Answers & Explanatory notes

Contents

Answers & Explanatory notes

UNIT 1 BASIC MATHEMATICS

1. D	2. C	3. A	4. C	5. B	6. B	7. B	8. A
9. C	10. A	11. B	12. D	13. C	14. D	15. A	16. B
17. D	18. C	19. B	20. D	21. B	22. A	23. C	24. D
25. A	26. D	27. D	28. A	29. A	30. C	31. B	32. B
33. C							

Explanatory Notes

5. 644 is not divisible by 8. $744 \div 8 = 93$.
    844 is not divisible by 8. $944 \div 8 = 116$.
    $\therefore$ II and IV are correct.

18. 48 is multiple of 4, $\therefore$ A is true.
    8 is even, and the given number is divisible by 3, $\therefore$ B is true.
    $1 + 5 + 9 + a + 4 + 8 = 27 + a$.
    When $a = 0$ or 9, the number is divisible by 9, $\therefore$ D is true

31. $36 = 2^2 \times 3^2$, $90 = 2 \times 3^2 \times 5$, $54 = 2 \times 3^3$
    The H.C.F. $= 2 \times 3^2 = 18$.

32. $10 = 2 \times 5$, $18 = 2 \times 3^2$, $24 = 2^3 \times 3$
    The L.C.M. $= 2^3 \times 3^2 \times 5 = 360$
    The least number $= 360 + 3 = 363$

33. $15 = 3 \times 5$, $25 = 5^2$, $45 = 3^2 \times 5$
    The L.C.M. $= 3^2 \times 5^2 = 225$
    225 minutes $=$ 3 hours 45 minutes, $\therefore$ the next time is 1:15 p.m.

UNIT 2 DIRECTED NUMBERS

1. B	2. D	3. A	4. A	5. D	6. D	7. C	8. C
9. C	10. C	11. C	12. D	13. C	14. B	15. C	16. C
17. A	18. C	19. A	20. A	21. D	22. B	23. B	24. C
25. B	26. D	27. B	28. C	29. B	30. A	31. B	32. D
33. D	34. A	35. D	36. C	37. C	38. B	39. D	40. D
41. B	42. D	43. A	44. D	45. B	46. A	47. B	48. B
49. A	50. B	51. C	52. C	53. A	54. B	55. A	56. A
57. C	58. B	59. A	60. A	61. C	62. C	63. C	

Explanatory Notes

4. integers: 整數   5.   "0" is nether positive nor negative.

21. $= -3 \div 0 = meaningless$

22. $= (-30) \times (0) = 0$ 23. $= \dfrac{(+42)}{(+7)(-3)} = -2$

34. $= 14 \times (+3) + (18 - 14) \times (-2) + (20 - 18) \times (-1) = 42 - 8 - 2 = 32$

35. $= 6000 - 6 \times (-400) = 6000 + 2400 = 8400$

45. $= (-1) \times (+1) = -1$ $[-1^{10} = -(1^{10}) = -1]$

47. $= -16 + (+16) = 0$ $[-4^2 = -(4^2) = -16]$

52. $-x > 0$ is true, $\because -1 \times ($negative no.$) =$ positive no.

     $-x < x$ is false, $\because$ positive no. is greater than negative no.

     $\dfrac{1}{x} < 0$ is true, $\because 1 \div ($negative no.$) =$ negative no.

55. $= 1 \div [(-1) - (-\dfrac{2}{3})] = 1 \div (-1 + \dfrac{2}{3}) = 1 \div (-\dfrac{1}{3}) = -3$

56. $= (1 - 2) + (3 - 4) + ... + (99 - 100) = (-1) + (-1) + ... + (-1)$

     $= (-1) \times 50 = -50$

57. $x + y > 0$ is true, $\because$ the sum of 2 negative nos. is negative.

     $x < y$, $\therefore x - x < y - x$, $0 < y - x$, $y - x > 0$

60. $-6 + x > 0$, $\therefore x > 6$, i.e. x is a positive number greater than 6.

62. $= -5 + (6900 - 4400) \div 500 \times (-3) = -5 + (-15) = -20$

63. $= [4 \times (-60000) + (12 - 4) \times (+25000)] \div 4 = -40000 \div 4$

     $= -10000$

UNIT 3   BASIC ALGEBRA

1. A	2. B	3. B	4. D	5. C	6. A	7. D	8. D
9. A	10. C	11. D	12. B	13. A	14. C	15. A	16. B
17. A	18. B	19. C	20. D	21. A	22. A	23. D	24. B
25. D	26. C	27. B	28. D	29. A	30. C	31. A	32. B
33. D	34. C	35. B	36. C	37. B	38. C	39. D	40. B
41. C	42. B	43. A	44. D	45. A			

Explanatory Notes

5. $A, B, D : y - 6$; $C : 6 - y$

6.   The sum of the squares of a and $b = a^2 + b^2$;

     the square of the sum of a and $b = (a + b)^2$;

     $\therefore$ the answer $= \dfrac{a^2 + b^2}{(a + b)^2}$

13. $= 25a + 5a - 1 \times 5 = 30a - 5$

15. $= 6 + 3y + 3y = 6 + 6y$

16. $= k^2 + k + k^2 - 2k = 2k^2 - k$

20. product: 積

21. quotient: 商

25. $= 1 \div \dfrac{2}{3} - \dfrac{1}{(-6)} = \dfrac{3}{2} + \dfrac{1}{6} = \dfrac{10}{6} = \dfrac{5}{3} = 1\dfrac{2}{3}$

26. A: $2(-2)^3 = 2(-8) = -16$

    B: $-(-2)^4 = -(16) = -16$

    C: $4(-2)^2 = 4(4) = 16$

    D: $8(-2) = -16$

28. $= 3^2 - (-2)^3 = 9 - (-8) = 9 + 8 = 17$

32. consecutive odd numbers.: 連續單數

33. consecutive multiples: 連續倍數

36. $2008 - 1999 = 9$; $(n - 7) + 9 = n + 2$

38. Distance = speed $\times$ time ; the actual speed = $(s - w)$ km/h ,

    $\therefore$ the distance = $(s - w)t$ km

42. $y \div 3x = \dfrac{y}{3x}$; $\ y \div 3 \div x = y \times \dfrac{1}{3} \times \dfrac{1}{x} = \dfrac{y}{3x}$;

