ln(\sin(x)+1)$

The integral is equal to $\int \frac{\sin(x)}{\cos(x)+1}\,dx = \int \frac{\sin(x)}{\cos(x)+1}\,dx = \int \frac{\sin(x)}{\cos(x)+1}\,dx$

$\therefore$ the integral equals $\int \frac{\sin(x)}{\cos(x)+1}\,dx = \int \frac{\sin(x)}{\cos(x)+1}\,dx = \int \frac{\sin(x)}{\cos(x)+1}\,dx$

(e) Let $f(x)$ and $g(x)$ be functions defined on $[0,1]$ such that $f(x)$ is monotonically increasing and $g(x)$ is monotonically decreasing. Which of the following inequalities must be true?

$\int_0^1 f(x)g(x)\,dx \le \int_0^1 f(x)\,dx \int_0^1 g(x)\,dx$ $\int_0^1 f(x)g(x)\,dx \ge \int_0^1 f(x)\,dx \int_0^1 g(x)\,dx$ $\int_0^1 f(x)g(x)\,dx = \int_0^1 f(x)\,dx \int_0^1 g(x)\,dx$ $\int_0^1 f(x)g(x)\,dx \le \int_0^1 f(x)\,dx \int_0^1 g(x)\,dx$

(f) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(g) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(h) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(i) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(j) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(k) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(l) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(m) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(n) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(o) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(p) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(q) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(r) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(s) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(t) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(u) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(v) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(w) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(x) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(y) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

(z) Let $f(x)$ be a function defined on $[0,1]$. Which of the following inequalities must be true?

$\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \ge \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx = \int_0^1 |f(x)|\,dx$ $\int_0^1 f(x)\,dx \le \int_0^1 |f(x)|\,dx$

[illegible]

[illegible]

[illegible]

(ii) Let, length of the rectangle

Then, according to the question, $\frac{x+8}{x} = \frac{x}{x-4}$

$\Rightarrow \frac{x+8}{x} = \frac{x}{x-4}$ $\Rightarrow (x+8)(x-4) = x \times x$ $\Rightarrow x^2 - 4x + 8x - 32 = x^2$ $\Rightarrow 4x - 32 = 0$

$\Rightarrow 4x = 32$ $\Rightarrow x = \frac{32}{4} = 8$ $\Rightarrow$ Length of the rectangle

(iii) Let the original speed of the train be x km/h. Then,

Time taken to cover 54 km $= \frac{54}{x}$ h

Time taken to cover 54 km $= \frac{54}{x+3}$ h

$\Rightarrow \frac{54}{x} - \frac{54}{x+3} = 3$ $\Rightarrow 54(x+3) - 54x = 3x(x+3)$ $\Rightarrow 54x + 162 - 54x = 3x^2 + 9x$

$\Rightarrow 3x^2 + 9x - 162 = 0$ $\Rightarrow x^2 + 3x - 54 = 0$ $\Rightarrow x^2 + 9x - 6x - 54 = 0$

$\Rightarrow x(x+9) - 6(x+9) = 0$ $\Rightarrow (x-6)(x+9) = 0$

$\Rightarrow x = 6$ or $x = -9$

Speed of train can not be negative. $\therefore x = 6$

$\therefore$ The original speed of the train is 6 km/h.

(iv) Let the length of the side of the square be x cm.

Then, $\frac{x^2}{2} = 2x + 4$ $\Rightarrow x^2 = 4x + 8$ $\Rightarrow x^2 - 4x - 8 = 0$

$\Rightarrow x = \frac{4 \pm \sqrt{16+32}}{2} = \frac{4 \pm \sqrt{48}}{2} = \frac{4 \pm 4\sqrt{3}}{2} = 2 \pm 2\sqrt{3}$

$\Rightarrow x = 2 + 2\sqrt{3}$ or $x = 2 - 2\sqrt{3}$

Length of the side of the square cannot be negative. $\therefore x = 2 + 2\sqrt{3}$

(v) Let, the length of the side of the square be x cm.

Then, $\frac{x^2}{2} = 2x + 4$ $\Rightarrow x^2 = 4x + 8$ $\Rightarrow x^2 - 4x - 8 = 0$

$\Rightarrow x = \frac{4 \pm \sqrt{16+32}}{2} = \frac{4 \pm \sqrt{48}}{2} = \frac{4 \pm 4\sqrt{3}}{2} = 2 \pm 2\sqrt{3}$

$\Rightarrow x = 2 + 2\sqrt{3}$ or $x = 2 - 2\sqrt{3}$

Length of the side of the square cannot be negative. $\therefore x = 2 + 2\sqrt{3}$

(vi) Let, the length of the side of the square be x cm.

Then, $\frac{x^2}{2} = 2x + 4$ $\Rightarrow x^2 = 4x + 8$ $\Rightarrow x^2 - 4x - 8 = 0$

$\Rightarrow x = \frac{4 \pm \sqrt{16+32}}{2} = \frac{4 \pm \sqrt{48}}{2} = \frac{4 \pm 4\sqrt{3}}{2} = 2 \pm 2\sqrt{3}$

$\Rightarrow x = 2 + 2\sqrt{3}$ or $x = 2 - 2\sqrt{3}$

Length of the side of the square cannot be negative. $\therefore x = 2 + 2\sqrt{3}$

[illegible]

(b) [illegible]

[illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

(j) [illegible]

(k) [illegible]

(l) [illegible]

(m) [illegible]

(n) [illegible]

(o) [illegible]

(p) [illegible]

(q) [illegible]

(r) [illegible]

(s) [illegible]

(t) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[

[illegible]

[illegible]

[illegible]

[

10. Use $\sin(\tan^{-1} x)$ to find $\cos(\tan^{-1} x)$, as follows:

$$\frac{\sin}{\cos} = \frac{\sin}{\cos} = \frac{\sin}{\cos} \quad \text{[illegible]}$$

so $\frac{\sin}{\cos} = \frac{\sin}{\cos}$. Therefore

$\cos(\tan^{-1} x) =$ [illegible]

11. Let $y = \sin^{-1} x$ and $x = \cos(\log_e z)$.

$\therefore$ Then $\frac{dy}{dx} = \frac{dy}{dz} \cdot \frac{dz}{dx}$

$\therefore$ [illegible]

$\therefore$ [illegible]

$\therefore$ [illegible]

18. PROBLEMS ON TRAINS

IMPORTANT FACTS AND FORMULAE

[illegible]

SOLVED EXAMPLES

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Sol. [illegible]

[illegible]

[illegible]

[

[illegible] [illegible]

Sol. [illegible]

[illegible]

[illegible] [illegible]

Sol. [illegible]

[illegible]

[illegible] [illegible]

Sol. [illegible]

[illegible]

[illegible]

OBJECTIVE TYPE QUESTIONS

Multiple Choice (Tick ✓ the correct answer in each case)

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

5. [illegible]

6. [illegible]

7. [illegible]

(8) Solve $\left(1+x\right)\dfrac{dy}{dx}+y=\sin x$ | Bernoulli

[illegible] $\left(1+x\right)\dfrac{dy}{dx}+y=\sin x$

or the length of the [illegible] is [illegible]

Then $\dfrac{\left(1+x\right)y}{x}=\int\left(\sin x\right)\left(\dfrac{1}{x}\right)dx+\left(\dfrac{1}{x}\right)\left(\dfrac{1}{x}\right)\left(\dfrac{1}{x}\right)$

(9) Solve $\dfrac{\left(1+x\right)y}{x}\dfrac{dy}{dx}+\dfrac{y}{x}=\dfrac{1}{x}$ | Bernoulli

[illegible] $\dfrac{\left(1+x\right)y}{x}\dfrac{dy}{dx}+\dfrac{y}{x}=\dfrac{1}{x}$

Then $\dfrac{\left(1+x\right)y}{x}=\dfrac{y}{x}$ or $\left(1+x\right)\left(\dfrac{dy}{dx}\right)+y=\left(\dfrac{1}{x}\right)\left(\dfrac{1}{x}\right)$

(10) [illegible] [illegible] [illegible] [illegible]

Then $\dfrac{1}{x}\left(1+x\right)=\dfrac{1}{x}$

$=\dfrac{\left(1+x\right)y}{x}+\dfrac{y}{x}=\left(1+x\right)\dfrac{dy}{dx}$

(11) [illegible] [illegible] [illegible] [illegible]

Then $\dfrac{1}{x}=\left(1+x\right)\left(1+x\right)$

Then $\dfrac{\left(1+x\right)y}{x}=\left(1+x\right)\left(\dfrac{dy}{dx}\right)+\left(2x\right)\left(1+x\right)\left(\dfrac{dy}{dx}\right)$

$\left(\text{Bernoulli}\right)+\left(2x\right)\left(\dfrac{dy}{dx}\right)=\left(2x\right)\left(\dfrac{1}{x}\right)\left(\dfrac{dy}{dx}\right)+\left(\dfrac{dy}{dx}\right)\left(\dfrac{dy}{dx}\right)$

(12) [illegible] [illegible]

$=\dfrac{1}{x}\left(\dfrac{dy}{dx}\right)+\dfrac{1}{x}\left(\dfrac{dy}{dx}\right)=\left(\dfrac{dy}{dx}\right)\left(\dfrac{dy}{dx}\right)+\left(\dfrac{dy}{dx}\right)\left(\dfrac{dy}{dx}\right)$

(13) [illegible] [illegible] [illegible]

$=\left(\dfrac{dy}{dx}\right)\left(\dfrac{dy}{dx}\right)+\left(\dfrac{dy}{dx}\right)\left(\dfrac{dy}{dx}\right)=\left(\dfrac{dy}{dx}\right)\left(\dfrac{dy}{dx}\right)$

(14) [illegible] [illegible] [illegible] [illegible]

$=\left(\dfrac{dy}{dx}\right)\left(\dfrac{dy}{dx}\right)+\left(\dfrac{dy}{dx}\right)\left(\dfrac{dy}{dx}\right)=\left(\dfrac{dy}{dx}\right)\left(\dfrac{dy}{dx}\right)$

(15) [illegible] [illegible] [illegible] [illegible]

$=\left(\dfrac{dy}{dx}\right)\left(\dfrac{dy}{dx}\right)+\left(\dfrac{dy}{dx}\right)\left(\dfrac{dy}{dx}\right)=\left(\dfrac{dy}{dx}\right)\left(\dfrac{dy}{dx}\right)$

(16) [illegible] [illegible] [illegible] [illegible]

[illegible]

[illegible]

[illegible]

The total distance travelled in the first 10 seconds is $\int_0^{10} |v(t)|\,dt$ metres.

$$= \int_0^{10} \left|\frac{t^2}{t+1} - 3\right| dt = \int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt$$

(iii) $\text{Average speed} = \dfrac{\text{Total distance}}{\text{Time}} = \dfrac{\int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt}{10} = \dfrac{\int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt}{10}$

Calculator: $\dfrac{\int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt}{10} = \dfrac{\int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt}{10} = 1.96$ (3dp)

(b) Graphical method: $\int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt = 19.6$ (3dp)

$$\int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt = \int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt$$

Calculator: $\dfrac{\int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt}{10} = \dfrac{\int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt}{10} = 1.96$ (3dp)

Calculator: $\dfrac{\int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt}{10} = \dfrac{\int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt}{10} = 1.96$ (3dp)

(iii) Speed is the rate change of a quantity $= \dfrac{\text{Change}}{\text{Time}} = \dfrac{\text{Change}}{\text{Time}}$

$$= \frac{\text{Change}}{\text{Time}} = \frac{\text{Change}}{\text{Time}} = \frac{\text{Change}}{\text{Time}}$$

Let the speed of the car at the instant. Then the car is speed $= 1.96$ (3dp)

$\therefore$ $v = 1.96$ $\Rightarrow$ $\dfrac{t^2-3t-3}{t+1} = 1.96$ (3dp)

(iv) Speed of the car is the derivative of the

$$\frac{d}{dt}\left(\frac{t^2-3t-3}{t+1}\right) = \frac{d}{dt}\left(\frac{t^2-3t-3}{t+1}\right) = \text{Derivative of}$$

Let the speed of the car at the instant. Then the speed is $= 1.96$ (3dp)

$\therefore$ $v = 1.96$ $\Rightarrow$ $\dfrac{t^2-3t-3}{t+1} = 1.96$ (3dp)

(v) $\text{Average velocity} = \dfrac{\text{Change}}{\text{Time}} = \dfrac{\int_0^{10} v\,dt}{10} = \dfrac{\int_0^{10} v\,dt}{10}$

$\text{Average velocity} = \dfrac{\text{Change}}{\text{Time}} = \dfrac{\text{Change}}{\text{Time}}$

Calculator: $\dfrac{\int_0^{10} v\,dt}{10} = \dfrac{\int_0^{10} v\,dt}{10} = 1.96$ (3dp)

(c) Let the height of the tower be h metres.

Then, we have a point $(0, h)$ on the curve $y = \dfrac{1}{x+1} + 3$

$$\int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt = \int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt = \int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt$$

$$\int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt = \int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt = \int_0^{10} \left|\frac{t^2-3t-3}{t+1}\right| dt$$

(b) Let the height of the tower be h metres.

Then, we have a point $(0, h)$ on the curve $y = \dfrac{1}{x+1} + 3$

$\text{Area} = \dfrac{1}{2}\left(\dfrac{\text{Sum}}{2}\right) \times \dfrac{\text{Sum}}{2} = \dfrac{\text{Sum}}{2} = \dfrac{\text{Sum}}{2}$ $\Rightarrow$ $\dfrac{\text{Sum}}{2} = \dfrac{\text{Sum}}{2}$

(c) Let the height of the tower be h metres.

Then, we have a point $(0, h)$ on the curve $y = \dfrac{1}{x+1} + 3$

$\therefore$ [illegible]

10. Speed of the [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

Speed of [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

Relative speed [illegible]

$\therefore$ [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

11. [illegible]

Resultant speed [illegible]

Relative speed [illegible]

$\therefore$ $\frac{[illegible]}{[illegible]}$ [illegible]

12. [illegible]

Resultant speed [illegible]

$$= [illegible] \quad \therefore [illegible]$$

$\therefore$ $\frac{[illegible]}{[illegible]}$ [illegible]

13. Resultant speed [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

14. Resultant speed [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

[illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

15. [illegible] $\frac{[illegible]}{[illegible]}$ [illegible]

Let the speed of [illegible] be [illegible]

Then [illegible]

$\therefore$ [illegible]

So strong wind [illegible]

$\therefore$ [illegible]

[illegible]. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]. [illegible]

[illegible]

[illegible]

[

[illegible]

PROBLEM 10

[illegible] SUFFICIENCY TYPE [illegible]

[illegible]

Theorem (Sufficiency Type [illegible]). [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

(j) [illegible]

(k) [illegible]

(l) [illegible]

(m) [illegible]

(n) [illegible]

(o) [illegible]

(p) [illegible]

(q) [illegible]

(r) [illegible]

(s) [illegible]

(t) [illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]				

[illegible]

[illegible]

[illegible]

[illegible]

1. Speed of a ship in km/hr = $\frac{[illegible]}{[illegible]}$

$= \frac{[illegible]}{[illegible]} = [illegible]$ km/hr.

The speed of the current = [illegible] km/hr.

∴ The speed of the ship = [illegible] km/hr.

2. Speed of the ship = $\frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = [illegible]$ km/hr.

Time taken when the ship moves

The time taken to cover the [illegible] $= \frac{[illegible]}{[illegible]}$

$= [illegible]$ hrs $= \frac{[illegible]}{[illegible]}$

∴ The speed of the current = [illegible] km/hr.

3. Time taken by [illegible] $= \frac{[illegible]}{[illegible]} = [illegible]$ hrs $= [illegible]$

Time taken by [illegible] $= \frac{[illegible]}{[illegible]}$

$= [illegible]$

Speed of the current $= [illegible] - [illegible] = [illegible]$

The time taken by the [illegible] $= \frac{[illegible]}{[illegible]}$

∴ The speed of the ship = [illegible] km/hr.

4. Speed of the ship $= \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = [illegible]$ km/hr.

Time taken $= \frac{[illegible]}{[illegible]}$

$= [illegible]$ hrs.

The time taken to cover the distance $= \frac{[illegible]}{[illegible]}$

$= [illegible]$ hrs $= [illegible]$

∴ Speed $= \frac{[illegible]}{[illegible]} = [illegible]$ km/hr.

∴ The speed of the ship = [illegible] km/hr.

5. [illegible]

(i) [illegible]

(ii) [illegible]

The speed of the current = [illegible] km/hr.

∴ The speed of the ship = [illegible] km/hr.

6. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

19. BOATS AND STREAMS

IMPORTANT FACTS AND FORMULAE

1. [illegible]
2. [illegible]

[illegible]

3. [illegible]

[illegible]

SOLVED EXAMPLES

Ex. 1. [illegible]

Sol. [illegible]

[illegible]

Ex. 2. [illegible]

Sol. [illegible]

[illegible]

Ex. 3. [illegible]

Sol. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] 111.

[illegible] TYPE QUESTIONS

[illegible]

1. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

2. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

3. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

4. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

5. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

6. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

7. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

8. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

9. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

10. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

11. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

12. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

24. [illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

ANSWERS

1. (a)	2. (d)	3. (b)	4. (d)	5. (a)	6. (d)	7. (b)	8. (c)
9. (a)	10. (b)	11. (b)	12. (c)	13. (a)	14. (c)	15. (c)	16. (b)
17. (c)	18. (c)	19. (c)	20. (d)	21. (a)	22. (c)	23. (c)	24. (c)

SOLUTIONS

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

5. [illegible]

6. [illegible]

7. [illegible]

8. [illegible]

[illegible]

[illegible]

[illegible]

[illegible] [illegible]

[illegible]

$$[illegible]$$

[illegible] [illegible]

[illegible]

$$[illegible]$$

[illegible] [illegible]

[illegible]

$$[illegible]$$

[illegible] [illegible]

[illegible]

$$[illegible]$$

[illegible]

[illegible]

[illegible] [illegible]

[illegible]

$$[illegible]$$

[illegible]

[illegible]

$$[illegible]$$

[illegible]

[illegible]

$$[illegible]$$

[illegible]

[illegible]

[illegible] [illegible]

[illegible]

$$[illegible]$$

[illegible]

[illegible]

$$[illegible]$$

[illegible]

[illegible]

[illegible]

[illegible]: [illegible]

DATA SUFFICIENCY TYPE QUESTIONS

[illegible]

(1) [illegible]

(2) [illegible]

(3) [illegible]

(4) [illegible]

(5) [illegible]

(6) [illegible]

(7) [illegible]

(8) [illegible]

(9) [illegible]

(10) [illegible]

(11) [illegible]

(12) [illegible]

(13) [illegible]

(14) [illegible]

(15) [illegible]

(16) [illegible]

(17) [illegible]

(18) [illegible]

(19) [illegible]

(20) [illegible]

(21) [illegible]

(22) [illegible]

(23) [illegible]

(24) [illegible]

(25) [illegible]

(26) [illegible]

(27) [illegible]

(28) [illegible]

(29) [illegible]

(30) [illegible]

(31) [illegible]

(32) [illegible]

(33) [illegible]

(34) [illegible]

(35) [illegible]

(36) [illegible]

(37) [illegible]

(38) [illegible]

(39) [illegible]

(40) [illegible]

(41) [illegible]

(42) [illegible]

(43) [illegible]

(44) [illegible]

(45) [illegible]

(46) [illegible]

(47) [illegible]

(48) [illegible]

(49) [illegible]

(50) [illegible]

(51) [illegible]

(52) [illegible]

(53) [illegible]

(54) [illegible]

(55) [illegible]

(56) [illegible]

(57) [illegible]

(58) [illegible]

(59) [illegible]

(60) [illegible]

(61) [illegible]

(62) [illegible]

(63) [illegible]

(64) [illegible]

(65) [illegible]

(66) [illegible]

(67) [illegible]

(68) [illegible]

(69) [illegible]

(70) [illegible]

(71) [illegible]

(72) [illegible]

(73) [illegible]

(74) [illegible]

(75) [illegible]

(76) [illegible]

(77) [illegible]

(78) [illegible]

(79) [illegible]

(80) [illegible]

(81) [illegible]

(82) [illegible]

(83) [illegible]

(84) [illegible]

(85) [illegible]

(86) [illegible]

(87) [illegible]

(88) [illegible]

(89) [illegible]

(90) [illegible]

(91) [illegible]

(92) [illegible]

(93) [illegible]

(94) [illegible]

(95) [illegible]

(96) [illegible]

(97) [illegible]

(98) [illegible]

(99) [illegible]

(100) [illegible]

[illegible]

MARKING

[illegible]

SOLUTIONS

[illegible]

20. ALLIGATION OR MIXTURE

IMPORTANT FACTS AND FORMULAE

1. **Alligation:** It is the rule that enables us to find the ratio in which two or more kinds of a certain commodity at the given prices must be mixed to produce a mixture of a mean price.
2. **Mean Price:** The cost price of a unit quantity of the mixture is called the mean price.
3. **Rule of Alligation:** If x_1 and x_2 are the prices of a unit quantity of two kinds of a commodity and m is their mean price, then

$$\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}} = \frac{(x_2 - m)}{(m - x_1)} = \frac{\text{C.P. of dearer} - \text{Mean price}}{\text{Mean price} - \text{C.P. of cheaper}}$$

This is known as alligation.

x_1 (C.P. of cheaper unit of mixture) x_2 (C.P. of dearer unit of mixture)

m (Mean price)

$(m - x_1)$ $(x_2 - m)$

Cheaper quantity : Dearer quantity $= (x_2 - m) : (m - x_1)$

4. Suppose a vessel is filled with a liquid, of which a quantity x is taken out and replaced by water. If this process is repeated n times, then

Quantity of pure liquid in final mixture	$\left(1 - \frac{x}{y}\right)^n$	y

SOLVED EXAMPLES

Ex. 1. A vessel contains a mixture of 10 litres of milk and water in the ratio 3 : 2. How much water should be added to make the ratio 1 : 2 ?

