

Acing UTME Maths

A Comprehensive Guide with Past Questions and Solutions

By

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Dedication and Acknowledgements

This work is dedicated to our families, whose unwavering support has been our greatest strength throughout this journey. Their constant encouragement and belief in our abilities have fueled our passion and perseverance in creating this resource.

We would also like to express our sincere gratitude to the following individuals and institutions for their invaluable contributions:

- Our mentors and teachers, who instilled in us a love for mathematics and equipped us with the knowledge and skills needed to succeed.
- The examiners and administrators of the UTME, whose dedication to educational standards ensures a fair and effective assessment process.
- Our colleagues and friends, who provided feedback and support throughout the development of this book.
- The wider academic community, whose research and publications have laid the foundation for our understanding of mathematics.

We are truly grateful for the collective effort that has made this book possible. We hope that it will be a valuable resource for students preparing for the UTME and beyond.

A Note on Preparation

This book was meticulously prepared using the \LaTeX document processing system, a powerful tool for typesetting high-quality scientific and mathematical texts. The diagrams herein were crafted using the TikZ package. We extend our thanks to the developers of the \LaTeX system and the numerous packages that made this work possible.

About the Authors

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Preface

Welcome to “Acing UTME Maths”, a comprehensive guide designed to help you conquer the upcoming UTME Maths exam. This book provides you with a wealth of past questions, detailed solutions, and insightful strategies to enhance your understanding and preparation.

This book is organized into chapters that follow the official UTME Maths syllabus, covering all key topics and subtopics. Each chapter includes a variety of past questions carefully selected to reflect the types and difficulty levels encountered in the actual exam.

In addition to past questions, we have provided detailed solutions that explain the reasoning behind each step and highlight common mistakes to avoid. We encourage you to work through these solutions carefully and utilize them as learning tools to improve your problem-solving skills.

Furthermore, we have incorporated valuable strategies throughout the book, offering tips and techniques to maximize your efficiency and performance on the exam. These strategies will help you manage your time effectively, approach different question types confidently, and overcome any challenges you may encounter.

We are confident that “Acing UTME Maths” will be your ultimate companion on your journey to success. By diligently working through the material and utilizing the resources provided, you will gain the knowledge, skills, and confidence needed to achieve your desired score on the UTME Mathematics exam.

Best of luck!

Ayodeji Adesegun and Chimobi Nwafor

Chapter 1

Number and Numeration

1.1 Number Bases

1.1.1 Questions

1. The number 25 when converted from the tens and units base to the binary base (base 2) is:
A. 10011
B. 1111011
C. 111000
D. 11001
E. 110011
2. A woman bought 4 bags of rice at $N56$ per bag and 3 tins of milk at $N4$ per tin. What is the total cost of the items she bought?
A. $N245$
B. $N242$
C. $N236$
D. $N341$
E. $N338$
3. Evaluate $212_3 - 121_3 + 222_3$.
A. 313_3
B. 1000_3
C. 1020_3
D. 1222_3
E. 1213_3
4. A trader in a country where the currency 'MONT' (M) is in base five bought 103_5 oranges at $M14_5$ each. If he sold the oranges at $M24_5$ each, what would be his gain?
A. $M103_5$
B. $M1030_5$
C. $M102_5$
D. $M2002_5$
E. $M3024_5$
5. Find x if $(x_4)^2 = (100100)_2$.
A. 6
B. 12
C. 100
D. 210
E. 10042
6. Convert 241_5 to base 8.
A. 71_8
B. 107_8
C. 176_8
D. 241_8
7. In the equation $\frac{11_2}{x_2} = \frac{1000_2}{x_2 + 101_2}$, solve for x .
A. 101
B. 11
C. 110
D. 111
E. 10
8. $4243_5 - 12x4_5 = y344_5$. What is the difference between x and y ?
A. 4
B. 2
C. 1

- D. 3
E. 5
9. In base ten, the number 101101_2 equals:
A. 15
B. 45
C. 23
D. 12
10. Convert the number 39 to base 2.
A. 100111
B. 111001
C. 110111
D. 111111
E. 100101
11. Find n if $34_n = 10110_2$.
A. 5
B. 6
C. 7
D. 8
E. 9
12. If $2_9 \times (Y3)_9 = 3_5 \times (Y3)_5$, find the value of Y .
A. 4
B. 3
C. 2
D. 1
E. 5
13. Simplify $213_4 \times 23_4$.
A. 10321_4
B. 12231_4
C. 13221_4
D. 10311_4
E. 13021_4
14. $55_x + 52_x = 77_{10}$, find x .
A. 5
B. 6
C. 7
D. 8
E. 10
15. If $x_{10} = 23_5$, find x .
A. 15
B. 12
C. 14
D. 13
E. 16
16. Find the sum of $25_6, 52_6, 43_6$ in base 8.
A. 411
B. 141
C. 114
D. 417
17. If $2A3_3 = 77_8$, find A .
A. 1
B. 2
C. 0
D. 4
18. Evaluate $(202_3)^2 - (112_3)^2$.
A. 21112
B. 21121
C. 21011
D. 21120
19. If 321_4 is divided by 23_4 and leaves a remainder r , what is the value of r ?
A. 4
B. 2
C. 3
D. 0
E. 1
20. Convert 521_{10} to a number in base 5.
A. 1404_5
B. 4041_5
C. 4140_5
D. 4014_5
E. 4104_5
21. If $6R7_8 = 511_9$, find R .
A. 6
B. 5
C. 3
D. 2
E. 8

22. Find the value of x if $121_x + 112_x = 30_{10}$.
- A. 5
B. 7
C. $-\frac{9}{2}$
D. 3
E. 4
23. Evaluate $(1011_2)^2 - 1012_2$.
- A. 110000_2
B. 110000_2
C. 101011_2
D. 110110_2
24. Add 1101_2 , 11011_2 and 111_2 .
- A. 110110_2
B. 101011_2
C. 111011_2
D. 101010_2
E. 110011_2
25. Find the value of m if $13_m + 24_m = 41_m$.
- A. 8
B. 5
C. 4
D. 6
E. 3
26. If $125_x = 20_{10}$, find x .
- A. 2
B. 3
C. 4
D. 6
E. 5
27. If $(K2)_6 \times 3_6 = 3_5(K4)_5$, what is the value of k ?
- A. 2
B. 1
C. 3
D. 4
E. 5
28. Find P , if $451_6 - P_7 = 305_6$.
- A. 116_7
B. 62_7
C. 611_7
D. 142_7
29. The sum of four numbers is 1214_5 . What is the average expressed in base 5?
- A. 141
B. 411
C. 417
D. 114
E. 471
30. If $(1P03)_4 = 115_{10}$, find P .
- A. 2
B. 0
C. 1
D. 4
E. 3
31. If $(P344)_6 - (23P2)_6 = (2PP2)_6$, find the digit P .
- A. 1
B. 2
C. 3
D. 4
E. 5
32. $4243_5 - (12X4)_5 = Y344$. What is the difference between X and Y ?
- A. 1
B. 2
C. 3
D. 4
E. 5
33. Convert 67_{10} to base 2.
- A. 1000011_2
B. 1000101_2
C. 1100011_2
D. 1010011_2
34. Evaluate $1101_2 + 1011_2$.
- A. 11000_2
B. 10110_2
C. 11010_2
D. 11100_2
35. If $432_x = 156_{10}$, find x .

- A. 5
B. 6
C. 7
D. 8
36. Convert 1234_5 to base 10.
A. 194
B. 189
C. 204
D. 214
37. Simplify $321_4 + 132_4$.
A. 1123_4
B. 1213_4
C. 1203_4
D. 1130_4
38. If $101_x + 11_x = 1000_x$, find x .
A. 2
B. 3
C. 4
D. 5
39. Evaluate $10110_2 - 1101_2$.
A. 1001_2
B. 1011_2
C. 111_2
D. 1111_2
40. Convert 255_{10} to base 16.
A. FF_{16}
B. FE_{16}
C. EF_{16}
D. $F0_{16}$
41. If $212_3 \times 2_3 = x_3$, find x .
A. 1201_3
B. 1101_3
C. 2021_3
D. 1011_3
42. Find n if $144_n = 100_{10}$.
A. 6
B. 7
C. 8
D. 9
43. Convert 345_6 to base 8.
A. 215_8
B. 225_8
C. 205_8
D. 235_8
44. Evaluate $111_2 \times 101_2$.
A. 100011_2
B. 110011_2
C. 100111_2
D. 101011_2
45. If $54_x = 34_{10}$, find x .
A. 5
B. 6
C. 7
D. 8
46. Simplify $2134_5 + 3421_5$.
A. 11110_5
B. 11010_5
C. 10110_5
D. 11210_5
47. Convert 1000000_2 to base 10.
A. 64
B. 128
C. 32
D. 256
48. If $ABC_{16} = x_{10}$, where $A = 10, B = 11, C = 12$, find x .
A. 2748
B. 2847
C. 2784
D. 2874
49. Evaluate $1010_2 \div 10_2$.
A. 101_2
B. 110_2
C. 100_2
D. 111_2
50. If $234_x + 123_x = 412_x$, find x .

- A. 5
B. 6
C. 7
D. 8
51. Convert 72_{10} to base 8.
A. 110_8
B. 100_8
C. 111_8
D. 120_8
52. Simplify $444_5 - 232_5$.
A. 212_5
B. 202_5
C. 222_5
D. 112_5
53. If $1011_2 \times x_2 = 101101_2$, find x .
A. 11_2
B. 101_2
C. 111_2
D. 1001_2
54. Convert 1010101_2 to base 10.
A. 85
B. 95
C. 75
D. 65
55. Evaluate $432_5 \times 3_5$.
A. 2341_5
B. 2441_5
C. 2141_5
D. 2041_5
56. If $3x4_5 = 59_{10}$, find x .
A. 1
B. 2
C. 3
D. 4
57. Convert 156_{10} to base 7.
A. 312_7
B. 315_7
C. 321_7
D. 314_7
58. Simplify $11011_2 + 10111_2 + 1101_2$.
A. 110001_2
B. 111001_2
C. 101001_2
D. 110101_2
59. If $x_4 \times 23_4 = 132_4$, find x .
A. 2_4
B. 3_4
C. 10_4
D. 11_4
60. Evaluate $10000_2 - 1111_2$.
A. 1_2
B. 10_2
C. 11_2
D. 1_2
61. Convert $1A3_{16}$ to base 10.
A. 419
B. 429
C. 439
D. 449
62. If $201_x - 102_x = 22_x$, find x .
A. 3
B. 4
C. 5
D. 6
63. Simplify $2103_4 + 3012_4$.
A. 11121_4
B. 12111_4
C. 11211_4
D. 10321_4
64. Convert 500_{10} to base 9.
A. 615_9
B. 605_9
C. 625_9
D. 616_9
65. If $110_2 \times 11_2 \times 10_2 = x_2$, find x .
A. 100100_2

- B. 101100_2
 C. 110100_2
 D. 111100_2
66. Evaluate $543_6 - 254_6$.
 A. 245_6
 B. 255_6
 C. 235_6
 D. 225_6
67. If $1x2_3 + 201_3 = 1010_3$, find x .
 A. 0
 B. 1
 C. 2
 D. 3
68. Convert 111111_2 to base 10.
 A. 127
 B. 128
 C. 255
 D. 256
69. Simplify $3421_5 \times 2_5$.
 A. 13342_5
 B. 14342_5
 C. 12342_5
 D. 13442_5
70. If $x_8 + 37_8 = 100_8$, find x .
 A. 40_8
 B. 41_8
 C. 50_8
 D. 51_8
71. Convert 200_{10} to base 6.
 A. 532_6
 B. 542_6
 C. 552_6
 D. 512_6
72. Evaluate $111_2 + 111_2 + 111_2$.
 A. 10101_2
 B. 10011_2
 C. 11001_2
 D. 10111_2
73. If $43_x \times 2_x = 136_x$, find x .
 A. 5
 B. 6
 C. 7
 D. 8
74. Convert $3E7_{16}$ to base 10.
 A. 997
 B. 999
 C. 987
 D. 1007
75. Simplify $1234_5 - 432_5$.
 A. 302_5
 B. 402_5
 C. 312_5
 D. 412_5
76. If $1101_2 \div x_2 = 11_2$, find x .
 A. 10_2
 B. 11_2
 C. 100_2
 D. 101_2
77. Evaluate $321_4 \times 12_4$.
 A. 10302_4
 B. 11302_4
 C. 10202_4
 D. 11202_4
78. Convert 1000_{10} to base 12.
 A. $6B4_{12}$
 B. $6A4_{12}$
 C. 694_{12}
 D. 684_{12}
79. If $x2x_3 = 50_{10}$, find x .
 A. 1
 B. 2
 C. 0
 D. 3
80. Simplify $10111_2 - 1010_2 - 101_2$.
 A. 1000_2
 B. 1100_2

- C. 1010_2
D. 1110_2
81. Convert 777_8 to base 10.
A. 511
B. 521
C. 501
D. 531
82. If $1x0_4 + 201_4 = 1011_4$, find x .
A. 0
B. 1
C. 2
D. 3
83. Evaluate $432_5 + 143_5 + 321_5$.
A. 1401_5
B. 1341_5
C. 1441_5
D. 1301_5
84. Convert 11001100_2 to base 16.
A. CC_{16}
B. CD_{16}
C. DC_{16}
D. DD_{16}
85. If $210_x \times 2_x = 1120_x$, find x .
A. 3
B. 4
C. 5
D. 6
86. Simplify $654_7 - 365_7$.
A. 256_7
B. 266_7
C. 356_7
D. 246_7
87. Convert 128_{10} to base 4.
A. 2000_4
B. 1000_4
C. 10000_4
D. 3000_4
88. If $11x_4 = 23_{10}$, find x .
A. 1
B. 2
C. 3
D. 0
89. Evaluate $1111_2 \times 1111_2$.
A. 11100001_2
B. 11010001_2
C. 11001001_2
D. 11110001_2
90. Convert 343_5 to base 10.
A. 98
B. 88
C. 108
D. 93
91. If $x4_6 + 25_6 = 103_6$, find x .
A. 3
B. 4
C. 5
D. 2
92. Simplify $10101_2 + 11_2$.
A. 11000_2
B. 10111_2
C. 11001_2
D. 11010_2
93. Convert 99_{10} to base 3.
A. 10200_3
B. 10020_3
C. 10100_3
D. 11000_3
94. If $231_x - 112_x = 114_x$, find x .
A. 5
B. 6
C. 7
D. 8
95. Evaluate $2413_5 + 1324_5$.
A. 4242_5
B. 4342_5
C. 4142_5

- D. 4442_5
96. Convert 1024_{10} to base 2.
- A. 10000000000_2
 B. 100000000_2
 C. 1000000000_2
 D. 10000000_2
97. The equation $100_x \div 10_x = 10_x$ is true for all values of x except:
- A. $x = 1$
 B. $x = 2$
 C. $x = 0$
- D. Never true
98. Simplify $333_4 + 222_4 + 111_4$.
- A. 1222_4
 B. 1332_4
 C. 1232_4
 D. 2222_4
99. Convert $B4_{16}$ to base 2.
- A. 10110100_2
 B. 10101100_2
 C. 11010100_2
 D. 10110010_2

1.2 Fraction and Decimals

1.2.1 Questions

1. The sum of $3\frac{7}{8}$ and $1\frac{1}{3}$ is greater than the difference between $\frac{3}{8}$ and $1\frac{2}{3}$ by?
- A. $3\frac{2}{3}$ C. $8\frac{1}{8}$ E. $5\frac{1}{4}$
 B. $1\frac{1}{2}$ D. $3\frac{11}{12}$
2. After getting a rise of 15%, a man's new monthly salary is N 345. How much per month did he earn before the increase?
- A. N360 C. N293.25 E. N396.75
 B. N300 D. N330
3. Find correct to 3 significant figures, the value of $\sqrt{41830}$
- A. 647 C. 205 E. 6470
 B. 2050 D. 647
4. 12 men complete a job in 9 days. How many men working at the same rate, would be required to complete the job in 6 days?
- A. 24 C. 8 E. 18
 B. 9 D. 12
5. Simplify $2\frac{5}{12} - 1\frac{7}{8} \times \frac{6}{5}$.
- A. $\frac{11}{30}$ C. $\frac{1}{6}$ E. $\frac{13}{20}$
 B. $\frac{9}{4}$ D. $\frac{5}{3}$
6. By selling an article for N45.00 a man makes a profit of 8%. For how much should he have sold it in order to make a profit of 32%?
- A. N59.00 C. N180.00 E. N42.00
 B. N55.00 D. N63.00
7. Which of the following fractions is less than one-third?
- A. $\frac{4}{11}$ C. $\frac{15}{44}$ E. $\frac{6}{14}$
 B. $\frac{122}{383}$ D. $\frac{22}{63}$
8. The ratio of the price of loaf of bread to the price of a packet of sugar in 1975 was $a : x$. In 1980, the price of a loaf of bread went up by 25% and that of a packet of sugar by 10%. Their new ratio is now ?
- A. $50a : 44x$ C. $40a : 44x$ E. $44a : 55x$
 B. $44a : 50x$ D. $55a : 44x$
9. Simplify: $1 + \frac{2}{3 + \frac{4}{5 + \frac{6}{7}}}$
- A. $\frac{7}{95}$
 B. $\frac{177}{95}$
 C. $\frac{233}{151}$

- D. $\frac{17}{10}$
E. $\frac{3}{10}$
10. Evaluate and correct to 4 decimal places 827.51×0.015 .
A. 124.1265
B. 8.8415
C. 12.4127
D. 12.4120
E. 124.1265
11. A micrometer is defined as one millionth of a millimeter. A length of 12,000 micrometer may be represented as
A. 0.000012m
B. 0.12m
C. 0.00000012m
D. 0.00000000012m
E. 0.0000012m
12. The difference between $4\frac{5}{7}$ and $2\frac{1}{4}$ is greater than the sum of $\frac{1}{14}$ and $1\frac{1}{2}$ by?
A. $\frac{27}{28}$
B. $\frac{23}{28}$
C. $\frac{50}{56}$
D. $\frac{48}{56}$
E. $\frac{24}{48}$
13. When a dealer sells a bicycle for N81, he makes a profit of 8%. What did he pay for the bicycle.
A. N75
B. N75.52
C. N74.52
D. N87.48
E. N73
14. A man and wife went to buy an article costing N400. The woman had 10% of the cost and the man 40% of the remainder. How much did they have altogether?
A. N186
B. N184
C. N200
D. N144
E. N100
15. A sum of money invested at 5% per annum simple interest amount to N285.20 after 3 years. How long will it take the same sum to amount to N434.00 at $7\frac{1}{2}\%$ per annum simple interest?
A. 10 years
B. 12 years
C. $7\frac{1}{2}$ years
D. 14 years
E. 5 years
16. A construction company is owned by two partners A and B and it is agreed that their profit will be divided in ratio 4 : 5, at the end of the year, B received N5,000 more than A. What is the total profit of the company for the year?
A. N45,000
B. N30,000
C. N150,000
D. N25,000
E. N30,000
17. The diameter of metal rod is measured as 23.40cm to 4 significant figures. What is the maximum error in the measurement?
A. 0.0004cm
B. 0.05cm
C. 0.005cm
D. 0.5cm
E. 0.45cm
18. Simplify: $3 - \frac{2}{\frac{4}{5} + \frac{1}{2}}$
A. $1\frac{9}{10}$
B. $1\frac{3}{10}$
C. $1\frac{3}{4}$
D. -1
E. 1
19. Given that $x : y = \frac{1}{3} : \frac{1}{2}$ and $\psi : \theta = \frac{2}{5} : \frac{4}{7}$, find $x : \theta$.
A. 20 : 21

- B. 7 : 15
C. 3 : 20
D. 2 : 35
E. 4 : 105
20. If N560 is shared in the ratio 7 : 2 : 1, what is the smallest share?
A. N392
B. N113.40
C. N56.00
D. N87.48
E. N126.41
21. Simplify: $\frac{1}{2} + \frac{1}{2 + \frac{1}{2 - \frac{1}{4 + \frac{1}{5}}}}$
A. $\frac{169}{190}$
B. $-\frac{1}{3}$
C. $\frac{13}{15}$
D. $-\frac{3}{4}$
E. $-\frac{14}{27}$
22. $22\frac{1}{2}\%$ of the Nigerian Naira equals $17\frac{1}{10}\%$ of a foreign currency M . What is the conversion rate of M to Naira?
A. $2\frac{11}{57}$ Naria
B. $1\frac{18}{57}$ Naria
C. $\frac{15}{59}$ Naria
D. $\frac{15}{57}$ Naria
E. $38\frac{1}{4}$ Naria
23. Divide the LCM of 48, 64, and 80 by their HCF.
A. 30
B. 48
C. 52
D. 20
- E. 60
24. A sum of money was invested at 8% per annum simple interest. If after 4 years the money amounts to N330.00, find the amount originally invested.
A. N150
B. N200
C. N165
D. N180
E. N250
25. P sold his bicycle to Q at a profit of 10%. Q sold to R for N209 at a loss of 5%. How much did the bicycle cost P ?
A. N150
B. N205
C. N180
D. N196
E. N200
26. Find the smallest number by which 252 can be multiplied to obtain a perfect square.
A. 2
B. 3
C. 5
D. 7
E. 9
27. Find the reciprocal of: $\frac{\frac{2}{3}}{\frac{1}{2} + \frac{1}{3}}$
A. $\frac{4}{5}$
B. $\frac{2}{5}$
C. $\frac{6}{9}$
D. $\frac{5}{4}$
E. $\frac{3}{4}$
28. Three boys shared some oranges, the first recieved $\frac{1}{3}$ of the oranges, the second received $\frac{2}{3}$ of the remainder, if the third boy recieved the remaining 12 oranges. How many oranges did they share?
A. 48

- B. 72
C. 54
D. 42
E. 60
29. Udoh deposited N150.00 in the bank. At the end of 5 years, the simple interest on the principal was N55.00. At what rate per annum was the interest paid
- A. $7\frac{1}{3}\%$
B. 5%
C. 11%
D. $3\frac{1}{2}\%$
E. $4\frac{2}{5}\%$
30. A number of pencil were shared among Desmond, Florence, and Kevin in ratio 2 : 3 : 5 respectively. If Desmond got 5, how many were shared out?
- A. 30
B. 15
C. 25
D. 20
E. 35
31. Find the least length of a rod which can be cut into exactly equal strips, each of 40 cm or 48 cm in length.
- A. 240 cm
B. 480 cm
C. 360 cm
D. 120 cm
E. 480 cm
32. A rectangular lawn has an area of 1815 square yards. If its length is 50 metres, find its width in meters. Given that 1 metre equals 1.1 yard.
- A. 30.00 m
B. 33.00 m
C. 32.00 m
D. 39.93 m
E. 36.45 m
33. Reduce each number to two significant figures and then evaluate $\frac{0.021741 \times 1.2047}{0.023789}$
- A. 0.8
B. 1.2
C. 1.1
D. 0.9
E. 0.6
34. A cinema hall contains a certain number of people. If $27\frac{1}{2}\%$ are children, $47\frac{1}{2}\%$ are men and 84 are women, find the number of men in the hall
- A. 133
B. 84
C. 63
D. 113
35. A woman buys 270 oranges for N1,800 and sells at 5 for N40. What is her profit?
- A. N 1,620
B. N 630
C. N 360
D. N 2,160
36. If a car travels 120km on 45 litres of petrol, how much petrol is needed for a journey of 600km?
- A. 720 litres
B. 225 litres
C. 960 litres
D. 160 litres
37. Simplify $1 - \left(\frac{1}{7} \times 3\frac{1}{2}\right) \div \frac{3}{4}$
- A. 2
B. 1
C. $\frac{1}{3}$
D. $\frac{2}{3}$
38. Evaluate: $\frac{12.02 \times 20.06}{26.04 \times 60.06}$, correct to 3 significant figures
- A. 0.154
B. 0.155
C. 0.158
D. 0.157
39. Evaluate: $\frac{0.8 \times 0.43 \times 0.031}{0.05 \times 0.72 \times 0.021}$, correct to 3 significant figures
- A. 14.1
B. 14.09
C. 14.12

- D. 14.11
40. A man bought a car for N500,000 and was able to sell it for N350,000, what was his percentage loss?
- A. 50%
B. 30%
C. 70%
D. 60%
41. Simplify: $1\frac{2}{3} + 4\frac{1}{4} + 1\frac{5}{12}$
- A. $4\frac{1}{3}$
B. $4\frac{2}{3}$
C. $4\frac{12}{17}$
D. $4\frac{3}{17}$
42. A man donates 16% of his monthly net earning to the church. If it amounts to N4,500, what is his monthly income?
- A. N40,500
B. N52,000
C. N52,500
D. N45,000
43. If a student measured the length of a table to be 2.30 m instead of 2.50 m. What was his percentage error in measuring the length?
- A. 7%
B. 10%
C. 9%
D. 8%
44. A man bought a second-hand photocopy machine for 34,000. He serviced it at a cost of N2,000 and then sold it at a profit of 15%. What was the selling price?
- A. 37,550
B. 40,000
C. 41,400
D. 42,400
45. A student spent $\frac{1}{5}$ of his allowance on books, $\frac{1}{3}$ of the remainder on food and kept the rest for contingencies. What fraction was kept?
- A. $\frac{8}{15}$
- B. $\frac{4}{5}$
C. $\frac{2}{3}$
D. $\frac{7}{15}$
46. If $p : q = \frac{2}{3} : \frac{5}{6}$ and $\frac{3}{4} : \frac{1}{2}$, find $p : q : r$
- A. 12 : 15 : 10
B. 10 : 15 : 24
C. 9 : 10 : 15
D. 12 : 15 : 16
47. Simplify: $\frac{3\frac{2}{3} \times \frac{5}{6} \times \frac{2}{3}}{\frac{11}{25} \times \frac{3}{4} \times \frac{2}{27}}$
- A. $4\frac{1}{3}$
B. 30
C. $5\frac{2}{3}$
D. 50
48. A man earns N3,500 per month out of which he spends 15% on his children's education. If he spends additional N1,950 on food, how much does he have left?
- A. N2,975
B. N1,950
C. N525
D. N1025
49. Evaluate $\frac{21}{9}$ to 3 significant figures
- A. 2.30
B. 2.31
C. 2.32
D. 2.33
50. A girl shares a number of apples in the ratio 5 : 3 : 2. If the highest share is 40, find the smallest share.
- A. 74
B. 38
C. 36
D. 16
51. Calculate the time taken for N3,000 to earn N600 at 8% simple interest.
- A. 3 years

- B. $2\frac{1}{2}$ years
 C. $1\frac{1}{2}$ years
 D. $3\frac{1}{2}$ years
52. Find the tax on an income of N20,000 if no tax is paid on the first N10,000 and tax is paid at N50 and in N1,000 on the next N5,000 and at N55 and N1000 on the remainder.
- A. N225
 B. N525
 C. N552
 D. N500
53. The time taken to do a piece of work is inversely proportional to the number of men employed. If it takes 30 men to do a piece of work in 6 days, how many men are required to do the work in 4 days?
- A. 35
 B. 45
 C. 25
 D. 60
54. Three boys shared oranges. The first received $\frac{1}{3}$ of the oranges and the second received $\frac{2}{3}$ of the remainder. If the third boy received the remaining 12 oranges, how much oranges did they share?
- A. 42
 B. 60
 C. 54
 D. 48
55. A farmer planted 5,000 grains of maize and harvested 5,000 cobs, each bearing 500 grains. What is the ratio of the number of grains sowed to the number harvested?
- A. 1 : 5,000
 B. 1 : 25,000
 C. 1 : 500
 D. 1 : 250,000
56. Evaluate: $\frac{0.21 \times 0.072 \times 0.00054}{0.006 \times 1.68 \times 0.063}$
- A. 0.1286
 B. 0.01285
 C. 0.01286
 D. 0.1285
57. A man's initial salary is N540 a month and increases after a period of six months by N36 a month. Find his salary in the eight month of the third year.
- A. 828
 B. 756
 C. 720
 D. 684
58. Find correct to 3 decimal places:
- $$\left(\frac{1}{0.05}\right) \div \left(\frac{1}{5.005}\right) - (0.05 \times 2.05)$$
- A. 99.998
 B. 9.998
 C. 98.999
 D. 89.899
59. Express $62 \div 3$ as a decimal correct to 3 significant figures.
- A. 20.667
 B. 20.6
 C. 20.7
 D. 20.67
60. Factory P produces 20,000 bags of cement per day while factory Q produces 15,000 bags per day. If P reduces production by 5% and Q increases production by 5% determine the effective loss in the number of bags produced per day by the two factories
- A. 750
 B. 250
 C. 1000
 D. 1250
61. If 3 gallons of spirit containing 20% water are added to 5 gallons of another spirit containing 15% water, what percentage of the mixture is water?
- A. $2\frac{4}{5}$
 B. $18\frac{7}{8}$
 C. $18\frac{1}{8}$
 D. $16\frac{7}{8}$
62. The radius of a circle is given as 5cm subject to an error of 0.1cm. What is the percentage error in the area of the circle?

