Quadratic Equations

$\boxed{Ex: 4.1}$

(1)

(i)

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

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

$x^2+\cancel{2x}-\cancel{2x}+1+6=0$

$x^2+7=0$

$\therefore$ Yes

(ii)

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

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

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

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

$\therefore$ Yes.

(iii)

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

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

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

$\cancel{x^2}-\cancel{x^2}+x-2x-3x+x-2+3=0$

$-3x-5=0$

$\therefore$ No

(iv)

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

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

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

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

$x^2-10x+3=0$

$\therefore$ Yes.

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

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

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

$2x^2-x^2-6x-\cancel{x}+\cancel{x}-5x+3+5=0$

$x^2-11x+8=0$

$\therefore$ Yes.

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

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

$\cancel{x^2}-\cancel{x^2}+3x+4x+1-4=0$

$7x-3=0$

$\therefore$ No.

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

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

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

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

$\therefore$ No

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

$\Rightarrow \cancel{x^3}-4x^2-x+1=\cancel{x^3}-8-6x^2+12x$

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

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

$\therefore$ Yes.

② Page

(i) Let the breadth be x, then the length would be $2x+1$

Area $= 528 m^2$

$\Rightarrow x(2x+1) = 528$

$\Rightarrow 2x^2 + x = 528$

$\Rightarrow \boxed{2x^2 + x - 528 = 0}$

(ii) Let one no. be x; then the other no. would be $x+1$

Product $= 306$

$\Rightarrow x(x+1) = 306$

$\Rightarrow x^2 + x = 306$

$\Rightarrow \boxed{x^2 + x - 306 = 0}$

(iii) Let rohan's age be x, then his mother's age would be ~~2x+~~ $x+26$

Three years from now,

Rohan's age $= x+3$

Mother's age $= x+26+3$

$= x+29$

Product $= 360$

$\Rightarrow (x+3)(x+29) = 360$

$\Rightarrow x(x+29)\ 3(x+29) = 360$

$\Rightarrow x^2 + 29x + 3x + 87 = 360$

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

$$\begin{array}{r} 360 \\ -87 \\ \hline 273 \end{array}$$

(iv) Let the speed be x km/hr
distance = 480 km
time = $\frac{480}{x}$

New speed = $(x-8)$ km/hr
distance = 480 km
time = $\frac{480}{x} + 3$

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

$$(x-8)\left[\frac{480}{x}+3\right] = 480$$

$$\Rightarrow (x-8)\left[\frac{480}{x}+3\right] = 480$$

$$\Rightarrow (x-8)\left[\frac{480+3x}{x}\right) = 480$$

$$\Rightarrow (x-8)(480+3x) = 480x$$
$$\Rightarrow x(480+3x) - 8(480+3x) = 480x$$
$$\Rightarrow 480x + 3x^2 - 3840 - 24x = 480x$$
$$\Rightarrow 480x + 3x^2 - 384 - 24x - 480x = 0$$
$$\Rightarrow 3x^2 - 24x - 3840 = 0$$
$$\Rightarrow 3(x^2 - 8x - 1280) = 0$$
$$\Rightarrow x^2 - 8x - 1280 = \frac{0}{3}$$

$$\Rightarrow \boxed{x^2 - 8x - 1280 = 0}$$

$\Rightarrow$

$\boxed{\text{Ex:- 4.2}}$

(1)

