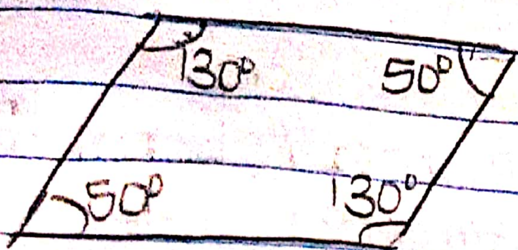
Geometry

Quadrilaterals

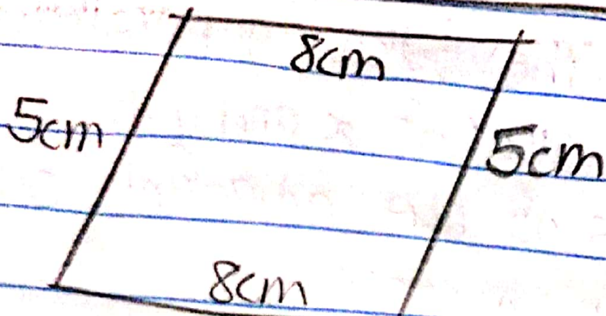
1. Are the following four sided figures the parallelograms? Answer with reason.

a)



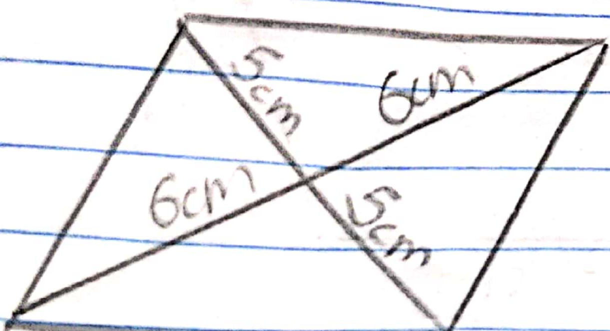
→ Yes, It is a parallelogram. Because ~~it has~~ opposite angles are equal.

b)



→ Yes, it is a parallelogram. Because the opposite sides are equal.

c)



→ Yes, it is a parallelogram. Because diagonals bisect each other.

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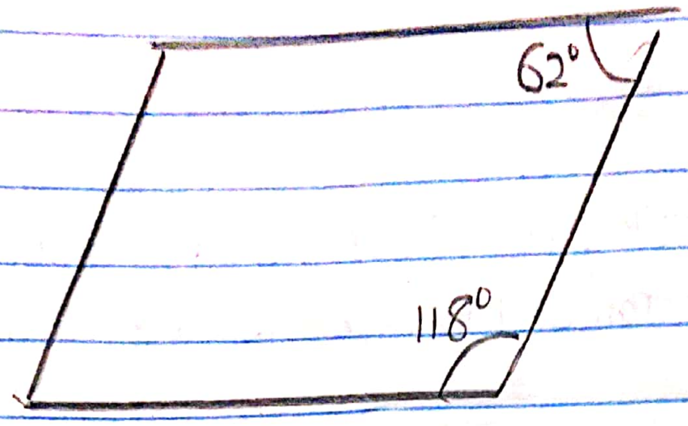
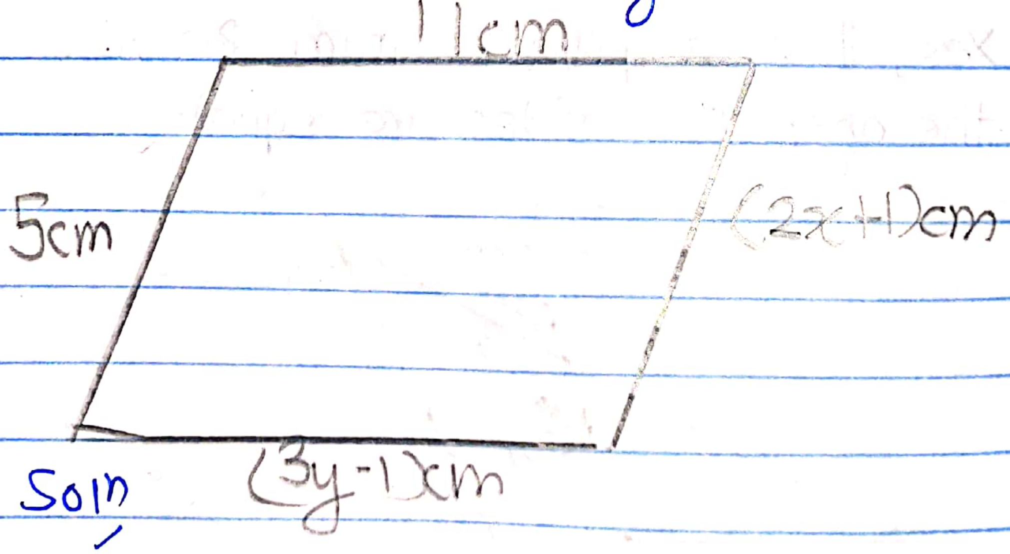
d)