Sol. Let the mixture be of x litres.

Then, $\left(\frac{3}{5}x\right)$ litres of milk and $\left(\frac{2}{5}x\right)$ litres of water.

$\left(\frac{3}{5}x\right)$ $\left(\frac{2}{5}x\right)$

$\left(\frac{3}{5}x\right) : \left(\frac{2}{5}x\right) = 3 : 2$

$\left(\frac{3}{5}x\right)$ $\left(\frac{2}{5}x\right)$

Water added $= \left(\frac{3}{5}x - \frac{2}{5}x\right) = \frac{x}{5}$

So, $\frac{x}{5} = 10$ litres. $\left(\frac{2}{5}x\right) = 4$ litres.

Let y litres of water be added to the mixture to make the ratio 1 : 2.

Then, $\left(\frac{2}{5}x + y\right) : \left(\frac{3}{5}x\right) = 1 : 2$

$\left(\frac{2}{5}x + y\right) : \left(\frac{3}{5}x\right) = 1 : 2$

$\left(\frac{2}{5}x + y\right) = \left(\frac{1}{2} \times \frac{3}{5}x\right)$

$\left(\frac{2}{5}x + y\right) = \left(\frac{3}{10}x\right)$

$y = \left(\frac{3}{10}x - \frac{2}{5}x\right) = \frac{x}{10}$

$y = \frac{x}{10} = 1$ litre

Ex 5 In triangle ABC, $\sin A = \frac{3}{5}$, $\cos B = \frac{5}{13}$. Find $\sin C$ and $\cos C$.

Sol $\sin A = \frac{3}{5}$ $\Rightarrow$ $\cos A = \frac{4}{5}$

$\cos B = \frac{5}{13}$ $\Rightarrow$ $\sin B = \frac{12}{13}$

$\sin C = \sin(A+B) = \sin A\cos B + \cos A\sin B = \frac{3}{5}\cdot\frac{5}{13} + \frac{4}{5}\cdot\frac{12}{13} = \frac{63}{65}$

$\cos C = -\cos(A+B) = \sin A\sin B - \cos A\cos B = \frac{3}{5}\cdot\frac{12}{13} - \frac{4}{5}\cdot\frac{5}{13} = \frac{16}{65}$

Ex 6 Show that $\sin^{-1}\frac{3}{5} + \sin^{-1}\frac{5}{13} = \sin^{-1}\frac{63}{65}$.

Sol $\sin^{-1}\frac{3}{5} = A$, $\sin^{-1}\frac{5}{13} = B$, $\sin^{-1}\frac{63}{65} = C$

$\sin A = \frac{3}{5}$, $\sin B = \frac{5}{13}$, $\sin C = \frac{63}{65}$

$\cos A = \frac{4}{5}$, $\cos B = \frac{12}{13}$, $\cos C = \frac{16}{65}$

$\sin(A+B) = \sin A\cos B + \cos A\sin B = \frac{3}{5}\cdot\frac{12}{13} + \frac{4}{5}\cdot\frac{5}{13} = \frac{56}{65}$

$\cos(A+B) = \cos A\cos B - \sin A\sin B = \frac{4}{5}\cdot\frac{12}{13} - \frac{3}{5}\cdot\frac{5}{13} = \frac{33}{65}$

$\sin(A+B) = \sin C$, $\cos(A+B) = \cos C$

[illegible]

[illegible]

[illegible]

Q6. [illegible]

[illegible]

[illegible]

[

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

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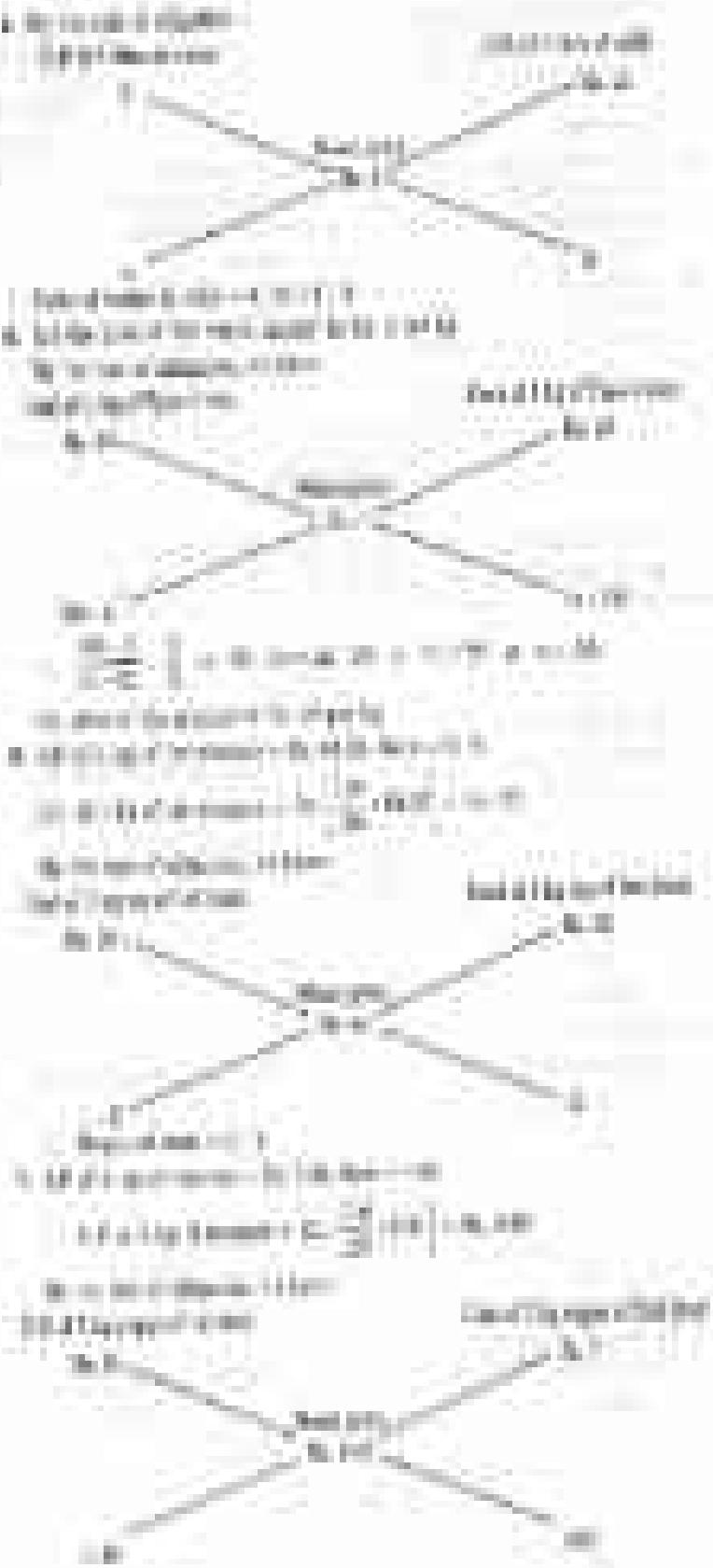
[illegible]

[illegible]

[illegible]

[illegible]



[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(c) [illegible]

[illegible]

(d) [illegible]

[illegible]

(e) [illegible]

[illegible]

(f) [illegible]

[illegible]

(g) [illegible]

[illegible]

(h) [illegible]

[illegible]

21. SIMPLE INTEREST

IMPORTANT FACTS AND FORMULAE

1. Principal : [illegible]
2. Interest : [illegible]
3. Amount : [illegible]

$$\text{Amount} = \text{Principal} + \text{Interest}$$

$$\text{Interest} = \frac{\text{Principal} \times \text{Rate} \times \text{Time}}{100}$$

$$\text{Principal} = \frac{100 \times \text{Interest}}{\text{Rate} \times \text{Time}}$$

$$\text{Rate} = \frac{100 \times \text{Interest}}{\text{Principal} \times \text{Time}} \quad \text{and} \quad \text{Time} = \frac{100 \times \text{Interest}}{\text{Principal} \times \text{Rate}}$$

SOLVED EXAMPLES

Ex. 1. [illegible] $\frac{1}{2}$ [illegible]

Sol. [illegible]

Ex. 2. [illegible] $\frac{1}{2}$ [illegible]

Sol. [illegible]

Ex. 3. [illegible] $\frac{1}{2}$ [illegible]

Sol. [illegible]

[illegible]

Ex. [illegible] [illegible]

Sol. [illegible]

[illegible]

Ex. [illegible] [illegible]

Sol. [illegible]

[illegible]

Ex. [illegible] [illegible]

Sol. [illegible]

[illegible]

Ex. [illegible] [illegible]

Sol. [illegible]

[illegible]

Ex. [illegible] [illegible]

Sol. [illegible]

[illegible]

Ex. [illegible] [illegible]

Sol. [illegible]

[illegible]

[illegible]

(ii) [illegible] [illegible] [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible]
(c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible]
(c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible]
(c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

34. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible]

(d) [illegible] (e) [illegible]

35. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible]

(d) [illegible] (e) [illegible]

36. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

37. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

38. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

39. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

40. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

41. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

42. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

43. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

44. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

45. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

46. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

47. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

48. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

49. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

50. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

1. [illegible]

   [illegible]

2. [illegible]

   [illegible]

3. [illegible]

   [illegible]

4. [illegible]

   [illegible]

5. [illegible]

6. [illegible]

   [illegible]

7. [illegible]

   [illegible]

8. [illegible]

   [illegible]

9. [illegible]

   [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(i) [illegible]

(ii) [illegible]

(iii) [illegible]

[illegible]

(i) [illegible]

(ii) [illegible]

[illegible]

[illegible]

(i) [illegible]

(ii) [illegible]

[illegible]

[illegible]

(i) [illegible]

(ii) [illegible]

[illegible]

[illegible]

(i) [illegible]

(ii) [illegible]

[illegible]

[illegible]

(i) [illegible]

(ii) [illegible]

[illegible]

[illegible]

(i) [illegible]

(ii) [illegible]

[illegible]

[illegible]

(i) [illegible]

(ii) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

18. [illegible]

19. [illegible]

20. [illegible]

21. [illegible]

22. [illegible]

23. [illegible]

24. [illegible]

25. [illegible]

26. [illegible]

27. [illegible]

[illegible]

[illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible]

EXERCISE 23.1

'SUM SUPERCHARGE' TYPE DECODE

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible] $\left[\begin{array}{c} [illegible] \\ [illegible] \end{array}\right]$

   [illegible]

   [illegible]

   [illegible]

   [illegible]

   [illegible]

2. [illegible]

   [illegible]

   [illegible]

   [illegible]

   [illegible]

   [illegible]

3. [illegible]

   [illegible]

   [illegible]

   [illegible]

   [illegible]

   [illegible]

   [illegible]

   [illegible]

4. [illegible]

   [illegible]

   [illegible]

   [illegible]

   [illegible]

   [illegible]

5. [illegible]

   [illegible]

$$\cdots \left\{ \cdots \right\} \cdots \left\{ \cdots \right\} \cdots \left\{ \cdots \right\} \

22. COMPOUND INTEREST

[illegible]

[illegible]

IMPORTANT FACTS AND FORMULAE

[illegible]

1. **[illegible]** [illegible]

[illegible]

2. [illegible]

[illegible]

3. [illegible]

[illegible]

4. [illegible]

[illegible]

5. [illegible]

[illegible]

6. [illegible]

[illegible]

[illegible] EXAMPLES

Ex. 1. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

Sol. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

Ex. 2. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

Sol. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

Ex. 3. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

Sol. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

Ex. 4. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

Sol. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

Ex. 5. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

Sol. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

Ex. 6. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

Sol. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

Ex. 7. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

Sol. [illegible] $\left(\frac{[illegible]}{[illegible]}\right)$ [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Q4. [illegible] Q4. [illegible] [illegible] [illegible] [illegible]

Sol. [illegible]

[illegible]

Q5. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

Sol. [illegible]

[illegible]

Q6. [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

2. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

3. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

4. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

5. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

6. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

7. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

8. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

9. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) None of these

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) None of these

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

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답안지

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해설지

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[illegible]

[illegible]

(ii) [illegible]

[illegible]

[illegible]

(iii) [illegible]

[illegible]

[illegible]

(iv) [illegible]

[illegible]

(v) [illegible]

[illegible]

(vi) [illegible]

[illegible]

(vii) [illegible]

[illegible]

(viii) [illegible]

[illegible]

(ix) [illegible]

[illegible]

(x) [illegible]

[illegible]

[illegible]

[illegible]

[illegible] 108

DATA SUFFICIENCY (YES/NO QUESTIONS)

[illegible]

Directions: [illegible] Each of the questions is followed by two statements, [illegible] Mark the answer as [illegible]

(A) [illegible]

(B) [illegible]

(C) [illegible]

(D) [illegible]

(E) [illegible]

[illegible]

[illegible]

[

(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

(j) [illegible]

(k) [illegible]

(l) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(4) [illegible]

[illegible]

[illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

[illegible]

(d) [illegible]

[illegible]

(e) [illegible]

[illegible]

(f) [illegible]

[illegible]

[illegible]

[illegible]

23. LOGARITHMS

IMPORTANT FACTS AND FORMULAE

1. **Logarithm:** If a is a positive real number other than 1 and $a^x = y$, then logarithm of y to the base a is x. We write $\log_a y = x$.

   Example:

   (i) $10^3 = 1000 \Rightarrow \log_{10} 1000 = 3$ (ii) $2^3 = 8 \Rightarrow \log_2 8 = 3$

   (iii) $4^{-2} = \frac{1}{16} \Rightarrow \log_4 \frac{1}{16} = -2$ (iv) $(0.01)^{-1} = 100 \Rightarrow \log_{0.01} 100 = -1$

2. **Properties of Logarithms:**

   (i) $\log_a(xy) = \log_a x + \log_a y$ (ii) $\log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$

   (iii) $\log_a 1 = 0$ (iv) $\log_a a = 1$

   (v) $\log_a x^n = n\log_a x$ (vi) $\log_a x = \frac{1}{\log_x a}$

   (vii) $\log_a x = \frac{\log_b x}{\log_b a} = \frac{\log_c x}{\log_c a}$

   Remember: Logarithm of a negative number, 0, or unity is not defined.

3. **Common logarithm:** Logarithm to the base 10 is called common logarithm.

4. (i) The number of the character (integer) in any given number is called the characteristic.

   Characteristic: The integral part of the logarithm of the number is called the characteristic.

   Example: When the number is greater than 1.

   In this case the characteristic is one less than the number of digits in the left of the decimal point in the given number.

   Let (ii) When the number is not less than 1

   In this case, the characteristic is one less than digit (no) number of digits between the decimal point and the first significant digit of the number and it is negative.

   Normally (i) + (ii) = 1 (one) or (ii) 2 (two) and 3 (three) etc.

   Example:

Number	Characteristic	Number	Characteristic
1234.56	3	0.0012	3
12.345	1	0.00012	4
1.0123	0	0.00002	5

   Mantissa: The mantissa is not the logarithm of the number but it depends on the characteristic. The mantissa is the fractional part of the logarithm.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] [illegible] [illegible]

[illegible] **[illegible]**

1. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

2. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

3. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

4. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

5. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

27. [illegible] (2010)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

28. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

29. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

30. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

31. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

32. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

33. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

34. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

35. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

36. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

37. [illegible] (2008)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

38. [illegible] (2008)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

39. [illegible] (2008)

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

1. [illegible]

2. [illegible]

3. [illegible]

[illegible] Let $\log_{[illegible]}(x) = 1$. Then $([illegible])^{x} = x$ so $([illegible])^{x^{[illegible]}} = x^{[illegible]}$ or $x = x^{[illegible]}$

$\therefore \log_{[illegible]}(x) = [illegible]$

[illegible] Let $\log_{[illegible]}(100) = x$.

Then $(1) = 100^{x}$ so $(1)^{[illegible]} = \frac{1}{100^{x}} = \frac{1}{100^{x}} = 100^{-x}$ or $x = 1$

$\therefore \log_{[illegible]}(100) = 1$.

[illegible] Let $\log_{[illegible]}(100) = x$.

Then $(1) = 100^{x}$ so $\frac{1}{100} = 100^{x}$ or $100^{-1} = 100^{x}$ or $-1 = x$ or $x = -1$

[illegible] $\log_{[illegible]}(100) = x$.

Then $(1) = (100)^{x} = \frac{100}{100^{x}} = 1 = \frac{1}{100} = 1 = 100^{-1}$ so $x = -1$

$\therefore \log_{[illegible]}(100) = -1$

[illegible] $\log_{[illegible]}(x) = 1$ if $x = \frac{1}{[illegible]}$

[illegible] $\log_{[illegible]}(x) = \frac{1}{[illegible]}$ or $x = [illegible]^{\frac{1}{[illegible]}}$

[illegible] $\log_{[illegible]}\left(\frac{[illegible]}{[illegible]}\right) = x$ so $\frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = [illegible]$ or $\frac{[illegible]}{[illegible]}$

$\therefore x = [illegible]$

[illegible] $\log_{[illegible]}(x) = 1$ or $\log_{[illegible]}(x) = \frac{[illegible]}{[illegible]}$ so $x^{[illegible]} = x$ or $x = x^{[illegible]} = x^{[illegible]}$

$\therefore x = x^{[illegible]}$ or $x = x^{[illegible]}$

[illegible] $\log_{[illegible]}(x) = \frac{[illegible]}{[illegible]}$ or $x = ([illegible])^{\frac{[illegible]}{[illegible]}} = ([illegible])^{\frac{[illegible]}{[illegible]}} = [illegible]^{\frac{[illegible]}{[illegible]}}$

[illegible] $\log_{[illegible]}(x) = \frac{1}{[illegible]}$ or $x = ([illegible])^{\frac{1}{[illegible]}} = [illegible]$

[illegible] $\log_{[illegible]}(x) = \frac{1}{[illegible]}$ or $x = x^{[illegible]} = x^{[illegible]} = \frac{1}{[illegible]} = x^{[illegible]} = \frac{[illegible]}{[illegible]} = [illegible]$

$\therefore x = [illegible]$ or $x = [illegible]$

[illegible] $\log_{[illegible]}(x) = x$ or $x = x^{[illegible]} = x^{[illegible]} = x^{[illegible]}$

[illegible] $\log_{[illegible]}(x) = [illegible]$

$\therefore \log_{[illegible]}(x) = [illegible] = [illegible] = x^{[illegible]} = x^{[illegible]} = x^{[illegible]}$

[illegible] $\log_{[illegible]}(x) = \frac{1}{[illegible]}$ or $x = [illegible]^{\frac{1}{[illegible]}} = [illegible]$

[illegible] $\log_{[illegible]}(x) = \frac{1}{[illegible]}$ or $x = x^{[illegible]} = x^{[illegible]} = \frac{1}{[illegible]} = x^{[illegible]} = \frac{[illegible]}{[illegible]} = [illegible]$

$\therefore x = [illegible]$ or $x = [illegible]$

[illegible] $\log_{[illegible]}(x) = [illegible]$ or $x = [illegible]^{[illegible]} = [illegible]^{[illegible]} = [illegible]$

[illegible] $\log_{[illegible]}(x) = [illegible]$ or $x = [illegible]^{[illegible]}$

$\therefore \log_{[illegible]}(x) = [illegible] = [illegible] = [illegible]^{[illegible]} = [illegible]^{[illegible]} = [illegible]$

[illegible] $\log_{[illegible]}(x) = [illegible]$ so $[illegible] = [illegible]$ or $[illegible] = [illegible]$

$\therefore x = [illegible]$ or $\log_{[illegible]}(x) = [illegible]$

[illegible] Let $\log_{[illegible]}(x) = x$

Then $\log_{[illegible]}(x) = x$ or $[illegible]^{x} = x$ or $[illegible]^{x} - x = 0$

$\therefore x^{[illegible]} = \log_{[illegible]}(x) = [illegible]$

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

24. AREA

FUNDAMENTAL CONCEPTS

1. Answer the following :

[illegible]

2. [illegible]

[illegible]

3. [illegible]

[illegible]

IMPORTANT FORMULAS

I. [illegible]

[illegible]

II. [illegible]

III. [illegible]

IV. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Q. 1. [illegible] **(a)** [illegible] **(b)** [illegible] **(c)** [illegible] **(d)** [illegible]

Sol. Let length = [illegible] and breadth = [illegible] km.

[illegible]

Q. 2. [illegible] **(a)** [illegible] **(b)** [illegible] **(c)** [illegible] **(d)** [illegible]

Sol. Let length = [illegible] km, breadth = [illegible] km.