    $y \div 3 \times x = y \times \dfrac{1}{3} \times x = \dfrac{xy}{3}$

45. The total distance they travelled in 1 second = $(h + k)$ m;

    they have to travel d m so as to meet each other,

    $\therefore$ the time taken = $\dfrac{d}{h + k}$ seconds

UNIT 4 SEQUENCES

1. B	2. C	3. A	4. B	5. D	6. A	7. D	8. D
9. C	10. D	11. A	12. B	13. D	14. B	15. D	16. B
17. C	18. B	19. D	20. A	21. A	22. C	23. C	24. B
25. A	26. B	27. A	28. C	29. C	30. D	31. D	32. B

Explanatory Notes

1. $16 - 7 = 9, 9 - 7 = 2$,

   $\therefore$ the sequence is $16, 9, 2, -5, -12, -19, \ldots$

2. $9 \times \dfrac{2}{3} = 6, 6 \times \dfrac{2}{3} = 4, 4 \times \dfrac{2}{3} = \dfrac{8}{3}$,

   $\therefore$ the sequence is $9, 6, 4, \dfrac{8}{3}, \dfrac{16}{9}, \dfrac{32}{27}, \dfrac{64}{81}, \ldots$

4. $a_1 = 4 \times 1$, $a_2 = 4 \times 2$, $a_3 = 4 \times 3$,
    $\therefore$ $a_4 = 4 \times 4 = 16$, $a_5 = 4 \times 5 = 20$

5. $a_1 = 4 = (1+1)^2$, $a_2 = 9 = (2+1)^2$, $a_3 = 16 = (3+1)^2$,
    $\therefore$ $a_6 = (6+1)^2 = 49$

6. $a_1 = 4$, $a_2 = 4 + 6 = 10$, $a_3 = 10 + 6 = 16$,
    $\therefore$ $a_4 = 16 + 6 = 22$, $a_5 = 22 + 6 = 28$

7. $-4 + \mathbf{1} = -3$, $-3 + \mathbf{3} = 0$, $0 + \mathbf{5} = 5$, $5 + \mathbf{7} = \underline{12}$, $12 + \mathbf{9} = \underline{\underline{21}}$

8. $2 \times \mathbf{1} = 2$, $2 \times \mathbf{3} = 6$, $6 \times \mathbf{5} = 30$, $30 \times \mathbf{7} = 210$, $210 \times \mathbf{9} = 1890$

9. $48 \div \mathbf{2} = 24$, $24 \div \mathbf{3} = 8$, $8 \div \mathbf{4} = 2$, $2 \div \mathbf{5} = \dfrac{2}{5}$

10. $\dfrac{7-1}{2+1} = \dfrac{6}{3} = 2$, $\dfrac{6-1}{3+1} = \dfrac{5}{4}$, $\dfrac{5-1}{4+1} = \dfrac{4}{5}$, $\dfrac{4-1}{5+1} = \dfrac{3}{6} = \dfrac{1}{\underline{\underline{2}}}$, $\dfrac{3-1}{6+1} = \dfrac{2}{\underline{7}}$

11. $3 + \mathbf{2} = 5$, $5 + \mathbf{4} = 9$, $9 + \mathbf{8} = 17$, $17 + \mathbf{16} = 33$, $33 + \mathbf{32} = 65$

12. $-6 \times (-2) + 1 = 13$, $13 \times (-2) + 1 = -25$, $-25 \times (-2) + 1 = 51$,
    $51 \times (-2) + 1 = -101$

13. $0^2 + 1 = 1$, $1^2 + 1 = 2$, $2^2 + 1 = 5$, $5^2 + 1 = 26$, $26^2 + 1 = 677$

16. $a_n = 2n(n-1)(n+1)$ which must be even (雙數),
    $\therefore$ 135 is impossible.

17. $a_n = 2^n + 1$ which must be odd (單數), $\therefore$ 324 is impossible.

23. Triangular numbers are: 1, 3, 6, 10, 15, 21, 28, 36, 45, 55, …

24. 1, 3, 5, 7, 9, ... is a sequence of consecutive odd numbers
    (連續單數); 1, 3, 7, 13, 21, ... is not. $\therefore$ II is false.
    $5 = 1^2 + 2^2$, $\therefore$ III is true.

25. The order (次序) of the numbers of the two sequences is different,
    $\therefore$ I is true.
    $-9, -6, -3, 0$ are non-positive terms, $\therefore$ III is false.

27. $a_1 = x - 3$, $a_2 = (x-3) + (x+1) = 2x - 2$,
    $a_3 = (2x-2) + (x+1) = 3x - 1$, $\therefore$ $a_4 = (3x-1) + (x+1) = 4x$,
    $a_7 = 4x + (x+1) + (x+1) + (x+1) = 7x + 3$

UNIT 5 LINEAR EQUATIONS IN ONE UNKNOWN

1. A	2. C	3. C	4. B	5. A	6. B	7. A	8. C
9. D	10. A	11. B	12. A	13. D	14. D	15. A	16. B
17. C	18. B	19. A	20. D	21. A	22. B	23. C	24. D
25. D	26. C	27. D	28. B	29. B	30. A	31. B	32. D
33. D	34. A	35. D	36. C	37. C	38. D	39. C	40. C
41. A	42. B	43. D	44. B	45. D	46. A	47. C	48. D

Answers & Explanatory notes

49. C	50. B	51. D	52. B	53. A	54. D	55. D	56. C
57. B	58. D	59. B	60. A	61. B	62. B	63. B	64. D
65. C							

Explanatory Notes

27. $9 - y = 21 + 7y - (12y + 4)$, $9 - y = 21 + 7y - 12y - 4$,
    $-y - 7y + 12y = 21 - 4 - 9$, $4y = 8$, $\therefore y = 2$

38. The larger number $= x$, the smaller number $= 84 - x$,
    $\therefore x = 3(84 - x) + 4$, $4x = 256$, $x = 64$

39. Upper base $= x$ cm, lower base $= 3x$ cm, $\therefore \dfrac{(3x + x) \times 12}{2} = 60$,
    $4x = 10$, $x = 2.5$, $\therefore$ lower base $= 3(2.5) = 7.5$ cm

40. No. of \$2 coins $= x$, no. of \$5 coins $= 50 - x$,
    $\therefore 2x + 5(50 - x) = 169$, $-3x = -81$, $x = 27$

41. No. of 1.5 kg packs $= x$, no. of 0.5 kg packs $= 96 - x$,
    $\therefore 1.5x + 0.5(96 - x) = 78$, $1.5x + 48 - 0.5x = 78$, $x = 30$

