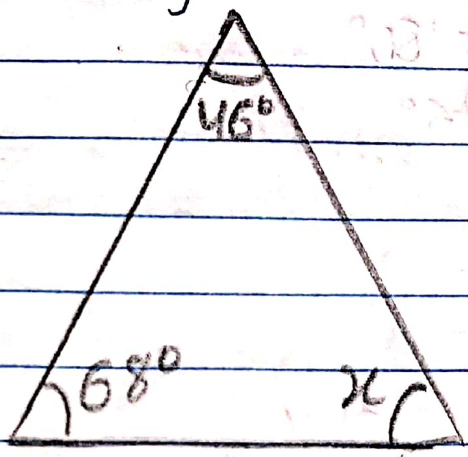
Ex-2(I)

1. Find the measures of the unknown angles in the following cases.

a)



→ Soln,

Here,

$x^\circ + 46^\circ + 68^\circ = 180^\circ$ [∵ Sum of the angles of a triangle]

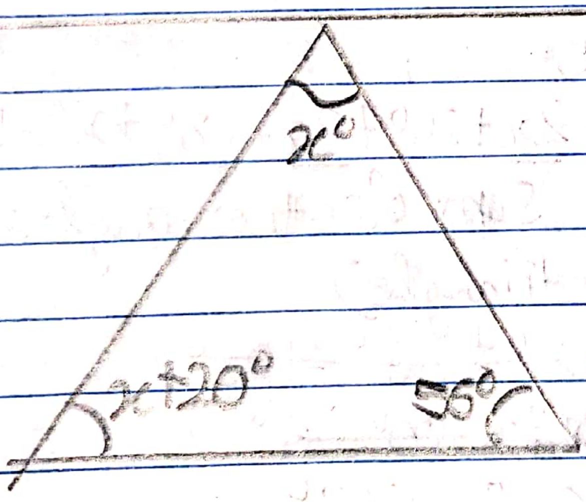
or, $x^\circ + 114^\circ = 180^\circ$

or, $x^\circ = 180^\circ - \cancel{104^\circ}\ 114^\circ$

∴ $x^\circ = 66^\circ$

$\begin{array}{r} 180 \\ -104 \\ \hline \cancel{176} \end{array}$ $\begin{array}{r} 68 \\ +46 \\ \hline 114 \end{array}$ $\begin{array}{r} 180 \\ -104 \\ \hline \end{array}$ $\begin{array}{r} 180 \\ -114 \\ \hline 066 \end{array}$

b)



→ Soln,

Here,

$x^\circ + (x + 20^\circ) + 56^\circ = 180^\circ$ [∵ Sum of the angles of a triangle]

or, $x^\circ + x^\circ + 20^\circ + 56^\circ = 180^\circ$

or, $2x^\circ + 76^\circ = 180^\circ$

or, $2x^\circ = 180^\circ - 76^\circ$

or, $2x = 104^\circ$

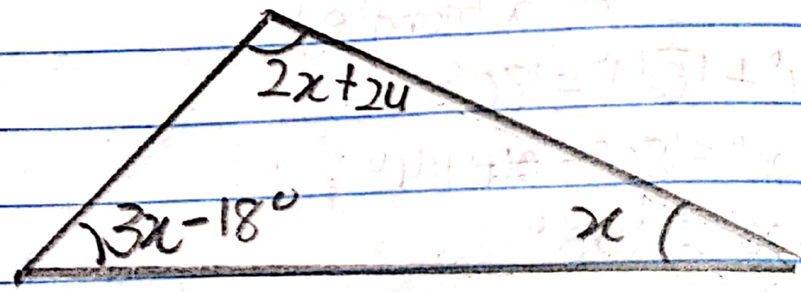
or, $x = \frac{\cancel{104^\circ}\,52}{\cancel{2}}$

∴ $x = 52^\circ$

∴ $x + 20^\circ = 52^\circ + 20^\circ = 72^\circ$

$\begin{array}{r} 180 \\ -76 \\ \hline 10 \end{array}$

c)



→ Soln,

Here,

$2x + 24^\circ + 3x - 18^\circ + x^\circ = 180^\circ$ [∵ Sum of the angles of a triangle]

or, $\cancel{6x^\circ + 6^\circ = 180^\circ}$

or, $\cancel{6x^\circ = 180^\circ - 6^\circ}$

or, $6x^\circ = 172^\circ$

$\begin{array}{r} 24 \\ -18 \\ \hline 06 \end{array}$

or, $6x^\circ = 180^\circ - 24^\circ + 18^\circ$

or, $6x^\circ = 174^\circ$

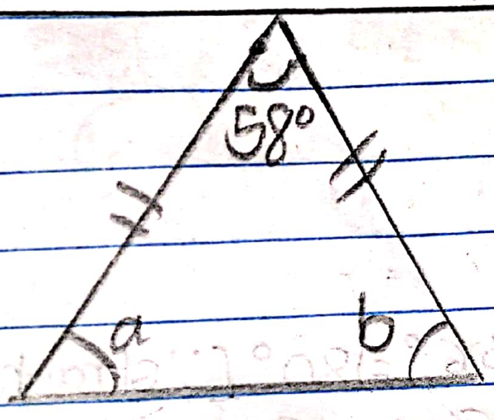
or, $x^\circ = \dfrac{174^\circ}{6}$

$\therefore x^\circ = 29^\circ$

$\therefore 2x + 24^\circ = 2\times29 + 24^\circ = 58 + 24^\circ$
$= 82^\circ$

$\therefore 3x - 18^\circ = 3\times29 - 18 = \cancel{89}87^\circ - 18^\circ$
$= 69^\circ$

d)



→ Soln,

Here,

$a^\circ = b^\circ$ [$\because$ base angles of an isosceles ~~right angled~~ triangle]

