**Answer Key – JSS 3 Term 1**

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| **Lesson Title:**  Sorting Objects |
| **Practice Activity:** PHM-09-001 |

1. School subjects: Math, Chemistry, English, Social Studies, Biology

Stationery/objects: Exercise book, Pen, Ruler, Desk, Pencil, Protractor

1. Vowels: A, O, E, U; Consonants: B, T, S, P, R, L, N, Q
2. a. Males: Issa Koroma, John Kamara, Mohamed Bah; females: Hawa Bangura, Aminata Kamara, Juliet Nyalloma

b. Surnames starting with letters A-M: Hawa Bangura, Issa Koroma, John Kamara, Mohamed Bah, Aminata Kamara; Surnames starting with letters N-Z: Juliet Nyalloma

c. Surnames starting with K: Issa Koroma, John Kamara, Aminata Kamara; Surnames starting with any other letters: Hawa Bangura, Mohamed Bah, Juliet Nyalloma

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| **Lesson Title:**  Introduction to Sets |
| **Practice Activity:** PHM-09-002 |

1. a. n(Colours) = 6; b. Blue Colours; c. Orange Colours
2. a. n(Continents) = 7; b. Africa Continents; c. Asia Continents
3. a. M is the set of months having 31 days; b. Yes, the set is well-defined because we can identify all of its members; c. M = {January, March, May, July, August, October, December}; d. August M; e. n(M) = 7

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| **Lesson Title:**  Sets in Real Life |
| **Practice Activity:** PHM-09-003 |

1. D = {Port Loko, Bombali, Kailahun, Koinadugu, Moyamba}
2. A = {Sierra Leone, Kenya, Mozambique, Liberia}
3. F = {Manchester United, Chelsea, Arsenal}
4. The set of people, P = {Abu, Fatu, Hawa, David, Mustapha, Alice}

The set of furniture, F = {desk, bed, table, chair}

The set of clothes, C = {trousers, hat, shirt, jacket, shoes, socks}

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| **Lesson Title:** Describe Sets of Objects |
| **Practice Activity:** PHM-09-004 |

1. M = {January, February, March, April, May, June, July, August, September, October, November, December}

M = {months of the year}

M = {x : x is a month of the year}

1. C = {c, h, e, m, i, s, t, r, y}

C = {letters in chemistry}

C = {x : x is a letter in chemistry}

1. a. P = {y : y is a letter in phone}; P = {p, h, o, n, e}
2. a. F = {z : z is a colour on the flag of Sierra Leone}; b. F = {green, white, blue}
3. a. S is the set of all x such that x is a sauce; b. F is the set of all y such that y is a female; c. M is the set of all z such that z is a letter in the word male.

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| **Lesson Title:** Write Sets of Numbers |
| **Practice Activity:** PHM-09-005 |

1. G = {4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44}
2. Z = {5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15}
3. a. S is the set of all x such that x is a multiple of 10 and x is less than 100; b. S = {10, 20, 30, 40, 50, 60, 70, 80, 90}; c. 30 S; d. 72 S
4. a. U = {3, 6, 9, 12, 15, 18, 21, 24, 27}; b. T = {y : y is a multiple of 6, y < 30}; c. See below; d. Tc = {3, 9, 15, 21, 27}; e. See below.

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| c. |  | e. |  |

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| **Lesson Title:**  Finite Sets |
| **Practice Activity:** PHM-09-006 |

1. F = {1, 2, 3, 6, 9, 18}; n(F) = 6
2. a. Finite, M = {January, February, March, … , December}, n(M) = 12; b. Finite, W = {8, 16, 24, 32, 40, 48}, n(W) = 6; c. Not finite, the list of all even numbers cannot be listed or counted; d. Finite, Y = {10, 12, 14, 16, 18, 20}, n(Y) = 6
3. a. A = {20, 22, 24, 26, 28, 30}, n(A) = 6; b. B = {25}, n{B} = 1; c. C = {20, 25, 30}, n(C) = 3; d. D = {20, 30}, n(D) = 2

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| **Lesson Title:** Infinite Sets |
| **Practice Activity:** PHM-09-007 |

1. a. Finite. The list ends with 100; b. Finite. The list ends with 101; c. Infinite. The ellipses show that it continues forever. d. Infinite. The ellipses show that it continues forever.
2. a. Infinite, A = {6, 8, 10, … }; b. Finite, B = {6, 8, 10}; c. Finite, C = {6, 8, 10, … , 100}; d. Infinite, D = {2, 4, 6, 8, … }
3. a. Infinite, X = {3, 6, 9, 12, … }; b. Finite, Y = {3, 6, 9}; c. Infinite, Z = {12, 15, 18, …}

