Squaring and adding:

a, b & x, y

$ax + by = p$ — (1)

$ay - bx = q$ — (2)

Squaring & Adding $(1)^2 + (2)^2$

$a^2x^2 + b^2y^2 + 2abxy = p^2$

$+ a^2y^2 + b^2x^2 - 2abxy = q^2$

$x^2(a^2+b^2) + y^2(a^2+b^2) = p^2+q^2$

$(a^2+b^2)(x^2+y^2) = p^2+q^2$

$ax+by=3$

$ay-bx=2$

$(a^2+b^2)(x^2+y^2)=3^2+2^2$

$13 \times (x^2+y^2)=13$

$x^2+y^2=1$

$a^2+b^2=13$, $x^2+y^2=?$

$$(ax+by)^2+(ay-bx)^2=(a^2+b^2)(x^2+y^2)$$

① ② ③ ④

4 में से 3

39. If $ax + by = 3, bx - ay = 4$ & $x^2 + y^2 = 1$, then find $a^2 + b^2$.

यदि $ax + by = 3, bx - ay = 4$ और $x^2 + y^2 = 1$ है, तो $a^2 + b^2$ ज्ञात करो |

a) 17 b) 16

c) 9 d) 25

$$(ax+by)^2 + (ay-bx)^2 = (a^2+b^2)(x^2+y^2)$$

$$9 + 16 = (a^2+b^2) \times 1$$

$$25 = a^2+b^2$$

40. If $ax + by = 6, bx - ay = 2$ & $x^2 + y^2 = 4$ then the value of $(a^2 + b^2)$ is

यदि $ax + by = 6, bx - ay = 2$ और $x^2 + y^2 = 4$ है, तो $(a^2 + b^2)$ का मान है :

a) 2 b) 4 c) 5 d) 10

$$(ax+by)^2 + (bx-ay)^2 = (a^2+b^2)(x^2+y^2)$$

$$40 = 36 + 4 = (a^2+b^2) \times 4$$

$$10$$

SSC CGL T1, 1 Jul 2012 S4

41. If $a^2 + b^2 = 25, x^2 + y^2 = 17$ and $ax + by = 8$, then what is the value of $(ay - bx)$?

यदि $a^2 + b^2 = 25, x^2 + y^2 = 17$ और $ax + by = 8$, है, तो $(ay - bx)$ का मान क्या होगा?

a) 23 b) 25 c) 21 d) 19

$$(ax+by)^2 + (ay-bx)^2 = (a^2+b^2) \times (x^2+y^2)$$

$$64 + (ay-bx)^2 = 25 \times 17$$

$$= 425$$

$$(ay-bx)^2 = 425 - 64 = 361$$

$$ay - bx = \pm 19$$

Misc:

42. If $(a^2+b^2)(m^2+n^2)=(am+bn)^2$ then, which of the following is correct.

यदि $(a^2+b^2)(m^2+n^2)=(am+bn)^2$, तो निम्नलिखित में से कौन –सा कथन सत्य है ?

a) $\frac{a}{m}-\frac{b}{n}=0$ b) $\frac{a}{n}=\frac{b}{m}$ c) $ab=mn$ d) $a+b=m+n$

$a^2m^2+a^2n^2+b^2m^2+b^2n^2=a^2m^2+b^2n^2+2abmn$

$a^2n^2+b^2m^2-2abmn=0$

$(an)^2+(bm)^2-2\times an\times bm=0$

$(an-bm)^2=0$

$\Rightarrow an-bm=0$

$an=bm$

$\frac{a}{m}=\frac{b}{n}$

$\frac{a}{m}-\frac{b}{n}=0$

43. If $\sqrt{x} = \sqrt{3} - \sqrt{5}$, then the value of $x^2 - 16x + 6$ is

यदि $\sqrt{x} = \sqrt{3} - \sqrt{5}$ है, तो $x^2 - 16x + 6$ का मान है:

a) 0 b) -2 c) 2 d) 4

$x = 8 - 2\sqrt{15}$

$\Rightarrow x - 8 = -2\sqrt{15}$

$\Rightarrow x^2 + 64 - 16x = 60$

$\Rightarrow x^2 - 16x + 4 = 0$

$+2 \quad +2$

$(\sqrt{3} - \sqrt{5})^2 = 3 + 5 - 2\sqrt{3} \times \sqrt{5}$

$-2\sqrt{15}$

५५. If $p = \sqrt{5} - 2$, then $p^4 + 16p^2 + 8p^3 + 4 = ?$

यदि $p = \sqrt{5} - 2$ है, तो $p^4 + 16p^2 + 8p^3 + 4$ ज्ञात करो |

a) 3 b) 5 c) 1 d) 0

$$p + 2 = \sqrt{5}$$

$$\Rightarrow p^2 + 4p + 4 = 5$$

$$\Rightarrow p^4 + 8p^3 + 16p^2 = 1$$

$$+4 \qquad +4$$

45. If $a = 89,\ b = -69,\ c = 8$ then the value of $9(a+b)^2 + 49c^2 - 42(a+b)c$ is:

यदि $a = 89,\ b = -69,\ c = 8$ है, तो $9(a+b)^2 + 49c^2 - 42(a+b)c$ का मान है :

a) 2 b) 4 c) 16 d) 0

$$(3(a+b))^2 + (7c)^2 - 2\times3(a+b)\times7c \qquad 2\times3(a+b)\times7c$$

$$= [3(a+b) - 7c]^2$$

$89-69 = 20$ $\quad 56$

$$= (y)^2 = 16$$

46. If x, y, z are positive integers such that $x^2 + y^2 = 45$ and $y^2 + z^2 = 40$, then find the value of $x + y + z$.

यदि x, y, z धनात्मक पूर्णांक हैं जैसे कि $x^2 + y^2 = 45$ और $y^2 + z^2 = 40$ हो, तो $x + y + z$ का मान ज्ञात कीजिए।

a) 11 b) 10 c) 20 d) 15

① - ②

$x^2 - z^2 = 5$

$(x+z)(x-z) = 5$

5 1 → 5 × 1

Sum > diff

$x = \frac{5+1}{2} = 3$

$z = \frac{5-1}{2} = 2$

$y^2 + 4 = 40$

36

$y = 6$

47. If a, b and c are positive integers such that $a^2 + b^2 = 82$ and $b^2 + c^2 = 65$, then the value of $2a + 7b - 3c$ is:

यदि a, b और c धनात्मक पूर्णांक इस प्रकार है कि $a^2 + b^2 = 82$ और $b^2 + c^2 = 65$ है, तो $2a + 7b - 3c$ का मान ज्ञात करें|

a) 2 b) 5 c) 49 d) 1

HW

$a^2 + b^2 = 82$

$-\ b^2 + c^2 = 65$

$a^2 - c^2 = 17$

$(a+c)(a-c) = 17 \rightarrow 17 \times 1$

17×1

$a = \frac{17+1}{2} = 9$

$c = \frac{17-1}{2} = 8$

$b^2 + c^2 = 65$

1 64

$b = 1$

Sum > diff

$a+b > a-b$

$2 \times 9 + 7 \times 1 - 3 \times 8$

$= 18 + 7 - 24$

$= 1$

48. If $\sqrt{13x^3 - 14x + 29} + \sqrt{13x^3 - 14x - 21} = 10$, then $\sqrt{13x^3 - 14x + 29} - \sqrt{13x^3 - 14x - 21} = ?$

यदि $\sqrt{13x^3 - 14x + 29} + \sqrt{13x^3 - 14x - 21} = 10$ है, तो $\sqrt{13x^3 - 14x + 29} - \sqrt{13x^3 - 14x - 21}$ का मान होगा :

a) 3 b) 4 c) 5 d) 6

$13x^3 - 14x + 29 - 13x^3 + 14x + 21 = 10$

$50 = 10$

5

Completing the square:

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

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

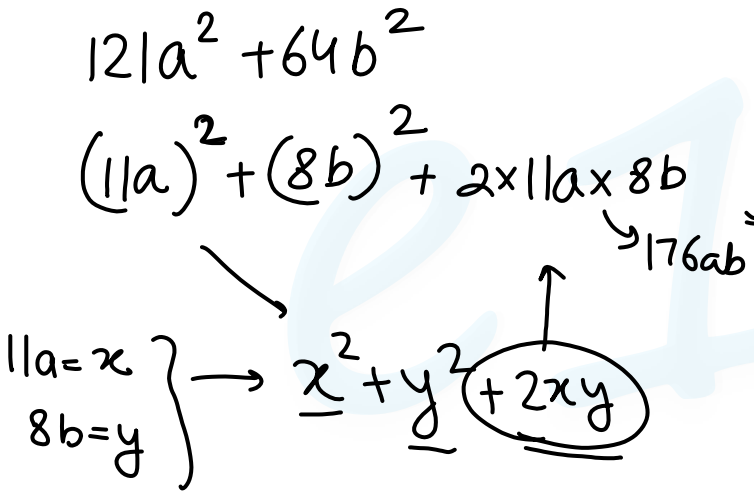
$$a^2 + b^2 \pm 2ab \rightarrow \text{perfect Square}$$