42. Smaller group $= x$, larger group $= 108 - x$,
    $\therefore 2(108 - x) = 7x$, $216 = 9x$, $x = 24$

43. If Stephanie has \$$(156 - x)$, Helen will have \$$(18 + x)$,
    $\therefore 5(156 - x) = 18 + x$, $780 - 5x = 18 + x$, $6x = 762$, $x = 127$

44. No. of boys $= x$, no. of girls $= (1 - \dfrac{1}{3})x = \dfrac{2}{3}x$,

    $\therefore x + \dfrac{2}{3}x = 40$, $x = 24$, $\therefore$ no. of girls $= \dfrac{2}{3}(24) = 16$

45. Speed of B $= x$ km/h, speed of A $= 2x$ km/h, $\therefore 3(2x + x) = 387$,
    $3x = 129$, $x = 43$, $\therefore$ speed of A $= 2(43) = 86$ km/h

46. Speed of boat in still water $= x$ m/s,
    $\therefore (x + 3) \times 5 \times 60 = 2400$, $x + 3 = 8$, $x = 5$

47. $18m - 24 = -24 + 18m$; since L.H.S. = R.H.S. for all values of m,
    $\therefore m$ can be any real numbers.

48. $a - 55 - 5a = -3a + 21 - a$, $-4a - 55 = -4a + 21$, $-55 = 21$;
    since L.H.S. $\neq$ R.H.S. for any values of a, $\therefore$ no solution.

53. $\dfrac{3 - x}{4} \times 8 - \dfrac{2x + 1}{8} \times 8 = \dfrac{1}{2} \times 8$, $2(3 - x) - (2x + 1) = 4$,

    $6 - 2x - 2x - 1 = 4$, $-4x = -1$, $x = \dfrac{1}{4}$

54. $5 \times 12 - \dfrac{x - 3}{6} \times 12 = \dfrac{x + 2}{4} \times 12$, $60 - 2(x - 3) = 3(x + 2)$,
    $60 - 2x + 6 = 3x + 6$, $-5x = -60$, $x = 12$

56. $\dfrac{x}{0.4} \times 1.2 - \dfrac{x}{0.6} \times 1.2 = 10 \times 1.2$, $3x - 2x = 12$, $x = 12$

57. $1 \times 3 + \dfrac{2x-5}{3} \times 3 = 4x \times 3$, $3 + 2x - 5 = 12x$, $-10x = 2$, $x = -\dfrac{1}{5}$

61. $\dfrac{y+2}{3} \times 12 - \dfrac{y-1}{2} \times 12 = \dfrac{6-y}{4} \times 12$, $4(y+2) - 6(y-1) = 3(6-y)$,
    $4y + 8 - 6y + 6 = 18 - 3y$, $y = 4$

63. No. of wrong answers $= x$, no. of correct answers $= 20 - x$,
    $\therefore 2(20-x) - x = 25$, $40 - 2x - x = 25$, $-3x = -15$, $x = 5$

64. Present age of son $= x$, present age of father $= 55 - x$,
    $\therefore 55 - x - 3 = 6(x-3)$, $52 - x = 6x - 18$, $-7x = -70$, $x = 10$

65. Speed of Y $= x$ km/h, speed of X $= 2x$ km/h,
    $\therefore (2x - x) \times \dfrac{40}{60} = 48$, $x \times \dfrac{2}{3} = 48$, $x = 72$,
    $\therefore$ speed of X $= 2(72) = 144$ km/h

UNIT 6 APPROXIMATION & NUMERICAL ESTIMATION

1. B	2. D	3. B	4. C	5. D	6. B	7. C	8. C
9. B	10. B	11. A	12. A	13. A	14. D	15. A	16. B
17. A	18. B	19. B	20. C	21. A	22. B	23. C	24. A
25. C	26. C	27. A	28. A	29. C	30. A	31. C	32. B
33. C	34. C	35. A	36. B	37. D	38. A		

Explanatory Notes

9. 5 h 23 min $= (5 \times 3600 + 23 \times 60)$ s $= 19000$ s (corr. to the nearest 1000 s)
10. 867 h $= (867 \div 24 \div 7)$ weeks $= 5.2$ weeks (corr. to 1 d.p.)
12. $7600042 = 7600040$ (corr. to the nearest 10)
21. $9010005 = 9010010$ (corr. to 6 sig. fig.)
25. $\approx 70 - 390 - 660 + 490 = -490$
32. $11.7 + 2.8 \times 6.04 \approx 12 + 3 \times 6 = 30 \neq 90$, $\therefore$ the answer is B.
38. 8848.8545 m $= 8848.85$ m (corr. to the nearest 0.01 m),
    $\therefore$ it cannot be the actual height.

UNIT 7 PERCENTAGES (1)

1. D	2. D	3. A	4. D	5. B	6. C	7. D	8. D
9. C	10. B	11. C	12. C	13. B	14. C	15. C	16. A
17. A	18. B	19. B	20. A	21. C	22. C	23. A	24. B
25. D	26. D	27. C	28. D	29. C	30. B	31. D	32. C

Answers & Explanatory notes

33. C	34. C	35. C	36. C	37. C	38. B	39. B	40. D
41. D	42. A	43. A	44. C	45. B	46. C	47. A	48. D
49. C	50. A	51. B	52. D	53. B	54. A	55. B	56. A
57. D	58. D	59. B	60. D	61. C	62. D	63. D	64. D
65. A	66. C	67. C	68. B	69. A	70. D	71. A	72. A
73. D	74. C						

Explanatory Notes

6. $= \dfrac{1\% \times 10\% \times 1}{0.1\% \times 0.1\%} = \dfrac{1 \times 10}{0.1 \times 0.1} = 1000$

11. $\dfrac{5y}{18} = 7.5$, $\therefore y = 7.5 \times \dfrac{18}{5} = 27 = 2700\%$

17. Man : $\$P \times 38\%$, Yen : $\$P(1-38\%)$,

    $\therefore$ percentage $= \dfrac{P(1-38\%)}{P \times 38\%} \times 100\%$

18. Alice : y g , Zeta : $(y \div 92\%)$ g , $\therefore y + y \div 92\% = 288$

19. Percentage $= \dfrac{50 \times (1-70\%) \times 60\%}{50} \times 100\% = 18\%$

20. No. of junior students joined $= x$, $80 \times 75\% + x = (80+x) \times 80\%$,
    $60 + x = 64 + 0.8x$, $x = 20$

22. % change $= \dfrac{75-80}{80} \times 100\% = -6\dfrac{1}{4}\%$, $\therefore$ % decrease $= 6\dfrac{1}{4}\%$

