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Mathematics, 2017 EC, Grade 8 model exam, Lideta

Grade 8 · Mathematics · 2017 E.C.

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Time allowed: 120 minutes | **Questions:** 41 | **Total marks:** 41

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1. What is the number of elements of set $ A = \{4, 5, 4, 7, 4\} $? (1)

A. ✓ 3
B. 4
C. 5
D. 6

> **Answer:** A
> In set theory, duplicate elements are ignored, so the unique elements of set A are $4, 5,$ and 7. Thus, the number of elements of set A is 3.

2. Which of the following statement is True about relations among sets? (1)

A. All equal sets are proper subsets of each other
B. ✓ **Empty set is a subset of any set**
C. All equivalent sets are equal
D. Any set is a proper subset of itself

> **Answer:** B
> The empty set is a subset of every set by definition. Equal sets are not proper subsets of each other, and equivalent sets only share the same number of elements but are not necessarily equal.

3. If $ A \subset B $, then which of the following statement is true? (1)

A. ✓ $A \cap B = A$
B. $A \cup B = A$
C. $B \subseteq A$
D. $B \subset A$

> **Answer:** A
> If $A \subset B$, then every element in A is also in B. Thus, the intersection of A and B, which contains elements common to both, is simply A.

4. A set of numbers containing all counting numbers and zero is called: (1)

A. Natural number
B. ✓ **Whole number**
C. Integer number
D. Rational number

> **Answer:** B
> The set containing all counting numbers (natural numbers) and zero, represented as $\{0, 1, 2, 3, \dots\}$, is called the set of whole numbers.

5. Which one of the following is the set of whole numbers? (1)

A. $\{0, 2, 4, 6, \dots\}$
B. $\{1, 2, 3, \dots\}$
C. ✓ $\{0, 1, 2, 3, \dots\}$
D. $\{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$

Answer: C
The set of whole numbers consists of zero and all natural numbers (counting numbers), which is written as $\{0, 1, 2, 3, \dots\}$.

6. The opposite of integer number $ a $ is equal to: (1)

A. ✓ $-a$
B. a
C. $1/a$
D. a^2

Answer: A
The opposite (or additive inverse) of any real number a is the number that when added to a yields zero, which is $-a$.

7. Which of the following is the number of elements in the set $ A = \{ 1, 2, 3, 4, 5 \} $?\ (1)

A. ✓ 5
B. 4
C. 3
D. 2

Answer: A
The set $A = \{1, 2, 3, 4, 5\}$ contains five distinct elements, so the number of elements is 5.

8. Which of the following is the set of prime numbers less than 10? (1)

A. ✓ $\{2, 3, 5, 7\}$
B. $\{2, 3, 5, 7, 9\}$
C. $\{1, 2, 3, 5, 7\}$
D. $\{2, 4, 6, 8\}$

Answer: A
The prime numbers less than 10 are 2, 3, 5, and 7. Note that 1 is not a prime number, and 9 is a composite number divisible by 3.

9. Which of the following is the set of multiples of 3 less than 15? (1)

A. ✓ $\{3, 6, 9, 12\}$
B. $\{3, 6, 9, 12, 15\}$
C. $\{1, 2, 3, 4, 5\}$
D. $\{2, 4, 6, 8, 10\}$

Answer: A
The positive multiples of 3 strictly less than 15 are 3, 6, 9, and 12, so the correct set is $\{3, 6, 9, 12\}$.

10. Which of the following is the set of numbers divisible by 4 less than 20? (1)

A. ✓ $\{4, 8, 12, 16\}$
B. $\{4, 8, 12, 16, 20\}$
C. $\{1, 2, 3, 4, 5\}$
D. $\{2, 4, 6, 8, 10\}$

Answer: A
The positive numbers divisible by 4 strictly less than 20 are 4, 8, 12, and 16, which corresponds to option A.

11. Which of the following is the set of perfect squares less than 20? (1)

A. ✓ $\{1, 4, 9, 16\}$
B. $\{1, 4, 9, 16, 20\}$
C. $\{1, 2, 3, 4, 5\}$
D. $\{2, 4, 6, 8, 10\}$

Answer: A
The perfect squares strictly less than 20 are $1^2 = 1, 2^2 = 4, 3^2 = 9$, and $4^2 = 16$.