$a^\circ + b^\circ + 58^\circ = 180^\circ$ [$\because$ sum of the angles of a triangle]

or, $a^\circ + a^\circ + 58^\circ = 180^\circ$

or, $2a^\circ = 180^\circ - 58^\circ$

or, $2a^\circ = 122^\circ$

or, $a^\circ = \frac{\cancel{122}^\circ\ 61}{\cancel{2}\ 1}$

$\therefore a^\circ = 61^\circ$

$\therefore b^\circ = 61^\circ$

$180 - 58 = 122$

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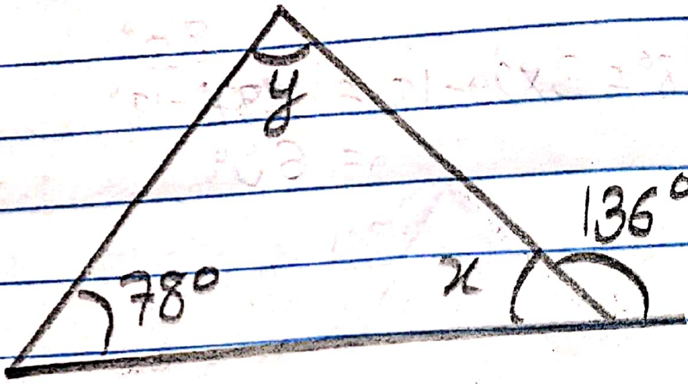
e)



$180 - 136 = 044$

→ Soln,

Here,

(i) $x^\circ + 136^\circ = 180^\circ$ [∵ straight angle]

or, $x^\circ = 180^\circ - 136^\circ$

$\therefore x^\circ = 44^\circ$

(ii) $x^\circ + y^\circ + 78^\circ = 180^\circ$ [∵ Sum of the angles of a triangle]

or, $44^\circ + y^\circ + 78^\circ = 180^\circ$

or, $y^\circ + 122^\circ = 180^\circ$

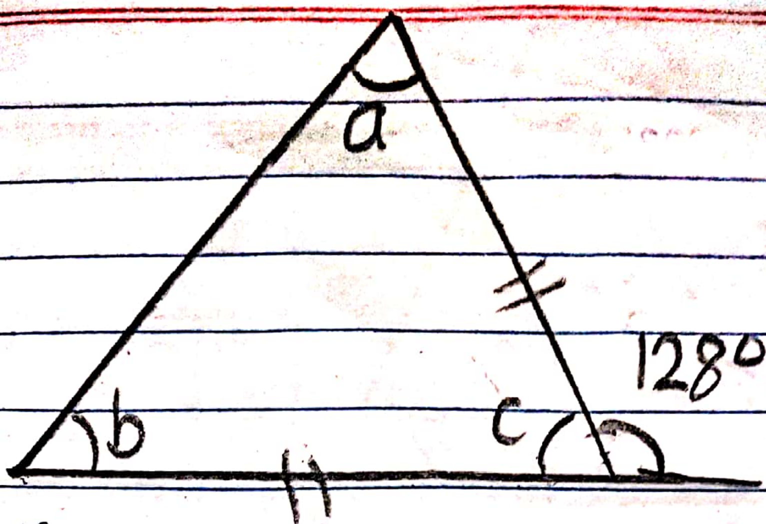
or, $y^\circ = 180^\circ - 122^\circ$

$\therefore y^\circ = 58^\circ$

$180^\circ - 122^\circ = 058$

DATE
PAGE No.

7)



→ Soln,

Here,

(I) $a^\circ = b^\circ$ [∵ base angles of an isosceles triangle]

(II) $c^\circ + 128^\circ = 180^\circ$ [∵ straight angle]

or, $c^\circ = 180^\circ - 128^\circ$

∴ $c^\circ = 52^\circ$

$$\begin{array}{r} 180 \\ -128 \\ \hline 052 \end{array}$$

(III) $a^\circ + b^\circ + c^\circ = 180^\circ$ [∵ sum of the angles of a triangle]

$$\begin{array}{r} 180 \\ -52 \\ \hline 128 \end{array}$$

or, $\cancel{2a^\circ}\, a^\circ + a^\circ + 52^\circ = 180^\circ$

or, $2a^\circ = 180^\circ - 52^\circ$

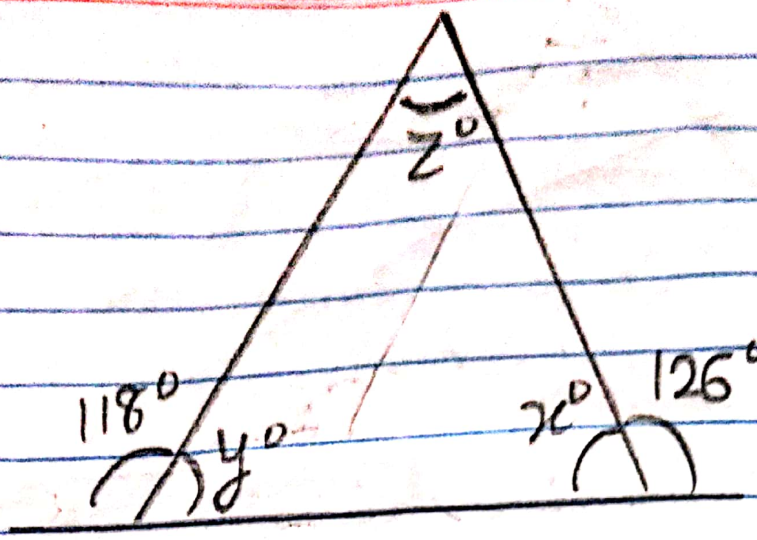
or, $2a^\circ = 128^\circ$

or, $a^\circ = \dfrac{\cancel{128^\circ}\,64}{\cancel{2}\,1}$

∴ $a^\circ = 64^\circ$

∴ $b^\circ = a^\circ = 64^\circ$

g)