[illegible]

Q. 3. [illegible] **(a)** [illegible] **(b)** [illegible] **(c)** [illegible] **(d)** [illegible]

Sol. [illegible]

Q. 4. [illegible] **(a)** [illegible] **(b)** [illegible] **(c)** [illegible] **(d)** [illegible]

Sol. [illegible]

Q. 5. [illegible] **(a)** [illegible] **(b)** [illegible] **(c)** [illegible] **(d)** [illegible]

Sol. [illegible]

Q. 6. [illegible] **(a)** [illegible] **(b)** [illegible] **(c)** [illegible] **(d)** [illegible]

Sol. [illegible]

[illegible] 11. Find the area of a square one of whose diagonals is [illegible] in length.

(b) [illegible]

[illegible] 12. [illegible] Find [illegible] Dominic Williams [illegible]

(b) [illegible]

[illegible] 13. If [illegible] is [illegible] in length, find the [illegible] in the [illegible]

(b) [illegible]

$$[illegible]$$

$$[illegible]$$

$$[illegible]$$

[illegible] 14. [illegible] Find [illegible]

(b) [illegible]

$$[illegible]$$

$$[illegible]$$

$$[illegible]$$

$$[illegible]$$

[illegible] 15. [illegible] (b) [illegible]

$$[illegible]$$

$$[illegible]$$

$$[illegible]$$

$$[illegible]$$

No. 12. [illegible]

Sol. [illegible]

No. 13. [illegible]

Sol. [illegible]

No. 14. [illegible]

Sol. [illegible]

No. 15. The area of a triangle can be found from the sides. Prove one of [illegible] for the area of an isosceles triangle in [illegible] that is base and length [illegible].

Sol. [illegible]

No. 16. The [illegible] is the base of an isosceles triangle of [illegible] and the isosceles is [illegible]. Find the area of the triangle.

Sol. [illegible]

No. 17. [illegible]

Sol. [illegible]

No. 18. [illegible] Find the [illegible] of the triangle.

Sol. [illegible]

[illegible]

[illegible]

[illegible]

[illegible] [illegible]

(a) [illegible]

[illegible]

[illegible] [illegible]

(a) [illegible]

[illegible]

[illegible] [illegible]

(a) [illegible]

[illegible]

[illegible] [illegible]

(a) [illegible]

[illegible]

[illegible] [illegible]

(a) [illegible]

[illegible]

[illegible] [illegible]

(a) [illegible]

[illegible]

[illegible] [illegible]

(a) [illegible]

[illegible]

[illegible]

[illegible] THE [illegible]

[illegible]

1. [illegible]
(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

2. [illegible]
(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

3. [illegible]
(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

4. [illegible]
(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

5. [illegible]
(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

6. [illegible]
(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

7. [illegible]
(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

8. [illegible]
(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

9. [illegible]
(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

10. [illegible]
(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

11. [illegible]
(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

12. [illegible]
(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

14. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(CAT, 2012)

15. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible]

(d) [illegible] (e) [illegible] **(CAT, 2010)**

16. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

17. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

18. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

19. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

20. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

21. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

22. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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(24) [illegible]

(25) [illegible]

(26) [illegible]

(27) [illegible]

(28) [illegible]

(29) [illegible]

(30) [illegible]

(31) [illegible]

(32) [illegible]

(33) [illegible]

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[illegible] [illegible] $\int_{[illegible]}^{[illegible]} [illegible]$

[illegible] $\int_{[illegible]}^{[illegible]} [illegible]$

$\therefore$ [illegible]

[illegible]

[illegible] [illegible]

[illegible]

[illegible] $\int_{[illegible]}^{[illegible]} [illegible]$

$\therefore$ [illegible]

[illegible] [illegible]

[illegible]

[illegible]

$\therefore$ [illegible]

[illegible] [illegible]

[illegible]

[illegible]

$\therefore$ [illegible]

[illegible] [illegible]

[illegible]

[illegible]

$\therefore$ [illegible]

[illegible] [illegible]

[illegible]

[illegible]

$\therefore$ [illegible]

[illegible] [illegible]

[illegible]

[illegible]

$\therefore$ [illegible]

[illegible]

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[illegible] [illegible]

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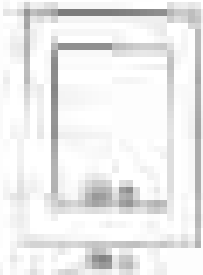

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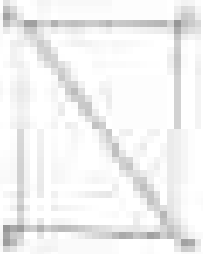

[illegible]

[illegible] [illegible]

[illegible]

(b) [illegible]

[illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

[illegible]

(f) [illegible]

(g) [illegible]

[illegible]

(h) [illegible]

[illegible]

(i) [illegible]

(j) [illegible]

[illegible]

(k) [illegible]

[illegible]

(l) [illegible]

[illegible]

(m) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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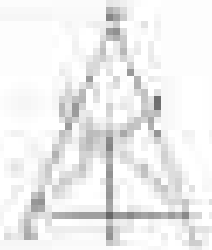
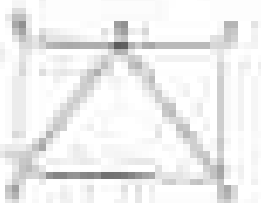


[illegible]

[illegible]

[illegible]



[illegible]

Hence $\int_{0}^{\frac{\pi}{2}} y\,dx = \frac{[illegible]}{[illegible]}\int_{0}^{\frac{\pi}{2}} [illegible]\,d\theta$ and $\int_{0}^{\frac{\pi}{2}} y\,dx = [illegible]$ cm^2

$\theta = \frac{\pi}{2}$

[illegible] Let θ be the angle of the sector in [illegible]. Then, for $0 \le \theta \le [illegible]$, we have

Hence, $\int_{0}^{\frac{\pi}{2}} y\,dx = [illegible]\int_{0}^{\frac{\pi}{2}} [illegible]\,d\theta$

Substituting in the equation $[illegible]$, we get $[illegible]$. Hence, the maximum area occurs when $\theta = [illegible]$.

Hence, the maximum area $= \int_{0}^{\frac{\pi}{2}} y\,dx = [illegible]\int_{0}^{\frac{\pi}{2}} [illegible]\,d\theta = [illegible]$ cm^2

[illegible] $\begin{cases} [illegible] & [illegible] \\ [illegible] & [illegible] \end{cases}$ Hence, [illegible] $\frac{\pi}{2}$. Each of these is $[illegible]$.

$\therefore$ [illegible] $\frac{[illegible]}{[illegible]}$ $\frac{[illegible]}{[illegible]}$

Hence, $[illegible]$, $[illegible]$ or $[illegible]$.

[illegible] Let the radius of a [illegible] be r cm and the angle of [illegible] be θ. Then, $\theta = \frac{[illegible]}{r}$.

Now, [illegible] $= \frac{[illegible]}{[illegible]}$ [illegible] $= \frac{[illegible]}{[illegible]}$ [illegible] $= [illegible]$

Hence, the area $= \int_{[illegible]}^{[illegible]} [illegible]\,d\theta = \int_{[illegible]}^{[illegible]} [illegible]\,d\theta = [illegible]$

$\therefore$ The area $= \left[\frac{[illegible]}{[illegible]} - \frac{[illegible]}{[illegible]}\right]$ [illegible] $= [illegible]$

[illegible] Let a circular [illegible] of radius r cm and [illegible] height h cm. Then, volume $= \int_{[illegible]}^{[illegible]} [illegible]\,dx$ cm^3

Now, [illegible] $= [illegible]$ or $[illegible]$ or $= \frac{[illegible]}{[illegible]}$ [illegible] $= \left[\frac{[illegible]}{[illegible]}\right]$ [illegible]

Hence, [illegible] $= [illegible]$ or $[illegible]$ or $= \left[\frac{[illegible]}{[illegible]}\right]$ [illegible] $= \frac{[illegible]}{[illegible]}$ [illegible]

Then, volume $= \int_{[illegible]}^{[illegible]} [illegible] = \left[\frac{[illegible]}{[illegible]}\right]$ cm^3

Lateral surface area $= \int_{[illegible]}^{[illegible]} [illegible] = \left[\frac{[illegible]}{[illegible]}\right]$ cm^2

Curved surface area $= \left[\frac{[illegible]}{[illegible]} - \frac{[illegible]}{[illegible]}\right]$ [illegible] $= [illegible]$

[illegible] $= \int_{[illegible]}^{[illegible]} [illegible]\,dx = \int_{[illegible]}^{[illegible]} [illegible]\,dx = \int_{[illegible]}^{[illegible]} [illegible]\,dx = [illegible]$

$= [illegible]$

[illegible] Area of [illegible] $= [illegible]$ $\int_{[illegible]}^{[illegible]} [illegible]\,dx$ cm^2

14. [illegible]

15. [illegible]

16. [illegible]

17. [illegible]

18. [illegible]

19. [illegible]

20. [illegible]

21. [illegible]

22. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] Let [illegible] be a [illegible] [illegible] [illegible]

182. [illegible]

183. [illegible]

$$= \frac{[illegible]}{[illegible]} [illegible] \, dx$$

184. [illegible]

[illegible]

$$= \int_{[illegible]}^{[illegible]} [illegible] \, dx$$

185. [illegible]

186. [illegible]

187. [illegible]

$$[illegible] = [illegible]$$

188. [illegible]

189. [illegible]

190. [illegible]

[illegible]

[illegible]

(18) [illegible]

[illegible]

(19) [illegible]

(20) [illegible]

(21) [illegible]

(22) [illegible]

(23) [illegible]

(24) [illegible]

(25) [illegible]

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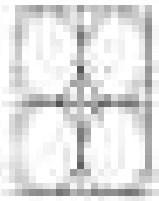
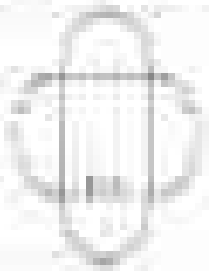


[illegible]



[illegible]

[illegible]

[illegible]

[illegible]

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DATA SUFFICIENCY (Y/N) [illegible]

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Directions: Questions [illegible] to [illegible] [illegible]

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Exercises 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 | 1.7 | 1.8 | 1.9 | 1.10 | 1.11 | 1.12 | 1.13 | 1.14 | 1.15 | 1.16 | 1.17 | 1.18 | 1.19 | 1.20 | 1.21 | 1.22 | 1.23 | 1.24 | 1.25 | 1.26 | 1.27 | 1.28 | 1.29 |

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25. VOLUME AND SURFACE AREA

IMPORTANT FORMULAE

1. Cuboid

Let length = l units, breadth = b units, height = h units. Then,

i. Volume = $(l \times b \times h)$ cubic units

ii. Surface area = $2(l \times b + b \times h + l \times h)$ sq. units

iii. Diagonal = $\sqrt{l^2 + b^2 + h^2}$ units

2. Cube

Let each edge of the cube = a units. Then,

i. Volume = (a^3) cubic units

ii. Surface area = $(6a^2)$ sq. units

iii. Diagonal = $(\sqrt{3}a)$ units

3. Cylinder

Let radius of the base = r units, height = h units. Then,

i. Volume = $(\pi r^2 h)$ cubic units

ii. Curved surface area = $(2\pi rh)$ sq. units

iii. Total surface area = $(2\pi r^2 + 2\pi rh)$ sq. units

= $(2\pi r(r + h))$ sq. units

4. Cone

Let radius of the base = r units, height = h units. Then,

i. Slant height, $l = \sqrt{r^2 + h^2}$ units

ii. Volume = $\left(\frac{1}{3}\pi r^2 h\right)$ cubic units

iii. Curved surface area = (πrl) sq. units

iv. Total surface area = $(\pi rl + \pi r^2)$ sq. units

5. Sphere

Let the radius of the sphere = r. Then,

i. Volume = $\left(\frac{4}{3}\pi r^3\right)$ cubic units

ii. Surface area = $(4\pi r^2)$ sq. units

6. Hemisphere

Let the radius of a hemisphere = r. Then,

i. Volume = $\left(\frac{2}{3}\pi r^3\right)$ cubic units

ii. Curved surface area = $(2\pi r^2)$ sq. units

iii. Total surface area = $(3\pi r^2)$ sq. units

Remark: Volume of a sphere : Volume of a hemisphere = 2 : 1

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Remark: Volume of a sphere : Volume of a hemisphere = 2 : 1

MIXED CHAPTER

Q.1. Find the volume and the surface area of a cuboid of the length 16 m, breadth 12 m and height 7 m.

Sol: Volume $= l \times b \times h = (16 \times 12 \times 7)$ m^3 $= 1344$ m^3

Surface area $= 2(lb + bh + hl) = 2(16 \times 12 + 12 \times 7 + 7 \times 16)$ m^2 $= 2(192 + 84 + 112)$ m^2 $= 784$ m^2

Q.2. Find the length of the diagonal and the surface area of a cuboid of length 12 m, breadth 4 m and height 3 m. (Use $\sqrt{2} = 1.414$ and $\sqrt{3} = 1.732$)

Sol: Length of a diagonal of a cuboid $= \sqrt{l^2 + b^2 + h^2}$

$= \sqrt{(12)^2 + (4)^2 + (3)^2} = \sqrt{169} = 13$ m

Q.3. The volume of a cuboid of length 4 cm, breadth 3 cm and height 2 cm is equal to the volume of a cube. Find the length of the diagonal of the cube.

Sol: (a) Volume of the cuboid (in cm^3) $= l \times b \times h = (4 \times 3 \times 2)$ cm^3 $= 24$ cm^3

Let the length of the side of the cube $= a$ cm

$\therefore$ Volume of the cube $= a^3$ cm^3

$\therefore$ $a^3 = 24$ cm^3 $\Rightarrow a = \sqrt[3]{24} = 2\sqrt[3]{3}$ cm

(b) Length of the diagonal of the cube $= a\sqrt{3}$ cm $= 2\sqrt[3]{3} \times \sqrt{3}$ cm $= 2\sqrt[3]{9}$ cm

Q.4. Find the number of bricks, each measuring 25 cm × 15 cm × 8 cm, required for covering a floor of a room 6 m long and 4 m wide. The length and the breadth of the room are to be taken in the direction of the length and breadth of the bricks.

Sol: Volume of the room $= (600 \times 400 \times 8)$ cm^3

Volume of a brick $= (25 \times 15 \times 8)$ cm^3

$\therefore$ Number of bricks $= \left(\frac{600 \times 400 \times 8}{25 \times 15 \times 8}\right) = 1024$

Q.5. Water flows from a pipe at the rate of 15 m s^{-1}. Find the length of water flowed in 1 minute if the diameter of the pipe is 14 cm. If this water fills a cuboid tank of the volume 154 m^3, find the height of the tank.

Sol: Water flowed in 1 minute $= (15 \times 60)$ m $= 900$ m

Length of water column flowed in 1 min $= \left(\frac{900 \times 100}{14}\right)$ cm $= \frac{4500}{7}$ cm

Volume of water column flowed in 1 min $= \left(\frac{22}{7} \times 7 \times 7 \times \frac{4500}{7}\right)$ cm^3 $= 154000$ cm^3

$\therefore$ Height of the tank $= \left(\frac{154000}{154 \times 100}\right)$ m $= 10$ m

Q.6. The dimensions of a room are 10 m, 8 m and 6 m. Find the length of a pole that can be placed in the room such that one end is on the floor and the other end is on the diagonally opposite corner of the room.

Sol: Volume of the room $= (10 \times 8 \times 6)$ m^3 $= 480$ m^3

Length of the diagonal $= \sqrt{(10)^2 + (8)^2 + (6)^2}$ m

$= \sqrt{100 + 64 + 36}$ m

$= \sqrt{200}$ m

Length of the pole required $= \left(\frac{480 \times 100}{200}\right)$ cm $= 240$ cm

Ex. 11. The diagonal of a cube is $10\sqrt{3}$ cm. Find its volume and surface area.

Sol. [illegible]

Ex. 12. The surface area of a cube is 294 sq. cm. Find its volume.

Sol. [illegible]

Ex. 13. A cuboidal [illegible] 2 cm. [illegible] 2 cuboids [illegible] 2 cm. [illegible]

Sol. [illegible]

Ex. 14. [illegible] 2 cm. [illegible] 2 cm. [illegible] 2 cm. [illegible]

Sol. [illegible]

Ex. 15. [illegible] 2 cm. [illegible] 2 cm. [illegible]

Sol. [illegible]

Ex. 16. [illegible] 2 cm. [illegible] 2 cm. [illegible]

Sol. [illegible]

Ex. 17. [illegible] 2 cm. [illegible] 2 cm. [illegible]

Sol. [illegible]

Ex. 18. [illegible] 2 cm. [illegible] 2 cm. [illegible]

Sol. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

21. 15. If the length of a rectangle is 20 cm and its diagonal is inclined to a side by an angle θ, find the area and length of the diagonal.

Sol. Given: $l = 20$ cm and $\angle \theta$ is [illegible]

[illegible]

22. 16. The diagonals of a rhombus are 16 cm and 12 cm. Find the area of the rhombus.

Sol. [illegible]

[illegible]

23. 17. The perimeter of a rhombus is 20 cm and one of its diagonals is 8 cm. Find the area of the rhombus.

Sol. [illegible]

[illegible]

24. 18. A circular piece of paper of radius 12 cm is cut into 4 equal sectors. Find the area of each sector.

Sol. [illegible]

[illegible]

25. 19. Find the area of a circle whose circumference is 44 cm.

Sol. [illegible]

[illegible]

Ex. [illegible]. [illegible]

Sol. [illegible]

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Sol. [illegible]

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Sol. [illegible]

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[illegible]. [illegible]

Sol. [illegible]

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[illegible]. [illegible]

Sol. [illegible]

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Q.6. [illegible]

Ans. [illegible]

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Q.7. [illegible]

Ans. [illegible]

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Q.8. [illegible]

Ans. [illegible]

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Q.9. [illegible]

Ans. [illegible]

$$[illegible]$$

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EXERCISE 19A

(OBJECTIVE TYPE QUESTIONS)

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Q.2. [illegible]

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Q.3. [illegible]

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Q.4. [illegible]

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12. [illegible]

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14. [illegible]

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15. [illegible]

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16. [illegible]

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18. [illegible]

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SOLUTIONS

1. Consider a rectangular prism of dimensions x, y, z.

$$\text{Surface area} = \frac{2(xy + yz + zx)}{\text{GCD}(x, y, z)}$$

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5. [illegible]

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(11) [illegible]

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(iii) $\text{Area of } \triangle ABC = \frac{1}{2}\left|\begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 3 & 4 \end{vmatrix}\right| = \frac{1}{2}\left|\begin{vmatrix} 1 & 1 & 1 \\ 0 & 1 & 2 \\ 0 & 2 & 3 \end{vmatrix}\right| = \frac{1}{2}\left|\begin{vmatrix} 1 & 2 \\ 2 & 3 \end{vmatrix}\right| = \frac{1}{2}|-1| = \frac{1}{2}$ sq units

(iv) Let the vertices of the triangle be $(x_1, y_1), (x_2, y_2), (x_3, y_3)$.

$\therefore$ Area of the triangle $= \frac{1}{2}\left|\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}\right|$

$= \frac{1}{2}\left|x_1(y_2 - y_3) - y_1(x_2 - x_3) + 1(x_2y_3 - x_3y_2)\right|$

$\therefore$ Area $= \frac{1}{2}\left|\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 - x_1 & y_2 - y_1 & 0 \\ x_3 - x_1 & y_3 - y_1 & 0 \end{vmatrix}\right|$ [$R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$]

(v) Let the vertices of the triangle be $(x_1, y_1), (x_2, y_2), (x_3, y_3)$.

$\therefore$ Area of the triangle $= \frac{1}{2}\left|\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}\right|$

$= \frac{1}{2}\left|\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 - x_1 & y_2 - y_1 & 0 \\ x_3 - x_1 & y_3 - y_1 & 0 \end{vmatrix}\right|$ [$R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$]

(vi) Let the vertices of the triangle be $(x_1, y_1), (x_2, y_2), (x_3, y_3)$.

$\therefore$ Area of the triangle $= \frac{1}{2}\left|\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}\right|$

$= \frac{1}{2}\left|\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 - x_1 & y_2 - y_1 & 0 \\ x_3 - x_1 & y_3 - y_1 & 0 \end{vmatrix}\right|$ [$R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$]

(vii) Let the vertices of the triangle be $(x_1, y_1), (x_2, y_2), (x_3, y_3)$.

$\therefore$ Area of the triangle $= \frac{1}{2}\left|\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}\right|$

$= \frac{1}{2}\left|\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 - x_1 & y_2 - y_1 & 0 \\ x_3 - x_1 & y_3 - y_1 & 0 \end{vmatrix}\right|$ [$R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$]

(viii) Let the vertices of the triangle be $(x_1, y_1), (x_2, y_2), (x_3, y_3)$.

$\therefore$ Area of the triangle $= \frac{1}{2}\left|\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}\right|$

$= \frac{1}{2}\left|\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 - x_1 & y_2 - y_1 & 0 \\ x_3 - x_1 & y_3 - y_1 & 0 \end{vmatrix}\right|$ [$R_2 \to R_2 - R_1$, $R_3 \to R_3 - R_1$]

(ix) Volume of the tetrahedron $= \frac{1}{6}\left|\begin{vmatrix} x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \\ x_3 & y_3 & z_3 \end{vmatrix}\right|$ cu units

Volume of $\triangle ABC = \frac{1}{2}\left|\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}\right|$ sq units

$\therefore$ Volume of tetrahedron $= \frac{1}{3}\left|\begin{vmatrix} x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \\ x_3 & y_3 & z_3 \end{vmatrix}\right|$ cu units.

