Chapter 3

Algebra

Ex 3.1

Question 1.
Fill in the blanks.

1. The exponential form 14^9 should be read as _____
2. The expanded form of $p^3\ q^2$ is _____
3. When base is 12 and exponent is 17, its e×ponential form is _____
4. The value of $(14 \times 21)^0$ is _____

Answers:

1. 14 Power 9
2. $p \times p \times p \times q \times q$
3. 12^{17}
4. 1

Question 2.
Say True or False.

1. $2^3 \times 3^2 = 65$
2. $2^9 \times 3^2 = (2 \times 3)^{9\times2}$
3. $3^4 \times 3^7 = 3^{11}$
4. $2^0 \times 1000^0$
5. $2^3 < 3^2$

Answers:

1. False
2. False
3. True
4. True
5. True

Question 3.
Find the value of the following.

1. 2^6
2. 11^2

3. 5^4
4. 9^3

Solution:

1. $2^6 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$
2. $11^2 = 11 \times 11 = 121$
3. $5^4 = 5 \times 5 \times 5 \times 5 = 625$
4. $9^3 = 9 \times 9 \times 9 = 729$

Question 4.
Express the following in e×ponential form.

1. $6 \times 6 \times 6 \times 6$
2. $t \times t$
3. $5 \times 5 \times 7 \times 7 \times 7$
4. $2 \times 2 \times a \times a$

Solution:

1. $6 \times 6 \times 6 \times 6 = 6^{1+1+1+1} = 64$ [Since $a^m \times a^n = a^{m+n}$]
2. $t \times t = t^{1+1} = t^2$
3. $5 \times 5 \times 7 \times 7 \times 7 = 5^{1+1} \times 7^{1+1+1} = 5^2 \times 7^3$
4. $2 \times 2 \times a \times a = 2^{1+1} \times a^{1+1} = 2^2 \times a^2 = (2a)^2$

Question 5.
E×press each of the following numbers using e×ponential form,
(i) 512
(ii) 343
(iii) 729
(iv) 3125

Solution:
(i) 512

512

2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$512 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$
$= 2^9$ [Using product rule]

(ii) 343

343	7	343
	7	49
	7	9
		1

$343 = 7 \times 7 \times 7 = 7^{1+1+1}$
$= 7^3$ [Using product rule]

(iii) 729

729	3	729
	3	243
	3	81
	3	9
	3	3
		1

$729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3$
$= 3^6$ [Using product rule]

(iv) 3125

3125	5	3125
	5	625
	5	125
	5	25
	5	5
		1

$3125 = 5 \times 5 \times 5 \times 5 \times 5$
$= 5^5$ [Using product rule]

Question 6.
Identify the greater number in each of the following.
(i) 63 or 36
(ii) 53 or 35
(iii) 28 or 82

Solution:

(i) 6^3 or 3^6
$6^3 = 6 \times 6 \times 6 = 36 \times 6 = 216$
$3^6 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 729$
$729 > 216$ gives $3^6 > 6^3$
∴ 36 is greater.

(ii) 5^3 or 3^5
$5^3 = 5 \times 5 \times 5 = 125$
$3^5 = 3 \times 3 \times 3 \times 3 \times 3 = 243$
$243 > 125$ gives $3^5 > 5^3$
∴ 3^5 is greater.

(iii) 2^8 or 8^2
$2^8 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 256$
$8^2 = 8 \times 8 = 64$
$256 > 64$ gives $2^8 > 8^2$
∴ 2^8 is greater.

Question 7.
Simplify the following
(i) 72×34
(ii) 32×24
(iii) 52×104

Solution:
(i) $7^2 \times 3^4 = (7 \times 7) \times (3 \times 3 \times 3 \times 3)$
$= 49 \times 81 = 3969$

(ii) $3^2 \times 2^4 = (3 \times 3) \times (2 \times 2 \times 2 \times 2)$
$= 9 \times 16 = 144$

(iii) $5^2 \times 10^4 = (5 \times 5) \times (10 \times 10 \times 10 \times 10)$
$= 25 \times 10000 = 2{,}50{,}000$

Question 8.
Find the value of the following.
(i) (-4)2
(ii) (-3) × (-2)3
(iii) (-2)3 × (-10)3