49. The term to be added to $121a^2 + 64b^2$ to make a perfect square is

$121a^2 + 64b^2$ में क्या जोड़ा जाए ताकि ये पूर्ण वर्ग बन जाए?

a) $176\,ab$ b) $276\,a^2b$

c) $178\,ab$ d) $188\,b^2a$



50. The term, that should be added to $(4x^2 + 8x)$ so that resulting expression be a perfect square is:

$(4x^2 + 8x)$ में क्या जोड़ा जाए ताकि ये पूर्ण वर्ग बन जाए?

a) $2x$ b) 2 c) 1 d) 4

$(2x)^2 + 8x + 4$

$a^2 \quad 2ab + b^2$

$\frac{2ab}{2a} \quad \frac{8x}{2x \times 2x} = b = 2$

$b^2 = 4$

$a^2 + b^2 \pm 2ab$

$\frac{2ab}{2a} = \frac{8x}{2x \times 2x} \quad 2 = b$

51. The expression $x^4 - x^2 + k$ a perfect square if the value of k is

K के किस मान के लिए $x^4 - x^2 + k$ एक पूर्ण वर्ग होगा?

a) 1 b) 0 c) $\frac{1}{4}$ d) $-\frac{1}{4}$

$\frac{x^2}{2 \times x^2} = \frac{1}{2} = b$

$(x^2)^2$

$a^2 - 2ab\ (b^2)$

$K = \frac{1}{4}$

$\frac{2ab}{2a} = \frac{x^2}{2 \times x^2} = \frac{1}{2} = b$

$\frac{1}{4} = b^2$

52. If $x + \frac{1}{5}\sqrt{x} + a^2$ is a perfect square then a is

a के किस मान के लिए $x + \frac{1}{5}\sqrt{x} + a^2$ एक पूर्ण वर्ग होगा?

a) $\frac{1}{100}$ b) $\pm\frac{1}{10}$ c) $\frac{1}{10}$ d) $-\frac{1}{10}$

PS → $(a)^2 + (b)^2 \pm 2ab$

$(\sqrt{x})^2 + \frac{1}{5}\sqrt{x} + \frac{1}{100}$

$a^2 + 2ab + b^2$

$\frac{2ab}{2a} = \frac{\frac{1}{5}\sqrt{x}}{2x\sqrt{x}} = \frac{1}{10} = b$

$\frac{1}{100} = b^2$

$a^2 = \frac{1}{100}$

$a = \pm\frac{1}{10}$

53. For what value(s) of k the expression $p + \frac{1}{4}\sqrt{p} + k$ is perfect square?

K के किस मान के लिए $p + \frac{1}{4}\sqrt{p} + k$ एक पूर्ण वर्ग होगा?

a) $\frac{1}{64}$ b) $\pm\frac{1}{4}$ c) $\pm\frac{1}{8}$ d) $\pm\frac{1}{64}$

$$\left(\sqrt{p}\right)^2 + \frac{1}{4}\sqrt{p} + \frac{1}{64}$$

$$a^2 + 2ab + b^2$$

$$\frac{2ab}{2a} = \frac{1\sqrt{p}}{4 \times 2 \times \sqrt{p}} = \frac{1}{8} = b$$

$$\frac{1}{64} = b^2$$

$b^2 \rightarrow \frac{1}{64}$

54. For what value(s) of k will the expression $p + \frac{1}{9}\sqrt{p} + k^2$ be a perfect square

k के किस मान/किन मानो के लिए व्यजक $p + \frac{1}{9}\sqrt{p} + k^2$ एक पूर्ण वर्ग होगा?

