#CRESTInnovator

CREST Mathematics Olympiad (CMO)

Worksheet *for*

Class 8

Topic

Factorisation

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Worksheet on Factorisation

1. **Factorise the following: $121y^2z^2 - 66xyz + 9x^2 - 9x + 33yz$**

   a. $(3x - 11yz)(11yz - 3x + 3)$
   b. $(3x - 11yz)(11yz + 3x - 3)$
   c. $(11yz - 3x)(11yz - 3x + 3)$
   d. $(11yz - 3x)(11yz + 3x - 3)$

2. **Evaluate (using factors): $401^2 \times 399 - 399^3$**

   a. 632400
   b. 634400
   c. 636400
   d. 638400

3. **Which of the following options is equal to $(x + \frac{3}{x})^2 - (x - \frac{3}{x})^2$?**

   a. 0
   b. 6
   c. 9
   d. 12

4. **Simplify the following expression:**

$$\frac{169^2 + 132^2 + 2 \times 132 \times 149 + 2 \times 169 \times 149 + 149^2 + 2 \times 132 \times 169}{2001^3 - 1996^3 - 3 \times 2001^2 \times 1996 + 3 \times 2001 \times 1996^2}$$

   a. 1520
   b. 1620
   c. 1720
   d. 1820

5. **What is the quotient of the following expression?**

   $(p^4 - 81)(p^2 + 4p - 12) \div (p^3 + 27 + 3p^2 + 9p)$

   a. $(p - 2)(p - 3)(p + 6)$
   b. $(p + 2)(p + 3)(p - 6)$
   c. $(p - 2)(p + 3)(p - 6)$
   d. $(p - 2)(p + 3)(p + 6)$

Answer Key

1. c - (11yz − 3x)(11yz − 3x + 3)

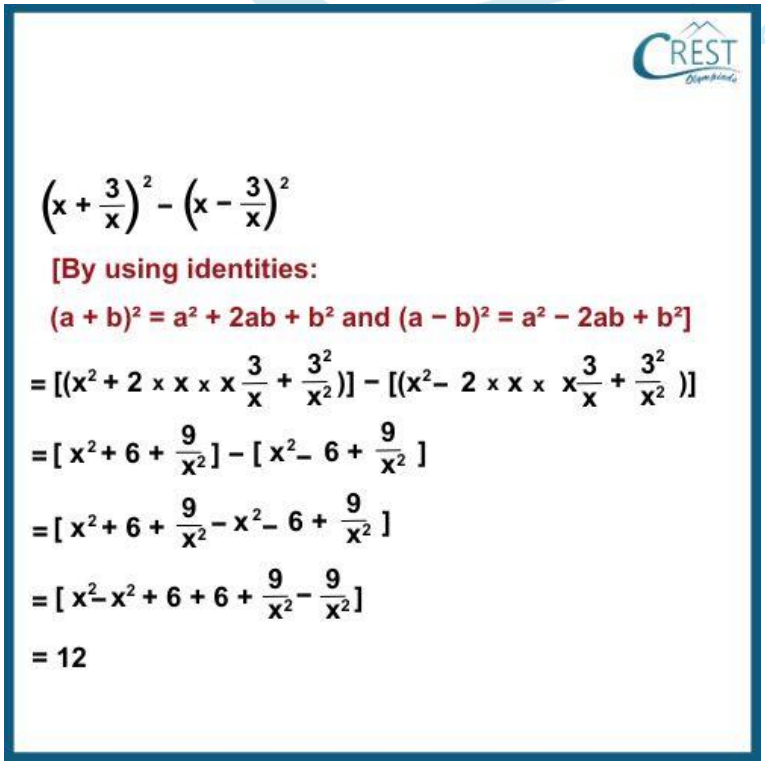
Explanation: $121y^2z^2 - 66xyz + 9x^2 - 9x + 33yz$
$= [121y^2z^2 - 66xyz + 9x^2] + [33yz - 9x]$
$= [(11yz)^2 - 2(11yz)(3x) + (3x)^2] + [3(11yz - 3x)]$ [Using $a^2 - 2ab + b^2 = (a - b)^2$]
$= [(11yz - 3x)^2] + [3(11yz - 3x)]$
$= [(11yz - 3x)(11yz - 3x)] + [3(11yz - 3x)]$ [Using $(a - b)^2 = (a - b)(a - b)$]
$= (11yz - 3x)[(11yz - 3x) + 3]$
$= (11yz - 3x)(11yz - 3x + 3)$