→ No, it is not a parallelogram. Because the sum of co-interior angles is not 180°

2. In each of the following parallelograms, find the values of x and y. Also, find the lengths of the adjacent sides whereever necessary:

a)



→ Soln

Here,

(i) $5cm = (2x+1)\,cm$ [$\because$ opposite sides of parallelogram are equal]

or, $2x = 5-1$

or, $2x = 4$

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

$\therefore x = 2\,cm$

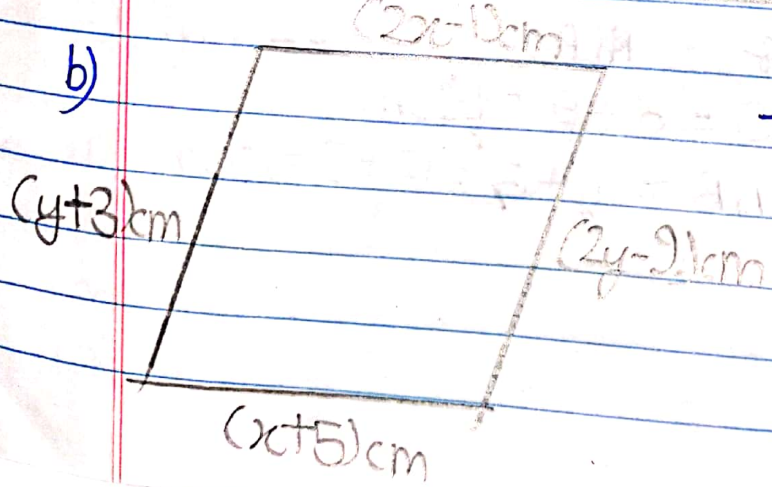
(ii) $(3y-1)\,cm = 11\,cm$ [$\because$ opposite sides of a parallelogram are always equal]

or, $3y = 11+1$

or, $y = \frac{12}{3}$

$\therefore y = 4cm$

b)



→ Soln,

Here,

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$\because (x+5)\,cm = (2x-1)\,cm$ [$\because$ opposite sides of parallelogram are always equal]

or, $x+5 = 2x-1$

or, $\cancel{3x}\,6 = 2x-x$

$\therefore$ $x = 6\,cm$

$\because$ $(y+3)\,cm = (2y-9)\,cm$ [$\because$ opposite sides of parallelogram are equal]

