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Question Bank

Ch-1 Rational Numbers

I Multiple Choice Question. (1-M)

Choose the correct option from the options given below.

(i) What number should be added to $\frac{-3}{4}$ to get $\frac{7}{6}$?

(a) $\frac{11}{24}$ (b) $\frac{10}{25}$ (c) $\frac{23}{12}$ (d) $\frac{9}{24}$

$\boxed{c = \frac{23}{24}}$

(ii) The property of rational numbers illustrated by the mathematical expression

$$\left(\frac{2}{7}+\frac{-3}{8}\right)\times\frac{5}{11} = \left(\frac{2}{7}\times\frac{5}{11}\right)+\left(\frac{-3}{8}\times\frac{5}{11}\right)$$

(a) Associative property of addition
(b) Commutative property
(c) Distributive property of multiplication over addition.
(d) Associative property of multiplication.

c = Distributive property of multiplication over addition.

(iii)

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(1-14)

(iii) The sum of the additive inverse and multiplicative inverse of $\frac{1}{5}$ is

(a) $\frac{24}{5}$ (b) $-\frac{24}{5}$ (c) 25 (d) -25

A = $\boxed{a = \frac{24}{5}}$

(iv) For three rational numbers a, b & c which of the following is correct?

(a) $a \div b = b \div a$
(b) $a \times (b \div c) = (a \div b) \times (a \div c)$
(c) $a \div (b \div c) = (a \div b) \div (a \div c)$
(d) $a \div (b \div c) \neq a \div b \div c$

A (d) $a \div (b \div c) \neq a \div b \div c$

(v) Among $\frac{6}{11}$, $\frac{-6}{13}$ & $-\frac{6}{7}$ the greatest rational number is
(a) $-\frac{6}{13}$ (b) $\frac{-6}{7}$ (c) $\frac{6}{11}$ (d) None of them

A - (a) $\boxed{\frac{6}{13}}$

(vi) $\frac{-7}{11} \div \left(\frac{-3}{44}\right) =$
(a) $3\frac{1}{9}$ (b) $2\frac{1}{7}$ (c) $9\frac{1}{3}$ (d) $4\frac{1}{7}$
A - (c) $9\frac{1}{3}$

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(vii) $\frac{0}{5}$ is a rational number, $\frac{0}{8}$ is a rational number, then $\frac{0}{5} \div \frac{0}{8}$ is:

(a) an irrational number
(b) a rational number
(c) 0
(d) undefined.
A - $\boxed{\text{(d) undefined}}$

(VIII) The product of a rational number $\frac{3}{8}$ and it's additive inverse is

(a) 1 (b) $-\frac{9}{64}$ (c) $\frac{9}{64}$ (d) 0

A - $\boxed{\text{(b)} -\frac{9}{64}}$

(1-M)

Q II The following questions are Assertion-Reason based questions. Choose your answers based on the codes given below.
(1) Both A & R are correct and R is the correct explanation of A.
(2) Both A & R are correct and R is not the correct explanation of A.
(3) A is true, but R is false.
(4) A is false, but R is true

(i) Assertion (A): Additive inverse of $\frac{2}{5}$ is $-\frac{5}{2}$
Reason (R): For every non-zero rationale

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number 'a', '-a' such that
$a + (-a) = 0$

(a) 1 (b) 2 (c) 3 (d) 4

Ans:- (d) 4 → (A) is false but (R) is true

(ii) Assertion (A) : Multiplicative inverse of $\frac{-7}{5}$ is $\frac{-5}{7}$.

Reason (R) : For every non-zero rational number 'a' there is a rational number $\frac{1}{a}$ such that $a \times \frac{1}{a} = 1$

(a) 1 (b) 2 (c) 3 (d) 4

(A) → (a) Both 'A' & 'R' are correct and 'R' is the correct explanation of 'A'.

(iii) Assertion (A) : $\frac{1}{2} + 2 = \frac{5}{2}$, which is a rational number.

Reason (R) : If $\frac{p}{q}$ and $\frac{r}{s}$ are any two rational numbers then $\frac{p}{q} + \frac{r}{s} = \frac{r}{s} + \frac{p}{q}$

(a) 1 (b) 2 (c) 3 (d) 4

A → (b) Both A & R are correct but 'R' is not the correct explanation of 'A'.

Q (iii) Write : (1 - M)

(i) The rational number that does not have a reciprocal (A = 0)

(ii) The rational number that is equal to their reciprocal. (A = 1)

(iii) The reciprocal of $\frac{-8}{17} + \left(\frac{-8}{17}\right)$ is

$\left(A = \frac{-17}{16}\right)$

Q (iv) Name the property used in the following

(a) $\frac{3}{5} \times \frac{-8}{9} = \frac{-8}{9} \times \frac{3}{5}$ (1 - M)

A - commutative property of multiplication of rational numbers.