12. Which of the following is the set of prime numbers between 10 and 20? (1)

A. ✓ $\{11, 13, 17, 19\}$
B. $\{11, 13, 17, 19, 20\}$
C. $\{1, 2, 3, 4, 5\}$
D. $\{2, 4, 6, 8, 10\}$

> **Answer:** A
> The prime numbers between 10 and 20 are those integers in that range with no divisors other than 1 and themselves, which are 11, 13, 17, and 19.

13. Which of the following is the set of multiples of 5 less than 20? (1)

A. ✓ $\{5, 10, 15\}$
B. $\{5, 10, 15, 20\}$
C. $\{1, 2, 3, 4, 5\}$
D. $\{2, 4, 6, 8, 10\}$

> **Answer:** A
> The positive multiples of 5 strictly less than 20 are 5, 10, and 15, which matches option A.

14. Which of the following is the set of numbers divisible by 6 less than 20? (1)

A. ✓ $\{6, 12, 18\}$
B. $\{6, 12, 18, 20\}$
C. $\{1, 2, 3, 4, 5\}$
D. $\{2, 4, 6, 8, 10\}$

> **Answer:** A
> The positive integers divisible by 6 strictly less than 20 are 6, 12, and 18.

15. Which of the following is the set of prime numbers between 20 and 30? (1)

A. ✓ $\{23, 29\}$
B. $\{23, 29, 30\}$
C. $\{1, 2, 3, 4, 5\}$
D. $\{2, 4, 6, 8, 10\}$

> **Answer:** A
> The prime numbers between 20 and 30 are 23 and 29. Therefore, the correct set is $\{23, 29\}$.

16. Which of the following is the set of multiples of 7 less than 30? (1)

A. ✓ $\{7, 14, 21, 28\}$
B. $\{7, 14, 21, 28, 30\}$
C. $\{1, 2, 3, 4, 5\}$
D. $\{2, 4, 6, 8, 10\}$

> **Answer:** A
> The positive multiples of 7 strictly less than 30 are 7, 14, 21, and 28, which corresponds to option A.

17. Which of the following is the set of numbers divisible by 8 less than 30? (1)

A. ✓ $\{8, 16, 24\}$
B. $\{8, 16, 24, 30\}$
C. $\{1, 2, 3, 4, 5\}$
D. $\{2, 4, 6, 8, 10\}$

> **Answer:** A
> The positive numbers divisible by 8 strictly less than 30 are 8, 16, and 24, which is given in option A.

18. Which of the following is the set of perfect squares less than 30? (1)

A. ✓ $\{1, 4, 9, 16, 25\}$
B. $\{1, 4, 9, 16, 25, 30\}$
C. $\{1, 2, 3, 4, 5\}$
D. $\{2, 4, 6, 8, 10\}$

> **Answer:** A
> The perfect squares strictly less than 30 are $1^2 = 1, 2^2 = 4, 3^2 = 9, 4^2 = 16$, and $5^2 = 25$.

19. Which of the following is the set of prime numbers between 30 and 40? (1)

A. ✓ $\{31, 37\}$
B. $\{31, 37, 40\}$
C. $\{1, 2, 3, 4, 5\}$
D. $\{2, 4, 6, 8, 10\}$

> **Answer:** A
> The prime numbers between 30 and 40 are 31 and 37, making the correct set $\{31, 37\}$.

20. Which of the following is the set of multiples of 9 less than 40? (1)

A. ✓ $\{9, 18, 27, 36\}$
B. $\{9, 18, 27, 36, 40\}$
C. $\{1, 2, 3, 4, 5\}$
D. $\{2, 4, 6, 8, 10\}$

> **Answer:** A
> The positive multiples of 9 strictly less than 40 are 9, 18, 27, and 36, which is option A.

21. Which of the following is the set of perfect cubes less than 40? (1)

A. ✓ $\{1, 8, 27\}$
B. $\{1, 8, 27, 64\}$
C. $\{1, 2, 3, 4, 5\}$
D. $\{2, 4, 6, 8, 10\}$

> **Answer:** A
> The perfect cubes strictly less than 40 are $1^3 = 1$, $2^3 = 8$, and $3^3 = 27$, which matches option A.