32. Percentage increase in width $= r\%$,

    $24(1+r\%) \times 25(1-20\%) = 24 \times 25$, $1 + r\% = \dfrac{5}{4}$, $r\% = \dfrac{1}{4} = 25\%$

33. Profit $= \$10560 \div 110\% + \$10560 = \$20160$

34. New speed $= \dfrac{180}{4} \times (1+20\%) = 54$ km/h ,

    $\therefore$ time saved $= 4 - \dfrac{180}{54} = \dfrac{2}{3}$ h $= 40$ minutes

36. Ming's mark $= 72 \div (1-25\%) = 96$

38. X's share $= x$, Y's share $= x \div (1+10\%) = \dfrac{10}{11}x$,

    $\therefore x + \dfrac{10}{11}x = 399$, $\dfrac{21}{11}x = 399$, $x = 209$

39. Percentage $= \dfrac{112 - 12 \times 7}{12 \times 7} \times 100\% = \dfrac{28}{84} \times 100\% = 33\dfrac{1}{3}\%$

40. $P = Q \times 20\%$, $P = \dfrac{1}{5}Q$, $\therefore Q = 5P = P \times 500\%$

41. $M = N(1 - 75\%)$, $M = \dfrac{1}{4}N$, $N = 4M$,

   $\therefore$ percentage $= \dfrac{N - M}{M} \times 100\% = \dfrac{4M - M}{M} \times 100\% = 300\%$,

   i.e. N is 300% more than M.

42. $a = b(1 + 50\%)$, $a = \dfrac{3}{2}b$, $b = \dfrac{2}{3}a$,

   $\therefore$ percentage $= \dfrac{a - b}{a} \times 100\% = \dfrac{a - \dfrac{2}{3}a}{a} \times 100\% = 33\dfrac{1}{3}\%$

   i.e. b is $33\dfrac{1}{3}\%$ more than a.

50. Cost $= 132000 \div 110\% = \$120000$

51. Loss $= 168 \div (1 - 4\%) - 168 = 175 - 168 = \$7$

52. Cost $= 180 \times 1.2 = \$216$, selling price $= 180 \times (1 - \dfrac{1}{6}) \times 1.8 = \$270$,

   $\therefore$ profit % $= \dfrac{270 - 216}{216} \times 100\% = \dfrac{54}{216} \times 100\% = 25\%$

56. Amount saved $= 408 \div (1 - 15\%) - 408 = 480 - 408 = \$72$

58. Selling price $= 500(1 + 40\%)(1 - 25\%) = \$525$

59. Selling price $= 2100(1 + 10\%)(1 - 10\%) = \$2079$,

   $\therefore$ loss % $= \dfrac{2100 - 2079}{2100} \times 100\% = \dfrac{21}{2100} \times 100\% = 1\%$

60. Marked price $= (108 + 18) \div (1 - 10\%) = 126 \div 0.9 = \$140$

61. Discount % $= \dfrac{1}{1 + 4} \times 100\% = \dfrac{1}{5} \times 100\% = 20\%$

62. A. $\dfrac{1}{1 + 3} \times 100\% = 25\%$;   B. 28% ;

   C. $\dfrac{2}{5 + 2} \times 100\% = 28\dfrac{4}{7}\%$;   D. 30% ;

   $\therefore$ the answer is D.

63. No. of students failed in either Paper 1 or 2 =
   $40 \times 25\% + 40 \times 15\% - 2 = 14$,
   $\therefore$ no. of students passed in both papers $= 40 - 14 = 26$

64. No. of Chinese boys $= 1500 \times 65\% \times (1 - 40\%) = 585$

67. Drink expense $= 300 \times 66\dfrac{2}{3}\% = \$200$,

   $\therefore$ percentage $= \dfrac{200}{200 + 300} \times 100\% = \dfrac{200}{500} \times 100\% = 40\%$

Answers & Explanatory notes

68. New number $= 400(1 - 15\%)(1 + 15\%) = 391$,

∴ % change $= \dfrac{391 - 400}{400} \times 100\% = \dfrac{-9}{400} \times 100\% = -2.25\%$

71. Amount paid by C $= 600(1 - 30\%)(1 + 35\%) = \$567$,

∴ loss % $= \dfrac{600 - 567}{600} \times 100\% = \dfrac{33}{600} \times 100\% = 5.5\%$

72. Shop A : $510 \times (1 - 20\%) = \$408$, Shop B : $440 \times (1 - 5\%) = \$418$,

∴ A is less than B by $418 - 408 = \$10$.

73. $M = 215 \div (1 - 14\%) = \$250$

74. Marked price $= 36000 \times (1 + 25\%) = \$45000$,

selling price $= 36000 \times (1 + 10\%) = \$39600$,

∴ Discount % $= \dfrac{45000 - 39600}{45000} \times 100\% = \dfrac{5400}{45000} \times 100\% = 12\%$

UNIT 8 LAWS OF INDICES (1)

1. C	2. D	3. B	4. D	5. C	6. C	7. A	8. C
9. C	10. C	11. A	12. C	13. B	14. C	15. B	16. D
17. C	18. A	19. D	20. D	21. C	22. D	23. B	24. D
25. D	26. B	27. D	28. C	29. D	30. B	31. A	32. D
33. D	34.B	35. C	36. A	37. B	38. A	39. A	40. D
41. B	42. D	43. B	44. B	45. A	46. A		

Explanatory Notes

5. $\dfrac{64 - (-27)}{-32 + 81} = \dfrac{91}{49} = \dfrac{13}{7} = 1\dfrac{6}{7}$

27. $3^9 \times 7^9 = (3 \times 7)^9 = 21^9$

28. $x^2 = 10$, $(x^2)^3 = 10^3$, ∴ $x^6 = 1000$

34. $\dfrac{a + a + a}{a \times a \times a} = \dfrac{3a}{a^3} = \dfrac{3}{a^2}$

38. $-1^{2000} - (-1)^{2000} = -1 - 1 = -2$ $[\because -1^{2000} = -(1^{2000})]$

40. ∵ $2n$ is an even number , ∴ $(-1)^{2n} + 1 = 1 + 1 = 2$

42. A. $4^5 = (2^2)^5 = 2^{10}$;   B. $9^6 = (3^2)^6 = 3^{12}$;

C. $8^3 = (2^3)^3 = 2^9$;   D. $25^3 = (5^2)^3 = 5^6 \neq 5^5$;

∴ the answer is D.