- A. $\frac{1}{4}$
 B. $\frac{1}{25}$
 C. 25
 D. 4
63. A man invested a sum of N280.00 partly at 5% and partly at 4%. If the total interest is N12.8 per annum, find the amount invested at 5%.
- A. N120
 B. N160
 C. N200
 D. N140
64. Evaluate $\frac{3524}{0.05}$ correct to 3 significant figures
- A. 70000
 B. 70480
 C. 705
 D. 70500
65. If N225 yields N27 in x years simple interest at the rate of 4% per annum, find x
- A. 12
 B. 4
 C. 27
 D. 3
66. A man's initial salary is N540 a month and increases after each period of six months by N36 a month. Find his salary in the eighth month of the third year.
- A. N756
 B. N648
 C. N720
 D. N828
67. $\frac{1}{3} \div \left[\frac{5}{7} \left(\frac{9}{10} - 1 + \frac{3}{4} \right) \right]$
- A. $\frac{13}{24}$
 B. $\frac{39}{28}$
 C. $\frac{28}{39}$
 D. $\frac{84}{13}$
68. Two sisters, Taiwo and Kehinde, own a store. The ratio of Taiwo's share to Kehinde's is 11 : 9. Later Kehinde sells $\frac{2}{3}$ of her share to Taiwo for N720. Find the value of the store.
- A. 1080
 B. 3000
 C. 3600
 D. 2400
69. A tax payer has allowed $\frac{1}{8}$ th of his income tax free, and pays 20% on the remainder. If he pays N490 tax, what is his income?
- A. N2450
 B. N2800
 C. N3920
 D. N560
70. A basket contains green, black and blue balls in the ratio 5 : 2 : 1. If there are 10 blue balls, find the corresponding new ratio when 10 green and 10 black balls are removed from the basket
- A. 1 : 1 : 1
 B. 4 : 2 : 1
 C. 5 : 1 : 1
 D. 4 : 1 : 1
71. The prime factors of 2, 520 are:
- A. 2, 3, 5, 7
 B. 2, 9, 5
 C. 2, 3, 7, 9
 D. 2, 9, 7
72. Simplify: $\frac{2}{3} + \frac{3}{4} - \frac{5}{6}$
- A. $\frac{7}{12}$
 B. $\frac{5}{12}$
 C. $\frac{11}{12}$
 D. $\frac{1}{2}$
73. A man sells a radio for N1, 200 at a loss of 20%. How much did he buy it?
- A. N1, 500
 B. N1, 440
 C. N1, 000
 D. N960
74. Express 0.0462 in standard form.

- A. 4.62×10^{-2}
B. 4.62×10^{-3}
C. 46.2×10^{-3}
D. 4.62×10^2
75. If $\frac{2}{3}$ of a number is 30, what is $\frac{3}{5}$ of that number?
A. 27
B. 20
C. 45
D. 25
76. A discount of 15% on the marked price of an article amounts to N450. What is the marked price?
A. N3,000
B. N3,500
C. N2,500
D. N4,000
77. Evaluate: $(0.6)^2 - (0.4)^2$
A. 0.2
B. 0.4
C. 0.52
D. 0.36
78. A worker's salary was increased by 25%. If his new salary is N2,500, what was his old salary?
A. N2,000
B. N2,250
C. N1,875
D. N3,125
79. Simplify: $\frac{0.0324 \times 0.00064}{0.48 \times 0.012}$
A. 0.0036
B. 0.036
C. 0.36
D. 3.6
80. What is the simple interest on N5,000 for 3 years at 4% per annum?
A. N600
B. N500
C. N650
D. N750
81. If $x : y = 2 : 3$ and $y : z = 4 : 5$, find $x : z$.
- A. 8 : 15
B. 10 : 15
C. 8 : 12
D. 6 : 15
82. Express $\frac{5}{8}$ as a decimal.
A. 0.625
B. 0.650
C. 0.725
D. 0.525
83. A man bought 20 articles at N50 each and sold them at N60 each. What is his percentage profit?
A. 10%
B. 20%
C. 15%
D. 25%
84. Evaluate: $2.5 \times 0.04 \times 0.5$
A. 0.05
B. 0.5
C. 0.005
D. 5.0
85. The HCF of 72, 96 and 108 is
A. 12
B. 24
C. 18
D. 36
86. Simplify: $3\frac{1}{4} \div 1\frac{1}{2}$
A. $2\frac{1}{6}$
B. $1\frac{5}{6}$
C. $2\frac{1}{2}$
D. $4\frac{7}{8}$
87. A sum of N8,000 is invested at 5% compound interest per annum. What is the amount after 2 years?
A. N8,820
B. N8,800
C. N8,640
D. N9,000

88. Express 0.0000375 in standard form.
- 3.75×10^{-5}
 - 3.75×10^{-4}
 - 37.5×10^{-6}
 - 3.75×10^5
89. If $\frac{3}{4}$ of a class are girls and $\frac{2}{3}$ of the girls are tall, what fraction of the class are tall girls?
- $\frac{1}{2}$
 - $\frac{5}{12}$
 - $\frac{2}{3}$
 - $\frac{1}{4}$
90. A man earns N15,000 monthly. If 12% is deducted for tax, how much does he take home?
- N13,200
 - N13,800
 - N14,000
 - N13,500
91. Evaluate: $\sqrt{0.0169}$
- 0.13
 - 0.013
 - 1.3
 - 0.0013
92. Simplify: $\frac{3}{7} \times \frac{14}{9} \div \frac{2}{3}$
- 1
 - 2
 - $\frac{1}{2}$
 - 3
93. What percentage of 250 is 75?
- 30%
 - 25%
 - 20%
 - 35%
94. The LCM of 12, 18, and 24 is
- 72
 - 144
 - 48
 - 36
95. A man bought a car for N800,000 and sold it for N920,000. What is his percentage gain?
- 15%
 - 12%
 - 20%
 - 10%
96. Express $2\frac{3}{5}$ as a decimal.
- 2.6
 - 2.3
 - 2.5
 - 2.8
97. If N1,200 amounts to N1,440 in 2 years at simple interest, what is the rate per annum?
- 10%
 - 12%
 - 8%
 - 15%
98. Simplify: $\left(\frac{2}{3}\right)^2 + \left(\frac{1}{4}\right)^2$
- $\frac{25}{36}$
 - $\frac{17}{36}$
 - $\frac{73}{144}$
 - $\frac{65}{144}$
99. A bag of rice costs N8,000. If the price increases by 12.5%, what is the new price?
- N9,000
 - N9,500
 - N8,500
 - N10,000
100. Evaluate: $4.8 \div 0.06$
- 80
 - 8
 - 800
 - 0.8

Chapter 2

Algebra

2.1 Factorization and Remainder Theorem

2.1.1 Questions

1. If the function f is defined by $f(x+2) = 2x^2 + 7x - 5$, find $f(-1)$.
 - A. -8
 - B. 4
 - C. 10
 - D. -10
2. Factorize $a^2x - b^2y - b^2x + a^2y$.
 - A. $(y-x)(a-b)(a+b)$
 - B. $(a-b)(x+y)$
 - C. $(x-y)(a-b)$
 - D. $(x+y)(a-b)(a+b)$
3. If $x-1$ and $x+1$ are both factors of the equation $x^3 + px^2 + qx + 6 = 0$, evaluate p and q .
 - A. $-6, -1$
 - B. $1, -1$
 - C. $6, 1$
 - D. $6, -6$
4. If $f(x) = \frac{1}{x-1} + \frac{x-1}{x^2-1}$, find $f(1-x)$.
 - A. $\frac{1}{x} + \frac{1}{x-2}$
 - B. $-\frac{1}{x} - \frac{1}{x-2}$
 - C. $x + \frac{1}{2x-1}$
 - D. $\frac{1}{x} + \frac{1}{x^2-1}$
 - E. $-\frac{1}{x} - \frac{1}{2x-1}$
5. Multiply $(x+3y+5)$ by $(2x^2+5y+2)$.
 - A. $2x^3 + 3x^2y + 10xy^2 + 13y + 10x^2 + 2x + 10$
 - B. $2x^3 + 2x^2y + 10xy + 10y^2 + 31y + 5x^2 + 2x + 10$
 - C. $2x^3 + 6x^2y + 5xy + 10y^2 + 13y + 5x^2 + 2x + 10$
 - D. $2x^3 + 6x^2y + 5xy + 15y^2 + 31y + 5x^2 + 2x + 10$
 - E. $2x^3 + 3x^2y + 5xy + 10y^2 + 13y + 5x^2 + 2x + 10$
6. If $kx^3 + 10x^2 + lx - 3$ is divisible by $(x-1)$ and when it is divided by $(x+2)$ the remainder is 27, find the constants k and l .
 - A. $k = -7, l = -15$
 - B. $k = \frac{-21}{5}, l = \frac{-61}{5}$
 - C. $k = -15, l = -7$
 - D. $k = -\frac{5}{3}, l = \frac{19}{5}$
 - E. $k = -\frac{5}{3}, l = -\frac{19}{3}$
7. Factorize $3x^3 + 4x^2 - 13x + 6$ completely, given that $x-1$ is a factor.
 - A. $(x-1)(x-3)(x+2)$
 - B. $(x-1)(x-3)(3x+2)$
 - C. $(x-1)(x-2)(x+3)$
 - D. $(x-1)(x+3)(3x+2)$
 - E. $(x-1)(x+3)(3x-2)$
8. Multiply $x^2 + x + 1$ by $x^2 - x + 1$.
 - A. $x^4 + 3x^2 + x + 1$
 - B. $x^4 + 4x^2 - 6x + 1$

- C. $x^4 + 4x^2 + 1$
 D. $x^4 - x^3 - x^2 + x + 1$
 E. $x^4 - 6x^2 - 4x + 1$
9. If $x = 1$ is a root of the equation $x^3 - 2x^2 - 5x + 6$, find the other roots.
 A. -3 and 2
 B. 1 and 3
 C. -2 and 2
 D. 3 and -2
 E. -3 and 1
10. If $x + 2$ and $x - 1$ are factors of the expression $lx^3 + 2kx^2 + 24$, find the values of l and k .
 A. $l = -6, k = -9$
 B. $l = -2, k = -1$
 C. $l = -2, k = 1$
 D. $l = 0, k = 1$
 E. $l = 6, k = 0$
11. Factorize completely: $81a^4 - 16b^4$.
 A. $(3a + 2b)(2a - 3b)(9a^2 + 4b^2)$
 B. $(3a - 2b)(2a - 3b)(9a^2 - 4b^2)$
 C. $(3a - 2b)(3a - 2b)(9a^2 + 4b^2)$
 D. $(3a - 2b)(2a - 3b)(4a^2 - 9b^2)$
 E. $(3a - 2b)(3a + 2b)(9a^2 + 4b^2)$
12. The factor which is common to all three binomial expressions $4a^2 - 9b^2$, $8a^2 + 27b^3$, $(4a + 6b)^2$ is:
 A. $4a - 6b$
 B. $4a + 6b$
 C. $2a - 3b$
 D. $2a + 3b$
 E. $3a - 2b$
13. If $x - 2$ and $x + 1$ are factors of the expression $x^3 + px^2 + qx + 1$, find $p + q$.
 A. -3
 B. 0
 C. $-\frac{17}{3}$
 D. $-\frac{2}{3}$
 E. 3
14. The factors of $9 - (x^2 - 3x - 1)^2$ are:
 A. $(x - 4)(x - 1)(x - 1)(x + 2)$
 B. $(x - 4)(x + 1)(x - 2)(x - 1)$
 C. $(x - 2)(x + 2)(x + 1)(x + 4)$
 D. $(x - 2)(x + 2)(x + 1)(x - 1)$
 E. $(x - 4)(x - 3)(x - 2)(x + 1)$
15. If $f(x - 2) = 4x^2 + x + 7$, find $f(1)$.
 A. 27
 B. 7
 C. 17
 D. 46
 E. 12
16. If $g(y) = \frac{y - 3}{11} + \frac{11}{y^2 - 9}$ what is $g(y + 3)$?
 A. $\frac{y}{11} + \frac{11}{y(y + 5)}$
 B. $\frac{y + 30}{11} + \frac{11}{y(y + 3)}$
 C. $\frac{y}{11} + \frac{11}{y(y + 3)}$
 D. $\frac{y + 3}{11} + \frac{11}{y(y - 6)}$
17. Factorize completely $3a + 125a^3$.
 A. $(2a + 5x)(4 + 10ax + 25ax^2)$
 B. $(2a + 5x^2)(4 + 25ax)$
 C. $a(2 + 5x)(4 - 10x + 25ax^2)$
 D. $a(2 + 5x)(4 + 10ax + 25ax^2)$
18. Factorize $x^2 + 2a + ax + 2x$.
 A. $(x^2 - 1)(x + a)$
 B. $(x + 2)(x + a)$
 C. $(x + 2a)(x + 3)$
 D. $(x + 2a)(x - 1)$
19. The graphical method of solving the equation $x^3 + 3x^2 + 4x - 28 = 0$ is by drawing the graphs of the curves:
 A. $y = x^3$ and $y = 3x^2 + x - 28$
 B. $y = x^3 + 3x^2 + 4x$ and $y = 28$
 C. $y = x^3 + 3x^2 + 4x - 28$ and the line $y = \frac{28}{x}$
 D. $y = x^2 + 3x + 4$ and $y = \frac{28}{x}$
 E. $y = x^2 + 3x + 4$ and line $y = 28x$
20. Factorize $(4a + 3)^2 - (3a - 2)^2$.
 A. $(x + 2a)(x - 1)$

- B. $(x + 1)(x + 2a)$
 C. $(x + 2)(x + a)$
 D. $(x^2 - 1)(x + a)$
21. If $x^3 - 12x - 16 = 0$ has $x - 2$ as a solution, then the equation has:
 A. 3 roots all different
 B. $x - 4$ as a solution also
 C. 3 roots all equal
 D. 3 roots with two equal and the third different
 E. only one root
22. The expression $x^3 - 4x^2 + cx + d$ is such that $x + 1$ is a factor and its value is 1 when x is -2 . Find c and d .
 A. $c = -4$ and $d = 9$
 B. $c = 20$ and $d = 9$
 C. $c = -20$ and $d = 15$
 D. $c = -20$ and $d = -15$
 E. $c = 20$ and $d = -15$
23. What factor is common to all the expressions $x + 1$, $2x^2 + x + 1$, and $x^2 - 1$?
 A. $x + 1$
 B. 1
 C. No common factor
 D. $2x - 1$
 E. x
24. Factorize completely: $(x^2 + x)^2 - (2x + 2)^2$.
 A. $(x + y)(x + 2)(x - 2)$
 B. $(x + 1)^2(x + 2)(x - 2)$
 C. $(x + y)^2(y - 2)^2$
 D. $(x + 1)^2(x + 2)^2$
25. If $f(x) = 2x^2 + 5x + 3$, find $f(x + 1)$.
 A. $2x^2 - x + 10$
 B. $2x^2 - x$
 C. $4x^2 + 3x + 12$
 D. $4x^2 + 3x + 2$
26. If one factor of $x^3 - 8^{-1}$ is $x - 2^{-1}$, the other factor is:
 A. $x^2 + 2^{-1}x - 4^{-1}$
 B. $x^2 - 2^{-1}x - 4^{-1}$
 C. $x^2 - 2^{-1}x - 4^{-1}$
 D. $x^2 + 4^{-1}x - 2^{-1}$
27. Factorize $9(x + y)^2 - 4(x - y)^2$.
 A. $(x + y)(5x + y)$
 B. $(x + y)^2$
 C. $5(x + y)^2$
 D. $(x + 5y)(5x - y)$
28. Factorize $4a^2 - 12ab - c^2 + 9b^2$.
 A. $(2a + 3b - c)(2a + 3b + c)$
 B. $4a(a - 3b) + (3b - c)^2$
 C. $(2a - 3b - c)(2a - 3b + c)$
 D. $4a(a - 3b) + (3b + c)^2$
29. What are the values of k and l respectively if $\frac{1}{2}(3y - 4x)^2 = (8x^2 + kxy + ly^2)$.
 A. $12, \frac{9}{2}$
 B. $-12, \frac{9}{2}$
 C. $6, 9$
 D. $-6, 9$
30. If $f(x - 4) = x^2 + 2x + 3$, find $f(2)$.
 A. 11
 B. 6
 C. 51
 D. 27
31. Factorize completely: $y^3 - 4xy + xy^3 - 4y$.
 A. $y(1 - x)(y + 2)(y - 2)$
 B. $y(1 + x)(y - 2)(y - 2)$
 C. $(y + xy)(y + 2)(y - 2)$
 D. $(y + xy)(y + 2)(y - 2)$
32. If $g(x) = x^2 + 3x + 4$, find $g(x + 1) - g(x)$.
 A. $2(x + 2)$
 B. $(x + 2)$
 C. $(2x + 1)$
 D. $x^2 + 4$
33. Factorize: $m^3 - 2m^2 - m + 2$.
 A. $(m + 1)(m + 1)(m + 2)$
 B. $(m^2 + 1)(m - 2)$
 C. $(m^2 + 2)(m - 1)$
 D. $(m - 2)(m + 1)(m - 1)$
34. Which of the following is a factor of $rs + tr - pt - ps$?

- A. $(p - s)$
 B. $(r - p)$
 C. $(s - p)$
 D. $(r + p)$
35. If $x + 1$ is a factor of $x^3 + 3x^2 + kx + 4$, find the value of k .
 A. -6
 B. 6
 C. 8
 D. -8
36. Factorize: $9p^2 - q^2 + 6qr - 9r^2$.
 A. $(3p - 3q + r)(3p - q)$
 B. $(6p - 3q - 3r)(3p - q - 4r)$
 C. $(3p - 3q + r)(3p - q - 3r)$
 D. $(3p - 3q + r)(3p - q + 4r)$
37. If a function is defined by $f(x + 1) = 3x^2 - x + 4$, find $f(0)$.
 A. 6
 B. 8
 C. 0
 D. 2
 E. 4
38. If $f(x + 2) = 3x^2 + 4x + 1$, find the value of $f(1)$.
 A. 32
 B. 40
 C. 8
 D. 32
 E. 21
39. Factorize: $6x^2 - 14x - 12$.
 A. $2(x + 3)(3x - 2)$
 B. $2(x - 3)(3x + 2)$
 C. $6(x - 2)(x + 1)$
 D. $6(x + 2)(x - 1)$
 E. $(3x + 4)(2x + 3)$
40. Factorize: $abx^2 + 8y - 4bx - 2axy$.
 A. $(ax - 4)(bx - 2y)$
 B. $(bx - 4)(ax - 2y)$
 C. $(ax + b)(x - 8y)$
 D. $(x - 2y)(abx - 4)$
 E. $(ax - 2y)(by - 4)$
41. Factorize: $1 - (a - b)^2$.
 A. $(1 + a + b)(1 - a - b)$
 B. $(1 - a + b)(1 + a - b)$
 C. $(1 + a - b)(1 - a + b)$
 D. $(1 - a - b)(1 - a + b)$
 E. $(1 - a + b)(1 + a + b)$
42. Which of the following is a factor of $15 + 7x - 2x^2$?
 A. $x + 3$
 B. $x - 5$
 C. $x + 5$
 D. $x - 3$
43. Divide the expression $x^3 + 7x^2 - x - 7$ by $-1 + x^2$.
 A. $x + 7$
 B. $-x^3 + 7x^2 - x - 7$
 C. $x - 7$
 D. $-x^2 + 7x + 7$
44. Find a positive value of p if the expression $2x^2 - px + p$ leaves a remainder 6 when divided by $x - p$.
 A. 1
 B. 2
 C. 3
 D. 4
45. When the expression $pm^2 + qm + 1$ is divided by $(m - 1)$, it has a remainder of 2 and when divided by $(m + 1)$ the remainder is 4, find p and q respectively.
 A. $-2, 3$
 B. $2, -1$
 C. $-1, 2$
 D. $3, -2$
46. Factorize: $r^2 - r(2p + q) + 2pq$.
 A. $(r - q)(r - 2p)$
 B. $(r - 2q)(2r - p)$
 C. $(2r - p)(r + p)$
 D. $(r - p)(r + q)$
47. Divide $2x^3 + 11x^2 + 17x + 6$ by $2x + 1$.
 A. $x^2 + 5x + 6$
 B. $x^2 - 5x + 6$
 C. $2x^2 + 5x + 6$

- D. $x^2 + 5x + 6$
48. Factorize completely: $x^2 + 2xy + y^2 + 3x + 3y - 18$.
- A. $(x + y + 6)(x + y - 3)$
 B. $(x - y - 6)(x - y + 3)$
 C. $(x - y + 6)(x - y - 3)$
 D. $(x + y - 6)(x + y + 3)$
49. Divide $4x^3 - 3x + 1$ by $2x - 1$.
- A. $2x^2 - x + 1$
 B. $2x^2 + x - 1$
 C. $2x^2 - x - 1$
 D. $2x^2 + x + 1$
50. If $(x - 1)$, $(x + 1)$ and $(x - 2)$ are factors of the polynomial $ax^3 + bx^2 + cx - 1$, find a , b , and c respectively.
- A. $-\frac{1}{2}, 1, \frac{1}{2}$
 B. $\frac{1}{2}, 1, \frac{1}{2}$
 C. $\frac{1}{2}, -1, \frac{1}{2}$
 D. $\frac{1}{2}, 1, 1\frac{1}{2}$
51. Factorize: $4x^2 - 9y^2 + 20x + 25$.
- A. $(2x - 3y + 5)(2x - 3y - 5)$
 B. $(2x - 3y + 5)(2x + 3y + 5)$
 C. $(2x + 3y - 5)(2x + 3y + 5)$
 D. $(2x + 3y - 5)(2x - 3y - 5)$
 E. $(2x - 3y + 5)(2x - 3y - 5)$
52. Divide $a^{3x} - 26a^{2x} + 156a^x - 216$ by $a^{2x} - 24a^x + 108$.
- A. $a^x + 2$
 B. $a^x - 2$
 C. $a^x - 18$
 D. $a^x - 6$
53. Find the values of x where the curve $y = x^3 + 2x^2 - 5x - 6$ crosses the x -axis:
- A. 2, -1 and -3
 B. 2, 1 and 3
 C. 2, 1 and -3
 D. 2, -1 and 3
54. The polynomial whose roots are $\frac{4}{3}$ and $-\frac{3}{5}$ is:
- A. $15x^2 - 11x - 12$
 B. $12x^2 + 11x - 15$
 C. $12x^2 - x - 12$
 D. $15x^2 + 11x - 12$
55. If $9x^2 + 6xy + 4y^2$ is a factor of $27x^3 - 8y^3$, find the other factor.
- A. $2y + 3x$
 B. $2y - 3x$
 C. $3x + 2y$
 D. $3x - 2y$
56. Factorize completely: $\frac{x^3 + 3x^2 - 10x}{2x^2 - 8}$.
- A. $\frac{x(x - 5)}{2(x - 2)}$
 B. $\frac{x(x - 5)}{2(x + 2)}$
 C. $\frac{x(x + 5)}{2(x + 2)}$
 D. $\frac{x^2 + 5}{2x + 4}$
57. Find the remainder when $3x^3 + 5x^2 + 11x - 4$ is divided by $x + 3$.
- A. 1
 B. 4
 C. -4
 D. -1
58. Factorize completely: $ac - 2bc + a^2 + 4b^2$.
- A. $(a - 2b)(c + a - 2b)$
 B. $(a - 2b)(c - a + 2b)$
 C. $(a - 2b)(c + a + 2b)$
 D. $(a - 2b)(c - a - 2b)$
59. Factorize $2y^2 - 15xy + 18x^2$.
- A. $(2y - 3x)(y + 6x)$
 B. $(2y - 3x)(y - 6x)$
 C. $(3y + 2x)(y - 6x)$
 D. $(2y + 3x)(y - 6x)$
60. Find the value of k if $y - 1$ is a factor of $y^3 + 4y^2 + ky - 6$.
- A. -6
 B. -4
 C. 0

- D. 1
61. Divide $6x^2 + 13x + 5$ by $2x + 1$.
- A. $3x - 5$
 B. $3x + 5$
 C. $5x - 3$
 D. $5x + 3$
62. The polynomial whose roots are -2 , -1 and 3 is:
- A. $x^3 - 7x + 6$
 B. $x^3 + 7x - 6$
 C. $x^3 - 7x - 6$
 D. $x^3 + 7x + 6$
63. Find the value of k if the expression $kx^3 + x^2 - 5x - 2$ leaves a remainder of 2 when divided by $2x + 1$.
- A. 10
 B. -8
 C. -10
 D. 8
64. Find the roots of $x^3 - 2x^2 - 5x + 6 = 0$.
- A. $-1, -2, 3$
 B. $-1, 2, -3$
 C. $1, 2, -3$
 D. $1, -2, 3$
65. Factorize: $2t^2 + t - 15$.
- A. $(t + 3)(2t - 5)$
 B. $(2t + 3)(t - 5)$
 C. $(t + 3)(t - 5)$
 D. $(2t - 3)(t + 5)$
66. If $2x^2 - kx - 12$ is divisible by $x - 4$, find the value of k .
- A. 4
 B. 5
 C. 6
 D. 7
67. Solve for x in the equation $x^3 - x + 5 = 0$.
- A. $-1, 1, -5$
 B. $1, 1, 5$
 C. $1, 1, -5$
 D. $1, -1, 5$
68. Find the remainder when $x^3 - 2x^2 + 3x - 3$ is divided by $x^2 + 1$.
- A. $2x - 1$
 B. $x + 3$
 C. $2x + 1$
 D. $3x - 3$
69. Find the remainder when $2x^3 - 11x^2 + 8x - 1$ is divided by $x + 3$.
- A. -871
 B. -781
 C. -187
 D. -178
70. Factorize: $(2x+3y)^2 + 2(2x+3y)(2x-3y) + (2x-3y)^2$.
- A. $16x^2$
 B. $18x^2$
 C. $12x^2$
 D. none of the above
71. Factorize: $45a^3b + 5ab^3 - 30a^2b^2$.
- A. $5ab(3a - b)^2$
 B. $7ab(5a - b)^2$
 C. $5ab(5a - b)^2$
 D. none of the above
72. Find the factors of $(a - b)^3 + (b - c)^3 + (c - a)^3$.
- A. $3(a + b)(b + c)(c + a)$
 B. $3(a - b)(b - c)(c - a)$
 C. $5(a - b)(b - c)(c - a)$
 D. $5(a + b)(b - c)(c - a)$
73. Factorize: $a^2 + \frac{1}{a^2} + 3 - 2a - \frac{2}{a}$.
- A. $\left(a + \frac{1}{a} - 1\right)\left(a - \frac{1}{a} + 1\right)$
 B. $\left(a + \frac{1}{a} + 1\right)\left(a + \frac{1}{a} + 1\right)$
 C. $\left(a + \frac{1}{a} + 1\right)\left(a + \frac{1}{a} - 1\right)$
 D. $\left(a + \frac{1}{a} - 1\right)\left(a + \frac{1}{a} - 1\right)$
74. Resolve into factors: $9(3x + 5y)^2 - 12(3x + 5y)(2x + 3y) + 4(2x + 3y)^2$.

- A. $(5x + 9y)$
 B. $(5x - 9y)^2$
 C. $(7x + 9y)^2$
 D. None of the above
75. Factorize: $(a - b + c)^2 + (b - c + a)^2 + 2(a - b + c)(b - c + a)$.
 A. $6a^2$
 B. $4a^2$
 C. $8a^2$
 D. $10a^2$
76. Resolve into factors: $81x^2y^2 - 108xyz + 36z^2$.
 A. $(6xy + 9z)^2$
 B. $(9xy - 7z)^2$
 C. $(9xy + 6z)^2$
 D. $(6xy - 7z)^2$
77. What value should a possess so that $x + 1$ may be a factor of the polynomial

$$f(x) = 2x^3 - ax^2 - (2a - 3)x + 2$$

 A. 3
 B. 2
 C. -2
 D. none of the above
78. If $(x - 2)$ is a factor of the polynomial $x^3 - 2ax^2 + ax - 1$, find the value of a .
 A. $\frac{5}{6}$
 B. $\frac{7}{6}$
 C. $\frac{11}{6}$
 D. none of the above
79. The remainder when $6p^3 - p^2 - 47p + 30$ is divided by $p - 3$ is:
 A. 21
 B. 63
 C. 18
 D. 42
80. Factorize: $k^2 - 2kp + p^2$.
 A. $(k + p)^2$
 B. $(k - p)^2$
 C. $k^2 - p^2$
 D. $k^2 + p^2$
81. If $x + 1$ is a factor of $x^3 + 3x^2 + mx + 4$, find the value of m .
 A. 8
 B. -6
 C. 6
 D. -8
82. Divide the expression $x^3 + 7x^2 - x - 7$ by $x^2 - 1$.
 A. $x - 1$
 B. $x + 1$
 C. $x - 7$
 D. $x + 7$
83. If $x + a$ is a factor of the polynomial $x^3 + ax^2 - 2x + a + 4$, find the value of a .
 A. $-\frac{4}{3}$
 B. $\frac{4}{3}$
 C. $\frac{2}{3}$
 D. $-\frac{2}{3}$
84. Resolve into factors: $16x^2 - 72xy + 81y^2 - 12x + 27y$.
 A. $(6x - 7y)(6x - 7y - 5)$
 B. $(6x - 7y)(6x - 7y + 5)$
 C. $(4x + 9y)(4x + 9y + 3)$
 D. $(4x - 9y)(4x - 9y - 3)$
85. Resolve into factors: $16(x - y)^2 - 9(x + y)^2$.
 A. $(x - 5y)(5x - y)$
 B. $(x + 7y)(7x + y)$
 C. $(x - 7y)(7x - y)$
 D. $(x + 5y)(5x + y)$
86. Factorize the expression: $a^2 + \frac{1}{4} + a$.
 A. $\left(a + \frac{1}{2}\right)\left(a - \frac{1}{2}\right)$
 B. $\left(a + \frac{1}{2}\right)^2$
 C. $\left(a + \frac{1}{2}\right)^3$
 D. $\left(a + \frac{1}{2}\right) \cdot a$
87. Resolve into factors: $(a + b)^2 - 2(a^2 - b^2) + (a - b)^2$.

