CREST Olympiads

#CRESTInnovator

CREST Mathematics Olympiad (CMO)

Worksheet *for*

Class 8

Topic

Algebraic Expressions and Identities

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Worksheet on Algebraic Expressions and Identites

1. **What is the result if $p^6 - q^6$ is divided by the product of $p^2 + pq + q^2$ and $p - q$?**

   a. $p^2 - q^2$
   b. $p^2 + q^2$
   c. $p^3 - q^3$
   d. $p^3 + q^3$

2. **What is the length of the adjacent side if an area of a rectangle is $(x^2-1)(x^2-4)$ and length of one of its sides is $(x + 1)(x - 2)$?**

   a. $x^2 + x + 2$
   b. $x^2 + x - 2$
   c. $x^2 - x + 2$
   d. $x^2 - x - 2$

3. **What is the value of st if $s + t = 7$ and $s^2 + t^2 = 31$?**

   a. 7
   b. 9
   c. 17
   d. 19

4. **Simplify:** $\left(3y - \frac{z}{3}\right)\left(3y - \frac{z}{3}\right)$

   a. $9y^2 - yz + \frac{z^2}{9}$

   b. $9z^2 - yz + \frac{y^2}{9}$

   c. $9y^2 - 2yz + \frac{z^2}{9}$

   d. $9z^2 - 2yz + \frac{y^2}{9}$

5. **What is the value of the given algebraic expression $c^2d^3(c - 3d) + 7$ if c = 1/2 and d = 2/3?**

   a. $6\frac{11}{27}$
   b. $6\frac{13}{27}$
   c. $6\frac{11}{27}$
   d. $6\frac{11}{27}$

Answer Key

1. d - $p^3 + q^3$

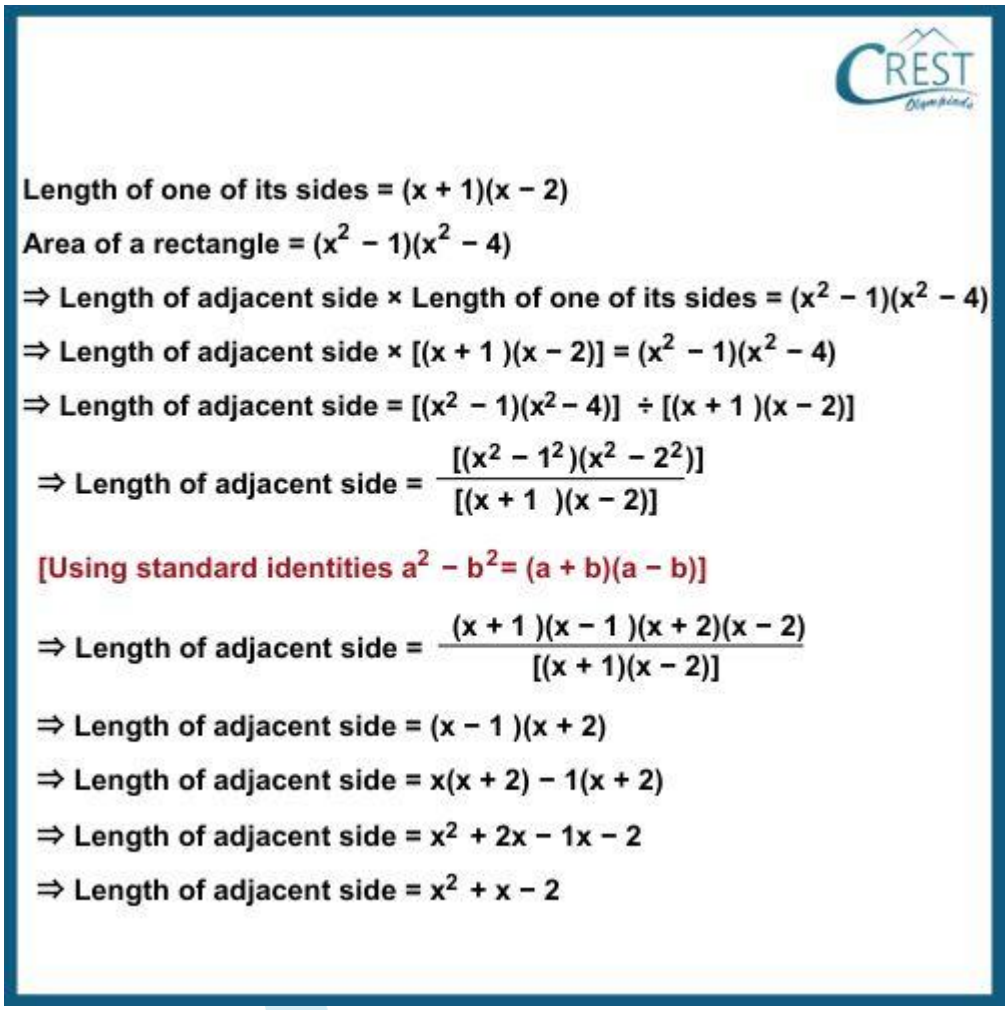
Explanation: Product of $p^2 + pq + q^2$ and $p - q$
$= (p^2 + pq + q^2) \times (p - q)$
$= p^2 (p - q) + pq(p - q) + q^2(p - q)$
$= p^3 - p^2q + p^2q - pq^2 + pq^2 - q^3$
$= p^3 - q^3$
Simplification of $p^6 - q^6$
$= (p^3)^2 - (q^3)^2$ [Using standard identities $a^2 - b^2 = (a + b)(a - b)$]
$= (p^3 + q^3)(p^3 - q^3)$
Result = $[(p^6 - q^6)] \div$ [Product of $p^2 + pq + q^2$ and $p - q$]
$= [(p^3 + q^3)(p^3 - q^3)] \div [p^3 - q^3]$