Solution:
(i) $(-4)^2 = (-1)^2 \times (4)^2$ [since $a^m \times b^m = (a \times b)^m$]
$= 1 \times 16 = 16$ [since $(-1)^n = 1$ if n is even]

(ii) $(-3) \times (-2)^3 = (-1) \times (-3) \times (-1)^3 \times (-2)^3$
$= (-1)^4 \times 24$ [Grouping the terms of same base]
$= 24$

(iii) $(-2)^3 \times (-10)^3 = (-1)^3 \times (-2)^3 \times (-1)^3 \times (-10)^3$
$= (-1)^{3+3} \times 2^3 \times 10^3$ [Grouping the terms of same base]
$= (-1)^6 \times (2 \times 10)^3$
[$\because a^m \times b^m = (a \times b)^m$]
$= 1 \times 20^3$ [since $(-1)^n = 1$ if n is even]
$= 8000$

Question 9.
Simplify using laws of exponents.
(i) 35 × 38
(ii) a4 × a10
(iii) 7x × 72
(iv) 25 ÷ 23
(v) 188 ÷ 184
(vi) (64)3
(vii) (xm)0
(viii) 95 × 35
(ix) 3y × 12y
(x) 256 × 56

Solution:

(i)	$3^5 \times 3^8$	=	$3^{5+8} = 3^{13}$	[since $a^m \times a^n = a^{m+n}$]
(ii)	$a^4 \times a^{10}$	=	$a^{4+10} = a^{14}$	
(iii)	$7^x \times 7^2$	=	7^{x+2}	
(iv)	$2^5 \div 2^3$	=	$2^{5-3} = 2^2$	[since $\frac{a^m}{a^n} = a^{m-n}$]
(v)	$18^8 \div 18^4$	=	$18^{8-4} = 18^4$	
(vi)	$(6^4)^3$	=	$6^{4\times3} = 6^{12}$	[since $(a^m)^n = a^{m \times n}$]
(vii)	$(x^m)^0$	=	$x^{m\times0} = x^0 = 1$	[since $(a^m)^n = a^{m \times n}$; $a^0 = 1$]
(viii)	$9^5 \times 3^5$	=	$(9 \times 3)^5 = 27^5$	[since $a^m \times b^m = (a \times b)^m$]
(ix)	$3^y \times 12^y$	=	$(3 \times 12)^y = 36^y$	
(x)	$25^6 \times 5^6$	=	$(25 \times 5)^6 = 125^6$	

Question 10.
If a = 3 and b = 2, then find the value of the following.
(i) ab + ba
(ii) aa – bb

(iii) (a + b)b
(iv) (a – b)a

Solution:
(i) $a^b + b^a$
a = 3 and b = 2
we get $3^2 + 2^3 = (3 \times 3) + (2 \times 2 \times 2) = 9 + 8 = 17$

(ii) $(a^a - b^b)$
Substituting a = 3 and b = 2
we get $3^2 - 2^2 = (3 \times 3 \times 3) - (2 \times 2) = 27 - 4 = 23$

(iii) $(a + b)^b$
Substituting a = 3 and b = 2
we get $(3 + 2)^2 = 5^2 = 5 \times 5 = 25$

(iv) $(a - b)^a$
Substituting a = 3 and b = 2
we get $(3 - 2)^3 = 1^3 = 1 \times 1 \times 1 = 1$

Question 11.
Simplify and express each of the following in exponential form:
(i) 45 × 42 × 44
(ii) (32 × 33)7
(iii) (52 × 58) ÷ 5s
(iv) 20 × 30 × 40
(v) 55×a8×b343×a5×b2
Solution:

(i) $4^5 \times 4^2 \times 4^4 = 4^{5+2+4} = 4^{11}$ [Using product rule]

(ii) $(3^2 \times 3^3)^7 = (3^{2+3})^7 = (3^5)^7 = 3^{5\times7} = 3^{5\times7} = 3^{35}$ [Using product rule]

(iii) $(5^2 \times 5^8) \div 5^5 = 5^{2+8} \div 5^5$ [Using product rule]
$= 5^{10} \div 5^5 = 5^{10-5} = 5^5$

(iv) $2^0 \times 3^0 \times 4^0 = (2 \times 3 \times 4)^0 = 24^0 = 1$ $[\because a^0 = 1]$