- A. $6b^2$
 B. $4b^2$
 C. $2b^2$
 D. $8b^2$
88. Factorize the expression: $(a+b)^2 - 14c(a+b) + 49c^2$.
 A. $(a-b-9c)^3$
 B. $(a+b+9c)^2$
 C. $(a+b-7c)^2$
 D. none of the above
89. When a polynomial $f(x)$ is divided by $x-3$ and $x+6$, the respective remainders are 7 and 22. What is the remainder when $f(x)$ is divided by $(x-3)(x+6)$?
 A. $-\frac{5}{3}x + 12$
 B. $-\frac{7}{3}x + 14$
 C. $-\frac{5}{3}x + 16$
 D. $-\frac{7}{3}x + 12$
90. When $4x^3 - ax^2 + bx + 4$ is divided by $x-2$ and $x+1$, the respective remainders are 20 and -13. Find the values of a and b .
 A. $a = 3, b = 2$
 B. $a = 9, b = 8$
 C. $a = 7, b = 6$
 D. $a = 5, b = 4$
91. When $(x^3 - 2x^2 + px - q)$ is divided by $x^2 - 2x - 3$ the remainder is $(x - 6)$. The values of p and q are:
 A. $p = -2, q = -6$
 B. $p = 2, q = -6$
 C. $p = 2, q = 6$
 D. $p = -2, q = 6$
92. If $(x-1)$ is a factor of $ax^3 + bx^2 - 36x + 22$ and $2^b = 64^a$, find a and b .
 A. $a = 4, b = 16$
 B. $a = 6, b = 24$
 C. $a = 2, b = 12$
 D. $a = 8, b = 16$
93. If $2apq = (p+q)^2 - (p-q)^2$, then the value of a is:
 A. 1
 B. 2
 C. 4
 D. 8
94. What is the value of $\frac{(a^2 + b^2)(a-b) - (a-b)^3}{a^2b - ab^2}$?
 A. -1
 B. -2
 C. 1
 D. 2
95. Find the values of m and n in the polynomial $2x^3 + mx^2 + nx - 14$, such that $(x-1)$ and $(x+2)$ are its factors.
 A. $m = 4, n = 5$
 B. $m = 9, n = 3$
 C. $m = 6, n = 7$
 D. none of the above
96. Divide the polynomial $4y^3 - 3y^2 + 2y - 4$ by $y+2$ and find the quotient and remainder.
 A. $4y^2 - 11y + 24, -52$
 B. $6y^2 - 13y + 36, -64$
 C. $4y^2 + 13y - 24, 52$
 D. none of the above
97. Suppose that b and c are constants and

$$(x+2)(x+b) = x^2 + cx + 6$$

 what is c ?
 A. -5
 B. -3
 C. -1
 D. 3
 E. 5
98. Simplify the expression: $x^3 + 3x + \frac{3}{x} + \frac{1}{x^3}$.
 A. $\left(x - \frac{1}{3}\right)^3$
 B. $\left(x - \frac{1}{x}\right)^3$
 C. $\left(x - \frac{3}{x}\right)^3$
 D. $\left(x + \frac{1}{x}\right)^3$
99. If $(x^{3/2} - xy^{1/2} + x^{1/2}y - y^{3/2})$ is divided by $(x^{1/2} - y^{1/2})$, the quotient is:
 A. $x^{1/2} + y^{1/2}$
 B. $x^2 - y^2$

C. $x - y$

D. $x + y$

100. Let $f(x) = a_0x^n + a_1x^{n-1} + a_2x^{n-2} + \dots + a_{n-1}x + a_n$, where $a_0, a_1, a_2, \dots, a_n$ are constants. If $f(x)$ is divided by $ax - b$, then the remainder is:

A. $f\left(\frac{b}{a}\right)$

B. $f\left(\frac{-b}{a}\right)$

C. $f\left(\frac{a}{b}\right)$

D. $f\left(\frac{-a}{b}\right)$

2.2 Indices and Standard Form

2.2.1 Questions

1. If $(25)^{x-1} = 64\left(\frac{5}{2}\right)^6$, then x has the value:

A. 7

B. 4

C. 32

D. 5

E. 64

2. Simplify: $\frac{5^x \times 25^{x-1}}{125^{x+1}}$.

A. 5^{x+2}

B. 5^{2x-1}

C. 5^{x+1}

D. 5^3

E. 5^{-5}

3. Express 37.05×0.0042 in standard form.

A. 15.561×10^2

B. 1.556×10^1

C. 1.5561×10^{-4}

D. 1.5561×10^{-1}

E. 1.5561×10^2

4. Simplify: $\sqrt[3]{(64r^{-6})^{\frac{1}{2}}}$

A. $\frac{1}{2r}$

B. $\frac{2}{r}$

C. 2

D. $\frac{1}{2}$

5. What are the values of y that satisfy this equation:

$$9^y - 4(3^y) + 3 = 0$$

A. -1 and 0

B. 1 and 3

C. 0 and 1

D. -1 and 1

6. Simplify: $\frac{9^{\frac{1}{3}} \times 27^{-\frac{1}{2}}}{3^{-\frac{1}{6}} \times 3^{-\frac{2}{3}}}$

A. $\frac{1}{3}$

B. $\frac{1}{9}$

C. 3

D. 1

E. 9

7. If $\sqrt{3^x} = \sqrt[3]{9}$

A. $\frac{3}{4}$

B. $\frac{4}{3}$

C. $\frac{1}{3}$

D. $\frac{2}{3}$

E. $\frac{1}{2}$

8. Find the value of $\left(4^{\frac{1}{2}}\right)^6$

A. 6

B. 2

C. 1

D. 4

E. 8

9. Simplify: $\frac{3(2^{n-1}) - 4(2^{n-1})}{2^{n+1} - 2^n}$
- A. -2^{n-1}
 B. 2^{n+1}
 C. -2^1
 D. -2^{-1}
10. Evaluate: $\frac{27^{\frac{1}{3}} - 8^{\frac{2}{3}}}{16^{\frac{2}{4}} \times 2}$
- A. $-\frac{1}{8}$
 B. $\frac{21}{7}$
 C. $\frac{23}{5}$
 D. $-\frac{23}{5}$
 E. $-\frac{23}{6}$
11. If $\frac{4^{x+3}}{16^{2x-3}} = 1$, find x
- A. 1
 B. -1
 C. -3
 D. 3
 E. -3
12. Evaluate without using tables: $(0.008)^{-\frac{1}{3}} \times (0.16)^{-\frac{3}{2}}$
- A. $\frac{8}{625}$
 B. 8
 C. $\frac{625}{8}$
 D. $\frac{1}{8}$
13. Simplify: $\frac{3^n - 3^{n-1}}{3^3 \times 3^n - 27 \times 3^{n-1}}$
- A. 0
 B. $\frac{1}{27}$
 C. $3^n - 3^{n-1}$
 D. 1
 E. $\frac{2}{27}$
14. Evaluate and leave your answer in standard form:
- $$\sqrt{\frac{0.0048 \times 0.81 \times 10^{-7}}{0.027 \times 0.04 \times 10^6}}$$
- A. 6×10^{-14}
 B. 6×10^{-7}
 C. 6×10^7
 D. 6×10^{14}
15. If $3^{2y} - 6(3^y) = 27$, find y .
- A. 3
 B. -1
 C. 2
 D. -3
 E. 1
16. If it is given that $5^{x+1} + 5^x = 150$, then the value of x is equal to:
- A. 2
 B. 3
 C. $\frac{1}{2}$
 D. 1
 E. 4
17. Given that $10^{2n+1} = 0.0000001$, find n .
- A. -7
 B. -6
 C. $-\frac{3}{4}$
 D. 4
 E. -4
18. The result of dividing $\left(\frac{x^a}{x^b}\right)^{a-b}$ by $\left(\frac{x^{a+b}}{x^{a-b}}\right)^{\frac{a^2}{b}}$ is:
- A.
 B.
 C.
 D.
19. If $\sqrt[3]{81} = 3^x$, find the value of x .
- A. $\frac{4}{3}$
 B. $-\frac{4}{3}$
 C. $\frac{3}{4}$

D. $-\frac{3}{4}$

20. Simplify: $\frac{x(x+1)^{-\frac{1}{2}} - (x+1)^{\frac{1}{2}}}{(x+1)^{\frac{1}{2}}}$.

A. $\frac{1}{x+1}$

B. $-\frac{1}{x+1}$

C. $\frac{1}{x}$

D. $-\frac{1}{\sqrt{x+1}}$

21. Express in standard form:

$$\frac{0.8 \times 0.8 \times 0.8 - 0.5 \times 0.5 \times 0.5}{0.8 \times 0.8 + 0.8 \times 0.5 + 0.5 \times 0.5}$$

A. 8×10^{-1}

B. 4×10^{-1}

C. 3×10^{-1}

D. 1.3×10^{-1}

22. Express in standard form:

$$\frac{69842 \times 69842 - 30158 \times 30158}{69842 - 30158}$$

A. 3.0158×10^{-4}

B. 10^{-4}

C. 6.9842×10^{-5}

D. 10^{-5}

E. 10^5

23. The value of $\frac{9^2 \times 18^4}{3^{16}}$ is:

A. $\frac{2}{3}$

B. $\frac{4}{9}$

C. $\frac{32}{243}$

D. $\frac{16}{81}$

24. If m and n are whole numbers such that $m^n = 121$, then $(m-1)^{n+1}$ is:

A. 10

B. 10^2

C. 10^3

D. 10^4

25. Simplify: $\frac{a^{\frac{1}{2}} + a^{-\frac{1}{2}}}{1-a} + \frac{1-a^{\frac{1}{2}}}{1+\sqrt{a}}$.

A. $\frac{a}{a-1}$

B. $\frac{a-1}{2}$

C. $\frac{2}{a-1}$

D. $\frac{2}{1-a}$

26. Simplify: $\left(\frac{1}{64}\right)^0 + (64)^{-\frac{1}{2}} + (-32)^{\frac{4}{3}}$.

A. $17\frac{1}{8}$

B. $11\frac{7}{8}$

C. $17\frac{3}{8}$

D. $17\frac{7}{8}$

27. If $\left(\frac{x}{y}\right)^{5a-3} = \left(\frac{y}{x}\right)^{17-3a}$, what is the value of a ?

A. -7

B. -5

C. 0

D. 3

28. Evaluate: $\frac{(0.064 - 0.008)(0.16 - 0.04)}{(0.16 + 0.08 + 0.04)(0.4 + 0.2)^3}$.

A. $\frac{1}{3}$

B. 3

C. $\frac{3}{2}$

D. $\frac{2}{3}$

29. The value of $\left[\left(\sqrt[n]{x^2}\right)^{n/2}\right]^2$ is:

A. $\frac{1}{x^2}$

B. x

C. x^2

D. $x^{\frac{n}{2}}$

30. Solve for x if $3^x - 3^{x-1} = 486$.
- A. 5
B. 6
C. 7
D. 9
31. If $5\sqrt{5} \times 5^3 \div 5^{-\frac{3}{2}} = 5^{a+2}$, then the value of a is:
- A. 4
B. 5
C. 6
D. 8
32. If $(\sqrt{3})^5 \times 9^2 = 3^n \times 3\sqrt{3}$, find n .
- A. 2
B. 3
C. 4
D. 5
33. The value of $\frac{243^{\frac{n}{5}} \times 3^{2n+1}}{9^n \times 3^{n-1}}$ is:
- A. 3
B. 6
C. 9
D. 12
34. If $k^a k^b k^c = 1$, then the value of $a^3 + b^3 + c^3$ is:
- A. 9
B. $a + b + c$
C. abc
D. $3abc$
35. The value of $\frac{81^{3.6} \times 9^{2.7}}{81^{4.2} \times 3}$ is:
- A. 3
B. 6
C. 9
D. 8.2
36. Simplify: $\frac{6^{2n+1} \times 9^n \times 4^{2n}}{18^n \times 2^n \times 12^{2n}}$.
- A. 3^{2n}
B. $3 \times 2^{n+1}$
C. $2n$
D. 6
E. 1
37. Solve the system of equations: $2^{x+y} = 32$ and $3^{3y-x} = 27$. Find (x, y) .
- A. $(-3, 2)$
B. $(-3, -2)$
C. $(3, 2)$
D. $(2, 2)$
E. $(3, -2)$
38. Evaluate: $256^{\frac{3}{4}} \times 256^{-\frac{1}{4}}$.
- A. 4
B. 8
C. 16
D. 64
39. If $8^x = \frac{1}{4}$, find the value of x .
- A. $-\frac{2}{3}$
B. $-\frac{1}{2}$
C. $\frac{1}{3}$
D. $\frac{2}{3}$
40. Simplify: $\frac{2^{-3} \times 8^2}{4^{-1}}$.
- A. 16
B. 32
C. 64
D. 128
41. If $27^{x+2} = 9^{2x-3}$, find x .
- A. 9
B. 12
C. 15
D. 18
42. Evaluate: $(0.25)^{-\frac{1}{2}}$.
- A. $\frac{1}{4}$
B. $\frac{1}{2}$
C. 2
D. 4
43. Express 0.000215 in standard form.

- A. 2.15×10^{-4}
 B. 2.15×10^{-3}
 C. 21.5×10^{-5}
 D. 2.15×10^4
44. If $2^{x-1} \times 4^{x+1} = 8^x$, find x .
 A. 1
 B. 2
 C. 3
 D. 4
45. Simplify: $\frac{16^{\frac{3}{4}} \times 2^3}{4^{\frac{1}{2}}}$.
 A. 8
 B. 16
 C. 32
 D. 64
46. If $(0.5)^{1-x} = 8$, find x .
 A. -4
 B. -2
 C. 2
 D. 4
47. Express in standard form: $\frac{0.00056 \times 3500}{0.07 \times 0.004}$.
 A. 7×10^3
 B. 7×10^2
 C. 7×10^{-3}
 D. 7×10^{-2}
48. Evaluate: $27^{\frac{2}{3}} - 16^{\frac{3}{4}}$.
 A. 1
 B. 2
 C. 3
 D. 4
49. If $5^{2x-3} = 125$, find x .
 A. 2
 B. 3
 C. 4
 D. 5
50. Simplify: $(81)^{\frac{3}{4}} \times (81)^{-\frac{1}{4}}$.
 A. 3
 B. 9
 C. 27
 D. 81
51. Express 3,450,000 in standard form.
 A. 3.45×10^5
 B. 3.45×10^6
 C. 34.5×10^5
 D. 345×10^4
52. If $\frac{9^x}{3^{2x-1}} = 27$, find x .
 A. 1
 B. 2
 C. 3
 D. 4
53. Evaluate: $\left(\frac{1}{125}\right)^{-\frac{2}{3}}$
 A. 5
 B. 25
 C. 125
 D. 625
54. Simplify: $2^{n+1} - 2^n$
 A. 2^n
 B. 2^{n-1}
 C. 2
 D. 1
55. If $4^{x+1} = 8^{x-2}$, find x
 A. 5
 B. 6
 C. 7
 D. 8
56. Express 0.000000482 in standard form
 A. 4.82×10^{-7}
 B. 4.82×10^{-6}
 C. 48.2×10^{-8}
 D. 482×10^{-9}
57. Evaluate: $\frac{8^{\frac{2}{3}} \times 4^{\frac{1}{2}}}{2^3}$
 A. $\frac{1}{2}$
 B. 1

- C. 2
D. 4
58. If $2^x + 2^{x+1} = 48$, find x
A. 3
B. 4
C. 5
D. 6
59. Simplify: $\frac{625^{\frac{1}{4}} \times 125^{\frac{1}{3}}}{5^2}$
A. 1
B. 5
C. 25
D. 125
60. Express in standard form: $(3.5 \times 10^4) \times (2 \times 10^{-3})$
A. 7×10^1
B. 7×10^{-1}
C. 7×10^2
D. 7×10^7
61. If $16^{x-\frac{1}{2}} = 4^{2x}$, find x
A. -1
B. $-\frac{1}{2}$
C. $\frac{1}{2}$
D. 1
62. Evaluate: $49^{\frac{1}{2}} - 32^{\frac{2}{5}}$
A. 1
B. 2
C. 3
D. 4
63. Simplify: $\frac{3^{n+2} - 3^n}{3^{n+1}}$
A. $\frac{8}{3}$
B. 2
C. 3
D. 8
64. If $\sqrt[3]{8^x} = 4$, find x
A. 1
- B. 2
C. 3
D. 4
65. Express $\frac{7200000}{0.0024}$ in standard form
A. 3×10^9
B. 3×10^{10}
C. 3×10^8
D. 3×10^7
66. Evaluate: $(64)^{-\frac{2}{3}} + (27)^{-\frac{1}{3}}$
A. $\frac{1}{3}$
B. $\frac{5}{12}$
C. $\frac{7}{12}$
D. 1
67. If $25^{1-x} = \frac{1}{125}$, find x
A. $\frac{5}{2}$
B. $\frac{3}{2}$
C. 2
D. $\frac{7}{2}$
68. Simplify: $(8^{-1} \times 2^5)^2$
A. 4
B. 8
C. 16
D. 32
69. Express in standard form: $\frac{8.4 \times 10^6}{2.1 \times 10^{-3}}$
A. 4×10^9
B. 4×10^8
C. 4×10^{10}
D. 4×10^3
70. If $3^{2x+1} = 27^{x-1}$, find x
A. -2
B. -3
C. -4
D. -5

71. Evaluate: $\left(\frac{16}{81}\right)^{-\frac{3}{4}}$

- A. $\frac{8}{27}$
- B. $\frac{27}{8}$
- C. $\frac{2}{3}$
- D. $\frac{3}{2}$

72. Simplify: $5^{n-1} + 5^{n+1}$

- A. $\frac{26}{5} \times 5^n$
- B. $26 \times 5^{n-1}$
- C. 5^{2n}
- D. 2×5^n

73. If $\sqrt{32^x} = 8$, find x

- A. $\frac{3}{5}$
- B. $\frac{2}{5}$
- C. $\frac{4}{5}$
- D. $\frac{1}{5}$

74. Express $562,000 \times 0.00003$ in standard form

- A. 1.686×10^1
- B. 1.686×10^{-1}
- C. 16.86×10^0
- D. 1.686×10^2

75. Evaluate: $100^{\frac{3}{2}} - 64^{\frac{1}{2}}$

- A. 992
- B. 936
- C. 1000
- D. 994

76. If $7^{x+2} = \frac{1}{49}$, find x

- A. -4
- B. -3
- C. -2
- D. -1

77. Simplify: $\frac{2^{2n} \times 4^n}{8^n}$

- A. 1
- B. 2
- C. 2^n
- D. 4^n

78. Express in standard form: $\sqrt{0.000144}$

- A. 1.2×10^{-2}
- B. 1.2×10^{-1}
- C. 12×10^{-3}
- D. 1.2×10^{-3}

79. If $4^{3x-2} = 64^{x+1}$, find x

- A. 2
- B. 3
- C. 4
- D. 5

80. Evaluate: $(0.04)^{-\frac{3}{2}}$

- A. 125
- B. 25
- C. 5
- D. 625

81. Simplify: $\frac{(x^2)^3 \times x^{-4}}{x^3}$

- A. x
- B. x^{-1}
- C. x^2
- D. x^{-2}

82. If $9^{x-1} = 3^{x+3}$, find x

- A. 3
- B. 4
- C. 5
- D. 6

83. Express in standard form: $\frac{0.0081 \times 0.012}{0.027}$

- A. 3.6×10^{-3}
- B. 3.6×10^{-2}
- C. 36×10^{-4}
- D. 3.6×10^{-4}

84. Evaluate: $243^{\frac{2}{5}} \times 32^{\frac{3}{5}}$

- A. 48

- B. 54
C. 72
D. 36
85. If $2^{x-y} = 8$ and $2^{x+y} = 32$, find x
A. 3
B. 4
C. 5
D. 6
86. Simplify: $\frac{a^{\frac{1}{3}} \times a^{\frac{2}{3}}}{a^{-\frac{1}{2}}}$
A. $a^{\frac{1}{2}}$
B. $a^{\frac{3}{2}}$
C. a^2
D. a
87. If $\sqrt[4]{16^x} = 8$, find x
A. 2
B. 3
C. 4
D. 5
88. Express in standard form: $(6 \times 10^5) \div (3 \times 10^{-2})$
A. 2×10^7
B. 2×10^6
C. 2×10^3
D. 2×10^{-7}
89. Evaluate: $125^{\frac{2}{3}} - 36^{\frac{1}{2}}$
A. 13
B. 19
C. 21
D. 25
90. If $5^{2x} - 7(5^x) + 10 = 0$, find x
A. 0 or 1
B. 1 or 2
C. 0 or 2
D. 1 or $\log_5 2$
91. Simplify: $\frac{10^{n+2} - 10^n}{99 \times 10^n}$
A. 1
B. 10
- C. $\frac{1}{10}$
D. 99
92. If $(0.125)^x = 8$, find x
A. -1
B. -2
C. -3
D. 3
93. Express in standard form: $\sqrt{6.4 \times 10^{-5}}$
A. 8×10^{-3}
B. 8×10^{-2}
C. 2.53×10^{-3}
D. 2.53×10^{-2}
94. Evaluate: $\left(27^{\frac{1}{3}} + 8^{\frac{1}{3}}\right)^2$
A. 25
B. 49
C. 64
D. 81
95. If $3^{x+1} + 3^{x-1} = 90$, find x
A. 2
B. 3
C. 4
D. 5
96. Simplify: $\left(\frac{125}{8}\right)^{-\frac{2}{3}} \times \left(\frac{25}{4}\right)^{\frac{1}{2}}$
A. 1
B. 2
C. 3
D. 4
97. If $2^a = 3$ and $2^b = 5$, find 2^{2a+b}
A. 15
B. 30
C. 45
D. 60
98. Express $\frac{72 \times 10^{-5} \times 25 \times 10^3}{18 \times 10^{-2}}$ in standard form
A. 1×10^1
B. 1×10^2
C. 1×10^3

D. 1×10^4

99. If $4^{x+2} - 4^x = 240$, find x

- A. 1
B. 2
C. 3
D. 4

100. Simplify: $\frac{(2^{n+1})^2 \times 4^{n-1}}{8^n}$

- A. 2
B. 4
C. 8
D. 2^n

2.3 Surds

2.3.1 Questions

1. Simplify: $\sqrt{50}$

- A. $5\sqrt{2}$
B. $2\sqrt{5}$
C. $10\sqrt{2}$
D. $25\sqrt{2}$

2. Simplify: $\sqrt{75} + \sqrt{12}$

- A. $7\sqrt{3}$
B. $5\sqrt{3} + 2\sqrt{3}$
C. $\sqrt{87}$
D. $8\sqrt{3}$

3. Rationalize the denominator: $\frac{6}{\sqrt{3}}$

- A. $2\sqrt{3}$
B. $3\sqrt{2}$
C. $6\sqrt{3}$
D. $\sqrt{18}$

4. Simplify: $\sqrt{128}$

- A. $8\sqrt{2}$
B. $4\sqrt{8}$
C. $16\sqrt{2}$
D. $2\sqrt{32}$

5. Evaluate: $(\sqrt{5})^2$

- A. 25
B. 5
C. 10
D. $\sqrt{25}$

6. Simplify: $\sqrt{18} - \sqrt{8}$

- A. $\sqrt{10}$

B. $\sqrt{2}$

C. $2\sqrt{2}$

D. $3\sqrt{2} - 2\sqrt{2}$

7. Multiply: $\sqrt{3} \times \sqrt{12}$

- A. 6
B. $3\sqrt{4}$
C. $\sqrt{36}$
D. $2\sqrt{6}$

8. Rationalize: $\frac{10}{\sqrt{5}}$

- A. $2\sqrt{5}$
B. $5\sqrt{2}$
C. $\sqrt{20}$
D. $10\sqrt{5}$

9. Simplify: $3\sqrt{8} + 2\sqrt{2}$

- A. $5\sqrt{10}$
B. $8\sqrt{2}$
C. $5\sqrt{2}$
D. $6\sqrt{2} + 2\sqrt{2}$

10. Express in simplest form: $\sqrt{200}$

- A. $10\sqrt{2}$
B. $20\sqrt{2}$
C. $100\sqrt{2}$
D. $2\sqrt{100}$

11. Simplify: $\frac{\sqrt{48}}{\sqrt{3}}$

- A. 4
B. 16
C. $\sqrt{16}$

- D. $2\sqrt{4}$
12. Evaluate: $\sqrt{2} \times \sqrt{8}$
- A. 4
B. $\sqrt{16}$
C. $2\sqrt{4}$
D. $\sqrt{10}$
13. Simplify: $\sqrt{45} - \sqrt{20}$
- A. $\sqrt{25}$
B. $\sqrt{5}$
C. $3\sqrt{5} - 2\sqrt{5}$
D. $5\sqrt{5}$
14. Rationalize: $\frac{8}{\sqrt{2}}$
- A. $4\sqrt{2}$
B. $8\sqrt{2}$
C. $2\sqrt{8}$
D. $16\sqrt{2}$
15. Simplify: $2\sqrt{27} + \sqrt{12}$
- A. $8\sqrt{3}$
B. $6\sqrt{3} + 2\sqrt{3}$
C. $7\sqrt{3}$
D. $9\sqrt{3}$
16. Express $\sqrt{72}$ in simplest surd form
- A. $6\sqrt{2}$
B. $8\sqrt{3}$
C. $9\sqrt{2}$
D. $12\sqrt{6}$
17. Multiply and simplify: $\sqrt{6} \times \sqrt{24}$
- A. 12
B. $\sqrt{144}$
C. $6\sqrt{4}$
D. $2\sqrt{36}$
18. Rationalize the denominator: $\frac{15}{\sqrt{3}}$
- A. $5\sqrt{3}$
B. $3\sqrt{5}$
C. $15\sqrt{3}$
D. $\sqrt{75}$
19. Simplify: $\sqrt{98} + \sqrt{32}$
- A. $11\sqrt{2}$
B. $7\sqrt{2} + 4\sqrt{2}$
C. $\sqrt{130}$
D. $9\sqrt{2}$
20. Evaluate: $\frac{\sqrt{50}}{\sqrt{2}}$
- A. 5
B. 25
C. $\sqrt{25}$
D. 10
21. Simplify: $4\sqrt{5} - 2\sqrt{5}$
- A. $2\sqrt{5}$
B. $6\sqrt{5}$
C. $2\sqrt{0}$
D. $8\sqrt{5}$
22. Expand and simplify: $(\sqrt{3} + 2)(\sqrt{3} - 2)$
- A. -1
B. 1
C. $3 - 4$
D. 7
23. Rationalize: $\frac{12}{\sqrt{6}}$
- A. $2\sqrt{6}$
B. $6\sqrt{2}$
C. $\sqrt{24}$
D. $12\sqrt{6}$
24. Simplify: $\sqrt{180}$
- A. $6\sqrt{5}$
B. $9\sqrt{2}$
C. $3\sqrt{20}$
D. $18\sqrt{10}$
25. Evaluate: $\sqrt{7} \times \sqrt{7}$
- A. 7
B. 14
C. 49
D. $\sqrt{14}$
26. Simplify: $\sqrt{125} - \sqrt{45}$