(i) $x^2-3x-10=0$

$\Rightarrow x^2-5x+2x-10=0$

$\Rightarrow x(x-5)2(x-5)=0$

$\Rightarrow (x+2)(x-5)=0$

$\Rightarrow \boxed{x=-2}$ or $\boxed{x=5}$

(ii) $2x^2+x-6=0$

$\Rightarrow 2x^2+4x-3x-6=0$

$\Rightarrow 2x(x+2)-3(x+2)=0$

$\Rightarrow (2x-3)(x+2)=0$

$\Rightarrow \boxed{x=\frac{3}{2}}$ or $\boxed{x=-2}$

(iii) $\sqrt{2}x^2+7x+5\sqrt{2}=0$

$\Rightarrow \sqrt{2}x^2+\sqrt{2}x+5\sqrt{2}x+5\sqrt{2}=0$

$\Rightarrow \sqrt{2}x(x+\sqrt{2})\,5\sqrt{2}(x+\sqrt{2})=0$

$\Rightarrow (\sqrt{2}x+5\sqrt{2})(x+1)=0$

$\rightarrow x=\frac{-5\sqrt{2}}{\sqrt{2}}$ or $x=-1$

$\boxed{x=-5}$ or $\boxed{x=-1}$.

(iii) $\sqrt{2}x^2+7x+5\sqrt{2}=0$

$\rightarrow \sqrt{2}x^2+2x+5x+5\sqrt{2}=0$

$\rightarrow \sqrt{2}x(x+\sqrt{2})5(x+\sqrt{2})=0$

$\rightarrow (\sqrt{2}x+5)(x+\sqrt{2})=0$

$\rightarrow \boxed{x=\frac{-5}{\sqrt{2}}}$ or $\boxed{x=-\sqrt{2}}$

(iv) $2x^2-x+\frac{1}{8}=0$

$\Rightarrow \frac{16x^2-8x+1}{8}=0$

$\Rightarrow 16x^2-8x+1=0\times 8$

$\Rightarrow 16x^2-8x+1=0$

$\Rightarrow 16x^2-4x-4x+1=0$

$\Rightarrow 4x(4x-1)-1(4x-1)=0$

$\Rightarrow (4x-1)(4x-1)=0$

$\Rightarrow \boxed{x=\frac{1}{4}}$ or $\boxed{x=\frac{1}{4}}$

(v) $100x^2-20x+1=0$

$\Rightarrow 100x^2-10x-10x+1=0$

$\Rightarrow 10x(10x-1)-1(10x-1)=0$

$\Rightarrow (10x-1)(10x-1)=0$

$\Rightarrow \boxed{x=\frac{1}{10}}$ or $\boxed{x=\frac{1}{10}}$

2

(i) Let John had be x

Jivanti had be $45-x$

After losing,

John had $= x-5$

Jivanti had $= 45-x-5$

$= 40-x$.

Product $= 124$

$\Rightarrow (x-5)(40-x) = 124$

$\Rightarrow x(40-x) - 5(40-x) = 124$

$\Rightarrow 40x - x^2 - 200 + 5x = 124$

$\Rightarrow -x^2 + 45x - 200 = 124$

$\Rightarrow -x^2 + 45x - 324 = 0$

$\Rightarrow x^2 - 45x + 324 = 0$

$\Rightarrow x^2 - 9x - 36x + 324 = 0$

$\Rightarrow x(x-9) - 36(x-9) = 0$

$\Rightarrow (x-36)(x-9) = 0$

$\Rightarrow \boxed{x = 36}$ or $\boxed{x = 9}$

(ii) Let the no. of toys produced in a day be x, and Cost of each toy be $55-x$

Total cost $=$ ₹750

$\Rightarrow$ ~~x(x-55) = x~~

$\Rightarrow x(55-x) = 750$

$\Rightarrow 55x - x^2 = 750$

$\Rightarrow -x^2 + 55x - 750 = 0$

$\Rightarrow x^2 - 55x + 750$

$\Rightarrow x^2 - 30x - 25x + 750 = 0$

$\Rightarrow x(x-30) - 25(x-30) = 0$

$(x-25)(x-30) = 0$

$\boxed{x = 25}$ or $\boxed{x = 30}$

2 | 76
2 | 38
| 19

2 | 324
2 | 162
3 | 81
3 | 27
3 | 9
3 | 3
| 1

Let one no. be x, then the other would be $27-x$.

