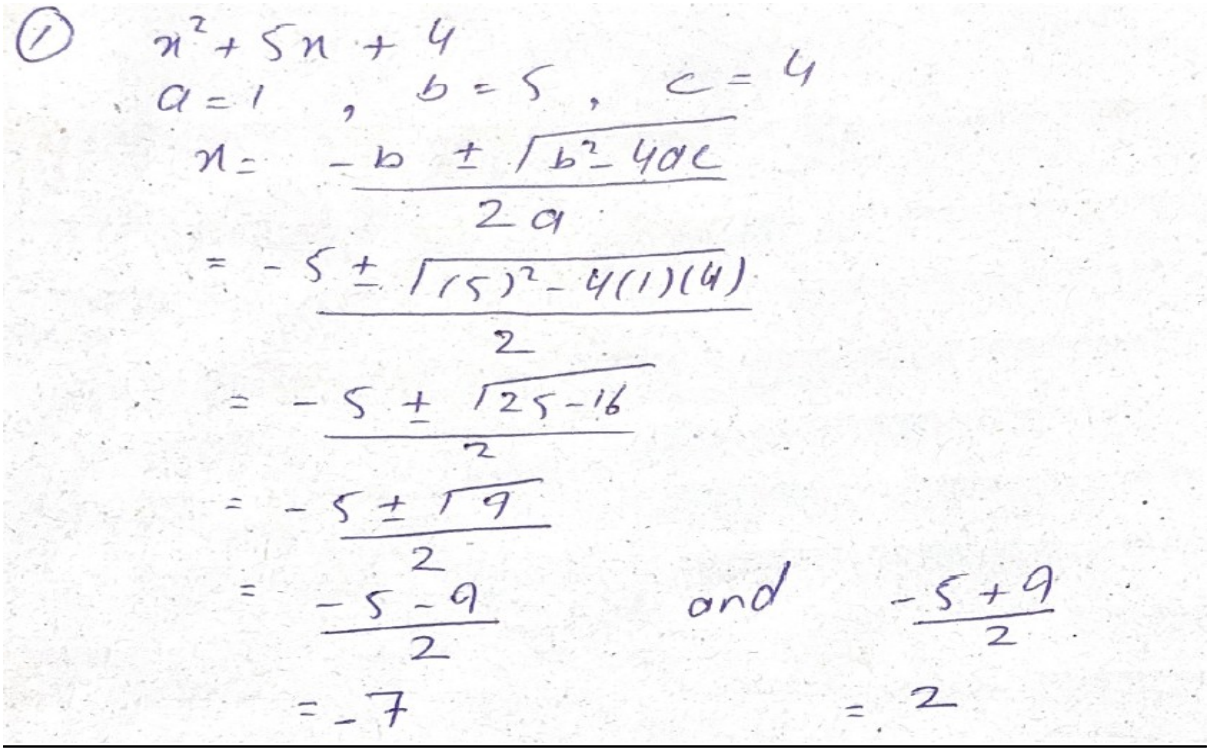
Answers Sheet

Quadratic Formula

1-



(1) $x^2 + 5x + 4$

$a = 1, \quad b = 5, \quad c = 4$

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

$$= \frac{-5 \pm \sqrt{(5)^2 - 4(1)(4)}}{2}$$

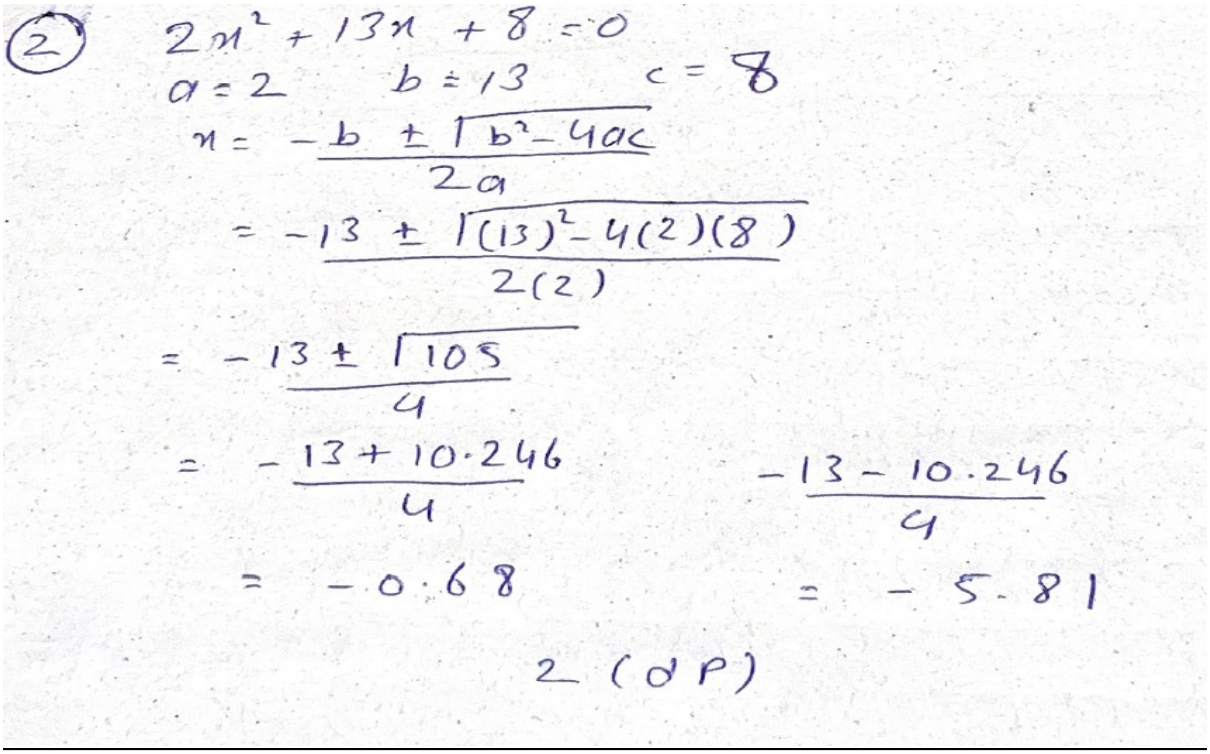
$$= \frac{-5 \pm \sqrt{25 - 16}}{2}$$

$$= \frac{-5 \pm \sqrt{9}}{2}$$

$$= \frac{-5 - 9}{2} \quad \text{and} \quad \frac{-5 + 9}{2}$$

$$= -7 \qquad = 2$$

2-



(2) $2x^2 + 13x + 8 = 0$

$a = 2 \quad b = 13 \quad c = 8$

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

$$= \frac{-13 \pm \sqrt{(13)^2 - 4(2)(8)}}{2(2)}$$

$$= \frac{-13 \pm \sqrt{105}}{4}$$

$$= \frac{-13 + 10.246}{4} \qquad \frac{-13 - 10.246}{4}$$

$$= -0.68 \qquad = -5.81$$

2 (dp)

3-

(3) $3x^2 + 2x - 14 = 0$

$a = 3, \quad b = 2, \quad c = -14$

$$= \frac{-2 \pm \sqrt{(+2)^2 - 4(3)(-14)}}{2(3)}$$

$$= \frac{-2 \pm \sqrt{4 + 168}}{6}$$

$$= \frac{-2 \pm 13.11}{6}$$

$$= \frac{-2 + 13.11}{6} \qquad \frac{-2 - 13.11}{6}$$