$$= \frac{(p^3 + q^3)(p^3 - q^3)}{p^3 - q^3}$$

$= p^3 + q^3$

2. b - $x^2 + x - 2$

Explanation:



3. b - 9

Explanation: Using standard identity: $(a + b)^2 = a^2 + 2ab + b^2$

$(s + t)^2 = s^2 + 2st + t^2$

$\Rightarrow (s + t)^2 = (s^2 + t^2) + 2st$

$\Rightarrow (7)^2 = 31 + 2st$

$\Rightarrow 49 = 31 + 2st$

$\Rightarrow 2st = 49 - 31$

$\Rightarrow 2st = 18$

$\Rightarrow st = 18/2$

$\Rightarrow st = 9$

4. c - $9y^2 - 2yz + \frac{z^2}{9}$

Explanation:

$\left(3y - \frac{z}{3}\right)\left(3y - \frac{z}{3}\right)$

$\left(3y - \frac{z}{3}\right)^2$ [Using standard identity: $(a - b)^2 = a - 2ab + b^2$]

$= (3y)^2 - 2 \times 3y \times \frac{z}{3} + \left(\frac{z}{3}\right)^2$

$= 9y - 2yz + \frac{z^2}{3}$

5. c - $6\frac{26}{27}$

Explanation:

$c^2d^3(c - 3d) + 7$

$= c^3d^3 - 3c\,d + 7$ [Put $c = \frac{1}{2}$ and $d = \frac{2}{3}$]

$= \left(\frac{1}{2}\right)^3\left(\frac{2}{3}\right)^3 - 3\left(\frac{1}{2}\right)^2\left(\frac{2}{3}\right)^4 + 7$

$= \left(\frac{1}{8}\right)\left(\frac{8}{27}\right) - 3\left(\frac{1}{4}\right)\left(\frac{16}{81}\right) + 7$

$= \frac{1}{27} - \frac{4}{27} + 7$

$= \frac{1 - 4 + 189}{27}$

$= \frac{186}{27}$

$= 6\frac{24}{27}$

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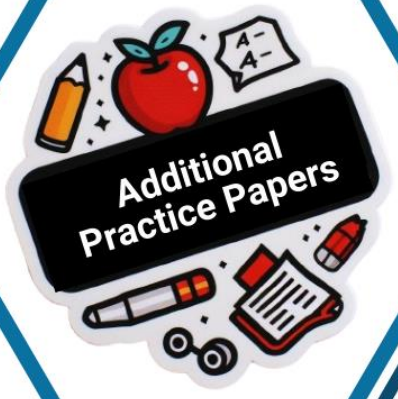

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