$$x(27-x)=182$$
$$27x-x^2=182$$
$$-x^2+27x-182=0$$
$$x^2-27x+182=0$$
$$x^2-14x-13x+182=0$$
$$x(x-14)-13(x-14)=0$$
$$(x-13)(x-14)=0$$
$$\boxed{x=13} \text{ or } \boxed{x=14}$$

(4) Let one integer be x, the other be $x+1$

$$\Rightarrow x^2+x^2+2x+1=365$$
$$\Rightarrow 2x^2+2x+1=365$$
$$\Rightarrow 2x^2+2x-364=0$$
$$\Rightarrow 2(x^2+x-182)=0$$
$$\Rightarrow x^2+x-182=0$$
$$\Rightarrow x^2+x-182=\frac{0}{2}$$
$$\Rightarrow x^2+14x-13x-182=0$$
$$\Rightarrow x(x+14)-13(x+14)=0$$
$$\Rightarrow (x-13)(x+14)=0$$
$$\Rightarrow \boxed{x=13} \text{ or } \boxed{x=-14} \times$$

$$\begin{array}{r|l} 2 & 182 \\ 7 & 91 \\ & 13 \end{array}$$

One integer $= 13$

Another $= 13+1$

$= 14$

hypotenuse = 13 cm.

By pythagoras theorem

$\Rightarrow x^2 + x^2 - 14x + 49 = 169$

$\Rightarrow 2x^2 - 14x - 120 = 0$

$\Rightarrow 2(x^2 - 7x - 60) = 0$

$\Rightarrow x^2 - 7x - 60 = \frac{0}{2}$

$\Rightarrow x^2 - 7x - 60 = 0$

$\Rightarrow x^2 + 5x - 12x - 60$

$\Rightarrow x(x+5) - 12(x+5) = 0$

$\Rightarrow (x-12)(x+5) = 0$

$\Rightarrow \boxed{x = 12}$ or $\boxed{x = -5}$

$\therefore$ Base = 12 cm.

Altitude = 5 cm.

6) Let the no. of pottery produced be x.

cost = $2x + 3$.

Total cost = ₹90

$\Rightarrow x(2x+3) = 90$

$\Rightarrow 2x^2 + 3x = 90$

$\Rightarrow 2x^2 + 3x - 90 = 0$

$\Rightarrow 2x^2 - 12x + 15x - 90 = 0$

$\Rightarrow 2x(x-6) + 15(x-6) = 0$

$\Rightarrow (2x+15)(x-6) = 0$

$\Rightarrow \boxed{x = -\frac{5}{6}}$ or $\boxed{x = 6}$

$\therefore$ 6 pottery was produced.

$\boxed{\text{Ex: 4.3}}$

(1)

(i) $2x^2 - 7x + 3 = 0$

$\Rightarrow \frac{\cancel{2}x^2 - 7x + 3}{\cancel{2}} = \frac{0}{\cancel{2}}$

$\Rightarrow x^2 - \frac{7x}{2} + \frac{3}{2} = 0$

$\Rightarrow \cancel{x^2 - 7x + 3 = 0 \times 2}$

$\Rightarrow (x)^2 + \left[\frac{7}{4}\right]^2 - \frac{7x}{2} + \frac{3}{2} - \left[\frac{7}{4}\right]^2 = 0$

$\Rightarrow \left[x - \frac{7}{4}\right]^2 + \frac{3}{2} - \left[\frac{7}{4}\right]^2 = 0$