22. What is the value of m if a point $(2, -6)$ lies on the line $y = mx + 2$? (1)

A. -2
B. ✓ -4
C. 3
D. -8

> **Answer:** B
> Substituting the point $(2, -6)$ into the line equation $y = mx + 2$ gives $-6 = m(2) + 2$, which simplifies to $2m = -8$, and thus $m = -4$.

23. On a number line, when we add a negative integer, we: (1)

A. Move to the right
B. Do not move at all
C. ✓ **Move to the left**
D. None

> **Answer:** C
> Adding a negative integer to a number is equivalent to subtracting its absolute value, which corresponds to moving to the left on a number line.

24. The solution set of $|x - 6| = 10$ is: (1)

A. $\{4, -16\}$
B. $\{-6, 10\}$
C. ✓ $\{-4, 16\}$
D. $\{10, -6\}$

> **Answer:** C
> The equation $|x - 6| = 10$ splits into two cases: $x - 6 = 10 \implies x = 16$ and $x - 6 = -10 \implies x = -4$, giving the solution set $\{-4, 16\}$.

25. Which one of the following is the equivalent fraction of $\frac{12}{20}$? (1)

A. ✓ $\frac{3}{5}$
B. $\frac{3}{4}$
C. $\frac{4}{5}$
D. $\frac{4}{3}$

> **Answer:** A
> Simplifying the fraction $\frac{12}{20}$ by dividing both the numerator and denominator by their greatest common divisor, 4, yields $\frac{3}{5}$.

26. Which one of the following numbers are in descending order? (1)

A. $\frac{7}{12}, \frac{2}{3}, \frac{3}{2}$
B. $\frac{3}{2}, \frac{7}{12}, \frac{2}{3}$
C. ✓ $\frac{3}{2}, \frac{2}{3}, \frac{7}{12}$
D. $\frac{2}{3}, \frac{3}{2}, \frac{7}{12}$

Answer: C
Converting the fractions to decimals gives $\frac{3}{2} = 1.5$, $\frac{2}{3} \approx 0.67$, and $\frac{7}{12} \approx 0.58$. Since $1.5 > 0.67 > 0.58$, they are in descending order in option C.

27. The sum of $\frac{1}{3} + \frac{2}{3}$ is equal to: (1)

A. $\frac{3}{6}$
B. 6
C. $\frac{1}{3}$
D. ✓ 1

Answer: D
Since the fractions have a common denominator, we add their numerators: $\frac{1}{3} + \frac{2}{3} = \frac{1+2}{3} = \frac{3}{3} = 1$.

28. $\frac{7}{9} - \frac{4}{3} =$ (1)

A. $\frac{-9}{5}$
B. ✓ $\frac{-5}{9}$
C. $\frac{3}{6}$
D. $\frac{5}{9}$

Answer: B
To subtract the fractions, find a common denominator of 9: $\frac{7}{9} - \frac{4}{3} = \frac{7}{9} - \frac{12}{9} = \frac{7-12}{9} = \frac{-5}{9}$.

29. The product of $2 \frac{5}{7} \times \left(-\frac{3}{2}\right) = $ (1)

A. ✓ $\frac{-57}{14}$
B. $\frac{-15}{7}$
C. $\frac{10}{9}$
D. $\frac{10}{3}$

Answer: A
First convert the mixed fraction to an improper fraction: $2\frac{5}{7} = \frac{19}{7}$. Then multiply: $\frac{19}{7} \times \left(-\frac{3}{2}\right) = -\frac{57}{14}$.

30. If Birr 1200 is invested at 10% simple interest per annum, then what is the simple interest after 5 years? (1)

A. 800 Birr
B. 500 Birr
C. 700 Birr
D. ✓ **600 Birr**

Answer: D
Simple interest is calculated as $I = P \times R \times T = 1200 \times 0.10 \times 5 = 600$ Birr.