43. $-(-a^5)^2 = -(a^{10}) = -a^{10}$

45. $4^5 + 4^5 + 4^5 + 4^5 = 4 \times 4^5 = 4^{5+1} = 4^6$

46. $4^7 \times 2^7 = (4 \times 2)^7 = 8^7$; $4^7 \times 2^7 = (2^2)^7 \times 2^7 = 2^{14} \times 2^7 = 2^{21}$;

∴ the answer is A.

UNIT 9 OPERATIONS OF SIMPLE POLYNOMIALS

1. B	2. C	3. B	4. A	5. A	6. C	7. A	8. D
9. A	10. D	11. B	12. B	13. C	14. C	15. B	16. A
17. B	18. D	19. A	20. D	21. C	22. A	23. B	24. C
25. B	26. B	27. B	28. D	29. C	30. A	31. D	32. D
33. A	34. C	35. A	36. D	37. B	38. C	39. B	40. C
41. C	42. A	43. B	44. D	45. B			

Explanatory Notes

1.　II. is wrong because there is a variable (變數) in the denominator (分母).

　　III. is wrong because it involves the square root of a variable.

22.　$(-2 + 7x^2 - 4x) - (-3x^2 - 6x + 5)$

　　$= -2 + 7x^2 - 4x + 3x^2 + 6x - 5 = 10x^2 + 2x - 7$

23.　Perimeter $= [(a^2 + 1) + (a^2 - 1)] \times 2 = 2a^2 \times 2 = 4a^2$ cm

29.　$(2x - 3)^2 = (2x - 3)(2x - 3) = 4x^2 - 6x - 6x + 9 = 4x^2 - 12x + 9$

33.　Area $= \dfrac{1}{2} \times (x + 7)(2x + 6) = \dfrac{1}{2}(2x^2 + 20x + 42)$

　　$= (x^2 + 10x + 21)$ cm^2

34.　Total surface area $= 6(x - 1)(x - 1) = 6(x^2 - 2x + 1)$

　　　　　　　　$= (6x^2 - 12x + 6)$ cm^2

38.　Coefficient of $x^2 = (1)(-1) + (-5)(1) = -6$;

　　constant term $= -5(+2) = -10$

41.　$y - (3 - y)(y + 1) = y - (3y + 3 - y^2 - y)$

　　$= y - 3y - 3 + y^2 + y = y^2 - y - 3$

44.　Lower base $=$ height $= (x + 3) + (x - 1) = 2x + 2$,

　　$\therefore$ area $= \dfrac{[(x + 3) + (2x + 2)](2x + 2)}{2} = (3x + 5)(x + 1)$

　　$= 3x^2 + 3x + 5x + 5 = (3x^2 + 8x + 5)$ sq. units

45.　Total bus fare $= y(2y - 1) + (y + 1)(5 - y)$

　　　　　　$= 2y^2 - y + (5y - y^2 + 5 - y) = \$(y^2 + 3y + 5)$

UNIT 10 SIMPLE STATISTICAL GRAPHS (1)

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

25. D   26. D   27. C   28. B   29. B   30. C   31. D   32. A
33. B

Explanatory Notes

6. $y = 360° \times \dfrac{10}{100} = 36°$

7.   Monthly salary = $15600 \div 30\%$ = \$52000

9.   The department store was losing money in the years in which sales < expenditure, i.e. 2017 and 2018.

14.   Percentage $= \dfrac{200-100}{200} \times 100\% = \dfrac{100}{200} \times 100\% = 50\%$

15.   % decrease $= \dfrac{250-150}{250} \times 100\% = \dfrac{100}{250} \times 100\% = 40\%$

16.   % increase $= \dfrac{250-100}{100} \times 100\% = \dfrac{150}{100} \times 100\% = 150\%$

19.   The required records are : 31, 35, 40 and 42, $\therefore$ 4 days

20. x can be 5, 6, 7 and 8, $\therefore$ 4 values

21.   No. of girls with scores 50 or above = $5 + 3 + 2 = 10$,
      $\therefore$ passing % $= \dfrac{10}{15} \times 100\% = 66\dfrac{2}{3}\%$

22.   No. of students failed = $30 \times (1 - 80\%) = 6$. From the diagram, the lowest marks are from 31 to 47, $\therefore$ the passing mark is 48.

23. y can be 0, 1 or 2.

UNIT 11 BASIC GEOMETRY

1. A   2. D   3. B   4. D   5. B   6. C   7. A   8. A
9. B   10. A   11. D   12. D   13. C   14. C   15. C   16. D
17. C   18. C   19. B   20. B   21. A   22. C   23. A   24. A
25. D   26. C   27. D   28. A   29. D   30. C   31. B   32. A
33. C   34. D   35. B   36. B   37. B   38. D   39. C   40. C
41. C   42 C   43. B   44. B   45. A   46. A

Explanatory Notes

11.   Counting from "6" to "2.5",
      the angle $= 360° \times \dfrac{8.5}{12} = 255°$

12.   I. $\because$ $\angle ABX = \angle XBY$ and $\angle XBY = \angle CBY$,
          $\therefore$ $\angle ABX = \angle XBY = \angle CBY$

      II. $\angle ABY = \angle ABX + \angle XBY = \angle CBY + \angle XBY = \angle CBX$
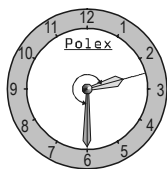
III. $\angle ABC = \angle ABX + \angle XBY + \angle CBY = 3\angle XBY$
∴ I, II and III are true.

13. $\angle DOE = \angle EOB = 15°$, $\angle COD = \angle DOB = 15° + 15° = 30°$,
$\angle AOC = \angle COB = 30° + 30° = 60°$,
∴ $\angle AOE = 60° + 30° + 15° = 105°$

25. By counting, there are 9 diagonals.
(OR : Every vertex forms 3 diagonals with other
non-adjacent vertices, but in this way each diagonal
is counted twice,
∴ the no. of diagonals $= 6 \times 3 \div 2 = 9$)
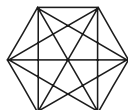
30. I.   II.   III.

∴ The answer is C.