(b) $\frac{-3}{4} \times \left(\frac{5}{7} \times \frac{-8}{15}\right) = \left(\frac{-3}{4} \times \frac{5}{7}\right) \times \frac{-8}{15}$

A - Associative property of multiplication

(c) $\frac{8}{-9} \times 1 = 1 \times \frac{8}{-9} = \frac{8}{-9}$

A - Existence of multiplicative identity

(d) $\frac{-3}{4} + 0 = \frac{-3}{4}$

A - Existence of additive identity.

Q V Verify that (3-M)

(a) $x \times (y - z) = x \times y - x \times z$, if

$x = \frac{3}{4}$, $y = \frac{8}{9}$ and $z = -5$

Solution:

L.H.S $x \times (y - z)$

$= \frac{3}{4} \times \left(\frac{8}{9} - (-5)\right)$

$= \frac{3}{4} \times \left(\frac{8}{9} + \frac{5}{1}\right)$

$= \frac{3}{4} \times \left(\frac{8 + 45}{9}\right)$

$= \frac{\cancel{3}^{1}}{4} \times \frac{53}{\cancel{9}_{3}}$

$= \frac{53}{12}$

R.HS : $x \times y - x \times z$

$= \frac{\cancel{3}}{\cancel{4}} \times \frac{\cancel{8}^{2}}{\cancel{9}_{3}} - \frac{3}{4} \times (-5)$

$= \frac{2}{3} - \frac{-15}{4}$

$= \frac{8 - (-45)}{12}$

$= \frac{8 + 45}{12}$

$= 53/12$

LHS = RHS (Proved)

∴ Distributive property of multiplication over subtraction verified

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(b) If $m = \frac{-7}{9}$ and $n = \frac{5}{6}$, verify that:

(i) $m - n \neq n - m$ (4-M)

(ii) $-(m + n) = (-m) + (-n)$

Solution

LHS

(i) $m - n = \frac{-7}{9} - \frac{5}{6}$

$= \frac{-14 - 15}{18}$

$= \frac{-29}{18}$

RHS $n - m$

$= \frac{5}{6} - \frac{(-7)}{9}$

$= \frac{15 - (-14)}{18}$

$= \frac{15 + 14}{18}$

$= \frac{29}{18}$

$\therefore m - n \neq n - m$ (Verified)

Commutative property is not applicable in case of subtraction of rational numbers.

(ii) L.H.S (4-M)

$$-(m+n)$$

$$= -\left[\frac{-7}{9} + \frac{5}{6}\right]$$

$$= -\left[\frac{-14+15}{18}\right]$$

$$= -\frac{1}{18}$$

R.H.S

$$(-m) + (-n)$$

$$= -\left(\frac{-7}{9}\right) + \left(-\frac{5}{6}\right)$$

$$= \frac{7}{9} - \frac{5}{6}$$

$$= \frac{14-15}{18}$$

$$= \frac{-1}{18}$$

$\therefore$ L.H.S = R.H.S (Verified)

VI Q(6) By what rational number should $\frac{12}{17}$ be multiplied to get $\frac{4}{7}$? (3-M)

Solution: Let the required number be x

So $x \times \frac{12}{17} = \frac{-4}{7}$

$\Rightarrow x = \frac{-4}{7} \div \frac{12}{17}$

$= -\frac{\cancel{4}^{1}}{7} \times \frac{17}{\cancel{12}_{3}}$

$= \frac{-17}{21}$

Q7 Write five rational numbers between $-\frac{3}{2}$ and $\frac{5}{3}$. (4-M)

Solution: L.C.M of 2 & 3 = 6

$\therefore \frac{-3 \times 3}{2 \times 3} = \frac{-9}{6}, \frac{5 \times 2}{3 \times 2} = \frac{10}{6}$

Thus the required 5 rational numbers between $\frac{-9}{6}$ & $\frac{10}{6}$ are

$-\frac{8}{6}, \frac{-7}{6}, \frac{-5}{6}, \frac{1}{6}, \frac{5}{6}$

(any five between -9 & 10)

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(8) The area of a rectangular plate is $5\frac{5}{7}\,m^2$ and it's length is $3\frac{3}{4}\,m$, find its breadth and it's perimeter. (4-M)