$\Rightarrow \left[x - \frac{7}{4}\right]^2 + \frac{3}{2} - \frac{49}{16} = 0$

$\Rightarrow \left[x - \frac{7}{4}\right]^2 + \frac{24 - 49}{16} = 0$

$\Rightarrow \left[x - \frac{7}{4}\right]^2 - \frac{25}{16} = 0$

$\Rightarrow \left[x - \frac{7}{4}\right]^2 = \frac{25}{16}.$

$\Rightarrow \left[x - \frac{7}{4}\right]^2 = \left[\frac{5}{4}\right]^2$

$\Rightarrow x - \frac{7}{4} = \pm\frac{5}{4}$

$x - 7 = \frac{+5}{4}$	$x - 7 = \frac{\pm 5}{4}$
$\Rightarrow x = \frac{7+5}{4}$	$\Rightarrow x = \frac{7-5}{4}$
$\Rightarrow x = \frac{\cancel{12}}{\cancel{4}}$	$\Rightarrow x = \frac{\cancel{2}}{\cancel{4}}$
$\Rightarrow \boxed{x = 3}$	$\Rightarrow \boxed{x = 1}$

(ii) $2x^2+x-4=0$

$\Rightarrow \frac{\cancel{2}x^2}{\cancel{2}}+\frac{x}{2}-\frac{\cancel{4}}{\cancel{2}}=0$

$\Rightarrow x^2+\frac{x}{2}-2=0$

$\Rightarrow (x)^2+2\times x\times\frac{1}{4}+\left[\frac{1}{4}\right]^2-\left[\frac{1}{4}\right]^2-2=0$

$\Rightarrow \left[x+\frac{1}{4}\right]^2-\frac{1}{16}-2=0$

$\Rightarrow \left[x+\frac{1}{4}\right]^2=2+\frac{1}{16}$

$\Rightarrow \left[x+\frac{1}{4}\right]^2=\frac{32+1}{16}$

$\Rightarrow x+\frac{1}{4}=\pm\frac{\sqrt{33}}{4}$

$\Rightarrow$ ~~x+1~~ $\boxed{x=\frac{-1-\sqrt{33}}{4}}$ || $\boxed{x=\frac{-1+\sqrt{33}}{4}}$

(iii) $4x^2+4\sqrt{3}x+3=0$

$=$ ~~4x²~~ $(2x)^2+2\times 2x\times\sqrt{3}+(\sqrt{3})^2-(\sqrt{3})^2+3=0$

$=(2x+\sqrt{3})^2-\cancel{3}+\cancel{3}=0$

$\Rightarrow 2x+\sqrt{3}=\sqrt{0}$

$= 2x+\sqrt{3}=0$

$=$ $\boxed{\cancel{x=0}}$ $= x=\frac{-\sqrt{3}}{2}$ | $x=\frac{-\sqrt{3}}{2}$

(iv) $2x^2+x+4=0$

$\Rightarrow \frac{2x^2}{2}+\frac{x}{2}+\frac{4}{2}=\frac{0}{2}$

$\Rightarrow x^2+\frac{x}{2}+2=0$

$\Rightarrow (x)^2+2\times x\times\frac{1}{4}+\left[\frac{1}{4}\right]^2-\left[\frac{1}{4}\right]^2+2=0$

$\Rightarrow \left[x+\frac{1}{4}\right]^2-\frac{1}{16}+2=0$

$\Rightarrow \left[x+\frac{1}{4}\right]^2=-2+\frac{1}{16}$

$\Rightarrow x+\frac{1}{4}=\sqrt{\frac{-31}{16}}$

$\Rightarrow x+\frac{1}{4}=\frac{\pm\sqrt{-31}}{4}$

$\Rightarrow$ ~~x = -b-~~ ∵ roots cannot be negative so the solution doesnot exist.

(2)

(i) $2x^2-7x+3=0$

$= a=2, b=-7, c=3.$

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

$= \frac{-(-7)\pm\sqrt{(-7)^2-4(2)(3)}}{(2)(2)}$

$= \frac{7\pm\sqrt{49-24}}{4}$

$= \frac{7\pm 5}{4}$

$= x=\frac{7-5}{4}$

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

$x=\frac{7+5}{4}$

$\boxed{x=3}$

(ii) $2x^2+x-4=0$

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

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

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

$= \frac{-1 \pm \sqrt{1+32}}{4}$

$= \frac{-1 \pm \sqrt{33}}{4}$

$= x = \frac{-1-\sqrt{33}}{4}, \; x = \frac{-1+\sqrt{33}}{4}$.