32. Uniform cross-section of
B: C: D:

37. The angle moved by the hour-hand in 1h $= \dfrac{1}{12} \times 720° = 30°$.

∴ The marked angle $= 30° \times 2 + 30° \times \dfrac{3}{12} = 67.5°$

41. It can be cut into 4 Δ s, ∴ sum $= 180° \times 4 = 720°$

42. It can be cut into 4 Δ s, ∴ sum $= 180° \times 4 = 720°$

45. The figure is composed of 2 Δ s,
∴ sum $= 180° \times 2 = 360°$

46. $2x + 2y + 70° = 180°$, $2x + 2y = 110°$,
$x + y = 55°$,
∴ $\angle D = 180° - (x + y) = 180° - 55° = 125°$
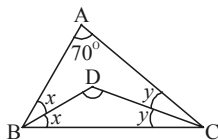
UNIT 12 AREAS AND VOLUMES (1)

1. D	2. C	3. A	4. D	5. B	6. A	7. C	8. A
9. B	10. B	11. D	12. B	13. C	14. B	15. B	16. A
17. A	18. D	19. B	20. B	21. D	22. D	23. B	24. C
25. B	26. C	27. D	28. A	29. A	30. C	31. A	32. D
33. A	34. B	35. B	36. B	37. D	38. D	39. C	40. D
41. B	42. C	43. A	44. A	45. D	46. A	47. B	48. C
49. B	50. B	51. C	52. C				

Explanatory Notes

9. Area $= (\frac{1}{2} \times 21 \times \frac{16}{2}) \times 2 = 168\,\text{cm}^2$

10. Area $= \frac{12 \times 10}{2} + \frac{12 \times 11}{2} = 60 + 66 = 126\,\text{cm}^2$

11. A. $\frac{25 \times 12}{2} = 150\,\text{cm}^2$ B. $10 \times 15 = 150\text{ cm}^2$

    C. $\frac{(7+17) \times 12.5}{2} = 150\,\text{cm}^2$ D. $\frac{19 \times 4}{2} + \frac{19 \times 12}{2} = 152\text{ cm}^2$

    $\therefore$ The answer is D.

14. $a \times 4 = 5 \times 12$, $\therefore$ $a = 60 \div 4 = 15$

15. Lower base $= x$ cm, $\frac{(10+x) \times 16}{2} = 320$, $10 + x = 40$, $x = 30$

16. Perimeter $= (5 + 5 + 3 + 3.5 + 2.5 + 6) \times 2 = 50$

17. Area $= (2 + 1.5 \times 2) \times (2 + 0.5 \times 2) - 2 \times 2 = 5 \times 3 - 4 = 11\,\text{m}^2$

19. Area $= \frac{1}{2} \times 16 \times 16 + \frac{1}{2} \times 7 \times 7 + (\frac{1}{2} \times 7 \times 16) \times 2 = 128 + 24.5 + 112$

    $= 264.5\,\text{cm}^2$

20. A regular hexagon can be divided into 6 identical triangles, each of

    them has 6 cm as the base, $\frac{10.4\text{cm}}{2}$ as the height.

    Area $= (\frac{1}{2} \times 6 \times \frac{10.4}{2}) \times 6 = 93.6\,\text{cm}^2$

26. Total surface area $= (\frac{1}{2} \times 12 \times 5) \times 2 + (5 + 12 + 13) \times 9$

    $= 60 + 270 = 330\,\text{cm}^2$

29. Volume $= 3 \times 5 \times \frac{24 - 5 \times 2}{2} = 3 \times 5 \times 7 = 105\,\text{cm}^3$

32. New water level $= (6 \times 60) \div (12 \times 15) + 14 = 360 \div 180 + 14$

    $= 2 + 14 = 16\,\text{cm}$

36. Height $= x$ cm, $\frac{(9+15)x}{2} \times 16 = 12^3$, $x = \frac{12 \times 12 \times 12}{24 \times 8} = 9$

37. Side $= x$ cm, $6x^2 = 486$, $x^2 = 81$, $x = \sqrt{81} = 9$,

    $\therefore$ volume $= 9^3 = 729\text{ cm}^3$

40. $\because \triangle ABC$, $\triangle ABE$ and $\triangle ABD$ share the same base (AB) and the same

    height, $\therefore$ they have the same area.

41. $AZ = DZ = \frac{20}{2} = 10$ cm, $DY = 6 \times 3 = 18$ cm,

    $AX = 18 + 6 - 8 = 16$ cm,

    $\therefore$ shaded area $= 20 \times 24 - \frac{8 \times 20}{2} - \frac{10 \times 18}{2} - \frac{10 \times 16}{2}$

    $= 480 - 80 - 90 - 80 = 230\,\text{cm}^2$

42. Shaded area $= 18 \times 13 + 22 \times 9 - 13 \times 9 = 234 + 198 - 117 = 315\,\text{cm}^2$

43. $CD = 26 \div 6.5 = 4\,\text{m}$,
    $\therefore$ shaded area $= 10.5 \times 4 + 26 \div 2 = 42 + 13 = 55\,\text{m}^2$

44. area of ΔPST = area of PQRS – 45 – 27 = 2 × area of ΔPQT – 72
    = 90 – 72 = 18 cm^2

48. Volume $= \dfrac{3 \times 1000}{1.5} = 2000\,\text{cm}^3$,
    $\therefore$ thickness $= 2000 \div (25 \times 16) \div 500 = 2000 \div 400 \div 500$
    = 0.01 cm = 0.1 mm

52. Shallow end : x m , deeper end : $(x + 3)$ m ,
    $\dfrac{(x + x + 3) \times 50}{2} \times 10 = 2000$, $2x + 3 = 8$, $x = 2.5$

UNIT 13 ANGLES AND PARALLEL LINES

1. C	2. C	3. A	4. C	5. B	6. B	7. A	8. D
9. C	10. C	11. D	12. B	13. D	14. D	15. B	16. A
17. C	18. A	19. C	20. D	21. A	22. B	23. B	24. D
25. C	26. B	27. C	28. A	29. D	30. A	31. D	32. B
33. C	34. C	35. A	36. D	37. A	38. D	39. A	40. A
41. A	42. D	43. C	44. D	45. D	46. B	47. B	48. C
49. B	50. B	51. B	52. C	53. D	54. C	55. A	56. D
57. B	58. B	59. C	60. B	61. D	62. D	63. C	64. A
65. B	66. C	67. C	68. D	69. C	70. B	71. A	

Explanatory Notes

13. $a + (a + 72°) + (a - 36°) = 360°$, $\therefore$ a = 108°;
    $2a + c = 2\,(108°) + (108° - 36°) = 288°$

15. $2x - 10° + y + 90° + 90° = 360°$, $2x + y = 190°$,
    $x = \dfrac{190° - y}{2} = 95° - \dfrac{y}{2}$

