CHAPTER P2

Real Numbers, Absolute Value and Sets

Multiple-Choice Old Exam Questions

44 questions • 5 topics • options A–E • two questions per page

Topic 1 | Order of Operations and Arithmetic

Evaluating arithmetic expressions with fractions, powers and brackets • Questions 1–8

Q **1**

$$\frac{-20 \div 4 \times 5 \div 5 - 3}{-4 - (1 - 3) - 2 \times 6 \div 2} =$$

A) 1

B) -1

C) $\frac{3}{8}$

D) $\frac{1}{8}$

E) $\frac{2}{3}$

Q **2**

$$3\frac{1}{7} - (-2^4)\left(\frac{3}{8} - \frac{5}{12}\right) \div \frac{1}{3} - 3\frac{1}{7} =$$

A) -2

B) 2

C) $\frac{1}{2}$

D) $\frac{1}{4}$

E) $-\frac{1}{2}$

Q
3

$$\left[\frac{5}{9}-\frac{1}{4}\right]-\left[-\frac{5}{18}-\left(-\frac{1}{2}\right)\right]=$$

A) $1/12$

B) $-1/12$

C) $7/12$

D) $-19/12$

E) $19/12$

Q
4

The value of the expression $-17+3[8x-4(3x-2)]$ when $x=-\frac{3}{4}$ is

A) 16

B) -11

C) 22

D) -5

E) 13

Q
5

If $X = -8 + (-4)(-6) \div \left(10\sqrt{1.44}\right)$ and $Y = 15 \div 5 \cdot 4 \div 6 - 8$, then $X - Y =$

A) 0

B) -12

C) 12

D) 6

E) -6

Q
6

$$\left[-5 + \frac{19}{3} - \left(-\frac{2}{3}\right)\right] \div \left(\frac{1}{2} - \frac{1}{3}\right) \cdot (-2^2 \div 16) =$$

A) 3

B) $-\frac{9}{2}$

C) -3

D) $\frac{9}{2}$

E) -12

Q
7

$$\frac{9+2^2\times(-1)^5}{(6-2)^2\div 8+3}=$$

A) $\frac{134}{80}$

B) $-\frac{134}{80}$

C) 1

D) -1

E) $\frac{5}{8}$

Q
8

Which one of the following statements is TRUE?

A) $(5.2)^2-(0.2)^2=27$

B) $2.05-10.5=-7.45$

C) $2.5\div 0.25=100$

D) $2.3+0.132=2.135$

E) $(1.5)^2=3$

Topic 2 | Rational and Irrational Numbers

Classifying numbers and counting the rational or irrational numbers in a set • Questions 9–16

Q **9**

The number of rational numbers in the set $A = \{0, -4, 3.14, \sqrt{3}, -2.17\overline{359}, \frac{\pi}{3.14}, \sqrt{64}, \sqrt[3]{-8}, \frac{12}{6}, \frac{-7}{\sqrt{4}}\}$ is

A) 8

B) 7

C) 6

D) 5

E) 9

Q **10**

Which ONE of the following statements is TRUE?

A) $4.13\overline{275}$ is a rational number.

B) If x is any real number, then $\sqrt{(-x)^2} = x$.

C) $\pi = \frac{22}{7}$

D) $-(3a - 5b)\frac{2}{15} = -\frac{2}{5}a - \frac{2}{3}b$

E) The sum of two irrational numbers is always an irrational number.

Q
11

The number of rational numbers in the set
$\{-\frac{\sqrt{2}}{\sqrt{8}}, -\frac{3}{10}, -\frac{\pi}{3.14}, -\frac{1}{\sqrt{27}}, 0, \sqrt[3]{8}, 1.2, \frac{22}{7}, 1\frac{2}{3}, 4.141141114\ldots\}$ is

A) 7

B) 8

C) 4

D) 5

E) 6

Q
12

The number of rational numbers in the set
$\{\frac{-7}{\sqrt{4}}, \frac{\pi}{2}, \frac{0}{3}, \sqrt{81}, \frac{22}{7}, 1.727227222\ldots, 3.125125125\ldots, \sqrt{27}\}$ is

A) 5

B) 3

C) 4

D) 6

E) 2

Q
13

The number of irrational numbers in the set

$\{5.3,\ 1.234\overline{7632},\ \sqrt{\frac{7}{4}},\ -132,\ 2\frac{13}{14},\ \sqrt[3]{-27},\ -\frac{20}{5},\ \frac{44}{14},\ \frac{2\pi}{3.14},\ \frac{0}{\sqrt{8}},\ \frac{22}{7}-\pi\}$ is

