7th CLASS

MATHEMATICS

IIT FOUNDATION

STUDY MATERIAL

1. INTEGERS

TEACHING TASK

JEE MAINS LEVEL QUESTIONS:

① $(-12)+8+(-5)+3$

$= -4-2 = -6.$ Ans: B

② The sum of n positive integers

$$\text{Sum} = \frac{n(n+1)}{2}$$

$n = 10$

$$\text{Sum} = \frac{10(10+1)}{2} = \frac{110}{2} = 55$$

∴ The sum of first 10 positive integer is 55.

Ans: B

(3) $a+b=8$ and $a-b=4$

Adding the both,

$a+b+a-b=8+4$

$2a=12$ Ans: A

$a=6$

∴ The value of a is 6.

---

(4) The product of first 5 positive integers is

$1\times2\times3\times4\times5$

$=120.$ Ans = A

---

(5) The value of $(-2)\times(-1)\times(-30)$

$=-300.$

Ans: B

---

(6) $p\times q=-18$

$p\times3=9$

compairing both equation

$q=-3\times6$

$q=-6$ Ans: A

(7) $m \times (-2) = -16$ and $m \times 4 = 32$

comparing both equation

$m = 8$.

Ans: 8

---

(8) $a \times 1 = 1 \times a = a$

for any whole number a is known as the Multiplicative Identity.

Ans: C

---

(9) product of $15 \times (-25) \times (-4) \times (-10)$

$= -15 \times 25 \times 4 \times 10$

$= -15 \times 100 \times 10$

$= -15000$

Ans: C

---

(10) $45 \div (-9)$

$= \frac{45}{-9_1} = -5$.

Ans: A

(11) Given $P \div (-2) = -6$ and $P \div 3 = 4$

$\frac{P}{-2} = -6$; $\frac{P}{3} = 4$

$P = -6 \times -2$; $P = 4 \times 3$

$P = 12$; $P = 12$

Ans: D

---

(12) Equivalent to $(-12) \div (-3)$ is

$= \frac{+12^{4}}{+3_{1}} = 4.$ Ans: A

---

(13) The value of $-107 - (-20) - 5$

$= -107 + 20 - 5$

$= -112 + 20$

$= -92.$ Ans: B

---

(14) $(-21) \times (+21) = -441$

Ans: B

(15) $8 \times 53 \times (-125) = 424 \times (-125)$

$= -53000$

Ans: B

(16) The value of $22 \times (-1) \times (-2) \times (-10)$

$= -44 \times 10$

$= -440$ Ans: A

(17) We need to observe the pair

$(5 + (-5)) = 0$

So, $0 \times 400 = 0$. Ans: A

(18) 'x' be the other integer

$60 + x = -300$

$x = -300 - 60$

$x = -360$.

Ans: B.

(19) 'x' is the other integer.

$7 + x = 20$

$x = 20 - 7$

$x = 13$

Ans: A

(20) 'Z' be the other integer

$y + Z = x$

$Z = x - y.$

Ans: A.

(21) Let z be the second Integer

$y \times Z = x$

$Z = \frac{x}{y}.$

Ans: $\frac{x}{y}$.

(22) The other integer is y

here, $(-1) \times y = -120$

$y = \frac{-120}{-1}$

$y = 120.$

Ans: A

(23) Given that $m \div (-3) = 9$ and $m \div 3 = -9$

$$\frac{m}{-3} = 9 \; ; \; \frac{m}{3} = -9$$

$$m = 9 \times (3) \; ; \; m = -9 \times 3$$

$$m = -27 \; ; \; m = -27.$$

$\therefore$ The $m = -27$.

Ans: A.

MULTIPLE CORRECT ANSWER TYPE:

(1) According to the question,

a) $-5 > -2$ it is false

b) $0 < 3$ its true

c) $-2 > 0$ its false

d) $-5 < 3$ its true

Ans: B and D

---

(2) According to Integers statement.

a) Sum of two positive integers always positive, yes it is true

b) Sum of negative integers, we can't say the result

c) Adding of positive and negative integers may be, zero, positive or negative.

Ans: A, D

d) No, because of it always positive (or) zero

(3) → Commutative property : For addition $(a+b = b+a)$, for multiplication $(a \times b = b \times a)$.

→ Associative property : For addition $((a+b)+c = a+(b+c))$ For multiplication $((a \times b) \times c = a \times (b \times c))$.

→ Identity Element : For addition, the identity element is 0 because $a+0 = a$, for multiplicative, the identity element is 1. because $a \times 1 = a$.

Ans : A, B, and D.

