(Section B)

Q. No. 2 (i)

$$\frac{x+1}{x} + \frac{x}{x+1} = \frac{25}{12}$$

$\Rightarrow$ Multiplying b/s by $x(x+1)$:-

$(x+1)^2 + x^2 = \frac{25}{12} x(x+1)$

$x^2 + 2x + 1 + x^2 = \frac{25}{12} x(x+1)$

$2x^2 + 2x + 1 = \frac{25}{12}(x^2 + x)$

$12(2x^2 + 2x + 1) = 25x^2 + 25x$

$24x^2 + 24x + 12 = 25x^2 + 25x$

$0 = 25x^2 - 24x^2 + 25x - 24x - 12$

$x^2 + x - 12 = 0$

$x^2 + 4x - 3x - 12 = 0$

$x(x+4) - 3(x+4) = 0$

$(x+4)(x-3) = 0$

$x + 4 = 0 \quad ; \quad x - 3 = 0$

$x = -4 \qquad x = 3$

$S.S = \{-4, 3\}$

Q. No. 2 (ii)

$5^{1+x} + 5^{1-x} = 10$

$5^1 \cdot 5^x + 5^1 \cdot 5^{-x} = 10$

$5^1 \cdot 5^x + 5^1 \cdot \frac{1}{5^x} = 10$ $(a^{m+n} = a^m \cdot a^n)$

$\Rightarrow$ Let $y = 5^x$

$5y + \frac{5}{y} = 10$

$\rightarrow$ Multiplying b/s by y :-

$5y^2 + 5 = 10y$

$5y^2 - 10y + 5 = 0$

$5(y^2 - 2y + 1) = 0$

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

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

$y(y-1) - 1(y-1) = 0$

$(y-1)(y-1) = 0$

$y - 1 = 0$ $y - 1 = 0$

$y = 1$ $y = 1$

$\Rightarrow$ Back to substitutions -

$5^x = 1$ $5^x = 1$

$5^x = 5^0$ $5^x = 5^0$

$x = 0$ $x = 0$

$S.S = \{0\}$

Q. No. 2 (iii)

Given :- Given equation:- $x^2+(mx+c)^2=a^2$

Given condition:- $c^2=a^2(1+m^2)$

To find:- $x^2+(mx+c)^2=a^2$ has equal roots if $c^2=a^2(1+m^2)$

Solution:-

=) Writing the given equation in standard form of quadratic equation :-

$$Ax^2+Bx+C=0$$

$$x^2+(mx+c)^2=a^2$$

$$x^2+m^2x^2+2mcx+c^2=a^2$$

$$x^2(1+m^2)+2mcx+c^2-a^2=0$$

-) Comparing with standard quadratic equation of form - $Ax^2+Bx+C=0$

$A=1+m^2$, $C=c^2-a^2$

$B=2mc$

=) If the equation has equal roots then,

$$Disc = B^2-4AC$$

$$= (2mc)^2-4(1+m^2)(c^2-a^2)$$

$$=4m^2c^2-4(c^2-a^2+m^2c^2-a^2m^2)$$

$$=4(\cancel{m^2c^2}-c^2+a^2-\cancel{m^2c^2}+a^2m^2)$$

$$=4(m^2a^2-c^2+a^2)$$

$$=4(a^2+m^2a^2-c^2)$$

$$=4[a^2(1+m^2)-c^2]$$

=> Put $c^2=a^2(1+m^2)$

$$=4[a^2(1+m^2)-a^2(1+m^2)]$$

$$Disc = 0$$

Result:-

A quadratic equation has equal roots if its discriminant is zero. On putting $c^2=a^2(1+m^2)$, the disc comes out to be zero which proves that the equation has equal roots.

Q. No. 2 (iv)

Given:-

w varies inversely as z

$w = 5$ when $z = 7$

To find:-

(a) Connecting equation = ?

(b) $k = ?$

(c) $w = ?$, $z = \frac{175}{4}$

Solution:- (a)

=) w varies inversely as z

$w \propto \frac{1}{z}$

$\boxed{w = \frac{k}{z}}$ connecting (i) equation.