A) 4

B) 3

C) 5

D) 2

E) 6

Q
14

The number of rational numbers in the set $\{\frac{7\pi}{22},\ (1-\sqrt{3})^0,\ 3.14,\ \sqrt[5]{-32},\ \sqrt{8},\ \frac{0}{\pi},\ \frac{\sqrt{3}}{\sqrt{27}},\ 1.2334\overline{2}\}$ is

A) 6

B) 5

C) 7

D) 4

E) 8

Q
15

The number of integers in the set $B = \{5, \sqrt{7}, -13, \frac{0}{9}, \sqrt{4}, 0.7, -7\pi, 0.\overline{4}\}$ is

A) 3

B) 4

C) 7

D) 6

E) 5

Q
16

The number of irrational numbers in the set $\{-\frac{22}{7}, -\frac{\pi}{3.14}, -\frac{\sqrt{3}}{\sqrt{12}}, -\frac{1}{\sqrt{2}}, \sqrt[3]{27}, \sqrt[4]{32}, 1.5, 1\frac{2}{3}, 3.1\overline{4}\}$ is

A) 4

B) 3

C) 2

D) 5

E) 6

Topic 3 | Absolute Value

Simplifying expressions with absolute values, and statements about absolute value • Questions 17–28

Q 17

If $x - 2 = y$, then $\frac{2|x-y|+|y-x|}{x-y} =$

A) 3

B) 0

C) -3

D) 1

E) -1

Q 18

If $x < 0$, then $|x - 1| + |-x| + 3 =$

A) $4 - 2x$

B) $2x + 2$

C) 2

D) $2x + 4$

E) $2x$

Q
19

If $x < 0$, then the expression $\left|x - \frac{2}{5}\right| + \left|\frac{1}{10} - x\right|$ simplifies to

A) $\frac{1}{2} - 2x$

B) $\frac{3}{10}$

C) $-\frac{1}{2} - 2x$

D) $-\frac{3}{10}$

E) $-\frac{1}{2} + 2x$

Q
20

If $0 < x < 1$, then $|5 + x| + \left|\frac{-2x+2}{|x|+|x-2|}\right| =$

A) 6

B) $2x + 4$

C) 4

D) $3x + 7$

E) $2x - 6$

Q
21

If $-5 < x < -2$, then the expression $|x+5| + |x-2| + \sqrt{x^2} + \sqrt[3]{x^3}$ simplifies to

A) 7

B) $-2x - 3$

C) $2x + 3$

D) 3

E) $2x + 7$

Q
22

If $x < -1$, then $|-x| + |x| - |x+1| =$

A) $-x + 1$

B) $-x - 1$

C) $x + 1$

D) $x - 1$

E) $-3x - 1$

Q
23

If $x < 0$ and $y > 0$, then $-|2x| - |3y| + x - y =$

A) $3x - 4y$

B) $-x - 4y$

C) $3x - 2y$

D) $3x + 4y$

E) $-3x + 4y$

Q
24

If $-3 < x < -1$, then $\left|\frac{|-2x|-2|x-2|}{4x+4}\right| =$

A) $-\frac{1}{x+1}$

B) $\frac{1}{x+1}$

C) $-\frac{1}{x-1}$

D) $\frac{4}{x+1}$

E) $-\frac{4}{x+1}$

Q
25

If $x < 0$, then the expression $\left|x - \frac{1}{4}\right| - \left|\frac{1}{2} - x\right|$ simplifies to

A) $2x - \frac{1}{4}$

B) $\frac{1}{4}$

C) $-\frac{1}{4}$

D) $2x - \frac{3}{4}$

E) $-2x + \frac{3}{4}$

Q
26

Which one of the following statements is false?

A) $|-k| = k$

B) If $|k - 3| > -3$ then k is any real number

C) $|2 - \pi| = \pi - 2$

D) $|k|$ is a non-negative number

E) $|k^2| = k^2$

Q
27

Which one of the following statements is FALSE?

A) $\left|5-\sqrt{26}\right| = 5-\sqrt{26}$

B) $-|-9| = -9$

C) $|x-y| = |y-x|$

D) $|-3\pi| = 3\pi$

E) $|x| \cdot |-7| = |-7x|$

Q
28

Which one of the following is TRUE?

