SIMPLIFICATION (ALGEBRA)

SQUARES

1. $(a+b)^2 = a^2 + 2ab + b^2$
2. $(a-b)^2 = a^2 - 2ab + b^2$
3. $(a+b)(a-b) = a^2 - b^2$

CUBES

1. $(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ → $a^3+b^3+3ab(a+b)$
2. $(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$ → $a^3-b^3-3ab(a-b)$
3. $a^3 + b^3 = (a+b)(a^2 - ab + b^2)$
4. $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

SQUARES (2D)

1. $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$
2. $(a - b - c)^2 = a^2 + b^2 + c^2 - 2ab - 2bc + 2ac$
3. $(a + b - c)^2 = a^2 + b^2 + c^2 + 2ab - 2bc - 2ac$
4. $(a - b + c)^2 = a^2 + b^2 + c^2 - 2ab + 2bc - 2ac$
5. $(a + b)^2 + (b + c)^2 + (c + a)^2 = 2(a^2 + b^2 + c^2 + ab + bc + ca)$
6. $(a + b + c)(a + b - c) = a^2 + b^2 - c^2$
7. $(a + b - c)(a - b + c) = a^2 - b^2 + c^2$
8. $(a - b - c)(a - b + c) = (a - b)^2 - c^2$

CUBES (3D)

1. $(a + b + c)^3 = a^3 + b^3 + c^3 + 3(a^2b + b^2c + c^2a) + 6abc$
2. $(a - b - c)^3 = a^3 - b^3 - c^3 - 3(a^2b + b^2c + c^2a) + 6abc$
3. $(a + b - c)^3 = a^3 + b^3 - c^3 + 3(a^2b - b^2c - c^2a) - 6abc$
4. $(a - b + c)^3 = a^3 - b^3 + c^3 - 3(a^2b - b^2c + c^2a) - 6abc$
5. $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$
6. $a^3 + b^3 + c^3 + 3abc = (a + b + c)(a^2 + b^2 + c^2 + ab + bc + ca)$
7. $(a + b)(b + c)(c + a) = abc + ab^2 + bc^2 + ca^2$
8. $(a + b + c)(a + b - c)(a - b + c)(-a + b + c)$

1. If $x + \frac{1}{x} = 2$ then what is the value of $x - \frac{1}{x}$?

$x + \frac{1}{x} = 2$ எனில் $x - \frac{1}{x}$ இன் மதிப்பு என்ன?

(A) −2

(B) 0

(C) 1

(D) 2

(E) Answer not known

$x + \frac{1}{x} = 2$

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

$x^2 + 1 = 2x$

$x^2 - 2x + 1 = 0$

$x = 1$

$x - \frac{1}{x} = 1 - \frac{1}{1} = 0$

+1 −1 −1 −2

2. If $\frac{x}{y} = \frac{6}{5}$ find the value of $\frac{x^2+y^2}{x^2-y^2}$

$\frac{x}{y} = \frac{6}{5}$ எனில் $\frac{x^2+y^2}{x^2-y^2}$ இன் மதிப்பைக் காண்க.

$\frac{6^2+5^2}{6^2-5^2} = \frac{36+25}{36-25} = \frac{61}{11}$

(A) $\frac{61}{25}$

(B) $\frac{25}{11}$

(C) $\frac{61}{11}$ ✓

(D) $\frac{36}{25}$

(E) Answer not known

3. If $x = 1, y = 2, z = 3$ then $x^3 + y^3 - z^3 + 3xyz$ is

$x = 1,\ y = 2,\ z = 3$ **எனில்** $x^3 + y^3 - z^3 + 3xyz$ **இன்** **மதிப்பு**

$1 + 2^3 - 3^3 + 3(1)(2)(3)$

$= 1 + 8 - 27 + 18$

$= 27 - 27$

$= 0$

(A) $x + y - z$ $1 + 2 - 3 = 0$

(B) $x + y + z$ $1 + 2 + 3 = 6$

(C) $x + y$ $1 + 2 = 3$

(D) −36

(E) Answer not known

4. Find $x^3 - y^3$ if $x - y = 5, xy = 14$

(A) 225

(B) 335

(C) 325

(D) 330

(E) Answer not known

$x - y = 5$, $xy = 14$ எனில் $x^3 - y^3$ காண்க.