Solution: Area of a rectangle $= l \times b$

$$\Rightarrow \text{it's length} = \frac{\text{area}}{\text{its breadth}}$$

$$\therefore \text{breadth} = \frac{\text{area}}{\text{length}}$$

$$\text{Area} = 5\frac{5}{7}\,m^2 = \frac{40}{7}\,m^2$$

$$\text{length} = 3\frac{3}{4}\,m = \frac{15}{4}\,m$$

$$\therefore \text{It's breadth} = \frac{40}{7}\,m^2 \div \frac{15}{4}\,m$$

$$= \frac{\cancel{40}^{8}}{7} \times \frac{4}{\cancel{15}_{3}}\,m$$

$$= \frac{32}{21}\,m = 1\frac{11}{21}\,m$$

$\therefore$ Perimeter of the plate $= 2(l + b)$

$$= 2\left(\frac{15}{4} + \frac{32}{21}\right)m$$

$$= 2\left(\frac{315 + 128}{84}\right)m = \frac{443}{42}\,m = 10\frac{23}{42}\,m$$

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(9) Evaluate :- $\frac{7}{20} + \frac{17}{-45} + \frac{-11}{-30} + \frac{-8}{15}$ [4-M]

Solution : $\frac{7}{20} + \frac{17}{-45} + \frac{-11}{-30} + \frac{-8}{15}$

$= \frac{7}{20} + \frac{-17}{45} + \frac{11}{30} + \frac{-8}{15}$

$= \left(\frac{7}{20} + \frac{11}{30}\right) + \left(\frac{-8}{15} + \frac{-17}{45}\right)$

$= \frac{21+22}{60} + \frac{-24+(-17)}{45}$

$= \frac{43}{60} + \frac{-41}{45}$

$= \frac{129+(-164)}{180}$

$= \frac{129-164}{180}$

$= \frac{-35}{180}$

$= \boxed{\frac{-7}{36}}$

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Chapter-2 Exponents & Powers

I Multiple Choice Questions

Choose the correct option from the option given below. (1 M)

(i) The value of $(7^{-1}-8^{-1})^{-1}-(3^{-1}-4^{-1})^{-1}$

(a) 44 (b) 56 (c) 68 (d) 12

A = a (44)

(ii) $(2^5 \div 2^8) \times 2^{-7} =$

(a) 2^{-10} (b) 2^{20} (c) 2^{13} (d) $\frac{1}{2^{-10}}$

A = a (2^{-10})

(iii) If $\left(\frac{-7}{8}\right)^{x-5} = 1$ then $x =$

(a) -5 (b) 4 (c) 5 (d) 0

A = c (5)

(iv) $\left[\left\{\left(\frac{-1}{3}\right)^{-2}\right\}^{2}\right]^{1} =$ ____

(a) 27 (b) -81 (c) $(-3)^{-4}$ (d) 81

A = d (81)

(V) If $\left(\frac{a}{b}\right)^{x-1} = \left(\frac{b}{a}\right)^{x-3}$, then the value of x

(a) 2 (b) 3 (c) 4 (d) -2

A = a (2)

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II Competency based questions (3M)

(i) If $64^a = \frac{1}{256^b}$, then $3a + 4b = ?$

Solution $(4^3)^a = \frac{1}{(4^4)^b}$

$\Rightarrow 4^{3a} = \frac{1}{4^{4b}}$

$\Rightarrow 4^{3a} = 4^{-4b}$

$\therefore 3a = -4b$

So $3a + 4b$

$= -4b + 4b$

$= \boxed{0}$ (A)

(ii) Which is the smallest number among the following?

(a) $\left[(5^{-2})^{-2}\right]^{-2}$, (b) $\left[(5^{-2})^{2}\right]^{-2}$ (c) $\left[(2^{-5})^{-2}\right]^{-2}$

(d) $\left[(2^{-5})^{2}\right]^{-2}$

Solution $\left[(5^{-2})^{-2}\right]^{-2}$ (1M)

$= (5)^{-8}$

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

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(b) $\left[(5^{-2})^{2}\right]^{-2}$ (1 M)

$= (5)^{8}$

(c) $\left[(2^{-5})^{-2}\right]^{-2}$

$= (2^{10})^{-2}$

$= (2)^{-20}$

$= \frac{1}{2^{20}}$

(d) $\left[(2^{-5})^{2}\right]^{-2}$ (1 M)

$= (2^{-10})^{-2}$

$= (2)^{20}$

(c) $\frac{1}{2^{20}}$ is the smallest one.