(b) Value of $k = ?$
when $w = 5, z = 7$

$5 = \frac{k}{7}$

$k = 35$

→ Put in (i)

$\boxed{w = \frac{35}{z}}$ → (ii)

(c) $w = ?, z = \frac{175}{4}$

=) Putting the values

$w = \frac{35}{z}$

$w = \frac{35}{\frac{175}{4}}$

$w = 35 \div \frac{175}{4}$

$w = \cancel{35} \times \frac{4}{\cancel{175}_5}$

$\boxed{w = \frac{4}{5}}$

Result:-

(i) Connecting equation:-
$w = \frac{k}{z}$, with constant:- $w = \frac{35}{z}$

(ii) $k = 35$

(iii) $z = \frac{175}{4}$, then $w = \frac{4}{5}$

Q. No. 2 (v)

Given:

$\frac{a}{x} = \frac{b}{y} = \frac{c}{z}$

To prove:-

$\frac{x^3}{a^3} + \frac{y^3}{b^3} + \frac{z^3}{c^3} = \frac{3xyz}{abc}$

Solution/Proof:-

$\frac{a}{x} = \frac{b}{y} = \frac{c}{z} = k$

$\frac{a}{x} = k \Rightarrow a = kx$

$\frac{b}{y} = k \Rightarrow b = ky$

$\frac{c}{z} = k \Rightarrow c = kz$

Proof:

Taking L.H.S

$= \frac{x^3}{a^3} + \frac{y^3}{b^3} + \frac{z^3}{c^3}$

$= \frac{x^3}{(kx)^3} + \frac{y^3}{(ky)^3} + \frac{z^3}{(kz)^3}$

$= \frac{\cancel{x^3}}{k^3\cancel{x^3}} + \frac{\cancel{y^3}}{k^3\cancel{y^3}} + \frac{\cancel{z^3}}{k^3\cancel{z^3}}$

$= \frac{1}{k^3} + \frac{1}{k^3} + \frac{1}{k^3}$

$= \frac{3}{k^3} \longrightarrow (i)$

→Taking R.H.S:-

$= \frac{3xyz}{abc}$

$= \frac{3xyz}{(kx)(ky)(kz)}$

$= \frac{3xyz}{k^3xyz}$

$= \frac{3}{k^3} \longrightarrow (ii)$

From (i) & (ii)

L.H.S = R.H.S

$\frac{x^3}{a^3} + \frac{y^3}{b^3} + \frac{z^3}{c^3} = \frac{3xyz}{abc}$

Hence, proved.

Q. No. 2 (vi)

Given:- $\frac{3x-2}{2x^2-x}$

To find:- Partial fractions

Solution:-

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

$$\frac{3x-2}{x(2x-1)} = \frac{A}{x} + \frac{B}{2x-1} \rightarrow (i)$$

=> Multiplying b/s by $x(2x-1)$

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

Put $2x-1=0$

$$2x = 1$$

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

$$3\left(\frac{1}{2}\right) - 2 = B\left(\frac{1}{2}\right)$$

$$\frac{3}{2} - 2 = \frac{B}{2}$$

$$\frac{3-4}{2} = \frac{B}{2}$$

$$\frac{-1}{2} = \frac{B}{2}$$

$$\Rightarrow \boxed{B = -1}$$

$$3x-2 = 2Ax - A + Bx$$

→ Comparing coefficients of x^0:-

$$-2 = -A$$

$$\boxed{A = 2}$$

→ Putting values of A and B in eq (i)

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

Which are the required partial fractions

Q. No. 2 (vii)

Q. No. 2 (viii)

Given :- $X = \{ x \mid x \in N \wedge x < 6 \}$
$Y = \{ y \mid y \in P \wedge y < 11 \}$

To find:- (a) X & Y in tabular form = ?
(b) $X \times Y$ = ?
(c) $R = \{ (x, y) \mid x + y = 6$

Solution:

(a) $X = \{1, 2, 3, 4, 5\}$
$Y = \{2, 3, 5, 7\}$

(b) $X \times Y$
No of elements = $5 \times 4 = 20$

~~(c)~~ $X \times Y = \{ (1,2), (1,3), (1,5), (1,7),$
$(2,2), (2,3), (2,5), (2,7),$
$(3,2), (3,3), (3,5), (3,7),$
$(4,2), (4,3), (4,5), (4,7),$
$(5,2), (5,3), (5,5), (5,7) \}$