A) $|-x| = -x$ for $x < 0$

B) $|x| = x$ for any real number x

C) $|x-2| = x-2$ when $x < 2$

D) $\sqrt{x^2} = x$ when $x < 0$

E) $|-x| = x$ when $x < 0$

Topic 4 | Sets, Intervals and Set Operations

Unions, intersections and descriptions of sets and intervals • Questions 29–38

Q **29**

If $A = \{x \mid x \text{ is a whole number}, -3 < x \leq 2\}$, $B = \{-2, -1, 0, 1\}$, and $C = \{x \mid x \text{ is a natural number less than } 5\}$, then $(A \cup B) \cap C =$

A) $\{1, 2\}$

B) $\{0, 1, 2, 4\}$

C) $\{0, 1, 2, 3\}$

D) $\{0, 1, 2\}$

E) $\{-2, -1, 0, 1, 2\}$

Q **30**

If $A = \{x \mid x \text{ is an even integer between } -1 \text{ and } 7\}$ and $B = \{0, 1, 3, 4, 5, 6\}$, then $A \cap B =$

A) $\{0, 4, 6\}$

B) $\{0, 6\}$

C) $\{4, 6\}$

D) $\{1, 2, 3, 4, 5, 6\}$

E) $\{0, 1, 2, 3, 4, 5, 6\}$

Q
31

Let $A = \{x \mid x \text{ is a natural odd number greater than } 3 \text{ and less than } 10\}$, $B = \{y \mid y = |-x| - 1, \ x \text{ is a whole number} < 5\}$ and $C = \{x \mid x \text{ is a whole even number less than } 7\}$. Then $(A \cup B) \cap C =$

A) $\{0, 2\}$

B) $\{0, 2, 3, 4\}$

C) $\{2\}$

D) $\{2, 3, 4\}$

E) $\{4\}$

Q
32

If $A = \{x \mid x \text{ is a prime number less than } 6\}$ and $B = \{y \mid y = 2x + |x|, \ x \text{ is an integer such that } 0 \leq x < 3\}$, then $A \cup B$ is:

A) $\{0, 2, 3, 5, 6\}$

B) $\{0, 1, 2, 3, 4, 5, 6\}$

C) $\{0, 2, 3, 4, 5\}$

D) $\{0, 2, 3, 4, 5, 6\}$

E) $\{0, 1, 2, 3, 5, 6\}$

Q
33

If $P = \{y \mid y \text{ is an even whole number} \leq 8\}$, $Q = \{1, 3, 5, 7, 9\}$ and $R = \{0, 1, 2, 3, 4\}$. Which one of the following statements is FALSE?

A) $P \cap R = \{2, 4\}$

B) $P \cup R = \{0, 1, 2, 3, 4, 6, 8\}$

C) $Q \cap R = \{1, 3\}$

D) $Q \cup R = \{0, 1, 2, 3, 4, 5, 7, 9\}$

E) P and Q are disjoint sets

Q
34

If $A = \{2, 4, 6, 8, \ldots\}$ then A can be written

A) $\{x \mid x \text{ is an even positive integer}\}$

B) $\{x \mid x \text{ is an even integer}\}$

C) $\{2x \mid x \text{ is a whole number}\}$

D) $\{2x \mid x \text{ is an integer}\}$

E) $\{2x \mid x \text{ is a rational number}\}$

Q
35

Let $A = \{-3, -1, 0, 1, 3\}$, $B = \{x \mid x \text{ is a whole number such that } x < 7\}$ and $C = \{-2, 0, 2, 4, 6\}$. Then $A \cap (B \cup C) =$

A) $\{0, 1, 3\}$

B) $\{-3, -1, 0, 1, 3\}$

C) $\{0, 1, 2, 3\}$

D) $\{-2, 0, 1, 3\}$

E) $\{0, 1\}$

Q
36

Let $A = \{x \mid x \text{ is an even integer}, -1 \leq x < 4\}$, $B = \{x \mid x \text{ is a negative integer greater than } -5\}$ and $C = \{-5, 2, 4\}$. Then $(A \cup B) \cap C =$

A) $\{2\}$

B) $\{2, 4\}$

C) $\{-5, 2\}$

D) $\{-5, 2, 4\}$

E) $\{\emptyset\}$

Q
37

Given the intervals $A = (-1, 5)$, $B = (1, 7]$ and $C = [2, 6]$, then $(A \cap B) \cup C =$

A) $(1, 5]$

B) $(-1, 7]$

C) $(1, 6]$

D) $[2, 6]$

E) $(-1, 6]$

Q
38

If $M = \{y \mid y \text{ is a real number, } 0 < y \leq 2\}$ and $N = (-1, 1]$, then $M \cup N =$

A) $(0, 1]$

B) $(-1, \infty)$

C) $\{1, 2\}$

D) $(-\infty, \infty)$

E) $(-1, 2]$

Topic 5 | Properties and Statements about Real Numbers

True or false statements about real numbers and their properties • Questions 39–44

Q **39**

Which one of the following statements is FALSE?

A) $\sqrt{x^2 - 2xy + y^2} = x - y$, for any real numbers x and y.