→ Soln

Here,

$y^\circ + 118^\circ = 180^\circ$ [∵ straight angle]

or, $y^\circ = 180^\circ - 118^\circ$

∴ $y^\circ = 62^\circ$

∴ $x^\circ + 126^\circ = 180^\circ$ [∵ straight angle]

or, $x^\circ = 180^\circ - 126^\circ$

∴ $x^\circ = 54^\circ$

$z^\circ + x^\circ + y^\circ = 180^\circ$ [∵ sum of the angles of a triangle]

or, $z^\circ + 54^\circ + 62^\circ = 180^\circ$

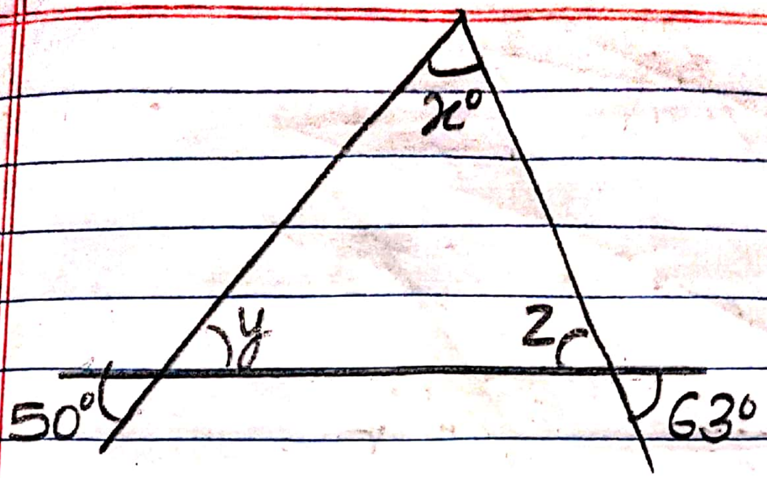
or, $z^\circ + 116^\circ = 180^\circ$

or, $z^\circ = 180^\circ - 116^\circ$

∴ $z^\circ = 64^\circ$

$$\begin{array}{r} 180 \\ -118 \\ \hline 062 \end{array} \quad \begin{array}{r} 180^\circ \\ -126 \\ \hline 54 \end{array} \quad \begin{array}{r} 180^\circ \\ -116 \\ \hline 64 \end{array}$$

h)



→ Soln,

Here,

$\therefore$ $y^\circ = 50^\circ$ [$\because$ Vertically

$\therefore$ $z^\circ = 63^\circ$ Opposite Angles]

$x^\circ + y^\circ + z^\circ = 180^\circ$ [$\because$ sum of the angles of a triangle]

or, $x^\circ + 50^\circ + 63^\circ = 180^\circ$

or, $x^\circ + 113^\circ = 180^\circ$

or, $x^\circ = 180^\circ - 113^\circ$

$\therefore$ $x^\circ = 67^\circ$

$180^\circ - 113 = 67$

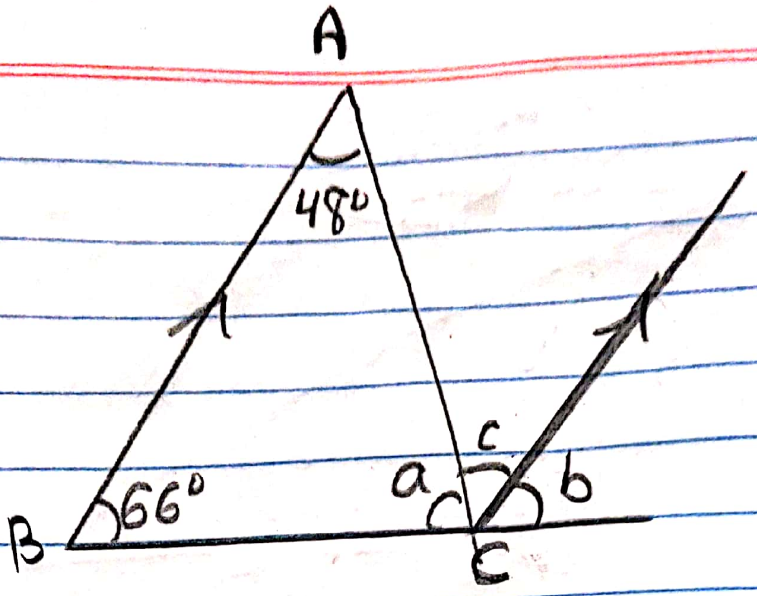
$180 - 118 = 062$

$180^\circ - 126^\circ = 54$

$180^\circ - 116 = 64$

2. Determine the size of the unknown angles in the following cases;

a)



→ Soln,

Here,

$\therefore c^\circ = 48^\circ$ [$\because$ alternate angle]

$\therefore b^\circ = 66^\circ$ [$\because$ corresponding angle]

$a^\circ + 48^\circ + 66^\circ = 180^\circ$ [$\because$ sum of the angles of a triangle]

or, $a^\circ + 114^\circ = 180^\circ$

or, $a^\circ = 180^\circ - 114^\circ$

$\therefore a^\circ = 66^\circ$

$180 - 114 = 66$

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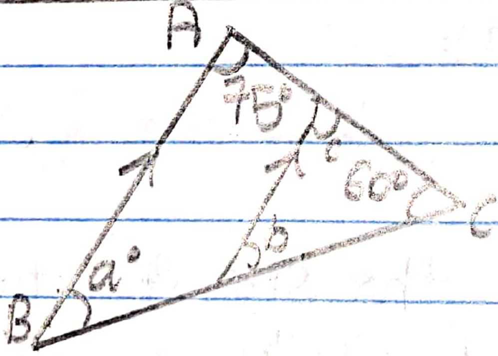
b)



→ Soln,

Here,

$c^\circ = 75^\circ$ [$\because$ corresponding angle]

$b^\circ + c^\circ + 60^\circ = 180^\circ$ [$\because$ sum of the angles of a triangle]

