Base Conversion

1. What is the binary representation of the hexadecimal number 89?

   A. 00101101
   B. 01011010
   C. 10110100
   D. 10011000
   E. 10001001

   [1984-CE-CS 1A-17]

2. Which of the following hexadecimal number is equal to the binary number 10011101?

   A. 5A
   B. FF
   C. 9D
   D. 9E
   E. 9F

   [1985-CE-CS 1A-17]

3. What is the number of 1's in the binary representation of $16^2 + 9 \times 16 + 3$?

   A. 2
   B. 4
   C. 5
   D. 6
   E. 8

   [1987-CE-CS 1A-9]

4. To convert a binary number into hexadecimals, a number of binary digits (bits) in the binary number are grouped together to form one hexadecimal digit. How many bits should be grouped?

   A. 2
   B. 3
   C. 4
   D. 8
   E. 16

   [1987-CE-CS 1A-12*]

5. Which of the following hexadecimal number is equivalent to the binary number 110110000000?

   A. D71
   B. D7
   C. D80
   D. D81
   E. E80

   [1988-CE-CS 1A-11]

6. The binary equivalent of the hexadecimal number ABC is

   A. 101010100011.
   B. 101010000011.
   C. 101010101010.
   D. 101010111100.
   E. 101011001011.

   [1989-CE-CS 1A-10]

7. The decimal representation of the binary number 11110 is

   A. 28.
   B. 30.
   C. 32.
   D. 34.
   E. 36.

   [1989-CE-CS 1A-11]

8. Which of the following is **not** a hexadecimal number?

   A. ABCGEF
   B. BCAEFC
   C. ACBDFA
   D. AFBCBF
   E. CEEFDA

   [1993-CE-CS 1A-6]

9. The decimal quantity represented by binary 1001 is _____.

   A. 1001
   B. 17
   C. –7
   D. 9
   E. 2

   [1999-CE-CS 1A-9]

10. Which of the following numbers is prime?

    A. 100_2
    B. 101_3
    C. 110_4
    D. 111_5
    E. None of the above

    [1972-CE-MATHS B1-1]

11. Convert the decimal number $2^{13} + 2^4 + 3$ to a binary number.

    A. 10000000000111_2
    B. 10000000001011_2
    C. 10000000010011_2
    D. 10000000100011_2

    [2006-CE-MATHS 2-39]

12. $ABCDE70000_{16}$ =

A. $10(16^9) + 11(16^8) + 12(16^7) + 13(16^6) + 14(16^5) + 7(16^4)$.
B. $10(16^{10}) + 11(16^9) + 12(16^8) + 13(16^7) + 14(16^6) + 7(16^5)$.
C. $11(16^9) + 12(16^8) + 13(16^7) + 14(16^6) + 15(16^5) + 7(16^4)$.
D. $11(16^{10}) + 12(16^9) + 13(16^8) + 14(16^7) + 15(16^6) + 7(16^5)$.

[2007-CE-MATHS 2-41]

13. 11000011000111_2 =

A. $2^{13} + 2^{12} + 2^7 + 2^6 + 7$.
B. $2^{13} + 2^{12} + 2^7 + 2^6 + 14$.
C. $2^{14} + 2^{13} + 2^8 + 2^7 + 7$.
D. $2^{14} + 2^{13} + 2^8 + 2^7 + 14$.

[2008-CE-MATHS 2-40]

14. Convert the decimal number $16^{12} + 14$ to a hexadecimal number.

A. $10000000000D_{16}$
B. $10000000000E_{16}$
C. $100000000000D_{16}$
D. $100000000000E_{16}$

[2009-CE-MATHS 2-40]

15. Convert the decimal number $11 \times 16^8 + 4 \times 16^3 + 14 \times 16^1 + 8$ to a hexadecimal number.

A. $A00040D8_{16}$
B. $B00040E8_{16}$
C. $A000040D8_{16}$
D. $B000040E8_{16}$

[2010-CE-MATHS 2-40]

16. 1000010000101_2 =

A. $5 + 2^7 + 2^{12}$.
B. $5 + 2^8 + 2^{13}$.
C. $10 + 2^7 + 2^{12}$.
D. $10 + 2^8 + 2^{13}$.

[2011-CE-MATHS 2-41]

HKDSE Problems

17. 1010010001001_2 =

A. $2^{12} + 2^{10} + 137$.
B. $2^{12} + 2^{10} + 273$.
C. $2^{13} + 2^{11} + 137$.
D. $2^{13} + 2^{11} + 273$.

[SP-DSE-MATHS 2-33]