[illegible] [illegible]

$$[illegible]$$

$$[illegible]$$

$\therefore$ Resistance of the [illegible] $= [illegible]$ ohm.

[illegible] [illegible]

$$[illegible]$$

$\therefore$ [illegible]

[illegible] [illegible]

$$[illegible]$$

$$[illegible]$$

[illegible] [illegible]

$$[illegible]$$

$$[illegible]$$

[illegible] [illegible]

$$[illegible]$$

[illegible] [illegible]

$$[illegible]$$

$\therefore$ [illegible]

[illegible] [illegible]

$$[illegible]$$

$$[illegible]$$

$\therefore$ [illegible]

[illegible] [illegible]

$$[illegible]$$

$$[illegible]$$

$\therefore$ [illegible]

[illegible] [illegible]

$$[illegible]$$

$$[illegible]$$

$\therefore$ [illegible]

(10) Find the volume of the solid obtained by the

Note: $\int_{0}^{1} \frac{x}{x^2+1}\,dx = \frac{1}{2}\ln(x^2+1)\Big|_{0}^{1}$

$$= \pi \int_{0}^{1} \left[\frac{x^2+1}{x^2+1} - \frac{1}{x^2+1}\right] dx = \pi\left[x - \tan^{-1} x\right]_{0}^{1} = \pi\left(1 - \frac{\pi}{4}\right)$$

$\therefore$ The volume is $\pi\left(1 - \frac{\pi}{4}\right)$ cubic units

(11) Find the volume of the solid obtained by the region bounded by $y = \sqrt{x}$, $y = \frac{x}{2}$, $x = 0$, $x = 4$ and

$$V = \int_{0}^{4} \pi\left[\left(\sqrt{x}\right)^2 - \left(\frac{x}{2}\right)^2\right] dx = \int_{0}^{4} \pi\left(x - \frac{x^2}{4}\right) dx$$

(12) Find the area of the region $y = x^2 + 2$, $y = 3x$, $x = 0$, $x = 2$

Note: $\int \left(x^2 + 2 - 3x\right) dx = \int \left(x^2 - 3x + 2\right) dx = \frac{x^3}{3} - \frac{3x^2}{2} + 2x$

Therefore the area $= \int_{0}^{2} \left(x^2 - 3x + 2\right) dx = \left[\frac{x^3}{3} - \frac{3x^2}{2} + 2x\right]_{0}^{2} = \frac{8}{3} - 6 + 4 = \frac{2}{3}$

$\therefore$ The area of the region is $\frac{2}{3}$ square units $\left(\approx 0.667\right)$

(13) Find the volume of the solid obtained by the region

Note: $\int \left(x^2 + 1\right) dx = \frac{x^3}{3} + x$

$$\therefore \text{ The volume } = \int_{0}^{1} \pi\left[\left(x^2+1\right)^2 - \left(x^2+1\right)\right] dx = \pi\int_{0}^{1} \left(x^4 + x^2 - x\right) dx$$

(14) Find the volume of the solid obtained by the region

Note: $\int \left(x^2 + 1\right) dx = \frac{x^3}{3} + x$

$$\therefore \text{ The volume } = \int_{0}^{1} \pi\left[\left(x^2+1\right)^2 - \left(x^2+1\right)\right] dx = \pi\int_{0}^{1} \left(x^4 + x^2 - x\right) dx$$

$$= \pi\left[\frac{x^5}{5} + \frac{x^3}{3} - \frac{x^2}{2}\right]_{0}^{1} = \pi\left(\frac{1}{5} + \frac{1}{3} - \frac{1}{2}\right) = \frac{\pi}{30}$$

$\therefore$ The volume is $\frac{\pi}{30}$ cubic units

(15) Find the area of the region bounded by $y = \sin x$, $y = \cos x$, $x = 0$, $x = \frac{\pi}{4}$

Note: $\int \left(\cos x - \sin x\right) dx = \sin x + \cos x$

$$\therefore \text{ The area } = \int_{0}^{\frac{\pi}{4}} \left(\cos x - \sin x\right) dx = \left[\sin x + \cos x\right]_{0}^{\frac{\pi}{4}} = \left(\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}\right) - \left(0 + 1\right) = \sqrt{2} - 1$$

$\therefore$ The area is $\sqrt{2} - 1$ square units $\left(\approx 0.414\right)$

(16) Find the volume of the solid obtained by the region

Note: $\int \left(x^2 + 1\right) dx = \frac{x^3}{3} + x$

$$\therefore \text{ The volume } = \int_{0}^{1} \pi\left[\left(x^2+1\right)^2 - \left(x^2+1\right)\right] dx = \pi\int_{0}^{1} \left(x^4 + x^2 - x\right) dx$$

$$= \pi\left[\frac{x^5}{5} + \frac{x^3}{3} - \frac{x^2}{2}\right]_{0}^{1} = \pi\left(\frac{1}{5} + \frac{1}{3} - \frac{1}{2}\right) = \frac{\pi}{30}$$

$\therefore$ The volume is $\frac{\pi}{30}$ cubic units

(17) Find the area of the region bounded by $y = x^2 + 1$, $y = x$, $x = 0$, $x = 1$

Note: $\int \left(x^2 + 1 - x\right) dx = \frac{x^3}{3} + x - \frac{x^2}{2}$

$$\therefore \text{ The area } = \int_{0}^{1} \left(x^2 + 1 - x\right) dx = \left[\frac{x^3}{3} + x - \frac{x^2}{2}\right]_{0}^{1} = \frac{1}{3} + 1 - \frac{1}{2} = \frac{5}{6}$$

$\therefore$ The area is $\frac{5}{6}$ square units $\left(\approx 0.833\right)$

(18) Find the volume of the solid obtained by the region

Note: $\int \left(x^2 + 1\right) dx = \frac{x^3}{3} + x$

$$\therefore \text{ The volume } = \int_{0}^{1} \pi\left[\left(x^2+1\right)^2 - \left(x^2+1\right)\right] dx = \pi\int_{0}^{1} \left(x^4 + x^2 - x\right) dx$$

$$= \pi\left[\frac{x^5}{5} + \frac{x^3}{3} - \frac{x^2}{2}\right]_{0}^{1} = \pi\left(\frac{1}{5} + \frac{1}{3} - \frac{1}{2}\right) = \frac{\pi}{30}$$

[illegible] The equilibrium constant K_c for the reaction $A_2(g) + B_2(g) \rightleftharpoons 2AB(g)$ is 4.0 at 298 K. If 0.5 mol of A_2 and 0.5 mol of B_2 are mixed in a 1 L vessel, what will be the concentration of AB at equilibrium?

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] The equilibrium constant for the reaction $N_2O_4(g) \rightleftharpoons 2NO_2(g)$ is 4.5 at 298 K. If 0.5 mol of N_2O_4 is taken in a 1 L vessel, what is the concentration of NO_2 at equilibrium?

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] The equilibrium constant for the reaction $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$ is 4.0 at 298 K. If 0.5 mol of N_2 and 0.5 mol of O_2 are mixed in a 1 L vessel, what will be the concentration of NO

[illegible]

EXERCISE [illegible]

(MCQ: SINGLE/MULTIPLE CORRECT TYPE QUESTIONS)

[illegible]

(A) [illegible]

(B) [illegible]

(C) [illegible]

(D) [illegible]

ANSWERS

1. (a)	2. (b)	3. (b)	4. (c)	5. (c)	6. (b)	7. (c)	8. (c)
9. (d)	10. (a)	11. (c)	12. (c)	13. (c)	14. (c)		

SOLUTIONS

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

5. [illegible]

6. [illegible]

7. [illegible]

[illegible]

[illegible]

[illegible]

26. RACES AND GAMES OF SKILL.

IMPORTANT FACTS

[illegible]

SOLVED EXAMPLES

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

EXERCISE (B)

OBJECTIVE TYPE QUESTIONS

[illegible]

1. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

2. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

3. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

4. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

5. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

27. CALENDAR

IMPORTANT FACTS AND FORMULAE

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

SOLVED EXAMPLES

[illegible]

[illegible]

[illegible]

Q. 7 What was the day of the week on 25th August, 2007?

Sol. [illegible]

[illegible]

Q. 8 What was the day of the week on 15th August, 2007?

Sol. [illegible]

[illegible]

Q. 9 Did a leap year occur between the year 1600 and 1700?

Sol. [illegible]

[illegible]

Q. 10 Find the day of the week on 26th January, 1950.

Sol. [illegible]

[illegible]

Q. 11 Today is Monday. After 65 days it will be [illegible]

Sol. [illegible]

[illegible]

Q. 12 Pierre leaves for office at 8:00 a.m. and returns at 2:00 p.m. Find the time he spends in office.

Sol. [illegible]

[illegible]

[illegible]

[illegible]

[illegible] TYPE QUESTIONS

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

28. CLOCKS

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] [illegible]

Antwoord C. [illegible]

[illegible]

$$[illegible] = \int_{[illegible]}^{[illegible]} \left(\frac{[illegible]}{[illegible]} + [illegible]\right) [illegible] + [illegible] \int_{[illegible]}^{[illegible]} [illegible] \, dx$$

[illegible]

Antwoord D. [illegible]

[illegible]

$$[illegible] = \int_{[illegible]}^{[illegible]} \left(\frac{[illegible]}{[illegible]} + [illegible]\right) [illegible]^2 \, dx$$

[illegible]

[illegible] [illegible]

[illegible] [illegible]

[illegible]

$$[illegible] = \int_{[illegible]}^{[illegible]} \left(\frac{[illegible]}{[illegible]} + [illegible]\right) [illegible] + [illegible] \int_{[illegible]}^{[illegible]} [illegible] \, dx$$

[illegible]

[illegible] [illegible]

Antwoord A. [illegible]

[illegible]

$$[illegible] = \int_{[illegible]}^{[illegible]} \left(\frac{[illegible]}{[illegible]} + [illegible]\right) [illegible] + [illegible] \int_{[illegible]}^{[illegible]} [illegible] \, dx$$

[illegible]

Antwoord B. [illegible]

[illegible]

$$[illegible] = \int_{[illegible]}^{[illegible]} \left(\frac{[illegible]}{[illegible]} + [illegible]\right) [illegible] + [illegible] \int_{[illegible]}^{[illegible]} [illegible] \, dx$$

[illegible]

Ex. 2. The series in $\sum_{n=1}^{\infty} \frac{\sin(\pi x)}{n^2}$ converges uniformly on $[0, 1]$. Hence it is possible to apply the integration term-by-term. Show that $\int_0^1 f(x)\,dx = \frac{1}{\pi}$ and find the sum of the series.

Sol. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Ex. 3. Let f be a bounded function on $[a, b]$ and $\{x_n\}$ be a sequence of points in $[a, b]$ such that $x_n \to x_0$ as $n \to \infty$. Let $\{\alpha_n\}$ be a sequence of positive numbers such that $\sum_{n=1}^{\infty} \alpha_n = 1$. Show that $\int_a^b f(x)\,d\left(\sum_{n=1}^{\infty} \alpha_n \chi_{[x_n, b]}(x)\right) = \sum_{n=1}^{\infty} \alpha_n f(x_n)$, where $\chi_{[x_n, b]}$ is the characteristic function of $[x_n, b]$.

Sol. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Ex. 4. Let f be a continuous function on $[0, 1]$. Show that $\int_0^1 f(x)\,dx = \int_0^1 f(1-x)\,dx$. Hence find the value of $\int_0^{\pi} \frac{x \sin x}{1 + \cos^2 x}\,dx$.

Sol. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Ex. 5. Let f be a bounded function on $[a, b]$. Show that f is integrable on $[a, b]$ if and only if f is continuous almost everywhere on $[a, b]$.

Sol. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

EXERCISE 3C

OBJECTIVE TYPE QUESTIONS

Tick-mark (✓) against the correct answer :

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Length of second hand = [illegible] = [illegible] cm

∴ Increased length = [illegible] = [illegible] cm

8. Length of second hand = [illegible] = [illegible] cm

Length of second hand = [illegible] = [illegible] cm

∴ Increased length = [illegible] = [illegible] cm

9. Length of second hand = [illegible] = [illegible] cm

Length of second hand = [illegible] = [illegible] cm

∴ Increased length = [illegible] = [illegible] cm

10. Length of second hand = [illegible] = [illegible] cm

Length of second hand = [illegible] = [illegible] cm

∴ Increased length = [illegible] = [illegible] cm

11. Angle turned by second hand in [illegible] = [illegible]

Angle turned by minute hand in [illegible] = [illegible]

∴ Required angle = [illegible] = [illegible]

12. Angle turned by second hand in [illegible] = [illegible]

Angle turned by minute hand in [illegible] = [illegible]

∴ Required angle = [illegible] = [illegible]

13. [illegible]

14. [illegible]

15. [illegible]

16. [illegible]

17. [illegible]

18. [illegible]

[illegible] = [illegible] = [illegible]

[illegible] = [illegible] = [illegible]

[illegible] = [illegible] = [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

29. STOCK AND SHARES

[illegible]

[illegible]

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]

[illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Sol. 3. [illegible]

Sol. [illegible]

Sol. 4. [illegible]

Sol. [illegible]

Sol. 5. [illegible]

Sol. [illegible]

Sol. 6. [illegible]

Sol. [illegible]

Sol. 7. [illegible]

Sol. [illegible]

Sol. 8. [illegible]

Sol. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
2. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
3. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
4. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
5. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
6. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
7. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
8. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
9. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
10. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

1. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(1) [illegible]

(2) [illegible]

(3) [illegible]

(4) [illegible]

(5) [illegible]

(6) [illegible]

(7) [illegible]

(8) [illegible]

(9) [illegible]

(10) [illegible]

(11) [illegible]

(12) [illegible]

(13) [illegible]

(14) [illegible]

(15) [illegible]

(16) [illegible]

(17) [illegible]

(18) [illegible]

(19) [illegible]

(20) [illegible]

8 (i) [illegible]

[illegible]

∴ [illegible]

10 (i) [illegible]

[illegible]

∴ [illegible]

11 (i) [illegible]

[illegible]

∴ [illegible]

12 (i) [illegible]

[illegible]

∴ [illegible]

13 (i) [illegible]

[illegible]

∴ [illegible]

14 (i) [illegible]

[illegible]

∴ [illegible]

15 (i) [illegible]

[illegible]

∴ [illegible]

16 (i) [illegible]

[illegible]

∴ [illegible]

17 (i) [illegible]

[illegible]

∴ [illegible]

18 (i) [illegible]

[illegible]

∴ [illegible]

(a) [illegible]

[illegible]

(b) [illegible]

[illegible]

(c) [illegible]

[illegible]

(d) [illegible]

[illegible]

(e) [illegible]

[illegible]

(f) [illegible]

[illegible]

(g) [illegible]

[illegible]

(h) [illegible]

[illegible]

(i) [illegible]

[illegible]

(j) [illegible]

[illegible]

(k) [illegible]

[illegible]

(l) [illegible]

[illegible]

(m) [illegible]

[illegible]

30. PERMUTATIONS AND COMBINATIONS

[illegible] FACTS and FORMULAS

[illegible]

$$[illegible]$$

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

$$[illegible] = \frac{[illegible]}{[illegible]}$$

[illegible]

[illegible]

$$[illegible]$$

[illegible]

[illegible]

[illegible]

[illegible]

$$[illegible]$$

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(d) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(e) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(f) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(g) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(h) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

ANSWERS

1. (a)	2. (a)	3. (d)	4. (c)	5. (a)	6. (a)
7. (a)	8. (c)	9. (c)	10. (c)	11. (c)	12. (c)
13. (c)	14. (c)	15. (c)	16. (c)	17. (c)	18. (c)
19. (c)	20. (c)	21. (c)	22. (c)	23. (c)	24. (c)
25. (c)	26. (c)	27. (c)			

SOLUTIONS

1. [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

5. [illegible]

6. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Number of ways of arranging [illegible] $= \frac{[illegible]}{[illegible]} = [illegible]$

Thus, [illegible] ways.

Required number of ways $= [illegible] - [illegible] = [illegible]$

(c) [illegible]

Each day [illegible] is used [illegible] times and [illegible] once. Hence

Number of ways of [illegible] $= \frac{[illegible]}{[illegible]} = [illegible]$

Thus, [illegible] ways. If [illegible] is used [illegible] times and [illegible] once, [illegible]

$= \frac{[illegible]}{[illegible]} = [illegible]$ ways.

Required number of ways $= [illegible] - [illegible] = [illegible]$

(d) [illegible]

Now, we [illegible] the number of [illegible]. [illegible] times and [illegible] times. Hence

[illegible]

Number of ways $= \frac{[illegible]}{[illegible]} = [illegible]$

Thus, [illegible] ways [illegible] times and [illegible] times. Hence

Number of ways $= \frac{[illegible]}{[illegible]} = [illegible]$

Therefore, required number of ways $= [illegible] - [illegible] = [illegible]$

(e) [illegible]

Now, [illegible] ways.

Number of ways $= [illegible]$

Thus, [illegible] ways.

Required number of ways $= [illegible] - [illegible] = [illegible]$

(f) [illegible]

Now, [illegible] ways.

Number of ways $= [illegible]$

Thus, [illegible] ways.

Required number of ways $= [illegible] - [illegible] = [illegible]$

(g) [illegible]

Now, [illegible] ways.

Number of ways $= [illegible]$

Thus, [illegible] ways.

Required number of ways $= [illegible] - [illegible] = [illegible]$

(h) Required number of ways $= [illegible] + [illegible] + [illegible] + [illegible] = [illegible]$

[illegible]

[illegible]

[illegible]

31. PROBABILITY

IMPORTANT FACTS AND FORMULAE

1. Experiment : [illegible]

2. Sample Space : [illegible]

Consider an ordinary die.

[illegible]

Results :

[illegible]

(iii) [illegible]

[illegible]

3. Sample Space : [illegible]

Exercise of Random Experiment :

[illegible]

4. [illegible]

5. [illegible]

Now, [illegible]

$$P(E) = \frac{n(E)}{n(S)}$$

6. Some Basic Formulas :

[illegible]

(i) [illegible]

[illegible]

(ii) [illegible]

31. PROBABILITY

IMPORTANT FACTS AND FORMULAE

1. Experiment : [illegible]

2. Sample Space : [illegible]

Consider an ordinary die.

[illegible]

Results :

[illegible]

(iii) [illegible]

[illegible]

3. Sample Space : [illegible]

Exercise of Random Experiment :

[illegible]

4. [illegible]

5. [illegible]

Now, [illegible]

$$P(E) = \frac{n(E)}{n(S)}$$

6. Some Basic Formulas :

[illegible]

(i) [illegible]

[illegible]

(ii) [illegible]

[illegible]

[illegible] Given [illegible] Find the probability of [illegible] is a head.

Sol: [illegible]

$$P(H) = \frac{[illegible]}{[illegible]} = [illegible]$$

[illegible] Two [illegible] are tossed. What is the probability of getting [illegible] and [illegible]?

Sol: [illegible]

[illegible]

$$P(T) = \frac{[illegible]}{[illegible]} = [illegible]$$

[illegible] [illegible] Find the probability of getting [illegible] and [illegible].

Sol: [illegible]

[illegible]

Then, [illegible]

$$P(A) = \frac{[illegible]}{[illegible]} = [illegible]$$

[illegible] A [illegible] of a pack of [illegible]. Find the probability of getting a [illegible] [illegible].

Sol: [illegible]

[illegible]

$$P(A) = \frac{[illegible]}{[illegible]} = [illegible]$$

[illegible] A bag contains [illegible] balls [illegible]. Two balls [illegible] are drawn at random. Find the probability that [illegible] are of the same colour.

Sol: [illegible]

[illegible]

$$P(A) = \frac{[illegible]}{[illegible]} = [illegible]$$

[illegible] Two dice are thrown together. What is the probability that the sum of the numbers on the two dice is [illegible]?