or, $y+3 = 2y-9$

or, $2y-y = 9+3$

$\therefore$ ~~or~~ $y = 12\,cm$

Finding ~~the values of the adjacent side,~~

(ii) $\cancel{x+5 = 2x-1}$

or, $\cancel{6+5 = 2\times 6-1}$

or, $\cancel{11 = 11}$

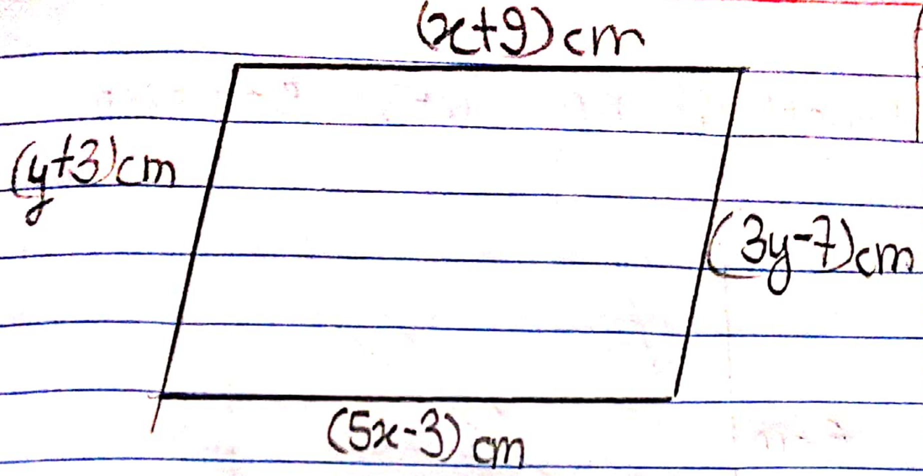
$\therefore$ Ans. = 11cm

$\because$ Length of ~~A~~BC,

$x+5 = 6+5 = 11\,cm$

$\because$ Length of AB = $y+3 = 12+3 = 15\,cm$

c)



→ Soln, Here,

(i) $(5x-3)cm = (x+9)cm$ [∵ opposite sides of parallelogram are equal]

or, $5x-3 = x+9$

or, $5x-x = 9+3$

or, $4x = 12$

or, $x = \frac{\cancel{12}\,3}{\cancel{4}\,1}$

∴ $x = 3$

- Length of BC $= 5x-3 = 5\times3-3 = 15-3$
$= 12cm$

(ii) $(y+3)cm = (3y-7)cm$ [∵ opposite sides of parallelogram are equal]

or, $y+3 = 3y-7$

or, $3+7 = 3y-y$

or, $2y = 10$

or, $y = \frac{\cancel{10}\,5}{\cancel{2}\,1}$ ∴ $y = 5cm$

$\therefore$ Length of $AB = y+3 = 5+3 = 8cm$

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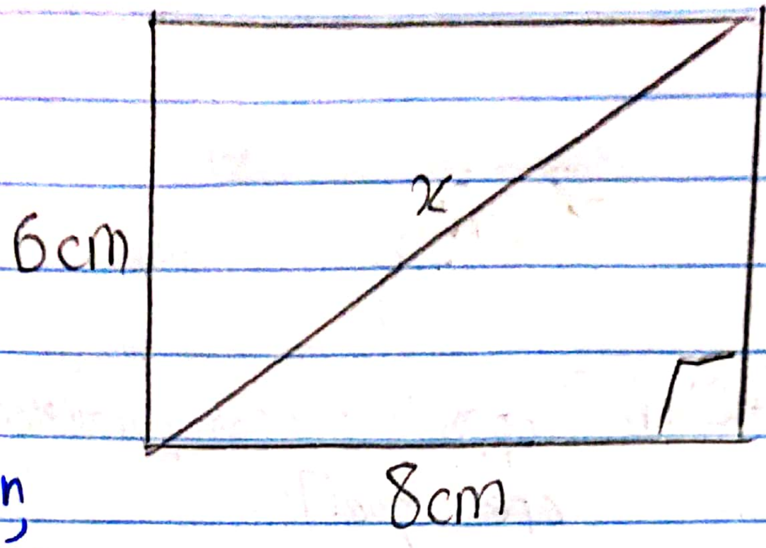
d)



→ Soln,

Here,

The distance between AC is;

$\cancel{d = \sqrt{\quad}}$

$$AC = \sqrt{(8)^2 + (6)^2}$$
$$= \sqrt{64+36}$$
$$= \sqrt{100}$$
$$= 10 \text{ units}$$

$\therefore x = 10cm$

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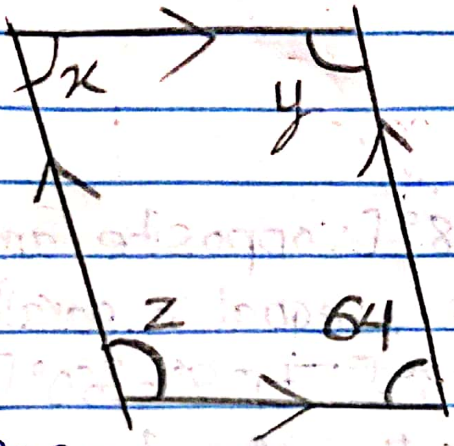
3. Find the values of x, y, z, a and b

in ~~neccessagry~~ each of the following parallelograms. Also find the remaining angles whenever necessary.

a)



→ Soln,

Here,

$\therefore x^\circ = 64^\circ$ [$\because$ opposite angles are equal in parallelogram]

$x + y = 180^\circ$ [$\because$ co-interior angle]