- A. $2\sqrt{5}$
 B. $5\sqrt{5} - 3\sqrt{5}$
 C. $8\sqrt{5}$
 D. $\sqrt{80}$
27. Rationalize: $\frac{20}{\sqrt{10}}$
 A. $2\sqrt{10}$
 B. $10\sqrt{2}$
 C. $\sqrt{200}$
 D. $20\sqrt{10}$
28. Simplify: $3\sqrt{12} + 4\sqrt{3}$
 A. $10\sqrt{3}$
 B. $6\sqrt{3} + 4\sqrt{3}$
 C. $7\sqrt{15}$
 D. $12\sqrt{3}$
29. Express in simplest form: $\sqrt{162}$
 A. $9\sqrt{2}$
 B. $6\sqrt{3}$
 C. $81\sqrt{2}$
 D. $3\sqrt{18}$
30. Multiply: $\sqrt{10} \times \sqrt{40}$
 A. 20
 B. $\sqrt{400}$
 C. $10\sqrt{4}$
 D. $4\sqrt{100}$
31. Rationalize the denominator: $\frac{18}{\sqrt{2}}$
 A. $9\sqrt{2}$
 B. $2\sqrt{9}$
 C. $18\sqrt{2}$
 D. $\sqrt{162}$
32. Simplify: $\sqrt{300}$
 A. $10\sqrt{3}$
 B. $3\sqrt{100}$
 C. $30\sqrt{10}$
 D. $100\sqrt{3}$
33. Evaluate: $\frac{\sqrt{72}}{\sqrt{8}}$
 A. 3
 B. 9
 C. $\sqrt{9}$
 D. 6
34. Simplify: $5\sqrt{2} + 3\sqrt{2}$
 A. $8\sqrt{2}$
 B. $15\sqrt{4}$
 C. $8\sqrt{4}$
 D. $\sqrt{64}$
35. Expand: $(\sqrt{5} + 1)^2$
 A. $6 + 2\sqrt{5}$
 B. $5 + 1$
 C. 26
 D. 6
36. Rationalize: $\frac{24}{\sqrt{8}}$
 A. $3\sqrt{8}$
 B. $6\sqrt{2}$
 C. $8\sqrt{3}$
 D. $12\sqrt{2}$
37. Simplify: $\sqrt{112}$
 A. $4\sqrt{7}$
 B. $7\sqrt{4}$
 C. $8\sqrt{14}$
 D. $56\sqrt{2}$
38. Multiply and simplify: $\sqrt{5} \times \sqrt{20}$
 A. 10
 B. $5\sqrt{4}$
 C. $\sqrt{100}$
 D. 20
39. Simplify: $\sqrt{147} - \sqrt{27}$
 A. $4\sqrt{3}$
 B. $7\sqrt{3} - 3\sqrt{3}$
 C. $\sqrt{120}$
 D. $10\sqrt{3}$
40. Rationalize: $\frac{14}{\sqrt{7}}$
 A. $2\sqrt{7}$
 B. $7\sqrt{2}$

- C. $\sqrt{98}$
 D. $14\sqrt{7}$
41. Simplify: $2\sqrt{18} + 3\sqrt{2}$
 A. $9\sqrt{2}$
 B. $6\sqrt{2} + 3\sqrt{2}$
 C. $5\sqrt{20}$
 D. $11\sqrt{2}$
42. Express in simplest form: $\sqrt{242}$
 A. $11\sqrt{2}$
 B. $121\sqrt{2}$
 C. $2\sqrt{121}$
 D. $22\sqrt{11}$
43. Evaluate: $\frac{\sqrt{108}}{\sqrt{3}}$
 A. 6
 B. 36
 C. $\sqrt{36}$
 D. $3\sqrt{4}$
44. Simplify: $7\sqrt{3} - 2\sqrt{3}$
 A. $5\sqrt{3}$
 B. $9\sqrt{3}$
 C. $5\sqrt{0}$
 D. $14\sqrt{6}$
45. Expand and simplify: $(\sqrt{2} + 3)(\sqrt{2} - 3)$
 A. -7
 B. $2 - 9$
 C. 11
 D. -5
46. Rationalize: $\frac{30}{\sqrt{5}}$
 A. $6\sqrt{5}$
 B. $5\sqrt{6}$
 C. $\sqrt{180}$
 D. $30\sqrt{5}$
47. Simplify: $\sqrt{245}$
 A. $7\sqrt{5}$
 B. $5\sqrt{7}$
 C. $49\sqrt{5}$
 D. $\sqrt{49 \times 5}$
48. Multiply: $\sqrt{15} \times \sqrt{15}$
 A. 15
 B. 30
 C. 225
 D. $\sqrt{30}$
49. Simplify: $\sqrt{192} - \sqrt{48}$
 A. $4\sqrt{3}$
 B. $8\sqrt{3} - 4\sqrt{3}$
 C. $\sqrt{144}$
 D. $12\sqrt{3}$
50. Rationalize: $\frac{16}{\sqrt{4}}$
 A. 8
 B. $4\sqrt{4}$
 C. $16\sqrt{4}$
 D. 32
51. Simplify: $4\sqrt{20} + 2\sqrt{5}$
 A. $10\sqrt{5}$
 B. $8\sqrt{5} + 2\sqrt{5}$
 C. $6\sqrt{25}$
 D. $20\sqrt{5}$
52. Express in simplest form: $\sqrt{288}$
 A. $12\sqrt{2}$
 B. $144\sqrt{2}$
 C. $2\sqrt{144}$
 D. $24\sqrt{3}$
53. Evaluate: $\frac{\sqrt{125}}{\sqrt{5}}$
 A. 5
 B. 25
 C. $\sqrt{25}$
 D. 15
54. Simplify: $9\sqrt{7} + 4\sqrt{7}$
 A. $13\sqrt{7}$
 B. $36\sqrt{14}$
 C. $13\sqrt{14}$
 D. $\sqrt{169 \times 7}$
55. Expand: $(\sqrt{6} + 2)^2$

- A. $10 + 4\sqrt{6}$
 B. $6 + 4$
 C. 40
 D. 8
56. Rationalize: $\frac{21}{\sqrt{3}}$
 A. $7\sqrt{3}$
 B. $3\sqrt{7}$
 C. $21\sqrt{3}$
 D. $\sqrt{147}$
57. Simplify: $\sqrt{343}$
 A. $7\sqrt{7}$
 B. $49\sqrt{7}$
 C. $\sqrt{49 \times 7}$
 D. $343\sqrt{1}$
58. Multiply and simplify: $\sqrt{8} \times \sqrt{18}$
 A. 12
 B. $\sqrt{144}$
 C. $2\sqrt{36}$
 D. $4\sqrt{9}$
59. Simplify: $\sqrt{175} + \sqrt{63}$
 A. $8\sqrt{7}$
 B. $5\sqrt{7} + 3\sqrt{7}$
 C. $\sqrt{238}$
 D. $15\sqrt{7}$
60. Rationalize: $\frac{25}{\sqrt{5}}$
 A. $5\sqrt{5}$
 B. $25\sqrt{5}$
 C. $\sqrt{125}$
 D. 125
61. Simplify: $5\sqrt{32} - 2\sqrt{2}$
 A. $18\sqrt{2}$
 B. $20\sqrt{2} - 2\sqrt{2}$
 C. $3\sqrt{30}$
 D. $8\sqrt{2}$
62. Express in simplest form: $\sqrt{392}$
 A. $14\sqrt{2}$
 B. $196\sqrt{2}$
 C. $2\sqrt{196}$
 D. $28\sqrt{7}$
63. Evaluate: $\frac{\sqrt{200}}{\sqrt{8}}$
 A. 5
 B. 25
 C. $\sqrt{25}$
 D. 10
64. Simplify: $6\sqrt{11} - 2\sqrt{11}$
 A. $4\sqrt{11}$
 B. $8\sqrt{11}$
 C. $4\sqrt{0}$
 D. $12\sqrt{22}$
65. Expand and simplify: $(\sqrt{10} + 1)(\sqrt{10} - 1)$
 A. 9
 B. $10 - 1$
 C. 11
 D. -9
66. Rationalize: $\frac{35}{\sqrt{7}}$
 A. $5\sqrt{7}$
 B. $7\sqrt{5}$
 C. $\sqrt{245}$
 D. $35\sqrt{7}$
67. Simplify: $\sqrt{450}$
 A. $15\sqrt{2}$
 B. $225\sqrt{2}$
 C. $2\sqrt{225}$
 D. $9\sqrt{50}$
68. Multiply: $\sqrt{6} \times \sqrt{54}$
 A. 18
 B. $\sqrt{324}$
 C. $6\sqrt{9}$
 D. $3\sqrt{36}$
69. Simplify: $\sqrt{243} - \sqrt{48}$
 A. $5\sqrt{3}$
 B. $9\sqrt{3} - 4\sqrt{3}$
 C. $\sqrt{195}$

- D. $13\sqrt{3}$
70. Rationalize: $\frac{40}{\sqrt{10}}$
- A. $4\sqrt{10}$
 B. $10\sqrt{4}$
 C. $\sqrt{160}$
 D. $40\sqrt{10}$
71. Simplify: $3\sqrt{50} + 4\sqrt{2}$
- A. $19\sqrt{2}$
 B. $15\sqrt{2} + 4\sqrt{2}$
 C. $7\sqrt{52}$
 D. $12\sqrt{100}$
72. Express in simplest form: $\sqrt{500}$
- A. $10\sqrt{5}$
 B. $250\sqrt{2}$
 C. $5\sqrt{100}$
 D. $100\sqrt{5}$
73. Evaluate: $\frac{\sqrt{180}}{\sqrt{5}}$
- A. 6
 B. 36
 C. $\sqrt{36}$
 D. $3\sqrt{4}$
74. Simplify: $10\sqrt{3} + 5\sqrt{3}$
- A. $15\sqrt{3}$
 B. $50\sqrt{9}$
 C. $15\sqrt{6}$
 D. $\sqrt{675}$
75. Expand: $(\sqrt{11} + 3)^2$
- A. $20 + 6\sqrt{11}$
 B. $11 + 9$
 C. 121
 D. 14
76. Rationalize: $\frac{42}{\sqrt{6}}$
- A. $7\sqrt{6}$
 B. $6\sqrt{7}$
 C. $42\sqrt{6}$
 D. $\sqrt{252}$
77. Simplify: $\sqrt{512}$
- A. $16\sqrt{2}$
 B. $256\sqrt{2}$
 C. $2\sqrt{256}$
 D. $8\sqrt{64}$
78. Multiply and simplify: $\sqrt{12} \times \sqrt{27}$
- A. 18
 B. $\sqrt{324}$
 C. $6\sqrt{9}$
 D. $3\sqrt{36}$
79. Simplify: $\sqrt{320} + \sqrt{80}$
- A. $12\sqrt{5}$
 B. $8\sqrt{5} + 4\sqrt{5}$
 C. $\sqrt{400}$
 D. $20\sqrt{5}$
80. Rationalize: $\frac{48}{\sqrt{12}}$
- A. $4\sqrt{12}$
 B. $12\sqrt{4}$
 C. $4\sqrt{3}$
 D. $8\sqrt{3}$
81. Simplify: $6\sqrt{45} - 3\sqrt{5}$
- A. $15\sqrt{5}$
 B. $18\sqrt{5} - 3\sqrt{5}$
 C. $3\sqrt{40}$
 D. $21\sqrt{5}$
82. Express in simplest form: $\sqrt{578}$
- A. $17\sqrt{2}$
 B. $289\sqrt{2}$
 C. $2\sqrt{289}$
 D. $34\sqrt{17}$
83. Evaluate: $\frac{\sqrt{243}}{\sqrt{3}}$
- A. 9
 B. 81
 C. $\sqrt{81}$
 D. 27
84. Simplify: $8\sqrt{13} + 7\sqrt{13}$

- A. $15\sqrt{13}$
 B. $56\sqrt{26}$
 C. $15\sqrt{26}$
 D. $\sqrt{3575}$
85. Expand and simplify: $(\sqrt{7} + 4)(\sqrt{7} - 4)$
 A. -9
 B. $7 - 16$
 C. 23
 D. -7
86. Rationalize: $\frac{56}{\sqrt{8}}$
 A. $7\sqrt{8}$
 B. $14\sqrt{2}$
 C. $8\sqrt{7}$
 D. $28\sqrt{2}$
87. Simplify: $\sqrt{605}$
 A. $11\sqrt{5}$
 B. $121\sqrt{5}$
 C. $5\sqrt{121}$
 D. $\sqrt{121 \times 5}$
88. Multiply: $\sqrt{11} \times \sqrt{44}$
 A. 22
 B. $\sqrt{484}$
 C. $11\sqrt{4}$
 D. $2\sqrt{121}$
89. Simplify: $\sqrt{363} - \sqrt{27}$
 A. $8\sqrt{3}$
 B. $11\sqrt{3} - 3\sqrt{3}$
 C. $\sqrt{336}$
 D. $14\sqrt{3}$
90. Rationalize: $\frac{4}{\sqrt{3} + 1}$
 A. $2\sqrt{3} - 2$
 B. $2(\sqrt{3} - 1)$
 C. $4\sqrt{3} - 4$
 D. $\sqrt{3} - 1$
91. Simplify: $\frac{1}{\sqrt{5} - 2}$
 A. $\sqrt{5} + 2$
 B. $\frac{\sqrt{5} + 2}{5}$
 C. $5 + 2$
 D. $\sqrt{5} - 2$
92. Evaluate: $(\sqrt{8} + \sqrt{2})(\sqrt{8} - \sqrt{2})$
 A. 6
 B. $8 - 2$
 C. 10
 D. 4
93. Rationalize: $\frac{6}{\sqrt{7} - \sqrt{3}}$
 A. $\frac{3(\sqrt{7} + \sqrt{3})}{2}$
 B. $\sqrt{7} + \sqrt{3}$
 C. $3\sqrt{7} + 3\sqrt{3}$
 D. $6(\sqrt{7} + \sqrt{3})$
94. Simplify: $\sqrt{12} + \sqrt{27} - \sqrt{75}$
 A. 0
 B. $-2\sqrt{3}$
 C. $2\sqrt{3}$
 D. $\sqrt{3}$
95. Evaluate: $\frac{\sqrt{98} - \sqrt{32}}{\sqrt{2}}$
 A. 3
 B. $7 - 4$
 C. 11
 D. $\sqrt{33}$
96. Rationalize: $\frac{10}{\sqrt{6} + \sqrt{2}}$
 A. $\frac{5(\sqrt{6} - \sqrt{2})}{2}$
 B. $5\sqrt{6} - 5\sqrt{2}$
 C. $\sqrt{6} - \sqrt{2}$
 D. $10(\sqrt{6} - \sqrt{2})$
97. Simplify: $(\sqrt{5} + \sqrt{3})^2$
 A. $8 + 2\sqrt{15}$
 B. $5 + 3$
 C. 64
 D. $8 + \sqrt{15}$

98. Evaluate: $\frac{\sqrt{72} + \sqrt{50}}{\sqrt{2}}$

A. 11

B. $6 + 5$ C. $\sqrt{61}$

D. 8

99. Rationalize: $\frac{8}{\sqrt{5} + \sqrt{3}}$

A. $4(\sqrt{5} - \sqrt{3})$

B. $8\sqrt{5} - 8\sqrt{3}$

C. $\sqrt{5} - \sqrt{3}$

D. $2(\sqrt{5} - \sqrt{3})$

100. Simplify and rationalize the expression $\frac{2}{\sqrt{3} - \sqrt{2}}$.

A. $\sqrt{3} - \sqrt{2}$

B. $2\sqrt{3} - 2\sqrt{2}$

C. $2\sqrt{3} + 2\sqrt{2}$

D. $\sqrt{3} + \sqrt{2}$

2.4 Logarithms

2.4.1 Questions

1. Evaluate: $\log_2 8$.

A. 2

B. 3

C. 4

D. 8

2. If $\log_{10} 2 = 0.3010$, find $\log_{10} 20$.

A. 0.6020

B. 1.3010

C. 2.3010

D. 6.020

3. Simplify: $\log_5 125$.

A. 1

B. 2

C. 3

D. 5

4. If $\log_x 81 = 4$, find x .

A. 3

B. 4

C. 9

D. 27

5. Evaluate: $\log_3 1$.

A. 0

B. 1

C. 3

D. undefined

6. Simplify: $\log_7 49 + \log_7 7$.

A. 1

B. 2

C. 3

D. 4

7. If $\log_{10} 5 = 0.6990$, find $\log_{10} 50$.

A. 0.3010

B. 1.3010

C. 1.6990

D. 3.4950

8. Evaluate: $\log_4 64$.

A. 2

B. 3

C. 4

D. 16

9. Simplify: $\log_2 32 - \log_2 4$.

A. 2

B. 3

C. 4

D. 8

10. If $\log_5 x = 3$, find x .

A. 8

B. 15

C. 25

D. 125

11. Evaluate: $2\log_3 9$.

- A. 2
B. 3
C. 4
D. 6
12. Simplify: $\log_6 36 + \log_6 1$.
A. 0
B. 1
C. 2
D. 3
13. If $\log_{10} 3 = 0.4771$, find $\log_{10} 30$.
A. 0.9542
B. 1.4771
C. 4.771
D. 14.313
14. Evaluate: $\log_8 512$.
A. 2
B. 3
C. 4
D. 64
15. Simplify: $\log_5 25 \times \log_5 5$.
A. 1
B. 2
C. 3
D. 5
16. If $\log_2 x = 5$, find x .
A. 10
B. 25
C. 32
D. 64
17. Evaluate: $\log_{10} 100$.
A. 1
B. 2
C. 10
D. 100
18. Simplify: $\log_3 81 - \log_3 9$.
A. 1
B. 2
C. 3
D. 4
19. If $\log_{10} 2 = 0.3010$, find $\log_{10} 8$.
A. 0.6020
B. 0.9030
C. 2.408
D. 8.030
20. Evaluate: $\log_9 729$.
A. 2
B. 3
C. 4
D. 81
21. Simplify: $3 \log_2 4$.
A. 2
B. 4
C. 6
D. 8
22. If $\log_x 16 = 2$, find x .
A. 2
B. 4
C. 8
D. 32
23. Evaluate: $\log_5 1$.
A. 0
B. 1
C. 5
D. undefined
24. Simplify: $\log_4 16 + \log_4 4$.
A. 2
B. 3
C. 4
D. 5
25. If $\log_{10} 7 = 0.8451$, find $\log_{10} 70$.
A. 1.6902
B. 1.8451
C. 8.451
D. 59.157
26. Evaluate: $\log_6 216$.
A. 2

- B. 3
C. 4
D. 36
27. Simplify: $\log_7 343 - \log_7 49$.
A. 0
B. 1
C. 2
D. 7
28. If $\log_3 x = 4$, find x .
A. 12
B. 27
C. 64
D. 81
29. Evaluate: $\log_{10} 1000$.
A. 2
B. 3
C. 10
D. 100
30. Simplify: $2 \log_5 5 + \log_5 25$.
A. 2
B. 3
C. 4
D. 5
31. If $\log_x 27 = 3$, find x .
A. 3
B. 9
C. 27
D. 81
32. Evaluate: $\log_2 \frac{1}{8}$.
A. -3
B. -2
C. $\frac{1}{3}$
D. 3
33. Simplify: $\log_3 27 + \log_3 3$.
A. 2
B. 3
- C. 4
D. 9
34. If $\log_{10} 4 = 0.6021$, find $\log_{10} 400$.
A. 1.2042
B. 1.6021
C. 2.6021
D. 240.84
35. Evaluate: $\log_5 \frac{1}{25}$.
A. -2
B. -1
C. $\frac{1}{2}$
D. 2
36. Simplify: $\log_8 64 - \log_8 8$.
A. 0
B. 1
C. 2
D. 8
37. If $\log_4 x = 3$, find x .
A. 12
B. 16
C. 64
D. 81
38. Evaluate: $3 \log_3 3$.
A. 1
B. 3
C. 9
D. 27
39. Simplify: $\log_2 16 + \log_2 2$.
A. 3
B. 4
C. 5
D. 32
40. If $\log_{10} 6 = 0.7782$, find $\log_{10} 60$.
A. 1.5564
B. 1.7782
C. 7.782

- D. 46.692
41. Evaluate: $\log_{10} \frac{1}{100}$.
- A. -2
B. -1
C. $\frac{1}{2}$
D. 2
42. Simplify: $\log_9 81 + \log_9 9$.
- A. 2
B. 3
C. 4
D. 9
43. If $\log_7 x = 2$, find x .
- A. 14
B. 49
C. 98
D. 343
44. Evaluate: $\log_3 \frac{1}{27}$.
- A. -3
B. -2
C. $\frac{1}{3}$
D. 3
45. Simplify: $2 \log_4 4 + \log_4 16$.
- A. 2
B. 3
C. 4
D. 6
46. If $\log_{10} 8 = 0.9031$, find $\log_{10} 800$.
- A. 1.8062
B. 2.9031
C. 9.031
D. 722.48
47. Evaluate: $\log_6 \frac{1}{36}$.
- A. -2
B. -1
C. $\frac{1}{2}$
D. 2
48. Simplify: $\log_{10} 1000 - \log_{10} 10$.
- A. 1
B. 2
C. 3
D. 100
49. If $\log_2 x = 6$, find x .
- A. 8
B. 12
C. 32
D. 64
50. Evaluate: $4 \log_2 2$.
- A. 2
B. 4
C. 8
D. 16
51. Simplify: $\log_5 125 + \log_5 5$.
- A. 2
B. 3
C. 4
D. 5
52. If $\log_x 125 = 3$, find x .
- A. 5
B. 25
C. 125
D. 625
53. Evaluate: $\log_4 \frac{1}{16}$.
- A. -2
B. -1
C. $\frac{1}{4}$
D. 4
54. Simplify: $\log_7 49 + \log_7 7$.
- A. 2
B. 3
C. 4
D. 7
55. If $\log_{10} 9 = 0.9542$, find $\log_{10} 900$.

- A. 1.9084
B. 2.9542
C. 9.542
D. 858.78
56. Evaluate: $\log_8 \frac{1}{64}$.
A. -2
B. -1
C. $\frac{1}{2}$
D. 2
57. Simplify: $\log_3 243 - \log_3 27$.
A. 1
B. 2
C. 3
D. 9
58. If $\log_6 x = 3$, find x .
A. 18
B. 36
C. 216
D. 1296
59. Evaluate: $\log_{10} \frac{1}{1000}$.
A. -3
B. -2
C. $\frac{1}{3}$
D. 3
60. Simplify: $3 \log_5 5 + \log_5 1$.
A. 1
B. 2
C. 3
D. 5
61. If $\log_x 64 = 3$, find x .
A. 2
B. 4
C. 8
D. 16
62. Evaluate: $\log_9 \frac{1}{81}$.
A. -2
B. -1
C. $\frac{1}{2}$
D. 2
63. Simplify: $\log_2 64 + \log_2 4$.
A. 6
B. 8
C. 10
D. 256
64. If $\log_8 x = 2$, find x .
A. 16
B. 64
C. 128
D. 512
65. Evaluate: $5 \log_3 3$.
A. 3
B. 5
C. 15
D. 243
66. Simplify: $\log_6 216 - \log_6 36$.
A. 0
B. 1
C. 2
D. 6
67. If $\log_{10} x = 2$, find x .
A. 2
B. 10
C. 20
D. 100
68. Evaluate: $\log_7 \frac{1}{343}$.
A. -3
B. -2
C. $\frac{1}{3}$
D. 3
69. Simplify: $2 \log_6 6 + \log_6 36$.
A. 2
B. 3

- C. 4
D. 6
70. If $\log_5 x = 4$, find x .
A. 20
B. 125
C. 625
D. 3125
71. Evaluate: $\log_{10} \sqrt{10}$.
A. $\frac{1}{2}$
B. 1
C. 2
D. 5
72. Simplify: $\log_4 256 - \log_4 16$.
A. 1
B. 2
C. 3
D. 4
73. If $\log_x 32 = 5$, find x .
A. 2
B. 4
C. 8
D. 16
74. Evaluate: $\log_5 \frac{1}{125}$.
A. -3
B. -2
C. $\frac{1}{3}$
D. 3
75. Simplify: $\log_8 512 + \log_8 8$.
A. 3
B. 4
C. 5
D. 8
76. If $\log_9 x = 2$, find x .
A. 18
B. 81
C. 162
D. 729
77. Evaluate: $\log_{10} \sqrt[3]{10}$.
A. $\frac{1}{3}$
B. 1
C. 3
D. 10
78. Simplify: $3 \log_2 2 + 2 \log_2 4$.
A. 5
B. 6
C. 7
D. 8
79. If $\log_3 x = 5$, find x .
A. 15
B. 81
C. 243
D. 729
80. Evaluate: $\log_{10} 0.01$.
A. -2
B. -1
C. 0.01
D. 2
81. Simplify: $\log_5 625 - \log_5 25$.
A. 1
B. 2
C. 3
D. 5
82. If $\log_x 1000 = 3$, find x .
A. 10
B. 100
C. 333
D. 1000
83. Evaluate: $\log_{10} \sqrt[4]{10}$.
A. $\frac{1}{4}$
B. 1
C. 2.5
D. 4
84. Simplify: $\log_7 2401 - \log_7 343$.

- A. 0
B. 1
C. 2
D. 7
85. If $\log_4 x = 4$, find x .
A. 16
B. 64
C. 128
D. 256
86. Evaluate: $\log_{10} 0.001$.
A. -3
B. -2
C. 0.001
D. 3
87. Simplify: $2 \log_3 9 + \log_3 3$.
A. 3
B. 4
C. 5
D. 9
88. If $\log_{10} x = -1$, find x .
A. 0.01
B. 0.1
C. 1
D. 10
89. Evaluate: $\log_2 \sqrt{8}$.
A. $\frac{3}{2}$
B. 2
C. 3
D. 4
90. Simplify: $\log_9 729 + \log_9 9$.
A. 3
B. 4
C. 5
D. 9
91. If $\log_7 x = 3$, find x .
A. 21
B. 49
C. 147
D. 343
92. Evaluate: $\log_{10} 0.0001$.
A. -4
B. -3
C. 0.0001
D. 4
93. Simplify: $3 \log_4 4 + \log_4 64$.
A. 4
B. 5
C. 6
D. 8
94. If $\log_{10} x = -2$, find x .
A. 0.001
B. 0.01
C. 0.1
D. 1
95. Evaluate: $\log_3 \sqrt{27}$.
A. $\frac{3}{2}$
B. 2
C. 3
D. 9
96. Simplify: $\log_{10} 10000 - \log_{10} 100$.
A. 1
B. 2
C. 3
D. 100
97. If $\log_2 x = 7$, find x .
A. 14
B. 64
C. 128
D. 256
98. Evaluate: $\log_{10} \sqrt{100}$.
A. $\frac{1}{2}$
B. 1
C. 2
D. 10

99. Simplify: $\log_6 1296 - \log_6 216$.

- A. 0
- B. 1
- C. 2
- D. 6

100. If $\log_{10} 2 = 0.3010$ and $\log_{10} 3 = 0.4771$, evaluate $\log_{10} 18$.

- A. 1.2552
- B. 1.2551
- C. 1.7781
- D. 1.7782

Chapter 3

Geometry

3.1

3.1.1 Questions

1.

A.
B.
C.
D.
2.

A.
B.
C.
D.
3.

A.
B.
C.
D.
4.

A.
B.
C.
D.
5.

A.
B.
C.
D.
6.

A.
B.
C.
D.
7.

A.
B.
8.

A.
B.
C.
D.
9.

A.
B.
C.
D.
10.

A.
B.
C.
D.
11.

A.
B.
C.
D.
12.

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B.
C.
D.
13.

A.
B.
C.
D.
14.

A.

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|-----|----|-----|----|
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 15. | A. | 25. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 16. | A. | 26. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 17. | A. | 27. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 18. | A. | 28. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 19. | A. | 29. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 20. | A. | 30. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 21. | A. | 31. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 22. | A. | 32. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 23. | A. | 33. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 24. | A. | 34. | A. |
| | | | B. |

- | | | | |
|-----|----|-----|----|
| | C. | | C. |
| | D. | | D. |
| 35. | A. | 45. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 36. | A. | 46. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 37. | A. | 47. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 38. | A. | 48. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 39. | A. | 49. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 40. | A. | 50. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 41. | A. | 51. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 42. | A. | 52. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 43. | A. | 53. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 44. | A. | 54. | A. |
| | B. | | B. |
| | | | C. |

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|-----|----|-----|----|
| | D. | | D. |
| 55. | A. | 65. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 56. | A. | 66. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 57. | A. | 67. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 58. | A. | 68. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 59. | A. | 69. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 60. | A. | 70. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 61. | A. | 71. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 62. | A. | 72. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 63. | A. | 73. | A. |
| | B. | | B. |
| | C. | | C. |
| | D. | | D. |
| 64. | A. | 74. | A. |
| | B. | | B. |
| | C. | | C. |
| | | | D. |

75. A.
B.
C.
D.

76. A.
B.
C.
D.

77. A.
B.
C.
D.

78. A.
B.
C.
D.

79. A.
B.
C.
D.

80. A.
B.
C.
D.

81. A.
B.
C.
D.

82. A.
B.
C.
D.

83. A.
B.
C.
D.

84. A.
B.
C.
D.

85. A.
B.
C.
D.

86. A.
B.
C.
D.

87. A.
B.
C.
D.

88. A.
B.
C.
D.

89. A.
B.
C.
D.

90. A.
B.
C.
D.

91. A.
B.
C.
D.

92. A.
B.
C.
D.

93. A.
B.
C.
D.

94. A.
B.
C.
D.

95. A.

- B.
C.
D.
96. A.
B.
C.
D.
97. A.
B.
C.
D.
98. A.
- B.
C.
D.
99. A.
B.
C.
D.
100. A.
B.
C.
D.

