

Q1. Expression is a number, a variable or a combination of numbers and variables and operation symbols. e.g. $x+y$.

An equation is made up of two expressions connected by an equal sign e.g. $x+y=4$.

Q2. a) $4-2x(x+2)$

$$= 4 - 2x^2 - 4x$$

$$= -2x^2 - 4x + 4$$

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

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

$$= 2x^3 + 5x^2 + 8x + 5$$

c) $(2x-4)^2 = (2x-4)(2x-4)$

$$= 4x^2 - 8x - 8x + 16$$

$$= 4x^2 - 16x + 16$$

$$\text{or } 4(x^2 - 4x + 4)$$

d) $(3x-y)^2 = (3x-y)(3x-y)$

$$= 9x^2 - 3xy - 3xy + y^2$$

$$= 9x^2 - 6xy + y^2$$

Q3.

a) $E = mc^2$

$$mc^2 = E$$

$$c^2 = \frac{E}{m}$$

$$c = \pm \sqrt{\frac{E}{m}} \text{ or } \left(\frac{E}{m}\right)^{1/2}$$

b) $\frac{1}{u} + \frac{1}{v} = \frac{2}{r}$

$$\frac{2}{r} = \frac{1}{u} + \frac{1}{v}$$

$$2uv = vr + ur$$

$$\frac{r(v+u)}{(v+u)} = \frac{2uv}{v+u}$$

$$r = \frac{2uv}{v+u}$$

Q4 a) $x^2 - 11x + 28$

$$a+b = -11$$

$$a \times b = 28 \quad -7, -4$$

$$\underline{x^2 - 7x - 4x + 28}$$

$$x(x-7) - 4(x-7)$$

$$(x-4)(x-7)$$

b) $12x^2 - 11x - 5$

$$a+b = -11$$

$$a \times b = -60 \quad +4, -15$$

$$12x^2 - 15x + 4x - 5$$

$$3x(4x-5) + 1(4x-5)$$

$$(3x+1)(4x-5)$$

5 a) $x^2 + 2x - 3 = 0$

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

$$(x - 1)(x + 3) = 0$$

$$x - 1 = 0 \quad x + 3 = 0$$

$$x = 1 \quad x = -3$$

$$\text{roots} = 1, -3.$$

b).

-1	1	4	3
		-1	-3
	1	3	0

$$(x + 1)(x + 3) = 0$$

$$x + 1 = 0$$

$$x = -1$$

$$x + 3 = 0$$

$$x = -3$$

$$\text{roots} = -1, -3.$$

Q 6. a) $x^2 - 7x + 12 = 0$

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

$$x = \frac{7 \pm \sqrt{(-7)^2 - 4 \times 1 \times 12}}{2 \times 1}$$

$$x = \frac{7 \pm 1}{2}$$

$$x = 4, 3.$$

Verify $x^2 - 7x + 12 = 0$

$$x = 4$$

$$4^2 - 7(4) + 12 = 0$$

$$16 - 28 + 12 = 0$$

$$16 + 12 - 28 = 0$$

$$28 - 28 = 0$$

$$x = 3$$

$$3^2 - 7(3) + 12 = 0$$

$$9 - 21 + 12 = 0$$

$$9 + 12 - 21 = 0$$

$$21 - 21 = 0$$

b) $x^2 - 8x + 15 = 0$

$$x = \frac{8 \pm \sqrt{(-8)^2 - 4 \times 1 \times 15}}{2 \times 1}$$

$$x = \frac{8 \pm 2}{2}$$

$$x = 5, 3.$$

Verify.

$$x^2 - 8x + 15 = 0$$

$$x = 5$$

$$5^2 - 8(5) + 15 = 0$$

$$25 - 40 + 15 = 0$$

$$25 + 15 - 40 = 0$$

$$40 - 40 = 0$$

$$x = 3$$

$$3^2 - 8(3) + 15 = 0$$

$$9 - 24 + 15 = 0$$

$$9 + 15 - 24 = 0$$

$$24 - 24 = 0$$

c) $x^2 + 4x + 13$

$$x = \frac{-4 \pm \sqrt{4^2 - 4 \times 1 \times 13}}{2 \times 1}$$

$$x = \frac{-4 \pm \sqrt{-36}}{2}$$

$$x = \frac{-4 \pm 6i}{2}$$

$$x = -2 + 3i, -2 - 3i.$$

$\therefore$ No real roots.