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

$= 5[x^2 + 14 + y^2]$

$= 5[14 + x^2 + y^2]$

$= 5[14 + (x-y)^2 + 2xy]$

$= 5[14 + (5)^2 + 2(14)]$

$= 5[14 + 25 + 28]$

$= 5 \times 67$

$= 335$

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

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

5. If $x^2 - 25$ is divided by $x^2 - 9$ then quotient is

(A) $(x-5)(x+3)$

(B) $(x-5)(x-3)$

(C) $(x+5)(x-3)$

(D) $(x+5)(x+3)$

(E) Answer not known

$$\frac{x^2-25}{x+3} \div \frac{x+5}{x^2-9}$$

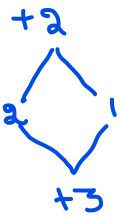
$$= \frac{x^2-5^2}{x+3} \times \frac{x^2-3^2}{x+5}$$

$$= \frac{(x+5)(x-5)}{x+3} \times \frac{(x+3)(x-3)}{x+5}$$

$$= (x-5)(x-3)$$

$x^2 - 25$ ஐ $x^2 - 9$ ஆல் வகுத்தால் கிடைக்கும் விடை?

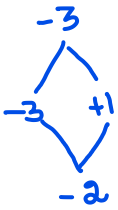
6. Simplify: $\frac{x+2}{x^2+3x+2} + \frac{x-3}{x^2-2x-3}$



$\frac{x+2}{(x+2)(x+1)} + \frac{x-3}{(x-3)(x+1)}$

$\frac{1}{x+1} + \frac{1}{x+1}$

$\frac{2}{x+1}$



- (A) $\frac{1}{x+1}$
- (B) $-\frac{1}{x+1}$
- (C) $\frac{2}{x+1}$
- (D) $-\frac{2}{x+1}$
- (E) Answer not known

7. Simplify:

$$\frac{x^3}{x-y}+\frac{y^3}{y-x}$$

(A) x^2+xy+y^2

(B) x^2-xy+y^2

(C) x^2-xy-y^2

(D) x^2+xy-y^2

(E) Answer not known

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

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

$= \frac{(x-y)(x^2+xy+y^2)}{x-y}$

$= (x^2+xy+y^2)$

8. Find

$$\frac{8.94^3 - 3.56^3}{8.94^2 + 8.94 \times 3.56 + 3.56^2}$$

8.94 x 8.94 x 8.94 − 3.56 x 3.56 x 3.56

a = 8.94

b = 3.56

$= \frac{a^3 - b^3}{a^2 + ab + b^2}$

$= \frac{(a-b)(a^2+ab+b^2)}{a^2+ab+b^2}$

$= a - b$

$= 8.94 - 3.56$

$= 5.38$

8.94
3.56
5.38

(A) 0.538

(B) 5.38 ✓

(C) 0.0538

(D) 53.8

(E) Answer not known

9. Find

$$\frac{0.1 \times 0.1 + 0.01 \times 0.01}{0.0101}$$

(A) 0.1

(B) 0.11

(C) 1

(D) 1.1

(E) Answer not known

$= \frac{0.01 + 0.001}{0.0101} = \frac{0.0101}{0.0101} = 1$

10. Simplify:

$$\frac{4356^2 - 2171^2}{2185} \times \frac{1}{4356 + 2171}$$

a b

- (A) 0
- (B) 1
- (C) 4356
- (D) 2171
- (E) Answer not known

$$= \frac{a^2 - b^2}{2185} \times \frac{1}{a+b}$$

$$= \frac{(a+b)(a-b)}{2185} \times \frac{1}{a+b}$$

$$= \frac{4356 - 2171}{2185}$$

$$= \frac{2185}{2185}$$

$$= 1$$

11. If $a^2 + b^2 = 234, ab = 108$ find $\frac{a+b}{a-b}$

(A) 10

(B) 8

(C) 5

(D) 4

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

$= 234 + 2(108)$

$= 234 + 216$

$(a+b)^2 = 450$

$a+b = \sqrt{450}$

$= 5\times3\times\sqrt{2} = 15\sqrt{2}$

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

$= 234 - 216$

$(a-b)^2 = 18$

$a-b = \sqrt{18} = 3\sqrt{2}$

$\frac{a+b}{a-b} = \frac{15\sqrt{2}}{3\sqrt{2}} = 5$

12. Multiply $\frac{a^3+b^3}{a^2+ab+b^2}$ by $\frac{a^2-b^2}{a-b}$

- (A) $a^2 - ab + b^2$
- (B) $a^2 + b^2$
- (C) $a^2 + ab + b^2$
- (D) $a^3 - b^3$