$= 1.8$ (1 dP) $\qquad -2.5$ (1 dP)

4-

(4) $5x^2 + x - 12 = 0$

$a = 5, \quad b = 1, \quad c = -12$

$$= \frac{-1 \pm \sqrt{(1)^2 - 4(5)(-12)}}{2(5)}$$

$$= \frac{-1 \pm \sqrt{241}}{10}$$

$$= \frac{-1 + 15.52}{10} \qquad = \frac{-1 - 15.52}{10}$$

$$= \frac{14.52}{10} \qquad = \frac{-16.52}{10}$$

$= 1.45$ (3 SF) $\qquad = -1.65$ (3 SF)

5-

(5) $3x^2 - 11x - 12 = 0$

$a = 3, \quad b = -11, \quad c = -12$

$$= \frac{-(-11) \pm \sqrt{(-11)^2 - 4(3)(-12)}}{2(3)}$$

$$= \frac{11 \pm \sqrt{121 + 144}}{6}$$

$$= \frac{11 \pm \sqrt{265}}{6}$$

$$= \frac{11 + 16.27}{6} \qquad = \frac{11 - 16.27}{6}$$

$= 4.54$ (3 SF) $\qquad = -0.87$ (3 SF)

6-

(6) $5x^2 = 6x + 4$

$5x^2 - 6x - 4 = 0$

$a = 5 \quad b = -6 \quad c = -4$

$$= \frac{-(-6) \pm \sqrt{(-6)^2 - 4(5)(-4)}}{2(5)}$$

$$= \frac{6 \pm \sqrt{36 + 80}}{10}$$

$$= \frac{6 \pm 10.770}{10}$$

$$= \frac{6 + 10.770}{10} \qquad = \frac{6 - 10.770}{10}$$

$= 1.67$ (3 SF) $\qquad = -0.477$ (3 SF)