(v) $\frac{5^5 \times a^8 \times b^3}{4^3 \times a^5 \times b^2} = 4^{5-3} \times a^{8-5} \times b^1$ [Using quotient rule]
$= 4^2 \times a^3 \times b^1 = 4 \times 4 \times a^3 \times b = 16a^3b$

Objective Type Questions

Question 12.
a × a × a × a × a equal to
(i) a5
(ii) 5 a

(iii) 5a
(iv) a + 5

Answer:
(i) a^5

Question 13.
The exponential form of 72 is
(i) 72
(ii) 27
(iii) 22 × 33
(iv) 23 × 32

Answer:
(iv) $2^3 \times 3^2$

Question 14.
The value of x in the equation a13 = x3 × a10 is
(i) a
(ii) 13
(iii) 3
(iv) 10

Answer:
(i) a

Question 15.
How many zeros are there in 10010 ?
(i) 2
(ii) 3
(iii) 100
(iv) 20

Answer:
(iv) 20

Question 16.
240 + 240 is equal to
(i) 440
(ii) 280
(iii) 241
(iv) 480

Answer:
(iii) 2^{41}

Ex 3.2

Question 1.
Fill in the blanks.

(i) Unit digit of $124 \times 36 \times 980$ is _____
(ii) When the unit digit of the base and its expanded form of that number is 9, then the exponent must be _____ power.

Answers:
(i) 0
(ii) Odd

Question 2.
Match the following:

	Group A Exponential form		Group B Unit digit of the number
(i)	20^{10}	(a)	6
(ii)	121^{11}	(b)	4
(iii)	444^{41}	(c)	0
(iv)	25^{100}	(d)	1
(v)	716^{83}	(e)	9
(vi)	729^{725}	(f)	5

Answer:
(i) – c
(ii) – d
(iii) – b
(iv) – f
(v) – a
(vi) – e

Question 3.
Find the unit digit of expanded form.
(i) 2523
(ii) 1110
(iii) 4615

(iv) 10012
(v) 2921
(vi) 1912
(vii) 2425
(viii) 3416

Solution:
(i) 25^{23}
Unit digit of base 25 is 5 and power is 23. Thus the unit digit of 25^{23} is 5.

(ii) 11^{10}
Unit digit of base 11 is 1 and power is 10. Thus the unit digit of 11^{10} is 1.

(iii) 46^{15}
Unit digit of base 46 is 6 and power is 15. Thus the unit digit of 46^{15} is 6.

(iv) 100^{12}
Unit digit of base 100 is 0 and power is 12. Thus the unit digit of 100^{12} is 0.

(v) 29^{21}
Unit digit of base 29 is 9 and power is 21 (odd power).
Therefore, unit digit of 29^{21} is 9.

(vi) 19^{12}
Unit digit of base 19 is 9 and power is 12 (even power).
Therefore, unit digit of 19^{12} is 1.

(vii) 24^{25}
Unit digit of base 24 is 4 and power is 25 (odd power).
Therefore, unit digit of 24^{25} is 4.

(viii) 34^{16}
Unit digit of base 34 is 4 and power is 16 (even power).
Therefore, unit digit of 34^{16} is 6.

Question 4.
Find the unit digit of the following numeric expressions.
(i) 11420 + 11521 + 11622
(ii) 1000010000 + 1111111111

Solution:
(i) $114^{20} + 115^{21} + 116^{22}$
In 114^{20} unit digit of base 114 is 4 and power is 20 (even power).
∴ Unit digit of 114^{20} is 6.
In 115^{21} unit digit of base 115 is 5 and power is 21 (Positive Integer).

∴ Unit digit of 115^{21} is 5.
In 116^{22} unit digit of base 116 is 6 and power is 22 (Positive Integer).
∴ Unit digit of 116^{22} is 6.
∴ Unit digit of $114^{20} + 115^{21} + 116^{22}$ can be obtained by adding $6 + 5 + 6 = 17$.
Unit digit of $114^{20} + 115^{21} + 116^{22}$ is 7.