18. $B0000000023_{16}$ =

A. $11 \times 16^{10} + 23$.
B. $11 \times 16^{10} + 35$.
C. $12 \times 16^{11} + 23$.
D. $12 \times 16^{11} + 35$.

[PP-DSE-MATHS 2-32]

19. $AD0000002012_{16}$ =

A. $(10)16^{11} + (13)16^{10} + 8210$.
B. $(10)16^{12} + (13)16^{11} + 131360$.
C. $(11)16^{11} + (14)16^{10} + 8210$.
D. $(11)16^{12} + (14)16^{11} + 131360$.

[2012-DSE-MATHS 2-33]

20. $A00000E00011_{16}$ =

A. $10 \times 16^{11} + 14 \times 16^5 + 17$.
B. $11 \times 16^{11} + 15 \times 16^5 + 17$.
C. $10 \times 16^{12} + 14 \times 16^6 + 272$.
D. $11 \times 16^{12} + 15 \times 16^6 + 272$.

[2013-DSE-MATHS 2-33]

21. $7 \times 2^{10} + 2^8 + 5 \times 2^3 - 2^3$ =

A. 111010100000_2.
B. 111100010000_2.
C. 1110100100000_2.
D. 1111000010000_2.

[2014-DSE-MATHS 2-34]

22. $11 + 2^6 + 2^{10} + 2^{11}$ =

A. 110001001011_2.
B. 110100100011_2.
C. 1100001001011_2.
D. 1101001000011_2.

[2015-DSE-MATHS 2-33]

23. $BC000DE000000_{16}$ =

A. $188 \times 16^{11} + 222 \times 16^6$.
B. $205 \times 16^{11} + 239 \times 16^6$.
C. $188 \times 16^{12} + 222 \times 16^7$.
D. $205 \times 16^{12} + 239 \times 16^7$.

[2016-DSE-MATHS 2-33]

24. $8^3 + 8^{19}$ =

A. 10000000000010_{16}.
B. 20000000000020_{16}.
C. 100000000000100_{16}.
D. 200000000000200_{16}.

[2017-DSE-MATHS 2-32]

25. $100110000010110_2 =$

A. $19 \times 2^{10} + 22$
B. $19 \times 2^{10} + 44$
C. $19 \times 2^{11} + 22$
D. $19 \times 2^{11} + 44$

[2019-DSE-MATHS 2-33]

26. $B000000000000030_{16} =$

A. $10 \times 2^{60} + 48$
B. $11 \times 2^{60} + 48$
C. $10 \times 2^{64} + 768$
D. $11 \times 2^{64} + 768$

[2020-DSE-MATHS 2-31]

Basic Arithmetic

1. Which of the following expressions will remain unchanged in value if both a and b are increased to k times of their original value?

   (1) $a - b$
   (2) $(\frac{a+b}{2a+b})^2$
   (3) $\frac{a+b}{a^2+b^2}$

   A. (1) only
   B. (2) only
   C. (3) only
   D. (1) and (2) only
   E. (1), (2) and (3)

   [1977-CE-MATHS 2-14]

2. Let a be a positive number. Which of the following has no meaning in mathematics?

   (1) $0 \times a$
   (2) $0 \div a$
   (3) $a \div 0$

   A. (1) only
   B. (2) only
   C. (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [SP-CE-MATHS 2-33]

3. In order to double the value of the expression

   $$(a + \frac{b}{c}) \div \frac{d}{e}$$

   which one of the numbers in the expression should be doubled?

   A. a
   B. b
   C. c
   D. d
   E. e

   [1979-CE-MATHS 2-2]

4. If $x + y = 0$, then which of the following are true?

   (1) both x and y must be zero
   (2) $(x^2 + y^2)$ must be zero
   (3) xy must be zero

   A. none of them
   B. (1) only
   C. (2) only
   D. (3) only
   E. (1), (2) and (3)

   [1979-CE-MATHS 2-37]

Divisibility

5. x and y are two unequal positive integers. Both are divisible by 3. Which of the following numbers **must** be divisible by 9?

   (1) $x + y^2$
   (2) $x + 2y$
   (3) $x^2 + 3y$

   A. (1) only
   B. (2) only
   C. (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [1978-CE-MATHS 2-42]

6. x, y and z are three consecutive positive integers. Which of the following is true?