DATE ______
PAGE No. ______

or, $b^\circ + 75^\circ + 60^\circ = 180^\circ$

or, $b^\circ + 135^\circ = 180^\circ$

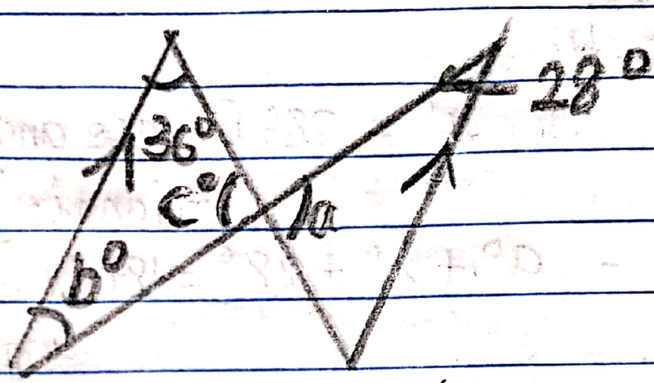
or, $b^\circ = 180^\circ - \cancel{165}\,135^\circ$

~~or,~~ $\therefore b^\circ = 45^\circ$

$$\begin{array}{r} 180^\circ \\ -135 \\ \hline 045 \end{array}$$

$\therefore a^\circ = b^\circ = 45^\circ$ [∵ corresponding angle]

c)



→ Soln

Here,

$b^\circ = 28^\circ$ [∵ alternate angle]

$b^\circ + c^\circ + 36^\circ = 180^\circ$ [∵ sum of the angles of a triangle]

$$\begin{array}{r} 180^\circ \\ -64 \\ \hline 116 \end{array}$$

or, $28^\circ + c^\circ + 36^\circ = 180^\circ$

or, $c^\circ + 64^\circ = 180^\circ$

or, $c^\circ = 180^\circ - 64^\circ$

$\therefore c^\circ = 116^\circ$

$\therefore a^\circ = c^\circ = 116^\circ$ [∵ Vertically Opposite Angles]

d)

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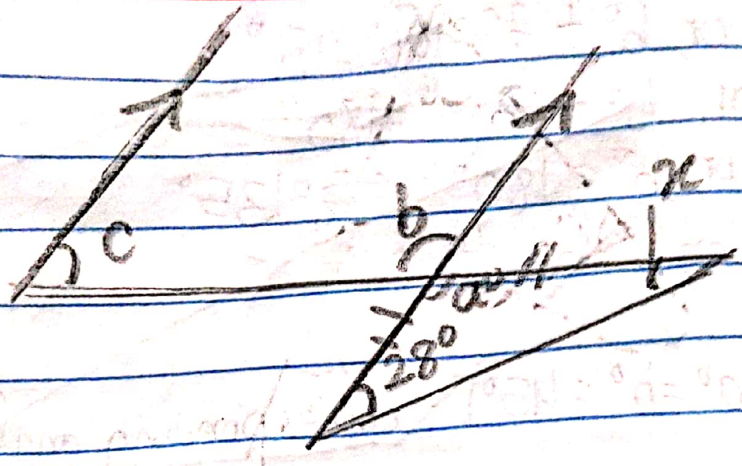
DATE
PAGE No.

d)



→ Soln,

Here,

- $x^\circ = 28^\circ$ [∵ base angles of an isosceles triangle]

- $a^\circ + x^\circ + 28^\circ = 180^\circ$ [∵ sum of the angles of a triangle]

or, $a^\circ + 28^\circ + 28^\circ = 180^\circ$

or, $a^\circ + 56^\circ = 180^\circ$

or, $a^\circ = 180^\circ - 56^\circ$

∴ $a^\circ = 124^\circ$

- ∴ $b^\circ = a^\circ = 124^\circ$ [∵ Vertically Opposite Angle]

- $b^\circ + c^\circ = 180^\circ$ [∵ co-interior angle]

or, $124^\circ + c^\circ = 180^\circ$

or, $c^\circ = 180^\circ - 124^\circ$

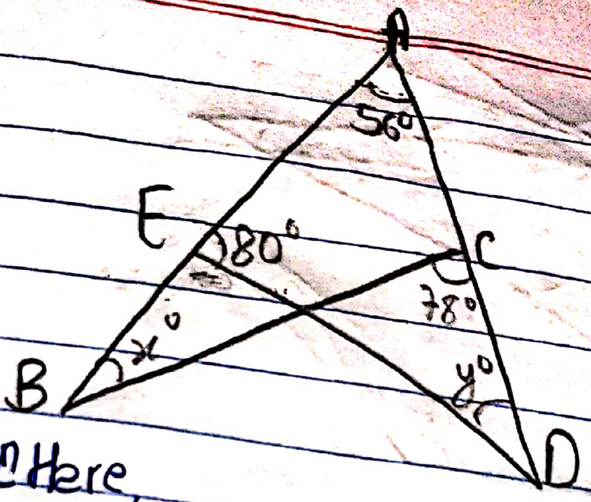
∴ $c^\circ = 56^\circ$

$$\begin{array}{r} 180 \\ -56 \\ \hline 124 \end{array}$$

e)

→

e)



→ Soln Here,

~~z + 80° = 180° [∵ straight angle]~~

IN ΔADE,

$y° + 56° + 80° = 180°$ [∵ Sum of the angles of a triangle]

or, $y° + 136° = 180°$

or, $y° = 180° - 136°$

$\therefore y° = 44°$

IN ΔABC,

$x° + 56 = 78°$ [∵ Sum of Two interior adjacent angles is equal to the exterior angle]

or, $x° = 78° - 56°$

$\therefore x° = 22°$

f)