(ii) $10000^{10000} + 11111^{11111}$
In 10000^{10000} the unit digit of base 10000 is 0 and power is 10000.
Unit digit of 10000^{10000} is 0.
In 11111^{11111} the unit digit of base 11111 is 1 and power is 11111.
Unit digit of 11111^{11111} is 1.
Unit digit of $10000^{100000} + 11111^{11111}$ is $0 + 1 = 1$

Objective Type Question

Question 5.
Observe the equation $(10 + y)4 = 50625$ and find the value of y.
(i) 1
(ii) 5
(iii) 4
(iv) 0

Answer:
(ii) 5

Question 6.
The unit digit of $(32 \times 65)0$ is
(i) 2
(ii) 5
(iii) 0
(iv) 1

Answer:
(iv) 1

Question 7.
The unit digit of the numeric expression $1071 + 1072 + 1073$ is
(i) 0
(ii) 3
(iii) 1
(iv) 2

Answer:
(i) 0

Ex 3.3

Question 1.
Fill in the blanks.

(i) The degree of the term $a^3b^2c^4d^2$ is _____
(ii) Degree of the constant term is _____
(iii) The coefficient of leading term of the expression $3z^2y + 2x - 3$ is _____

Answers:
(i) 11
(ii) 0
(iii) 3

Question 2.
Say True or False.

(i) The degree of m^2 n and mn^2 are equal.
(ii) $7a^2b$ and $-7ab^2$ are like terms.
(iii) The degree of the expression $-4x^2$ yz is -4
(iv) Any integer can be the degree of the expression.

Answers:
(i) True
(ii) False
(iii) False
(iv) True

Question 3.
Find the degree of the following terms.
(i) $5x^2$
(ii) -7 ab
(iii) $12pq^2$ r^2
(iv) -125
(v) 3z

Solution:
(i) $5x^2$
In $5x^2$, the exponent is 2. Thus the degree of the expression is 2.

(ii) -7ab
In -7ab, the sum of powers of a and b is 2. (That is $1 + 1 = 2$).
Thus the degree of the expression is 2.

(iii) $12pq^2 r^2$
In $12pq^2 r^2$, the sum of powers of p, q and r is 5. (That is $1 + 2 + 2 = 5$).
Thus the degree of the expression is 5.

(iv) -125
Here – 125 is the constant term. Degree of constant term is 0.
∴ Degree of -125 is 0.

(v) 3z
The exponent is 3z is 1.
Thus the degree of the expression is 1.

Question 4.
Find the degree of the following expressions.
(i) $x^3 - 1$
(ii) $3x^2 + 2x + 1$
(iii) $3t^4 - 5st^2 + 7s^2t^2$
(iv) $5 - 9y + 15y2 - 6y3$
(v) $u^5 + u^4v + u^3v^2 + u_2v^3 + uv^4$

Solution:
(i) $x^3 - 1$
The terms of the given expression are x^3, -1
Degree of each of the terms: 3,0
Terms with highest degree: x^3.
Therefore, degree of the expression is 3.

(ii) $3x^2 + 2x + 1$
The terms of the given expression are $3x^2$, 2x, 1
Degree of each of the terms: 2, 1, 0
Terms with highest degree: $3x^2$
Therefore, degree of the expression is 2.

(iii) $3t^4 - 5st^2 + 7s^2t^2$
The terms of the given expression are $3t^4$, $- 5st^2$, $7s^3t^2$
Degree of each of the terms: 4, 3, 5
Terms with highest degree: $7s^2t^2$
Therefore, degree of the expression is 5.

(iv) $5 - 9y + 15y^2 - 6y^3$
The terms of the given expression are $5, -9y, 15y^2, -6y^3$
Degree of each of the terms: 0, 1, 2, 3
Terms with highest degree: $-6y^3$
Therefore, degree of the expression is 3.

(v) $u^5 + u^4v + u^3v^2 + u_2v^3 + uv^4$
The terms of the given expression are $u^5, u^4v, u^3v^2, u^2v^3, uv^4$
Degree of each of the terms: 5, 5, 5, 5, 5
Terms with highest degree: $u^5, u^4v, u^3v^2, u^2v^3, uv^4$
Therefore, degree of the expression is 5.

Question 5.
Identify the like terms : 12x3y2z, – y3x2z, 4z3y2x, 6x3z2y, -5y3x2z

Solution:
$-y^3 x^2z$ and $-5y^3x^2z$ are like terms.