31. If $X = \frac{-2}{3}$, then $X^2 = $ (1)

A. $\frac{-4}{6}$
B. $\frac{4}{6}$
C. ✓ $\frac{4}{9}$
D. $\frac{-4}{9}$

Answer: C
Squaring a negative fraction results in a positive fraction: $X^2 = \left(\frac{-2}{3}\right)^2 = \frac{(-2)^2}{3^2} = \frac{4}{9}$.

32. $\sqrt{\frac{25}{9}} =$ (1)

A. ✓ $\frac{5}{3}$
B. $\frac{14}{9}$
C. $\frac{3}{5}$
D. $\frac{7}{10}$

Answer: A
The square root of a fraction is the square root of the numerator divided by the square root of the denominator: $\sqrt{\frac{25}{9}} = \frac{\sqrt{25}}{\sqrt{9}} = \frac{5}{3}$.

33. Which one of the following numbers is both a perfect square and a perfect cube? (1)

A. 81
B. ✓ **64**
C. 100
D. 36

> **Answer:** B
> The number 64 is both a perfect square ($8^2 = 64$) and a perfect cube ($4^3 = 64$).

34. $\sqrt[3]{0.001}$ is equal to: (1)

A. 0.01
B. ✓ **0.1**
C. 0.001
D. 0.0001

> **Answer:** B
> The number 0.001 can be written as 10^{-3}, and its cube root is $(10^{-3})^{1/3} = 10^{-1} = 0.1$.

35. The area of a square park is $81m^2$. Its length of side is equal to: (1)

A. 27 m
B. 6 m
C. ✓ **9 m**
D. 3 m

> **Answer:** C
> The area of a square is given by $A = s^2$. Thus, the side length $s = \sqrt{81} = 9$ m.

36. The cube of 0.4 is equal to: (1)

A. 0.16
B. ✓ **0.064**
C. $\frac{64}{100}$
D. $\frac{16}{100}$

> **Answer:** B
> The cube of 0.4 is $(0.4)^3 = 0.4 \times 0.4 \times 0.4 = 0.064$.

37. Which of the following points does not satisfy the equation $y = 4x$? (1)

A. $(0, 0)$
B. $(2, 8)$
C. ✓ $(-1, 4)$
D. $(3, 12)$

> **Answer:** C
> For the point $(-1, 4)$, substituting $x = -1$ gives $y = 4(-1) = -4$, which does not equal the given y-value of 4.

38. If the point $P(a, 3)$ lies on the line given by the equation $12x - 2y = 0$, then what is the value of a? (1)

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

> **Answer:** A
> Substituting $P(a, 3)$ into the line equation $12x - 2y = 0$ gives $12a - 2(3) = 0 \implies 12a = 6 \implies a = \frac{1}{2}$.

39. What is the solution set of the inequality $\frac{x+1}{3} > \frac{2x}{5}$ in the set of natural numbers? (1)

A. $\{1, 2\}$
B. $\{1, 2, 3\}$
C. $\{1, 2, 3, 4, 5\}$
D. ✓ $\{1, 2, 3, 4\}$

> **Answer:** D
> Multiplying both sides of the inequality $\frac{x+1}{3} > \frac{2x}{5}$ by 15 gives $5x + 5 > 6x \implies x < 5$. In the set of natural numbers $\{1, 2, 3, \ldots\}$, the solutions are $\{1, 2, 3, 4\}$.

40. The solution set of $2x - 5 < x + 1, x \in \mathbb{Q}$ is: (1)

A. $\{x : x < -4\}$

B. $\{x : x > 6\}$

C. $\{x : x > -4\}$

D. ✓ $\{x : x < 6\}$

> **Answer:** D
> By simplifying the inequality $2x - 5 < x + 1$, we subtract x and add 5 to both sides to obtain $x < 6$. Since $x \in \mathbb{Q}$, the solution set is $\{x : x < 6\}$.

41. The sum of the age of the mother and her daughter is 68 years. The mother is 22 years older than her daughter. How old is her mother? (1)

A. ✓ **45 years**

B. 46 years

C. 23 years

D. 50 years

> **Answer:** A
> Let the mother's age be m and the daughter's age be d. We have $m + d = 68$ and $m - d = 22$. Adding these two equations gives $2m = 90 \implies m = 45$ years.

END OF THE MARKING KEY

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