28. $x + 57° + 64° = 180°$, $x = 59°$;
    $y + 80° + 59° = 180°$, $y = 41°$

31. $b + x = 180°$, $x = 180° - b$;
    $a + (180° - b) + 90° = 360°$,
    $a - b = 90°, b = a - 90°$

32. $\because a = x$, $\therefore x + b = a + b = 180°$;
    $\because d = y$, $\therefore y + c = d + c = 180°$;
    $\therefore a + b + c + d = 180° + 180° = 360°$
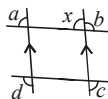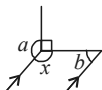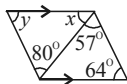
33. $a = x$; $a + b = 180°$, $b = 180° - a = 180° - x$;
    $y + (180° - x) = 360°$, $y = 180° + x$
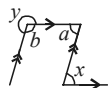
37. $\angle R = x + 3y$; $\angle R + 3y - y = 180°$, $x + 3y + 3x - y = 180°$,
    $4x + 2y = 180°$, $2x = 90° - y$, $x = 45° - \dfrac{y}{2}$

38. $p + q = 74° \cdots (1)$, $p - q = 42° \cdots (2)$, Solving (1) and (2), we have
    $p = 58°$, $q = 16°$.

41. $x = 150°$, $y = 114°$, $\therefore$ $150° + 114° + k = 360°$,
    $k = 96°$
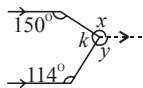
42. $x = z_1$, $y = z_2$,
    $\therefore$ $z = z_1 + z_2 = x + y$
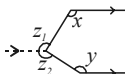
44. $x = p$, $y = 2p$,
    $\therefore$ $p + 2p + 5p - 20° = 360°$,
    $8p = 380°$, $p = 47.5°$
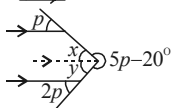
45. $\angle BCF = 30°$, $\angle DCF = p + 15°$,
    $\therefore$ $30° + p + 15° = 2p$, $p = 45°$,
    $\therefore$ $\angle BCD = 2(45°) = 90°$
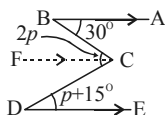
46. $a = 70°$; $70° + b + 230° = 360°$,
    $b = 60°$; $c = b = 60°$;
    $d = 90° - 60° = 30°$; $y = d = 30°$
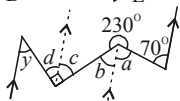
47. $x + a = 180°$, $x = 180° - a$; $y = c$;
    $\therefore$ $(180° - a) + b + c = 360°$,
    $b + c - a = 180°$
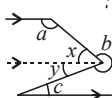
50. $a = 180° - 6w$, $b = 180° - 2w$,
    $\therefore$ $(180° - 6w) + 36° + (180° - 2w) = 180°$,
    $8w = 216°$, $w = 27°$
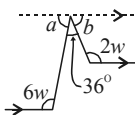
51. $x = 180° - a$, $y = 180° - b$,
    $\therefore$ $(180° - a) + c + (180° - b) = 180°$,
    $c - a - b + 180° = 0$, $a + b = 180° + c$
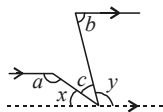
52. $x = p$, $y = 180° - 2p$,
    $\therefore$ $p + 2(180° - 2p) = 180°$,
    $p + 360° - 4p = 180°$, $3p = 180°$, $p = 60°$
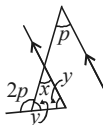
53. $92° + n = 180°$, $n = 16°$;
    $\therefore$ $m = 126° + 16° = 142°$
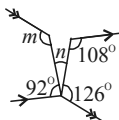
54. $y = 54°$, $\therefore$ $k + 54° = 154°$,
    $k = 100°$
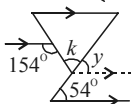
56. $x = 180° - a$, $y = 180° - b$,
   $\therefore\ (180° - a) + (180° - b) + c = 180°$,
   $c - a - b + 180° = 0$, $c = a + b - 180°$
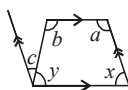
58. $\angle AOC = 227° + 241° - 360° = 108°$

59. $p + q + r = 360° \times 3 - 180° = 900°$

60. $x = 180° - 90° - b = 90° - b$,
   $y = 180° - 90° - c = 90° - c$,
   $\therefore\ a + (90° - b) + (90° - c) = 360°$, $a = 180° + b + c$
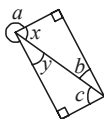
62. $a = b = 180° - 2x$, but $a = c$ and $b = d$,
   $\therefore\ (180° - 2x) + (180° - 2x) + y = 180°$,
   $y = 4x - 180°$
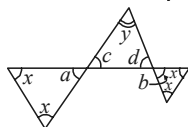
63. $\angle AOB = \angle COD = 90° - a$,
   $\angle EOF = \angle AOD = (90° - a) + a + (90° - a) = 180° - a$

69. $117° + 128° - \angle ACD = 180°$, $\angle ABC = 65°$, $\therefore\ y = 65°$

70. $2y = 3x$, $y = 1.5x \cdots (1)$, $4x + 2y + 2y = 180°$, $x + y = 90° \cdots (2)$,
   Solving (1) and (2), we have $x = 18°$, $y = 27°$.
   $\therefore z = 180° - 5(27°) = 45°$

UNIT 14 CONGRUENT TRIANGLES

1. C	2. C	3. B	4. A	5. D	6. B	7. D	8. C
9. A	10. A	11. D	12. A	13. B	14. B	15. D	16. A
17. D	18. C	18. D	20. B	21. C	22. A	23. D	24. A
25. A	26. B	27. C	28. C	29. D	30. A	31. D	32. D
33. A							

Explanatory Notes

20. In ΔACE and ΔADE, $AE = AE$ (common), $\angle AEC = \angle AED = 90°$
   (given), $CE = DE$ (given), $\therefore\ \Delta ACE \cong \Delta ADE$ (S.A.S.)

29. I. $AB = BC = CD = DC$ (corr. sides, $\cong \Delta$s)
   II. $\angle EAB = \angle FBC$ (corr. $\angle$s, $\cong \Delta$s), $\angle ABE + \angle EAB + 90° = 180°$
      ($\angle$ sum of Δ), $\angle ABE + \angle EAB = 90°$,
      $\therefore\ \angle ABE + \angle FBC = 90°$, i.e. $\angle ABC = 90°$
   III. By II, $\angle ABC = \angle BCD = \angle CDA = \angle DAB = 90°$, and by I,
      $ABCD$ is a square.