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

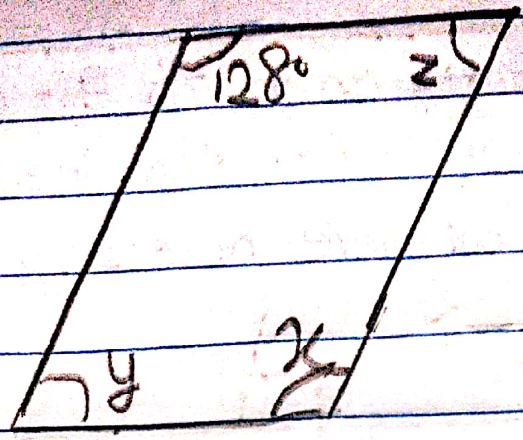
or, $y^\circ = 180^\circ - 64^\circ$

$\therefore y^\circ = 116^\circ$

$\therefore z^\circ = y^\circ = 116^\circ$ [$\because$ opposite angles are equal in parallelogram]

→

b.



→ Soln, Here,

① $x^\circ = 128^\circ$ [∵ opposite angles are equal in parallelogram

⑪ $x^\circ + y^\circ + z^\circ \cancel{= 128^\circ} + 128^\circ = 360^\circ$ [∵ Sum of the angles of a parallelogram]

or, $x^\circ + y^\circ + y^\circ + 128^\circ = 360^\circ$ [∵ $\cancel{z^\circ = y^\circ}$ opposite angles of parallelogram are equal]

or, $2y^\circ + 128^\circ + 128^\circ = 360^\circ$

or, $2y^\circ + 256^\circ = 360^\circ$

or, $2y^\circ = 360^\circ - 256^\circ$

or, $2y^\circ = 104^\circ$

or, $y^\circ = \frac{\cancel{104}^\circ\ 52}{\cancel{2}\ 1}$

∴ $y^\circ = 52^\circ$

∴ $z^\circ = 52^\circ$

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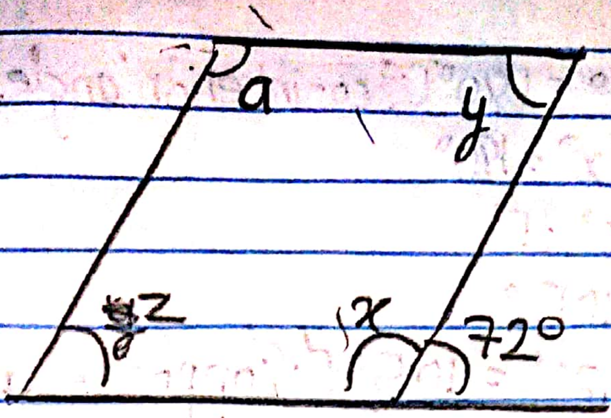
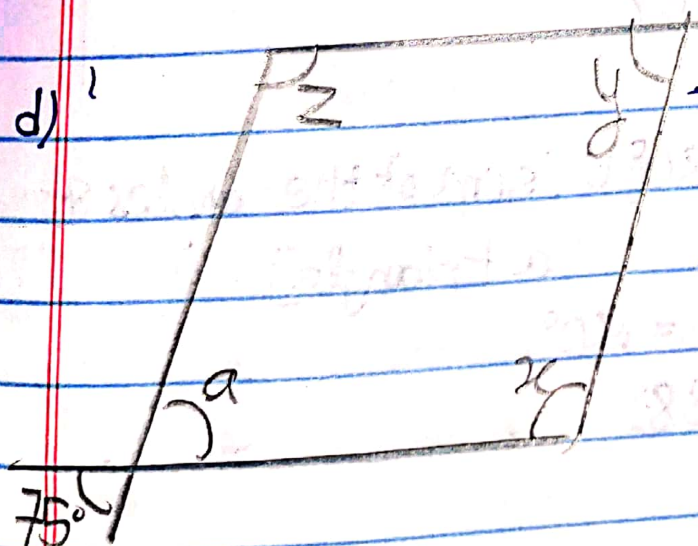
c)



→ Soln,
Here,

- $x° + 72° = 180°$ [∵ straight angle]
or, $x° = 180° - 72°$
∴ $x° = 108°$
- ∴ $a° = x° = 108°$ [∵ opposite angles of parallelogram are equal]
- ∴ $z° = 72°$ [∵ corresponding angle]
- ∴ $y° = z° = 72°$ [∵ opposite angles of parallelogram are equal]

d)



