Coordinate geometry:

Ex-7(I)

1. Examine whether the following measures be sides of a right angled triangle:

a) 3cm, 4cm, 5cm

→ Soln,

Let $a=3, b=4, c=5$

Now,

$\cancel{b^2+c^2} = a^2+b^2 = 3^2+4^2$

$= 9+16 = 25$

$c^2 = 5^2 = 25$

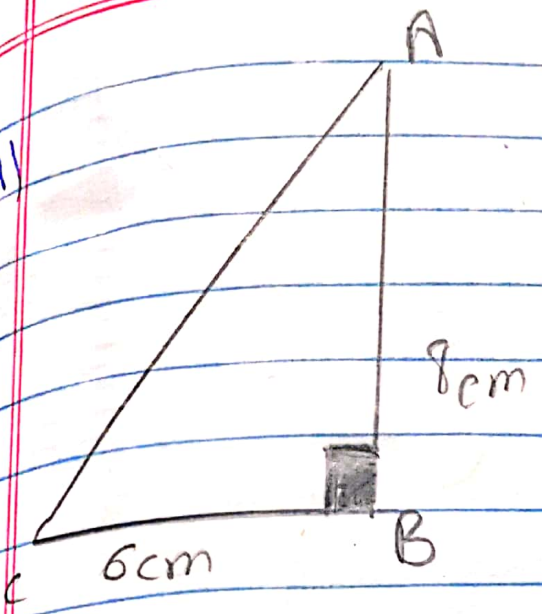
Since, $c^2 = a^2+b^2$

∴ The following measures are the sides of a right angled triangle.

2. Find the length of the unknown side:

→

2)



→ Soln,
Here,

$h = ?$, $p = 8cm$ and $b = 6cm$.

Now,
According to pythagoras theorem,

$h^2 = p^2 + b^2$

or, $h^2 = 8^2 + 6^2$

or, $h^2 = 64 + 36$

or, $h^2 = 100$

or, $h = \sqrt{100}$

$\therefore h = 10$ units

$\therefore AC = 10$ units #

DATE
PAGE No.

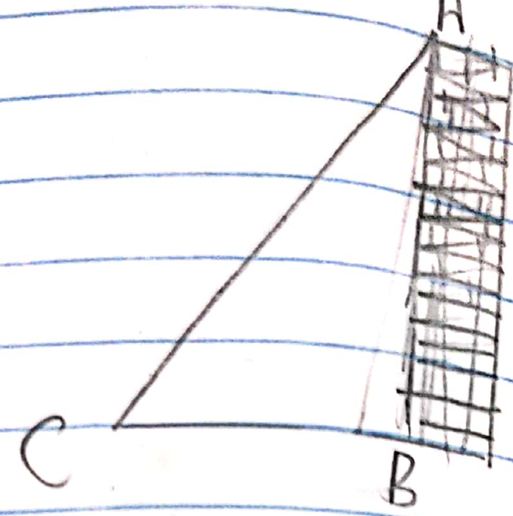
3(b) → Solⁿ;

Here,

Let, $AC = h = 13m$

$AB = p = 12m$

$BC = b = ?$



Now,

According to pythagoras theorem,

$h^2 = p^2 + b^2$

or, $b^2 = h^2 - p^2$

or, $b = \sqrt{h^2 - p^2}$

or, $b = \sqrt{13^2 - 12^2}$

or, $b = \sqrt{169 - 144}$

or, $b = \sqrt{25}$

$\therefore b = 5m$

$\therefore$ The distance of the foot of the ladder from the wall is 5m.

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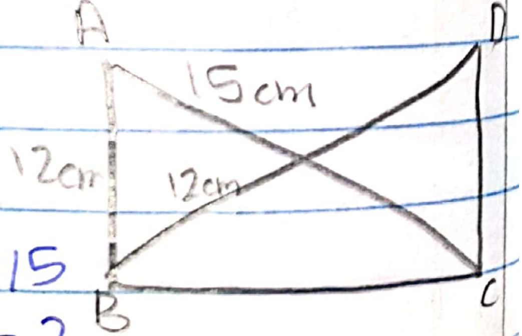
(7) → Solⁿ;



Here,

$AB = 12cm, AC = 15$

$BD = 12cm, CD = ?$

DATE
PAGE No.