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| **Lesson Title:** Unit and Empty Sets |
| **Practice Activity:** PHM-09-008 |

1. a. Not an empty set; b. Empty set; c. Not an empty set; d. Empty set
2. a. Unit set; b. Not a unit set; c. Unit set; d. Not a unit set
3. a. Neither; b. Empty set; c. Unit set; d. Neither

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| **Lesson Title:** Equal Sets |
| **Practice Activity:** PHM-09-009 |

1. a. Not equal; b. Not equal; c. Equal; d. Equal; e. Not equal; f. Equal
2. The following are 5 examples. Your own may be different:

A = {5, 5, 10, 10, 15, 15, 20, 20, 25}

B = {25, 20, 15, 10, 5}

C = {5, 15, 10, 25, 20}

D = {5, 5, 15, 20, 20, 25, 10}

E = {10, 5, 25, 20, 15}

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| **Lesson Title:** Equivalent Sets |
| **Practice Activity:** PHM-09-010 |

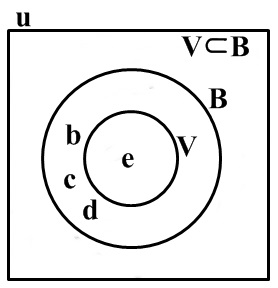
1. a. Equivalent; b. Not equivalent; c. Not equivalent; d. Equivalent
2. a. W and X are equivalent because n(W) = n(X) = 3. Y and Z are equivalent because n(Y) = n(Z) = 4.

b. W and X are equal because they have exactly the same elements, W = X = {r, s, t}. Y and Z are equal because they have exactly the same elements, Y = Z = {r, s, t, u}

1. a. B = {10, 12, 14, 16, 18}, D = {1, 2, 3, 4, 5}; b. A B, B C, C D, A D.

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| **Lesson Title:**  Introduction to Subsets |
| **Practice Activity:** PHM-09-011 |

1. S0 = {a, b, c, d}, S1 = {a, b, c}, S2 = {b, c, d}, S3 = {c, d, a}, S4 = {d, a, b}, S5 = {a, b}, S6 = {a, c}, S7 = {a, d}, S8 = {b, c }, S9 = {b, d}, S10 = {c, d}, S11 = {a}, S12 = {b}, S13 = {c}, S14 = {d}, S15 = ⏀ = {}
2. a. W is a subset of X; b. V is a subset of X; c. T is **not** a subset of X.
3. Venn diagram:



1. M1 = {2, 4, 6}, M2 = {2, 4}, M3 = {2, 6}, M4 = {4, 6}, M5 = {2}, M6 = {4}, M7 = {6}, M8 = { }

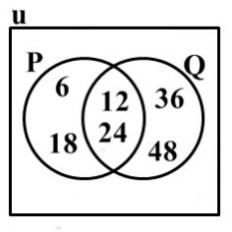
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| **Lesson Title:** Identifying Subsets of the set of Real Numbers |
| **Practice Activity:** PHM-09-012 |

1. Yes. N, W and Z are all subsets of Q.
2. Venn diagrams:

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| a. |  | b. |  | c. |  |

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| **Lesson Title:**  Comparing Sets of Real Numbers |
| **Practice Activity:** PHM-09-013 |

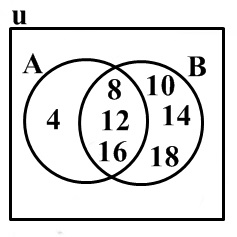
1. a. See below; b. P Q = {12, 24}; c. P Q = {6, 12, 18, 24, 36, 48}; d. PC = {36, 48}, QC = {6, 18}



1. a. R = {1, 2, 3, 4, 6, 12}, S = {2, 4, 6, 8, 10, 12}, U = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}; b. See below; c. R S = {2, 4, 6, 12}; d. R S = {1, 2, 3, 4, 6, 8, 10, 12}; e. RC = {5, 7, 8, 9, 10, 11}



1. a. A = {4, 8, 12, 16} , B = {8, 10, 12, 14, 16, 18}; b. See below; c. A B = {8, 12, 16}; d. A B = {2, 8, 10, 12, 14, 16, 18}; e. BC = {4}



1. a. A = {1, 2, 3, 4, 9}, B = {1, 4, 5, 7, 8}; b. A B = {1, 4}; c. A B = {1, 2, 3, 4, 5, 7, 8, 9}; d. AC = {5, 7, 8}, BC = {2, 3, 9}

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| **Lesson Title:** Ordering Sets of Real Numbers |
| **Practice Activity:** PHM-09-014 |

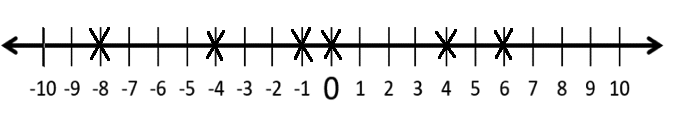
1. a. ; b. ; c. ; d.
2. a. ; b. ; c. ; d.