30. $CG = AE = 5$ cm , $FG = 8 - 5 = 3$ cm , $\because\ EFGH$ is a square,
   $\therefore$ area of $EFGH = 3 \times 3 = 9$ cm^2

32. A. $CD = CE$, $CB = CA$, $\angle DCB = \angle ECA = 60°$,
      $\therefore\ \Delta ACE \cong \Delta BCD$ (SAS)

B. $\because \Delta ACE \cong \Delta BCD$, $\therefore \angle AEC = \angle BDC = 90°$,
   $\therefore \angle AEB = 180° - 90° = 90°$,
   but $AB = AC$ and AE is common, $\therefore \Delta ACE \cong \Delta ABE$ (RHS)

C. $\angle DBC = 180° - \angle BCD - \angle BDC = 180° - 60° - 90° = 30°$,
   $\angle BDE = 90° - 60° = 30°$,
   $\therefore BE = DE$, $\therefore \Delta BDE$ is isosceles.

33. I. $\Delta ABC \cong \Delta CDE$ (ASA/AAS)

II. $AC = EC$, $AF = EF$, $CF = CF$, $\therefore \Delta AFC \cong \Delta EFC$ (SSS),
    $\therefore \angle AFC = \angle EFC = 90°$

III. $\because \Delta AFC \cong \Delta EFC$, $\therefore \angle ACF = \angle ECF = \dfrac{90°}{2} = 45°$,
     $\therefore \angle FAC = 180° - 90° - 45° = 45°$,
     $\therefore AF = FC$, but $AB \neq BC$,
     $\therefore \Delta AFC$ is not congruent to ΔABC.
     $\therefore$ The answer is A.

UNIT 15 INTRODUCTION TO COORDINATES

1. A	2. B	3. C	4. C	5. D	6. A	7. C	8. A
9. B	10. A	11. A	12. D	13. B	14. C	15. B	16. C
17. C	18. B	19. B	20. D	21. B	22. C	23. D	24. C
25. B	26. C	27. B	28. B	29. A	30. D	31. C	32. A
33. D	34. D	35. B	36. C	37. C	38. D	39. B	40. D
481. C	42. A	43. C	44. D	45. D	46. A	47. B	48. A
48. D	50. B	51. A	52. D	53. C			

Explanatory Notes

5. y-coordinate $= 0$, $\therefore 1 - b = 0$, $b = 1$
14. $AB = (m+6) - (m-1) = m + 6 - m + 1 = 7$ units,
    $BC = (m-1) - (m-5) = m - 1 - m + 5 = 4$ units
16. $1 - (-k) = 6$, $1 + k = 6$, $\therefore k = 5$
17. A. XY is horizontal, $\therefore b = d$
    B. YZ is vertical, $\therefore c = e$
    C. $XY = a - c = 0 - c = -c$ units
    D. $YZ = d - f = d - 0 = d$ units
    $\therefore$ The answer is C.
18. Area $= \dfrac{(7+13) \times 6}{2} = 60$ sq. units
19. Area $= \dfrac{5 \times 6}{2} + \dfrac{5 \times 6}{2} = 15 + 15 = 30$ sq. units

20. $\text{Area} = 5 \times 4 - \dfrac{5 \times 2}{2} - \dfrac{2 \times 2}{2} - \dfrac{3 \times 4}{2} = 20 - 5 - 2 - 6 = 7$ sq. units

23. $\text{Area} = (15 - 0) \times [9 - (-4)] = 15 \times 13 = 195$ sq. units

24. $\dfrac{(x-4) \times [10 - (-2)]}{2} = 48$, $6(x-4) = 48$, $x - 4 = 8$, $\therefore\ x = 12$

25. Upper base $= a$, $\dfrac{(a+11) \times 4}{2} = 30$, $a + 11 = 15$, $a = 4$,

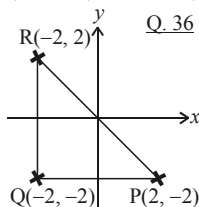 $\therefore$ x-coordinate of $P = 1 - 4 = -3$, $\therefore\ P = P_2$

30. $X'(a,b)$ reflects along y-axis $\to (-a,b)$ reflects along x-axis $\to$
    $X(-a,-b)$

31. $A(5,2)$; distance from A to $L = 5 - (-3) = 8$,
    $\therefore$ image of A is $(5 - 8 \times 2,\, 2) = (-11, 2)$

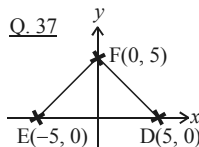34. $H' = (3,-8) = (a+1, -b)$, $\therefore\ a + 1 = 3$, $a = 2$; $-b = -8$, $\therefore\ b = 8$

36. $P(2,-2) \to Q(-2,-2) \to R(-2,2)$

    $\therefore \text{Area} = \dfrac{[2-(-2)] \times [2-(-2)]}{2}$

    $= \dfrac{4 \times 4}{2} = 8$ sq. units

    Q. 36

37. $D(5,0) \to E(-5,0) \to F(0,5)$,

    $\therefore \text{Area} = \dfrac{[5-(-5)] \times (5-0)}{2}$

    $= \dfrac{10 \times 5}{2} = 25$ sq. units

    Q. 37

42. A. Distance $= 6 - 0 = 6$ units
    B. Distance $= 10 - 6 = 4$ units
    C. Distance $= 4 - (-1) = 5$ units
    D. Distance $= -1 - (-4) = 3$ units
    $\therefore$ The answer is A.

43. $(4q - 7) - (-2 - q) = 15$, $4q - 7 + 2 + q = 15$, $5q = 20$, $q = 4$

45. When A is on the left of B : $(2m - 7) - (m + 4) = 8$,
    $2m - 7 - m - 4 = 8$, $m = 19$.
    When A is on the right of B : $(m + 4) - (2m - 7) = 8$,
    $m + 4 - 2m + 7 = 8$, $m = 3$

46. $PS = QR = 3 - (-7) = 10$ units , $\therefore\ R = (-1 - 10, -12) = (-11, -12)$

48. $\text{Area} = 11 \times 14 - \dfrac{8 \times 11}{2} - \dfrac{7 \times 2}{2} - \dfrac{(2+14) \times 4}{2}$

    $= 154 - 44 - 7 - 32 = 71$ sq. units

51. $\triangle XYZ$ is a right-angled $\triangle$. $XY = h$ units ; $YZ = k$ units ,

    $\therefore\ \text{area} = \dfrac{1}{2} hk$ units