(iii) $(2^{-1} + 3^{-1} + 5^{-1})^{0} = ?$ (3 M)

Solution $(2^{-1} + 3^{-1} + 5^{-1})^{0}$

$= \left(\frac{1}{2} + \frac{1}{3} + \frac{1}{5}\right)^{0}$

$= \left(\frac{15 + 10 + 6}{30}\right)^{0}$

$= \left(\frac{31}{30}\right)^{0}$

$= 1$

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(iv) Find the value of x, if (4M)

$$\left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{11} = \left(\frac{8}{5}\right)^{2x} \times \left(\frac{5}{8}\right)^{-4}$$

Solution:- $\left(\frac{5}{8}\right)^{-7} \times \left(\frac{8}{5}\right)^{11} = \left(\frac{8}{5}\right)^{2x} \times \left(\frac{5}{8}\right)^{-4}$

$$\Rightarrow \left(\frac{8}{5}\right)^{7} \times \left(\frac{8}{5}\right)^{11} = \left(\frac{8}{5}\right)^{2x} \times \left(\frac{8}{5}\right)^{4}$$

$$\Rightarrow \left(\frac{8}{5}\right)^{7+11} = \left(\frac{8}{5}\right)^{2x+4}$$

$$\Rightarrow \left(\frac{8}{5}\right)^{18} = \left(\frac{8}{5}\right)^{2x+4}$$

$$\therefore 18 = 2x+4$$

$$\Rightarrow 18-4 = 2x$$

$$\Rightarrow 14 = 2x$$

$$\Rightarrow 14/2 = x$$

$$\Rightarrow \boxed{7 = x} \text{ (A)}$$

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(v) Show that $\dfrac{1}{1+p^{a-b}} + \dfrac{1}{1+p^{b-a}} = 1$ (4M)

L.H.S $\dfrac{1}{1+p^{a-b}} + \dfrac{1}{1+p^{b-a}}$

$$= \frac{1}{1+\frac{p^a}{p^b}} + \frac{1}{1+\frac{p^b}{p^a}}$$

$$= \frac{1}{\frac{p^b+p^a}{p^b}} + \frac{1}{\frac{p^a+p^b}{p^a}}$$

$$= \frac{p^b}{p^b+p^a} + \frac{p^a}{p^a+p^b}$$

$$= \frac{(p^b+p^a)}{(p^a+p^b)}$$

$= 1$ (LHS = RHS) Proved.

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(III) The following questions are Assertion-Reason based questions. Choose your answer based on the codes given below. (1 M)

(1) Both A and R are correct and R is the correct explanation for A
(2) Both A and R are correct and R is not the correct explanation of A
(3) A is true but R is false

(4) A is false but R is true.

(i) Assertion (A) : $(-100)^3 = -10{,}00{,}000$

Reason (R) : $(-p)^q = p^q$; if q is even

Solution $(-100)^3 = (-100)(-100)(-100)$
$= -1000000$ (True)

$(-p)^q = (-1)^q \times p^q = p^q$ (True

$(-1^q = 1$, if q is even)

a (1) b (2) c (3) d (4)

A:-(b) Code - 2 - Both A & R are correct and 'R' is not the correct explanation of A.

(ii) Assertion (A) : $(7^0 + 2^0)(7^0 - 2^0) = 0$

Reason (R) : Any number raised to the power zero (0) is always equal to 1.

Solution : $(7^0 + 2^0)(7^0 - 2^0)$
$= (1+1)(1-1) = 2 \times 0 = 0$

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$\therefore$ 'A' is true and 'R' is the correct explanation for 'A'.

$\therefore$ Ans. (a)

(iii) Assertion (A) : $\left(\frac{1}{5}\right)^{-5} \times \left(\frac{1}{2}\right)^{-5} = (10)^{-5}$

Reason (R) : $p^{-q} = \frac{1}{p^q}$ and $\frac{1}{p^{-q}} = p^q$

where $p \neq 0$.

a. (1) b. (2) c. (3) d. (4)

<u>Solution</u> $\left(\frac{1}{5}\right)^{-5} \times \left(\frac{1}{2}\right)^{-5}$

$= 5^5 \times 2^5$

$= (10)^5$ $\therefore$ A is False

R is true

Ans. (d) A is False but R is true.

(iv) Assertion (A) : $\frac{x^m}{y^m}$ = Reciprocal of $\left(\frac{x}{y}\right)^{-m}$

Reason (R) : If $\frac{p}{q}$ is any rational number and n is any integer; then $\left(\frac{p}{q}\right)^n = \frac{p^n}{q^n}$

a. (1) b. (2) c. (3) d. (4)

Ans: b (2) Both Assertion and Reason are true but 'R' is not the correct explanation for 'A'.