Verify.

$$x^2 + 4x + 13$$

$$x = -2 + 3i$$

$$(-2 + 3i)^2 + 4(-2 + 3i) + 13 = 0$$

$$4 - 12i - 9 - 8 + 12i + 13 = 0$$

$$17 - 17 = 0$$

$$x = -2 - 3i$$

$$(-2 - 3i)^2 + 4(-2 - 3i) + 13 = 0$$

$$4 + 12i - 9 - 8 - 12i + 13 = 0$$

$$17 - 17 = 0$$

$$a) x^2 - 10x + 41 = 0$$

~~or~~

$$x = \frac{10 \pm \sqrt{(-10)^2 - 4 \times 1 \times 41}}{2 \times 1}$$

$$x = \frac{10 \pm \sqrt{-64}}{2}$$

$$x = \frac{10 \pm 8i}{2}$$

$$x = 5 + 4i, 5 - 4i$$

Verify.

$$x^2 - 10x + 41 = 0$$

$$x = 5 + 4i$$

$$(5 + 4i)^2 - 10(5 + 4i) + 41 = 0$$

$$25 + 40i - 16 - 50 - 40i + 41 = 0$$

$$66 - 66 = 0$$

$$x = 5 - 4i$$

$$(5 - 4i)^2 - 10(5 - 4i) + 41 = 0$$

$$25 - 40i - 16 - 50 + 40i + 41 = 0$$

$$66 - 66 = 0$$

□

$$Q7. a) 2(x+4) < 2-x$$

$$2x+8 < 2-x$$

$$2x+x < 2-8$$

$$3x < -6$$

$$x < -2$$

Verify

$$2(-2+4) < 2-(-2)$$

$$2(2) < 2+2$$

$$4 < 4 \text{ false}$$

$$b) x-2 > 2x-3(x+3)$$

$$x-3 > 2x-3x-9$$

$$x-3 > -x-9$$

$$x+x > -9+3$$

$$2x > -6$$

$$x > -3$$

Verify

$$-3-2 > 2(-3)-3(-3+3)$$

$$-5 > -6 \text{ true.}$$

$$Q8. a) x > 3$$

$$b) x < -2$$

$$Q9. 3(x+1) = 2(2y+1)$$

$$3x+3 = 4y+2$$

$$3x+4y = -1 \text{ --- (i)}$$

$$2(y+3) = 4(x+1)$$

$$2y+6 = 4x+4$$

$$4x-2y = 2$$

$$2x-y = 1 \text{ --- (ii)}$$

$$\begin{pmatrix} 3x-4y = -1 \\ 2x-y = 1 \end{pmatrix} \times \begin{matrix} 3(x+1) = 4y+2 \\ 3(1) = 4y+2 \end{matrix}$$

$$3x-4y = -1$$

$$8x-4y = 4$$

$$-5x = -5$$

$$x = 1$$

$$2x-y = 1 \quad \therefore x=1$$

$$2-y = 1 \quad y=1$$

$$y = 2-1$$

$$y = 1$$

Q.10.

$$\begin{aligned} 3x + 4y + 2z &= 11 \\ 2x + 3y - z &= 4 \\ 5x + 5y - 3z &= -1 \end{aligned}$$

$$\begin{pmatrix} 3x + 4y + 2z = 11 \\ 2x + 3y - z = 4 \end{pmatrix} \begin{matrix} 1 \\ 2 \end{matrix}$$

$$\begin{aligned} 3x + 4y + 2z &= 11 \\ 4x + 6y - 2z &= 8 \end{aligned} \quad +$$

$$7x + 10y = 19$$

$$\begin{pmatrix} 2x + 3y - z = 4 \\ 5x + 5y - 3z = -1 \end{pmatrix} \begin{matrix} 3 \\ 1 \end{matrix}$$

$$\begin{aligned} 6x + 9y - 3z &= 12 \\ 5x + 5y - 3z &= -1 \end{aligned} \quad -$$

$$\begin{pmatrix} x + 4y = 13 \\ 7x + 10y = 19 \end{pmatrix} \begin{matrix} 7 \\ 1 \end{matrix}$$