---

(4)

From following expressions.

$a = -6 \times (4+2)$ $\quad b = -6 \times 4 + 2$ $\quad c = -6 \times (4+2)$

$a = -6 \times 6$ $\quad b = -24 + 2$ $\quad c = -6 \times (6)$

$a = -36$ $\quad b = -22$ $\quad c = -36$.

Ans : B

REASON AND ASSERTION TYPE

(5) Let's take two odd integers, say $(2n-1+1)$ and $(2n-2+2)$. =

→ Their sum would be: $(2n-1+1)+(2n-2+1)$

$= 2(n-1+n-2+1)$ is an integer and the sum is even.

→ this representation is correct because an odd integer indeed follows the form $(2n+1)$ for some integer n.

Ans: A

---

(6) Their product is $-a \times (-b) = ab$.

Here, ab is positive because the product of two positive integers is positive.

→ Reason Analysis is true, If you multiply a positive integer by a negative integer, the product is negative.

→ If you multiply a negative integer by a positive integer, the product is also negative.

Ans: B.

STATEMENT TYPE:

(7) ⇒ Statement-I is true. It describes the Property of additive identity in integers, where adding zero to any integer does not change the integer itself.

⇒ Statement-II is also true. In mathematics, the number 0 (zero) is indeed known as the additive identity because adding 0 (zero) to any number leaves that number unchanged

Ans: B

---

(8) ⇒ This statement is not true for all real numbers (R). In fact, (R-1 = 1) in general unless R=2. Therefore, Statement-I is false.

⇒ Statement-II is also not correct. The number 1 is not called the multiplicative identity. Instead, the multiplicative identity in mathematics is the number 1 itself because multiplying any number 'a' by 1 result in a.

i.e. $a \times 1 = 1 \times a = a$.

Ans:

COMPREHENSION TYPE

COMPREHENSION-1

(9) → The statement $513627+0 = 0+513627$ is true. This equality holds because '0' (zero) is the additive identity in integers, meaning adding zero (0) to any integer does not change the integer.

Ans: B

(10) Multiplicative identity refers to the element that, when multiplied by any element, leaves the element unchanged. This is (1) in the case of integers.

Ans: B

(11) The additive inverse of a number 'x', you need to find another number 'y'. Such that $x+y=0$.

Given $x = b-a$.

$x+y=0$

$b-a+y=0$

$y = -(b-a)$

Ans: C

∴ The additive inverse of $(b-a)$ is $(-(b-a))$.

(12) To find the multiplicative inverse of $-\frac{1}{12}$, we are looking for a number x.

Such that

$$-\frac{1}{12} \times x = 1$$

$$x = -12.$$

Ans: D

INTEGER TYPE

(13) If $x = 10$, the value of $2x-5$ is

substitute x in the above equation

$$\Rightarrow 2x-5$$
$$\Rightarrow 2\times10-5$$
$$= 20-5$$
$$= 15.$$

(14) Notice the alternative pattern,

$$1-1=0$$

This pattern continues for 111 times.

To find the sum of this sequence:

$$1-1+1-1+\cdots = 0$$

(15) Let x, y and z are the three integers

So, product of three integers is

$$xyz = 139750 \quad \text{— (1)}$$

and product of two integers is

$$xy = -2150 \quad \text{— (2)}$$

Simplifing equation (1) and (2)

$$-2150 \times z = 139750$$

$$z = \frac{139750}{-2150}$$

$$z = -65,$$

(16)

$$12 \div (-3)$$

$$= \frac{12^{4}}{-3_{1}} = -4$$

(17)

$$5+6 \div 12 \times 2$$

$$= 5 + \frac{6^{1}}{\cancel{12}_{2}} \times 2$$

$$= 5 + \frac{1}{\cancel{2}_{1}} \times \cancel{2}^{1}$$

$$= 5+1 = 6.$$

MATRIX MATCHING TYPE:

18)

a) $x+y$; we can write it as $y+x$.