(c) Relation $R = \{ (x, y) \mid x + y = 6 \}$

$R = \{ (1,5), (3,3), (4,2) \}$

$Dom(R) = \{1, 3, 4\}$
$Range(R) = \{2, 3, 5\}$

Q. No. 2 (ix) (Entra Question)

Given :-

Class limits	X	f	$\log X$	$f \log X$
4-6	5	10	0.6989	6.989
7-9	8	20	0.9030	18.06
10-12	11	13	1.0413	13.5369
13-15	14	7	1.1461	8.0227
		$\Sigma f = 50$		$\Sigma f \log X = 46.6086$

(a) $\Sigma f = 50$

(b) $\Sigma f \log X = 46.6086$

(c) $G.M = \text{Antilog}\left(\frac{\Sigma f \log X}{\Sigma f}\right)$

$= \text{Antilog}\left(\frac{46.6086}{50}\right)$

$= \text{Antilog}(0.932172)$

$G.M = 8.554$

Q. No. 2 (x)

To verify: $(\tan\theta + \cot\theta)(\cos\theta + \sin\theta) = \sec\theta + \operatorname{cosec}\theta$

Proof:-

$\Rightarrow$ Taking L.H.S

$= (\tan\theta + \cot\theta)(\cos\theta + \sin\theta)$

$= \left(\dfrac{\sin\theta}{\cos\theta} + \dfrac{\cos\theta}{\sin\theta}\right)(\cos\theta + \sin\theta)$ $\quad \because \tan\theta = \dfrac{\sin\theta}{\cos\theta}, \cot\theta = \dfrac{\cos\theta}{\sin\theta}$

$= \left(\dfrac{\sin^2\theta + \cos^2\theta}{\cos\theta \cdot \sin\theta}\right)(\cos\theta + \sin\theta)$

$= \left(\dfrac{1}{\cos\theta \cdot \sin\theta}\right)(\cos\theta + \sin\theta)$ $\quad \because 1 = \cos^2\theta + \sin^2\theta$

$= \dfrac{\cos\theta + \sin\theta}{\cos\theta \cdot \sin\theta}$

$= \dfrac{\cancel{\cos\theta}}{\cancel{\cos\theta} \cdot \sin\theta} + \dfrac{\cancel{\sin\theta}}{\cos\theta \cdot \cancel{\sin\theta}}$

$= \dfrac{1}{\sin\theta} + \dfrac{1}{\cos\theta}$

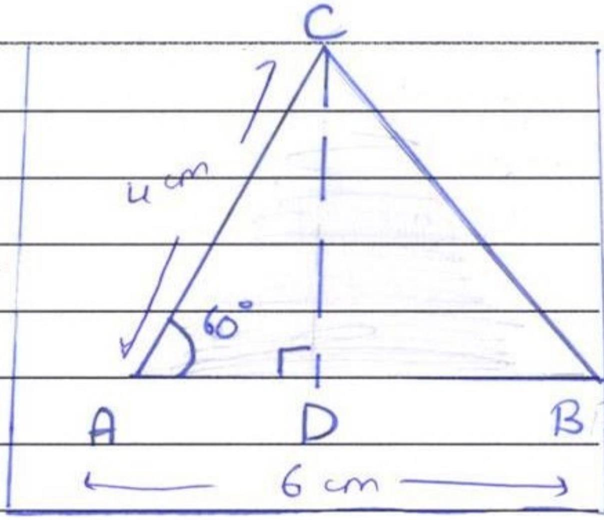
$= \operatorname{cosec}\theta + \sec\theta$ $\quad \left(\because \sec\theta = \dfrac{1}{\sin\theta}, \operatorname{cosec}\theta = \dfrac{1}{\cos\theta}\right)$

$= \sec\theta + \operatorname{cosec}\theta = R.H.S$

Hence, proved.

Q. No. 2 (xi)

Given: In a ΔABC,
$m\overline{AB} = 6$ cm, $\overline{AD}$ is projection of $\overline{AC}$ on $\overline{AB}$
$m\overline{AC} = 4$ cm
$m\angle A = 60^\circ$



To find:- $mBC = ?$

Solution:-

In a $\angle$rt ΔADC:-

$\cos\theta = \frac{\text{base}}{\text{hypotenuse}}$

$\cos(60) = \frac{m\overline{AD}}{4}$

$\frac{1}{2} = \frac{m\overline{AD}}{4}$

$2m\overline{AD} = 4$

$\boxed{m\overline{AD} = 2 \text{ cm}}$

* In any Δ, the square on the side opposite to the acute angle is equal to the sum of the squares of the sides containing the acute angle diminished by twice the rectangle contained by one of the sides and the projection on it of the other.