Q IV (1) Find m so that $\left(\frac{2}{3}\right)^{3} \times \left(\frac{2}{3}\right)^{-6} = \left(\frac{2}{3}\right)^{2m-1}$

Solution : $\left(\frac{2}{3}\right)^{3} \times \left(\frac{2}{3}\right)^{-6} = \left(\frac{2}{3}\right)^{2m-1}$

(4M)

$\Rightarrow \left(\frac{2}{3}\right)^{3+(-6)} = \left(\frac{2}{3}\right)^{2m-1}$

$\Rightarrow \left(\frac{2}{3}\right)^{-3} = \left(\frac{2}{3}\right)^{2m-1}$

$\Rightarrow -3 = 2m-1$

$\Rightarrow -3+1 = 2m$

$\Rightarrow -2 = 2m$

$\Rightarrow -2/2 = m$ $\quad (\therefore m = -1)$

$\Rightarrow \boxed{-1 = m}$ (A)

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(2) Simplify & express with positive exponents (3)

(a) $\left(\frac{-5}{9}\right)^{-5} \div \left(\frac{-5}{9}\right)^{-11}$

$= \left(\frac{-5}{9}\right)^{-5+11}$ $\quad [-5-(-11)]$

$= \left(\frac{-5}{9}\right)^{6}$

(b) $\left(\frac{-2}{3}\right)^{-4} \times \left(\frac{5}{8}\right)^{-4}$ (3)

$= \left(\frac{-\cancel{2}}{3} \times \frac{5}{\cancel{8}_4}\right)^{-4}$

$= \left(\frac{-5}{12}\right)^{-4}$

$= \left(\frac{-12}{5}\right)^{4}$

Q3 Simplify (4)

$\left[\left(\frac{2}{3}\right)^2\right]^3 \times \left(\frac{1}{3}\right)^{-4} \times 3^{-1} \times \frac{1}{6}$

Solution :- $\left[\left(\frac{2}{3}\right)^2\right]^3 \times \left(\frac{1}{3}\right)^{-4} \times 3^{-1} \times \frac{1}{6}$

$= \left(\frac{2}{3}\right)^6 \times 3^4 \times \frac{1}{3} \times \frac{1}{6}$

$= \frac{2^6}{3^6} \times 3^4 \times \frac{1}{3} \times \frac{1}{2} \times \frac{1}{3}$

$= \frac{2^6 \times 3^4}{3^8 \times 2}$

$= \frac{2^{6-1}}{3^{8-4}}$

$= \frac{2^5}{3^4} = \boxed{\frac{32}{81}}$ (A)

(4) By what number should $\left(\frac{5}{4}\right)^{-3}$ be divided so that the quotient may be $\left(\frac{15}{16}\right)^{-2}$?

Solution :- (3)

Let the required number be x

$\therefore \left(\frac{5}{4}\right)^{-3} \div x = \left(\frac{15}{16}\right)^{-2}$

$\Rightarrow \left(\frac{4}{5}\right)^{3} \times \frac{1}{x} = \left(\frac{16}{15}\right)^{2}$

$\Rightarrow \left(\frac{4}{5}\right)^{3} = \left(\frac{16}{15}\right)^{2} \times x$

$\Rightarrow \frac{64}{125} = \left(\frac{16}{15}\right)^{2} \times x$

$\Rightarrow \frac{64}{125} \div \frac{256}{225} = x$

$\Rightarrow \frac{\cancel{64}^{1}}{_{5}\cancel{125}} \times \frac{\cancel{225}^{9}}{\cancel{256}_{4}} = x$

$\Rightarrow \boxed{\frac{9}{20} = x}$ (A)

(5) Show that $\left(\frac{x^a}{x^b}\right)^{c} \times \left(\frac{x^b}{x^c}\right)^{a} \times \left(\frac{x^c}{x^a}\right)^{b} = 1$

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Solution :- (4)

L.H.S $\left(\frac{x^a}{x^b}\right)^c \times \left(\frac{x^b}{x^c}\right)^a \times \left(\frac{x^c}{x^a}\right)^b$

$= \left(x^{a-b}\right)^c \times \left(x^{b-c}\right)^a \times \left(x^{c-a}\right)^b$

$= x^{(a-b)c} \times x^{(b-c)a} \times x^{(c-a)b}$

$= x^{ac-bc} \times x^{ab-ac} \times x^{bc-ab}$

$= x^{\cancel{ac}-\cancel{bc}+\cancel{ab}-\cancel{ac}+\cancel{bc}-\cancel{ab}}$

$= x^0$

$= 1$

$\therefore$ L.H.S = R.H.S (Proved)

—x—

Chapter - 10 Algebraic Expression & Identities.

Q1. MCQS (1 M)

Choose the correct option from the options given below.

(i) If $-15mn^4p^2$ is divided by $\frac{1}{6}m^4n^4p^2$, the quotient is

(a) $\frac{-5}{3m^3}$ (b) $\frac{-90n^8p^4}{m^3}$ (c) $\frac{-90}{m^3}$ (d) $-90m^3$

Ans. $\frac{-90}{m^3}$

(ii) $4p(-p-q+r) - (-4p^2+4pq+4pr) = ?$

(a) $8p^2$ (b) 0 (c) $-8pq$ (d) $-8p^2+8pr$

Ans: (c) $-8pq$

(iii) The sum of $a-b+ab$, $b-c+bc$ and $c-a+ca$ is:

(a) 0 (b) $2(a+b+c)$ (c) $ab+bc+ca$ (d) non of these.