B) $(y - x)^2 = (x - y)^2$, for any real numbers x and y.

C) $\frac{22}{7}$ is a rational number.

D) The multiplicative inverse of $\frac{1}{\sqrt{3}}$ is $\sqrt{3}$.

E) $\sqrt{3}x^2 + x + \frac{1}{2}$ is a polynomial of degree 2.

Q **40**

Which ONE of the following statements is FALSE?

A) $(-\infty, 2) \cap [1, \infty] = \{1\}$

B) Every irrational number has a multiplicative inverse.

C) The set $\{314.\overline{273}, \pi, \sqrt{2}\}$ contains exactly one rational number.

D) $A + (B + C) = (B + C) + A$ represents the commutative property for addition.

E) $|3 - \pi| = \pi - 3$

Q
41

Which one of the following statements is TRUE?

A) The multiplicative inverse of $-6\frac{3}{8}$ is $-\frac{8}{51}$.

B) Every real number has a multiplicative inverse.

C) $(a+b)+c=(b+a)+c$ represents the associative property.

D) $-\frac{\sqrt{18}}{4\sqrt{2}}$ is an irrational number.

E) 2π is a rational number.

Q
42

Which one of the following statements is TRUE?

A) 3^{-4} is greater than 5^{-3}.

B) $(9)^{-2}$ is greater than 1.

C) $(0.03)^2=0.9$

D) $\frac{(3^3)(3^{-5})}{3^8}=1$

E) $5^{-1}+2^{-3}=\frac{7}{40}$

Q
43

Which one of the following statements is FALSE?

A) If x is any integer and y is any irrational number, then $\frac{x}{y}$ is an irrational number.

B) If x is any positive real number, then $|x| = x$.

C) If the set $B = \{-6,\ 0,\ \pi,\ 3.14,\ \frac{15}{4},\ \sqrt{18}\}$ then B has four rational numbers.

D) The distributive property states that $(x + y)z = xz + yz$.

E) If $y > 10$, then $|10 - y| = y - 10$.

Q
44

The property of real numbers illustrated in the statement $3y + 2(xy) = 3y + (2x)y$ is the

A) associative property of multiplication.

B) commutative property of addition.

C) associative property of addition.

D) distributive property.

E) commutative property of multiplication.

Answer Key

"Original" shows the question number in the source worksheet.

Q	Original	Ans.	Value
1	1	**A**	1
2	5	**A**	-2
3	18	**A**	$1/12$
4	19	**A**	16
5	23	**A**	0
6	33	**C**	-3
7	41	**C**	1
8	25	**A**	$(5.2)^2 - (0.2)^2 = 27$
9	3	**A**	8
10	8	**A**	$4.13\overline{275}$ is a rational number.
11	9	**A**	7
12	14	**A**	5
13	32	**B**	3
14	36	**A**	6
15	42	**B**	4
16	45	**B**	3
17	2	**A**	3
18	6	**A**	$4 - 2x$
19	10	**A**	$\frac{1}{2} - 2x$
20	17	**A**	6
21	20	**A**	7
22	24	**A**	$-x + 1$
23	26	**A**	$3x - 4y$
24	38	**A**	$-\frac{1}{x+1}$
25	46	**C**	$-\frac{1}{4}$
26	16	**A**	$\lvert -k \rvert = k$
27	29	**A**	$\lvert 5 - \sqrt{26} \rvert = 5 - \sqrt{26}$
28	39	**A**	$\lvert -x \rvert = -x$ for $x < 0$
29	7	**A**	$\{1, 2\}$
30	11	**A**	$\{0, 4, 6\}$
31	12	**A**	$\{0, 2\}$
32	15	**A**	$\{0, 2, 3, 5, 6\}$
33	22	**A**	$P \cap R = \{2, 4\}$
34	31	**A**	$\{x \mid x$ is an even positive integer$\}$
35	34	**A**	$\{0, 1, 3\}$
36	35	**A**	$\{2\}$
37	43	**C**	$(1, 6]$

Q	Original	Ans.	Value
38	44	**E**	$(-1, 2]$
39	4	**A**	$\sqrt{x^2 - 2xy + y^2} = x - y$, for any real numbers x and y.
40	13	**A**	$(-\infty, 2) \cap [1, \infty] = \{1\}$
41	27	**A**	The multiplicative inverse of $-6\frac{3}{8}$ is $-\frac{8}{51}$.
42	28	**A**	3^{-4} is greater than 5^{-3}.
43	30	**A**	If x is any integer and y is any irrational number, then $\frac{x}{y}$ is an irrational number.
44	47	**A**	associative property of multiplication.