→

$$\begin{array}{r} 180 \\ -56 \\ \hline 124 \end{array}$$

$$\begin{array}{r} 180 \\ -78 \\ \hline 102 \end{array}$$

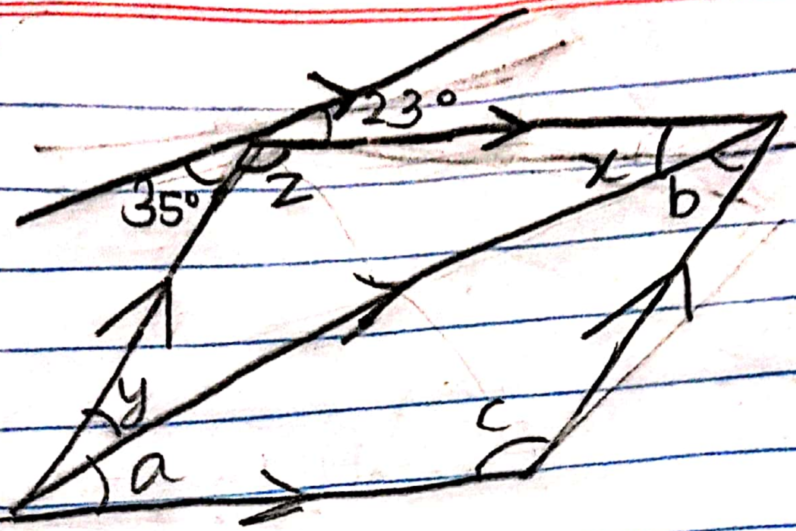
$$\begin{array}{r} 22 \\ +78 \\ \hline 100 \end{array}$$

$$\begin{array}{r} 80 \\ +56 \\ \hline 136 \end{array}$$

$$\begin{array}{r} 180 \\ -136 \\ \hline 044 \end{array}$$

DATE
PAGE No.

f)



→ Sol^n

Here,

$y° = 35°$ [∵ alternate angle]

(i) ∴ $b° = y° = 35°$ [∵ alternate angle]

$x° = 23°$ [∵ alternate angle]

(ii) ∴ $a° = x° = 23°$ [∵ alternate angle]

(iii) $a° + b° + c° = 180°$ [∵ Sum of the angles of a triangles]

or, ~~35° + 23~~ $23° + 35° + c° = 180°$

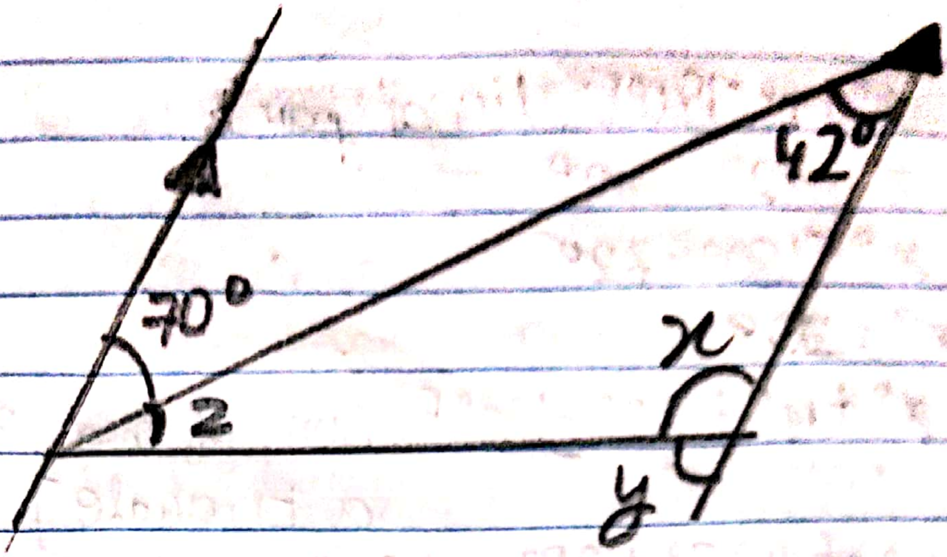
or, $58° + c° = 180°$

or, $c° = 180° - 58°$

∴ $c° = 122°$

3. Find the unknown angles from the following figures:

i)



→ Soln,

Here,

- ~~$z^\circ + 70^\circ = 42^\circ$~~ $70^\circ - z^\circ = 42^\circ$ [∵ alternate angle]

$z^\circ = 70^\circ - 42^\circ$

$\therefore z^\circ = 28^\circ$

- ~~70~~ $\therefore y^\circ = 70^\circ$ [∵ alternate angle]

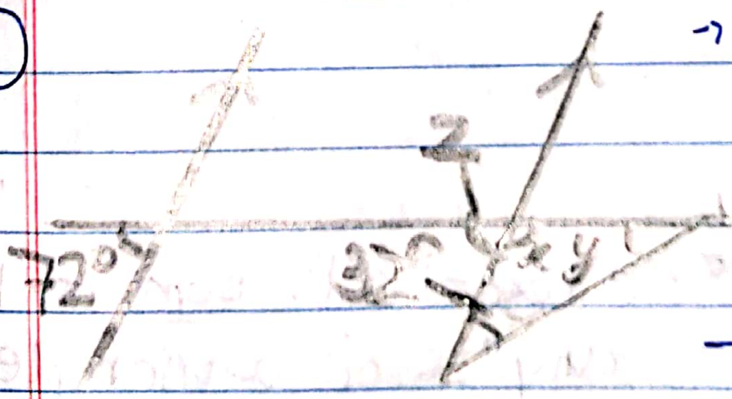
$\because x^\circ + y^\circ = 180^\circ$ [∵ straight angle]

or, $x^\circ + 70^\circ = 180^\circ$

or, $x^\circ = 180^\circ - 70^\circ$

$\therefore x^\circ = 110^\circ$

ii)



→ Soln

Here,

$z^\circ = 72^\circ$ [∵ Corresponding angle]

→

DATE
PAGE No.