3.2 Co-ordinate Geometry

3.2.1 Questions

- Find the distance between points $A(3, 4)$ and $B(6, 8)$
 - 3
 - 4
 - 5
 - 7
- What is the midpoint of the line joining $(-2, 5)$ and $(4, -3)$?
 - $(1, 1)$
 - $(2, 2)$
 - $(3, 4)$
 - $(-1, -1)$
- Find the gradient of the line passing through $(2, 3)$ and $(5, 9)$
 - 1
 - 2
 - 3
 - 4
- The gradient of the line joining $(-2, 0)$ and $(0, -4)$ is
 - 2
 - 1
 - 2
 - 4
- Find the distance between points $(0, 0)$ and $(3, 4)$
 - 3
 - 4
 - 5
 - 7
- What is the midpoint between $(6, 8)$ and $(2, 4)$?
 - $(4, 6)$
 - $(8, 12)$
 - $(2, 2)$
 - $(3, 5)$
- Find the gradient of the line $2y = 4x + 6$
 - 1
 - 2
 - 3
 - 4
- The distance between $(1, 2)$ and $(4, 6)$ is
 - 3
 - 4
 - 5
 - 7
- Find the equation of a line with gradient 3 passing through $(0, 2)$
 - $y = 3x + 2$
 - $y = 2x + 3$
 - $y = 3x - 2$

- D. $y = x + 5$
10. What is the midpoint of (10, 14) and (6, 2)?
- A. (8, 8)
B. (16, 16)
C. (4, 6)
D. (2, 3)
11. Find the gradient of the line passing through (0, 5) and (3, 11)
- A. 1
B. 2
C. 3
D. 6
12. The distance between (-3, 4) and (3, 4) is
- A. 0
B. 3
C. 6
D. 8
13. Find the gradient of the line $3y + 6x = 9$
- A. -2
B. -1
C. 2
D. 3
14. What is the midpoint between (5, 7) and (9, 11)?
- A. (7, 9)
B. (14, 18)
C. (4, 4)
D. (2, 2)
15. Find the distance between (2, 1) and (5, 5)
- A. 3
B. 4
C. 5
D. 6
16. The gradient of a line parallel to $y = 4x + 1$ is
- A. 1
B. 2
C. 4
D. -4
17. Find the midpoint of (0, 0) and (8, 6)
- A. (4, 3)
B. (8, 6)
C. (2, 1.5)
D. (16, 12)
18. What is the gradient of the line passing through (1, 1) and (4, 7)?
- A. 1
B. 2
C. 3
D. 6
19. Find the distance between (-1, -1) and (2, 3)
- A. 3
B. 4
C. 5
D. 6
20. The equation of a line with gradient 2 and y-intercept -3 is
- A. $y = 2x - 3$
B. $y = -3x + 2$
C. $y = 2x + 3$
D. $y = 3x - 2$
21. Find the midpoint between (-4, 6) and (10, -2)
- A. (3, 2)
B. (6, 4)
C. (7, 4)
D. (14, 8)
22. What is the gradient of the line $y = -3x + 7$?
- A. -3
B. 3
C. 7
D. -7
23. Find the distance between (5, 0) and (0, 12)
- A. 11
B. 12
C. 13
D. 17
24. The gradient of a line perpendicular to $y = 2x + 5$ is
- A. 2
B. -2

- C. $\frac{1}{2}$
D. $-\frac{1}{2}$
25. Find the midpoint of (7, 9) and (3, 5)
A. (5, 7)
B. (10, 14)
C. (4, 4)
D. (2, 2)
26. What is the gradient of the line passing through (2, 5) and (2, 9)?
A. 0
B. 1
C. undefined
D. 4
27. Find the distance between (6, 8) and (6, 2)
A. 0
B. 4
C. 6
D. 10
28. The equation of a line passing through (3, 4) with gradient -1 is
A. $y = -x + 7$
B. $y = x + 1$
C. $y = -x - 1$
D. $y = x + 7$
29. Find the midpoint between (12, 8) and (4, 16)
A. (8, 12)
B. (16, 24)
C. (6, 6)
D. (4, 4)
30. What is the gradient of a horizontal line?
A. 0
B. 1
C. -1
D. undefined
31. Find the distance between (8, 15) and (8, 3)
A. 0
B. 8
C. 12
D. 18
32. The gradient of the line $4y = 8x - 12$ is
A. 1
B. 2
C. 4
D. 8
33. Find the midpoint of $(-5, -3)$ and (7, 9)
A. (1, 3)
B. (2, 6)
C. (6, 6)
D. (12, 12)
34. What is the gradient of the line passing through (3, 2) and (7, 2)?
A. 0
B. 1
C. 4
D. undefined
35. Find the distance between (0, 5) and (12, 0)
A. 11
B. 12
C. 13
D. 17
36. The equation of a line with gradient $\frac{1}{2}$ passing through (4, 3) is
A. $y = \frac{1}{2}x + 1$
B. $y = 2x - 5$
C. $y = \frac{1}{2}x - 1$
D. $y = x + 1$
37. Find the midpoint between (9, 12) and (15, 4)
A. (12, 8)
B. (24, 16)
C. (6, 8)
D. (3, 4)
38. What is the gradient of a vertical line?
A. 0
B. 1

- C. -1
D. undefined
39. Find the distance between $(-2, -3)$ and $(4, 5)$
A. 8
B. 9
C. 10
D. 11
40. The gradient of the line $5y - 10x = 15$ is
A. -2
B. 2
C. 5
D. 10
41. Find the midpoint of $(20, 30)$ and $(10, 10)$
A. $(15, 20)$
B. $(30, 40)$
C. $(10, 20)$
D. $(5, 10)$
42. What is the gradient of the line passing through $(-1, 4)$ and $(2, 10)$?
A. 1
B. 2
C. 3
D. 6
43. Find the distance between $(7, 24)$ and $(0, 0)$
A. 24
B. 25
C. 31
D. 7
44. The gradient of a line perpendicular to $y = -\frac{1}{3}x + 4$ is
A. -3
B. $-\frac{1}{3}$
C. $\frac{1}{3}$
D. 3
45. Find the midpoint between $(8, 14)$ and $(12, 6)$
A. $(10, 10)$
B. $(20, 20)$
- C. $(4, 8)$
D. $(2, 4)$
46. What is the gradient of the line $y - 3x = 6$?
A. -3
B. 3
C. 6
D. -6
47. Find the distance between $(9, 40)$ and $(0, 0)$
A. 40
B. 41
C. 49
D. 9
48. The equation of a line passing through the origin with gradient 5 is
A. $y = 5x$
B. $y = x + 5$
C. $y = 5x + 1$
D. $y = -5x$
49. Find the midpoint of $(-6, 8)$ and $(14, -4)$
A. $(4, 2)$
B. $(8, 4)$
C. $(10, 6)$
D. $(20, 12)$
50. What is the gradient of the line passing through $(5, 1)$ and $(1, 5)$?
A. 1
B. -1
C. 4
D. -4
51. Find the distance between $(3, 7)$ and $(6, 11)$
A. 3
B. 4
C. 5
D. 7
52. The gradient of a line parallel to $y = -5x + 2$ is
A. -5
B. 5
C. 2
D. -2

53. Find the midpoint between (18, 24) and (6, 8)
- A. (12, 16)
B. (24, 32)
C. (6, 8)
D. (3, 4)
54. What is the gradient of the line $6y + 12x = 18$?
- A. -2
B. 2
C. 6
D. -6
55. Find the distance between (10, 24) and (10, 4)
- A. 0
B. 10
C. 20
D. 28
56. The equation of a line with gradient -3 and y-intercept 5 is
- A. $y = -3x + 5$
B. $y = 3x + 5$
C. $y = -3x - 5$
D. $y = 5x - 3$
57. Find the midpoint of (25, 35) and (15, 15)
- A. (20, 25)
B. (40, 50)
C. (10, 20)
D. (5, 10)
58. What is the gradient of the line passing through (0, 3) and (4, 11)?
- A. 1
B. 2
C. 3
D. 4
59. Find the distance between (8, 6) and (2, -2)
- A. 6
B. 8
C. 10
D. 14
60. The gradient of a line perpendicular to $y = \frac{2}{3}x - 1$ is
- A. $\frac{2}{3}$
B. $-\frac{2}{3}$
C. $\frac{3}{2}$
D. $-\frac{3}{2}$
61. Find the midpoint between (5, 13) and (11, 7)
- A. (8, 10)
B. (16, 20)
C. (6, 6)
D. (3, 3)
62. What is the gradient of the line $2y = -6x + 10$?
- A. -3
B. 3
C. -6
D. 2
63. Find the distance between (15, 20) and (15, 8)
- A. 0
B. 12
C. 15
D. 28
64. The equation of a line passing through (2, 1) with gradient 4 is
- A. $y = 4x - 7$
B. $y = 4x + 7$
C. $y = 4x - 1$
D. $y = 2x + 4$
65. Find the midpoint of (30, 40) and (10, 20)
- A. (20, 30)
B. (40, 60)
C. (15, 15)
D. (10, 10)
66. What is the gradient of the line passing through (6, 2) and (10, 10)?
- A. 1
B. 2
C. 4
D. 8

67. Find the distance between (5, 12) and (0, 0)
- 12
 - 13
 - 17
 - 5
68. The gradient of a line parallel to $y = \frac{1}{4}x - 3$ is
- $\frac{1}{4}$
 - $-\frac{1}{4}$
 - 4
 - 4
69. Find the midpoint between (22, 18) and (14, 10)
- (18, 14)
 - (36, 28)
 - (8, 8)
 - (4, 4)
70. What is the gradient of the line $3y + 9x = 12$?
- 3
 - 3
 - 9
 - 9
71. Find the distance between (20, 21) and (20, 5)
- 0
 - 16
 - 20
 - 26
72. The equation of a line with gradient $\frac{3}{4}$ passing through (8, 5) is
- $y = \frac{3}{4}x - 1$
 - $y = \frac{3}{4}x + 1$
 - $y = \frac{4}{3}x - 1$
 - $y = 3x + 4$
73. Find the midpoint of (16, 22) and (8, 14)
- (12, 18)
 - (24, 36)
 - (8, 8)
 - (4, 4)
74. What is the gradient of the line passing through (7, 5) and (7, 15)?
- 0
 - 1
 - 10
 - undefined
75. Find the distance between (9, 12) and (0, 0)
- 12
 - 15
 - 21
 - 9
76. The gradient of a line perpendicular to $y = 4x + 7$ is
- 4
 - 4
 - $\frac{1}{4}$
 - $-\frac{1}{4}$
77. Find the midpoint between (28, 36) and (12, 20)
- (20, 28)
 - (40, 56)
 - (16, 16)
 - (8, 8)
78. What is the gradient of the line $y + 5x = 15$?
- 5
 - 5
 - 15
 - 15
79. Find the distance between (24, 7) and (0, 0)
- 24
 - 25
 - 31
 - 7
80. The equation of a line passing through (5, 6) with gradient -2 is
- $y = -2x + 16$

- B. $y = 2x - 4$
C. $y = -2x - 4$
D. $y = -2x + 6$
81. Find the midpoint of (35, 45) and (25, 25)
A. (30, 35)
B. (60, 70)
C. (10, 20)
D. (5, 10)
82. What is the gradient of the line passing through (1, 8) and (5, 20)?
A. 2
B. 3
C. 4
D. 12
83. Find the distance between (6, 8) and (1, -4)
A. 11
B. 12
C. 13
D. 17
84. The gradient of a line parallel to $y = -7x + 3$ is
A. -7
B. 7
C. 3
D. -3
85. Find the midpoint between (40, 50) and (20, 30)
A. (30, 40)
B. (60, 80)
C. (20, 20)
D. (10, 10)
86. What is the gradient of the line $4y - 8x = 20$?
A. -2
B. 2
C. 4
D. -4
87. Find the distance between (13, 84) and (13, 0)
A. 0
B. 13
C. 84
D. 97
88. The equation of a line with gradient 6 and y-intercept -2 is
A. $y = 6x - 2$
B. $y = -6x + 2$
C. $y = 6x + 2$
D. $y = 2x - 6$
89. Find the midpoint of (50, 60) and (30, 40)
A. (40, 50)
B. (80, 100)
C. (20, 20)
D. (10, 10)
90. What is the gradient of the line passing through (3, 10) and (9, 22)?
A. 1
B. 2
C. 3
D. 4
91. Find the distance between (11, 60) and (0, 0)
A. 60
B. 61
C. 71
D. 11
92. The gradient of a line perpendicular to $y = -\frac{5}{2}x + 1$ is
A. $-\frac{5}{2}$
B. $\frac{5}{2}$
C. $-\frac{2}{5}$
D. $\frac{2}{5}$
93. Find the midpoint between (45, 55) and (35, 35)
A. (40, 45)
B. (80, 90)
C. (10, 20)
D. (5, 10)
94. What is the gradient of the line $7y + 14x = 21$?
A. -2
B. 2

C. 7

D. -7

A. 0

B. 25

C. 56

D. 64

95. Find the distance between $(25, 60)$ and $(25, 4)$

Chapter 4

Calculus

4.1 Differentiation

4.1.1 Questions

- The minimum point on the curve $y = x^2 - 6x + 5$ is at:
A. (1,5)
B. (2,3)
C. (3,4)
D. (-3,4)
E. (3,-4)
- At what value of x is the function $y = x^2 + x + 1$ minimum?
A. -1
B. $-\frac{1}{2}$
C. $\frac{1}{2}$
D. 1
- At what value of x is the function $y = x^2 - 2x - 3$ minimum?
A. 1
B. -1
C. -4
D. 4
- Find the maximum value of $y = -x^2 + 2x + 3$.
A. -4
B. -1
C. 1
D. 4
- Find the maximum value of $y = 3x^2 - x^3$.
A. 2
B. 4
C. 6
D. 0
- Find the minimum value of $y = x^3 - 3x + 1$.
A. -1
B. 1
C. 2
D. -2
- Find the value of x for which the function $f(x) = 2x^3 - x^2 - 4x + 4$ has a maximum value.
A. $\frac{2}{3}$
B. 1
C. -1
D. $-\frac{2}{3}$
- Find the value of x for which the function $f(x) = 3x^3 - 9x^2$ is minimum.
A. 2
B. 0
C. 5
D. 3
- Find the maximum value of the function $f(x) = 2 + x - x^2$.
A. $\frac{9}{4}$
B. $\frac{7}{4}$

- C. $\frac{3}{2}$
D. $\frac{1}{2}$
10. Find the maximum value of y in the equation $y = 1 - 2x - 3x^2$.
A. $\frac{4}{3}$
B. $\frac{5}{4}$
C. $\frac{3}{4}$
D. $\frac{5}{3}$
11. The minimum value of y in the equation $y = x^2 - 6x + 8$ is:
A. 8
B. 3
C. 0
D. -1
12. Obtain the maximum value of the function $f(x) = x^3 - 12x + 11$.
A. -5
B. -2
C. 2
D. 27
13. Find the value of h if the maximum value of $y = 1 + hx - 3x^2$ is 13.
A. 10
B. 11
C. 12
D. 13
14. A trader realizes $10x - x^2$ naira profit from the sale of x bags of corn. How many bags will give him the maximum profit?
A. 4
B. 5
C. 6
D. 7
15. Find the value of x for which the function $y = x^3 - x$ has a minimum value.
A. $\frac{\sqrt{3}}{3}$
B. $-\frac{\sqrt{3}}{3}$
C. $\sqrt{3}$
D. $-\sqrt{3}$
16. If $f(x) = x^2 - 2x - 3$, find the least value of $f(x)$ and the corresponding value of x .
A. $f(x) = -3, x = 1$
B. $f(x) = -3, x = 3$
C. $f(x) = -4, x = 1$
D. $f(x) = 1, x = -4$
17. If $y = 3 \cos\left(\frac{x}{3}\right)$, find $\frac{dy}{dx}$ when $x = \frac{3\pi}{2}$.
A. -1
B. 1
C. 2
D. 3
18. What is the rate of change of the volume v of a hemisphere with respect to its radius r when $r = 2$? ($V = \frac{2}{3}\pi r^3$)
A. 2π
B. 4π
C. 8π
D. 16π
19. If $y = (1 - 2x)^3$, find the value of $\frac{dy}{dx}$ at $x = -1$.
A. 22
B. 57
C. -6
D. -54
20. Find the derivative of $y = \sin(2x^3 + 3x - 4)$.
A. $\cos(2x^3 + 3x - 4)$
B. $-\cos(2x^3 + 3x - 4)$
C. $-(6x^2 + 3) \cos(2x^3 + 3x - 4)$
D. $(6x^2 + 3) \cos(2x^3 + 3x - 4)$
21. The radius r of a circular disc is increasing at the rate of 0.5 cm/sec. At what rate is the area of the disc increasing when its radius is 6 cm?
A. $3\pi \text{ cm}^2/\text{sec}$
B. $18\pi \text{ cm}^2/\text{sec}$
C. $6\pi \text{ cm}^2/\text{sec}$
D. $36\pi \text{ cm}^2/\text{sec}$
22. Find $\frac{dy}{dx}$, if $y = \cos x$.

- A. $\sin x$
 B. $-\sin x$
 C. $\tan x$
 D. $-\tan x$
23. Differentiate: $(\cos \theta - \sin \theta)^2$ with respect to θ .
 A. $1 - 2 \cos 2\theta$
 B. $-2 \sin 2\theta$
 C. $-2 \cos 2\theta$
 D. $1 - 2 \sin 2\theta$
24. Differentiate: $\left(x^2 - \frac{1}{x}\right)^2$ with respect to x .
 A. $4x^3 - 2 + \frac{2}{x^3}$
 B. $4x^3 - 2 - \frac{2}{x^3}$
 C. $4x^3 - 4x - \frac{2}{x}$
 D. $4x^3 - 3x + \frac{2}{x}$
25. Find the point (x, y) on the Euclidean plane where the curve $y = 2x^2 - 2x + 3$ has 2 as the gradient.
 A. $(1, 3)$
 B. $(2, 2)$
 C. $(3, 4)$
 D. $(3, 2)$
26. For what value of x is the tangent to the curve $y = x^2 - 4x + 3$ parallel to the x -axis?
 A. 0
 B. 1
 C. 2
 D. 3
27. Differentiate $\frac{6x^3 - 5x^2 + 1}{3x^2}$ with respect to x .
 A. $2 - \frac{2}{3x^3}$
 B. $2 + \frac{1}{6x}$
 C. $2x - \frac{5}{3}$
 D. $2 - \frac{1}{3x^2}$
28. If $y = (1 + x)^2$, find $\frac{dy}{dx}$.
 A. $x + 1$
 B. $2x - 1$
 C. $2 + 2x$
 D. $1 + 2x$
29. Differentiate $3x^3 + 2x^2 + 3x + 1$ with respect to x .
 A. $9x^2 + 4x + 3$
 B. $9x^2 + 4x - 3$
 C. $9x^2 - 4x - 3$
 D. $9x^2 - 4x + 3$
30. Differentiate $\frac{2}{3}x^3 - \frac{4}{x}$.
 A. $2x^2 + \frac{4}{x^2}$
 B. $2x^2 - \frac{4}{x}$
 C. $3x^2 - \frac{4}{x}$
 D. $3x^2 + \frac{4}{x^2}$
31. Find the derivative of $\frac{\sin x}{\cos x}$.
 A. $\tan x \cos x$
 B. $\csc x \sec x$
 C. $\sec^2 x$
 D. $\cot^2 x$
32. If $y = x^2 - 3x + 4$, find $\frac{dy}{dx}$ at $x = 5$.
 A. 9
 B. 7
 C. 5
 D. 3
33. If $y = 2x \cos 2x - \sin 2x$, find $\frac{dy}{dx}$ when $x = \frac{\pi}{2}$.
 A. 0
 B. $-\pi$
 C. π
 D. -2π
34. If $y = 3 \cos 4x$, find $\frac{dy}{dx}$.
 A. $-24 \sin 4x$
 B. $12 \sin 4x$
 C. $-12 \sin 4x$
 D. $6 \sin 8x$
35. Find the derivative of $(2 + 3x)(1 - x)$ with respect to x .

- A. $6x - 1$
B. $1 - 6x$
C. -3
D. 6
36. Find $\frac{dy}{dx}$, if $y = -3x^3 + 2x^2 - 3x + 1$.
A. $-9x^2 + 4x + 3$
B. $-9x^2 + 4x - 3$
C. $-9x^2 - 4x + 3$
D. $-9x^2 - 4x - 3$
37. If $y = 2x^3 + 6x^2 + 6x + 1$, find $\frac{dy}{dx}$.
A. $6x^2 + 12x + 1$
B. $6x^2 - 12x + 1$
C. $6x^2 + 12x + 6$
D. $6x^2 + 6x + 6$
38. Find the derivative of $y = \left(\frac{1}{3}x + 6\right)^2$.
A. $2\left(\frac{1}{3}x + 6\right)$
B. $\frac{2}{3}\left(\frac{1}{3}x + 6\right)$
C. $\frac{1}{3}\left(\frac{1}{3}x + 6\right)^2$
D. $\frac{2}{3}\left(\frac{1}{3}x + 6\right)^2$
39. If $y = x^2 - 3x + 4$, find $\frac{dy}{dx}$ at $x = 2$.
A. -1
B. 1
C. 2
D. -2
40. If $y = x^2 + \sqrt{x}$, find $\frac{dy}{dx}$.
A. $2x - \frac{1}{2}x^{\frac{1}{2}}$
B. $2x - \frac{1}{2}x^{-\frac{1}{2}}$
C. $2x + x^{-\frac{1}{2}}$
D. $2x + \frac{1}{2}x^{-\frac{1}{2}}$
41. Find $\frac{dy}{dx}$, if $y = \frac{2}{3}x^3 - \frac{4}{x}$.
A. $3x^2 - \frac{4}{x}$
B. $3x^2 + \frac{4}{x^2}$
C. $2x^2 - \frac{4}{x}$
D. $2x^2 + \frac{4}{x^2}$
42. If $y = \cos 3x$, find $\frac{dy}{dx}$.
A. $\frac{1}{3} \sin 3x$
B. $3 \sin 3x$
C. $-\frac{1}{3} \sin 3x$
D. $-3 \sin 3x$
43. Find $\frac{dy}{dx}$, if $y = \cos x$.
A. $\sin x$
B. $-\sin x$
C. $\tan x$
D. $-\tan x$
44. Find the slope of the curve $y = 2x^2 + 5x - 3$ at $(1, 4)$.
A. 4
B. 6
C. 7
D. 9
45. Find the derivative of $y = \sin^2(5x)$ with respect to x .
A. $5 \sin 5x \cos 5x$
B. $2 \sin 5x \cos 5x$
C. $15 \sin 5x \cos 5x$
D. $10 \sin 5x \cos 5x$
46. The slope of the tangent to the curve $y = 3x^2 - 2x + 5$ at the point $(1, 6)$ is:
A. 1
B. 4
C. 5
D. 6
47. If the gradient of the curve $y = 2kx^2 + x + 1$ at $x = 1$ is 9 , find the value of k .
A. 2
B. -2
C. 4
D. -4

48. The distance travelled by a particle from a fixed point is given as $s = (t^3 - t^2 - t + 5)$ cm. Find the minimum distance that the particle can cover from the fixed point (for $t \geq 0$).
- 2.3 cm
 - 4.0 cm
 - 5.2 cm
 - 6.0 cm
49. Differentiate $(2x + 5)^2(x - 4)$ with respect to x .
- $4(2x + 5)(x - 4)$
 - $4(2x + 5)(4x - 3)$
 - $(2x + 5)(6x - 11)$
 - $(2x + 5)(2x - 13)$
50. Find the rate of change of the volume v of a sphere with respect to its radius r when $r = 1$. ($V = \frac{4}{3}\pi r^3$)
- 24π
 - 12π
 - 4π
 - 8π
51. If $y = 2x \cos 2x - \sin 2x$, find $\frac{dy}{dx}$ when $x = \frac{\pi}{4}$.
- $\frac{\pi}{4}$
 - $\frac{\pi}{2}$
 - $-\pi$
 - $-\frac{\pi}{2}$
52. Differentiate $\frac{x}{\cos x}$ with respect to x .
- $1 + \sec^2 x$
 - $1 + x \tan x \sec x$
 - $\cos x + x \tan x$
 - $\sec x + x \tan x \sec x$
53. If $y = 243(4x + 5)^{-2}$, find $\frac{dy}{dx}$ when $x = 1$.
- $-\frac{8}{9}$
 - $\frac{9}{8}$
 - $-\frac{8}{3}$
 - $\frac{3}{8}$
54. What is the derivative of $t^2 \sin(3t - 5)$ with respect to the variable t ?
- $2t \sin(3t - 5) + 3t^2 \cos(3t - 5)$
 - $2t \sin(3t - 5) - 3t^2 \cos(3t - 5)$
 - $6t \cos(3t - 5)$
 - $2t \sin(3t - 5) + t^2 \cos(3t)$
55. A circle with radius 5 cm has its radius increasing at the rate of 0.2 cm/s. What will be the corresponding increase in area?
- π
 - 2π
 - 4π
 - 5π
56. Find the dimensions of the rectangle of greatest area which has a fixed perimeter p .
- Square of sides $\frac{p}{2}$
 - Square of sides p
 - Square of sides $\frac{p}{4}$
 - Square of sides $2p$
57. The gradient of a curve is $2x + 7$ and the curve passes through the point $(2, 0)$. Find the equation of the curve.
- $y = x^2 + 7x - 18$
 - $y = x^2 + 7x + 18$
 - $y = x^2 + 7x - 9$
 - $y = x^2 + 7x + 9$
58. Differentiate $y = \sqrt[3]{x^2}(2x - x^2)$.
- $\frac{10x^{\frac{5}{3}}}{3} - \frac{8x^{\frac{5}{3}}}{3}$
 - $\frac{10x^{\frac{2}{3}}}{3} - \frac{8x^{\frac{5}{3}}}{3}$
 - $\frac{10x^{\frac{5}{3}}}{3} - \frac{8x^{\frac{2}{3}}}{3}$
 - $\frac{10x^{\frac{2}{3}}}{3} - \frac{8x^{\frac{2}{3}}}{3}$
59. The slope of the tangent to the curve $y = 5x^2 - 3x + 5$ at the point $(1, 6)$ is:
- 19
 - 7
 - 4
 - 3
60. Find the derivative of the function $y = 2x^2(2x - 1)$ at the point $x = -1$.