→ Soln, Here,
∴ $a° = 75°$ [∵ VOA]
∴ $a° = y°$ [∵ opposite angles of parallelogram are equal]

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$a^\circ + x^\circ = 180^\circ$ [$\because$ co-interior angles]

or, $75^\circ + x^\circ = 180^\circ$

or, $x^\circ = 180^\circ - 75^\circ$

$\therefore x^\circ = 105^\circ$

$\therefore z^\circ = x^\circ = 105^\circ$ [$\because$ opposite angles of parallelogram are equal]

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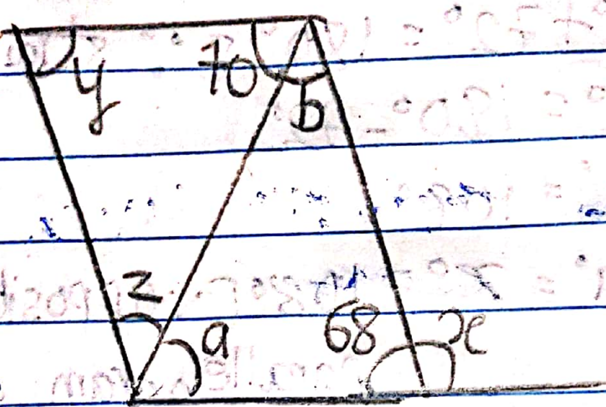
e) 

→ Soln, Here,

$\therefore y^\circ = 68^\circ$ [$\because$ opposite angles of a parallelogram are equal]

$\therefore a^\circ = 70^\circ$ [$\because$ alternate angle]

- $x^\circ + 68^\circ = 180^\circ$ [$\because$ straight angle]

or, $x^\circ = 180^\circ - 68^\circ$

$\therefore x^\circ = 112^\circ$

- $a^\circ + b^\circ + 68^\circ = 180^\circ$ [$\because$ sum of the angles of a triangle]

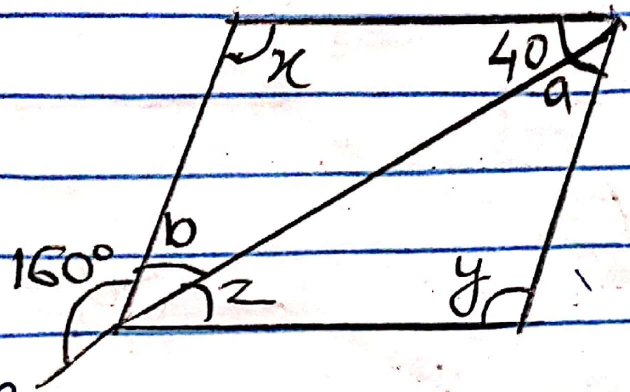
or, $70^\circ + 68^\circ + b^\circ = 180^\circ$

or, $b^\circ = 180^\circ - 138^\circ$

$\therefore b^\circ = 42^\circ$

$\therefore z^\circ = b^\circ = 42^\circ$ [$\because$ alternate angle]

f)



→ Soln, Here,

- $160^\circ + b^\circ = 180^\circ$ [$\because$ straight angle]

or, $b^\circ = 180^\circ - 160^\circ$

$\therefore b^\circ = 20^\circ$

- $x^\circ + b^\circ + 40^\circ = 180^\circ$ [$\because$ sum of the angles of a triangle]

or, $x^\circ + 20^\circ + 40^\circ = 180^\circ$

or, $x^\circ = 180^\circ - 60^\circ$

$\therefore x^\circ = 120^\circ$

$\therefore y^\circ = x^\circ = 120^\circ$ [$\because$ opposite angles of a parallelogram]