In $\triangle ABC$,

$h = 15cm$, $p = 12cm$ and $b = ?$

According ~~th~~ to pythagoras theorem,

$$h^2 = p^2 + b^2$$

or, $b = \sqrt{h^2 - p^2}$

or, $b = \sqrt{15^2 - 12^2}$

or, $b = \sqrt{81}$

$\therefore b = 9$ units $\therefore BC =$ ~~9 units~~ $9cm$

Now,

In $\triangle BCD$,

$h = 15cm$, $b = 9cm$ and $p = ?$

According ~~th~~ to pythagoras theorem,

$$h^2 = p^2 + b^2$$

or, $p = \sqrt{h^2 - b^2}$

or, $p = \sqrt{15^2 - 9^2}$

or, $p = \sqrt{144}$

$\therefore p = 12cm$

$\therefore CD = 12cm$ #

DATE
PAGE No.

Ex-7(II)

1. In which quadrants do following points lie:

a) $(3,8)$

→ 1^{st} quadrant.

2. Find the distance between the pair of points:

h) $(a+b, a)$ and $(b, a-b)$

→ Soln

Here,

$(x_1, y_1) = (a+b, a)$ & $(x_2, y_2) = (b, a-b)$

Using distance formula,

DATE
PAGE No.

$$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$
$$= (b - (a+b))^2 + ((a-b) - a)^2$$
$$= (b + a+b)(b - a + b) + (a - b + a)(a - b - a)$$
$$= (2b + a)(2b - a) + (2a - b)(-b)$$

$$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$
$$= (b - (a+b))^2 + ((a-b) - a)^2$$
$$\cancel{= (b - a - b)^2 + ((}$$
$$= b^2 - 2b(a+b) + (a+b)^2 + (a-b)^2 - 2(a-b)a + a^2$$
$$= b^2 - 2ab - 2b^2 + a^2 + 2ab + b^2 + a^2 - 2ab + b^2 - 2a^2 + 2ab + a^2$$
$$= b^2 - 2b^2 + a^2 + b^2 + a^2 + b^2 - 2a^2 + a^2$$
$$= 3b^2 - 2b^2 + 3a^2 - 2a^2$$
$$= b^2 + a^2$$
$$d = \sqrt{a^2 + b^2} \text{ units}$$

3. a) → Soln,

Here,

~~Let A~~ $(x_1, y_1) = (8, 0)$

$(x_2, y_2) = (0, 6)$

Now,

distace between A(~~0, 8,~~ 8, 0) and B(0, 6) is:

DATE
PAGE No.

$$d^2 = (x_2-x_1)^2 + (y_2-y_1)^2$$
$$= (0-8)^2 + (6-0)^2$$
$$= (-8)^2 + (6)^2$$
$$= 64+36$$
or, $d^2 = 100$
or, $d = \sqrt{100}$
$\therefore d = 10$ units.
So, distance between A and B is 10 units.

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4. → Soln,
Here,
Let the ~~the~~ coordinates of house ~~are~~, school and picnic spot be H(2,5), S(6,1) and P(-3,3) respectively.
We know,
a) distance between $H(\overset{x_1}{2},\overset{y_1}{5})$ and $S(\overset{x_2}{6},\overset{y_2}{1})$ is:
$$d^2 = (x_2-x_1)^2 + (y_2-y_1)^2$$
$$= (6-2)^2 + (1-5)^2$$
$$= (4)^2 + (-4)^2$$
$$= 16+16$$
$$d^2 = 32$$
$d = \sqrt{32}$ $\therefore d = 4\sqrt{2}$ units.

$\sqrt{2\times2\times2\times2\times2}$
$2\times2\sqrt{2}$
$4\sqrt{2}$

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DATE
PAGE No.

b) distance between $S(\overset{x_1}{6},\overset{y_1}{1})$ and $P(\overset{x_2}{-3},\overset{y_2}{3})$ is:

$$d^2 = (x_2-x_1)^2+(y_2-y_1)^2$$
$$= (-3-6)^2+(3-1)^2$$
$$= (-9)^2+(2)^2$$
$$= 81+4$$
$$d^2 = 85$$
$$\therefore d = \sqrt{85} \text{ units}$$

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6. c) → Soln;

Here,

To show : ΔABC with vertices $A(\underset{x_1}{1},\underset{y_1}{2})$, $B(\underset{x_2}{4},\underset{y_2}{5})$ and $C(7,2)$ is isosceles.

We know,

$$AB^2 = (x_2-x_1)^2+(y_2-y_1)^2$$
$$= (4-1)^2+(5-2)^2$$
$$= (3)^2+(3)^2$$
$$= 9+9$$
$$\text{or, } AB^2 = 18$$
$$\text{or, } AB = \sqrt{18}$$
$$\therefore AB = 3\sqrt{2} \text{ units}$$

DATE
PAGE No.