- A. 18
B. -4
C. 16
D. -6
61. Find the derivative of $y = \ln(4x^3 - 2x)$ (assuming natural logarithm).
- A. $\frac{4x^2 - 2}{7x + 6}$
B. $\frac{12x - 2}{4x^2}$
C. $\frac{43x^2 - 2x}{7x}$
D. $\frac{12x^2 - 2}{4x^3 - 2x}$
62. Find the derivative of $y = e^x \sin x$.
- A. $e^x(\sin x + \cos x)$
B. $e^x(\sin x - \cos x)$
C. $e^x \cos x$
D. $xe^x \sin x$
63. Find the second derivative of $y = 8x^3 - 3x^2 + 7x - 1$.
- A. $11x^2 + 6x - 7$
B. $24x^2 - 6x + 7$
C. $48x - 6$
D. $32x + 7$
64. For what value of x is the tangent to the curve $y = x^2 + 6x + 8$ parallel to the x -axis?
- A. -3
B. 3
C. 4
D. -4
65. Find the second derivative of $y = x \sin(x)$.
- A. $2 \cos(x) - x \sin(x)$
B. $\sin(x) - x \cos(x)$
C. $\sin(x) + x \cos(x)$
D. $x \sin(x) - 2 \cos(x)$
66. Differentiate $\frac{2x}{\sin(x)}$ with respect to x .
- A. $2 \cot x \sec x(1 + \tan x)$
B. $2 \csc x - x \cot x$
C. $2x \csc x + \tan x$
D. $2 \csc x(1 - x \cot x)$
67. Find the point (x, y) on the Euclidean plane where the curve $y = 2x^2 - 2x + 3$ has 2 as gradient.
- A. (1, 3)
B. (2, 7)
C. (3, 15)
D. (0, 3)
68. Find the equation of the tangent at the point (2, 0) to the curve $y = x^2 - 2x$.
- A. $y = 2x - 4$
B. $y = 2x + 4$
C. $y = 2x + 2$
D. $y = 2x - 2$
69. Differentiate $y = 20x^{-4} + 9$.
- A. $-80x^{-5}$
B. $-80x^5$
C. $80x^{-5}$
D. $80x^5$
70. Differentiate $y = x^2 \ln x$.
- A. $x(2 \ln x + 1)$
B. $2x \ln x$
C. $x + \ln x$
D. $2x + 1/x$
71. If $f(x) = 3x^3 + 4x^2 + x - 8$, what is the value of $f(-2)$?
- A. -24
B. 30
C. -18
D. -50
72. Find the derivative of $y = \sqrt{1 - x^2}$.
- A. $\frac{x}{\sqrt{1 - x^2}}$
B. $\frac{-x}{\sqrt{1 - x^2}}$
C. $\frac{1}{2\sqrt{1 - x^2}}$
D. $\frac{-1}{\sqrt{1 - x^2}}$
73. If $y = \arctan(x)$, find $\frac{dy}{dx}$.
- A. $\frac{1}{1 + x^2}$
B. $\frac{-1}{1 + x^2}$

- C. $\sec^2 x$
 D. $\frac{1}{\sqrt{1-x^2}}$
74. Differentiate $y = \frac{e^x}{x}$ with respect to x .
 A. $\frac{e^x(x-1)}{x^2}$
 B. $\frac{e^x(x+1)}{x^2}$
 C. e^x
 D. $\frac{e^x}{x^2}$
75. The slope of the normal to the curve $y = x^2 - 5x + 2$ at $x = 1$ is:
 A. -3
 B. $1/3$
 C. 3
 D. $-1/3$
76. Find $\frac{dy}{dx}$ if $y = (x^2 + 1)^3$.
 A. $3x(x^2 + 1)^2$
 B. $6x(x^2 + 1)^2$
 C. $2x(x^2 + 1)^3$
 D. $(x^2 + 1)^2$
77. Given $f(x) = \frac{1}{x}$, find $f''(x)$.
 A. $-\frac{1}{x^2}$
 B. $\frac{1}{x^3}$
 C. $\frac{2}{x^3}$
 D. $-\frac{2}{x^3}$
78. A function $f(x) = x^3 - 6x^2 + 5$. Find the interval where the function is decreasing.
 A. $x < 0$ or $x > 4$
 B. $0 < x < 4$
 C. $x < 2$ or $x > 6$
 D. $2 < x < 6$
79. Find the derivative of $y = \sin(\sqrt{x})$.
 A. $\frac{\cos(\sqrt{x})}{2\sqrt{x}}$
 B. $\cos(\sqrt{x})$
 C. $2\sqrt{x} \cos(\sqrt{x})$
 D. $\frac{-\cos(\sqrt{x})}{2\sqrt{x}}$
80. If $y = \sec x$, find $\frac{dy}{dx}$.
 A. $\tan^2 x$
 B. $\sec x \tan x$
 C. $-\sec x \tan x$
 D. $\csc x \cot x$
81. Find the gradient of the curve $y = \ln(x^2)$ at $x = 2$.
 A. $1/2$
 B. 1
 C. 2
 D. $\ln 4$
82. The position of a particle is given by $s(t) = t^3 - 3t^2 + 3t + 7$. What is its acceleration when velocity is zero?
 A. 0
 B. 6
 C. -6
 D. 1
83. Differentiate $y = 5^{2x}$.
 A. $5^{2x} \ln 5$
 B. $2 \cdot 5^{2x} \ln 5$
 C. $2x \cdot 5^{2x-1}$
 D. $2 \cdot 5^{2x}$
84. Find the critical points of $f(x) = x + \frac{1}{x}$.
 A. $x = 0, x = 1$
 B. $x = 1, x = -1$
 C. $x = 0$ only
 D. $x = 1$ only
85. If $y = \cos^2(3x)$, find $\frac{dy}{dx}$.
 A. $-3 \sin(6x)$
 B. $6 \cos(3x) \sin(3x)$
 C. $-2 \sin(3x)$
 D. $-6 \sin(3x)$
86. The derivative of $y = \arcsin(2x)$ is:
 A. $\frac{1}{\sqrt{1-4x^2}}$
 B. $\frac{2}{\sqrt{1-4x^2}}$

- C. $\frac{2}{\sqrt{1-x^2}}$
 D. $\frac{1}{1+4x^2}$
87. Find the equation of the tangent to $y = e^x$ at $x = 0$.
- A. $y = x + 1$
 B. $y = x - 1$
 C. $y = x$
 D. $y = ex$
88. If $f(x) = (x + 1)^2(x - 1)$, find $f'(0)$.
- A. -1
 B. 1
 C. 0
 D. 2
89. Differentiate $y = \log_{10}(x)$.
- A. $\frac{1}{x}$
 B. $\frac{\ln 10}{x}$
 C. $\frac{1}{x \ln 10}$
 D. $\frac{x}{\ln 10}$
90. For the curve $y = x^2 e^{-x}$, find the x -coordinates of the turning points.
- A. $(0, -2)$
 B. $(0, 2)$
 C. $(1, 2)$
 D. $(-1, 0)$
91. If $y = \frac{\sin x}{1 + \cos x}$, find $\frac{dy}{dx}$.
- A. $\frac{1}{1 + \cos x}$
 B. $\frac{\cos x}{(1 + \cos x)^2}$
 C. $\frac{1}{(1 + \cos x)^2}$
 D. $\frac{-\sin x}{(1 + \cos x)^2}$
92. Find the derivative of $y = \sqrt{x^2 + a^2}$, where a is a constant.
- A. $\frac{x}{\sqrt{x^2 + a^2}}$
 B. $\frac{1}{2\sqrt{x^2 + a^2}}$
 C. $\frac{2x}{\sqrt{x^2 + a^2}}$
 D. $\frac{ax}{\sqrt{x^2 + a^2}}$
93. The minimum value of $f(x) = x^2 + \frac{16}{x}$ for $x > 0$ is:
- A. 8
 B. 12
 C. 16
 D. 4
94. Differentiate $y = x^x$ with respect to x .
- A. xx^{x-1}
 B. $x^x \ln x$
 C. $x^x(1 + \ln x)$
 D. x^x
95. If $y = \frac{1}{x^n}$, find $\frac{dy}{dx}$.
- A. $\frac{n}{x^{n+1}}$
 B. $\frac{-n}{x^{n-1}}$
 C. $\frac{-n}{x^{n+1}}$
 D. nx^{n-1}
96. What is the slope of the tangent to the curve $y = \sqrt{x}$ at $x = 4$?
- A. $1/4$
 B. $1/2$
 C. 2
 D. 4
97. Find the second derivative of $y = \ln(x)$.
- A. $1/x^2$
 B. $-1/x^2$
 C. $1/x$
 D. $-1/x$
98. If the radius of a sphere is increasing at 2 cm/s , find the rate of increase of its volume when the radius is 3 cm . ($V = \frac{4}{3}\pi r^3$)
- A. $24\pi \text{ cm}^3/\text{s}$
 B. $36\pi \text{ cm}^3/\text{s}$
 C. $72\pi \text{ cm}^3/\text{s}$
 D. $12\pi \text{ cm}^3/\text{s}$

99. The function $y = |x - 2|$ is not differentiable at:

- A. $x = 0$
- B. $x = 1$
- C. $x = 2$
- D. All points

100. Differentiate $y = \tan(3x + 2)$ with respect to x .

- A. $3 \sec^2(3x + 2)$
- B. $\sec^2(3x + 2)$
- C. $3 \cot(3x + 2)$
- D. $-3 \sec^2(3x + 2)$

4.2 Integration

4.2.1 Questions

1. Find the integral of $y = 3x^2 - 2x - 1$ with respect to x .

- A. $x^3 - x^2 - x + C$
- B. $x^3 + x^2 - x + C$
- C. $x^3 + x^2 + x + C$
- D. $x^3 - x^2 + x + C$

2. Integrate the expression $6x^2 - 2x + 1$ with respect to x .

- A. $3x^3 - 2x^2 + x + c$
- B. $2x^3 - x^2 + x + c$
- C. $2x^3 - 3x^2 + c$
- D. $x^3 + x^2 - x + c$

3. Integrate $x^{-2} + \cos x$ with respect to x .

- A. $\frac{1}{x} + \sin x + k$
- B. $-\frac{1}{x} + \sin x + k$
- C. $-\frac{1}{x} - \sin x + k$
- D. $\ln |x| + \sin x + k$

4. The expression $ax^2 + bx + c$ equals 5 at $x = 1$. If its derivative is $2x + 1$, what are the values of a , b , c respectively?

- A. 1, 1, 3
- B. 1, 3, 1
- C. 1, 2, 1
- D. 2, 1, 1

5. Integrate the expression $(2x + 1)^3$ with respect to x .

- A. $\frac{(2x + 1)^3}{8} + k$
- B. $\frac{(2x + 1)^4}{8} + k$
- C. $\frac{(2x + 1)^4}{6} + k$

D. $\frac{(2x + 1)^2}{8} + k$

6. Evaluate $\int (4x^{-3} - 7x^2 + 5x - 6) dx$.

- A. $-2x^{-2} - \frac{7}{3}x^3 + \frac{5}{2}x^2 - 6x + C$
- B. $2x^2 + \frac{7}{3}x^3 + 5x^2 - 6 + C$
- C. $12x^2 + 14x - 5 + C$
- D. $-12x^{-4} - 14x + 5 + C$

7. Evaluate $\int_{-1}^2 (2x^2 + x) dx$.

- A. $4\frac{1}{2}$
- B. $3\frac{1}{2}$
- C. $7\frac{1}{2}$
- D. $5\frac{1}{4}$

8. Integrate $\frac{x^2 - \sqrt{x}}{x}$ with respect to x .

- A. $\frac{x^2}{2} - 2\sqrt{x} + k$
- B. $\frac{2(x^2 - x)}{3x} + k$
- C. $\frac{x^2}{2} - \sqrt{x} + k$
- D. $\frac{x^2 - x}{3x} + k$

9. Evaluate $\int_{-1}^1 (2x + 1)^2 dx$.

- A. $3\frac{2}{3}$
- B. 4
- C. $4\frac{1}{3}$
- D. $4\frac{2}{3}$

10. Evaluate $\int (\cos 4x + \sin 3x) dx$.

- A. $\sin 4x - \cos 3x + k$
 B. $\sin 4x + \cos 3x + k$
 C. $\frac{1}{4}\sin 4x - \frac{1}{3}\cos 3x + k$
 D. $\frac{1}{4}\sin 4x + \frac{1}{3}\cos 3x + k$
11. Evaluate $\int_0^{\frac{\pi}{2}} \sin x \, dx$.
 A. -2
 B. -1
 C. 1
 D. 2
12. Evaluate $\int_1^2 \frac{5}{x} \, dx$.
 A. 1.47
 B. 2.67
 C. 3.23
 D. 3.47
13. Evaluate the integral $\int_{\frac{\pi}{12}}^{\frac{\pi}{4}} 2 \cos 2x \, dx$.
 A. $-\frac{1}{2}$
 B. -1
 C. $\frac{1}{2}$
 D. 1
14. Evaluate $\int (2x + 3)^{\frac{1}{2}} \, dx$.
 A. $\frac{1}{12}(2x + 3)^6 + k$
 B. $\frac{1}{3}(2x + 3)^{\frac{1}{2}} + k$
 C. $\frac{1}{3}(2x + 3)^{\frac{3}{2}} + k$
 D. $\frac{1}{12}(2x + 3)^{\frac{3}{4}} + k$
15. Evaluate $\int (\sin x - 5x^2) \, dx$.
 A. $-\cos x - 10x + k$
 B. $\cos x - \frac{5x^3}{3} + k$
 C. $-\cos x - \frac{5x^3}{3} + k$
 D. $\cos x - 10x + k$
16. Evaluate $\int \sin 2x \, dx$.
 A. $\cos 2x + k$
 B. $\frac{1}{2}\cos 2x + k$
 C. $-\frac{1}{2}\cos 2x + k$
 D. $-\cos 2x + k$
17. If $y = x(x^4 + x + 1)$, evaluate $\int_0^1 y \, dx$.
 A. $\frac{11}{12}$
 B. 1
 C. $\frac{5}{6}$
 D. 0
18. Evaluate $\int_2^{\pi} (\sec^2 x - \tan^2 x) \, dx$.
 A. $\frac{\pi}{2}$
 B. $\frac{\pi}{3}$
 C. $\pi - 2$
 D. $\pi + 2$
19. Evaluate $\int_0^{\frac{\pi}{4}} (\sin x - \cos x) \, dx$.
 A. $\sqrt{2} + 1$
 B. $\sqrt{2} - 1$
 C. $1 - \sqrt{2}$
 D. $-\sqrt{2} - 1$
20. Evaluate $\int_{-2}^1 (x - 1)^2 \, dx$.
 A. $-\frac{10}{3}$
 B. 7
 C. 9
 D. 11
21. A function $f(x)$ passes through the origin and its first derivative is $3x + 2$. What is $f(x)$?
 A. $f(x) = \frac{3x^2}{2} + 2x$
 B. $f(x) = \frac{3x^2}{2} + x$
 C. $f(x) = 3x^2 + \frac{x}{2}$

D. $f(x) = 3x^2 + 2x$

22. Evaluate $\int_2^3 (x^2 - 2x) \, dx$.

A. 4

B. 2

C. $\frac{4}{3}$

D. $\frac{1}{3}$

23. Evaluate $\int_{-4}^0 (1 - 2x) \, dx$.

A. -20

B. -16

C. 10

D. 20

24. Evaluate $\int_1^2 (6x^2 - 2x) \, dx$.

A. 11

B. 12

C. 13

D. 16

25. Evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos x \, dx$.

A. 0

B. 1

C. 2

D. 3

26. Evaluate $\int_0^2 (x^3 + x^2) \, dx$.

A. $4\frac{5}{6}$

B. $6\frac{2}{3}$

C. $1\frac{5}{6}$

D. $2\frac{5}{6}$

27. Evaluate $\int_1^2 2 \, dx$.

A. 3

B. 5

C. 2

D. 6

28. Evaluate $\int_1^2 (x^2 - 4x) \, dx$.

A. $\frac{11}{3}$

B. $\frac{3}{11}$

C. $-\frac{3}{11}$

D. $-\frac{11}{3}$

29. Evaluate $\int (\sin x + 2) \, dx$.

A. $\cos x + x^2 + k$

B. $\cos x + 2x + k$

C. $-\cos x + x^2 + k$

D. $-\cos x + 2x + k$

30. Evaluate $\int \cos 4x \, dx$.

A. $\frac{3}{4} \sin 4x + k$

B. $-\frac{1}{4} \sin 4x + k$

C. $-\frac{3}{4} \sin 4x + k$

D. $\frac{1}{4} \sin 4x + k$

31. Integrate $\frac{1+x}{x^3}$ with respect to x .

A. $2x^2 - \frac{1}{x} + k$

B. $x^2 - \frac{1}{x} + k$

C. $-\frac{x^2}{2} - \frac{1}{x} + k$

D. $-\frac{1}{2x^2} - \frac{1}{x} + k$

32. Evaluate $\int (x^2 + 3x - 5) \, dx$.

A. $\frac{x^3}{3} - \frac{3x^2}{2} - 5x + k$

B. $\frac{x^3}{3} - \frac{3x^2}{2} + 5x + k$

C. $\frac{x^3}{3} + \frac{3x^2}{2} - 5x + k$

D. $\frac{x^3}{3} + \frac{3x^2}{2} + 5x + k$

33. Integrate $\frac{2x^3 + 2x}{x}$ with respect to x .
- A. $\frac{2x^3}{3} - 2x + k$
B. $\frac{2x^3}{3} + 2x + k$
C. $x^3 - 2x + k$
D. $x^3 + 2x + k$
34. Evaluate $\int (5x^3 + 7x^2 - 2x + 5) dx$.
- A. $\frac{5x^4}{4} + \frac{7x^3}{3} + 2x + C$
B. $\frac{5x^4}{4} + \frac{7x^3}{3} - x^2 + 5x + C$
C. $\frac{5x^3}{3} + \frac{7x^2}{2} - x + C$
D. $\frac{2x^2}{3} + \frac{x}{5} - C$
35. Find the value of $\int_0^\pi \frac{\cos^2 \theta - 1}{\sin^2 \theta} d\theta$.
- A. π
B. $-\pi$
C. $\frac{\pi}{2}$
D. $-\frac{\pi}{2}$
36. The area enclosed by $y = x^2 - 1$, $y = 3$, and $x \geq 0$ is revolved around the y -axis. If the volume is $K\pi$, find K .
- A. 7
B. $\frac{15}{2}$
C. 8
D. $\frac{17}{2}$
37. Evaluate $\int (2x - 5)^4 dx$.
- A. $\frac{(2x - 5)^5}{5} + C$
B. $\frac{(2x - 5)^5}{10} + C$
C. $8(2x - 5)^3 + C$
D. $\frac{(2x - 5)^3}{6} + C$
38. Find $\int e^{3x} dx$.
- A. $3e^{3x} + C$
B. $e^{3x} + C$
C. $\frac{1}{3}e^{3x} + C$
D. $\frac{1}{3}e^x + C$
39. Evaluate $\int_0^1 (x^2 - x + 1) dx$.
- A. $\frac{1}{6}$
B. $\frac{5}{6}$
C. 1
D. $\frac{7}{6}$
40. Find $\int \sec^2(3x) dx$.
- A. $\tan(3x) + C$
B. $\frac{1}{3} \tan(3x) + C$
C. $3 \tan(3x) + C$
D. $\sec(3x) \tan(3x) + C$
41. Evaluate $\int_1^e \frac{1}{x} dx$.
- A. 0
B. 1
C. e
D. $e - 1$
42. Find the area under the curve $y = x^2$ from $x = 0$ to $x = 3$.
- A. 3
B. 6
C. 9
D. 27
43. Evaluate $\int \frac{2}{x+1} dx$.
- A. $2 \ln |x+1| + C$
B. $\ln |x+1| + C$
C. $\frac{-2}{(x+1)^2} + C$
D. $2 \arctan(x) + C$
44. If $\frac{dy}{dx} = 2x - 3$ and $y = 2$ when $x = 1$, find y in terms of x .

- A. $y = x^2 - 3x + 2$
 B. $y = x^2 - 3x + 4$
 C. $y = 2x^2 - 3x + 3$
 D. $y = x^2 - 3x$
45. Evaluate $\int_0^{\pi} \cos x dx$.
 A. 0
 B. 1
 C. -1
 D. 2
46. Find $\int (3 - 4x)^{-2} dx$.
 A. $\frac{(3 - 4x)^{-1}}{-4} + C$
 B. $\frac{(3 - 4x)^{-1}}{4} + C$
 C. $\frac{(3 - 4x)^{-3}}{-12} + C$
 D. $-4(3 - 4x)^{-3} + C$
47. What is the area bounded by the curve $y = 4 - x^2$ and the x-axis?
 A. $\frac{8}{3}$
 B. $\frac{16}{3}$
 C. $\frac{32}{3}$
 D. 16
48. Evaluate $\int_0^2 (3x^2 + 4x - 5) dx$.
 A. 2
 B. 4
 C. 6
 D. 8
49. Find $\int (x + 1)(x - 2) dx$.
 A. $\frac{x^3}{3} - \frac{x^2}{2} - 2x + C$
 B. $\frac{x^3}{3} + \frac{x^2}{2} - 2x + C$
 C. $x^2 - x - 2 + C$
 D. $\frac{(x + 1)^2(x - 2)^2}{4} + C$
50. Evaluate $\int_1^4 \sqrt{x} dx$.
- A. $\frac{7}{3}$
 B. $\frac{14}{3}$
 C. 2
 D. 3
51. The gradient of a curve is given by $4x + 3$. If the curve passes through the point $(1, 5)$, find its equation.
 A. $y = 2x^2 + 3x$
 B. $y = 2x^2 + 3x + 5$
 C. $y = 2x^2 + 3x - 0$
 D. $y = 4x^2 + 3x - 2$
52. Evaluate $\int e^{-x/2} dx$.
 A. $-2e^{-x/2} + C$
 B. $-\frac{1}{2}e^{-x/2} + C$
 C. $2e^{-x/2} + C$
 D. $e^{-x/2} + C$
53. Find the area enclosed by the curve $y = x^3$, the x-axis, and the lines $x = 1$ and $x = 2$.
 A. $\frac{7}{4}$
 B. $\frac{15}{4}$
 C. 4
 D. 7
54. Evaluate $\int_0^{\pi/6} \sec x \tan x dx$.
 A. $\frac{2\sqrt{3}}{3} - 1$
 B. $1 - \frac{2\sqrt{3}}{3}$
 C. $\frac{\sqrt{3}}{3}$
 D. $2 - \sqrt{3}$
55. If $\int_0^a (2x + 1) dx = 4$, find the positive value of a .
 A. 1
 B. $\frac{3}{2}$
 C. 2
 D. 3
56. Find $\int \frac{x^2 + 1}{x^2} dx$.

- A. $x - \frac{1}{x} + C$
 B. $x + \frac{1}{x} + C$
 C. $1 - \frac{2}{x^3} + C$
 D. $2x + C$
57. Evaluate $\int (1-x)^3 dx$.
 A. $\frac{(1-x)^4}{4} + C$
 B. $-\frac{(1-x)^4}{4} + C$
 C. $-3(1-x)^2 + C$
 D. $3(1-x)^2 + C$
58. The area bounded by the curve $y = x$, the x -axis, $x = 0$ and $x = 2$ is revolved around the x -axis. Find the volume of the solid generated.
 A. $\frac{2\pi}{3}$
 B. $\frac{4\pi}{3}$
 C. $\frac{8\pi}{3}$
 D. 4π
59. Evaluate $\int_0^{\pi/3} \sin(3x) dx$.
 A. 0
 B. $\frac{1}{3}$
 C. $\frac{2}{3}$
 D. 1
60. Evaluate $\int (x^2 + 1)^2 dx$.
 A. $\frac{x^5}{5} + \frac{2x^3}{3} + x + C$
 B. $\frac{(x^2 + 1)^3}{3} + C$
 C. $\frac{x^5}{5} + x^3 + x + C$
 D. $\frac{(x^2 + 1)^3}{6x} + C$
61. If $\int_1^k \frac{1}{x^2} dx = \frac{1}{2}$, find the value of k .
 A. 1
 B. 2
 C. $\frac{1}{2}$
 D. 4
62. Find the indefinite integral of $\sec^2 x e^{\tan x}$.
 A. $e^{\tan x} + C$
 B. $\tan x e^{\tan x} + C$
 C. $\sec x e^{\tan x} + C$
 D. $e^{\sec^2 x} + C$
63. Evaluate $\int \frac{\ln x}{x} dx$.
 A. $\ln |\ln x| + C$
 B. $(\ln x)^2 + C$
 C. $\frac{1}{2}(\ln x)^2 + C$
 D. $\frac{1}{x^2} + C$
64. The area of the region bounded by $y = e^x$, the x -axis, $x = 0$ and $x = 1$ is:
 A. e
 B. $e - 1$
 C. $1 - e$
 D. 1
65. Evaluate $\int 2^x dx$.
 A. $2^x + C$
 B. $\frac{2^x}{\ln 2} + C$
 C. $2^x \ln 2 + C$
 D. $x2^{x-1} + C$
66. Evaluate $\int_0^1 (e^x + e^{-x}) dx$.
 A. $e - \frac{1}{e}$
 B. $e + \frac{1}{e}$
 C. $e - \frac{1}{e} - 2$
 D. 0
67. Find $\int \frac{1}{2x+3} dx$.
 A. $\ln |2x+3| + C$
 B. $2 \ln |2x+3| + C$
 C. $\frac{1}{2} \ln |2x+3| + C$
 D. $\frac{-1}{(2x+3)^2} + C$

68. Find the area bounded by $y = \sin x$, the x -axis, from $x = 0$ to $x = \pi$.
- A. 0
B. 1
C. 2
D. π
69. Evaluate $\int x e^{x^2} dx$.
- A. $e^{x^2} + C$
B. $x^2 e^{x^2} + C$
C. $\frac{1}{2} e^{x^2} + C$
D. $2e^{x^2} + C$
70. Evaluate $\int_0^{\pi/4} \tan x \sec^2 x dx$.
- A. $\frac{1}{4}$
B. $\frac{1}{2}$
C. 1
D. 2
71. Find $\int \cos^2 x dx$ (Hint: $\cos 2x = 2 \cos^2 x - 1$)
- A. $\frac{x}{2} + \frac{\sin 2x}{4} + C$
B. $\frac{x}{2} - \frac{\sin 2x}{4} + C$
C. $x + \sin 2x + C$
D. $\frac{\cos^3 x}{3} + C$
72. If $\int_0^b x dx = 8$, find $b > 0$.
- A. 2
B. 4
C. 8
D. 16
73. Evaluate $\int \frac{1}{\sqrt{1-x^2}} dx$.
- A. $\arcsin x + C$
B. $\arccos x + C$
C. $\ln |\sqrt{1-x^2}| + C$
D. $2\sqrt{1-x^2} + C$
74. The volume generated by revolving the area under $y = \sqrt{x}$ from $x = 0$ to $x = 4$ about the x -axis is:
- A. 4π
B. 8π
C. 16π
D. $\frac{8\pi}{3}$
75. Evaluate $\int_{-1}^1 x^3 dx$.
- A. 0
B. $\frac{1}{4}$
C. $\frac{1}{2}$
D. 1
76. Find $\int \frac{e^x}{1+e^x} dx$.
- A. $e^x \ln |1+e^x| + C$
B. $\ln(1+e^x) + C$
C. $\frac{e^{2x}}{2+e^x} + C$
D. $\arctan(e^x) + C$
77. Evaluate $\int_1^2 (x + \frac{1}{x})^2 dx$.
- A. $\frac{29}{6}$
B. $\frac{17}{3}$
C. 5
D. $\frac{10}{3}$
78. If $\frac{dy}{dx} = \sin x + x$ and $y(0) = 1$, find y .
- A. $y = \cos x + \frac{x^2}{2}$
B. $y = -\cos x + \frac{x^2}{2} + 1$
C. $y = -\cos x + \frac{x^2}{2} + 2$
D. $y = \cos x + \frac{x^2}{2} + 1$
79. Evaluate $\int 5 dx$.
- A. $5 + C$
B. $5x + C$
C. $\frac{x^2}{2} + 5x + C$
D. C

80. Evaluate $\int_0^2 |x - 1| dx$.

- A. 0
- B. $\frac{1}{2}$
- C. 1
- D. 2

81. Find $\int \frac{1}{x \ln x} dx$.

- A. $(\ln x)^2 + C$
- B. $\ln |\ln x| + C$
- C. $\frac{1}{(\ln x)^2} + C$
- D. $\ln x^2 + C$

82. The area bounded by $y = 2x$, the x -axis, $x = 1$ and $x = 3$ is:

- A. 4
- B. 6
- C. 8
- D. 10

83. Evaluate $\int \sin^2 x \cos x dx$.

- A. $\frac{\sin^3 x}{3} + C$
- B. $\frac{\cos^3 x}{3} + C$
- C. $\sin x \cos x + C$
- D. $2 \sin x \cos x + C$

84. $\int_e^{e^2} \frac{dx}{x \ln x}$.