   A. $x+y+z$ must be odd
   B. $x+y+z$ must be even
   C. xyz must be odd
   D. xyz must be even
   E. $x^2+y^2+z^2$ must be even

   [1980-CE-MATHS 2-36]

7. x is a positive integer such that $x^2 + 2x + 7$ is even. What are the possible value of x?

   A. x can be any positive integers
   B. x can be any positive even number
   C. x can be any positive odd number
   D. x must be an even number greater than 10000
   E. x must be a positive odd number less than 10000

   [1980-CE-MATHS 2-40]

8. If n is a positive integer, which of the following numbers is/are odd?

   (1) 2^{2n+1}
   (2) $3(2^n)$
   (3) $(2n+1)^2$

   A. (2) only
   B. (3) only
   C. (1) and (3) only
   D. (2) and (3) only
   E. (1), (2) and (3)

   [1981-CE-MATHS 2-37]

9. Let n be a positive integer. Which of the following numbers is/are odd?

(1) 2^{2n+1}
(2) $2^n + 1$
(3) $3(2^n)$

A. (1) only
B. (2) only
C. (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1987-CE-MATHS 2-44]

10. Which of the following is/are true?

(1) If both 2 and 3 are factors of m, then 6 is also a factor of m.
(2) If 15 is a factor of n, then both 3 and 5 are factors of n.
(3) If p is a multiple of both 4 and 6, then p is also a multiple of 24.

A. (1) only
B. (2) only
C. (1) and (2) only
D. (2) and (3) only
E. (1), (2) and (3)

[1989-CE-MATHS 2-10]

11. Let a and b be two consecutive positive integers. Which of the following must be true?

(1) $a + b$ is odd
(2) ab is odd
(3) $a^2 + b^2$ is odd

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1998-CE-MATHS 2-37]

12. Let m be a positive integer. Which of the following must be true?

(1) m^2 is even.
(2) $m(m+1)$ is even.
(3) $m(m+2)$ is even.

A. (1) only
B. (2) only
C. (3) only
D. (1) and (3) only
E. (2) and (3) only

[1999-CE-MATHS 2-14]

H.C.F. & L.C.M. of Numbers

13. Given two numbers, one even and one odd, their H.C.F.

(1) must be odd,
(2) must be even,
(3) may be odd or even;

their L.C.M.

(4) must be odd,
(5) must be even,
(6) may be odd or even.

Which of the following is true?

A. (1) and (5)
B. (1) and (6)
C. (2) and (4)
D. (2) and (5)
E. (3) and (4)

[SP-CE-MATHS 2-19]

14. The Highest Common Factor of two unequal positive integers a and b is 8. Which of the following must be true?

(1) The difference between a and b is divisible by 8.
(2) $(a + b)$ is divisible by 16.
(3) ab is divisible by 64.

A. (3) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1980-CE-MATHS 2-35]

15. m and n are multiples of 3 and 4 respectively. Which of the following must be true?

(1) mn is a multiple of 12.
(2) The H.C.F. of m and n is even.
(3) The L.C.M. of m and n is even.

A. (1) only
B. (1) and (2) only
C. (1) and (3) only
D. (2) and (3) only
E. (1), (2) and (3)

[1996-CE-MATHS 2-37]

Scientific Notations

1. $2 \times 10^{-5} + 3 \times 10^{-4} =$

A. 3.2×10^{-4}.
B. 3.2×10^{-5}.
C. 2.3×10^{-5}.
D. 5×10^{-9}.
E. 6×10^{-9}.

[1978-CE-MATHS 2-1]

2. $(4.5 \times 10^{8}) \div (9 \times 10^{2}) =$

A. 2×10^{5}.
B. 2×10^{6}.
C. 5×10^{4}.
D. 5×10^{5}.
E. 5×10^{6}.

[1979-CE-MATHS 2-1]

Significant Figures

3. Which of the following is $\sqrt{0.0006}$, correct to 4 significant figures?

A. 0.7746
B. 0.2449
C. 0.07746
D. 0.02449
E. 0.007746

[1972-CE-MATHS B1-3]

4. When 0.001 844 81 is expressed correct to 3 significant figures, it becomes

A. 0.001 80 .
B. 0.001 84 .
C. 0.001 85 .
D. 0.001 90 .
E. 0.002 .

[SP-CE-MATHS 2-6]