Ans: (c) $ab+bc+ca$

(iv) $13 \times a + b \div 2c$ is a

(a) Monomial (b) Binomial (c) Trinomial (d) Multinomial

Ans: (b) Binomial

(v) The coefficient of 8 in $a^2 - 8ax + a$ is

(a) $-ax$ (b) $-8a$ (c) $-8x$ (d) ax

Ans: (a) $-ax$

(vi) The following questions are Assertion - Reason based questions. Choose your answer based on the codes given below. (1 M)

(1) Both A and R are correct and R is the correct explanation for A.
(2) Both A and R are correct, and R is not the correct explanation of A.
(3) A is true but R is false.
(4) A is false but R is true.

(a) Assertion (A) : $5x + y^2 - x^3$, $xy + yz + zx$, $x^2 - x + 1$ are all trinomials

Reason (R) : An algebraic expression which contains three different terms is called a trinomial.

a. (1) b. (2) c. (3) d. (4)

Ans: a (1)

(b) Assertion (A) : $2xyz + 3x^2y$ is a cubic polynomial in three variables.

Reason (R) : An algebraic expression having two or more variables the highest sum of the powers of all the variables in each term taken as the degree of the polynomial if this sum is a whole number.

(a) 1 (b) 2 (c) 3 (d) 4

Ans: (a) 1 .

(c) Assertion (A):
$7a - 2b = 5ab$

Reason (R) : Unlike terms cannot be directly added or subtracted.

(a) 1 (b) 2 (c) 3 (d) 4

Ans: d (4)

(d) Assertion (A) : $7m^2n$ and $-5m^2n$ are like terms.

Reason (R) : Terms having same variables, same power and same numeral coefficient are like terms

(a) 1 (b) 2 (c) 3 (d) 4

Ans: c (3)

(e) Assertion (A) : $(25)^2 = 400 + (2 \times 20 \times 5) + 25$

Reason (R) : $(a+b)^2 = a^2 + 2ab + b^2$

(a) 1 (b) 2 (c) 3 (d) 4

Ans: (a) 1 .

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Q2. Competency based questions

(i) To make $36x^2 + 84xy$ a perfect square, you need to add ___ to the expression (3M)

Solution : $36x^2 + 84xy$

$a^2 = 36x^2 = (6x)^2$

$2ab = 2 \times 6x \times \_ = 84xy$ $(\because b = 7y)$

$\Rightarrow 12x \times 7y = 84xy$

$\Rightarrow 36x^2 + 84xy + 49y^2$

$(a+b)^2 = (6x + 7y)^2$

$= 36x^2 + 84xy + 49y^2$

$\therefore 49y^2$ to be added.

(ii) Which algebraic identity would you use to evalua[te] 197×203? (3M)

(a) $(a+b)^2 = a^2 + 2ab + b^2$

(b) $(a+b)(a-b) = a^2 - b^2$ ✓

(c) $(a-b)^2 = a^2 - 2ab + b^2$

(d) None of these

(3M)

Solution : 197×203

$= (200-3) \times (200+3)$ $\left[\underbrace{(a-b)(a+b)}_{\text{used}} = a^2 - b^2\right]$

$= (200)^2 - (3)^2$

$= 40000 - 9$

$= \boxed{39{,}991}$

(iii) In $\frac{5}{9}ab^2c^3$, write the coefficient of (1 M) Each

(a) 5 A → $\frac{1}{9}ab^2c^3$ (e) $5ab^2$ A → $c^3/9$

(b) $\frac{5}{9}$ A → ab^2c^3 (f) $\frac{1}{9}bc$ A → $5abc^2$

(c) c^3 A → $\frac{5}{9}ab^2$ (g) c A → $\frac{5}{9}ab^2c^2$

(d) $5a$ A → $\frac{b^2c^3}{9}$ (h) $5abc$ A → $\frac{bc^2}{9}$

(iv) The area of a rectangle is x^3-8x^2+7 and one of its sides is $x-1$. Find it's perimeter. (4M)

Solution: Area of a rectangle $= x^3-8x^2+7$

one of it's side $= (x-1)$

$\therefore$ The other side = Area / one of it's adjacent side

$= (x^3-8x^2+7) \div (x-1)$

$$
\begin{array}{r|l}
x-1 & x^3 - 8x^2 + 7 \;\left(\, x^2 - 7x - 7 \right. \\
 & \cancel{x^3} - x^2 \\
 & \cancel{-} \quad + \\
\hline
 & 0 \quad -7x^2 + 7 \\
 & \quad \cancel{-7x^2} \quad + 7x \\
 & \quad \cancel{+} \quad - \\
\hline
 & 0 \quad \cancel{7} \quad -\cancel{7x} \quad \cancel{+7} \\
 & \quad \cancel{-7x} \quad \cancel{+7} \\
 & \quad \cancel{+} \quad \cancel{-} \\
\hline
 & \quad 0 \quad 0
\end{array}
$$