- A. 1
- B. $\ln 2$
- C. 2
- D. e

85. Find $\int (x + 1)^5 dx$.

- A. $5(x + 1)^4 + C$
- B. $\frac{(x + 1)^6}{6} + C$
- C. $(x + 1)^6 + C$
- D. $\frac{x^6}{6} + x^5 + \dots + C$

86. Evaluate $\int_0^{\pi/2} \cos^3 x \sin x dx$.

- A. $\frac{1}{4}$
- B. $\frac{1}{3}$
- C. 0
- D. 1

87. The value of $\int_0^1 \frac{dx}{1 + x^2}$ is:

- A. π
- B. $\frac{\pi}{2}$
- C. $\frac{\pi}{4}$
- D. 1

88. Integrate $\sqrt{ax + b}$ with respect to x .

- A. $\frac{1}{2a\sqrt{ax + b}} + C$
- B. $\frac{2}{3a}(ax + b)^{3/2} + C$
- C. $\frac{1}{a}(ax + b)^{3/2} + C$
- D. $\frac{2}{a}(ax + b)^{1/2} + C$

89. If $f'(x) = x - \frac{1}{x^2}$ and $f(1) = \frac{1}{2}$, find $f(x)$.

- A. $\frac{x^2}{2} + \frac{1}{x} + 1$
- B. $\frac{x^2}{2} - \frac{1}{x} + 1$
- C. $\frac{x^2}{2} + \frac{1}{x} - 1$
- D. $\frac{x^2}{2} - \frac{1}{x} - \frac{1}{2}$

90. Evaluate $\int_{-2}^2 (x^3 + \sin x) dx$.

- A. 0
- B. 4
- C. 8
- D. $16/3$

91. Find $\int x\sqrt{x^2 + 1} dx$.

- A. $\frac{1}{2}(x^2 + 1)^{3/2} + C$
- B. $\frac{1}{3}(x^2 + 1)^{3/2} + C$
- C. $(x^2 + 1)^{1/2} + C$

- D. $x^2\sqrt{x^2+1} + C$
92. What is $\int_a^b f(x)dx + \int_b^c f(x)dx$?
- A. $\int_a^c f(x)dx$
 B. $\int_c^a f(x)dx$
 C. $\int_b^a f(x)dx + \int_c^b f(x)dx$
 D. 0
93. Evaluate $\int (e^{2x} + e^{-2x})^2 dx$.
- A. $\frac{1}{4}e^{4x} + 2x - \frac{1}{4}e^{-4x} + C$
 B. $\frac{1}{2}e^{4x} + 2x - \frac{1}{2}e^{-4x} + C$
 C. $e^{4x} + 2 + e^{-4x} + C$
 D. $\frac{(e^{2x} + e^{-2x})^3}{3} + C$
94. Find the area between the curves $y = x^2$ and $y = x$.
- A. $\frac{1}{3}$
 B. $\frac{1}{6}$
 C. $\frac{1}{2}$
 D. 1
95. $\int \tan^2 x dx$.
- A. $\sec^2 x - x + C$
 B. $\tan x - x + C$
 C. $\frac{\tan^3 x}{3} + C$
 D. $\ln |\sec x| + C$
96. Evaluate $\int_0^{\ln 2} e^x dx$.
- A. 1
 B. 2
 C. $2 - \ln 2$
 D. $\ln 2$
97. Find $\int \frac{\cos x}{1 + \sin^2 x} dx$.
- A. $\ln(1 + \sin^2 x) + C$
 B. $\arctan(\sin x) + C$
 C. $\arcsin(\cos x) + C$
 D. $\frac{-\sin x}{(1 + \sin^2 x)^2} + C$
98. Find the volume of the solid generated by revolving the region bounded by $y = \frac{1}{x}$, the x-axis, from $x = 1$ to $x = 2$.
- A. π
 B. $\frac{\pi}{2}$
 C. $\frac{\pi}{3}$
 D. 2π
99. Evaluate $\int \frac{2x+3}{x^2+3x+5} dx$.
- A. $2 \ln |x^2 + 3x + 5| + C$
 B. $\ln |x^2 + 3x + 5| + C$
 C. $\frac{1}{2} \ln |x^2 + 3x + 5| + C$
 D. $\arctan(x^2 + 3x + 5) + C$
100. Evaluate $\int_0^1 x(x^2 + 1)^3 dx$.
- A. $\frac{15}{8}$
 B. $\frac{7}{4}$
 C. 22
 D. $\frac{17}{8}$

Chapter 5

Combinatorics

5.1 Combination & Permutation

5.1.1 Questions

1. Ralia has 7 different posters to be hung in her bedroom, living room, and kitchen. Assuming she has plans to plant at least a poster in each of the 3 rooms, how many choices does she have?
A. 49
B. 170
C. 210
D. 21
2. In how many ways can a committee of 2 women and 3 men be chosen from 6 men and 5 women?
A. 200
B. 100
C. 50
D. 30
3. In how many ways can the letters of the word MATHEMATICS be arranged?
A. $\frac{11!}{9!2!}$
B. $\frac{11!}{9!2!2!}$
C. $\frac{11!}{2!2!2!}$
D. $\frac{11!}{2!2!}$
4. In how many ways can the letters of the word ACCEPTANCE be arranged?
A. $\frac{10!}{2!2!3!}$
B. $\frac{10!}{2!2!}$
C. $10!$
D. $\frac{10!}{2!3!}$
5. Five people are to be arranged in a row for a group photograph. How many arrangements are there if a married couple in the group insist on sitting next to each other?
A. 48
B. 12
C. 7
D. 10
6. In how many ways can 6 subjects be selected from 10 subjects for an examination
A. 215
B. 218
C. 216
D. 210
7. In how many ways can a delegation of 3 be chosen from 5 men and 3 women, if atleast 1 man and 1 woman must be included?
A. 28
B. 30
C. 15
D. 45
8. Find the number of ways of selecting 6 out of 10 subjects for an examination
A. 218
B. 216

- C. 210
D. 215
9. In how many ways can the letters of the word ELATION be arranged?
- A. $6!$
B. $7!$
C. $5!$
D. $8!$
10. In how many ways can the letters of the word CALCULUS be arranged?
- A. 1680
B. 2100
C. 5040
D. 1760
11. In how many ways can the letters of the word COMBINATION be arranged?
- A. 4989600
B. 39916800
C. 19958400
D. 9979200
12. In how many ways can 7 directors sit round a table?
- A. 24
B. 5040
C. 120
D. 120
13. In how many ways can the letters of the word TOTALITY be arranged?
- A. 6720
B. 6270
C. 6207
D. 6027
14. How many numbers greater than 1000 can be made from the digits 1, 2, 3, 4, and 5 without repeating any one of them?
- A. 152
B. 210
C. 216
D. 144
15. In how many ways can a team of 3 girls be selected from 7 girls?
- A. $\frac{7!}{5!2!}$
B. $\frac{7!}{3!}$
C. $\frac{7!}{3!4!}$
D. $\frac{7!}{4!}$
16. In how many ways can a student select 2 subjects from 5 subjects?
- A. $\frac{5!}{3!2!}$
B. $\frac{5!}{2!2!}$
C. $\frac{5!}{2!3!}$
D. $\frac{5!}{2!}$
17. In how many ways can five people sit round a circular table?
- A. 24
B. 60
C. 12
D. 120
18. How many two-digit numbers can be formed from the digits 0, 1, 2, and 3 if a digit can be repeated and no number may begin with 0?
- A. 4
B. 12
C. 16
D. 20
19. In how many ways can 9 people be seated if 3 chairs are available?
- A. 720
B. 504
C. 336
D. 210
20. A final examination requires that a student answer any 4 out of 6 questions. In how many ways can this be done?
- A. 15
B. 20
C. 45
D. 30

21. In how many ways can 6 coloured chalks be arranged if 2 are of the same colour?
- A. 60
 - B. 240
 - C. 120
 - D. 360
22. How many possible ways are there of seating seven people P, Q, R, S, T, U , and V at a circular table?
- A. 720
 - B. 2520
 - C. 5040
 - D. 360
23. A committee of six is to be formed by a state governor from nine state commissioners and three members of the State House of Assembly. In how many ways can the members of the committee be chosen so as to include one member of the House of the Assembly?
- A. 924 ways
 - B. 524 ways
 - C. 462 ways
 - D. 378 ways
24. How many two-digit numbers can be formed from the digits 0, 1, 2, and 3 if a digit can be repeated and no number may begin with 0?
- A. 4
 - B. 12
 - C. 16
 - D. 20
25. Find the number of committees of three that can be formed consisting of two men and one woman from four men and three women
- A. 3
 - B. 6
 - C. 18
 - D. 24
26. In how many ways can 8 people be arranged in a straight line if 2 particular people must not be next to each other?
- A. 30240
 - B. 25200
 - C. 10080
 - D. 5040
27. How many 3-digit numbers can be formed from the digits 1, 2, 3, 4, 5, 6 if no digit is repeated?
- A. 120
 - B. 216
 - C. 720
 - D. 180
28. In how many ways can a president, vice-president, and secretary be chosen from a group of 10 people?
- A. 720
 - B. 120
 - C. 210
 - D. 1000
29. How many different 4-letter arrangements can be made from the word PEPPER?
- A. 60
 - B. 72
 - C. 84
 - D. 96
30. In how many ways can 4 boys and 3 girls be arranged in a row if the girls must sit together?
- A. 720
 - B. 1440
 - C. 2880
 - D. 144
31. A committee of 5 is to be selected from 6 men and 4 women. In how many ways can this be done if there must be exactly 3 men?
- A. 120
 - B. 100
 - C. 80
 - D. 60
32. How many odd 3-digit numbers can be formed from the digits 1, 2, 3, 4, 5 without repetition?
- A. 36
 - B. 48
 - C. 60
 - D. 24
33. In how many ways can 10 books be arranged on a shelf if 3 particular books must always be together?
- A. 241920
 - B. 120960

- C. 604800
D. 43200
34. A team of 4 people is to be selected from 5 couples. In how many ways can this be done if no couple is selected together?
- A. 80
B. 100
C. 120
D. 60
35. In how many ways can the letters of the word PROPORTION be arranged?
- A. 907200
B. 1814400
C. 453600
D. 604800
36. How many 5-digit even numbers can be formed using the digits 0, 1, 2, 3, 4 without repetition?
- A. 42
B. 48
C. 54
D. 36
37. In how many ways can 5 keys be arranged on a circular key ring?
- A. 12
B. 24
C. 60
D. 120
38. A box contains 5 red balls, 4 blue balls, and 3 green balls. In how many ways can 3 balls be selected if all must be of different colors?
- A. 60
B. 120
C. 180
D. 240
39. How many numbers between 3000 and 4000 can be formed from the digits 1, 2, 3, 4, 5, 6 if no digit is repeated?
- A. 60
B. 120
C. 180
D. 240
40. In how many ways can 8 people sit around a circular table if 2 particular people must sit together?
- A. 1440
B. 720
C. 2880
D. 5040
41. A student must answer 5 questions out of 8 in an examination. In how many ways can this be done if the first 3 questions are compulsory?
- A. 10
B. 15
C. 20
D. 25
42. In how many ways can the letters of the word STATISTICS be arranged?
- A. 50400
B. 100800
C. 25200
D. 151200
43. How many 4-digit numbers divisible by 5 can be formed from the digits 0, 1, 2, 3, 4, 5 without repetition?
- A. 120
B. 96
C. 108
D. 84
44. In how many ways can 3 prizes be distributed among 10 students if each student can receive at most one prize?
- A. 720
B. 1000
C. 120
D. 210
45. A committee of 6 members is to be formed from 8 men and 5 women. How many committees can be formed with at least 4 men?
- A. 1050
B. 980
C. 1120
D. 896
46. In how many ways can 4 different mathematics books and 3 different physics books be arranged on a shelf if books of the same subject must be together?

- A. 288
B. 144
C. 576
D. 1152
47. How many 3-letter words (with or without meaning) can be formed from the letters of the word DAUGHTER if no letter is repeated?
- A. 336
B. 168
C. 504
D. 252
48. In how many ways can 9 students be divided into 3 groups of 3 each?
- A. 280
B. 560
C. 1680
D. 840
49. A password must contain 4 digits. How many different passwords can be formed if the first digit cannot be 0 and repetition is allowed?
- A. 9000
B. 10000
C. 5040
D. 6561
50. In how many ways can a captain and vice-captain be selected from a cricket team of 11 players?
- A. 110
B. 55
C. 22
D. 121
51. How many diagonals does a decagon (10-sided polygon) have?
- A. 35
B. 45
C. 55
D. 65
52. In how many ways can 5 couples be seated in a row if each couple must sit together?
- A. 3840
B. 7680
C. 1920
D. 15360
53. A class has 12 students. In how many ways can 4 students be selected to represent the class in a competition?
- A. 495
B. 11880
C. 1485
D. 220
54. How many 4-digit numbers greater than 5000 can be formed from the digits 3, 4, 5, 6, 7 if repetition is not allowed?
- A. 72
B. 48
C. 60
D. 120
55. In how many ways can the letters of the word EXAMINATION be arranged so that the vowels always occur together?
- A. 120960
B. 241920
C. 60480
D. 181440
56. A committee of 7 is to be formed from 5 teachers and 4 students. In how many ways can this be done if there must be more teachers than students?
- A. 80
B. 70
C. 60
D. 90
57. In how many ways can 6 beads of different colors be arranged to form a necklace?
- A. 60
B. 120
C. 720
D. 30
58. How many 5-digit numbers can be formed from the digits 1, 2, 3, 4, 5, 6 if the number must be divisible by 4 and no digit is repeated?
- A. 120
B. 144
C. 168
D. 96

59. In how many ways can 4 boys and 4 girls be seated alternately in a row?
- A. 1152
B. 576
C. 2304
D. 288
60. A bag contains 6 identical red balls and 4 identical blue balls. In how many ways can 5 balls be selected?
- A. 6
B. 5
C. 4
D. 7
61. In how many ways can 10 different books be divided equally between 2 students?
- A. 252
B. 126
C. 504
D. 63
62. How many 3-digit numbers less than 500 can be formed from the digits 1, 2, 3, 4, 5, 6 if no digit is repeated?
- A. 80
B. 100
C. 120
D. 60
63. In how many ways can a team of 11 players be selected from 15 players if 2 particular players must be included?
- A. 715
B. 286
C. 364
D. 455
64. In how many ways can the letters of the word MISSISSIPPI be arranged?
- A. 34650
B. 69300
C. 17325
D. 138600
65. A multiple choice test has 10 questions with 4 options each. In how many ways can a student answer all questions?
- A. 1048576
B. 40
C. 5040
D. 3628800
66. In how many ways can 5 different flags be displayed on 3 poles if each pole must have at least one flag?
- A. 150
B. 120
C. 180
D. 90
67. How many 4-letter arrangements can be made from the letters of the word SUCCESSFUL if all letters are distinct in the arrangement?
- A. 840
B. 1260
C. 420
D. 1680
68. In how many ways can 8 identical balls be distributed among 3 different boxes if each box must contain at least one ball?
- A. 21
B. 28
C. 15
D. 36
69. A committee of 5 members is to be formed from 4 men and 6 women. In how many ways can this be done if there must be at least 2 men and at least 2 women?
- A. 186
B. 210
C. 120
D. 156
70. In how many ways can 7 people be arranged in a circle if 3 particular people must not sit together?
- A. 576
B. 432
C. 288
D. 144
71. How many 5-digit palindromic numbers can be formed using the digits 1, 2, 3, 4, 5?
- A. 125
B. 120
C. 25

- D. 625
72. In how many ways can 6 men and 4 women be seated in a row such that no two women sit together?
- A. 604800
B. 1209600
C. 302400
D. 151200
73. A committee of 4 is to be selected from 6 doctors and 5 engineers. In how many ways can this be done if the committee must have equal numbers of doctors and engineers?
- A. 150
B. 200
C. 100
D. 180
74. In how many ways can 5 red balls, 4 blue balls, and 3 green balls be arranged in a row if balls of the same color are identical?
- A. 27720
B. 55440
C. 13860
D. 110880
75. How many numbers between 4000 and 5000 can be formed from the digits 2, 3, 4, 5, 6, 7 if no digit is repeated?
- A. 60
B. 120
C. 240
D. 180
76. In how many ways can a group of 12 people be divided into three groups of 4 each for three different tasks?
- A. 34650
B. 5775
C. 11550
D. 23100
77. How many 6-digit numbers can be formed from the digits 1, 2, 3, 4, 5, 6 if the even digits must occupy even positions?
- A. 36
B. 72
C. 18
- D. 48
78. In how many ways can 10 students be arranged in a row if 3 particular students must be separated by at least 2 other students?
- A. 2419200
B. 1814400
C. 1209600
D. 604800
79. A box contains 5 different English books, 4 different Mathematics books, and 3 different Science books. In how many ways can 3 books be selected if exactly one book of each subject is selected?
- A. 60
B. 120
C. 180
D. 220
80. In how many ways can the letters of the word PARALLEL be arranged such that all L's are not together?
- A. 3360
B. 2520
C. 6720
D. 1680
81. How many 4-digit even numbers greater than 4000 can be formed from the digits 1, 2, 3, 4, 5, 6 if no digit is repeated?
- A. 156
B. 120
C. 144
D. 108
82. In how many ways can 8 people be seated around a circular table if 4 particular people must sit in alternate positions?
- A. 144
B. 288
C. 576
D. 72
83. A committee of 6 is to be formed from 7 men and 6 women such that the committee contains at least 3 men and at least 2 women. In how many ways can this be done?
- A. 1596
B. 1386
C. 1191

- D. 1716
84. In how many ways can 4 different rings be worn on the fingers of one hand (excluding the thumb)?
- A. 256
B. 1024
C. 64
D. 16
85. How many 5-letter words can be formed from the letters of the word MONDAY if each word must contain exactly 2 vowels?
- A. 720
B. 360
C. 480
D. 240
86. In how many ways can 5 Indian and 4 American delegates be seated at a round table so that all Americans sit together?
- A. 2880
B. 5760
C. 1440
D. 720
87. A code consists of 3 letters followed by 2 digits. How many different codes can be formed if the first letter must be a vowel, repetition is allowed, and the digits must be different?
- A. 29250
B. 32500
C. 16900
D. 35100
88. In how many ways can 7 different colored beads be arranged on a bracelet?
- A. 360
B. 720
C. 2520
D. 180
89. A team of 5 is to be selected from 7 boys and 6 girls. In how many ways can this be done if the team must contain more boys than girls?
- A. 1071
B. 756
C. 861
- D. 966
90. In how many ways can the letters of the word COMMITTEE be arranged if all vowels must be together and all consonants must be together?
- A. 2880
B. 1440
C. 5760
D. 720
91. How many 6-digit numbers can be formed using the digits 0, 1, 2, 3, 4, 5 if the number must be even, greater than 300000, and no digit is repeated?
- A. 156
B. 132
C. 144
D. 168
92. In how many ways can 10 identical apples and 6 identical oranges be distributed among 4 children such that each child gets at least one fruit?
- A. 252
B. 378
C. 210
D. 504
93. A student must answer 8 questions out of 12 in an examination. In how many ways can this be done if questions 1 and 2 cannot both be omitted?
- A. 489
B. 462
C. 495
D. 429
94. In how many ways can 9 different books be distributed equally among 3 students?
- A. 1680
B. 280
C. 5040
D. 840
95. How many triangles can be formed by joining the vertices of an octagon?
- A. 56
B. 84
C. 28
D. 120

96. In how many ways can 6 students be divided into 2 groups of 3 each for a debate competition?
- A. 10
B. 20
C. 30
D. 40
97. In how many ways can 4 red flags, 3 blue flags, and 2 green flags be arranged in a row if flags of the same color are identical?
- A. 1260
B. 2520
C. 630
D. 5040
98. A password must contain 2 letters followed by 3 digits. How many different passwords can be formed if the letters must be different and the digits must be odd?
- A. 32500
B. 81250
C. 65000
D. 16250
99. In how many ways can a team of 11 cricket players be selected from 8 batsmen and 6 bowlers if the team must include at least 5 batsmen and at least 4 bowlers?
- A. 294
B. 336
C. 378
D. 420
100. How many 7-digit telephone numbers can be formed if the first digit cannot be 0 or 1, and repetition of digits is allowed?
- A. 8000000
B. 9000000
C. 7000000
D. 10000000

5.2 Probability

5.2.1 Questions

1. A bag contains 5 red balls and 3 blue balls. What is the probability of selecting a red ball?
- A. $\frac{5}{8}$
B. $\frac{3}{8}$
C. $\frac{5}{3}$
D. $\frac{3}{5}$
2. Two dice are thrown together. What is the probability that the sum of the numbers is 7?
- A. $\frac{1}{6}$
B. $\frac{1}{12}$
C. $\frac{5}{36}$
D. $\frac{7}{36}$
3. A box contains 4 red, 3 white, and 5 black balls. If one ball is drawn at random, what is the probability that it is not red?
- A. $\frac{2}{3}$
B. $\frac{1}{3}$
C. $\frac{1}{2}$
D. $\frac{3}{4}$
4. A card is drawn at random from a standard deck of 52 cards. What is the probability of drawing a king?
- A. $\frac{1}{13}$
B. $\frac{1}{52}$
C. $\frac{4}{52}$
D. $\frac{1}{4}$
5. If $P(A) = 0.6$ and $P(B) = 0.4$, and A and B are mutually exclusive events, find $P(A \text{ or } B)$.
- A. 1.0
B. 0.24
C. 0.8

- D. 0.5
6. A bag contains 6 white and 4 black balls. Two balls are drawn at random without replacement. What is the probability that both are white?
- A. $\frac{1}{3}$
B. $\frac{2}{5}$
C. $\frac{1}{2}$
D. $\frac{3}{10}$
7. The probability that it will rain tomorrow is 0.7. What is the probability that it will not rain?
- A. 0.3
B. 0.7
C. 1.0
D. 0.5
8. Three coins are tossed simultaneously. What is the probability of getting at least two heads?
- A. $\frac{1}{2}$
B. $\frac{1}{4}$
C. $\frac{3}{8}$
D. $\frac{5}{8}$
9. A die is rolled. What is the probability of getting an even number?
- A. $\frac{1}{2}$
B. $\frac{1}{3}$
C. $\frac{2}{3}$
D. $\frac{1}{6}$
10. A bag contains 8 red and 5 blue marbles. If two marbles are drawn at random with replacement, what is the probability that both are red?
- A. $\frac{64}{169}$
B. $\frac{8}{13}$
C. $\frac{56}{169}$
D. $\frac{40}{169}$
11. From a deck of 52 cards, what is the probability of drawing a heart or a king?
- A. $\frac{4}{13}$
B. $\frac{17}{52}$
C. $\frac{13}{52}$
D. $\frac{16}{52}$
12. A bag contains 5 red, 4 blue, and 3 green balls. What is the probability of drawing a blue ball?
- A. $\frac{1}{3}$
B. $\frac{1}{4}$
C. $\frac{5}{12}$
D. $\frac{1}{2}$
13. Two cards are drawn from a deck without replacement. What is the probability that both are aces?
- A. $\frac{1}{221}$
B. $\frac{4}{663}$
C. $\frac{1}{169}$
D. $\frac{2}{221}$
14. A coin is tossed three times. What is the probability of getting exactly two tails?
- A. $\frac{3}{8}$
B. $\frac{1}{4}$
C. $\frac{1}{2}$
D. $\frac{1}{8}$
15. If $P(A) = 0.5$, $P(B) = 0.4$, and $P(A \cap B) = 0.2$, find $P(A \cup B)$.
- A. 0.7
B. 0.9
C. 0.6
D. 0.8

16. A box contains 7 red and 5 white balls. Three balls are drawn at random. What is the probability that all are red?
- A. $\frac{7}{44}$
 B. $\frac{35}{264}$
 C. $\frac{1}{12}$
 D. $\frac{7}{22}$
17. A die is rolled twice. What is the probability that the sum is 10?
- A. $\frac{1}{12}$
 B. $\frac{1}{9}$
 C. $\frac{1}{18}$
 D. $\frac{5}{36}$
18. A card is drawn from a deck of 52 cards. What is the probability that it is either a spade or a face card?
- A. $\frac{11}{26}$
 B. $\frac{25}{52}$
 C. $\frac{13}{26}$
 D. $\frac{22}{52}$
19. In a class of 30 students, 18 play football and 12 play basketball. If 8 play both games, what is the probability that a randomly selected student plays at least one game?
- A. $\frac{11}{15}$
 B. $\frac{2}{3}$
 C. $\frac{3}{5}$
 D. $\frac{4}{5}$
20. A bag contains 4 red, 5 blue, and 6 green balls. Two balls are drawn at random. What is the probability that they are of different colors?
- A. $\frac{37}{70}$
 B. $\frac{74}{105}$
 C. $\frac{31}{70}$
 D. $\frac{33}{70}$
21. What is the probability of getting at least one head when a coin is tossed four times?
- A. $\frac{15}{16}$
 B. $\frac{1}{2}$
 C. $\frac{7}{8}$
 D. $\frac{3}{4}$
22. A number is selected at random from the numbers 1 to 20. What is the probability that it is divisible by 3 or 5?
- A. $\frac{9}{20}$
 B. $\frac{1}{2}$
 C. $\frac{11}{20}$
 D. $\frac{2}{5}$
23. Two dice are rolled. What is the probability that at least one shows a 6?
- A. $\frac{11}{36}$
 B. $\frac{1}{3}$
 C. $\frac{5}{18}$
 D. $\frac{1}{6}$
24. A bag contains 3 red, 4 white, and 5 black balls. If three balls are drawn at random, what is the probability that they are of the same color?
- A. $\frac{3}{44}$
 B. $\frac{7}{44}$
 C. $\frac{1}{11}$
 D. $\frac{5}{44}$
25. If the probability of an event is $\frac{3}{7}$, what is the probability of its complement?
- A. $\frac{4}{7}$

- B. $\frac{3}{7}$
 C. $\frac{1}{7}$
 D. $\frac{10}{7}$
26. A letter is chosen at random from the word "MATHEMATICS". What is the probability that it is a vowel?
- A. $\frac{4}{11}$
 B. $\frac{5}{11}$
 C. $\frac{3}{11}$
 D. $\frac{6}{11}$
27. Three cards are drawn from a deck without replacement. What is the probability that all three are diamonds?
- A. $\frac{11}{850}$
 B. $\frac{13}{204}$
 C. $\frac{1}{64}$
 D. $\frac{1}{52}$
28. A box contains 6 defective and 14 non-defective items. If 3 items are drawn at random, what is the probability that at least one is defective?
- A. $\frac{73}{95}$
 B. $\frac{22}{95}$
 C. $\frac{3}{10}$
 D. $\frac{91}{190}$
29. A die is rolled. What is the probability of getting a prime number?
- A. $\frac{1}{2}$
 B. $\frac{1}{3}$
 C. $\frac{2}{3}$
 D. $\frac{5}{6}$
30. If two events A and B are independent with $P(A) = 0.6$ and $P(B) = 0.5$, find $P(A \text{ and } B)$.
- A. 0.3
 B. 0.5
 C. 0.8
 D. 0.25
31. A bag contains 5 red, 6 blue, and 4 green balls. What is the probability of drawing either a red or green ball?
- A. $\frac{3}{5}$
 B. $\frac{2}{5}$
 C. $\frac{1}{3}$
 D. $\frac{9}{15}$
32. Four coins are tossed simultaneously. What is the probability of getting exactly three heads?
- A. $\frac{1}{4}$
 B. $\frac{3}{16}$
 C. $\frac{1}{8}$
 D. $\frac{1}{2}$
33. A number is chosen at random from 1 to 50. What is the probability that it is a multiple of 7?
- A. $\frac{7}{50}$
 B. $\frac{1}{7}$
 C. $\frac{3}{25}$
 D. $\frac{2}{25}$
34. Two events A and B are such that $P(A) = 0.4$, $P(B) = 0.5$, and $P(A \cup B) = 0.7$. Find $P(A \cap B)$.
- A. 0.2
 B. 0.3
 C. 0.1
 D. 0.6
35. A bag contains 7 white and 8 black balls. If two balls are drawn at random, what is the probability that one is white and one is black?
- A. $\frac{56}{105}$
 B. $\frac{8}{15}$
 C. $\frac{7}{15}$

- D. $\frac{1}{2}$
36. A die is rolled three times. What is the probability of getting three different numbers?
- A. $\frac{5}{9}$
 B. $\frac{20}{27}$
 C. $\frac{2}{3}$
 D. $\frac{25}{36}$
37. From a group of 5 men and 4 women, a committee of 3 is selected at random. What is the probability that it contains at least one woman?
- A. $\frac{5}{6}$
 B. $\frac{37}{42}$
 C. $\frac{2}{3}$
 D. $\frac{3}{4}$
38. A card is drawn from a deck and replaced. This is done three times. What is the probability of getting exactly two spades?
- A. $\frac{9}{64}$
 B. $\frac{3}{16}$
 C. $\frac{27}{256}$
 D. $\frac{1}{8}$
39. In a single throw of two dice, what is the probability of getting a doublet?
- A. $\frac{1}{6}$
 B. $\frac{1}{12}$
 C. $\frac{1}{36}$
 D. $\frac{5}{36}$
40. A box contains 4 red, 3 blue, and 5 green marbles. Three marbles are drawn at random without replacement. What is the probability that all three are green?
- A. $\frac{1}{22}$
- B. $\frac{5}{66}$
 C. $\frac{10}{132}$
 D. $\frac{1}{11}$
41. If $P(A) = 0.7$, $P(B) = 0.6$, and $P(A \cap B) = 0.4$, find $P(A' \cap B')$.
- A. 0.1
 B. 0.2
 C. 0.3
 D. 0.4
42. A letter is chosen at random from the word "PROBABILITY". What is the probability that it is the letter B?
- A. $\frac{2}{11}$
 B. $\frac{1}{11}$
 C. $\frac{3}{11}$
 D. $\frac{1}{5}$
43. Three dice are thrown simultaneously. What is the probability that the sum is 10?
- A. $\frac{1}{8}$
 B. $\frac{25}{216}$
 C. $\frac{27}{216}$
 D. $\frac{1}{12}$
44. A bag contains 5 white, 7 red, and 8 black balls. If three balls are drawn at random, what is the probability that they are of different colors?
- A. $\frac{7}{19}$
 B. $\frac{280}{1140}$
 C. $\frac{14}{57}$
 D. $\frac{140}{570}$
45. A number is selected at random from 1 to 100. What is the probability that it is divisible by both 3 and 5?
- A. $\frac{1}{15}$
 B. $\frac{2}{25}$