Question 6.
Add and find the degree of the following expressions.
(i) (9x + 3y) and (10x – 9y)
(ii) (k2 – 25k + 46) and (23 – 2k2 + 21 k)
(iii) (3m2n + 4pq2) and (5nm2 – 2q2p)

Solution:
(i) (9x + 3y) and (10x – 9y)
This can be written as (9x + 3y) + (10x – 9y)
Grouping the like terms, we get
$(9x + 10x) + (3y - 9y) = x(9 + 10) + y(3 - 0) = 19x + y(-6) = 19x - 6y$
Thus degree of the expression is 1.

(ii) $(k^2 - 25k + 46)$ and $(23 - 2k^2 + 21k)$
This can be written as $(k^2 - 25k + 46) + (23 - 2k^2 + 21k)$
Grouping the like terms, we get
$(k^2 - 2k^2) + (-25\,k + 21\,k) + (46 + 23)$
$= k^2 (1 - 2) + k(-25 + 21) + 69 = -1k^2 - 4k + 69$
Thus degree of the expression is 2.

(iii) $(3m^2n + 4pq^2)$ and $(5nm^2 - 2q^2p)$
This can be written as $(3m^2n + 4pq^2) + (5nm^2 - 2q^2p)$
Grouping the like terms, we get
$(3m^2n + 5m^2n) + (4pq^2 - 2pq^2)$
$= m^2n(3 + 5) + pq^2(4 - 2) = 8m^2n + 2pq^2$
Thus degree of the expression is 3.

Question 7.
Simplify and find the degree of the following expressions.
(i) 10x2 – 3xy + 9y2 – (3x2 – 6xy – 3y2)
(ii) 9a4 – 6a3 – 6a4 – 3a2 + 7a3 + 5a2
(iii) 4x2 – 3x – [8x – (5x2 – 8)]

Solution:
(i) $10x^2 – 3xy + 9y^2 – (3x^2 – 6xy – 3y^2)$
$= 10x^2 – 3xy + 9y^2 + (-3x^2 + 6xy + 3y^2)$
$= 10x^2 – 3xy + 9y^2 – 3x^2 + 6xy + 3y^2$
$= (10x^2 – 3x^2) + (- 3xy + 6xy) + (9y^2 + 3y^2)$
$= x^2(10 – 3) + xy(-3 + 6) + y^2(9 + 3)$
$= x^2(7) + xy(3) + y^2(12)$
Hence, the degree of the expression is 2.

(ii) $9a^4 – 6a^3 – 6a^4 – 3a^2 + 7a^3 + 5a^2$
$= (9a^4 – 6a^4) + (- 6a^3 + 7a^3) + (- 3a^2 + 5a^2)$
$= a^4(9-6) + a^3 (- 6 + 7) + a^2(-3 + 5)$
$= 3a^4 + a^3 + 2a^2$
Hence, the degree of the expression is 4.

(iii) $4x^2 – 3x – [8x – (5x^2 – 8)]$
$= 4x^2 – 3x – [8x + -5x^2 + 8)]$
$= 4x^2 – 3x – [8x – 5x^2 – 8]$
$= 4x^2 – 3x – 8x + 5x^2 – 8$
$(4x^2 + 5x^2) + (- 3x – 8x) – 8$
$= x^2(4+ 5) + x(-3-8) – 8$
$= x^2(9) + x(- 11) – 8$
$= 9x^2 – 11x – 8$
Hence, the degree of the expression is 2.

Objective Type Question

Question 8.
3p2 – 5pq + 2q2 + 6pq – q2 +pq is a
(i) Monomial
(ii) Binomial
(iii) Trinomial
(iv) Quadrinomial

Answer:
(iii) Trinomial

Question 9.
The degree of 6x7 – 7x3 + 4 is
(i) 7
(ii) 3
(iii) 6
(iv) 4
Answer:
(i) 7

Question 10.
If p(x) and q(x) are two expressions of degree 3, then the degree of p(x) + q(x) is
(i) 6
(ii) 0
(iii) 3
(iv) Undefined

Answer:
(iii) 3

Ex 3.4

Miscellaneous Practice Problems

Question 1.
$62 \times 6m = 65$, find the value of 'm'
Solution:
$62 \times 6m = 65$
$62+m = 65$ [Since $am \times an = am+n$]
Equating the powers, we get
$2 + m = 5$
$m = 5 – 2 = 3$

Question 2.
Find the unit digit of 124128×126124

Solution:
In 124^{128}, the unit digit of base 124 is 4 and the power is 128 (even power).
Therefore, unit digit of 124^{128} is 4.
Also in 126^{124}, the unit digit of base 126 is 6 and the. power is 124 (even power).
Therefore, unit digit of 126^{124} is 6.
Product of the unit digits $= 6 \times 6 = 36$
$\therefore$ Unit digit of the $124^{128} \times 126^{124}$ is 6.