Sol: [illegible]

[illegible]

$$P(A) = \frac{[illegible]}{[illegible]} = [illegible]$$

[illegible]

EXERCISE-II

OBJECTIVE TYPE QUESTIONS

[illegible]

[illegible] **[illegible] Mathematics Exam, 2012]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] **[illegible]**

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(Bank P.O. 2000)

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

(A) [illegible] (B) [illegible] (C) [illegible] (D) [illegible]

[illegible]

(A) [illegible] (B) [illegible] (C) [illegible] (D) [illegible]

(Grade 1 [illegible])

[illegible]

(A) [illegible] (B) [illegible] (C) [illegible] (D) [illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

[illegible]

1. [illegible]
   [illegible]

   $$\therefore f(x) = \frac{[illegible]}{[illegible]} + \frac{[illegible]}{[illegible]}$$

2. [illegible]
   [illegible]

   $$\therefore f(x) = \frac{[illegible]}{[illegible]} + \frac{[illegible]}{[illegible]}$$

3. [illegible]
   [illegible]
   [illegible]

   $$\therefore f(x) = \frac{[illegible]}{[illegible]} + \frac{[illegible]}{[illegible]}$$

4. [illegible]
   [illegible]

   $$\therefore f(x) = \frac{[illegible]}{[illegible]} + \frac{[illegible]}{[illegible]}$$

5. [illegible]
   [illegible]

   $$\therefore f(x) = \frac{[illegible]}{[illegible]} + \frac{[illegible]}{[illegible]}$$

6. [illegible]
   [illegible]

   $$\therefore f(x) = \frac{[illegible]}{[illegible]} + \frac{[illegible]}{[illegible]}$$

7. [illegible]

Sol: [illegible]

$\therefore P(E) = \frac{1,000}{2,000} = \frac{1}{2} = \frac{1}{2}$

8. [illegible]

Sol: [illegible]

$\therefore P(E) = \frac{[illegible]}{[illegible]} = \frac{1}{2}$

9. [illegible]

Sol: [illegible]

$\therefore P(E) = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = \frac{1}{2}$

10. [illegible]

Sol: [illegible]

$\therefore P(E) = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

11. [illegible]

Sol: [illegible]

$\therefore P(E) = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

12. [illegible]

Sol: [illegible]

$\therefore P(E) = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

13. [illegible] $= \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

14. [illegible]

Sol: [illegible]

$\therefore P(E) = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

15. [illegible]

Sol: [illegible]

$\therefore P(E) = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

16. [illegible]

Sol: [illegible]

$\therefore P(E) = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

17. [illegible]

Sol: [illegible]

$\therefore P(E) = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

18. [illegible] $= \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

19. [illegible]

$\therefore P(E) = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

20. [illegible]

Sol: [illegible]

$\therefore P(E) = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

21. [illegible]

Sol: [illegible]

$\therefore P(E) = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

22. [illegible]

Sol: [illegible]

$\therefore P(E) = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]} = \frac{[illegible]}{[illegible]}$

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(iii) [illegible]

[illegible]

(iv) [illegible]

[illegible]

(v) [illegible]

[illegible]

(vi) [illegible]

[illegible]

(vii) [illegible]

[illegible]

(viii) [illegible]

[illegible]

(ix) [illegible]

[illegible]

(x) [illegible]

[illegible]

(xi) [illegible]

[illegible]

(xii) [illegible]

[illegible]

(xiii) [illegible]

[illegible]

(xiv) [illegible]

[illegible]

(xv) [illegible]

[illegible]

(xvi) [illegible]

[illegible]

(xvii) [illegible]

[illegible]

(xviii) [illegible]

[illegible]

(xix) [illegible]

[illegible]

(xx) [illegible]

[illegible]

(xxi) [illegible]

[illegible]

(xxii) [illegible]

[illegible]

(xxiii) [illegible]

[illegible]

(xxiv) [illegible]

[illegible]

(xxv) [illegible]

[illegible]

(xxvi) [illegible]

[illegible]

(xxvii) [illegible]

[illegible]

(xxviii) [illegible]

[illegible]

(xxix) [illegible]

[illegible]

(xxx) [illegible]

[illegible]

(xxxi) [illegible]

[illegible]

(xxxii) [illegible]

[illegible]

(xxxiii) [illegible]

[illegible]

(xxxiv) [illegible]

[illegible]

(xxxv) [illegible]

[illegible]

(xxxvi) [illegible]

[illegible]

(xxxvii) [illegible]

[illegible]

(xxxviii) [illegible]

[illegible]

(xxxix) [illegible]

[illegible]

(xl) [illegible]

[illegible]

(xli) [illegible]

[illegible]

(xlii) [illegible]

[illegible]

(xliii) [illegible]

[illegible]

(xliv) [illegible]

[illegible]

(xlv) [illegible]

[illegible]

(xlvi) [illegible]

[illegible]

(xlvii) [illegible]

[illegible]

(xlviii) [illegible]

[illegible]

(xlix) [illegible]

[illegible]

(l) [illegible]

[illegible]

(li) [illegible]

[illegible]

(lii) [illegible]

[illegible]

(liii) [illegible]

[illegible]

(liv) [illegible]

[illegible]

(lv) [illegible]

[illegible]

(lvi) [illegible]

[illegible]

(lvii) [illegible]

[illegible]

(lviii) [illegible]

[illegible]

(lix) [illegible]

[illegible]

(lx) [illegible]

[illegible]

(lxi) [illegible]

[illegible]

(lxii) [illegible]

[illegible]

(lxiii) [illegible]

[illegible]

(lxiv) [illegible]

[illegible]

(lxv) [illegible]

[illegible]

(lxvi) [illegible]

[illegible]

(lxvii) [illegible]

[illegible]

(lxviii) [illegible]

[illegible]

(lxix) [illegible]

[illegible]

(lxx) [illegible]

[illegible]

(lxxi) [illegible]

[illegible]

(lxxii) [illegible]

[illegible]

(lxxiii) [illegible]

[illegible]

(lxxiv) [illegible]

[illegible]

(lxxv) [illegible]

[illegible]

(lxxvi) [illegible]

[illegible]

(lxxvii) [illegible]

[illegible]

(lxxviii) [illegible]

[illegible]

(lxxix) [illegible]

[illegible]

(lxxx) [illegible]

[illegible]

(lxxxi) [illegible]

[illegible]

(lxxxii) [illegible]

[illegible]

(lxxxiii) [illegible]

[illegible]

(lxxxiv) [illegible]

[illegible]

(lxxxv) [illegible]

[illegible]

(lxxxvi) [illegible]

[illegible]

(lxxxvii) [illegible]

[illegible]

(lxxxviii) [illegible]

[illegible]

(lxxxix) [illegible]

[illegible]

(xc) [illegible]

[illegible]

(xci) [illegible]

[illegible]

(xcii) [illegible]

[illegible]

(xciii) [illegible]

[illegible]

(xciv) [illegible]

[illegible]

(xcv) [illegible]

[illegible]

(xcvi) [illegible]

[illegible]

(xcvii) [illegible]

[illegible]

(xcviii) [illegible]

[illegible]

(xcix) [illegible]

[illegible]

(c) [illegible]

[illegible]

(ci) [illegible]

[illegible]

(cii) [illegible]

[illegible]

(ciii) [illegible]

[illegible]

(civ) [illegible]

[illegible]

(cv) [illegible]

[illegible]

(cvi) [illegible]

[illegible]

(cvii) [illegible]

[illegible]

(cviii) [illegible]

[illegible]

(cix) [illegible]

[illegible]

(cx) [illegible]

[illegible]

(cxi) [illegible]

[illegible]

(cxii) [illegible]

[illegible]

(cxiii) [illegible]

[illegible]

(cxiv) [illegible]

[illegible]

(cxv) [illegible]

[illegible]

(cxvi) [illegible]

[illegible]

(cxvii) [illegible]

[illegible]

(cxviii) [illegible]

[illegible]

(cxix) [illegible]

[illegible]

(cxx) [illegible]

[illegible]

(cxxi) [illegible]

[illegible]

(cxxii) [illegible]

[illegible]

(cxxiii) [illegible]

[illegible]

(cxxiv) [illegible]

[illegible]

(cxxv) [illegible]

[illegible]

(cxxvi) [illegible]

[illegible]

(cxxvii) [illegible]

[illegible]

(cxxviii) [illegible]

[illegible]

(cxxix) [illegible]

[illegible]

(cxxx) [illegible]

[illegible]

(cxxxi) [illegible]

[illegible]

(cxxxii) [illegible]

[illegible]

(cxxxiii) [illegible]

[illegible]

(cxxxiv) [illegible]

[illegible]

(cxxxv) [illegible]

[illegible]

(cxxxvi) [illegible]

[illegible]

(cxxxvii) [illegible]

[illegible]

(cxxxviii) [illegible]

[illegible]

(cxxxix) [illegible]

[illegible]

(cxl) [illegible]

[illegible]

(cxli) [illegible]

[illegible]

(cxlii) [illegible]

[illegible]

(cxliii) [illegible]

[illegible]

(cxliv) [illegible]

[illegible]

(cxlv) [illegible]

[illegible]

(cxlvi) [illegible]

[illegible]

(cxlvii) [illegible]

[illegible]

(cxlviii) [illegible]

[illegible]

(cxlix) [illegible]

[illegible]

(cl) [illegible]

[illegible]

(cli) [illegible]

[illegible]

(clii) [illegible]

[illegible]

(cli

問1 [illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

$$[illegible]$$

問2 (a) [illegible]

(b) [illegible]

$$[illegible]$$

$$[illegible]$$

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

$$[illegible]$$

[illegible]

問3 (a) [illegible]

(b) [illegible]

$$[illegible]$$

$$[illegible]$$

[illegible]

[illegible]

[illegible]

[illegible]

$$[illegible]$$

32. TRUE DISCOUNT

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

人名以外の漢字

[illegible]

送り仮名の付け方

[illegible]

[illegible]

[illegible]

[illegible]

33. BANKER'S DISCOUNT

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

33. BANKER'S DISCOUNT

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] II

[illegible]

[illegible]

1. The [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
2. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
3. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
4. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
5. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
6. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
7. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
8. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
9. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
10. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
11. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
12. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Exercise 10.2. Let $\mathcal{H} = \mathbb{C}^2$ and $\mathcal{E}_{\mathrm{Kraus}}(\rho) = \sum_{k=1}^{2} K_k \rho K_k^{\dagger}$ with

$$K_1 = \begin{pmatrix} 1 & 0 \\ 0 & \sqrt{1-p} \end{pmatrix}, \qquad K_2 = \begin{pmatrix} 0 & \sqrt{p} \\ 0 & 0 \end{pmatrix}.$$

(a) Verify $\sum_k K_k^{\dagger} K_k = I$ and compute the Choi matrix $J(\mathcal{E}) = (\mathcal{E} \otimes \mathrm{id})(|\Phi^+\rangle\langle\Phi^+|)$ explicitly.

(b) Show $\mathcal{E}$ is CP but not unital when $p > 0$, and that $\mathcal{E}^{\dagger}(I) = K_1^{\dagger} K_1 + K_2^{\dagger} K_2 \neq I$.

(c) Compute the fixed point $\rho^{\ast}$ satisfying $\mathcal{E}(\rho^{\ast}) = \rho^{\ast}$ and verify it is independent of the initial state.

Solution. (a) Vectorising $\rho = \begin{pmatrix} a & b \\ b^{\ast} & d \end{pmatrix}$ gives $\mathcal{E}(\rho) = \begin{pmatrix} a & b\sqrt{1-p} \\ b^{\ast}\sqrt{1-p} & d(1-p) + p\,a \end{pmatrix}$, so

$$J(\mathcal{E}) = \frac{1}{2}\begin{pmatrix} 1 & 0 & 0 & \sqrt{1-p} \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1-p & 0 \\ \sqrt{1-p} & 0 & 0 & 1-p+p \end{pmatrix} = \frac{1}{2}\begin{pmatrix} 1 & 0 & 0 & \sqrt{1-p} \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1-p & 0 \\ \sqrt{1-p} & 0 & 0 & 1 \end{pmatrix}.$$

(b) $\sum_k K_k^{\dagger} K_k = \begin{pmatrix} 1 & 0 \\ 0 & 1-p \end{pmatrix} \neq I$ for $p > 0$, so $\mathcal{E}^{\dagger}(I) \neq I$ and $\mathcal{E}$ is not unital.

(c) Fixed point equation $\rho^{\ast} = \begin{pmatrix} a & b \\ b^{\ast} & d \end{pmatrix}$ gives $b = b\sqrt{1-p}$ and $d = d(1-p) + p\,a$, hence $b = 0$ and $d = a$. Thus $\rho^{\ast} = \begin{pmatrix} a & 0 \\ 0 & a \end{pmatrix}$ for any $a \in [0,1]$, independent of the initial state.

Exercise 10.3. Let $\mathcal{E}(\rho) = \rho + \gamma\,(\sigma_z \rho \sigma_z - \rho)$ with $\gamma \geq 0$. Show $\mathcal{E}$ is unital and CP, and that $\mathrm{Tr}(\rho^2)$ is monotonically decreasing for all ρ.

Solution. Unital: $\mathcal{E}(I) = I + \gamma(\sigma_z I \sigma_z - I) = I$. CP: $\mathcal{E} = (1-\gamma)\,\mathrm{id} + \gamma\,\mathcal{U}$ with $\mathcal{U}(\rho) = \sigma_z \rho \sigma_z$, a convex combination of CP maps. Monotonicity: $\mathrm{Tr}(\mathcal{E}(\rho)^2) = (1-\gamma)^2 \mathrm{Tr}(\rho^2) + \gamma(1-\gamma)\,\mathrm{Tr}(\sigma_z \rho \sigma_z \rho) + \gamma^2 \mathrm{Tr}(\rho^2)$, and $\mathrm{Tr}(\sigma_z \rho \sigma_z \rho) \leq \mathrm{Tr}(\rho^2)$ by Cauchy–Schwarz, so $\mathrm{Tr}(\mathcal{E}(\rho)^2) \leq \mathrm{Tr}(\rho^2)$.

Exercise 10.4. Show that the depolarising channel $\mathcal{E}_p(\rho) = (1-p)\rho + p\,\frac{I}{2}$ is the unique qubit channel invariant under all unitaries.

Solution. Any invariant channel must satisfy $\mathcal{E}(U \rho U^{\dagger}) = U \mathcal{E}(\rho) U^{\dagger}$ for all U. Averaging over the Haussdorf measure on $SU(2)$ gives $\mathcal{E}(\rho) = \int dU\, U \mathcal{E}(\rho) U^{\dagger} = \mathrm{Tr}(\mathcal{E}(\rho))\,\frac{I}{2}$, so $\mathcal{E}(\rho) = (1-p)\rho + p\,\frac{I}{2}$ for some $p \in [0,1]$.

34. HEIGHTS AND DISTANCES

IMPORTANT FACTS AND FORMULAE

1. The angeles in line (s).

[illegible]

2. Trigonometrical Ratios:

[illegible]

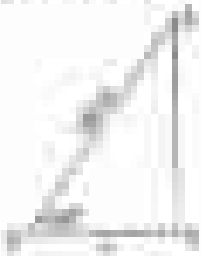
3. Values of Ratios:

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

4. Angle of Elevation: [illegible]

[illegible]

SOLVED EXAMPLES



[illegible]

[illegible]

[illegible]. [illegible]

[illegible]

[illegible]

[illegible]. [illegible]

[illegible]

[illegible]

EXERCISE 6(c)

(OBJECTIVE TYPE QUESTIONS)

Fill in the blanks / Choose the correct answer / Tick (✓) the correct alternative:

1. The angle of a triangle is thrice the sum of its other two angles. Find the angle. **(H.S.E. 2000)**
   (a) $45°$ (b) $55°$ (c) $60°$ (d) $65°$

2. Given a scale. If an angle of triangle is equal to the sum of the other two angles, then the triangle is ____ **(H.S.E. 2002)**
   (a) right (b) obtuse (c) acute (d) [illegible]

3. The angles of a triangle are in the ratio 1 : 2 : 3. The smallest angle of the triangle is ____ **(H.S.E. 2003)**
   (a) $15°$ (b) $30°$ (c) $45°$ (d) $60°$

4. In a triangle ABC, $AB = AC$ and $\angle A = 90°$. The measure of each of the other two angles is ____
   (a) $45°$ (b) $90°$ (c) $45°$ (d) [illegible]

5. The angles of a triangle are in the ratio 1 : 2 : 3. The smallest angle is ____
   (a) $30°$ (b) $60°$ (c) $90°$ (d) $120°$

6. In a triangle, the ratio of the angles is 1 : 2 : 3. The smallest angle measures ____ **(Board Pr. 2000)**
   (a) $30°$ (b) $60°$ (c) $90°$ (d) $120°$

7. The angles of a triangle are in the ratio 1 : 2 : 3. The smallest angle is ____
   (a) $15°$ (b) $30°$ (c) $45°$ (d) $60°$

8. A triangle ABC is such that $\angle A$ is equal to the sum of $\angle B$ and $\angle C$. The angle $\angle A$ is ____ **(H.S.E. 2000)**
   (a) right angle (b) obtuse angle (c) acute angle (d) [illegible]

9. In a triangle ABC, $\angle A = 90°$ and $\angle B = \angle C$. The measure of each of the other two angles is ____
   (a) $45°$ (b) $90°$ (c) $45°$ (d) [illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	

[illegible]

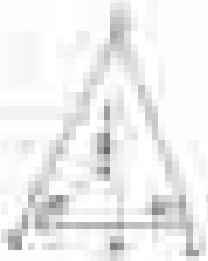
[illegible]

[illegible]

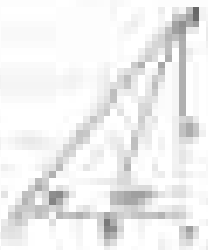
[illegible]

[illegible]

[illegible]



[illegible]



[illegible]

[illegible]

[illegible]

[illegible]

(2) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(3) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

35. ODD MAN OUT AND SERIES

EXERCISE 35

Directions : Find out odd from the

1. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
2. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
3. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
4. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
5. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
6. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
7. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
8. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
9. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
10. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
11. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
12. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
13. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
14. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
15. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
16. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
17. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
18. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
19. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
20. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

Equation | Page(s) | Equation | Page(s) | Equation | Page(s) | Equation | Page(s)

(1) 51, 56, 58, 60, 212, 213, 215, 216
(10) 72 (11) 72, 240 (12) 180 (13) 414

(2) 52, 56, 1, 2, 7 (14) 414, 417
(15) 417 (16) 417 (17) 418 (18) 419

(3) 53, 60, 61, 63, 71, 74, 237, 240
(19) 124 (20) 124 (21) 125 (22) 126

(4) 54, 60, 63, 64, 66, 70, 71
(23) 1 (24) 2 (25) 10 (26) 70

(5) 1, 5, 172, 173, 174, 175, 180
(27) 1 (28) 2 (29) 10 (30) 11

(6) 1, 10, 11, 15, 17, 18, 19
(31) 2 (32) 3 (33) 11 (34) 12, 13, 14, 15, 16

(7) 2, 12, 13, 14, 15, 16, 21
(35) 12 (36) 13 (37) 14 (38) 15

(8) 3, 22, 23, 24, 25, 26, 27
(39) 22 (40) 23 (41) 24 (42) 25

(9) 4, 32, 33, 34, 35, 36, 37
(43) 32 (44) 33 (45) 34 (46) 35

(10) 5, 42, 43, 44, 45, 46, 47
(47) 42 (48) 43 (49) 44 (50) 45

(11) 6, 52, 53, 54, 55, 56, 57
(51) 52 (52) 53 (53) 54 (54) 55

(12) 7, 62, 63, 64, 65, 66, 67
(55) 62 (56) 63 (57) 64 (58) 65

(13) 8, 72, 73, 74, 75, 76, 77
(59) 72 (60) 73 (61) 74 (62) 75

(14) 9, 82, 83, 84, 85, 86, 87
(63) 82 (64) 83 (65) 84 (66) 85

(15) 10, 92, 93, 94, 95, 96, 97
(67) 92 (68) 93 (69) 94 (70) 95

(16) 11, 102, 103, 104, 105, 106, 107
(71) 102 (72) 103 (73) 104 (74) 105

(17) 12, 112, 113, 114, 115, 116, 117
(75) 112 (76) 113 (77) 114 (78) 115

(18) 13, 122, 123, 124, 125, 126, 127
(79) 122 (80) 123 (81) 124 (82) 125

(19) 14, 132, 133, 134, 135, 136, 137
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(20) 15, 142, 143, 144, 145, 146, 147
(87) 142 (88) 143 (89) 144 (90) 145

(21) 16, 152, 153, 154, 155, 156, 157
(91) 152 (92) 153 (93) 154 (94) 155

(22) 17, 162, 163, 164, 165, 166, 167
(95) 162 (96) 163 (97) 164 (98) 165

(23) 18, 172, 173, 174, 175, 176, 177
(99) 172 (100) 173 (101) 174 (102) 175

(24) 19, 182, 183, 184, 185, 186, 187
(103) 182 (104) 183 (105) 184 (106) 185

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(107) 192 (108) 193 (109) 194 (110) 195

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(111) 202 (112) 203 (113) 204 (114) 205

(27) 22, 212, 213, 214, 215, 216, 217
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(28) 23, 222, 223, 224, 225, 226, 227
(119) 222 (120) 223 (121) 224 (122) 225