Now,
$$BC^2 = (x_2-x_1)^2 + (y_2-y_1)^2$$
$$= (7-4)^2 + (2-5)^2$$
$$= (3)^2 + (-3)^2$$
$$= 9 + 9$$
$$BC^2 = 18$$
or, $BC = \sqrt{18}$
$\therefore BC = 3\sqrt{2}$ units

$$AC^2 = (x_2-x_1)^2 + (y_2-y_1)^2$$
$$= (7-1)^2 + (2-2)^2$$
$$= (6)^2 + (0)^2$$
or, $AC^2 = 36 + 0$
or, $AC = \sqrt{36}$
$\therefore AC = 6$ units.

Since,

$AB = BC$ and $AB \neq AC$. We can say that ΔABC is an isosceles ~~th~~ triangle because it has ~~ont~~ two sides equal.

DATE
PAGE No.

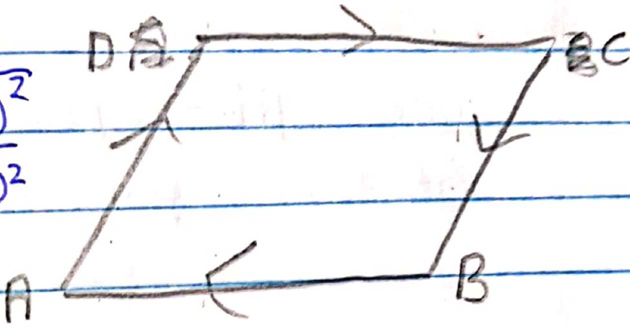
parallelogram. [opposite side equal, opposite angle equal, diagonals bisect each other)

7. → Sol^n,

Here,

To show: A(4, 3), B(2, 1), C(6, -1) and D(8, 1) are the vertices of a parallelogram.

We know,



$AB = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

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

$= \sqrt{(-2)^2+(-2)^2}$

$= \sqrt{4+4}$

$= \sqrt{8}$

$\therefore AB = 2\sqrt{2}$ units.

~~BC^2~~ $BC = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

$= \sqrt{(6-2)^2+(-1-1)^2}$

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

$= \sqrt{16+4}$

$= \sqrt{20}$

$\therefore AB = 2\sqrt{5}$ units.

$CD = \sqrt{(8-6)^2+(1+1)^2}$

$= \sqrt{(2)^2+(2)^2}$

$= \sqrt{4+4} = \sqrt{8}$ $\therefore CD = 2\sqrt{2}$ units

DATE
PAGE No.

$$AD = \sqrt{(8-4)^2 + (1-3)^2}$$
$$= \sqrt{(4)^2 + (-2)^2}$$
$$= \sqrt{16+4}$$
$$= \sqrt{20}$$
$$\therefore AD = 2\sqrt{5} \text{ units}$$

Since, $AB = CD$ and $BC = AD$.
ABCD is a parallelogram.

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8. a) → Soln,
Here.
Let given points be $A(1,3)$, $B(5,6)$ and $C(9,9)$.
We know,
From AB: $A(1,3)$, $B(5,6)$
$$AB = \sqrt{(5-1)^2 + (6-3)^2}$$
$$= \sqrt{(4)^2 + (3)^2}$$
$$= \sqrt{16+9}$$
$$= \sqrt{25}$$
$$\therefore AB = 5 \text{ units}$$

→

From BC: B(5,6) and C(9,9)

$$BC = \sqrt{(9-5)^2 + (9-6)^2}$$
$$= \sqrt{(4)^2 + (3)^2}$$
$$= \sqrt{16+9}$$
$$= \sqrt{25}$$

$\therefore BC = 5$ units

From AC : A(1,3) and C(9,9)

$$AC = \sqrt{(9-1)^2 + (9-3)^2}$$
$$= \sqrt{(8)^2 + (6)^2}$$
$$= \sqrt{64+36}$$
$$= \sqrt{100}$$

$\therefore AC = 10$ units

~~Since,~~ Now,

$AB + BC = 5 + 5 = 10$ units

$\therefore AB + BC = AC$

Hence, ~~ABC~~ the three points A, B and C are collinear.

$\longrightarrow$

9(b) → Soln,

Here,

$(x_1, y_1) = (6, k)$ and $(x_2, y_2) = (-2, 2)$

and $d = 10$.

Using distance formula,

$$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

or, $10^2 = (-2-6)^2 + (2-k)^2$

or, $100 = 64 + (2-k)^2$

or, $(2-k)^2 = 100 - 64$

or, $(2-k)^2 = 36$

or $2-k = \sqrt{36} = \cancel{6}$

$\therefore 2-k = \pm 6$

Taking positive sign,	Taking negative sign,
$\cancel{k = 6-2}$ $k = 6+2$	$k = \cancel{6-2}\ 2-6$
$\cancel{=4}$ $= 8$	$= \cancel{-8}\ -4$

#