Question 3.
Find the unit digit of the numeric expression: 1623 + 7148 + 5961

Solution:
In 16^{23}, the unit digit of base 16 is 6 and the power is 23 (odd power).
Therefore, unit digit of 16^{23} is 6.
In 71^{48}, the unit digit of base 71 is 1 and the power is 48 (even power).
Therefore, unit digit of 71^{48} is 1.
Also in 59^{61}, the unit digit of base 59 is 9 and the power is 61 (odd power).
Therefore, unit digit of 59^{61} is 9.
Sum of the unit digits = 6 + 1 + 9 = 16
∴ Unit digit of the given expression is 6.

Question 4.
Find the value of

$$\frac{(-1)^6 \times (-1)^7 \times (-1)^8}{(-1)^3 \times (-1)^5}$$

Solution:

$$\frac{(-1)^6 \times (-1)^7 \times (-1)^8}{(-1)^3 \times (-1)^5} = \frac{(-1)^{6+7+8}}{(-1)^{3+5}} = \frac{(-1)^{21}}{(-1)^8} = (-1)^{21-8} \text{ [By Quotient rule]}$$

$$= (-1)^{13} = -1 \text{ [Since the power 13 is odd positive number]}$$

$$\therefore \frac{(-1)^6 \times (-1)^7 \times (-1)^8}{(-1)^3 \times (-1)^5} = 1$$

Question 5.
Identify the degree of the expression, 2a3be + 3a3b + 3a3c – 2a2b2c2

Solution:
The terms of the given expression are $2a^3bc$, $3a^3b + 3a^3c - 2a^2b^2c^2$
Degree of each of the terms: 5,4,4,6.
Terms with the highest degree: $-2a^2b^2c^2$
Therefore degree of the expression is 6.

Question 6.
If p = -2, q = 1 and r = 3, find the value of 3p2q2r.

Solution:
Given p = -2; q = 1; r = 3
∴ $3p^2q^2r = 3 \times (-2)^2 \times (1)^2 \times (3)$
$= 3 \times (-2 \times 1)^2 \times (3)$ [Since $a^m \times b^m = (a \times b)^m$]
$= 3 \times (-2)^2 \times (3)$

$= 3 \times (-1)^2 \times 2^2 \times 3$
$= 3^{1+1} \times 1 \times 4$ [Since $a^m \times a^n = a^{m+n}$]
$= 3^2 \times 4 = 9 \times 4$
$\therefore 3p^2q^2r = 36$

Challenge Problems

Question 7.
LEADERS is a WhatsApp group with 256 members. Every one of its member is an admin for their own WhatsApp group with 256 distinct members. When a message is posted in LEADERS and everybody forwards the same to their own group, then how many members in total will receive that message?

Solution:
Members of the groups LEADERS = 256
Members is individual groups of the members of LEADERS = 256
Total members who receive the message

2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$= 256 \times 256 = 2^8 \times 2^8$
$2^{8+8} = 2^{16}$
$= 65536$
Totally 65536 members receive the message.

Question 8.
Find x such that $3x+2 = 3x + 216$.