a) $k = \pm\frac{1}{8}$

b) $k = \pm\frac{1}{9}$

c) $k = \pm\frac{1}{21}$

d) $k = \pm\frac{1}{18}$

$$p + \frac{1}{9}\sqrt{p} + k^2$$

$$a^2 + 2ab + b^2 = \frac{1}{324}$$

$$\frac{1\sqrt{p}}{9 \times 2\sqrt{p}} = \frac{1}{18} = b$$

$$\frac{1}{324} = b^2$$

$$k^2 = \frac{1}{324}$$

$$k = \pm\frac{1}{18}$$

$a^2 \pm 2ab + b^2$

$\left(\frac{2x}{y}\right)^2 + tx + \left(\frac{y}{2}\right)^2$

$tx = \pm 2 \times \frac{2x}{y} \times \frac{y}{2}$

$tx = \pm 2x$

$t = \pm 2$

55. If the expression $\frac{4x^2}{y^2} + tx + \frac{y^2}{4}$ is a perfect square, then the values of t is

अगर $\frac{4x^2}{y^2} + tx + \frac{y^2}{4}$ एक पूर्ण वर्ग है तो t का मान:

a) 2 b) ± 2

c) 0 d) -2

56. The expression $x^4 - 16x^2 + k^3$ a perfect square if the value of k is
K के किस मान के लिए $x^4 - 16x^2 + k^3$ एक पूर्ण वर्ग होगा?

a) 64 b) 8 c) 4 d) ± 4

$(x^2)^2$

$a - 2ab + b^2$

$\frac{16x^2}{2 \times x^2} = 8 = b$

$64 = b^2$

$k^3 = 64$

$k = 4$

57. If the expression $x^2 + x + 1$ is written in the form of $\left(x + \frac{1}{2}\right)^2 + q^2$, then the possible values of q are

अगर $x^2 + x + 1$ को $\left(x + \frac{1}{2}\right)^2 + q^2$ के रूप में लिखा जाए तो q के संभव मान:

a) $\pm\frac{1}{3}$ b) $\pm\frac{\sqrt{3}}{2}$ c) $\pm\frac{2}{\sqrt{3}}$ d) $\pm\frac{1}{2}$

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

$$1 = \frac{1}{4} + \frac{3}{4}$$

$$q^2 = \frac{3}{4}$$

$$q = \sqrt{\frac{3}{4}} = \pm\frac{\sqrt{3}}{2}$$

58. If $N = (12345)^2 + 12345 + 12346$, then what is the value of $\sqrt{N}$?

यदि $N = (12345)^2 + 12345 + 12346$ है, तो $\sqrt{N}$ का मान क्या है?

a)12346 b)12345 c)12344 d)12347

Observation:

① $N = 2^2 + 2 + 3 = 9$

$\sqrt{N} = \sqrt{9} = 3$

② $N = 1^2 + 1 + 2 = 4$

$\sqrt{N} = \sqrt{4} = 2$

$12345 = a$

$N = a^2 + a + a + 1$

$= a^2 + 2a + 1$

$N = (a+1)^2$

$\sqrt{N} = a + 1$

SSC CGL T2, 09 Mar 2018

59. If the expression $x + 809436 \times 809438$ be a perfect square, then the value of x is

अगर $x + 809436 \times 809438$ एक पूर्ण वर्ग है, तो x का मान पता करो|

a) 809436 b) 809438 c) 0 d) 1

observation:

① $x + 2 \times 4$
$= x + 8$

② $x + 3 \times 5$
$= x + 15$

③ $x + 5 \times 7$
$= x + 35$

$x = 1$

$x + (809437 - 1)(809437 + 1)$ — a

$= x + a^2 - 1$

$x = 1$

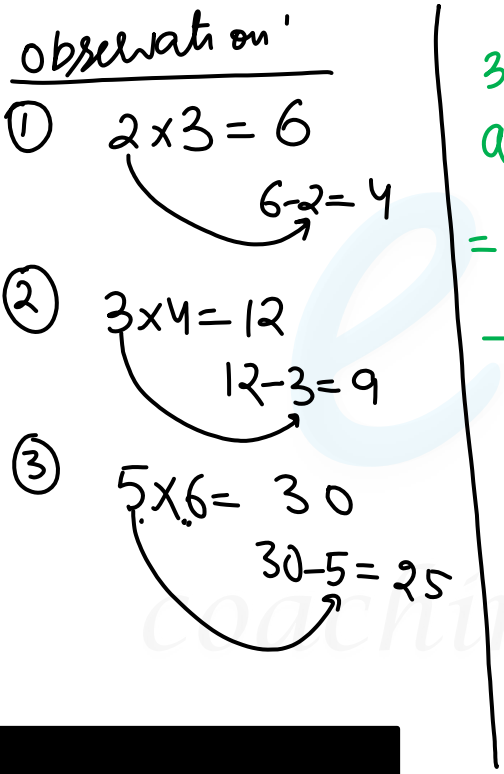
$809436 = a$

$x + a(a+2)$

$= x + a^2 + 2a \times 1$

$b^2 \quad a^2 \quad 2ab$

$a^2 + 2a + 1 = (a+1)^2$



60. The least positive integer that should be subtracted from 3011×3012 so that the difference is a perfect square is

3011×3012 में से कौनसा छोटे से छोटा धनात्मक पूर्णांक घटाया जाए ताकि उन अंकों का अंतर एक पूर्ण वर्ग हो