Ans: r

b) $x \times (y \times z)$; we can write it as $(x \times y) \times z$

Ans: t

c) $(x-y)$; we can write it as $-(y-x)$

Ans: s

d) $(x+y)+z$: we can write it as $x+(y+z)$

Ans: q

---

19)

a) $-51 \times (16+13)$; Distributive property $(-51) \times 16 + (-51) \times$

Ans: s

b) $(-51+16) \times 13$: $(-51) \times 13 + 16 \times 13$

Ans: r

c) $(-51+16)+13$: Associative property $-51+(16+13)$

Ans: p

(d) $-51+(16-13)$: $(-51+16)-13$. Ans: q

LEARNER'S TASK

Conceptual understanding Questions (CUQ's):

(1) Sum of $-373, 20, -3, -5$ is

$= -373 + 20 + (-3) + (-5)$

$= -373 + 20 - 3 - 5$ Ans: A

$= -361$

---

(2) $3576 + 0 = 0 + 3576$

$= 3576.$

Ans: B

---

(3) $(-3) \times (-5) \times (-2)$

$= -15 \times 2$

$= -30.$ Ans: D

---

(4) $-312, 39, 192$

Sum $= -312 + 39 + 192$

$= -81$ Ans: C

(5) $(-10)+92+84+(-15)$

$= -25+176$

$= 151$ Ans: D

(6) $(-9)+4+(-6)+(3)$

$= -15+7$

$= -8$ Ans: C

(7) The product of -5 and 6 is

$-5 \times 6 = -30$

Ans: A

(8) $x = -7,\ 3x-2$

$= 3x-2$

$= 3 \times (-7)-2$

$= -21-2$

$= -23.$ Ans: A

(9) The property that states for any integers a, b, c

$(a+b)+c = a+(b+c)$, Associative property.

Ans: B

---

(10) $b+9 = 3$

$b = 3-9$

$b = -6$

Ans: B

JEE MAIN LEVEL QUESTIONS:

(1) $x+y = 40$ — (1)

$x-y = 4$ — (2)

Adding two equations

$\Rightarrow (x+y)+(x-y) = 40+4$

$\Rightarrow x+y+x-y = 44$

$\Rightarrow 2x = 44$

$\Rightarrow x = 22.$

Substitute x value in eqn (1)

$x+y = 40$

$22+y = 40$

$y = 40-22$

$y = 18$

Ratio of x and y

$\Rightarrow \frac{x}{y} = \frac{22}{18} = \frac{11}{9}.$

Ans: A.

(2) Let two numbers are x and y.

the first half of the second number

$$x = \frac{1}{2}y \quad -(1)$$

The sum of the two numbers is 60

$$x + y = 60 \quad -(2)$$

Substitute (1) equation into (2) equation

$$\frac{1}{2}y + y = 60$$

$$\frac{y + 2y}{2} = 60$$

$$\frac{1}{2}3y = \overset{20}{\cancel{60}} \times 2$$

$$y = 40$$

Substitute y value in equation (1)

$$x = \frac{1}{\cancel{2}} \times \overset{20}{\cancel{40}}$$

$$x = 20$$

$\therefore x = 20, \; y = 40.$

Ans: B

3) Let x and y are the numbers.

⇒ The first number is 5 more than the second number.

$$x = y + 5 \quad — ①$$

⇒ The sum of the two number is 25

$$x + y = 25 \quad — ②$$

Substitute equation ① in equation ②

$$(y+5) + y = 25$$

$$2y = 25 - 5$$

$$y = \frac{20}{2}$$

$$y = 10.$$

substitute y value in equation ①

$$x = 10 + 5$$

$$x = 15.$$

$\therefore x = 15, \; y = 10.$ Ans: A.

---

④

$$(368 \times 12) + (18 \times 368)$$

$$= 368 (12 + 18)$$

$$= 368 \times 30$$

$$= 11040$$

Ans: B

---

(5) Let a, b, c are three positive integers.

=> Sum of 3 positive integers is 'x'

$$a+b+c = x \quad - (1)$$

Sum of the other two numbers are

$$a+b = -y \quad - (2)$$

Substract (2) equation from (1)

$$(a+b+c) - (a+b) = x-(-y)$$

$$a+b+c-a-b = x+y$$

$$c = x+y.$$

The third number is $x+y$

Ans: B

(6) Let a, b, c and d are numbers

Sum of four number is x

$$a+b+c+d = x$$

Sum of two number is y

$$a+b = y$$

Sum of last two number is z

$$c+d = z$$

To determine the relationship b/w x, y and z. we add the equations for y and z

$$y+z = (a+b)+(c+d)$$
$$= a+b+c+d$$

Since, $a+b+c+d = x$.

$$y+z = x.$$

Ans: A

(7) $3+(4+2)=(3+4)+2$

The Associative property states that for any three numbers a, b, and c.

$a+(b+c)=(a+b)+c$.

Ans: A

(8) Integers $-3, 0, 5$ and -7

product of Integers $= -3\times0\times5\times-7$

$= 0$.

product of zero with any number is always zero.