(iii) $4x^2+4\sqrt{3}x+3=0$

$= a=4, b=4\sqrt{3}, c=3$

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

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

$= \frac{-4\sqrt{3} \pm \sqrt{48-48}}{8}$

$= \frac{-\cancel{4}^{1}\sqrt{3}}{\cancel{8}_{2}}$

$\Rightarrow x = -\frac{\sqrt{3}}{2}$

(iv) $2x^2+x+4=0$

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

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

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

$= \frac{-1 \pm \sqrt{1-32}}{4}$

$= \frac{-1 \pm \sqrt{-31}}{4}$

= since root is negative the solution doesnot exist

$\neq 0.$ (3)

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

$= x - \frac{1}{x} - 3 = 0$

$= \frac{x^2 - 1 - 3}{x} = 0$

x $\Rightarrow x^2 - 3x - 1 = 0$

$\Rightarrow a = 1, b = -3, c = -1.$

$-1.$ $\Rightarrow \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$\Rightarrow \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-1)}}{2(1)}$

$\Rightarrow \frac{3 \pm \sqrt{9 + 4}}{2}$

$\Rightarrow \frac{3 \pm \sqrt{13}}{2}$

$\Rightarrow x = \frac{3 + \sqrt{13}}{2}$ | $x = \frac{3 - \sqrt{13}}{2}$

(4)

$= 4, \; x \neq 4, 7$

(ii) $\frac{1}{x+4} - \frac{1}{x-7} = \frac{11}{30}, x \neq 4,$

$= \frac{\cancel{x} - 7 - \cancel{x} + 4}{x(x-7) 4(x-7} = \frac{11}{30}$

$\Rightarrow \frac{-11}{x^2 - 7x + 4x - 28} = \frac{11}{30}$

$\Rightarrow \frac{-1}{x^2 - 3x - 28} = \frac{1}{30}$

$x^2 - 3x - 28 = -30$

$= x^2 - 3x - 28 + 30 = 0$

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

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

$= x(x-1) - 2(x-1) = 0$

$= (x-2)(x-1) = 0$

$= \boxed{x = 2} \quad \boxed{x = 1}$

$= \cancel{x^2 - 3x - 28 = 30}$

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

$= a = 1, b = -3, c = 2$

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

$= \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(2)}}{2(1)}$

$= \frac{3 \pm \sqrt{9-8}}{2}$

$= \frac{3 \pm 1}{2}$

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

$x = \frac{4}{2}$

$\boxed{x = 2}$

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

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

$\boxed{x = 1}$

4) Let the present age of Rehman's be x years.

3 years ago,

$x - 3$

5 years from now,

$x + 5$

The sum $= \frac{1}{3}$

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

$= \frac{x+5+x-3}{x(x+5)-3(x+5)} = \frac{1}{3}$

$= \frac{2x+2}{x^2+5x-3x-15} = \frac{1}{3}$

$= \frac{2x+2}{x^2+2x-15} = \frac{1}{3}$

$\Rightarrow 6x+6 = x^2+2x-15$

$= x^2+6$

$= x^2+2x-6x-15-6=0$

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

$= x^2-7x+3x-21=0$

$= x(x-7)3(x-7)=0$

$= (x+3)(x-7)=0$

$= \boxed{x=-3} \quad \boxed{x=7}$

$\therefore$ Rehman's age is 7 years.

(5) Mathematics + English = 30

~~2 marks less in Maths~~

Let mark of maths be x, then mark of english would be $30-x$.

New maths marks $= x+2$.

New english marks $= 30-x-3$

$= 27-x$.