(29) 24, 232, 233, 234, 235, 236, 237
(123) 232 (124) 233 (125) 234 (126) 235

(30) 25, 242, 243, 244, 245, 246, 247
(127) 242 (128) 243 (129) 244 (130) 245

Brown James | Rebirth | Ex-wife's lawyer to children

47	Acute	Ice	Ice	Ice
	14–17	3–7	1.5	17–18
48	Ice	Ice	Ice	Ice
	10–13	12–15	1.5	16–19
49	Ice	Ice	Ice	Ice
	13–15	15–18	1.5	15–18
50	Acute	Ice	Ice	Ice
	12–14	7–11	1.5	16–20
51	Ice	Ice	Ice	Ice
	9–12	14–17	1.5	18–21
52	Ice	Ice	Ice	Ice
	11–13	10–13	1.5	17–20
53	Ice	Ice	Ice	Ice
	8–11	16–19	1.5	19–22
54	Ice	Ice	Ice	Ice
	13–16	9–12	1.5	15–18
55	Ice	Ice	Ice	Ice
	10–13	11–14	1.5	16–19
56	Ice	Ice	Ice	Ice
	14–17	8–11	1.5	17–20
57	Ice	Ice	Ice	Ice
	12–15	13–16	1.5	18–21
58	Ice	Ice	Ice	Ice
	9–12	15–18	1.5	19–22
59	Ice	Ice	Ice	Ice
	11–14	10–13	1.5	16–19
60	Ice	Ice	Ice	Ice
	13–16	12–15	1.5	17–20
61	Ice	Ice	Ice	Ice
	10–13	14–17	1.5	18–21
62	Ice	Ice	Ice	Ice
	12–15	11–14	1.5	19–22
63	Ice	Ice	Ice	Ice
	14–17	13–16	1.5	15–18
64	Ice	Ice	Ice	Ice
	11–14	15–18	1.5	16–19
65	Ice	Ice	Ice	Ice
	13–16	10–13	1.5	17–20
66	Ice	Ice	Ice	Ice
	12–15	12–15	1.5	18–21
67	Ice	Ice	Ice	Ice
	14–17	14–17	1.5	19–22
68	Ice	Ice	Ice	Ice
	11–14	11–14	1.5	15–18
69	Ice	Ice	Ice	Ice
	13–16	13–16	1.5	16–19
70	Ice	Ice	Ice	Ice
	12–15	12–15	1.5	17–20
71	Ice	Ice	Ice	Ice
	14–17	14–17	1.5	18–21
72	Ice	Ice	Ice	Ice
	11–14	11–14	1.5	19–22
73	Ice	Ice	Ice	Ice
	13–16	13–16	1.5	15–18
74	Ice	Ice	Ice	Ice
	12–15	12–15	1.5	16–19
75	Ice	Ice	Ice	Ice
	14–17	14–17	1.5	17–20
76	Ice	Ice	Ice	Ice
	11–14	11–14	1.5	18–21
77	Ice	Ice	Ice	Ice
	13–16	13–16	1.5	19–22
78	Ice	Ice	Ice	Ice
	12–15	12–15	1.5	15–18
79	Ice	Ice	Ice	Ice
	14–17	14–17	1.5	16–19
80	Ice	Ice	Ice	Ice
	11–14	11–14	1.5	17–20
81	Ice	Ice	Ice	Ice
	13–16	13–16	1.5	18–21
82	Ice	Ice	Ice	Ice
	12–15	12–15	1.5	19–22
83	Ice	Ice	Ice	Ice
	14–17	14–17	1.5	15–18
84	Ice	Ice	Ice	Ice
	11–14	11–14	1.5	16–19
85	Ice	Ice	Ice	Ice
	13–16	13–16	1.5	17–20
86	Ice	Ice	Ice	Ice
	12–15	12–15	1.5	18–21
87	Ice	Ice	Ice	Ice
	14–17	14–17	1.5	19–22
88	Ice	Ice	Ice	Ice
	11–14	11–14	1.5	15–18
89	Ice	Ice	Ice	Ice
	13–16	13–16	1.5	16–19
90	Ice	Ice	Ice	Ice
	12–15	12–15	1.5	17–20
91	Ice	Ice	Ice	Ice
	14–17	14–17	1.5	18–21
92	Ice	Ice	Ice	Ice
	11–14	11–14	1.5	19–22
93	Ice	Ice	Ice	Ice
	13–16	13–16	1.5	15–18
94	Ice	Ice	Ice	Ice
	12–15	12–15	1.5	16–19
95	Ice	Ice	Ice	Ice
	14–17	14–17	1.5	17–20
96	Ice	Ice	Ice	Ice
	11–14	11–14	1.5	18–21
97	Ice	Ice	Ice	Ice
	13–16	13–16	1.5	19–22
98	Ice	Ice	Ice	Ice
	12–15	12–15	1.5	15–18
99	Ice	Ice	Ice	Ice
	14–17	14–17	1.5	16–19
100	Ice	Ice	Ice	Ice
	11–14	11–14	1.5	17–20

Trigonometrical Ratios (Circular Measure) in Decimal Fractions

Radians	Sin	Cos	Tan	Cot	Sec	Cosec
0.000	0.000	1.000	0.000	∞	1.000	∞
0.001	0.001	1.000	0.001	1000.0	1.000	1000.0
0.002	0.002	1.000	0.002	500.0	1.000	500.0
0.003	0.003	1.000	0.003	333.3	1.000	333.3
0.004	0.004	1.000	0.004	250.0	1.000	250.0
0.005	0.005	1.000	0.005	200.0	1.000	200.0
0.006	0.006	1.000	0.006	166.7	1.000	166.7
0.007	0.007	1.000	0.007	142.9	1.000	142.9
0.008	0.008	1.000	0.008	125.0	1.000	125.0
0.009	0.009	1.000	0.009	111.1	1.000	111.1
0.010	0.010	1.000	0.010	100.0	1.000	100.0
0.011	0.011	1.000	0.011	90.91	1.000	90.91
0.012	0.012	1.000	0.012	83.33	1.000	83.33
0.013	0.013	1.000	0.013	76.92	1.000	76.92
0.014	0.014	1.000	0.014	71.43	1.000	71.43
0.015	0.015	1.000	0.015	66.67	1.000	66.67
0.016	0.016	1.000	0.016	62.50	1.000	62.50
0.017	0.017	1.000	0.017	58.82	1.000	58.82
0.018	0.018	1.000	0.018	55.56	1.000	55.56
0.019	0.019	1.000	0.019	52.63	1.000	52.63
0.020	0.020	1.000	0.020	50.00	1.000	50.00
0.021	0.021	1.000	0.021	47.62	1.000	47.62
0.022	0.022	1.000	0.022	45.45	1.000	45.45
0.023	0.023	1.000	0.023	43.48	1.000	43.48
0.024	0.024	1.000	0.024	41.67	1.000	41.67
0.025	0.025	1.000	0.025	40.00	1.000	40.00
0.026	0.026	1.000	0.026	38.46	1.000	38.46
0.027	0.027	1.000	0.027	37.04	1.000	37.04
0.028	0.028	1.000	0.028	35.71	1.000	35.71
0.029	0.029	1.000	0.029	34.48	1.000	34.48
0.030	0.030	1.000	0.030	33.33	1.000	33.33
0.031	0.031	1.000	0.031	32.26	1.000	32.26
0.032	0.032	1.000	0.032	31.25	1.000	31.25
0.033	0.033	1.000	0.033	30.30	1.000	30.30
0.034	0.034	1.000	0.034	29.41	1.000	29.41
0.035	0.035	1.000	0.035	28.57	1.000	28.57
0.036	0.036	1.000	0.036	27.78	1.000	27.78
0.037	0.037	1.000	0.037	27.03	1.000	27.03
0.038	0.038	1.000	0.038	26.32	1.000	26.32
0.039	0.039	1.000	0.039	25.64	1.000	25.64
0.040	0.040	1.000	0.040	25.00	1.000	25.00
0.041	0.041	1.000	0.041	24.39	1.000	24.39
0.042	0.042	1.000	0.042	23.81	1.000	23.81
0.043	0.043	1.000	0.043	23.26	1.000	23.26
0.044	0.044	1.000	0.044	22.73	1.000	22.73
0.045	0.045	1.000	0.045	22.22	1.000	22.22
0.046	0.046	1.000	0.046	21.74	1.000	21.74
0.047	0.047	1.000	0.047	21.28	1.000	21.28
0.048	0.048	1.000	0.048	20.83	1.000	20.83
0.049	0.049	1.000	0.049	20.41	1.000	20.41
0.050	0.050	1.000	0.050	20.00	1.000	20.00

解 [illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

解答欄

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

解説欄

1. [illegible]
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3. [illegible]
4. [illegible]
5. [illegible]
6. [illegible]
7. [illegible]
8. [illegible]
9. [illegible]
10. [illegible]
11. [illegible]
12. [illegible]
13. [illegible]
14. [illegible]
15. [illegible]
16. [illegible]
17. [illegible]
18. [illegible]

(1) [illegible]

(2) [illegible]

(3) [illegible]

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(6) [illegible]

(7) [illegible]

(8) [illegible]

(9) [illegible]

(10) [illegible]

(11) [illegible]

(12) [illegible]

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(26) [illegible]

(27) [illegible]

(28) [illegible]

(29) [illegible]

(30) [illegible]

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27. [illegible]
28. [illegible]
29. [illegible]
30. [illegible]
31. [illegible]
32. [illegible]
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34. [illegible]
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36. [illegible]
37. [illegible]
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39. [illegible]
40. [illegible]

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[illegible]

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(v) [illegible]

(vi) [illegible]

(vii) [illegible]

(viii) [illegible]

(ix) [illegible]

(x) [illegible]

(xi) [illegible]

(xii) [illegible]

(xiii) [illegible]

(xiv) [illegible]

(xv) [illegible]

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(xvii) [illegible]

(xviii) [illegible]

(xix) [illegible]

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(xxiii) [illegible]

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(xxxi) [illegible]

(xxxii) [illegible]

(xxxiii) [illegible]

(xxxiv) [illegible]

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(xxxvi) [illegible]

(xxxvii) [illegible]

(xxxviii) [illegible]

(xxxix) [illegible]

(xl) [illegible]

(xli) [illegible]

(xlii) [illegible]

(xliii) [illegible]

(xliv) [illegible]

(xlv) [illegible]

(xlvi) [illegible]

(xlvii) [illegible]

(xlviii) [illegible]

(xlix) [illegible]

(l) [illegible]

(li) [illegible]

(lii) [illegible]

(liii) [illegible]

(liv) [illegible]

(lv) [illegible]

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(lxxix) [illegible]

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(lxxxiv) [illegible]

(lxxxv) [illegible]

(lxxxvi) [illegible]

(lxxxvii) [illegible]

(lxxxviii) [illegible]

(lxxxix) [illegible]

(xc) [illegible]

(xci) [illegible]

(xcii) [illegible]

(xciii) [illegible]

(xciv) [illegible]

(xcv) [illegible]

(xcvi) [illegible]

(xcvii) [illegible]

(xcviii) [illegible]

(xcix) [illegible]

(c) [illegible]

(ci) [illegible]

(cii) [illegible]

(ciii) [illegible]

(civ) [illegible]

(cv) [illegible]

(cvi) [illegible]

(cvii) [illegible]

(cviii) [illegible]

(cix) [illegible]

(cx) [illegible]

(cxi) [illegible]

(cxii) [illegible]

(cxiii) [illegible]

(cxiv) [illegible]

(cxv) [illegible]

(cxvi) [illegible]

(cxvii) [illegible]

(cxviii) [illegible]

(cxix) [illegible]

(cxx) [illegible]

(cxxi) [illegible]

(cxxii) [illegible]

(cxxiii) [illegible]

(cxxiv) [illegible]

(cxxv) [illegible]

(cxxvi) [illegible]

(cxxvii) [illegible]

(cxxviii) [illegible]

(cxxix) [illegible]

(cxxx) [illegible]

(cxxxi) [illegible]

(cxxxii) [illegible]

(cxxxiii) [illegible]

(cxxxiv) [illegible]

(cxxxv) [illegible]

(cxxxvi) [illegible]

(cxxxvii) [illegible]

(cxxxviii) [illegible]

(cxxxix) [illegible]

(cxl) [illegible]

(cxli) [illegible]

(cxlii) [illegible]

(cxliii) [illegible]

(cxliv) [illegible]

(cxlv) [illegible]

(cxlvi) [illegible]

(cxlvii) [illegible]

(cxlviii) [illegible]

(cxlix) [illegible]

(cl) [illegible]

(cli) [illegible]

(clii) [illegible]

(cliii) [illegible]

(civ) [illegible]

(cv) [illegible]

(cvi) [illegible]

(cvii) [illegible]

(cviii) [illegible]

(cix) [illegible]

(cx) [illegible]

(cxi) [illegible]

(cxii) [illegible]

(cxiii) [illegible]

(cxiv) [illegible]

(cxv) [illegible]

(cxvi) [illegible]

(cxvii) [illegible]

(cxviii) [illegible]

(cxix) [illegible]

(cxx) [illegible]

(cxxi) [illegible]

(cxxii) [illegible]

(cxxiii) [illegible]

(cxxiv) [illegible]

(cxxv) [illegible]

(cxxvi) [illegible]

(cxxvii) [illegible]

(cxxviii) [illegible]

(cxxix) [illegible]

(cxxx) [illegible]

(cxxxi) [illegible]

(cxxxii) [illegible]

(cxxxiii) [illegible]

(cxxxiv) [illegible]

(cxxxv) [illegible]

(cxxxvi) [illegible]

(cxxxvii) [illegible]

(cxxxviii) [illegible]

(cxxxix) [illegible]

(cxl) [illegible]

**(cx

SECTION II

DATA INTERPRETATION

38. TABULATION

[illegible]

[illegible]

MULTI EXAMPLES

Ex. 1. [illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

1. [illegible]
2. [illegible]
3. [illegible]
4. [illegible]
5. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Regions / Years	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

1. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]
2. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]
3. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]
4. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]
5. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

Ans. 1. (a) [illegible]

[illegible]

2. (a) [illegible]

[illegible]

[illegible]

[illegible]

3. (a) [illegible]

[illegible]

[illegible]

[illegible]

4. (a) [illegible]

[illegible]

5. (a) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] Section 1 [illegible] Section 2 [illegible] Section 3 [illegible] Section 4 [illegible] Section 5 [illegible] Section 6 [illegible] Section 7 [illegible] Section 8 [illegible] Section 9 [illegible] Section 10 [illegible] Section 11 [illegible] Section 12 [illegible] Section 13 [illegible] Section

11. [illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

[illegible] [illegible] [illegible] [

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

1. [illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

2. [illegible]

[illegible]

3. [illegible]

[illegible]

4. [illegible]

[illegible]

5. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Material 1.1 — [illegible]

Finally, the [illegible] Lumbrieras [illegible]

- Total [illegible] [illegible]
  - [illegible]
  - [illegible]
  - [illegible]
  - [illegible]

Finally, the [illegible] [illegible]

Material 1.2 — [illegible]

Material 1.3 — [illegible]

Material 1.4 — [illegible]

Finally, the [illegible] [illegible] Lumbrieras [illegible]

- [illegible]
  - **Section 1.1** — [illegible]
  - **Section 1.2** — [illegible]
  - **Section 1.3** — [illegible]
  - **Section 1.4** — [illegible]

Finally, the [illegible] [illegible]

- [illegible]
  - [illegible]
  - [illegible]
  - [illegible]
  -

[illegible]

[illegible]

(i) [illegible]

[illegible]

(ii) [illegible]

[illegible]

(iii) [illegible]

[illegible]

(iv) [illegible]

[illegible]

(v) [illegible]

[illegible]

(vi) [illegible]

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(vii) [illegible]

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(viii) [illegible]

[illegible]

(ix) [illegible]

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(x) [illegible]

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(xi) [illegible]

[illegible]

(xii) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(a) Use Table 6

[illegible]

[illegible]

$$[illegible] = \frac{[illegible]}{[illegible]} = [illegible]$$

[illegible]

If X_1 is the total calculated in Table 6, then

$$[illegible] \; X_1 \sim [illegible] \quad \text{so} \quad [illegible] = \frac{[illegible]}{[illegible]} \quad \text{and} \quad [illegible]$$

(b) Table 7

[illegible]

[illegible]

Then $[illegible] = [illegible] = \frac{[illegible]}{[illegible]} = [illegible]$

[illegible]

If X_2 is the total calculated in Table 7, then

$$[illegible] \; X_2 \sim [illegible] \quad \text{so} \quad [illegible] = \frac{[illegible]}{[illegible]} \quad \text{and} \quad [illegible]$$

Then [illegible] $= \frac{[illegible]}{[illegible]} = [illegible]$

37. BAR GRAPHS

[illegible]

Ex. 1. The bar graph given below shows the [illegible] in a certain [illegible] in [illegible] in [illegible] in

[illegible]

[illegible]

9a [illegible]

9b [illegible]

9c [illegible]

9d [illegible]

9e [illegible]

9f [illegible]

9g [illegible]

9h [illegible]

9i [illegible]

9j [illegible]

9k [illegible]

9l [illegible]

9m [illegible]

9n [illegible]

9o [illegible]

9p [illegible]

9q [illegible]

9r [illegible]

9s [illegible]

9t [illegible]

9u [illegible]

9v [illegible]

9w [illegible]

9x [illegible]

9y [illegible]

9z [illegible]

9aa [illegible]

9ab [illegible]

9ac [illegible]

9ad [illegible]

9ae [illegible]

9af [illegible]

9ag [illegible]

9ah [illegible]

9ai [illegible]

9aj [illegible]

9ak [illegible]

9al [illegible]

9am [illegible]

9an [illegible]

9ao [illegible]

9ap [illegible]

9aq [illegible]

9ar [illegible]

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9aiq [illegible]

9air [illegible]

9ais [illegible]

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9aiu [illegible]

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9aiw [illegible]

9aix [illegible]

9aiy [illegible]

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9anb [illegible]

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9and [illegible]

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9bcg [illegible]

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9bci [illegible]

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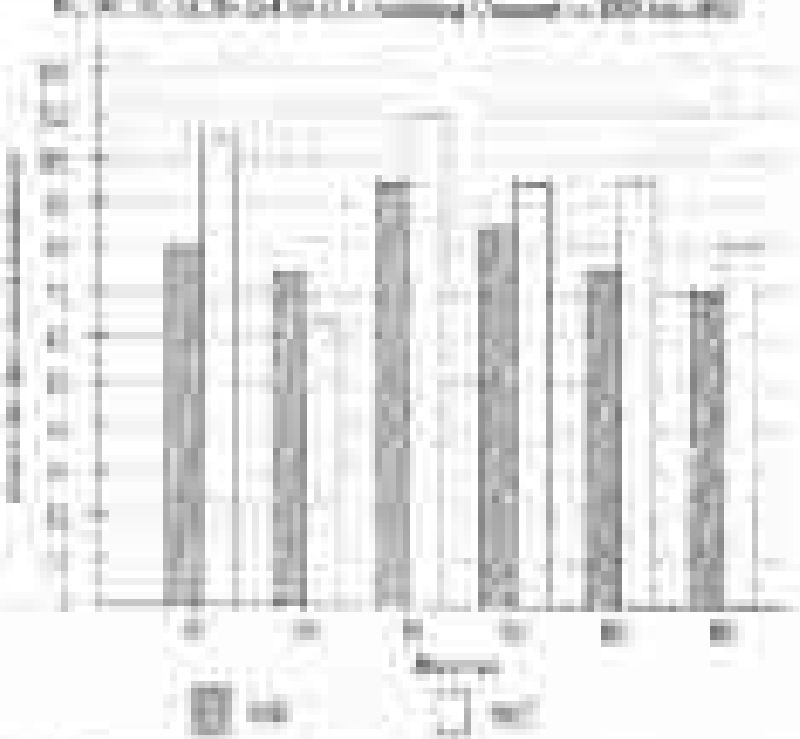
9bco [illegible]

9bcp [illegible]

**



1) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

2) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

3) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

4) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

5) [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

[illegible]

[illegible]

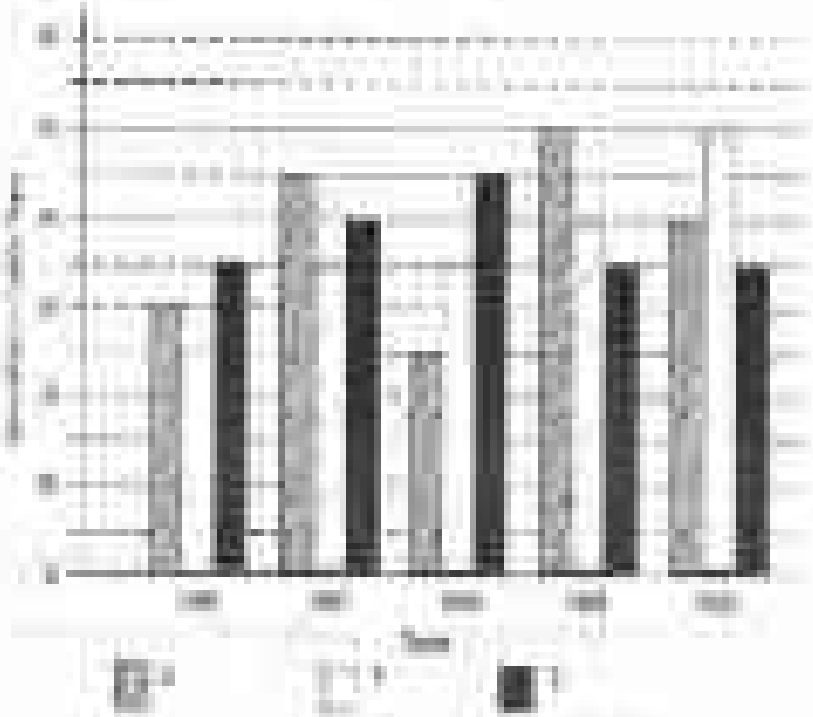
[illegible]

[illegible]

[illegible]

[illegible]

[illegible]


[illegible]
[illegible]
[illegible]

1. The yield of one thousand eggs laid by an average hen will be approximately. Find the profit or loss realized in Company Y.

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible] and [illegible]

2. By which year was the production of [illegible] of Company P in the production of Company Y [illegible]?

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

Sol. 1. (e) : Required difference = [illegible] = [illegible] = [illegible] kg.