$\frac{a^3+b^3}{a^2+2ab+b^2} \times \frac{a^2-b^2}{a-b}$

$\frac{(a+b)(a^2-ab+b^2)}{(a+b)^2} \times \frac{(a+b)(a-b)}{a-b}$

$= a^2 - ab + b^2$

13. If $x = \sqrt{3} + 1$ find $\left(x - \frac{2}{x}\right)^2$

(A) 25

(B) 4

(C) 36

(D) 9

$x = \sqrt{3}+1$

$\frac{1}{x} = \frac{1}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1} = \frac{\sqrt{3}-1}{(\sqrt{3})^2-1^2} = \frac{\sqrt{3}-1}{3-1} = \frac{\sqrt{3}-1}{2}$

$a+b \quad a-b$

$\frac{2}{x} = \frac{2}{1} \times \frac{\sqrt{3}-1}{2} = \sqrt{3}-1$

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

$= 2^2 = 4$

14. If $\frac{x^4-1}{x^2+1} = 8$ find the value of x.

(A) ±1

(B) ±3

(C) ±4

(D) ±2

$$\frac{x^4-1}{x^2+1} = 8$$

$$\frac{(x^2)^2 - 1^2}{x^2+1} = 8$$

$$\frac{(x^2+1)(x^2-1)}{x^2+1} = 8$$

$$x^2 - 1 = 8$$

$$x^2 = 9$$

$$x = \sqrt{9}$$

$$x = \pm 3$$

15. Find

Comment

$$\frac{a^2-(b-c)^2}{(a+c)^2-b^2}+\frac{b^2-(a-c)^2}{(a+b)^2-c^2}+\frac{c^2-(a-b)^2}{(b+c)^2-a^2}$$

(A) −1

(B) 0

(C) 1

(D) 3

(E) Answer not known

$$\frac{a^2-(b-c)^2}{(a+c)^2-b^2} = \frac{(a+b-c)(a-b+c)}{(a+c+b)(a+c-b)}$$

$$= \frac{a+b-c}{a+b+c}$$

16. Simplify:

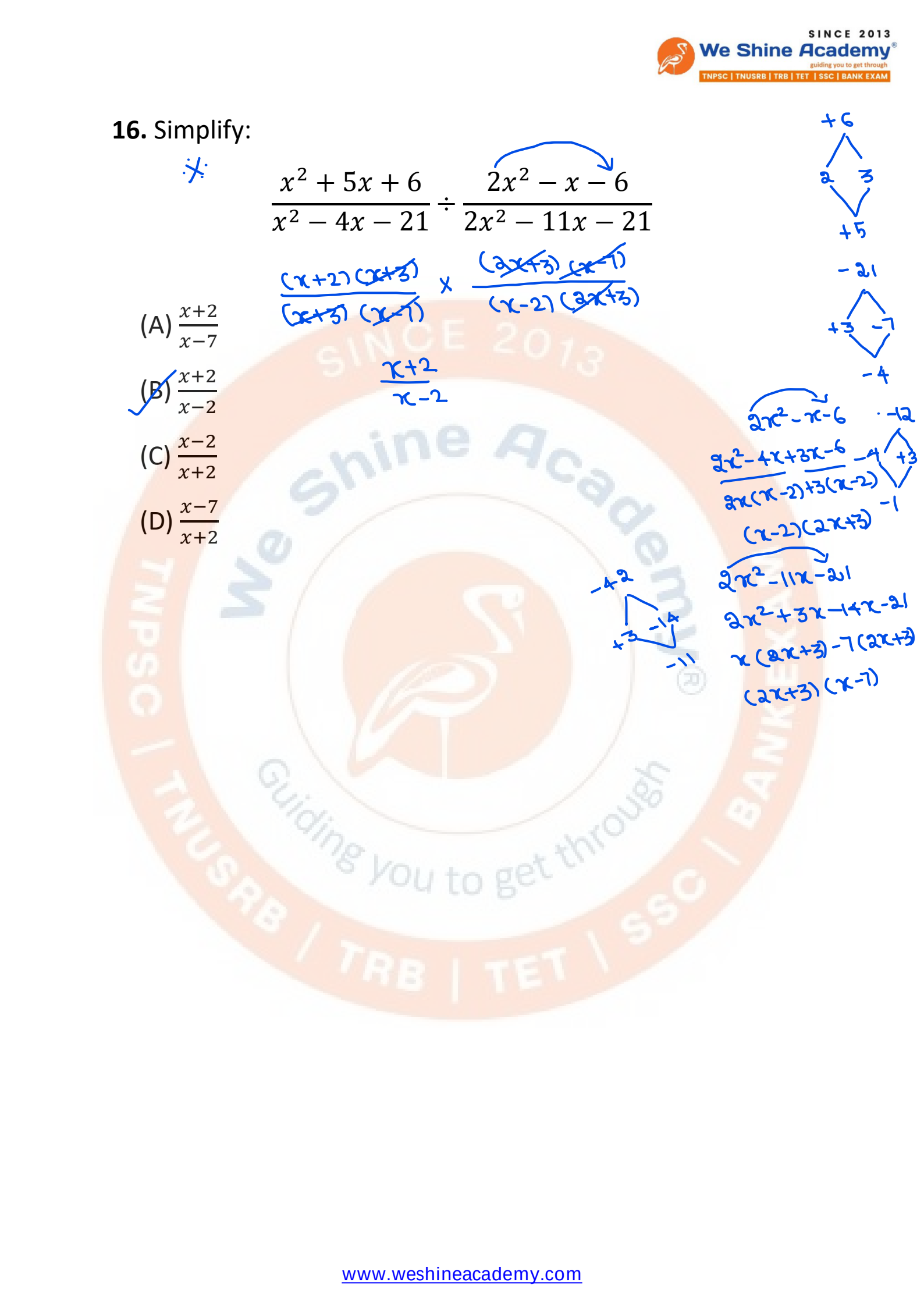
$$\frac{x^2+5x+6}{x^2-4x-21} \div \frac{2x^2-x-6}{2x^2-11x-21}$$