7-

(7) $x^2 + 8x - 8 = 0$

$a = 1 \quad b = 8 \quad c = -8$

$$= \frac{-8 \pm \sqrt{(8)^2 - 4(1)(-8)}}{2(1)}$$

$$= \frac{-8 \pm \sqrt{64 + 32}}{2}$$

$$= \frac{-8 \pm \sqrt{+96}}{2}$$

$$= \frac{-8 \pm 4\sqrt{6}}{2}$$

$$= -\frac{8}{2} \pm \frac{4\sqrt{6}}{2}$$

$= -4 \pm 2\sqrt{6}$ in form of $a \pm b\sqrt{c}$

$\therefore \sqrt{+96}$

$\sqrt{96}$

$\sqrt{(16)(6)}$

$\sqrt{16}\sqrt{6}$

$4\sqrt{6}$

8-

(8) $x^2 - 4x - 2 = 0$

$a = 1$, $b = -4$, $c = -2$

$$= \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-2)}}{2(1)}$$

$$= \frac{4 \pm \sqrt{16 + 8}}{2}$$

$$= \frac{4 \pm \sqrt{24}}{2}$$

$\therefore \sqrt{24} = \sqrt{4}.\sqrt{6}$

$$= \frac{4 \pm \sqrt{4}\sqrt{6}}{2}$$

$$= \frac{4 \pm 2\sqrt{6}}{2}$$

$$= \frac{2(2 \pm \sqrt{6})}{2}$$

$$= 2 \pm \sqrt{6}$$

Similar to $a \pm \sqrt{b}$

9-

(9) $x^2 + 6x - 12 = 0$

$a = 1$, $b = 6$, $c = -12$

$$= \frac{-6 \pm \sqrt{(6)^2 - 4(1)(-12)}}{2}$$

$$= \frac{-6 \pm \sqrt{36 + 48}}{2}$$

$$= \frac{-6 \pm \sqrt{84}}{2}$$

$\therefore \sqrt{84} = \sqrt{21}\sqrt{4}$

$$= \frac{-6 \pm \sqrt{4}\sqrt{21}}{2}$$

$$= \frac{-6 \pm 2\sqrt{21}}{2}$$

$$= -3 \pm \sqrt{21}$$

OR $-3 \pm 1\sqrt{21}$

$a \pm b\sqrt{c}$

10-

(10) To show $2x^2 + 6x - 73 = 0$

a) $(2x+2)(x-4) + 4(3x-10) = 25$

$2x^2 - 8x + 2x - 8 + 12x - 40 = 25$

$2x^2 + 6x - 48 - 25 = 0$

$2x^2 + 6x - 73 = 0$

b) $a = 2, \quad b = 6, \quad c = -73$

$$= \frac{-6 \pm \sqrt{(6)^2 - 4(2)(-73)}}{2(2)}$$

$$= \frac{-6 \pm \sqrt{620}}{4}$$

$$= \frac{-6 \pm 24.899}{4}$$

$$= \frac{18.899}{4} \quad \text{and} \quad = \frac{-30.899}{4}$$

$= 4.72$ (3 SF)

$= -7.72$ (3 SF)

-7.72 is not possible because Line or x cannot be negative

So Answer = 4.72 (3 SF)

11-

(ii) To show =) $x^2 + 5x - 12 = 0$

$x(2x-2) + 6(2x+2) = 36$

$2x^2 - 2x + 12x + 12 = 36$

$2x^2 + 10x - 24 = 0$

$2(x^2 + 5x - 12) = 0$

$x^2 + 5x - 12 = 0$

b) $a = 1$, $b = 5$, $c = -12$

$$= \frac{-5 \pm \sqrt{(5)^2 - 4(1)(-12)}}{2(1)}$$

$$= \frac{-5 \pm \sqrt{25 + 48}}{2}$$

$$= \frac{-5 \pm \sqrt{73}}{2}$$

$$= \frac{-5 - 8.54}{2} \quad \text{and} \quad = \frac{-5 + 8.54}{2}$$

$$= \frac{-13.54}{2} \quad \text{and} \quad = \frac{3.54}{2}$$

$= -6.77$ $\quad = 1.77$

$\therefore x$ cannot be negative

so,

$x = 1.77$ (3 SF)

12-

(12) To Show $4x^2 - 27x + 21 = 0$

$4x(x-5) + 7(7-x) = 28$

$4x^2 - 20x + 49 - 7x = 28$

$4x^2 - 27x + 21 = 0$

b) $a = 4$, $b = -27$, $c = 21$

$$= \frac{-(-27) \pm \sqrt{(-27)^2 - 4(4)(21)}}{2(4)}$$

$$= \frac{27 \pm \sqrt{729 - 336}}{8}$$

$$= \frac{27 \pm \sqrt{393}}{8}$$

$$= \frac{27 + 19.824}{8}$$

$= 5.85$ (3 SF)

$$= \frac{27 - 19.824}{8}$$

$= 0.897$

⇓

Not possible because it make $(x-5)$ as negative

13-

(13) $x^2 - 2x - 23 = 0$

a) $(x+2)^2 + (x+3)^2 = (x+6)^2$

$(x+2)(x+2) + (x+3)(x+3) = (x+6)(x+6)$

$[x^2+2x+2x+4] + [x^2+3x+3x+9] = x^2+6x+6x+36$

$x^2+4x+4+x^2+6x+9 = x^2+12x+36$

$2x^2+10x+13 = x^2+12x+36$

$x^2 - 2x - 23 = 0$

b) $a = 1, \quad b = -2, \quad c = -23$

$$= \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-23)}}{2(1)}$$

$$= \frac{2 \pm \sqrt{96}}{2}$$

$$= \frac{2 \pm (\sqrt{16}\sqrt{6})}{2}$$

$$= \frac{2 \pm 4\sqrt{6}}{2}$$

$= 1 \pm 2\sqrt{6} \Rightarrow 1+2\sqrt{6}$

similar to $a+b\sqrt{c}$ ← $\therefore$ neglect $1-2\sqrt{6}$