Solution:
Given $3^{x+2} = 3^x + 216$; $3^{x+2} = 3^x + 216$
Dividing throught by 3^x, we get

$$\frac{3^{x+2}}{3^x} = \frac{3^x}{3^x} + \frac{2^3 \times 3^3}{3^x}$$

$$3^{x+2-x} = 3^{x-x} + (2^3 \times 3^{3-x})$$

$$3^2 = 3^0 + 2^3 \times 3^{3-x}$$

$$3^2 - 3^0 = 2^3 \times 3^{3-x}$$

$$9 - 1 = 2^3 \times 3^{3-x}$$

$$8 = 2^3 \times 3^{3-x}$$

$$\frac{2^3}{2^3} = 3^{3-x}$$

$$2^{3-3} = 3^{3-x}$$

$$2^0 = 3^{3-x}$$

$$1 = 3^{3-x}$$

$$3^0 = 3^{3-x}$$

Equating the powers of same base

$$0 = 3 - x$$

$$x = 3$$

Question 9.
If X = 5x2 + 7x + 8 and Y = 4x2 – 7x + 3, then find the degree of X + Y.

Solution:
Given $x = 5x^2 + 7x + 8$
$X + Y = 5x^2 + 7x + 8 + (4x^2 - 7x + 3)$
$= (5x^2 + 4x^2) + (7x - 7x) + (8 + 3)$
$= x^2 (5 + 4) + x(7 - 7) + (8 + 3) = 9x^2 + 11$
Degree of the expression is 2.

Question 10.
Find the degree of (2a2 + 3ab – b2) – (3a2 -ab- 3b2)

Solution:
$(2a^2 + 3ab - b^2) - (3a^2 - ab - 3b^2)$
$= (2a^2 + 3ab - b^2) + (- 3a^2 + ab + 3b^2)$
$= 2a^2 + 3ab - b^2 - 3a^2 + ab + 3b^2$
$= 2a^2 - 3a^2 + 3ab + ab + 3b^2 - b^2$
$= 2a^2 - 3a^2 + ab (3 + 1) + b^2(3 - 1)$
$= - a^2 + 4 ab + 2b^2$
Hence degree of the expression is 2.

Question 11.
Find the value of w, given that x = 4, y = 4, z = – 2 and w = x2 – y2 + z2 – xyz.

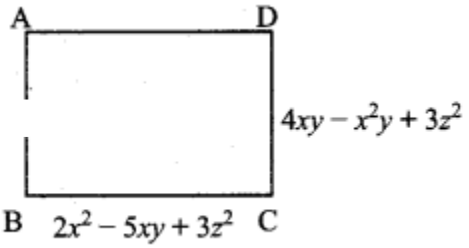
Solution:
Given x = 3; y = 4 and z = -2.
$w = x^2 - y^2 + z^2 - xyz$
$w = 3^2 - 4^2 + (-2)^2 - (3)(3)(-2)$
$w = 9 - 16 + 4 + 24$
$w = 37 - 16$
$w = 21$

Question 12.
Simplify and find the degree of 6x2 + 1 – [8x – {3x2 – 7 – (4x2 – 2x + 5x + 9)}]

Solution:
$6x^2 + 1 - [8x - (3x^2 - 7 - (4x^2 - 2x + 5x + 9)}]$
$= 6x^2 + 1 - [8x - \{3x^2 - 7 - 4x^2 - 2x + 5x + 9\}]$
$= 6x^2 + 1 - [8x - 3x^2 + 7 + 4x^2 - 2x + 5x + 9\}]$
$= 6x^2 - 1 - [8x + 3x^2 - 7 - 4x^2 + 2x - 5x - 9]$
$= 6x^2 + 3x^2 - 4x^2 - 8x + 2x - 5x - 1 - 7 - 9]$
$= x^2(6 + 3 - 4) + x(8 + 2 - 5) - 15$
$= 5x^2 - 11x - 15$
Degree of the expression is 2.

Question 13.
The two adjacent sides of a rectangle are 2x2 – 5xy + 3z2 and 4xy – x2 – z2.
Find the perimeter and the degree of the expression.

Solution:
Let the two adjacent sides of the rectangle as
$l = 2x^2 - 5xy + 3z^2$ and $b = 4xy - x^2y + 3z^2$



Perimeter of the rectangle
$= 2(l + b) = 2(2x^2 - 5xy + 3z^2 + 4xy - x^2 - z^2)$
$= 4x^2 - 10xy + 6z^2 + 8xy - 2x^2 - 2z^2$
$= 4x^2 - 2x^2 - 10xy + 8xy + 6z^2 - 2z^2$
$= x^2(4 - 2) + xy(-10 + 8) + z^2(6 - 2z^2)$

Perimeter $= 2x^2 - 2xy + 4z^2$
Degree of the expression is 2.