5. Round off the number 0.044449 to 3 significant figures.

A. 0.04
B. 0.044
C. 0.045
D. 0.0444
E. 0.0445

[1995-CE-MATHS 2-1]

6. Evaluate $1.15 \div 15$ correct to 3 significant figures.

A. 0.076
B. 0.077
C. 0.0766
D. 0.0767
E. $0.07\dot{6}$

[1996-CE-MATHS 2-1]

7. Express π^2 as a decimal correct to 3 significant figures.

A. 9.86
B. 9.87
C. 9.88
D. 9.860
E. 9.870

[1997-CE-MATHS 2-1]

8. If $0.8448 < a < 0.8452$, which of the following must be true?

A. $a = 0.9$ (correct to 1 significant figure)
B. $a = 0.85$ (correct to 2 significant figures)
C. $a = 0.845$ (correct to 3 significant figures)
D. $a = 0.8450$(correct to 4 significant figures)

[2003-CE-MATHS 2-9]

9. Express $\sqrt{2007}$ as a decimal correct to 5 significant figures.

A. 44.790
B. 44.799
C. 44.79955
D. 44.800

[2007-CE-MATHS 2-12]

10. 0.0498765 =

A. 0.050 (correct to 2 decimal places).
B. 0.050 (correct to 3 significant figures).
C. 0.0499 (correct to 4 decimal places).
D. 0.0499 (correct to 5 significant figures).

[2008-CE-MATHS 2-17]

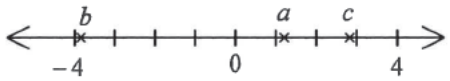
Estimation

11. If the radius of a sphere is measured as 8 cm correct to the nearest cm, then the least possible surface area of the sphere is

A. 64π cm^2.
B. 225π cm^2.
C. 256π cm^2.
D. $\frac{1125\pi}{2}$ cm^2.

[2008-CE-MATHS 2-16]

12. The figure shows the positions of three real numbers a, b and c on the number line. Which of the following is the best estimate of $c(a-b)$?



A. −15
B. −9
C. 9
D. 15

[2009-CE-MATHS 2-15]

13. If the length and the breadth of a rectangle are measured as 12 cm and 10 cm respectively and all the measurements are correct to the nearest cm, then the least possible area of the rectangle is

A. 99 cm^2.
B. 109.25 cm^2.
C. 120 cm^2.
D. 131.25 cm^2.

[2010-CE-MATHS 2-17]

14. The figure shows the positions of four real numbers p, q, r and s on the number line. Which of the following is the best estimate of $(p-q)(r+s)$?

A. −36
B. −12
C. 12
D. 36

[2011-CE-MATHS 2-14]

HKDSE Problems

15. The lengths of the three sides of a triangle are measured as 15 cm, 24 cm and 25 cm respectively. If the three measurements are correct to the nearest cm, find the percentage error in calculating the perimeter of the triangle correct to the nearest 0.1%.

A. 0.8%
B. 2.3%
C. 4.7%
D. 6.3%

[SP-DSE-MATHS 2-15]

16. 0.009049999 =

A. 0.00905 (correct to 3 decimal places).
B. 0.00905 (correct to 3 significant figures).
C. 0.00905 (correct to 6 decimal places).
D. 0.00905 (correct to 6 significant figures).

[PP-DSE-MATHS 2-14]

17. 0.0322515 =

A. 0.032 (correct to 3 significant figures).
B. 0.0322 (correct to 4 decimal places).
C. 0.03225 (correct to 5 significant figures).
D. 0.032252 (correct to 6 decimal places).

[2012-DSE-MATHS 2-13]

18. The length of a piece of thin string is measured as 25 m correct to the nearest m. If the string is cut into n pieces such that the length of each piece is measured as 5 cm correct to the nearest cm, find the greatest possible value of n.

A. 445
B. 566
C. 567
D. 650

[2012-DSE-MATHS 2-14]

19. 0.0504545 =

A. 0.051 (correct to 2 significant figures).
B. 0.0505 (correct to 3 decimal places).
C. 0.05045 (correct to 4 significant figures).
D. 0.05046 (correct to 5 decimal places).

[2013-DSE-MATHS 2-4]

20. The width and the length of a thin rectangular metal sheet are measured as 8 cm and 10 cm correct to the nearest cm respectively. Let x cm^2 be the actual area of the metal sheet. Find the range of values of x.