$\rightarrow$ $x^\circ + z^\circ = 180^\circ$ [$\because$ linear pair]

or, $x^\circ + 72^\circ = 180^\circ$

or, $x^\circ = 180^\circ - 72^\circ$

$\therefore$ $x^\circ = 108^\circ$

$-$ $x^\circ + y^\circ + 32^\circ = 180^\circ$ [$\because$ sum of the angles of a triangle]

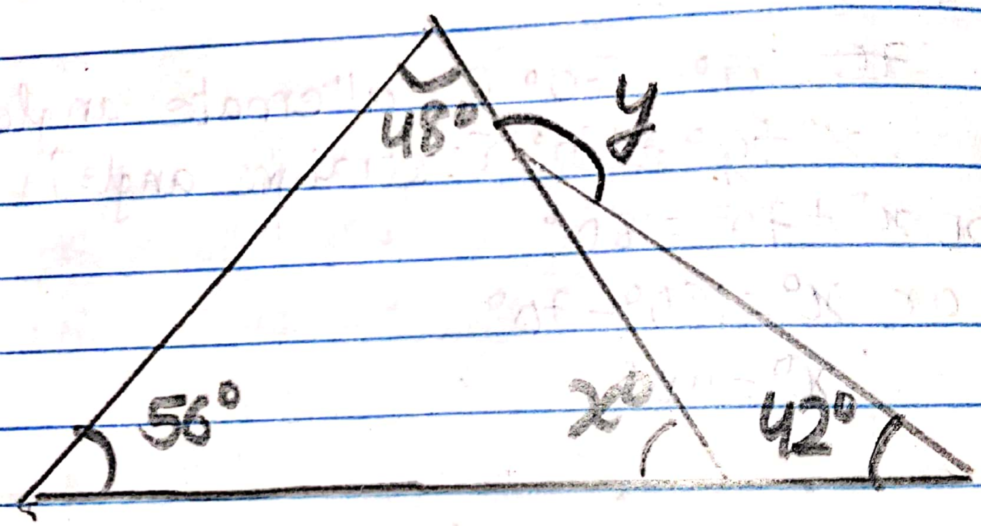
or, $y^\circ + 108^\circ + 32^\circ = 180^\circ$

or, $y^\circ + 140^\circ = 180^\circ$

or, $y = 180^\circ - 140^\circ$

$\therefore$ $y^\circ = 40^\circ$

(iii)



$\rightarrow$ Soln,

Here,

$x^\circ + 48^\circ + 56^\circ = 180^\circ$ [$\because$ sum of the angles of a triangle]

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or, $x^\circ + 104^\circ = 180^\circ$

or, $x^\circ = 180^\circ - 104^\circ$

$\therefore x^\circ = 76^\circ$

$\therefore z^\circ = 48^\circ + 56^\circ$ [$\because$ sum of two adjacent interior angles is equal to the exterior angles of a triangle]

$\therefore z^\circ = 104^\circ$

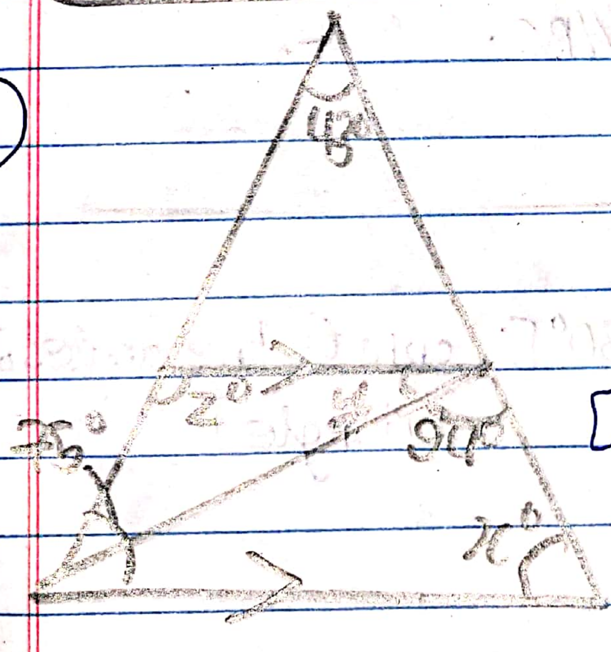
$\therefore y^\circ = z^\circ + 42^\circ$ [$\because$ sum of two interior angles is equal to the exterior angle of triangle]

or, $y^\circ = 104^\circ + 42^\circ$

$\therefore y^\circ = 146^\circ$

$\begin{array}{r} 180 \\ -104 \\ \hline \boxed{76} \end{array}$ $\begin{array}{r} 48 \\ +56 \\ \hline \boxed{104} \end{array}$ $\begin{array}{r} 180 \\ -75 \\ \hline \boxed{105} \end{array}$

(iv)



→ Soln.

Here,

~~In ΔABC,~~

$x^\circ + 43^\circ + 75^\circ = 180^\circ$

[$\because$ Sum of the angles of a triangle]

or, $x^\circ + 118^\circ = 180^\circ$
or, $x^\circ = 180^\circ - 118^\circ$
$\therefore x^\circ = 62^\circ$

$y^\circ + 94^\circ + x^\circ = 180^\circ$ [$\because$ co-interior angles]
or, $y^\circ + 94^\circ + 62^\circ = 180^\circ$
or, $y^\circ + 156^\circ = 180^\circ$
or, $y^\circ = 180^\circ - 156^\circ$
$\therefore y^\circ = 24^\circ$

$z^\circ + 75^\circ = 180^\circ$ [$\because$ co-interior angles]
or, $z^\circ = 180^\circ - 75^\circ$
$\therefore z^\circ = 105^\circ$

$180 - 118 = 062$

$180 - 156 = 024$

$180 - 75 = 105$

4(a) In the adjoining figure, $\angle A = 63^\circ$, $\angle ACB = 49^\circ$, $\angle DAE = 68^\circ$, find $\angle a$ and $\angle b$. Also, show that $AE \parallel BC$.