Product $= 210$

$(x+2)(27-x)=210$

$x(27-x)\ 2(27-x)=210$

$27x-x^2+54-2x=210$

$-x^2+27x-2x+54-210=0$

$-x^2+25x-156=0$

$x^2-25x+156=0$

$x^2-12x-13x+156=0$

$x(x-12)-13(x-12)=0$

$(x-13)(x-12)=0$

$\boxed{x=13}$ $\boxed{x=12}$

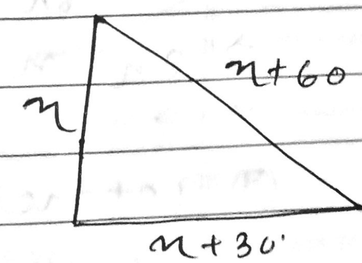
2	2700
2	1350
3	670
3	225
3	75
5	25
	5

If Maths = 13, then english = 30 − 13
= 17

If english = 13, then maths = 30 − 13
= 17

(6) Let the shorter side be x, then the ~~longer side~~ diagonal would be $x+60$;

longer side = $x+30$



$= (x)^2+(x+30)^2=(x+60)^2.$

$= x^2+x^2+60x+900=x^2+120x+3600$

$= 2x^2+60x+900=x^2+120x+3600$

$= 2x^2-x^2+60x-120x+900-3600=0$

$= x^2-60x-2700=0$

$= \cancel{a=1,\ b=-60,\ c=-2700}$

60

$= x^2 - 60x - 2700 = 0$

$= x^2 - 90x + 30x - 2700 = 0$

$= x(x-90)\ 30(x-90) = 0$

$= (x+30)(x-90) = 0$

$= \boxed{x = -30}$ or $\boxed{x = 90}$

$\because$ shorter side $= 90$ m.

diagonal $= 90 + 60$

$= 150$ m

longer side $= 90 + 30$

$= 120$ m.

7. Let one no. be x then the other would be $x+180$

$8x^2 = x + 180$

$\Rightarrow 8x^2 - x - 180 = 0$

$\Rightarrow$

7. Let the larger no. be x.

$(\text{smaller no.})^2 = 8 \times \text{larger no.}$

$(\text{smaller no.})^2 = 8x$

smaller no. $= \pm\sqrt{8x}$

difference of square $= 180$.

$\rightarrow x^2 - (\sqrt{8x})^2 = 180$

$\rightarrow x^2 - 8x = 180$

$\rightarrow x^2 - 8x - 180 = 0$

$\rightarrow x^2 + 10x - 18x - 180 = 0$

$\rightarrow x(x+10) - 18(x+10) = 0$

$\rightarrow (x-18)(x+10) = 0$

∴ the larger no. is 18 and the smaller no. is $= \pm\sqrt{8\times 18}$
$= 12$.

let the speed be x km/hr

(8) normal speed, ~~= 360 km~~

distance = 360 km

speed = x km/hr

$x = \frac{360}{time}$

time $= \frac{360}{x}$

new speed,

distance = 360 km

speed = $(x+5)$ km/hr

$x+5 = \frac{360}{time}$

$x+5 = \frac{360}{\left[\frac{360}{x} - 1\right]}$

$(x+5)\left[\frac{360}{x} - 1\right] = 480$

$\rightarrow (x+5)\left(\frac{360}{x} - 1\right) = 360$

$\rightarrow x\left[\frac{360}{x} - 1\right] 5\left(\frac{360}{x} - 1\right) = 360$

$\rightarrow 360 - x + \frac{1800}{x} - 5 = 360$

$\rightarrow \frac{360x - x^2 + 1800 - 5x}{x} = 360$

$\rightarrow 360x - x^2 + 1800 - 5x = 360x$

$\Rightarrow \cancel{360x} - \cancel{360x} - x^2 + 1800 - 5x = 0$

$\Rightarrow x^2 - 1800 + 5x = 0$

$\Rightarrow x^2 + 5x - 1800 = 0$

$\Rightarrow x^2 + 45x - 40x - 1800 = 0$

$\Rightarrow x(x+45) - 40(x+45) = 0$

$\Rightarrow (x-40)(x+45) = 0$

$\Rightarrow \boxed{x = 40}$ or $\boxed{x = -45}$

∴ The speed of the train is 40 km/hr

~~Time taken by,~~

(9) Two tape together to fill $= 9\frac{3}{8}$ hr.