2. d - 638400

Explanation: $401^2 \times 399 - 399^3$
$= 401^2 \times 399 - 399 \times 399^2$
$= 399 \times (401^2 - 399^2)$
$= 399 \times (401 + 399)(401 - 399)$ **[By using: $a^2 - b^2 = (a + b)(a - b)$]**
$= (400 - 1) \times (800)(2)$ **[399 can be written as (400 − 1)]**
$= (400 - 1) \times 1600$
$= 1600 \times 400 - 1600 \times 1$
$= 640000 - 1600$
$= 638400$

3. d - 12

Explanation:



4. b - 1620

Explanation:

$$\frac{169^2 + 132^2 + 2 \times 132 \times 149 + 2 \times 169 \times 149 + 149^2 + 2 \times 132 \times 169}{2001^3 - 1996^3 - 3 \times 2001^2 \times 1996 + 3 \times 2001 \times 1996^2}$$

$$= \frac{169^2 + 132^2 + 149^2 + 2 \times 132 \times 169 + 2 \times 132 \times 149 + 2 \times 149 \times 169}{2001^3 - 1996^3 - 3 \times 2001^2 \times 1996 + 3 \times 2001 \times 1996^2}$$

[Using $a^2 + b^2 + c^2 + 2ab + 2bc + 2ca = (a + b + c)^2$ and $a^3 - b^3 - 3a^2b + 3ab^2 = (a - b)^3$]

$$= \frac{(169 + 132 + 149)^2}{(2001 - 1996)^3}$$

$$= \frac{(450)^2}{(5)^3}$$

$$= \frac{450 \times 450}{5 \times 5 \times 5}$$

$$= 1620$$

5. a - (p – 2)(p – 3) (p + 6)

Explanation:

$$(p^4 - 81)(p^2 + 4p - 12) \div (p^3 + 27 + 3p^2 + 9p)$$

$$\frac{(p^4 - 81)(p^2 + 4p - 12)}{p^3 + 3p^2 + 9p + 27}$$

$$= \frac{[(p^2)^2 - (9)^2][p^2 + 6p - 2p - 12]}{p^2(p + 3) + 9(p + 3)}$$

[Using $a^2 - b^2 = (a + b)(a - b)$, middle term factorisation and factorisation using common factor]

$$= \frac{[(p^2 + 9)(p^2 - 9)][p(p + 6) - 2(p + 6)]}{p^2(p + 3) + 9(p + 3)}$$

$$= \frac{[(p^2 + 9)\{(p)^2 - (3)^2\}][(p + 6)(p - 2)]}{(p + 3)(p^2 + 9)}$$

$$= \frac{(p^2 + 9)(p + 3)(p - 3)(p + 6)(p - 2)}{(p^2 + 9)(p + 3)}$$

[Using $a^2 - b^2 = (a + b)(a - b)$]

$$= (p - 2)(p - 3)(p + 6)$$

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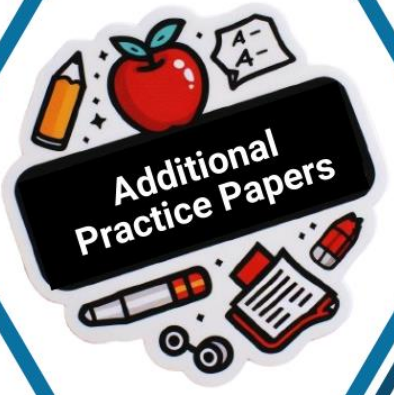

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