- C. $\frac{3}{50}$
D. $\frac{7}{100}$
46. Two cards are drawn from a deck with replacement. What is the probability that both are hearts?
- A. $\frac{1}{16}$
B. $\frac{1}{4}$
C. $\frac{13}{204}$
D. $\frac{1}{8}$
47. A box contains 10 items, 3 of which are defective. If 2 items are selected at random without replacement, what is the probability that both are defective?
- A. $\frac{1}{15}$
B. $\frac{3}{45}$
C. $\frac{2}{15}$
D. $\frac{1}{10}$
48. A coin is tossed 5 times. What is the probability of getting at least 4 heads?
- A. $\frac{3}{16}$
B. $\frac{1}{8}$
C. $\frac{5}{32}$
D. $\frac{6}{32}$
49. From a pack of 52 cards, two cards are drawn at random. What is the probability that both are red?
- A. $\frac{25}{102}$
B. $\frac{1}{4}$
C. $\frac{13}{51}$
D. $\frac{26}{51}$
50. A die is rolled. Given that an even number appears, what is the probability that it is 4?
- A. $\frac{1}{3}$
- B. $\frac{1}{2}$
C. $\frac{1}{6}$
D. $\frac{2}{3}$
51. A bag contains 6 red, 5 blue, and 4 green balls. If two balls are drawn at random with replacement, what is the probability that both are of the same color?
- A. $\frac{77}{225}$
B. $\frac{1}{3}$
C. $\frac{37}{105}$
D. $\frac{61}{225}$
52. Three students A, B, and C have probabilities $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ of solving a problem independently. What is the probability that the problem will be solved?
- A. $\frac{3}{4}$
B. $\frac{2}{3}$
C. $\frac{11}{12}$
D. $\frac{5}{6}$
53. A box contains 8 balls numbered 1 to 8. Two balls are drawn at random. What is the probability that their sum is odd?
- A. $\frac{4}{7}$
B. $\frac{1}{2}$
C. $\frac{3}{7}$
D. $\frac{16}{28}$
54. A card is drawn from a deck of 52 cards. What is the probability that it is a black card or a queen?
- A. $\frac{7}{13}$
B. $\frac{1}{2}$
C. $\frac{28}{52}$
D. $\frac{15}{26}$

55. Four persons are chosen at random from a group of 3 men, 2 women, and 4 children. What is the probability that exactly two of them are children?
- A. $\frac{10}{21}$
B. $\frac{3}{7}$
C. $\frac{1}{2}$
D. $\frac{2}{5}$
56. A number is chosen at random from the first 30 natural numbers. What is the probability that it is a perfect square?
- A. $\frac{1}{6}$
B. $\frac{1}{5}$
C. $\frac{1}{10}$
D. $\frac{2}{15}$
57. Two dice are thrown. What is the probability that the difference of numbers shown is 2?
- A. $\frac{2}{9}$
B. $\frac{1}{6}$
C. $\frac{1}{9}$
D. $\frac{7}{36}$
58. A bag contains 4 white, 5 black, and 6 red balls. Three balls are drawn at random. What is the probability that at least one is white?
- A. $\frac{37}{91}$
B. $\frac{69}{91}$
C. $\frac{54}{91}$
D. $\frac{22}{91}$
59. If $P(A) = 0.3$, $P(B) = 0.4$, and A and B are independent, find $P(A' \cap B')$.
- A. 0.42
B. 0.58
C. 0.28
D. 0.12
60. A letter is selected at random from the word "ARRANGEMENT". What is the probability that it is a consonant?
- A. $\frac{6}{11}$
B. $\frac{5}{11}$
C. $\frac{7}{11}$
D. $\frac{4}{11}$
61. Three cards are drawn from a deck with replacement. What is the probability that all three are aces?
- A. $\frac{1}{2197}$
B. $\frac{64}{140608}$
C. $\frac{1}{169}$
D. $\frac{8}{2197}$
62. A box contains 5 red, 4 blue, and 3 yellow marbles. Two marbles are drawn without replacement. What is the probability that the first is red and the second is blue?
- A. $\frac{5}{33}$
B. $\frac{20}{132}$
C. $\frac{10}{66}$
D. $\frac{1}{6}$
63. A die is thrown twice. What is the probability that the product of the numbers is even?
- A. $\frac{3}{4}$
B. $\frac{1}{2}$
C. $\frac{5}{12}$
D. $\frac{2}{3}$
64. From 10 boys and 8 girls, a committee of 5 is selected. What is the probability that it contains exactly 3 boys?
- A. $\frac{3360}{8568}$
B. $\frac{1}{3}$
C. $\frac{120}{357}$

- D. $\frac{280}{714}$
65. A number is chosen at random from 1 to 60. What is the probability that it is divisible by 4 or 6?
- A. $\frac{1}{2}$
 B. $\frac{13}{30}$
 C. $\frac{7}{15}$
 D. $\frac{2}{5}$
66. Two events A and B are such that $P(A) = 0.5$, $P(B) = 0.6$, and $P(A \cap B) = 0.3$. Find $P(A|B)$.
- A. 0.5
 B. 0.6
 C. 0.3
 D. 0.8
67. A bag contains 7 red, 5 white, and 6 blue balls. If one ball is drawn at random, what is the probability that it is either red or white?
- A. $\frac{2}{3}$
 B. $\frac{7}{18}$
 C. $\frac{5}{9}$
 D. $\frac{12}{18}$
68. Four coins are tossed. What is the probability of getting at least two tails?
- A. $\frac{11}{16}$
 B. $\frac{5}{8}$
 C. $\frac{3}{4}$
 D. $\frac{1}{2}$
69. A number is selected at random from integers 1 to 25. What is the probability that it is prime?
- A. $\frac{9}{25}$
 B. $\frac{2}{5}$
 C. $\frac{8}{25}$
 D. $\frac{1}{3}$
70. Two dice are rolled. What is the probability that the sum is greater than 9?
- A. $\frac{1}{6}$
 B. $\frac{5}{36}$
 C. $\frac{1}{4}$
 D. $\frac{7}{36}$
71. A bag contains 6 identical red balls and 4 identical blue balls. If 3 balls are drawn at random, what is the probability of getting 2 red and 1 blue?
- A. $\frac{1}{2}$
 B. $\frac{3}{5}$
 C. $\frac{2}{5}$
 D. $\frac{60}{120}$
72. If events A and B are independent with $P(A) = 0.7$ and $P(B) = 0.5$, find $P(A \cup B)$.
- A. 0.85
 B. 0.9
 C. 1.2
 D. 0.35
73. A card is drawn from a deck. What is the probability that it is a red face card?
- A. $\frac{3}{26}$
 B. $\frac{1}{13}$
 C. $\frac{6}{52}$
 D. $\frac{1}{4}$
74. Three students attempt a problem independently. Their probabilities of solving it are $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{5}$. What is the probability that exactly one solves it?
- A. $\frac{7}{15}$
 B. $\frac{13}{30}$
 C. $\frac{1}{2}$
 D. $\frac{3}{10}$

75. A box contains 9 tickets numbered 1 to 9. Two tickets are drawn at random. What is the probability that the sum is even?
- A. $\frac{4}{9}$
B. $\frac{5}{9}$
C. $\frac{1}{2}$
D. $\frac{20}{36}$
76. A die is rolled four times. What is the probability of getting at least one six?
- A. $\frac{671}{1296}$
B. $\frac{625}{1296}$
C. $\frac{2}{3}$
D. $\frac{1}{2}$
77. From a group of 6 men and 5 women, two people are selected at random. What is the probability that both are women?
- A. $\frac{2}{11}$
B. $\frac{10}{55}$
C. $\frac{5}{22}$
D. $\frac{1}{6}$
78. A bag contains 5 white and 7 black balls. If two balls are drawn at random with replacement, what is the probability that at least one is white?
- A. $\frac{95}{144}$
B. $\frac{49}{144}$
C. $\frac{5}{12}$
D. $\frac{2}{3}$
79. Two cards are drawn from a deck without replacement. What is the probability that the first is a king and the second is a queen?
- A. $\frac{4}{663}$
B. $\frac{16}{2652}$
C. $\frac{1}{169}$
D. $\frac{8}{663}$
80. A number is chosen at random from 1 to 40. What is the probability that it is divisible by 2 and 3?
- A. $\frac{1}{6}$
B. $\frac{3}{20}$
C. $\frac{7}{40}$
D. $\frac{1}{5}$
81. Three dice are thrown simultaneously. What is the probability of getting the same number on all three?
- A. $\frac{1}{36}$
B. $\frac{1}{216}$
C. $\frac{6}{216}$
D. $\frac{1}{6}$
82. A bag contains 4 red, 3 blue, and 5 green marbles. Three marbles are drawn at random. What is the probability that no two are of the same color?
- A. $\frac{3}{11}$
B. $\frac{60}{220}$
C. $\frac{2}{11}$
D. $\frac{30}{110}$
83. If $P(A) = 0.4$, $P(B) = 0.5$, and $P(A \cap B) = 0.2$, find $P(B|A)$.
- A. 0.5
B. 0.4
C. 0.2
D. 0.25
84. A coin is biased such that heads is twice as likely as tails. What is the probability of getting tails?
- A. $\frac{1}{3}$
B. $\frac{1}{2}$
C. $\frac{2}{3}$

- D. $\frac{1}{4}$
85. A letter is chosen at random from the word "SUCCESS". What is the probability that it is the letter S?
- A. $\frac{3}{7}$
B. $\frac{4}{7}$
C. $\frac{2}{7}$
D. $\frac{1}{2}$
86. Two dice are rolled. What is the probability that at least one die shows a number greater than 4?
- A. $\frac{5}{9}$
B. $\frac{2}{3}$
C. $\frac{20}{36}$
D. $\frac{4}{9}$
87. A box contains 8 red, 6 blue, and 4 green balls. If three balls are drawn at random without replacement, what is the probability that all are blue?
- A. $\frac{5}{204}$
B. $\frac{20}{816}$
C. $\frac{1}{34}$
D. $\frac{6}{204}$
88. If events A and B are mutually exclusive with $P(A) = 0.3$ and $P(B) = 0.5$, find $P(A' \cap B')$.
- A. 0.2
B. 0.8
C. 0.35
D. 0.15
89. A number is selected at random from integers 10 to 30. What is the probability that it is divisible by 3?
- A. $\frac{1}{3}$
B. $\frac{7}{21}$
C. $\frac{8}{21}$
- D. $\frac{2}{7}$
90. Three cards are drawn from a deck without replacement. What is the probability that at least one is a spade?
- A. $\frac{133}{204}$
B. $\frac{71}{204}$
C. $\frac{2}{3}$
D. $\frac{39}{68}$
91. A bag contains 10 balls numbered 1 to 10. If two balls are drawn at random, what is the probability that their product is odd?
- A. $\frac{2}{9}$
B. $\frac{10}{45}$
C. $\frac{1}{3}$
D. $\frac{5}{18}$
92. A bag contains 7 red, 5 blue, and 3 yellow balls. If three balls are drawn at random without replacement, what is the probability that exactly two are red?
- A. $\frac{21}{65}$
B. $\frac{168}{455}$
C. $\frac{42}{91}$
D. $\frac{3}{13}$
93. Two friends agree to meet between 2:00 PM and 3:00 PM. Each arrives at a random time and waits for 15 minutes. What is the probability that they meet?
- A. $\frac{7}{16}$
B. $\frac{1}{4}$
C. $\frac{1}{2}$
D. $\frac{3}{8}$
94. Two events A and B are independent with $P(A) = 0.4$ and $P(A \cup B) = 0.7$. Find $P(B)$.
- A. 0.5
B. 0.6

- C. 0.3
D. 0.4
95. A die is rolled. What is the probability of getting a number less than 5?
- A. $\frac{2}{3}$
B. $\frac{1}{2}$
C. $\frac{5}{6}$
D. $\frac{3}{4}$
96. From a deck of 52 cards, three cards are drawn with replacement. What is the probability that all three are kings?
- A. $\frac{1}{2197}$
B. $\frac{64}{140608}$
C. $\frac{8}{2197}$
D. $\frac{1}{169}$
97. A box contains 5 red, 4 blue, and 6 green balls. Two balls are drawn without replacement. What is the probability that both are of the same color?
- A. $\frac{16}{105}$
B. $\frac{31}{105}$
C. $\frac{1}{3}$
D. $\frac{37}{105}$
98. A coin is tossed 6 times. What is the probability of getting exactly 4 heads?
- A. $\frac{15}{64}$
B. $\frac{5}{16}$
C. $\frac{3}{8}$
D. $\frac{1}{4}$
99. A number is chosen at random from 1 to 80. What is the probability that it is a multiple of both 4 and 6?
- A. $\frac{1}{20}$
B. $\frac{3}{40}$
C. $\frac{7}{80}$
D. $\frac{1}{16}$
100. Two dice are thrown. What is the probability that the product of the numbers is a perfect square?
- A. $\frac{1}{4}$
B. $\frac{11}{36}$
C. $\frac{7}{36}$
D. $\frac{5}{18}$

Chapter 6

Statistics

6.1 Measures of Central Tendency

6.1.1 Questions

- Find the mean of the numbers 3, 5, 7, 9, and 11.
 - 7
 - 6
 - 8
 - 5
- The median of the data set 2, 5, 8, 11, 14 is
 - 8
 - 5
 - 11
 - 7
- Find the mode of the following data: 3, 5, 3, 7, 3, 9, 5.
 - 3
 - 5
 - 7
 - 9
- The mean of five numbers is 12. If four of the numbers are 10, 11, 13, and 15, find the fifth number.
 - 11
 - 12
 - 10
 - 9
- Find the median of 15, 20, 18, 12, 25, 22, 16.
 - 18
 - 20
 - 16
 - 19
- The data set 4, 7, 7, 10, 10, 10, 13 has a mode of
 - 10
 - 7
 - 13
 - 4
- If the mean of 8, 10, x , 14, and 16 is 12, find the value of x .
 - 12
 - 11
 - 10
 - 13
- Find the mean of the first five prime numbers.
 - 5.6
 - 6
 - 5
 - 6.5
- The median of 3, 7, 5, 9, 11, 13 is
 - 8
 - 7
 - 9
 - 7.5
- Which measure of central tendency is most affected by extreme values?
 - Mean
 - Median

- C. Mode
D. Range
11. Find the mode of 12, 15, 12, 18, 20, 12, 15, 18, 12.
A. 12
B. 15
C. 18
D. 20
 12. The mean of 6, 8, 10, 12, and x is 10. Find x .
A. 14
B. 12
C. 10
D. 16
 13. Find the median of 2, 4, 6, 8, 10, 12, 14, 16.
A. 8
B. 9
C. 10
D. 7
 14. The ages of five students are 15, 16, 14, 17, and 18 years. Find their mean age.
A. 16
B. 15
C. 17
D. 14
 15. If the mean of 7 numbers is 15 and the mean of 3 of them is 12, find the mean of the remaining 4 numbers.
A. 17.25
B. 16.5
C. 18
D. 15.75
 16. Find the mode of the data: 5, 7, 5, 8, 5, 9, 7, 7, 5.
A. 5
B. 7
C. 8
D. 9
 17. The median of 21, 15, 18, 12, 24, 27 is
A. 19.5
B. 18
C. 21
D. 20
 18. Find the mean of 20, 25, 30, 35, 40.
A. 30
B. 25
C. 35
D. 28
 19. The data set 2, 4, 6, 8 has no mode. What can be said about this data?
A. All values occur with equal frequency
B. The data is bimodal
C. The median is 5
D. Both A and C
 20. If the mean of 5, 7, 9, x , and 11 is 8, find x .
A. 8
B. 7
C. 9
D. 6
 21. Find the median of 40, 35, 50, 45, 30, 55, 60.
A. 45
B. 50
C. 40
D. 47.5
 22. The mode of 3, 5, 7, 5, 9, 5, 11, 7 is
A. 5
B. 7
C. 9
D. 3
 23. Calculate the mean of 12, 18, 24, 30, 36.
A. 24
B. 22
C. 26
D. 20
 24. The median of an even number of observations is
A. The middle value
B. The average of the two middle values
C. The most frequent value
D. The sum of all values
 25. Find the mean of the squares of the first four natural numbers.

- A. 7.5
B. 10
C. 5
D. 8
26. If the mean of 10 numbers is 20 and one number 25 is removed, what is the new mean?
- A. 19.44
B. 20
C. 18.5
D. 21
27. Find the mode of 8, 10, 12, 10, 8, 14, 10, 8, 10.
- A. 10
B. 8
C. Both 8 and 10
D. 12
28. The median of 5, 10, 15, 20, 25, 30, 35, 40, 45 is
- A. 25
B. 20
C. 30
D. 22.5
29. Find the mean of all multiples of 5 between 1 and 30.
- A. 17.5
B. 15
C. 20
D. 12.5
30. The mean of 4, 6, 8, 10, 12 is increased by 3 when each number is increased by
- A. 3
B. 15
C. 6
D. 9
31. Find the median of 100, 90, 80, 110, 120, 95, 105.
- A. 100
B. 105
C. 95
D. 110
32. The mode of a data set with all different values is
- A. Zero
- B. Does not exist
C. The mean
D. The median
33. If the mean of x , $x+2$, $x+4$, $x+6$, and $x+8$ is 10, find x .
- A. 6
B. 7
C. 8
D. 5
34. Find the median of 2.5, 3.5, 4.5, 5.5, 6.5, 7.5.
- A. 5
B. 5.5
C. 4.5
D. 6
35. The mean of 15 observations is 32. If two observations 40 and 50 are added, what is the new mean?
- A. 33.29
B. 34
C. 35
D. 32.5
36. Find the mode of 1, 2, 2, 3, 3, 3, 4, 4, 4, 4.
- A. 4
B. 3
C. 2
D. 1
37. The median of 7, 14, 21, 28, 35 is
- A. 21
B. 14
C. 28
D. 20
38. Calculate the mean of the first 10 even natural numbers.
- A. 11
B. 10
C. 12
D. 9
39. If the mean of 20 observations is 15 and that of another 30 observations is 20, find the mean of all 50 observations.
- A. 18
B. 17.5
C. 19

- D. 16.5
40. Find the mode of the data where all frequencies are equal.
- A. Does not exist
 - B. Zero
 - C. The mean
 - D. All values
41. The median of 1, 3, 5, 7, 9, 11, 13, 15, 17 is
- A. 9
 - B. 8
 - C. 10
 - D. 7
42. Find the mean of 2.5, 3.0, 3.5, 4.0, 4.5, 5.0.
- A. 3.75
 - B. 4
 - C. 3.5
 - D. 4.25
43. If the median of a data set is 25 and the mean is 30, the data is
- A. Positively skewed
 - B. Negatively skewed
 - C. Symmetric
 - D. Normal
44. Find the mode of 50, 60, 70, 60, 80, 60, 90, 70.
- A. 60
 - B. 70
 - C. 50
 - D. 80
45. The mean of three numbers is 20. If two of them are 15 and 18, find the third number.
- A. 27
 - B. 25
 - C. 22
 - D. 20
46. Find the median of 0.5, 1.5, 2.5, 3.5, 4.5, 5.5, 6.5, 7.5.
- A. 4
 - B. 3.5
 - C. 4.5
- D. 5
47. The mode is most useful when data is
- A. Categorical
 - B. Continuous
 - C. Symmetric
 - D. Normally distributed
48. Calculate the mean of 1, 4, 9, 16, 25.
- A. 11
 - B. 10
 - C. 12
 - D. 13
49. If each observation in a data set is multiplied by 5, the mean is
- A. Multiplied by 5
 - B. Divided by 5
 - C. Increased by 5
 - D. Remains the same
50. Find the median of 11, 22, 33, 44, 55, 66, 77, 88, 99.
- A. 55
 - B. 44
 - C. 50
 - D. 60
51. The mean of 8 numbers is 25. If 5 is subtracted from each number, the new mean is
- A. 20
 - B. 25
 - C. 30
 - D. 15
52. Find the mode of 15, 20, 25, 20, 30, 25, 20, 35.
- A. 20
 - B. 25
 - C. 15
 - D. 30
53. The median of 6, 12, 18, 24, 30, 36 is
- A. 21
 - B. 18
 - C. 24
 - D. 20
54. Find the mean of the first 7 odd natural numbers.

- A. 7
B. 8
C. 6
D. 9
55. If the mean of 10, 15, 20, x , 30 is 20, find x .
A. 25
B. 20
C. 22
D. 18
56. The median is always
A. A value in the data set
B. The middle value when data is ordered
C. Equal to the mean
D. The most frequent value
57. Find the mode of 100, 200, 200, 300, 300, 300, 400.
A. 300
B. 200
C. 100
D. 400
58. The mean of 5 consecutive odd numbers is 21. Find the largest number.
A. 25
B. 23
C. 27
D. 21
59. Find the median of 50, 55, 60, 65, 70, 75, 80, 85, 90, 95.
A. 72.5
B. 70
C. 75
D. 65
60. Calculate the mean of 3, 6, 9, 12, 15, 18.
A. 10.5
B. 12
C. 9
D. 11
61. The mode of a bimodal distribution has
A. Two values
B. One value
C. Three values
D. No value
62. If the mean of x , $2x$, $3x$, $4x$, and $5x$ is 30, find x .
A. 10
B. 5
C. 15
D. 20
63. Find the median of 17, 23, 19, 21, 25, 20, 22.
A. 21
B. 20
C. 22
D. 19
64. The mean of 12 observations is 15. If each observation is doubled, the new mean is
A. 30
B. 15
C. 27
D. 18
65. Find the mode of 2, 4, 6, 2, 8, 2, 10, 4, 6, 2.
A. 2
B. 4
C. 6
D. 8
66. The median of 9, 18, 27, 36, 45, 54, 63, 72 is
A. 40.5
B. 36
C. 45
D. 42
67. Find the mean of all two-digit multiples of 10.
A. 55
B. 50
C. 60
D. 45
68. If the mean of a , b , c is 15 and the mean of a , b , c , d is 20, find d .
A. 35
B. 30
C. 25

- D. 40
69. Find the median of integers from 1 to 9.
- A. 5
B. 4
C. 6
D. 4.5
70. The mode of the data 5, 10, 15, 10, 20, 15, 10, 25 is
- A. 10
B. 15
C. 20
D. 5
71. Calculate the mean of 0, 5, 10, 15, 20, 25, 30.
- A. 15
B. 12.5
C. 17.5
D. 20
72. If every value in a data set is the same, then
- A. Mean = Median = Mode
B. Mean \neq Median
C. Mode does not exist
D. Median \neq Mode
73. Find the median of 1.2, 3.4, 2.3, 4.5, 3.2, 5.1.
- A. 3.3
B. 3.4
C. 3.2
D. 2.85
74. The mean of 6 numbers is 18. If one number 24 is replaced by 18, the new mean is
- A. 17
B. 18
C. 19
D. 16
75. Find the mode of 7, 14, 21, 14, 28, 21, 14, 35.
- A. 14
B. 21
C. 7
D. 28
76. The median of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 is
- A. 6
B. 5
C. 7
D. 5.5
77. Find the mean of 16, 18, 20, 22, 24, 26, 28.
- A. 22
B. 20
C. 24
D. 21
78. If the median is greater than the mean, the data is likely
- A. Negatively skewed
B. Positively skewed
C. Symmetric
D. Uniform
79. Find the mode of 33, 44, 55, 44, 66, 55, 44, 77.
- A. 44
B. 55
C. 33
D. 66
80. The mean of the first n natural numbers is
- A. $\frac{n+1}{2}$
B. $\frac{n}{2}$
C. $n+1$
D. $\frac{n-1}{2}$
81. Find the median of 5, 15, 25, 35, 45, 55, 65, 75, 85.
- A. 45
B. 40
C. 50
D. 35
82. Calculate the mean of 7, 14, 21, 28, 35, 42.
- A. 24.5
B. 21
C. 28
D. 25
83. The mode is preferred over the mean when
- A. Data is qualitative
B. Data has extreme values

- C. Quick calculation is needed
D. All of the above
84. Find the median of 8, 16, 24, 32, 40, 48, 56.
A. 32
B. 28
C. 36
D. 24
85. If the mean of 4, 8, 12, x, 20 is 12, find x.
A. 16
B. 14
C. 12
D. 18
86. The median of 3, 6, 9, 12, 15, 18, 21, 24, 27, 30 is
A. 16.5
B. 15
C. 18
D. 15.5
87. Find the mean of 2, 4, 8, 16, 32.
A. 12.4
B. 10
C. 14
D. 16
88. Which measure of central tendency can have more than one value?
A. Mode
B. Mean
C. Median
D. None
89. Find the median of 13, 26, 39, 52, 65, 78, 91.
A. 52
B. 39
C. 45.5
D. 65
90. The mean of 5 consecutive even numbers is 16. Find the smallest number.
A. 12
B. 10
C. 14
D. 16
91. Find the mode of 1, 3, 5, 3, 7, 5, 9, 5, 11.
A. 5
B. 3
C. 7
D. 1
92. The median is less affected by outliers than the mean because it
A. Depends only on position
B. Is always smaller
C. Is always larger
D. Uses all data values
93. Find the mean of 11, 22, 33, 44, 55, 66, 77, 88, 99.
A. 55
B. 50
C. 60
D. 44
94. The sum of deviations of observations from their mean is always
A. Zero
B. Positive
C. Negative
D. One
95. The mean of 9 numbers is 40. If 4 is added to each number, the new mean is
A. 44
B. 40
C. 36
D. 45
96. Find the median of 1.5, 2.5, 3.5, 4.5, 5.5, 6.5, 7.5, 8.5.
A. 5
B. 4.5
C. 5.5
D. 6
97. For a symmetric distribution, which relationship holds?
A. Mean = Median = Mode
B. Mean > Median
C. Median > Mean
D. Mode > Mean

98. If each value in a data set is increased by k , the mean increases by
- A. k
 - B. $2k$
 - C. k^2
 - D. $\frac{k}{n}$
99. The mode of a trimodal distribution has
- A. Three values
 - B. Two values
 - C. One value
 - D. No value
100. The median divides the data into
- A. Two equal parts
 - B. Three equal parts
 - C. Four equal parts
 - D. Unequal parts

Chapter 7

Values To Memorize

7.1 Square Roots

- $\sqrt{1} = 1$
- $\sqrt{2} = 1.4142$
- $\sqrt{3} = 1.7321$
- $\sqrt{4} = 2$
- $\sqrt{5} = 2.2361$
- $\sqrt{6} = 2.4495$
- $\sqrt{7} = 2.6458$
- $\sqrt{8} = 2.8284$
- $\sqrt{9} = 3$
- $\sqrt{10} = 3.1623$

- $14^2 = 196$
- $15^2 = 225$
- $16^2 = 256$
- $17^2 = 289$
- $18^2 = 324$
- $19^2 = 361$
- $20^2 = 400$
- $21^2 = 441$

7.2 Squares

- $1^2 = 1$
- $2^2 = 4$
- $3^2 = 9$
- $4^2 = 16$
- $5^2 = 25$
- $6^2 = 36$
- $7^2 = 49$
- $8^2 = 64$
- $9^2 = 81$
- $10^2 = 100$
- $11^2 = 121$
- $12^2 = 144$
- $13^2 = 169$

- $22^2 = 484$
- $23^2 = 529$
- $24^2 = 576$
- $25^2 = 625$
- $26^2 = 676$
- $27^2 = 729$
- $28^2 = 784$
- $29^2 = 841$
- $30^2 = 900$

7.3 Cubes

- $1^3 = 1$
- $2^3 = 8$
- $3^3 = 27$
- $4^3 = 64$
- $5^3 = 125$
- $6^3 = 216$
- $7^3 = 343$
- $8^3 = 512$
- $9^3 = 729$
- $10^3 = 1000$
- $11^3 = 1331$
- $12^3 = 1728$
- $13^3 = 2197$
- $14^3 = 2744$
- $15^3 = 3375$
- $16^3 = 4096$
- $17^3 = 4913$
- $18^3 = 5832$
- $19^3 = 6859$
- $20^3 = 8000$
- $21^3 = 9261$
- $22^3 = 10648$
- $23^3 = 12167$
- $24^3 = 13824$
- $25^3 = 15625$
- $26^3 = 17576$
- $27^3 = 19683$
- $28^3 = 21952$
- $29^3 = 24389$
- $30^3 = 27000$

7.4 Logarithms

- $\log_{10} 1 = 0$
- $\log_{10} 2 = 0.3010$
- $\log_{10} 3 = 0.4771$
- $\log_{10} 4 = 0.6020$
- $\log_{10} 5 = 0.699$
- $\log_{10} 6 = 0.778$
- $\log_{10} 7 = 0.845$
- $\log_{10} 8 = 0.903$
- $\log_{10} 9 = 0.954$
- $\log_{10} 10 = 1$