Ans: C

(9) ★

$a+b=10$ and $a-b=4$

adding of two equations

$(a+b)+(a-b)=10+4$

$2a=14$

$a=7$

Substitute 'a' in any equation

$a+b=10$

$7+b=10$

$b=10-7$

$b=3$

product of a and b is $=a\times b$

$=3\times7$

$=21$ ★

Ans:

(10) Let x, y and z are the three numbers.

product of 3 number is A

$$xyz = A \quad \text{—(1)}$$

product of 2nd number and 3rd number is B

$$yz = B \quad \text{—(2)}$$

Susstitute eqn (2) in (1)

$$x \times B = A$$

$$x = A/B.$$

Ans: A

---

(11) $a+b+c+d=100$

a and c are multiples of 10

b is a multiple of 5

we need to determine the nature of d.

$a = 10m$ for some integer m.

$q = 10n$ for some integer n

$b = 5k$ for some integer k.

Substitute these into the equation

$$10m+10n+5k+d=100$$

Ans: B

$$d = 100 - 10(m+n) - 5k$$

100, $10(m+n)$ and $5k$ are multiple of 5.

∴ The d is multiple of 5.

(12) $xyz = 105$

xy is a multiple of 7

factorize of 105

$105 = 3 \times 5 \times 7$

xy be a multiple of 7

$3 \times 5 \times 7$, z must be the product of the remaining factors 3 and 5

$z = 3 \times 5$ Ans: D

$= 15$.

(13) $2a + 2b + 2c = 48$

$2(a+b+c) = 48$

$a+b+c = 24$ -①

$b+c = 28$ -②

Subtract eqn ② from ①

$(a+b+c) - (b+c) = 24 - 28$

$a + \cancel{b} + \cancel{c} - \cancel{b} - \cancel{c} = -4$

$a = -4$

Ans: A

(14) $3 \times (5+x) = 33$

$\Rightarrow 5+x = 11$

$x = 6$ Ans: A

(15) $x \times (y+7) = 16$

from options $x = 2, y = 1$

$2 \times (1+7) = 2 \times 8 = 16.$ Ans: A

(16) $a + x = 0$

$x = -a.$ Ans: B

(17) $a+b = b+a = x$

This equation illustrates the order of addition does not affect the result. it known as commutative property of addition.

ANS: A

(18) Let $x = 8, y = 2, z = 9$

$8 \times (2 + 9) = 8 \times 11$

$= 88.$ Ans: B

ADVANCED LEVEL QUESTIONS

MULTIPLE CORRECT ANSWER TYPE

(1) Option A: This is true because an even integer is defined as an integer that is divisible by 2.

Option B: Adding of two even integer result is even integer only. So, this Statement is true.

Option D: The product of two multiples of 2 will also be a multiple of 2.

Ans: A, B and D.

---

(2) Option A: The Sum of two integer is always an integer.

Option C: The product of two integer is always an integer.

Ans: A, C.

---

(3) Option A : $(a+b)+c = a+(b+c)$; The Associative property of addition in integers.

option B : $(a \times b) \times c = a \times (b \times c)$; The Associative property of multiplication in integers.

Ans : A, B

(4) Option A : $cd = 3ab$

$30 = 3 \times 10$

$30 = 30$

Option B $\Rightarrow ab = \frac{1}{3} cd$

$10 = \frac{1}{3} \times 30$

$10 = 10.$

Ans: A, B

(5) $x=5, y=3, z=4$

throught option checking

Option B $\Rightarrow x^2 = y^2 + z^2$

$5^2 = 3^2 + 4^2$

$25 = 9+16$

$25 = 25.$

Ans: B

⑥ Through options

Option A: $a+0=0+a=a$, '0' is called the additive identity.

Option D: $a \div (b \div c) = (a \div b) \div c$; this is the Associative property under division.

Ans: A, D

---

⑦ $3x(a+b) = 2x(5+b) = 3x(a+7)$

$3x(a+b) = 2x(5+b)$

$3a+3b = 10+2b$

$3a+3b-2b = 10$

$3a+b = 10$ — ①

$2x(5+b) = 3x(a+7)$

$\Rightarrow 10+2b = 3a+21$

$\Rightarrow 2b-3a = 21-10$

$\Rightarrow 2b-3a = 11$ — ②

From equation ① solve be

$3a+b = 10$

$b = 10-3a$ — ③

Substitute eqn ③ in ②

$\Rightarrow 2(10-3a)-3a = 11$

$\Rightarrow 20-6a-3a = 11$

$-9a = 11-20$

$\Rightarrow -9a = -9$

$\Rightarrow a = \frac{-9}{-9}$

$\Rightarrow a = 1$

Substitute 'a' in ③

$b = 10-3x1$

$b = 10-3$

$b = 7$

∴ The values of a and b are $a=1$ and $b=7$

Ans: A

REASON AND ASSERTION TYPE

(8) Assertion: This statement claims that if a and b are integers, then their sum a+b will also be an integer.