$$\begin{aligned} 7x + 28y &= 91 \\ 7x + 10y &= 19 \end{aligned} \quad -$$

$$18y = 72$$

$$y = 4$$

$$x + 4y = 13$$

$$x + 16 = 13$$

$$x = 13 - 16 = -3$$

$$2x - 3y - z = 4$$

$$-6 - 12 - z = 4$$

$$-18 - z = 4$$

$$z = -18 - 4$$

$$z = -22$$

$$x = -3$$

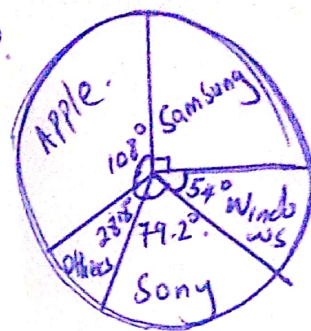
$$y = 4$$

$$z = -22$$

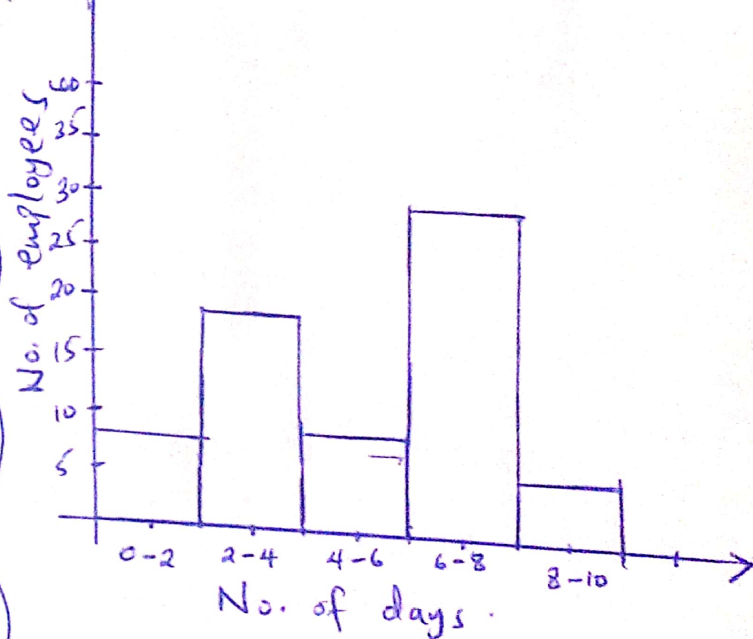
Section 2

Q1. Apple Samsung

2160	1800
(108°)	(90°)
Sony	Windows
1584	1080
(79.2°)	(64°)
Other brands	
576	
(28.8°)	



Q2



Q3. a) normal distribution c

b) skewed negatively. B.

c) positively skewed. A

d) c. normal distribution.

	Leaf.
2	
3	
4	0 0 7
5	1 4 5
6	0 1 3 3 5 5 9 9
7	0 2 2 2 3 3 6 6
8	2 3 4 5 6 7 7 9
9	0 1 4 5 6 7 8 8
	0 1

b) The distribution is normally distributed.

Section 3. ALGORITHMS

Q1. An algorithm is a set of instructions designed to perform a given task. It can entail a simple process, e.g. multiplication of 2 integers or a detailed task such as playing a compressed video function.

A function is an implementation of an algorithm.

$$Q2. a) \sum_{x=3}^8 x$$

$$= 3 + 4 + 5 + 6 + 7 + 8$$

$$= 33$$

$$b) \sum_{j=1}^3 \sum_{k=2}^5 (2jk)$$

$$\sum_{k=2}^5 (2jk)$$

$$\begin{array}{r} 142 \\ 22 \\ 124 \end{array}$$

$$2 \times 3k + 2 \times 4k + 2 \times 5k$$

$$6k + 8k + 10k$$

$$3 = 24k$$

$$\sum_{j=1}^3 24k = 24 \times 1 + 24 \times 2 + 24 \times 3$$

$$= 24 + 48 + 72$$

$$= 144$$

$$c) \prod_{k=5}^7 k = 5 \times 6 \times 7$$

$$= 210$$

$$\prod_{x=2}^4 \prod_{y=3}^6 (5xy)$$

$$\prod_{y=3}^6 (5xy)$$

$$= 5 \times 3 \times 4 \times 5 \times 6$$

$$= 1800x$$

$$\prod_{x=2}^4 (1800x) = 1800 \times 2 \times 3$$

$$= 43200$$