$(BC)^2 = (AC)^2 + (AB)^2 - 2(AB)(AD)$

$(BC)^2 = (4)^2 + (6)^2 - 2(6)(2)$

$(BC)^2 = 16 + 36 - 24$

$(BC)^2 = 28$

=) Taking square root on b/s

$\sqrt{(BC)^2} = \sqrt{28}$

$mBC = \pm\sqrt{28}$

$m\overline{BC} = \sqrt{28} = 2\sqrt{7}$

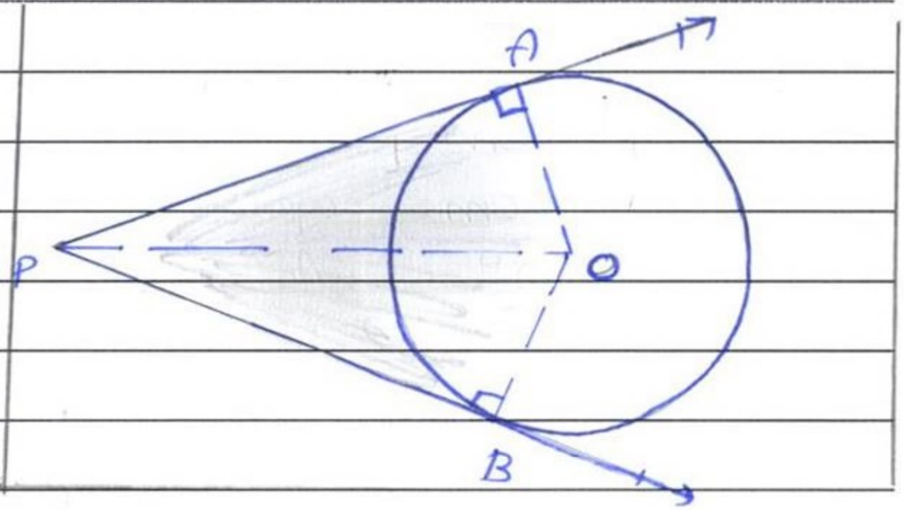
$m\overline{BC} = 5.29$ cm

Result:-

$m\overline{BC} = 5.29$ cm

Q. No. 2 (xii)

Given:-
Two tangents $\overrightarrow{PA}$ and $\overrightarrow{PB}$ are drawn from an external point P to a circle with centre O.



To prove: $m\overline{PA} = m\overline{PB}$

Construction:- Join O to A and O to B. Join O to P to form right triangles OAP and ΔOBP

Proof:-

Statements	Reasons
In $\angle$rt Δs OAP $\leftrightarrow$ ΔOBP,	
$m\angle OAP = m\angle OBP = 90^\circ$	$\overrightarrow{PA}$ and $\overrightarrow{PB}$ (tangents) are perpendicular to radial segments $\overline{OA}$ and $\overline{OB}$ respectively
hyp $m\overline{OP}$ = hyp $m\overline{OP}$	Common.
$m\overline{OA} = m\overline{OB}$	Radii of same circle are equal
$\therefore \Delta OAP \cong \Delta OBP$	In $\angle$rtΔs H.S $\cong$ H.S
$\therefore m\overline{PA} = m\overline{PB}$	Corresponding sides of congruent Δs

Hence, proved

Q. No. 2 (xiii)

Q. No. 2 (xiv)

Q. No. 3 (Page 1/2)

Q3

Solution:

Let 'y' be the digit at tens place and 'x' be the digit at units place.

Number $= 10y + x \longrightarrow$ (a)

=> According to the first given condition,

$x^2 + y^2 = 65 \rightarrow$ (i)

=> According to the second given condition:-

$10y + x = 9(x+y)$

$10y + x = 9x + 9y$

$10y - 9y = 9x - x$

$\boxed{y = 8x} \longrightarrow$ (ii)

→ Put (ii) in eq (i)

$x^2 + (8x)^2 = 65$

$x^2 + 64x^2 = 65$

$65x^2 = 65$

$x^2 = \frac{65}{65}$

$x^2 = 1$

=> Taking $\sqrt{\ }$ on b/s :-

$\sqrt{x^2} = 1$

$x = \pm 1$

→ Neglecting the negative sign:-

$\boxed{x = 1}$

→ Put $x=1$ in eq (ii)

$y = 8(1)$

$\boxed{y = 8}$

Q. No. 3 (Page 2/2)

Number $= 10y + x$

$= 10(8) + 1$

$= 80 + 1$

$= 81$

Number = 81

⇒ Result :- Hence, the number is 81.