A. $71.25 \leq x < 89.25$
B. $71.25 < x \leq 89.25$
C. $79.5 \leq x < 80.5$
D. $79.5 < x \leq 80.5$

[2014-DSE-MATHS 2-11]

21. 0.0023456789 =

A. 0.00235 (correct to 6 decimal places).
B. 0.002345 (correct to 6 decimal places).
C. 0.002346 (correct to 6 significant figures).
D. 0.00234568 (correct to 6 significant figures).

[2015-DSE-MATHS 2-4]

22. There is a bag of white sugar. The weight of white sugar in the bag is measured as 5 kg correct to the nearest kg. If the bag of white sugar is packed into n packets such that the weight of white sugar in each packet is measured as 10 g correct to the nearest g, find the greatest possible value of n.

A. 429
B. 500
C. 578
D. 579

[2015-DSE-MATHS 2-14]

23. 0.0765403 =

A. 0.076 (correct to 2 significant figures).
B. 0.0765 (correct to 3 decimal places).
C. 0.07654 (correct to 4 significant figures).
D. 0.076540 (correct to 5 decimal places).

[2016-DSE-MATHS 2-4]

24. $\frac{1}{\pi^4}$ =

A. 0.0102 (correct to 3 significant figures).
B. 0.01025 (correct to 4 significant figures).
C. 0.01026 (correct to 5 decimal places).
D. 0.010266 (correct to 6 decimal places).

[2017-DSE-MATHS 2-4]

25. If $0.06557 < x < 0.06564$, which of the following is true?

A. $x = 0.065$ (correct to 2 decimal places)
B. $x = 0.065$ (correct to 2 sig. fig.)
C. $x = 0.0656$ (correct to 3 decimal places)
D. $x = 0.0656$ (correct to 3 sig. fig.)

[2019-DSE-MATHS 2-6]

Complex Numbers

1. If $i = \sqrt{-1}$, then $2i^2 + 3i^3 + 4i^4 + 5i^5 =$

A. $2 + 2i$.
B. $2 + 8i$.
C. $2 - 8i$.
D. $-6 - 8i$.
E. $-6 + 2i$.

[SP-CE-MATHS 2-46]

2. If $i = \sqrt{-1}$, then $\frac{i^{23}}{i^{10}} =$

A. 1.
B. -1.
C. i.
D. $-i$.
E. $i^{2\frac{3}{10}}$.

[SP-CE-MATHS 2-47]

3. If $i = \sqrt{-1}$, then $(1 + ai)(1 + bi) =$

A. $1 + ab$.
B. $2 + (a + b)i$.
C. $(1 - ab) + abi$.
D. $(1 - ab) + (a + b)i$.
E. $(1 + ab) + (a + b)i$.

[1979-CE-MATHS 2-27]

HKDSE Problems

4. If k is a real number, then $4k - \frac{6 + ki}{i} =$

A. $3k + 6i$.
B. $3k - 6i$.
C. $5k + 6i$.
D. $5k - 6i$.

[SP-DSE-MATHS 2-34]

5. If x is a real number, then the real part of $(x + 3i)(3 + i)$ is

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

[PP-DSE-MATHS 2-34]

6. $i^3(\beta i - 3) =$

A. $\beta + 3i$.
B. $\beta - 3i$.
C. $-\beta + 3i$.
D. $-\beta - 3i$.

[2012-DSE-MATHS 2-35]

7. The real part of $i + 2i^2 + 3i^3 + 4i^4$ is

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

[2013-DSE-MATHS 2-36]

8. If β is a real number, then $\frac{\beta^2 + 4}{\beta + 2i} =$

A. $\beta - 2i$.
B. $\beta + 2i$.
C. $2 - \beta i$.
D. $2 + \beta i$.

[2014-DSE-MATHS 2-36]

9. Let $z = (a + 5)i^6 + (a - 3)i^7$, where a is a real number. If z is a real number, then $a =$

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

[2015-DSE-MATHS 2-35]

10. Let $u = \frac{7}{a + i}$ and $v = \frac{7}{a - i}$, where a is a real number. Which of the following must be true?

(1) uv is a rational number.
(2) The real part of u is equal to the real part of v.
(3) The imaginary part of $\frac{1}{u}$ is equal to the imaginary part of $\frac{1}{v}$.

A. (1) only
B. (2) only
C. (1) and (3) only
D. (2) and (3) only

[2016-DSE-MATHS 2-34]

11. If k and $\frac{5}{2 - i} + ki$ are real numbers, then $k =$

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

[2017-DSE-MATHS 2-35]