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SUBJECT : MATHEMATICS
CHAPTER NUMBER: 05
CHAPTER NAME : EXPONENTS

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Learning outcomes

Students will be able to evaluate problems based on laws of exponents.

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PREVIOUS CONNECT

Find the reciprocal of the rational number $\left(\frac{1}{2}\right)^2 \div \left(\frac{2}{3}\right)^3$.

Given, $\left(\frac{1}{2}\right)^2 \div \left(\frac{2}{3}\right)^3 = \frac{\left(\frac{1}{2}\right)^2}{\left(\frac{2}{3}\right)^3}$ $\left[\because a \div b = \frac{a}{b}\right]$

$= \frac{\frac{(1)^2}{(2)^2}}{\frac{(2)^3}{(3)^3}} = \frac{\left(\frac{1}{4}\right)}{\left(\frac{8}{27}\right)}$ $\left[\because \left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}\right]$

$[\because 1^2 = 1, 2^2 = 4, 2^3 = 8 \text{ and } 3^3 = 27]$

$= \frac{1}{4} \times \frac{27}{8} = \frac{27}{4 \times 8} = \frac{27}{32}$ $\left[\because \frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}\right]$

We know that, reciprocal of a rational number is obtained by interchanging numerator and denominator.

$\therefore$ Reciprocal of given number $= \frac{32}{27}$

(xviii) $(4x^2y^3)^3 \div (3x^2y^3)^3$

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EVALUATION QUESTION

5. Evaluate:

(i) $6^{-2} \div (4^{-2} \times 3^{-2})$

(iii) $5^3 \times 3^2 + (17)^0 \times 7^3$

(iv) $2^5 \times 15^0 + (-3)^3 - (2/7)^{-2}$

(v) $(2^2)^0 + 2^{-4} \div 2^{-6} + (1/2)^{-3}$

(vi) $5^n \times 25^{n-1} \div (5^{n-1} \times 25^{n-1})$

5.Solution:

(i) $6^{-2} \div (4^{-2} \times 3^{-2})$

$= (1/6)^2 \div (1/4)^2 \times (1/3)^2$

$= 1/36 \div 1/16 \times 1/9$

$= 1/36 \div 1/144$

$= 1/36 \times 144/1$

$= 4$

iii) $5^3 \times 3^2 + (17)^0 \times 7^3$

$= 5 \times 5 \times 5 \times 3 \times 3 + (17)^0 \times 7 \times 7 \times 7$

$= 125 \times 9 + 1 \times 343$

$= 1125 + 343$

$= 1468$

(iv) $2^5 \times 15^0 + (-3)^3 – (2/7)^{-2}$

$= 2 \times 2 \times 2 \times 2 \times 2 \times 1 + (-3) \times (-3) \times (-3) – (7/2) \times (7/2)$

$= 32 \times 1 – 27 – 49/4$

$= (32 \times 4)/ (1 \times 4) – (27 \times 4)/ (1 \times 4) – 49/ (4 \times 1)$

$= (128 – 108 – 49)/ 4$

$= -29/ 4$

$= – 7\ 1/4$

(v) $(2^2)^0 + 2^{-4} \div 2^{-6} + (1/2)^{-3}$

$= (4)^0 + (1/2)^4 \div (1/2)^6 + (2/1)^3$

$= 1 + (1/2 \times 1/2 \times 1/2 \times 1/2) \div (1/2 \times 1/2 \times 1/2 \times 1/2 \times 1/2 \times 1/2) + (2/1 \times 2/1 \times 2/1)$

$= 1 + (1/2 \times 1/2 \times 1/2 \times 1/2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2) + 8$

$= 1 + 4 + 8$

$= 13$

(vi) $5^n \times 25^{n-1} \div (5^{n-1} \times 25^{n-1})$

$= 5^n \times 25^{n-1} \times 1/ (5^{n-1} \times 25^{n-1})$

$= 5^n \times 1/ 5^{n-1}$

$= 5^{n - n + 1}$

$= 5^1$

6. If m = – 2 and n = 2; find the value of:

(i) $m^2 + n^2 – 2mn$

(ii) $m^n + n^m$

(iii) $6m^{-3} + 4n^2$

(iv) $2n^3 – 3m$

6.Solution:

(i) $m^2 + n^2 – 2mn$

m = – 2 and n = 2

$= (-2)^2 + 2^2 – 2 (-2) (2)$

$= 4 + 4 – (-8)$

$= 8 + 8$

$= 16$

$= 2^4$

(ii) $m^n + n^m$

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

$= 4 + 1/2 \times 1/2$

$= (4 \times 4)/ (1 \times 4) + 1/4$

$= (16 + 1)/ 4$

$= 17/ 4$

$= 4 ¼$

(iii) $6m^{-3} + 4n^2$

m = – 2 and n = 2

$= 6 (-2)^{-3} + 4 (2)^2$

$= 6 \times 1/ -2 \times 1/ -2 \times 1/ -2 + 4 \times 2 \times 2$

$= – 3/4 + 16$

$= (-3 + 16 \times 4)/ 4$

$= (-3 + 64)/ 4$

(iv) $2n^3 – 3m$

m = – 2 and n = 2

$= 2 (2)^3 – 3 (-2)$

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

$= 16 – 3 \times (-2)$

$= 16 + 6$

$= 22$

AHA

Find the value of n, where n is an integer and $2^{n-5} \times 6^{2n-4} = \dfrac{1}{12^4 \times 2}$.

THANKING YOU

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