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| **Lesson Title:** Real Numbers on a Number Line |
| **Practice Activity:** PHM-09-015 |

1. Number line:



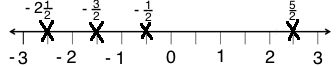
1. Number line:



1. Number line:



1. Number line:



1. Number line:



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| **Lesson Title:**  The Roman Numeral System |
| **Practice Activity:** PHM-09-016 |

1. Mark’s phone number:

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| 4 | 3 | 2 | 9 | 8 | 8 | 5 | 7 | 6 | 9 | 5 |
| IV | III | II | IX | VIII | VIII | V | VII | VI | IX | V |

1. a. XIII; b. XV; c. XIX; d. XVI

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| **Lesson Title:**  Converting between Base 10 and Roman Numerals |
| **Practice Activity:** PHM-09-017 |

1. a. XIX; b. XXIX; c. LV; d. LXXVIII; e. LXXXIII
2. a. 94; b. 14; c. 63; d. 49; e. 38

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| **Lesson Title:** Introduction to Base 2 |
| **Practice Activity:** PHM-09-018 |

1. Completed table:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***16*** | ***8*** | ***4*** | ***2*** | ***1*** |  |  |
| *1* | *0* | *0* | *0* | *0* | *=* | ***16*** |
| *1* | *0* | *0* | *0* | *1* | *=* | ***17*** |
| *1* | *0* | *0* | *1* | *0* | *=* | ***18*** |
| *1* | *0* | *0* | *1* | *1* | *=* | ***19*** |
| *1* | *0* | *1* | *0* | *0* | *=* | ***20*** |

1. a. 14; b. 12; c. 19; d. 5; e. 7

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| **Lesson Title:** Ordering and Comparing Numbers in Base 2 |
| **Practice Activity:** PHM-09-019 |

1. a. 101 < 1000; b. 1110 < 11011; c. 1011 < 1100; d. 11101 > 11001
2. a. {1, 10, 11, 100, 101, 110, 111}; b. {1011, 1100, 1101}; c. {10011, 10101, 10111, 11011, 11111}; d. {101, 110, 111, 1010, 1011}
3. a. { 111; 101; 100}, b. { 11101; 10111; 1101; 1011}; c. { 111; 110; 101; 11; 10}; d. { 11011; 10101; 10000; 1110; 1011; 1000}

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| **Lesson Title:**  Converting between Base 10 and Base 2 |
| **Practice Activity:** PHM-09-020 |

1. a. 110001two; b. 100000two; c. 10101two; d. 101011two; e. 100100two
2. a. 41ten; b. 31ten; c. 33ten; d. 27ten; e. 45ten

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| **Lesson Title:** Capacity and Mass |
| **Practice Activity:** PHM-09-021 |

1. a. 7 kg; b. 7,000 g
2. 200 ml
3. a. 1,500 ml; b. 1.5 l
4. 1.3 l
5. 2 kg

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| **Lesson Title:** Percentages of Quantities |
| **Practice Activity:** PHM-09-022 |

1. 480
2. 50
3. Le 960.00
4. 42 mangoes
5. 15 oranges
6. a. 420 children; b. 1,080 adults
7. a. He sold 125 newspapers; b. 375 newspapers remain
8. 64
9. Le 33,000.00
10. a. Le 80,000.00 b. Le 48,000.00

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| **Lesson Title:**  Percentage Increase and Decrease |
| **Practice Activity:** PHM-09-023 |

1. 15%
2. 5%
3. 50%
4. 7.5%
5. 5%
6. Le 66,500.00
7. 9.2 seconds
8. 104 cm
9. 598 pupils
10. Le 576,000.00

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| **Lesson Title:**  Ratios |
| **Practice Activity:** PHM-09-024 |

1. 48 bananas and 60 bananas
2. 50 grammes and 150 grammes
3. 60 exercise books and 90 exercise books

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| **Lesson Title:**  Rates |
| **Practice Activity:** PHM-09-025 |

1. 30 km/hr
2. 5 km/hr
3. 2.5 cars/day
4. 2 minutes/problem
5. 3 kg/hr
6. 1,700 cartons/hour
7. Le 2,520,000.00
8. Le 2,122,480.00

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| **Lesson Title:**  Direct Proportions |
| **Practice Activity:** PHM-09-026 |

