Ex:- 4.1

1) Check whether the following are quadratic Equations

i) $(x+1)^2 = 2(x-3)$

$x^2+1^2+2x = 2x-2\times3 = 0$

$x^2+1+2x-2x-6 = 0$

$x^2-5 = 0$ Yes it is quadratic equation

ii) $(x-2)(x+1) = (x-1)(x+3)$

$(x-2)\times(x+1) = (x-1)\times(x+3)$

$x(x+1)-2(x+1) = x(x+3)-1(x+3)$

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

$x^2-x+2 = x^2+2x-3 = 0$

$x^2-x^2-x-2x+2+3 = 0$

$-3x+5 = 0$ Yes it is quadratic equation

iii) $x^2+3x+1=(x-2)^2$

$x^2+3x+1=x^2-2x2+2^2=0$

$x^2+3x+1=x^2-4x+4=0$

$x^2-x^2+3x-4x+1-4=0$

$7x-3=0$ Yes it is quadratic equation

iv) $(x-3)(2x+1)=x(x+5)$

$(x-3)(2x+1)=x^2+5x$

$x(2x+1)-3(2x+1)=x^2+5x$

$2x^2+x-6x+(-3)=x^2+5x$

$2x^2+x-6x-3=x^2+5x$

$2x^2-x^2+x-5x-6x-3=0$

$x^2-10x-3=0$ Yes it is quadratic equation

ii) $(x+2)^3 = 2x(x^2-1)$

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

$x^3 + 6x^2 + 12x + 8 = 2x^3 - 2x$

$x^3 - 2x^3 + 6x^2 + 12x + 2x + 8 = 0$

$-x^3 + 6x^2 + 14x + 8 = 0$

No, this is not a quadratic equation

iii) $x^3 - 4x^2 - x + 1 = (x-2)^3$

$x^3 - 4x^2 - x + 1 = x^3 - (2)^3 - 3x^2(2) + 3x(2)^2$

$x^3 - 4x^2 - x + 1 = x^3 - 8 - 6x^2 + 12x$

$x^3 - x^3 - 4x^2 + 6x^2 - x - 12x + 1 + 8 = 0$

$2x^2 - 13x + 9 = 0$

Yes this is a quadratic equation

(11) Represent the following situation mathematically:
The product of two consecutive integers is 306. We need to find the integers.

Ans) Let the two consecutive positive integers be x and $x+1$

$x(x+1) = 306$

$x^2 + x = 306$

$x^2 + x - 306 = 0$

$x^2 - 18x + 17x - 306 = 0$

$x(x-18) + 17(x-18) = 0$

$(x+17)(x-18) = 0$

The two integers are 17 and 18

$306 = 2 \times 3 \times 3 \times 17$

2	306
3	153
3	51
17	17
	1

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(11) Rohan's mother is 26 years older than him. The product of their ages (in years) 3 years from now will be 360. We would like to find Rohan's present age.

Sol) Let present age of Rohan be x years.

Rohan's mother present age be (x+26) years

After 3 years, Rohan's age = (x+3) years

After 3 years, Rohan's mother age = (x+26+3) years

ATQ $(x+3)(x+29) = 360$

$\Rightarrow x^2 + 32x - 273 = 0$

$x^2 + 39x - 7x - 273 = 0$

$x(x+39) - 7(x+39) = 0$

$(x-7)(x+39)$

$x = 7 \quad x = -39$

Rohan's present age is 7

3 | 273
7 | 91
13

(IV) (8) A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, then it would have taken 3 hours more to cover the same distance, we need to find the speed of the train.

Ans) Total distance = 480 km

Let the usual speed be x km/h

Usual time = $\frac{480}{x}$ h

New speed = $(x-8)$ km/h

New time $\frac{480}{x-8}$ h

ATQ $\frac{480}{x-8} - \frac{480}{x} = 3$

$\frac{1}{(x-8)} - \frac{1}{x} = \frac{3}{480}$

~~$\frac{480}{x-8} - \frac{480}{x} = 3$~~ ~~$\frac{1}{x-8} = 0$~~

$\frac{x-(x-8)}{x(x-8)} = \frac{3}{480}$

$$\frac{x-(x-8)}{x(x-8)} = \frac{3}{480}$$

$$\frac{8}{x^2-8x} = \frac{3}{480}$$

$$8 \times 480 = 3(x^2-8x)$$

$$3840 = 3x^2 - 24x$$

$$3x^2 - 24x = 3840$$

$$3x^2 - 24x - 3840 = 0$$

$$x^2 - 8x - 1280$$

$$x^2 - 40x + 32x - 1280$$

$$x(x-40) + 32(x-40)$$

$$x = 40 \quad x = -32$$

Speed of train = 40 km/h

2	3840
2	1920
2	960
2	480
2	240
2	120
2	60
2	30
3	15
	5