$= \frac{75}{8}$ hr

Let the time taken by smaller tap be x hr, then the time taken by larger tap will be $x-10$.

In one hour,

Volume filled by smaller tap $= \frac{1}{x}$.

by larger tap $= \frac{1}{x-10}$

In $\frac{75}{8}$ hrs,

by smaller tap $= \frac{1}{x} \times \frac{75}{8} = \frac{75}{8x}$.

by larger tap $= \frac{1}{x-10} \times \frac{75}{8} = \frac{75}{8x-80}$.

NO,

$$\frac{75}{8}\left[\frac{1}{x}+\frac{1}{x-10}\right]=1$$

$$=\frac{1}{x}+\frac{1}{x-10}=\frac{8}{75}$$

$$=\frac{x-10+x}{x^2-10}=\frac{8}{75}$$

$$=\frac{2x-10}{x^2-10}=\frac{8}{75}$$

$$=75(2x-10)=8(x^2-10)$$

$$=150x-750=8x^2-80x$$

$$=8x^2-230x+7500$$

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

$$=\frac{-(-230)\pm\sqrt{(230)^2-4\times8\times750}}{2\times8}$$

$$=\frac{230\pm\sqrt{28900}}{16}$$

$$=\frac{230\pm170}{16}$$

$$=x=\frac{230+170}{16} \qquad x=\frac{230-170}{16}$$

$$x=\frac{400}{16} \qquad x=\frac{60}{16}$$

$$\boxed{x=25} \qquad \boxed{x=\frac{15}{4}}$$

∴ Time taken by the smaller tap is 25 hrs. and time taken by larger tap is (25-10) i.e., 15 hrs.

(10) Let the average speed of passanger train be x

Passanger train	Express train
speed $= x$ km/hr	speed $= x+11$
distance $= 132$ km	distance $= 132$ km.
time $= \frac{132}{x}$	time $= \frac{132}{x+11}$

A/Q,

$= \frac{132}{x} - \frac{132}{x+11} = 1.$

$= \frac{132(x+11) - 132x}{x^2+11x} = 1.$

$= \frac{\cancel{132x} + 1452 - \cancel{132x}}{x^2+11x} = 1.$

$= x^2+11x = 1452$

$= x^2+11x - 1452 = 0$

$= a = 1,\ b = 11,\ c = -1452$

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

$= \frac{-11 \pm \sqrt{(11)^2 - 4\times1\times-1452}}{2\times1}$

$= \frac{-11 \pm \sqrt{121+5808}}{2}$

$= \frac{-11 \pm \sqrt{5929}}{2}$

12/4

$= \frac{-11 \pm 77}{2}$

$= x = \frac{-11+77}{2}$	$= x = \frac{-11-77}{2}$
$x = \frac{66}{2}$	$x = \frac{-88}{2}$
$\boxed{x = 33}$	$\boxed{x = -44}$

∴ The average speed of passanger train is 33 km per hr and the average speed of express train is (33+11) km/hr i.e, 44 km/hr.

(ii) ~~Let the length~~

(ii) Let the side of 1st square be x, the perimeter would $4x$.