2. (c) : Average production of Company P is the greatest [illegible]

$$= \left[\frac{1}{5}\left(\cdots\right)\right] \times \left[\frac{\cdots}{\cdots}\right] = \cdots$$

Average production of Company Y is the greatest [illegible]

$$= \left[\frac{1}{5}\left(\cdots\right)\right] \times \left[\frac{\cdots}{\cdots}\right] = \cdots$$

$\therefore$ Required ratio $= \left(\frac{\cdots}{\cdots}\right) : \left(\frac{\cdots}{\cdots}\right) = \frac{\cdots}{\cdots} : \frac{\cdots}{\cdots}$

3. (d) : Percentage increase in the production of Company P from [illegible] to [illegible]

$$\frac{[illegible]}{[illegible]} \times 100\% = \frac{[illegible]}{[illegible]} \times 100 \% = [illegible]$$

4. (e) : Average profit (loss) in the [illegible] Company for the three years is [illegible]

For Company P : $\frac{1}{3}\left(\cdots\right) = \frac{\cdots}{\cdots}$

For Company Y : $\frac{1}{3}\left(\cdots\right) = \frac{\cdots}{\cdots}$

For Company P : $\frac{1}{3}\left(\cdots\right) = \frac{\cdots}{\cdots}$

$\therefore$ Required difference of the [illegible] is [illegible]. Hence the [illegible] is [illegible].

5. (c) : Percentage change in the [illegible] of Company P in comparison to the previous year for different years are

$$\text{In } [illegible] = \frac{[illegible]}{[illegible]} \times 100 \% = [illegible]$$

$$\text{In } [illegible] = \frac{[illegible]}{[illegible]} \times 100 \% = [illegible]$$

$$\text{In } [illegible] = \frac{[illegible]}{[illegible]} \times 100 \% = [illegible]$$

$$\text{So, } [illegible] = \frac{[illegible]}{[illegible]} \times 100 \% = [illegible]$$

Hence, the [illegible] of [illegible] was the [illegible] in [illegible] and [illegible] in [illegible].

[illegible]

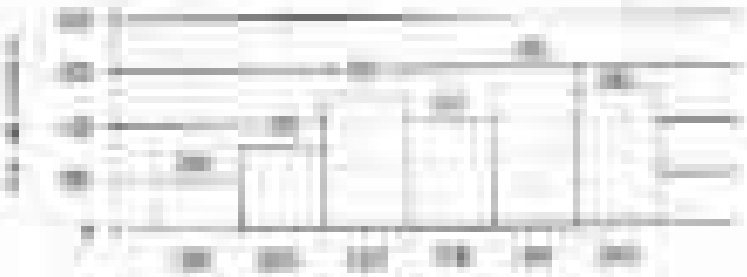
[illegible]

[illegible]

[illegible]

[illegible]

[illegible]



[illegible]

1. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
2. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]
3. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible]
   (d) [illegible] (e) [illegible]

4. The table at [illegible] shows the [illegible] and [illegible] of the [illegible] average [illegible] recorded in the [illegible] in the [illegible] 2007. What was the "[illegible]"?

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

5. The [illegible] difference between the [illegible] recorded in the [illegible] and the [illegible] of [illegible] [illegible] was [illegible]?

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

Hint 4. (a) The [illegible] average [illegible] in the [illegible] [illegible] is [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible]

[illegible]

For [illegible] [illegible] is [illegible]

[illegible]

For [illegible] [illegible] is [illegible]

The [illegible] [illegible] [illegible]

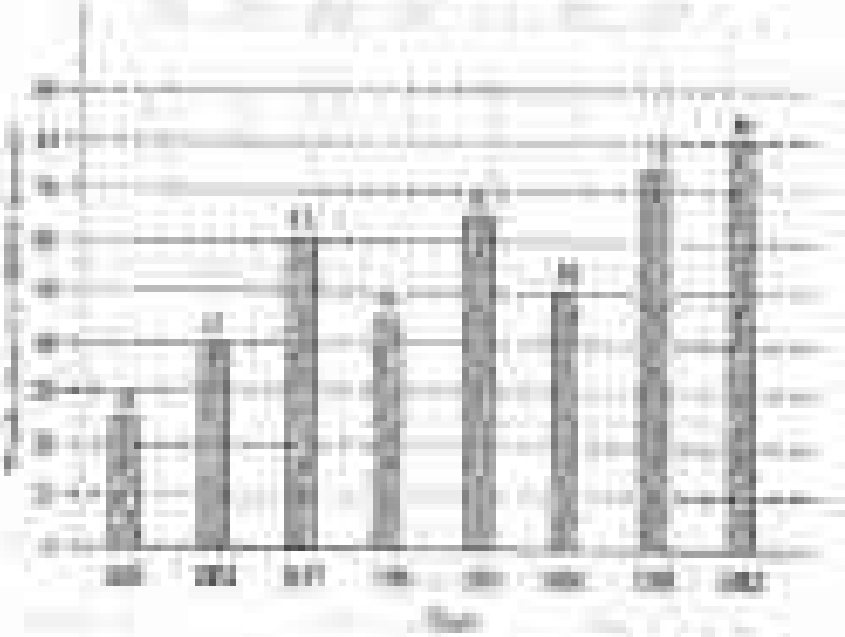
4.16 The [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible]

[illegible] 27

[illegible] [illegible] the following line graph and answer the questions given below. [illegible]

Production of Fertilisers (in [illegible]) [illegible]



1. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

2. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

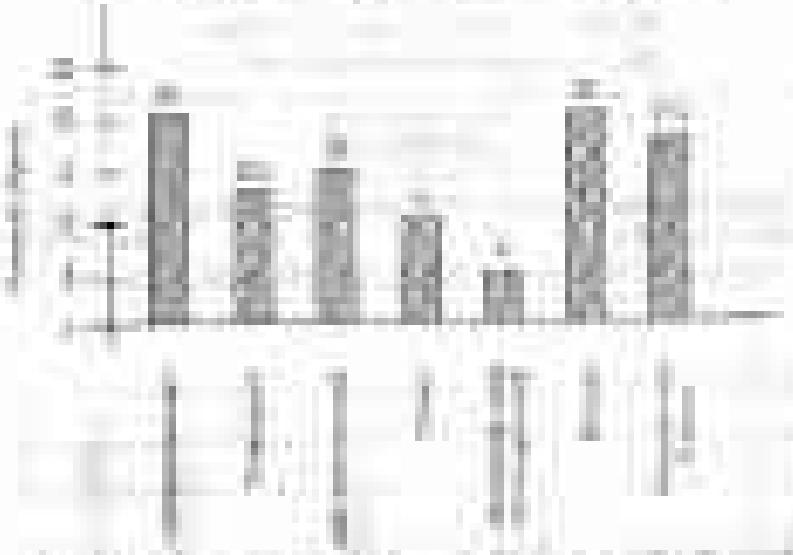
3. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

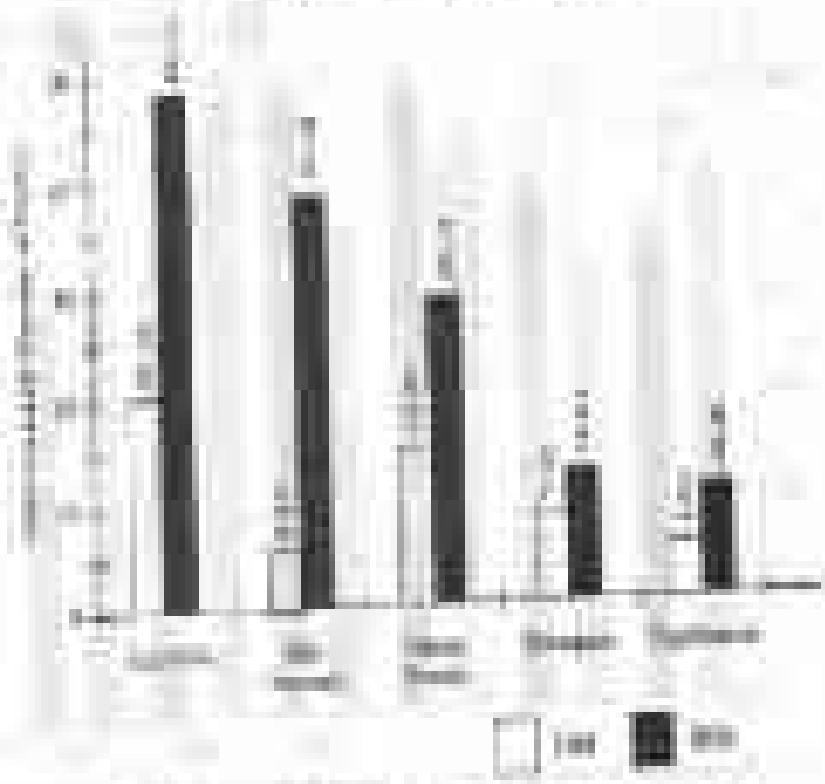
4. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

[illegible]



[illegible]



6. The story is a reworking of an old folk-tale. Name the tale. ___ (2 marks)
   (a) Cinderella (b) Snow White (c) Beauty and the Beast (d) The Ugly Duckling
   (e) Rapunzel (f) Hansel and Gretel

7. Read the following lines from Act I, Scene 1 and answer the question that follows:

   "Nothing will come of nothing: speak again."

   Which of the following is the correct meaning of the underlined word?
   (a) Cordelia (b) Goneril (c) Regan (d) Burgundy
   (e) France (f) Gloucester

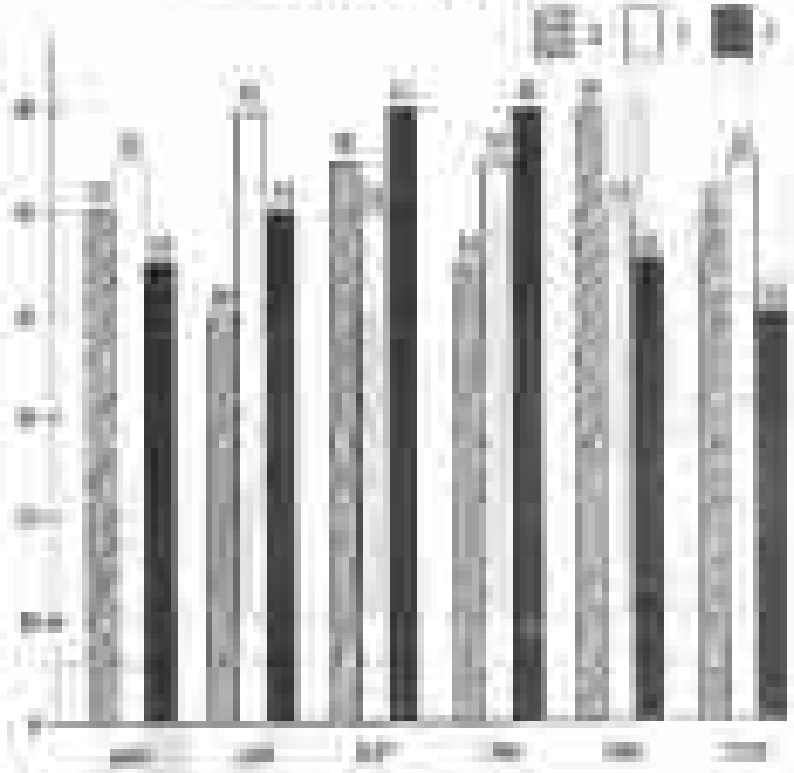
8. "The wheel is come full circle; I am here." Which character is speaking when he says this? ___ (2 marks)
   (a) Lear (b) Edgar (c) Edmund (d) Gloucester
   (e) Cordelia (f) Kent

9. The story of King Lear is based on a Celtic legend. Who is the King of Britain who rules from Dublin? ___ (2 marks)
   (a) Brian Boru (b) Cormac (c) Niall (d) Malachy (e) Aodh

10. Which of the following characters does not die in the play? ___ (2 marks)
    (a) Lear (b) Cordelia (c) Goneril (d) Regan (e) Edmund (f) Gloucester

11. Write a paragraph (approx. 100–150 words) on the theme of blindness in the play, with reference to at least two characters. (10 marks)

12. Discuss the theme of nature versus unnatural behaviour in the play. Refer to at least three characters in your answer. (20 marks)



(a) The value of the velocity over the [illegible] is approximately [illegible] the pendulum was initially released. At the [illegible]?

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

(b) The [illegible] is at the average speed [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

(c) The [illegible] parameters of [illegible] are [illegible] and [illegible] respectively. [illegible] parameters of [illegible] [illegible]?

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

(d) [illegible] between the average [illegible] of [illegible] and [illegible]?

(a) [illegible] (b) [illegible] (c) [illegible]

(d) [illegible] (e) [illegible]

(e) [illegible] is the [illegible] is the [illegible]?

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

Ex. [illegible] (Tip: [illegible] calculation of the [illegible] of a [illegible] transformation matrix [illegible] [illegible] [illegible]

The bar graph of the different types of [illegible] in [illegible] is given below. Study the graph and answer the questions.

(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

(j) [illegible]

(k) [illegible]

(l) [illegible]

(m) [illegible]

(n) [illegible]

(o) [illegible]

(p) [illegible]

(q) [illegible]

(r) [illegible]

(s) [illegible]

(t) [illegible]

(u) [illegible]

(v) [illegible]

(w) [illegible]

(x) [illegible]

(y) [illegible]

(z) [illegible]

(aa) [illegible]

(ab) [illegible]

(ac) [illegible]

(ad) [illegible]

(ae) [illegible]

(af) [illegible]

(ag) [illegible]

(ah) [illegible]

(ai) [illegible]

(aj) [illegible]

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(bej) [illegible]

(bek) [illegible]

(bel) [illegible]

(bem) [illegible]

(ben) [illegible]

(beo) [illegible]

(bep) [illegible]

(beq) [illegible]

(ber) [illegible]

(bes) [illegible]

(bet) [illegible]

(beu) [illegible]

(bev) [illegible]

(bew) [illegible]

(bex) [illegible]

(bey) [illegible]

(bez) [illegible]

(bfa) [illegible]

(bfb) [illegible]

(bfc) [illegible]

(bfd) [illegible]

(bfe) [illegible]

(bff) [illegible]

(bfg) [illegible]

(bfh) [illegible]

(bfi) [illegible]

(bfj) [illegible]

(bfk) [illegible]

(bfl) [illegible]

(bfm) [illegible]

(bfn) [illegible]

(bfo) [illegible]

(bfp) [illegible]

(bfq) [illegible]

(bfr) [illegible]

(bfs) [illegible]

(bft) [illegible]

(bfu) [illegible]

(bfv) [illegible]

(bfw) [illegible]

(bfx) [illegible]

(bfy) [illegible]

(bfz) [illegible]

(bga) [illegible]

(bgb) [illegible]

(bgc) [illegible]

(bgd) [illegible]

(bge) [illegible]

(bgf) [illegible]

(bgg) [illegible]

(bgh) [illegible]

(bgi) [illegible]

(bgj) [illegible]

(bgk) [illegible]

(bgl) [illegible]

(bgm) [illegible]

(bgn) [illegible]

(bgo) [illegible]

(bgp) [illegible]

(bgq) [illegible]

(bgr) [illegible]

(bgs) [illegible]

(bgt) [illegible]

(bgu) [illegible]

(bgv) [illegible]

(bgw) [illegible]

(bgx) [illegible]

(bgy) [illegible]

(bgz) [illegible]

(bha) [illegible]

(bhb) [illegible]

(bhc) [illegible]

(bhd) [illegible]

(bhe) [illegible]

(bhf) [illegible]

(bhg) [illegible]

(bhh) [illegible]

(bhi) [illegible]

(bhj) [illegible]

(bhk) [illegible]

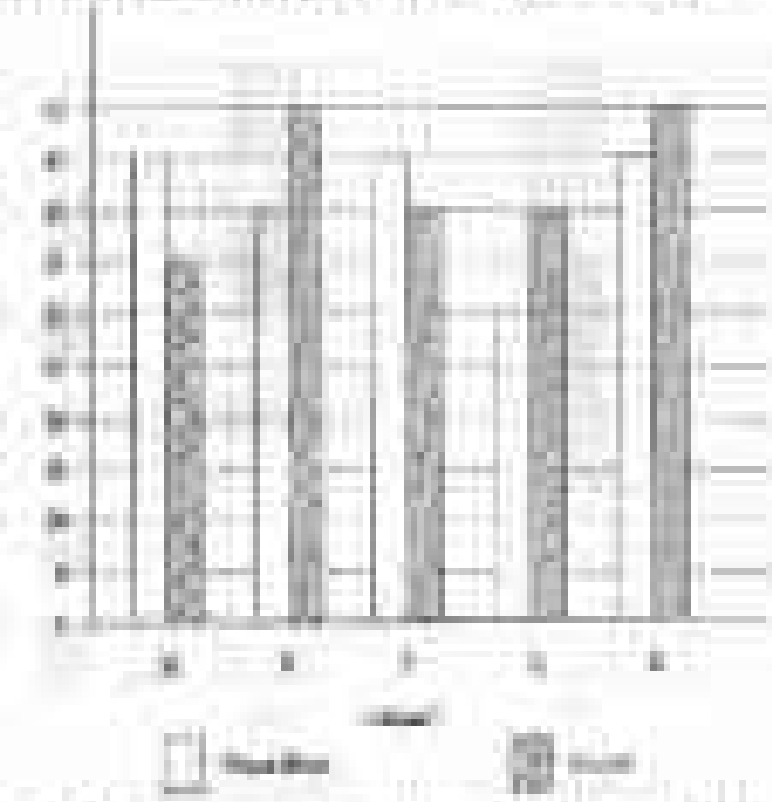
(bhl) [illegible]

(bhm) [illegible]

(bhn) [illegible]

(bho) [

[illegible]



(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

ANSWER

[illegible]

[illegible]

1. Average [illegible] is [illegible] [illegible] of [illegible] [illegible]

   $= \frac{1}{2}\left[\ \ \right]$ [illegible]

   ∴ The [illegible] [illegible] [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(ii) Number of [illegible] $= \frac{[illegible]}{[illegible]} \times [illegible] = [illegible]$

(iii) Number of [illegible] $= \frac{[illegible]}{[illegible]} \times [illegible] = [illegible]$

(iv) Number of [illegible] $= \frac{[illegible]}{[illegible]} \times [illegible] = [illegible]$

11. [illegible]

(i) **[illegible]** : $\frac{[illegible]}{[illegible]} \times [illegible] = [illegible]$ [illegible]

(ii) **[illegible]** : $\frac{[illegible]}{[illegible]} \times [illegible] = [illegible]$ [illegible]

(iii) **[illegible]** : $\frac{[illegible]}{[illegible]} \times [illegible] = [illegible]$ [illegible]

(iv) **[illegible]** : $\frac{[illegible]}{[illegible]} \times [illegible] = [illegible]$ [illegible]

(v) **[illegible]** : $\frac{[illegible]}{[illegible]} \times [illegible] = [illegible]$ [illegible]

∴ [illegible] $= [illegible] + [illegible] + [illegible] + [illegible] + [illegible] = [illegible]$

12. [illegible]

From the [illegible] $= [illegible]$ [illegible]

For the [illegible] $= [illegible]$ [illegible]

$= [illegible]$ [illegible]

For the [illegible] $= [illegible]$ [illegible]

Therefore [illegible] the [illegible] of the Factor ?

(i) Probable [illegible] $= \frac{[illegible]}{[illegible]} \times [illegible] = [illegible]$ [illegible]

(ii) Average [illegible] of Factor ? is [illegible] $= [illegible]$ [illegible]

$= \frac{[illegible]}{[illegible]}$ [illegible]

Average [illegible] of Factor ? is [illegible] $= [illegible]$ [illegible]

$= \frac{[illegible]}{[illegible]}$ [illegible]

(iii) [illegible] $= \frac{[illegible]}{[illegible]} \times [illegible] = [illegible]$ [illegible]

[illegible]

(a) [illegible]

(b) [illegible]

[illegible]

[illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

[illegible]

19. [illegible]

[illegible]

20. [illegible]

[illegible]

21. [illegible]

[illegible]

22. [illegible]

[illegible]

23. [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

38. PIE-CHARTS

IMPORTANT FACTS AND FORMULAE

[illegible]

SOLVED EXAMPLES

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

8. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

9. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

10. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

SOLUTIONS

1. (a) [illegible]

(i) [illegible]

(ii) [illegible]

(iii) [illegible]

(iv) [illegible]

[illegible]

2. (a) [illegible]

[illegible]

(b) [illegible]

[illegible]

3. (a) [illegible]

[illegible]

(b) [illegible]

[illegible]

4. (a) [illegible]

[illegible]

(b) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

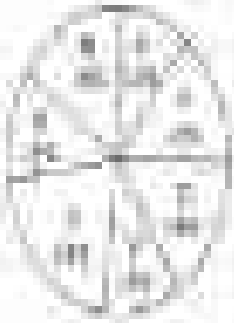
[illegible]

SOLUTION

[illegible]

Direction : Study the following pie chart and table carefully and answer the questions given below. (2.8.2.2) 2000

[illegible]



Village	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

1. (a) [illegible]

[illegible]

(b) [illegible]

2. (a) [illegible]

[illegible]

(b) [illegible]

3. (a) [illegible]

(b) [illegible]

[illegible]

4. (a) [illegible]

(b) [illegible]

5. (a) [illegible]

[illegible]

(b) [illegible]

[illegible]

6. (a) [illegible]

(b) [illegible]

[illegible]

7. (a) [illegible]

[illegible]

(b) [illegible]

[illegible]

[illegible] 16

1. [illegible] Study the chart.

[illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible] Study the chart.

2. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

3. [illegible]

(a) [illegible] (b) [illegible]
(c) [illegible] (d) [illegible]

4. [illegible]

(a) [illegible] (b) [illegible]
(c) [illegible] (d) [illegible]

5. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

1. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

2. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

3. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

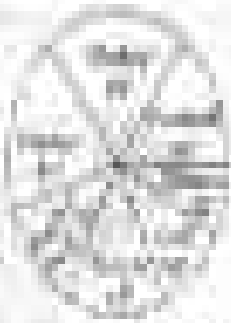
4. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

10. [illegible]

    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

Problem Exercises (1–6): **[illegible]**



11. [illegible]

    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

12. [illegible]

    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

13. [illegible]

    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

14. [illegible]

    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

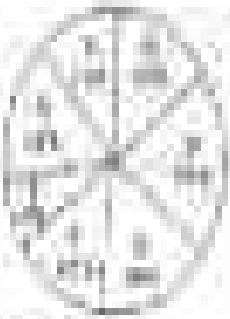
15. [illegible]

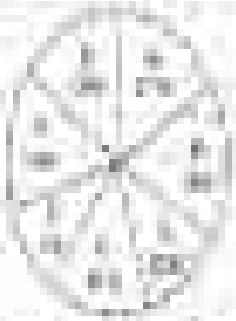
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

Directions (Questions 1 to 10): Study the following pie charts carefully and answer the questions given below.

[illegible]

[illegible]

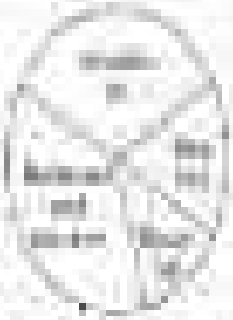




1. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
2. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
3. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
4. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
5. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

Directions (Questions 11 to 20): Study the following pie charts carefully and answer the questions given below.

[illegible]



11. [illegible]
    (a) $\frac{1}{4}$ (b) $\frac{3}{8}$ (c) $\frac{3}{4}$ (d) [illegible]
12. [illegible]
    (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]						

[illegible]

[illegible]

[illegible]

[

[illegible]

[illegible]

[illegible]

(d) Measurements: [illegible]

7. [illegible]

[illegible]

(c) Measurements: [illegible]

8. [illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

[illegible]

9. [illegible]

10. [illegible]

11. [illegible]

12. [illegible]

13. [illegible]

[illegible]

[illegible]

[illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

39. LINE-GRAPHS

[illegible]

[illegible] EXAMPLES

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]
2. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]
3. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]
4. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]
5. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]
6. [illegible]
   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]
7. [illegible]

[illegible]

[illegible]

[illegible]

1. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

2. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

3. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible]

   (d) [illegible] (e) [illegible]

4. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

5. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible]

   (d) [illegible] (e) [illegible]

[illegible] 1. [illegible] [illegible]

[illegible] 2. [illegible] [illegible]

[illegible] 3. [illegible] [illegible]

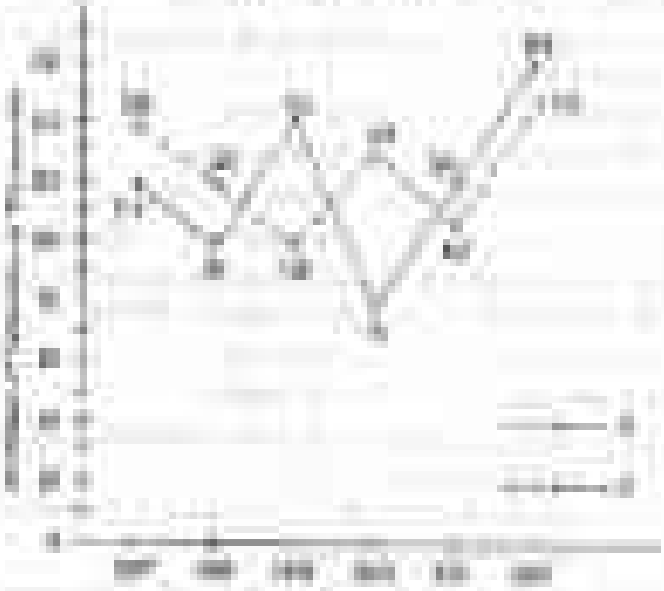
[illegible] 4. [illegible] [illegible]

[illegible] 5. [illegible] [illegible]

[illegible] 6. [illegible] [illegible]

[illegible]

[illegible]



[illegible]

1. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

2. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

3. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

4. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

5. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible] (e) [illegible]

B6. [illegible]

   (a) [illegible] (b) [illegible] (c) [illegible] (d) [illegible]

   (e) [illegible]
   [illegible]
   [illegible]
   [illegible]
   [illegible]
   [illegible]

   (f) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

$$[illegible] \tag{1}$$

[illegible]

$$[illegible] \tag{2}$$

[illegible]

$$[illegible] \tag{3}$$

[illegible]

$$[illegible] \tag{4}$$

[illegible]

$$[illegible] \tag{5}$$

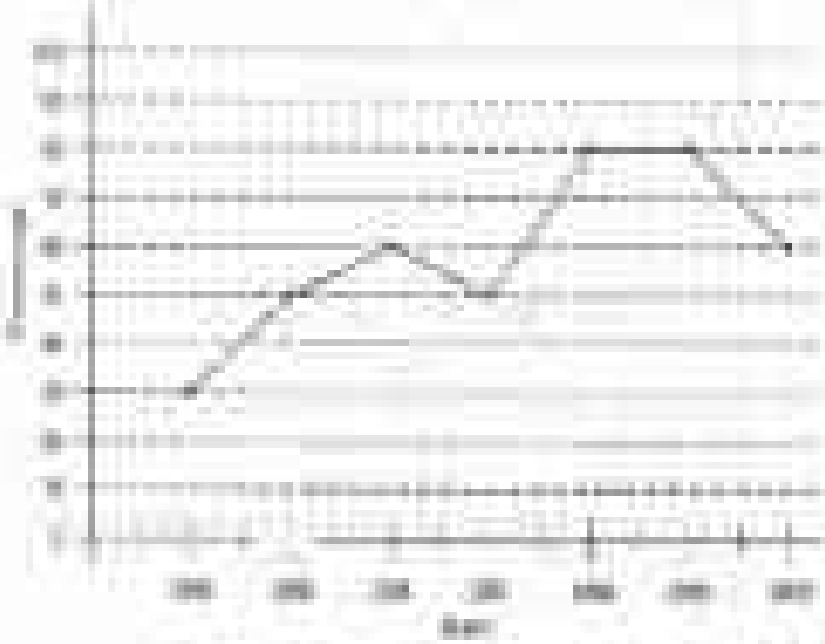
[illegible]

$$[illegible] \tag{6}$$

[illegible]

[illegible] 26

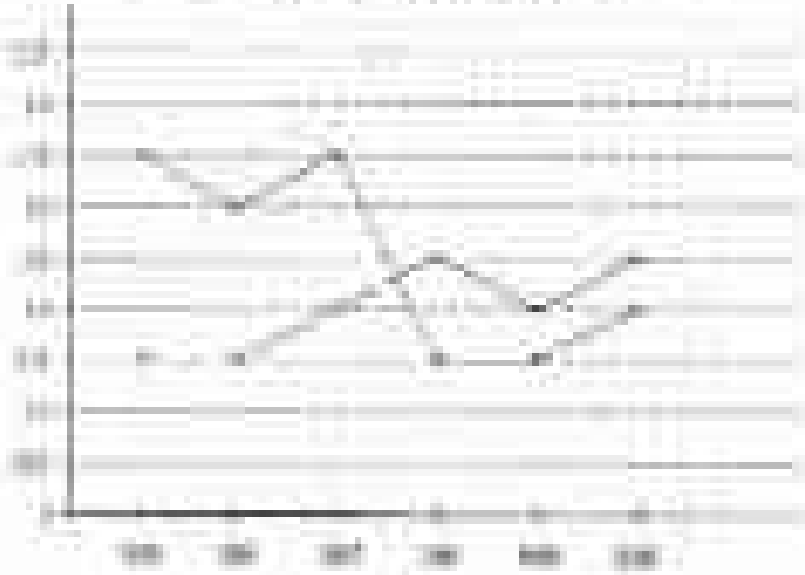
[illegible]


[illegible]
[illegible]
[illegible]

[illegible]

Direction (Questions 1-4): The following table gives the [illegible] [illegible] [illegible]

[illegible]



[illegible]

(b) Cross-sectional comparison of 1991 crude mortality by ethnicity, Kalandwa District, 1991 (Figure 2).

(c) Trends in crude mortality, 1991–1994, Kalandwa District (Figure 3).

Overall crude mortality (0.8 vs. 1.1) and infant mortality (14 vs. 21) were lower in Kalandwa than in Ndorobo. Yet in contrast to the national transition, these rates had not fallen appreciably between 1991 and 1994. Overall fertility was also lower in Kalandwa (2.6 vs. 3.1), and the gap widened slightly over the period. Crude mortality in Kalandwa rose from 0.7 to 0.9 per thousand, while in Ndorobo it fell from 1.2 to 1.0. Infant mortality in Kalandwa rose from 12 to 16, while in Ndorobo it fell from 23 to 19. Fertility in Kalandwa remained stable at 2.6 throughout the period.

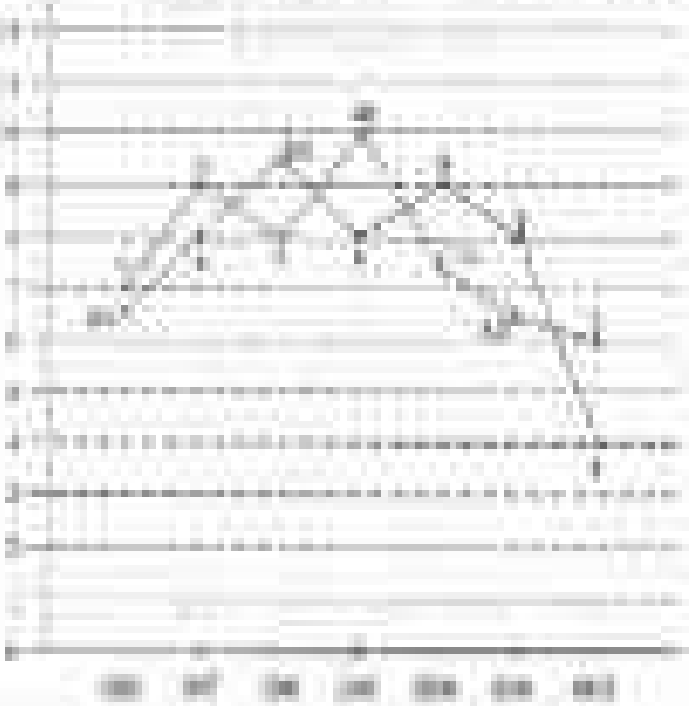


Figure 3. Crude mortality, Kalandwa District, 1991–1994.

(d) Total population, Kalandwa District, 1991–1994 (Figure 4).

(e) Crude mortality, Kalandwa District, 1991–1994 (Figure 5).

(f) Crude mortality, Ndorobo District, 1991–1994 (Figure 6).

10. [illegible]

11. [illegible]

(a) [illegible] (b) [illegible] (c) [illegible]
(d) [illegible] (e) [illegible]

12. [illegible]

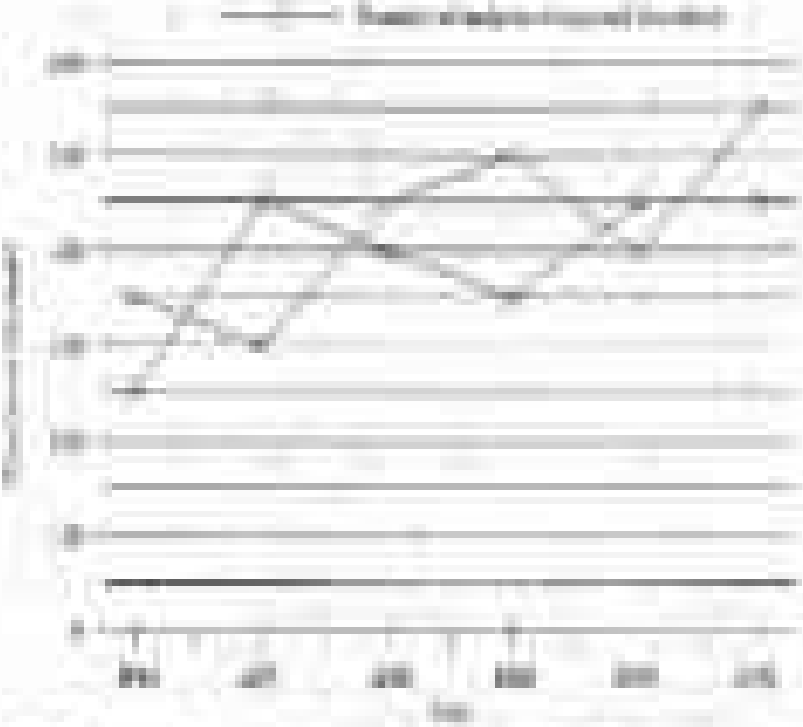
(a) [illegible] (b) [illegible] (c) [illegible]
(d) [illegible] (e) [illegible]

Problem Set 10.4 (Log 10). Plot the following logarithmic period graph for the period of a [illegible] from [illegible] to [illegible] in [illegible] [illegible] (To do so, use Table 10.4, p. 767.)

(a) [illegible] (b) [illegible] (c) [illegible]
(d) [illegible] (e) [illegible] (f) [illegible]

Solution: [illegible]

Plot your results gives below the graph and based on this graph, [illegible]


[illegible]
[illegible]
[illegible]

(1) The number of students scoring in the range 15 – 20 in the entire class is the sum of the number of students scoring in the range 15 – 20 in Section A and in Section B.

(a) 36, 28 (b) 40, 24 (c) 34, 30 (d) 32, 32 (e) 30, 34

(2) Average Marks (Sec A + Sec B) = (Average marks of Section A × No. of students in Sec A + Average marks of Sec B × No. of students in Sec B) / (No. of students in Sec A + No. of students in Sec B)

(a) 4.08 (b) 4.00 (c) 3.96 (d) 3.92 (e) 3.84

(3) The difference between the number of students in the range 0 – 5 in Section A and the number of students in the range 0 – 5 in Section B is

(a) 1.75 (b) 1.50 (c) 1.00 (d) 0.75 (e) 0.50

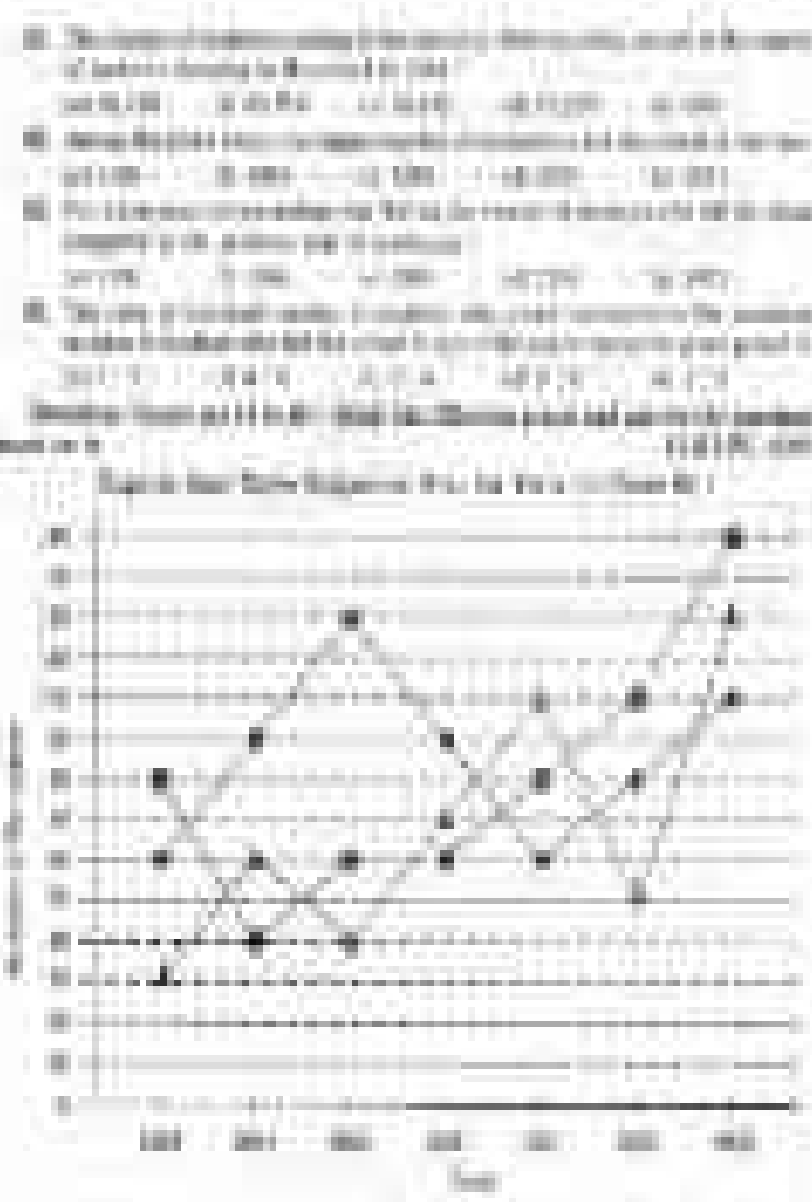
(4) The ratio of total number of students in the range 0 – 5 in Section A to the total number of students in the range 0 – 5 in Section B is

(a) 1 : 1 (b) 4 : 3 (c) 3 : 4 (d) 7 : 3 (e) 3 : 7

Directions: Answer the 5 to 10 Questions based on the following graph and answer the questions given below.

5 x 6 = 30 (Marks)

Graph for Sales Revenue Budgets for the Year 2010 in Crores (Rupees)



(5) Average sales of Category A in the period 2013 to 2017 is approximately equal to the average sales of the category B in the period 2013 to 2017.

(a) 10.5 % (b) 12.5 % (c) 7.5 % (d) 15.5 % (e) 20.5 %

(6) In how many years the sales revenue of Category A was more than the average sales revenue of the given years?

(a) 1 (b) 2 (c) 3 (d) 4 (e) 5

(7) What is the difference between the average sales revenue of Category A and Category B in the period 2013 to 2017?

(a) Rs. 2.25 crores (b) Rs. 2.75 crores (c) Rs. 3.25 crores
(d) Rs. 3.75 crores (e) Rs. 4.25 crores

(8) In which year the difference between the sales revenue of Category B and C was maximum?

(a) 2009 (b) 2010 (c) 2012 (d) 2013 (e) None of the above

[illegible]

ANSWERS

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

HAVING

1. [illegible]

   (a) [illegible] (b) [illegible]

   (c) [illegible] (d) [illegible]

   (e) [illegible] (f) [illegible]

   [illegible]

2. [illegible]

3. [illegible]

4. [illegible]

5. [illegible]

6. [illegible]

7. [illegible]

8. [illegible]

9. [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

(j) [illegible]

(k) [illegible]

(l) [illegible]

(m) [illegible]

(n) [illegible]

(o) [illegible]

(p) [illegible]

(q) [illegible]

(r) [illegible]

(s) [illegible]

(t) [illegible]

(u) [illegible]

(v) [illegible]

(w) [illegible]

(x) [illegible]

(y) [illegible]

(z) [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

(i) [illegible]

(j) [illegible]

(k) [illegible]

(l) [illegible]

(m) [illegible]

(b) [illegible]

(d) [illegible]

(f) Using the substitution above we have

$$\text{Volume} = \int_{[illegible]}^{[illegible]} [illegible] \, dx = [illegible]$$

(h) [illegible]

(i) The parabola $y = x^2$ in the xy-plane is symmetric about the y-axis. Hence the solid is the union of two congruent half-solids, one in the $x \geq 0$ half-space and the other in the $x \leq 0$ half-space. Each half-solid is the region between the plane $x = 1$ and the parabolic cylinder $y = x^2$. Hence

$$\text{Volume} = \int_{[illegible]}^{[illegible]} [illegible] \, dx = [illegible]$$

(j) [illegible]

(k) Using the [illegible] we have

$$\text{Volume} = \int_{[illegible]}^{[illegible]} [illegible] \, dx = [illegible]$$

Exercises 14 to 19:

Hint/Sketch: [illegible]

(a) [illegible]

(b) [illegible]

(c) [illegible]

(d) [illegible]

$$\int_{[illegible]}^{[illegible]} [illegible] \, dx = [illegible]$$

[illegible]

$$\int_{[illegible]}^{[illegible]} [illegible] \, dx = [illegible]$$

$$\text{Volume} = \int_{[illegible]}^{[illegible]} [illegible] \, dx = [illegible]$$

(e) [illegible]

(f) [illegible]

(g) [illegible]

(h) [illegible]

[illegible]

10. [illegible]

$$[illegible]$$

[illegible]

$$[illegible]$$

[illegible]

$$[illegible]$$

11. [illegible]

a. [illegible]
b. [illegible]
c. [illegible]
d. [illegible]
e. [illegible]
f. [illegible]
g. [illegible]
h. [illegible]

[illegible]

12. [illegible]

a. [illegible]
b. [illegible]
c. [illegible]
d. [illegible]
e. [illegible]
f. [illegible]
g. [illegible]
h. [illegible]

[illegible]