$\therefore$ Perimeter of the rectangle = 2 (sum of the adjacent sides)

$$= 2\{(x^2 - 7x - 7) + (x - 1)\}$$
$$= 2(x^2 - 7x + x - 7 - 1)$$
$$= 2(x^2 - 6x - 8)$$
$$= \boxed{2x^2 - 12x - 16} \text{ unit.}$$

(V) If $x = 6a + 8b + 9c$
$y = 2b - 3a - 6c$
$z = c - b + 3a$; find $2x - y - 3z$.
(4 M)

Solution : $2x - y - 3z$

$$= 2(6a + 8b + 9c) - (2b - 3a - 6c) - 3(c - b + 3a)$$
$$= 12a + 16b + 18c - 2b + 3a + 6c - 3c + 3b - 9a$$
$$= 12a + 3a - 9a + 16b + 3b - 2b + 18c + 6c - 3c$$
$$= 15a - 9a + 19b - 2b + 24c - 3c$$
$$= \boxed{6a + 17b + 21c}$$

—x—

(Vi) The adjacent sides of a rectangle are $3x^2 - 2xy + 5y^2$ and $2x^2 + 5xy - 3y^2$. Find the area of the rectangle. (4M)

Solution : Area = Product of it's adjacent sides.

$$= (3x^2 - 2xy + 5y^2)(2x^2 + 5xy - 3y^2)$$

$= 3x^2(2x^2 + 5xy - 3y^2) - 2xy(2x^2 + 5xy - 3y^2)$
$+ 5y^2(2x^2 + 5xy - 3y^2)$

$= 6x^4 + 15x^3y - 9x^2y^2 - 4x^3y - 10x^2y^2 + 6xy^3$
$+ 10x^2y^2 + 25xy^3 - 15y^4$

$= 6x^4 + 15x^3y - 4x^3y - 9x^2y^2 - \cancel{10x^2y^2} + \cancel{10x^2y^2}$
$+ 6xy^3 + 25xy^3 - 15y^4$

$= 6x^4 + 11x^3y - 9x^2y^2 + 31xy^3 - 15y^4$ square unit.

—x—

(vii) If $x - \frac{1}{x} = 3$, find the value of $x^2 + \frac{1}{x^2}$

Solution

$\left(x - \frac{1}{x}\right)^2 = 3^2$ (3M)

$\Rightarrow x^2 + \frac{1}{x^2} - 2 \times \cancel{x} \times \frac{1}{\cancel{x}} = 9$

$\Rightarrow x^2 + \frac{1}{x^2} = 9 + 2$

$\Rightarrow x^2 + \frac{1}{x^2} = \boxed{11}$ (A)

(OR)

$x^2 + \frac{1}{x^2} = \left(x - \frac{1}{x}\right)^2 + 2$

$= 3^2 + 2$

$= 9 + 2$

$= \boxed{11}$ (A)

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Q3 Find the value of a^2+b^2, when

(i) $a+b=7$, $ab=12$ (ii) $(a-7)=7$, $ab=18$

(3M)

Solution (i)

$$a^2+b^2 = (a+b)^2 - 2ab$$
$$= (7)^2 - 2\times 12$$
$$= 49-24$$
$$\therefore \boxed{a^2+b^2 = 25} \text{ (A)}$$

Q4 Solution(ii) (3M)

$$a^2+b^2 = (a-b)^2 + 2ab$$
$$= (7)^2 + 2\times 18$$
$$= 49+36$$
$$\therefore \boxed{a^2+b^2 = 85} \text{ (A)}$$

Q 4 Find the value of $(a+b)$ if $a-b=3$, $ab=40$

solution :-

$$(a+b)^2 = (a-b)^2 + 4ab$$ (3M)

$$= (3)^2 + 4\times 40$$
$$= 9+160$$
$$\Rightarrow (a+b)^2 = 169$$
$$\Rightarrow (a+b) = \sqrt{169}$$
$$\boxed{a+b = \pm 13} \text{ (A)}$$

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Q5 If $x + \frac{1}{x} = 4$, find the value of (a) $x^2 + \frac{1}{x^2}$

(b) $x^4 + \frac{1}{x^4}$ (4M)