a) 3009 b) 2010

c) 3011 d) 3012

61. If $(a+b)^2 - 2(a+b) = 80$ and $ab = 16$, then what can be the value of $3a - 19b$?

यदि $(a+b)^2 - 2(a+b) = 80$ तथा $ab = 16$ है, तो $3a - 19b$ का मान क्या हो सकता है?

a)-16 b)-14

c)-18 d)-20

$(a+b)^2 - 2(a+b) \times 1 + 1^2 = 81$

$(a+b-1)^2 = 81$

$a+b-1 = \pm 9$

$a+b = 10 \,/\, -8$

$ab = 16$

$-3-5 = -8$

I) $a+b = 10$, $ab = 16$ (8, 2)

$a = 8, b = 2$

$a = 2, b = 8$

II) $a+b = -8$, $ab = 16$ (-4, -4)

$a = -4, b = -4$

$24 - 38 = -14$

62. If $\left[a+\left(\frac{1}{a}\right)\right]^2-2\left[a-\left(\frac{1}{a}\right)\right]=12$, then which of the following is a value of a?

यदि $\left[a+\left(\frac{1}{a}\right)\right]^2-2\left[a-\left(\frac{1}{a}\right)\right]=12$ हो, तो निम्नलिखित में से कोन सा a का मान है ?

a) $-8+\sqrt{3}$ b) $-8-\sqrt{3}$ c)$-8+\sqrt{5}$ d)none of these

$$\left(a-\frac{1}{a}\right)^2+4\times\cancel{a}\times\frac{1}{\cancel{a}}-2\left(a-\frac{1}{a}\right)=12$$

$$(a+b)^2=(a-b)^2+4ab$$

$$\Rightarrow\left(a-\frac{1}{a}\right)^2-2\left(a-\frac{1}{a}\right)_{+1}=8+1$$

$$\Rightarrow\left(a-\frac{1}{a}-1\right)^2=9$$

$$a-\frac{1}{a}-1=\pm 3$$

$$\Rightarrow a-\frac{1}{a}=4/-2$$

i) $a-\frac{1}{a}=4$

$$1a^2-4a-1=0$$

$$a=\frac{4\pm 2\sqrt{5}}{2}$$

$$=2\pm\sqrt{5}$$

$\sqrt{16+4}$

ii) $a-\frac{1}{a}=-2$

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

$\sqrt{4+4}$

$$a=\frac{-2\pm 2\sqrt{2}}{2}$$

$$=-1\pm\sqrt{2}$$

$$ax^2+bx+c=0$$

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

Regular 8 hr

Maximum

i) Consistency

ii) Patience

HW

63. Simplify the following expression.

$[(1+p)(1+p^2)(1+p^4)(1+p^8)(1+p^{16})(1-p)-1]$

निम्नलिखित व्यंजक को सरल कीजिये.

$[(1+p)(1+p^2)(1+p^4)(1+p^8)(1+p^{16})(1-p)-1]$

a) $-p^{32}$

b) p^{32}

c) $(1+p^{32})$

d) $(1-p^{32})$

$1-p^{32}-1 = -p^{32}$

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

$$\frac{(p+q-r)(p-q+r)}{(p+r+q)(p+r-q)}+\frac{(q+p-r)(q-p+r)}{(p+q+r)(p+q-r)}+\frac{(r+p-q)(r-p+q)}{(q+r+p)(q+r-p)}$$

$$=\frac{p+q-r+q-p+r+r+p-q}{p+q+r}=\frac{p+q+r}{p+q+r}=1$$

HW 64. The value of $\frac{P^2-(q-r)^2}{(p+r)^2-q^2}+\frac{q^2-(p-r)^2}{(p+q)^2-r^2}+\frac{r^2-(p-q)^2}{(q+r)^2-p^2}$ is:

$\frac{P^2-(q-r)^2}{(p+r)^2-q^2}+\frac{q^2-(p-r)^2}{(p+q)^2-r^2}+\frac{r^2-(p-q)^2}{(q+r)^2-p^2}$ का मान ज्ञात कीजिए|

a) 1 b) 2
c) 0 d) 3