- $y^\circ + (40 + a)^\circ = 180^\circ$ [$\because$ co-interior angle]

or, $120^\circ + 40^\circ + a^\circ = 180^\circ$

or, $a^\circ = 180^\circ - 160^\circ$

$\therefore a^\circ = 20^\circ$

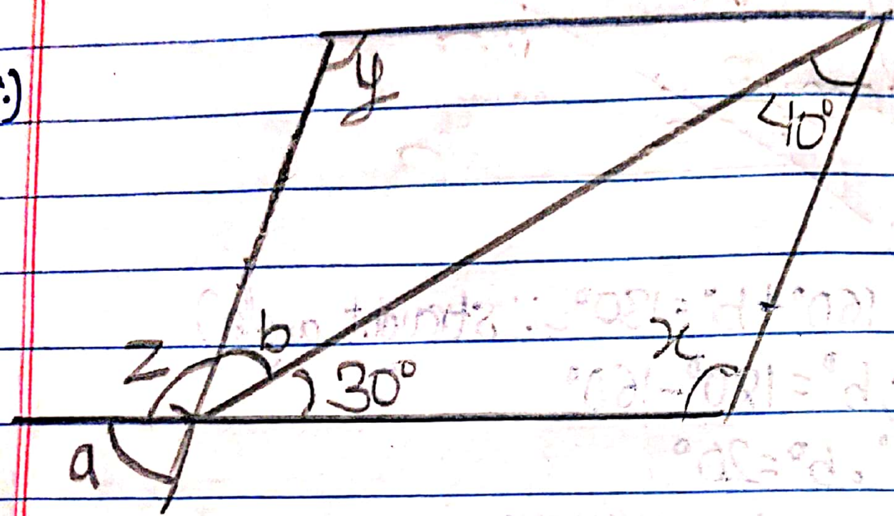
~~- $z^\circ = 40 + a^\circ$ [$\because$ alt]~~

- $y^\circ + z^\circ = 180^\circ$ [$\because$ co-interior angle] or, $120^\circ + z^\circ = 180^\circ$

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

$\therefore z^\circ = 60^\circ$

g.)



→ Soln; Here,

$x^\circ + 30^\circ + 40^\circ = 180^\circ$ [$\because$ sum of the angles of a triangle]

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

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

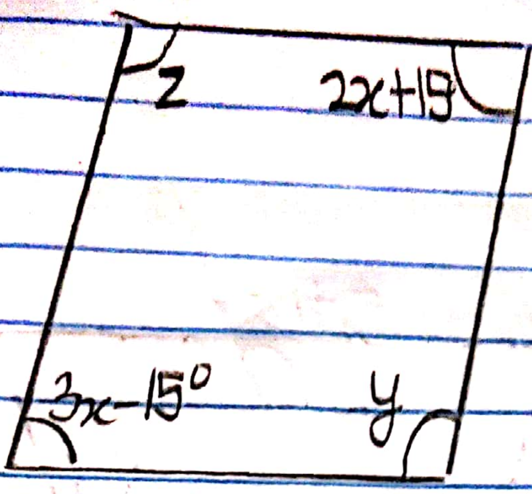
$\therefore x^\circ = 110^\circ$

$\therefore y^\circ = x^\circ = 110^\circ$ [$\because$ opposite angles of a parallelogram]

$\therefore z^\circ = x^\circ = 110^\circ$ [$\because$ corresponding angle]

$\therefore b^\circ = 40^\circ$ [$\because$ alternate angle]

$\therefore a^\circ = 40^\circ + 30^\circ = 70^\circ$ [$\because$ voA] b)



→ Soln: Here,

$3x-15° = 2x+15°$ [∵ opposite angles of a ~~patra~~ parallelogram]

or, $3x-2x = 15°+15°$

∴ or, $x° = 30°$

$3x-15° + y° = 180°$ [∵ co-interior angle]

or, $3\times30 - 15 + y = 180°$

or, $90-15+y° = 180°$

or, $75° + y° = 180°$

or, $y° = 180° - 75°$

∴ $y = 105°$

∴ $z° = y° = 105°$ [∵ opposite angles of a parallelogram]

∴ $3x-15° = 3\times30-15° = 90-15° = 75°$

∴ $2x+15° = 2\times30+15 = \cancel{90+}60+15 = 75°$

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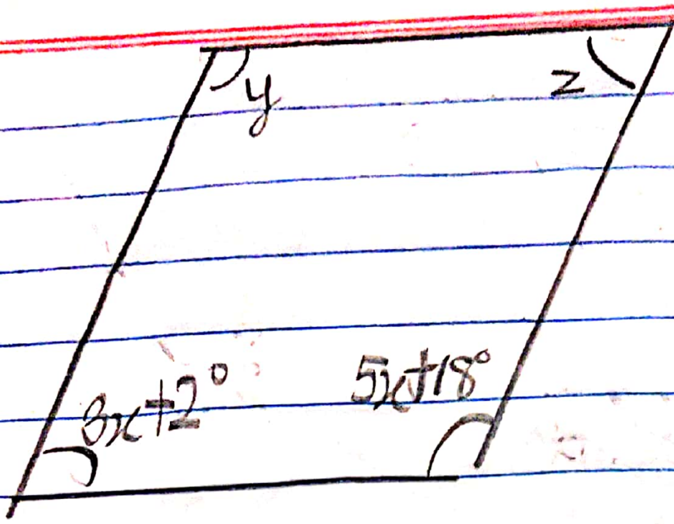
i)