81 = 9(x+y)

81 = 9(8+1)

81 = 81

8 1

sum of square digits = 64 + 1

= 65

Q. No. 4 (Page 1/2)

Q. No. 4 (Page 2/2)

Q. No. 5 (Page 1/2)

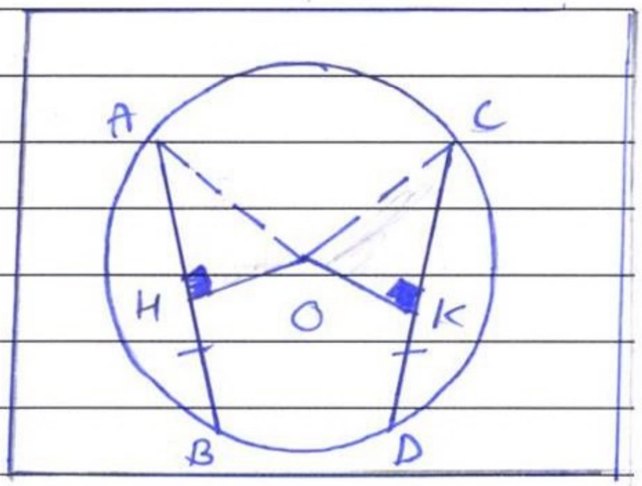
Q. No. 5 (Page 2/2)

Q. No. 6 (Page 1/2)

Statement:

If two chords of a circle are congruent, then prove that they will be equidistant from the centre.

Given:



* $\overline{AB}$ and $\overline{CD}$ are two chords of a circle with centre O such that

$m\overline{AB} = m\overline{CD}$

i.e they are equal in length

* $\overline{OH} \perp \overline{AB}$, $\overline{OK} \perp \overline{CD}$

To prove:-

$m\overline{OH} = m\overline{OK}$

Construction: - Join O to A and C so that we have two right triangles $\triangle OHA$ and $\triangle OKC$.

Proof:-

Statements	Reasons
$\overline{OH}$ bisects $\overline{AB}$.	$\overline{OH} \perp \overline{AB}$ (Given) Perpendicular drawn from centre of circle on a chord bisects the chord.
i.e $m\overline{AH} = \frac{1}{2} m\overline{AB} \rightarrow (i)$	
$\overline{OK}$ bisects $\overline{CD}$.	$\overline{OK} \perp \overline{CD}$ (Given)

Q. No. 6 (Page 2/2)

	from centre of circle on a chord bisects the chord.
i.e $m\overline{CK} = \frac{1}{2} m\overline{CD} \rightarrow$ (ii)	
$m\overline{AB} = m\overline{CD} \rightarrow$ (iii)	Given
$m\overline{AH} = m\overline{CK} \rightarrow$ (iv)	From (i), (ii) & (iii)
In $\angle$rt Δs $OHA \leftrightarrow \Delta OKC$	$\overline{OH} \perp \overline{AB}$, $\overline{OK} \perp \overline{CD}$ (Given)
$m\overline{OA} = m\overline{OC}$	Radii of same circle
$m\angle OHA = m\angle OKC = 90°$	Given, $\overline{OH} \perp \overline{AB}$, $\overline{OK} \perp \overline{CD}$
$m\overline{AH} = m\overline{CK}$	Proved in (iv)
$\therefore \Delta OHA \cong \Delta OKC$	In $\angle$rt Δs, $H.S \cong H.S$
$m\overline{OH} = m\overline{OK}$	Corresponding sides of congruent Δs

Result:

Hence, it has been proved that two equal chords in a circle are equidistant from the centre