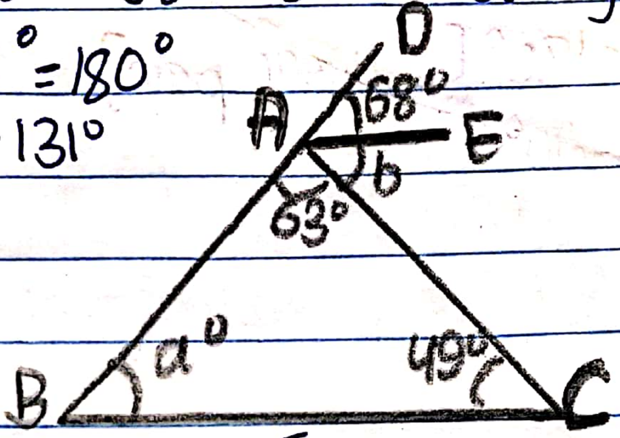
→ Soln,
Here,
$a^\circ + 63^\circ + 49^\circ = 180^\circ$ [$\because$ sum of the angles of a triangle]
or, $a^\circ + 112^\circ = 180^\circ$

or, $a^\circ = 180^\circ - 112^\circ$
$\therefore a^\circ = 68^\circ$

$$\begin{array}{r} 180 \\ -112 \\ \hline 68 \end{array}$$

$\cancel{y^\circ} + b^\circ + 63^\circ + 68^\circ = 180^\circ$ [$\because$ straight angle]
or, $b^\circ + 131^\circ = 180^\circ$
or, $b^\circ = 180^\circ - 131^\circ$
$\therefore b^\circ = 49^\circ$

$$\begin{array}{r} 180 \\ -131 \\ \hline 049 \end{array}$$



As,
$\angle ABC = \angle DAE$ [$a^\circ = 68^\circ$, $68^\circ = 68^\circ$]
and $\angle EAC = ACB$ [$b^\circ = 49^\circ$, $49^\circ = 49^\circ$]

$\therefore AE \parallel BC$ [$\because$ alternate and corresponding angles are equal.]

b) In the adjoining figure $AB \parallel DC$ and $BC \parallel AD$. If OA and OB bisect angles DAB and ABC respectively, show that $\angle AOB = 90^\circ$.

→ Soln;

or, $\cancel{x^\circ = 180^\circ - 110^\circ}$

$\cancel{\therefore x^\circ = 70^\circ}$

- $120 + x^\circ = 180^\circ$ [$\because$ co-interio

or, $x^\circ = 180^\circ - 120^\circ$

$\therefore x^\circ = 70^\circ$

- $a = \frac{110}{2}$ [$\because$ the bisecto

$\therefore a = 55^\circ$

- $b^\circ = \frac{70^\circ}{2}$ [$\because$ the bisecto

$\therefore b^\circ = 35^\circ$

DATE
PAGE No.

$a^\circ + b^\circ + c^\circ = 180^\circ$ [∵ sum of the angles of a triangle]

or, $55^\circ + 35^\circ + c^\circ = 180^\circ$

or, $90^\circ + c^\circ = 180^\circ$

or, $c^\circ = 180^\circ - 90^\circ$

∴ ~~or.~~ $c^\circ = 90^\circ$

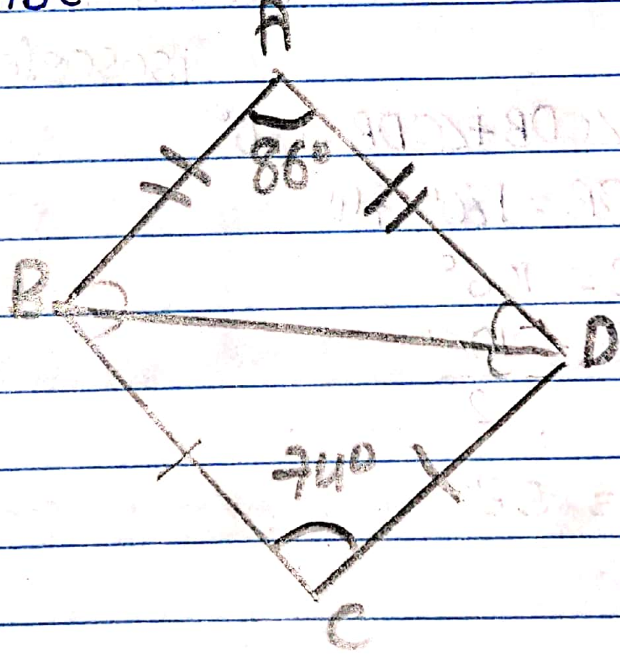
∴ $\angle AOB = 90^\circ$

Hence Shown,

c) In the adjoining figure, ABD and CBD are isosceles triangles on the same base BD. If $\angle A = 86^\circ$ and $\angle C = 74^\circ$ find $\angle ADC$

→ Soln

Here,



DATE
PAGE No.

- $\angle A + \angle ABD + \angle ADB = 180°$ [$\because$ Sum of the angles of a triangle]
- $86° + \angle ABD + \angle ABD = 180°$ [$\because$ base angles of an isosceles triangle)

or, $2\angle ABD = 180° - 86°$
or, $2\angle ABD = 94$
or, $\angle ABD = \frac{\cancel{94}\,47}{\cancel{2}\,1}$

$\therefore \angle ABD = 47°$
$\therefore \angle ADB = \angle ABD = 47°$

- $\angle C + \angle CDB + \angle CBD = 180°$ [$\because$ sum of the angles of a triangle]

or, $74° + \angle CDB + \angle CDB = 180°$ [$\because$ base angles of an isosceles triangle]

or, $74° + \angle CDB + \angle CDB = 180°$
or, $2\angle CDB = 180° - 74°$
or, $2\angle CDB = 106°$
or, $\angle CDB = \frac{106°}{2}$