→ Sol^n Here,

$3x+2° + 5x+18° = 180°$ (∵ co-interior angle)

or, $8x + 20° = 180°$

or, $8x° = 180° - 20°$

or, $x° = \frac{\cancel{160°}\,20}{8°}$

∴ $x° = 20°$

∴ $3x+2° = 3\times20+2 = 60+2 = 62°$

∴ $5x+18 = 5\times20+18 = 100+18 = 118°$

∴ $5x+18° = y = 118°$ [∵ opposite angles of a parallelogram]

∴ $3x+2° = z = 62°$

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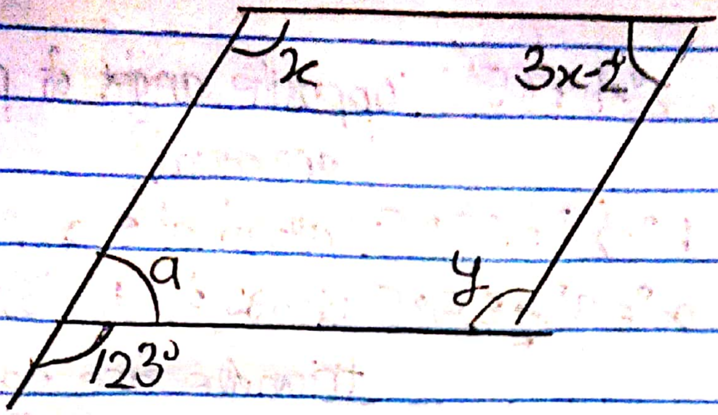
j) 

→ Soln, Here,

~~$\therefore x^\circ = 123^\circ$ [$\because$ corresponding angle]~~

~~$\therefore 3x-2^\circ = 3\times 123-2^\circ =$~~

$\cancel{a^\circ = 18}$ $a^\circ + 123^\circ = 180^\circ$ [$\because$ straight angle]

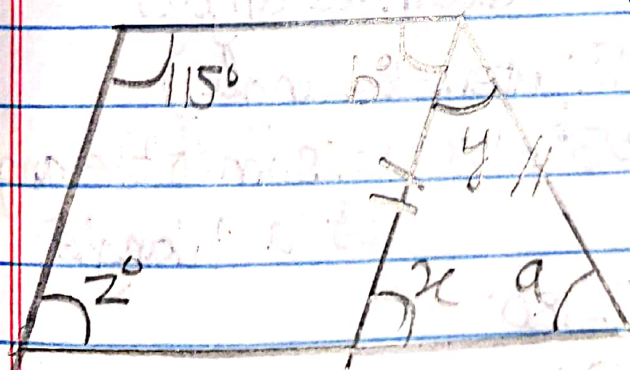
or, $a^\circ = 180^\circ - 123^\circ$

$\therefore a^\circ = 57^\circ$

$\therefore x^\circ = 123^\circ$ [$\because$ corresponding angle]

$\therefore x^\circ = y^\circ = 123^\circ$ [$\because$ opposite angles of a parallelogram]

Question is Wrong

k. 

Soln, Here,

~~$\therefore z^\circ = b^\circ$~~

$z^\circ + 115^\circ = 180^\circ$ [$\because$ co-interior angle]

or, $z^\circ = 180^\circ - 115^\circ$

$\therefore z^\circ = 65^\circ$

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$\therefore z^\circ = b^\circ = 65^\circ$ [$\because$ opposite anges of parallelogram are equal]

$\therefore b^\circ = x^\circ = 65^\circ$ [$\because$ alternate angle]

$\therefore x^\circ = a^\circ = 65^\circ$ [$\because$ base angles of isosceles triangle are equal]