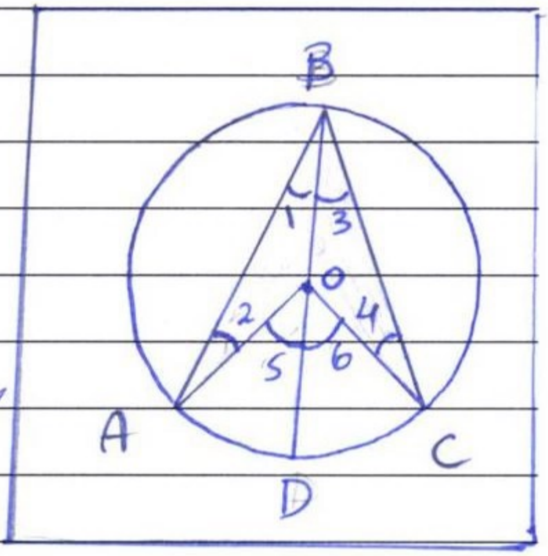
Q. No. 7 (Page 1/2)

Statement:

The measure of central angle of minor arc of a circle is double than that of ∠ of the corresponding major arc.

Given:

* $\widehat{AC}$ is the arc of a circle with centre O.
* ∠AOC and ∠ABC are the central and the circum angles respectively standing on an arc $\widehat{AC}$ of the circle with centre O



To prove:

$m\angle AOC = 2m\angle ABC$

Construction:

Join B to O and extend it to meet the circle (arc) at D. Name the angles as ∠1, ∠2, ∠3, ∠4, ∠5 & ∠6 in the figure shown above.

Proof:-

Statements	Reasons
$m\angle 1 = m\angle 2 \rightarrow$ (i)	Angles opposite to equal sides of △AOB.
$m\angle 3 = m\angle 4 \rightarrow$ (ii)	Angles opposite to equal sides of △BOC
$m\angle 5 = m\angle 1 + m\angle 2 \rightarrow$ (iii)	Exterior angle of a △ is equal to the

Q. No. 7 (Page 2/2)

$m\angle 6 = m\angle 3 + m\angle 4 \rightarrow$ (iv)	Enterior angle of a Δ is equal to the sum of opposite interior $\angle$s.
$m\angle 5 = m\angle 1 + m\angle 1 = 2m\angle 1 \rightarrow$ (v)	From eq (i) & (iii)
$m\angle 6 = m\angle 3 + m\angle 3 = 2m\angle 3 \rightarrow$ (vi)	From eq (ii) & (iv)
Then from figure	
$m\angle 5 + m\angle 6 = 2m\angle 1 + 2m\angle 3$	Adding eq (v) & (vi)
$m\angle AOC = 2(m\angle 1 + m\angle 3)$	$m\angle 5 + m\angle 6 = m\angle AOC$ (figure)
$m\angle AOC = 2m\angle ABC$	$m\angle 1 + m\angle 3 = m\angle ABC$ (figure)

Result:-

Hence, it has been proved that the measure of central angle of minor arc of a circle is double than that of the angle subtended by corresponding major arc.

گراف پیپر: متعلقہ سوال کا سیریل نمبر ضرور درج کریں۔

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Graph Page No. 1

Graph Page No. 2

Rough Work 1

Rough Work 2

$x-4=0$

$x=4$

$x+1=0$

$x=0-1$

$x=-1$

$\alpha=\frac{1}{\beta}, \beta=\frac{1}{\alpha}$

$1=\alpha\beta$

$\alpha+\beta=\alpha+\frac{1}{\alpha}=\frac{\alpha^2+1}{\alpha}=(\alpha+\beta)^2$

$\frac{1}{\sin\theta}\times\tan\theta$

$\frac{1}{\sin\theta}\times\frac{\sin\theta}{\cos\theta}$

$\frac{\sin\theta}{\sin\theta\cos\theta}$

$\frac{1}{\cos\theta}=\sec\theta$

$\Sigma x \quad \bar{x}=\frac{\Sigma x}{n}$

$\frac{2}{p}=1$

$10=\frac{7+9k}{7}$

30

$70=7+9k$

$9k=63$

$k=7$

$\alpha=\frac{1}{\beta}$

$\alpha\beta=1$

$\alpha+\beta=-\frac{q}{p}$

$\alpha=\frac{1}{\beta}$

$1=\alpha\beta$

$\alpha\beta=\frac{2}{p}$

$px^2-qx+2=0$

$\alpha\beta=\frac{2}{p}$

$\alpha\beta=$

$1=\frac{2}{p}$

$p=2$

$\alpha=\frac{1}{\beta}$

$1=\alpha\beta$

$\alpha+\beta=$

$2x^2+9x+2$ $\quad 3\times2 \quad 6$