The perimeter of 2nd square will be $4x-24$.

side of 2nd square $= \frac{4x-24}{4}$ =

$= \frac{4(x-6)}{4}$

$= x-6$

A/Q,

$= (x)^2 + (x-6)^2 = 468$

$= x^2 + x^2 - 2 \times x \times 6 + 6^2 = 468$

$= 2x^2 - 12x - 432 = 0$

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

$= \frac{-(-6) \pm \sqrt{(-6)^2 - 4 \times 1 \times (-216)}}{2 \times 1}$

$= \frac{-(-6) \pm \sqrt{900}}{2}$

$x = \frac{6 \pm 30}{2}$

$x = \frac{6+30}{2}$ | $x = \frac{6-30}{2}$

$x = \frac{36}{2}$ | $x = \frac{-24}{2}$

$\boxed{x = 18}$ | $\boxed{x = -12}$

∴ side of the 1st square is 18 m and the side of 2nd square is 12 m

Exercise 4.4

(1)

(i) $2x^2 - 3x + 5$

$= b^2 - 4ac$

$= (-3)^2 - 4 \times 2 \times 5$

$= 9 - 40$

$= -31 < 0$

∴ no real roots

(ii) $3x^2 - 4\sqrt{3}x + 4 = 0$

$= b^2 - 4ac$

$= (-4\sqrt{3})^2 - 4 \times 3 \times 4$

$= 48 - 48$

$= 0 = 0$

∴ two real equal roots

(iii) $2x^2 - 6x + 3 = 0$

$= b^2 - 4ac$

$= (-6)^2 - 4 \times 2 \times 3$

$= 36 - 24 = 12 > 0$, real distinct roots

(2)

(i) $2x^2+kx+3=0$

$= \cancel{2x^2+kx} =$

$= a=2, b=k, c=3$

$= b^2-4ac=0$

$= k^2-4\times2\times3=0$

$= k^2-24=0$

$= k=\pm\sqrt{24}$

$= \boxed{k=\pm2\sqrt{6}}$.

(ii) $kx(x-2)+6=0$

$= kx^2-2kx+6=0$

$= a=k, b=-2k, c=6$

$= b^2-4ac=0$

$= (-2k)^2-4\times k\times6=0$

$= 4k^2-24k=0$

$= 4k(k-6)=0$

$= k-6=\frac{0}{4k}$

$= \boxed{k=6}$

(3) Let the breadth be x, length would be $2x$.

A/Q,

$x(2x)=800$

$2x^2=800$

$x^2=\frac{800}{2}$

$x^2=400$

$\boxed{x=20}$.

b^2-4ac

$= \boxed{2x^2-800}$

∴ breadth will be 20m

Length will be $2\times20=40$m.

(4) Sum of the ages = 20yrs.

Let one friend's age be x, the other one's would be $20-x$.

Four years ago,

1st friend's age $= x-4$

2nd friend's age $= \cancel{20-4-x}$ $20-x-4$

$= 16-x$.

A/Q,

$= (x-4)(16-x) = 48$

$= x(16-x) - 4(16-x) = 48$

$= 16x - x^2 - 64 + 4x = 48$

$= -x^2 + 16x + 4x - 48 = 0$

$= -x^2 + 20x - 48 = 0.$

$= x^2 - 20x + 48 = 0$

$= a = 1,\ b = -20,\ c = 48$

$= b^2 - 4ac$

$= (-20)^2 - 4 \times 1 \times 48$

$= -400 - 192$

$= -592 < 0$

$\therefore$ Solution is not possible.

(5) Let the length be x.

~~breadth~~ perimeter = 80m

$2(l+b) = 80m$

$l + b = \cancel{80}/\cancel{2}$

$l + b = 40$

$x + \text{breadth} = 40$

$\text{breadth} = 40 - x$

$x^2 - 40x + 400 = 0$

$b^2 - 4ac$

$= (-40)^2 - 4 \times 1 \times 400$

$= 1600 - 1600$

$= 0 = 0$

A/Q,

$x(40-x) = 400$

$= 40x - x^2 = 400$

$= -x^2 + 40x - 400 = 0$

$= x^2 - 40x + 400 = 0$

$= x^2 - 20x - 20x + 400 = 0$

$= x(x-20) - 20(x-20) = 0$

$= (x-20)(x-20) = 0$

$= \boxed{x = 20}$ $\boxed{x = 20}$

$\therefore$ length is 20m and the breadth is 40-20 i.e., 20m