1. 60 minutes, or 1 hour
2. 10 pieces of chalk
3. 14 bottles of fertiliser
4. 96 minutes, or 1 hour and 36 minutes
5. 9 cups of rice

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| **Lesson Title:**  Indirect Proportions |
| **Practice Activity:** PHM-09-027 |

1. a. ; b. ; c.
2. 120 workers
3. 3 days
4. 25 days
5. 3 plums each

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| **Lesson Title:**  Proportion Problem Solving |
| **Practice Activity:** PHM-09-028 |

1. Le 9,100,000.00
2. Le 72,000.00
3. 1 more pot of rice
4. They need 1 more tailor
5. a. 60 girls; b. 27 minutes

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| **Lesson Title:**  Financial Literacy I |
| **Practice Activity:** PHM-09-029 |

1. Le 862,500.00
2. Le 810,000.00
3. Le 325,000.00
4. a. Le 1,800,000.00; b. Le 265,000.00
5. a. Le 1,040,000.00; b. Le 83,000.00; c. Le 957,000.00

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| **Lesson Title:**  Financial Literacy II |
| **Practice Activity:** PHM-09-030 |

1. Le 270,000.00
2. Le 140,000.00
3. Le 12,000.00
4. 4%
5. 5%
6. 2.5 years

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| **Lesson Title:**  Index Notation and the Laws of Indices |
| **Practice Activity:** PHM-09-031 |



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| **Lesson Title:**  Application of the Laws of Indices |
| **Practice Activity:** PHM-09-032 |



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| **Lesson Title:**  Indices with Negative Powers |
| **Practice Activity:** PHM-09-033 |



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| **Lesson Title:** Indices with Fractional Powers |
| **Practice Activity:** PHM-09-034 |

1. a. ; b. ; c.
2. a. 2; b. 8; c. 10
3. a. 2; b. 3; c. or ; d. or
4. a. ; b.

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| **Lesson Title:** Multiplying and Dividing Indices with Fractional Powers |
| **Practice Activity:** PHM-09-035 |

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| **Lesson Title:** Multiplying and Dividing by Powers of 10 |
| **Practice Activity:** PHM-09-036 |

1. 567
2. 0.2546
3. 48.7
4. 23,100
5. 240
6. 0.009
7. 2.309
8. 187.1
9. 0.24598
10. 2,600

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| **Lesson Title:** Standard Form of Large Numbers |
| **Practice Activity:** PHM-09-037 |

1. a. ; b. ; c. ; d. ; e.
2. a. 67,500; b. 1,900,000; c. 999; d. 171.5; e. 8,000

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| **Lesson Title:** Standard Form of Small Numbers |
| **Practice Activity:** PHM-09-038 |

1. a. ; b. ; c. ; d. ; e.
2. a. 0.02752; b. 0.00451; c. 0.000007; d. 0.2541; e. 0.000105

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| **Lesson Title:**  Conversion to and from Standard Form |
| **Practice Activity:** PHM-09-039 |

1. Completed table:

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| **Country** | **Population** | **Ordinary Form** | **Standard Form** |
| China | 1.38 billion | 1,380,000,000 |  |
| India | 1.297 billion | 1,297,000,000 |  |
| United States | 329 million | 329,000,000 |  |
| Indonesia | 263 million | 263,000,000 |  |
| Brazil | 208.8 million | 208,800,000 |  |

1. a. ; b. ; c. ; d.
2. a. ; b. ; c. ; d.

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| **Lesson Title:** Multiplying and Dividing Small and Large Numbers |
| **Practice Activity:** PHM-09-040 |

4. or

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| **Lesson Title:** Right-angled Triangles (Revision) |
| **Practice Activity:** PHM-09-041 |

1. a. BC; b. WX; c. QS; d. AC
2. b, c
3. Example answers:



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| **Lesson Title:**  Introduction to Pythagoras’ Theorem |
| **Practice Activity:** PHM-09-042 |

1. Substitute the given values for each triangle into Pythagoras’ theorem and verify that LHS = RHS. This is true for both triangles a and b, which are actually right-angled triangles.
2. a. Right-angled triangle; b. Not a right-angled triangle

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| **Lesson Title:**  Finding the Hypotenuse of a Right-Angled Triangle |
| **Practice Activity:** PHM-09-043 |

1. a. m; b. m; c. cm; d. m
2. PS = 17 m

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| **Lesson Title:** Finding the Other Sides of a Right-Angled Triangle |
| **Practice Activity:** PHM-09-044 |

1. a. cm; b. cm; c. cm

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| **Lesson Title:** Applying Pythagoras’ Theorem |
| **Practice Activity:** PHM-09-045 |

1. 5.3 cm
2. 7.8 m
3. 6.9 cm
4. 30 cm
5. 17 m