Reason: The reason provided states that the sum of two integers is always an integer.

Ans: A

---

(9) Assertion: An even integer a can be expressed as $a = 2k$, where k is an integer. The negation of a, which is (-a) would be $(-a = -2k)$. Since (-2k) is also an integer.

Reason: The reason provided states that the negation of an even integer is always even. This is true because if $a = 2k$, the $-a = -2k$.

Ans: A

STATEMENT TYPE:

(10) Statement-I: The product of a negative integer and positive integer is always a negative integer.

Statement-II: Division by zero is not defined in mathematics.

Ans: B

---

(11) Statement-I : The commutative property under addition states that $a+b=b+a$. The given equation $a-c=b-d$ with $c=a$ and $d=b$ is not commutative property under addition.

Statement-II: $\frac{a}{1}=a$

$a\times 1 = 1\times k$

k should equal a

$k\times a$ is incorrect if k is supposed to be the result of multiplication.

Ans: D

(12) Statement-I : Distributive law states that

$a\times(b+c) = ab+ac$; not $ab+am$.

∴ The no basis for concluding $m=c$

Statement-II : Division is not Associative

in general $a\div(b\div c) \neq (a\div b)\div c$

Ans: B

COMPREHENSION TYPE

Comprehension-1

(13) $(a+b-1)$

we need to add 1 to above equation

$= (a+b-1+1)$

$= a+b.$ Ans: A

---

(14) $(x-y)$; we need to substract 1 from $(x-y)$

$= (x-y)-1$

$= x-y-1.$ Ans: C

---

(15) Successor of x is $x+1$

predecessor of x is $x-1$

Sum of successor and precesesior is

$= (x+1)+(x-1)$

$= x+1+x-1$

$= 2x.$ Ans: C

Comprehension-2

(16) a, b, c, d are consecutive integers

$\therefore$ The Average of a and c

$$b = \frac{a+c}{2}$$

Ans: A

(17) $b = a+1$

$c = a+2$

$d = a+3$

$b+d = ?$

$b+d = (a+1)+(a+3)$

$b+d = a+1+a+3$

$b+d = 2a+4$

$b+d = 2(a+2)$

$b+d = 2c \quad (\because c = a+2)$

Ans: B

(18) $a = b-1$

$d = b+2$

$a+d = b-1+b+2$

$a+d = 2b+1$

option c : $b+c$: this is $(b+(b+1)) = 2b+1$

Ans: C

INTEGER TYPE:

(19) $c \div (-4) = 5$

$$\frac{c}{-4} = 5$$

$$c = 5 \times (-4)$$

$$c = -20.$$

(20) $b + 9 = 3$

$$b = 3 - 9$$

$$b = -6$$

(21) $= 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{6}$

$\Rightarrow 1 = \frac{6}{6}, \frac{1}{2} = \frac{3}{6}, \frac{1}{3} = \frac{2}{6}, \frac{1}{6} = \frac{1}{6}$

add then

$$= \frac{6}{6} + \frac{3}{6} + \frac{2}{6} + \frac{1}{6} = \frac{12}{6} = 2$$

(22) Sum of the integers from 1 to 100

formula $= \frac{n(n+1)}{2}$

$$= \frac{100 \times (100+1)}{2}$$

$$= \frac{50 \times 101}{2_1} = 5050.$$

(23) The sum of integers from $(-n)$ to n where n is positive is 0.

$\therefore -50$ to $50 = 0$

MATRIX MATCHING TYPE

(24)

(a) Ans: r

(b) Ans: t

(c) Ans: p

(d) Ans: q

(e) Ans: s

(25) $a=1, b=2, c=3$

(a) $a+(b+c) = a\times(b\times c)$

$1+(2+3) = 1\times(2\times3)$ Ans: t

$6 = 6.$

(b) $ab+bc+ca$

$= 1\times2+2\times3+3\times1$ Ans: r

$= 2+6+3$

$= 11$

(c) $a^2+b^2+c^2$

$= (1)^2+(2)^2+(3)2$ Ans: S

$= 1+4+9$

$= 14$

(d) $a^3+b^3+c^3$

$= (1)^3+(2)^3+(3)^3$ Ans: q.

$= 1+8+27$

$= 36$