$\therefore \angle CDB = 53°$

- $\angle ADB + \angle CDB = \angle ADC$ [$\because$ Whole part axiom]

or, $47^\circ + 53^\circ = \angle ADC$

or, $\therefore \angle ADC = 100^\circ$

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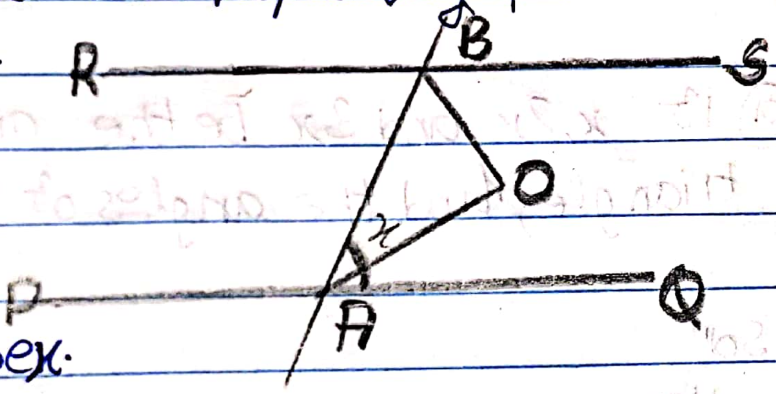
d) In the adjoining figure, PQ//RS, If OA and OB are the bisectors of angles QAB and ABS respectively, prove that $\angle AOB = 90^\circ$.



→ Soln,

Here,

Let $\angle QAB$ be x.

Now,

- $\angle QAB + \angle ABS = 180^\circ$ [$\because$ co-interior angle]

or, $x + \angle ABS = 180^\circ$

$\therefore \angle ABS = 180^\circ - x^\circ$

- $\angle OAB = \frac{x}{2}$ [$\because$ bisector of $\angle QAB$]

- ~~$\angle SBA$~~ $= \angle OBA =$ ~~90~~ $\frac{180 - x}{2}$ [$\because$ bisector of $\angle ABS$]

- $\angle OBA + \angle OAB + \angle AOB = 180^\circ$ [$\because$ sum of the angles of a triangle]

DATE
PAGE No.

or, $\frac{180-x}{2}+\frac{x}{2}+\angle AOB=180^\circ$

or, $90-\cancel{\frac{x}{2}}+\cancel{\frac{x}{2}}+\angle AOB=180^\circ$

or, $\angle AOB+90^\circ=180^\circ$

or, $\angle AOB=180^\circ-90^\circ$

$\therefore \angle AOB=90^\circ$

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5 (a) If $x, 2x$ and $3x$ be the angles of a triangle, find the angles of the triangle.

→ Soln,

Here,

$x^\circ+2x^\circ+3x^\circ=180^\circ$ [$\because$ Sum of the angles of a triangle]

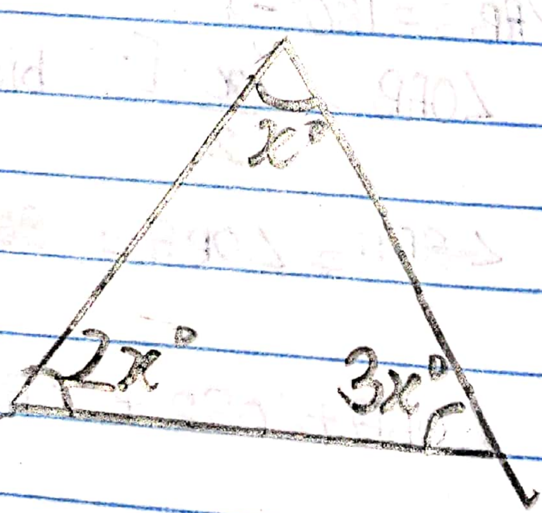
or, $6x^\circ=180^\circ$

or, $x^\circ=\frac{\cancel{180}^{30}}{\cancel{6}}{}^\circ$

$\therefore x^\circ=30^\circ$

$\therefore 2x^\circ=2\times30^\circ=60^\circ$

$\therefore 3x^\circ=3\times30^\circ=90^\circ$



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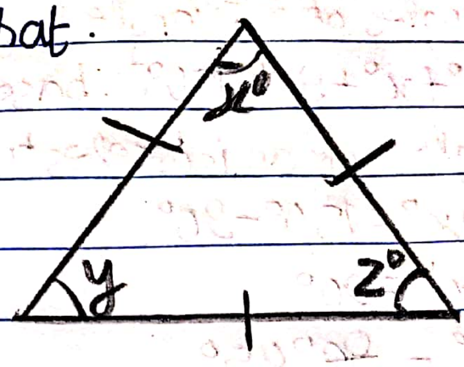
b) If y be an angle of an equilateral triangle, find an angle of that.



→ Soln,

Here,

$y^\circ + \overset{x}{\cancel{y}}{}^\circ + \overset{z}{\cancel{y}}{}^\circ = 180^\circ$ [∵ sum of the angles of a triangle]

or, $y^\circ + y^\circ + y^\circ = 180^\circ$ [∵ ~~Even~~ Equilateral triangle]

or, $3y^\circ = 180^\circ$

or, $y^\circ = \dfrac{\overset{60}{\cancel{180}}{}^\circ}{\cancel{3}}$

∴ $y^\circ = 60^\circ$

---

c) If x be an ~~actual~~ acute angles of a right angled isosceles triangle, find x.

→ Soln,

Here,

$x^\circ + y^\circ + 90^\circ = 180^\circ$ [∵ Sum of the angles of a triangle]

or, $x^\circ + x^\circ + 90^\circ = 180^\circ$ [∵ base angles of an isosceles triangle]

or, $2x^\circ = 180^\circ - 90^\circ$

or, $2x^\circ = 90^\circ$

or, $x^\circ = \frac{\cancel{90}^\circ 45^\circ}{\cancel{2} 1}$

∴ $x^\circ = 40^\circ$