(A) $\frac{x+2}{x-7}$

(B) $\frac{x+2}{x-2}$

(C) $\frac{x-2}{x+2}$

(D) $\frac{x-7}{x+2}$



17. If $\frac{a}{b}=\frac{4}{5}, \frac{b}{c}=\frac{15}{16}$ find $\frac{c^2-a^2}{c^2+a^2}$

(A) $\frac{1}{7}$

(B) $\frac{7}{25}$

(C) $\frac{3}{4}$

(D) $\frac{25}{7}$

$a : b : c$

$4 : 5 : 5$

$15 : 15 : 16$

$60 : 75 : 80$

$12 : 15 : 16$

$a \quad b \quad c$

$\frac{16^2-12^2}{16^2+12^2}$

$= \frac{256-144}{256+144}$

$= \frac{112}{400}$

$= \frac{7}{25}$

18. Simplify:

$$\frac{3y^3 - 7y^2 - y}{y} \div \frac{3y^2}{3y^3}$$

$\frac{3y-3}{y} \div \frac{7y-7}{3y^2}$

$= \frac{3(y-1)}{y} \times \frac{3y^2}{7(y-1)}$

$= \frac{9y}{7}$ //

19. Simplify:

$$\frac{x^2 - 16}{x + 4} \div \frac{x - 4}{x + 4}$$

(A) $x + 4$

(B) $x - 4$

(C) $(x + 4)(x - 4)$

(D) $x^2 - 4^2$

20. Simplify:

$$\frac{(6.5 \times 4.7) + (6.5 \times 5.3)}{(1.3 \times 7.9) - (1.3 \times 6.9)}$$

(A) 50.15

(B) 10.5

(C) 1.5

(D) 50

21. Find

HW

$$\frac{(963+476)^2+(963-476)^2}{963^2+476^2}$$

(A) 1449

(B) 497

(C) 2

(D) 4

22. Find $a^3 + b^3 + c^3 - 3abc$

$$\frac{38^3 + 34^3 + 28^3 - 3(38)(34)(28)}{38^2 + 34^2 + 28^2 - 38 \cdot 34 - 34 \cdot 28 - 38 \cdot 28}$$

$a^2 + b^2 + c^2 - ab - bc - ca$

(A) 100

(B) 48

(C) 32

(D) 24

$$= \frac{(a+b+c)(a^2+b^2+c^2-ab-bc-ca)}{a^2+b^2+c^2-ab-bc-ca}$$

$= a+b+c = 38+34+28$

$= 100$

23. Simplify:

$$\frac{2t^2+7t+6}{2t^2+9t+9} \div \frac{t^2+5t+6}{3t^2+18t+27}$$

(A) 3

(B) 1

(C) 2

(D) 4

(E) Answer not known