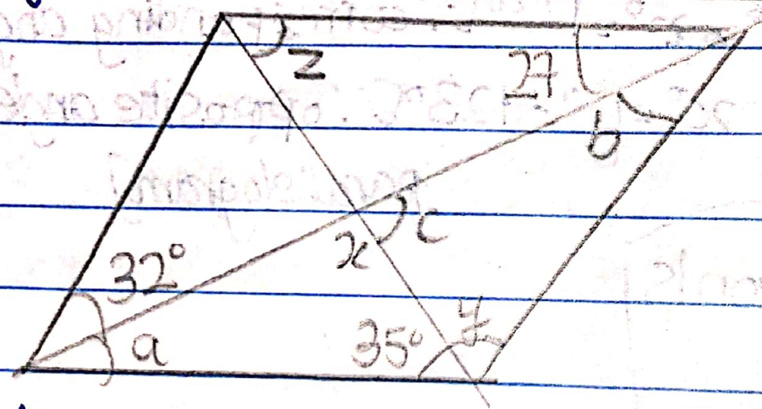
$x^\circ + a^\circ + y^\circ = 180^\circ$ [$\because$ sum of the angles of a triangle]

or, $65^\circ + 65^\circ + y^\circ = 180^\circ$

or, $y^\circ = 180^\circ - 130^\circ$

$\therefore y^\circ = 50^\circ$

l.



→ Soln Here,

$\therefore z^\circ = 35^\circ$ [$\because$ alternate angle]

$\therefore a^\circ = 27^\circ$ [$\because$ alternate angle]

$x^\circ + \cancel{27} a^\circ + 35^\circ = 180^\circ$ [$\because$ sum of the angles of a triangle]

or, $x^\circ + 27^\circ + 35^\circ = 180^\circ$

or, $x^\circ = 180^\circ - 62^\circ$

$\therefore x^\circ = 118^\circ$

$\therefore b^\circ = 32^\circ$ [$\because$ alternate angle]

- $x^\circ + c^\circ = 180^\circ$ [$\because$ straight angle]

or, $118^\circ + c^\circ = 180^\circ$

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

$\therefore c^\circ = 62^\circ$

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

or, $y^\circ + 32^\circ + 62^\circ = 180^\circ$

or, $y^\circ = 180^\circ - 94^\circ$

$\therefore y^\circ = 86^\circ$

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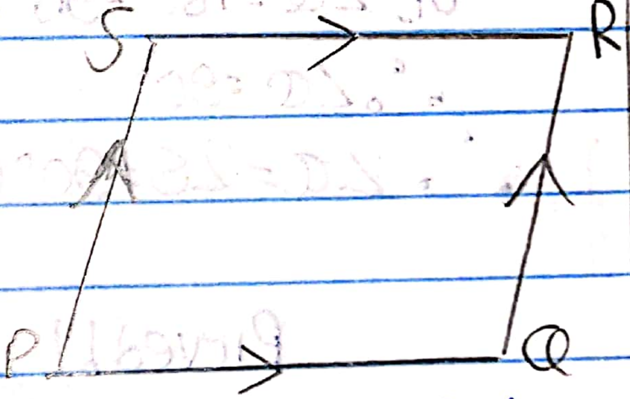
4. In the figure given alongside, PQ//SR and PS//QR, prove that



a) ~~PQ=SR and PS=QR~~

→ Soln, Here,

Since,

PQ//SR and PS//QR. ~~It is a~~ PQRS is a parallelogram.

a) PQ=RS & PQ=QR:

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Since, As PQRS is a parallelogram
$\therefore$ ~~PQ≠~~ $PQ=SR$ and $PS=QR$ as opposite ~~site~~sides of parallelogram are equal.

b. $\angle P = \angle R$ and $\angle Q = \angle S$.
→ Since, PQRS is a parallelogram.
$\therefore \angle P = \angle R$ and $\angle Q = \angle S$ as opposite angle of parallelogram are equal.

e. $\angle Q = \angle R = \angle S = 90°$ if $\angle P = 90°$
→ ~~$\angle P + \angle Q$~~ Soln,
Here,
$\therefore \angle P = \angle R = 90°$ [$\because$ according to (b)]
$\angle P + \angle Q = 180°$ ($\because$ co-interior angle)
or, $\angle Q = 180° - 90°$
$\therefore \angle Q = 90°$
$\therefore \angle Q = \angle S = 90°$ [$\because$ according to (b)]

Proved!! #