Solution (a)

$$x^2 + \frac{1}{x^2} = \left(x + \frac{1}{x}\right)^2 - 2$$

$$= (4)^2 - 2$$

$$= 16 - 2$$

$$\boxed{x^2 + \frac{1}{x^2} = 14}$$

(b) $$x^4 + \frac{1}{x^4} = \left(x^2 + \frac{1}{x^2}\right)^2 - 2$$

$$= (14)^2 - 2$$

$$= 196 - 2$$

$$\boxed{\left(x^4 + \frac{1}{x^4}\right) = 194}$$ (A)

—x—

6. Expand the following

(i) $(3a^2 + b^2)^2 = (3a^2)^2 + 2 \times 3a^2 \times b^2 + (b^2)^2$ (3M)

$= 9a^4 + 6a^2b^2 + b^4$ (A)

(ii) $(5a^2 - 7b^2)^2 = (5a^2)^2 - 2 \times 5a^2 \times 7b^2 + (7b^2)^2$ (3M)

$= 25a^4 - 70a^2b^2 + 49b^4$ (A)

(iii) Evaluate

$(2a-5b)(2a+5b)(4a^2+25b^2)$ (4M)

Solution

$(2a-5b)(2a+5b)(4a^2+25b^2)$

$=\{(2a)^2-(5b)^2\}(4a^2+25b^2)$

$=(4a^2-25b^2)(4a^2+25b^2)$

$=(4a^2)^2-(25b^2)^2$

$=\boxed{16a^4-625b^4}$ (A)

Q 7 Find the product using identity.

(i) 30.8×29.2 (3M)

Solution: 30.8×29.2

$=(30+0.8)(30-0.8)$

$=(30)^2-(0.8)^2$

$=900-0.64$

$=899.36$ (A)

(3M)

(ii) 107×93

Solution $=(100+7)(100-7)$

$=(100)^2-(7)^2$

$=10000-49$

$=9951$ (A)

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Q8. Devide the following

(i) (x^3-4x^2+7x-2) by $(x-2)$ (4M)

Solution

$$x-2 \,\big)\, x^3-4x^2+7x-2 \,\big(\, x^2-2x+3$$
$$\cancel{x^3} \mp 2x^2$$
$$-$$
$$0 \quad \cancel{-2x^2}+7x$$
$$\cancel{-2x^2}\pm 4x$$
$$+ \quad -$$
$$0 \quad \cancel{3}x-2$$
$$\cancel{3}x \mp 6$$
$$- \quad +$$
$$0 \quad 4$$

$\therefore$ Quotient $= x^2-2x+3$
Remainder $= 4$

(ii) (a^4-b^4) by $a-b$ (4M)

Solution

$$a-b \,\big|\, a^4 \qquad -b^4 \quad\quad a^3+a^2b+ab^2+b^3$$
$$\cancel{a^4} \mp a^3b$$
$$-$$
$$0 \quad \cancel{a^3b}$$
$$\cancel{a^3b} \mp a^2b^2$$
$$-$$
$$0 \quad \cancel{a^2b^2}$$
$$\cancel{a^2b^2} \mp ab^3$$
$$-$$
$$0 \quad \cancel{ab^3}-\cancel{b^4}$$
$$\cancel{ab^3} \mp \cancel{b^4}$$
$$- \quad +$$
$$0 \quad 0$$

$\boxed{Q = a^3+a^2b+ab^2+b^3}$

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(9) What must be subtracted from $x^4 + 6x^3 + 13x^2 + 13x + 8$ so that the resulting polynomial is exactly divisible by (x^2+3x+2)? (4M)

Solution:

$$
\begin{array}{r|l}
 & x^2 + 3x + 2 \\
x^2+3x+2 & \cancel{x^4} + 6x^3 + 13x^2 + 13x + 8 \\
 & \cancel{x^4} + 3x^3 + 2x^2 \\
 & - \quad - \quad - \\
\hline
 & 0 \quad \cancel{3x^3} + 11x^2 + 13x \\
 & \cancel{3x^3} + 9x^2 + 6x \\
 & - \quad - \quad - \\
\hline
 & \cancel{2x^2} + 7x + 8 \\
 & \cancel{2x^2} + 6x + 4 \\
 & - \quad - \quad - \\
\hline
 & 0 \quad x + 4 \\
\hline
\end{array}
$$

Quotient $= x^2 + 3x + 2$
Remainder $= x + 4$

$\therefore$ $(x+4)$ should be subtracted. (A)

Find the product using identities

(10) (i) $(x+3)(x+4)$ (3M)

$= (x)^2 + x(3+4) + 3 \times 4$

$= \boxed{x^2 + 12x + 12}$

(ii) $(3a-5)(3a-8)$ (3M)

$= (3a)^2 + 3a\{(-5)+(-8)\} + \{(-5)\times(-8)\}$

$= \boxed{9a^2 - 39a + 40}$