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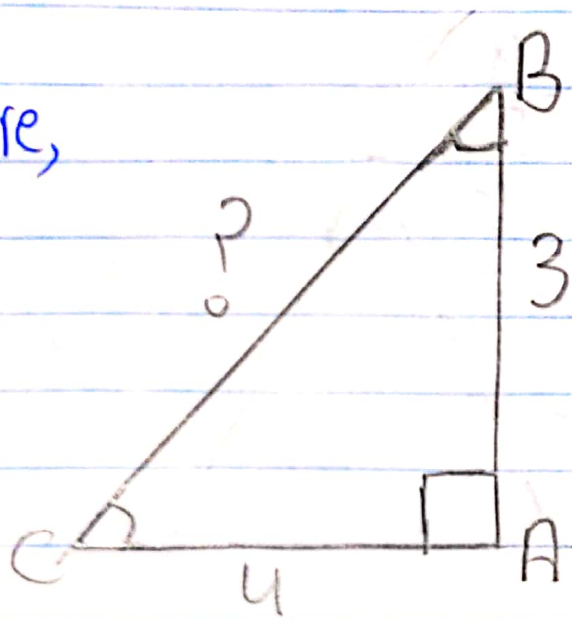
4. In a right angled triangle ABC, right angle at A.

i) If AB=3cms, AC=4cms, find sinB, cosB, tanC

→ Soln

Here,



In ΔABC,

$BC = h = ?$

$AB = p = 3cms$

$AC = b = 4cms$

Using pythagoras theorem,

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

or, $h^2 = 3^2 + 4^2$

or, $h^2 = 9 + 16$

or, $h = \sqrt{25}$ $\therefore h = 5$

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For angle B,

$h = BC = 5$
$p = AC = 4$
$b = AB = 3$

$\sin B = \frac{p}{h} = \frac{4}{5}$

$\cos B = \frac{b}{h} = \frac{3}{5}$

For angle C,

$h = BC = 5$
$p = AB = 3$
$b = AC = 4$

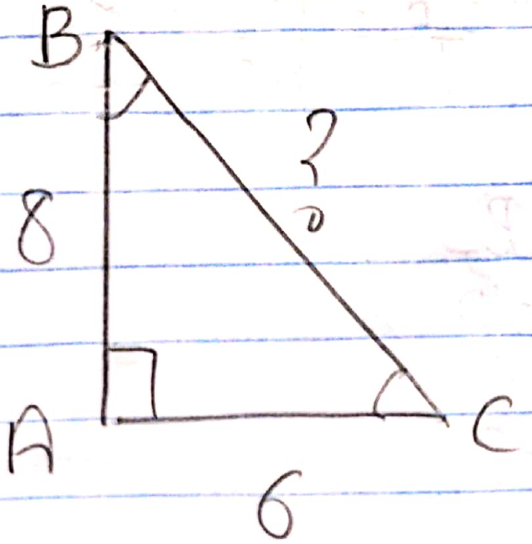
$\tan C = \frac{p}{b} = \frac{3}{4}$

ii) if AB = 8cms, AC = 6cms, find sin C,

$\cos C$, $\tan B$.

→ Soln

Here,



From the figure,

$h = ?$

$p = AB = 8$

$b = AC = 6$

By pythagoras theorem,

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

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

or, $= \sqrt{8^2 + 6^2}$

$= \sqrt{64 + 36}$

$= \sqrt{100}$

$= 10$ cms

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i) By angle C, $h=10, p=8, b=6$

i) $\sin C = \frac{p}{h} = \frac{AB}{AC} = \frac{\cancel{8}4}{\cancel{10}5} = \frac{4}{\cancel{8}5}$

ii) $\cos C = \frac{b}{h} = \frac{BC}{AC} = \frac{\cancel{6}3}{\cancel{10}5} = \frac{3}{5}$

By angle B,

$h=10$

$p=6$

$b=8$

iii) $\tan B = \frac{p}{b} = \frac{\cancel{6}3}{\cancel{8}4} = \frac{3}{4}$ //

~~Ans proved~~

iii) if $AB = 5$ cms, $BC = \cancel{13}$ 12 13 cms, find $\cos B$, $\tan C$, $\operatorname{cosec} B$.

→ Sol^n,

Here,

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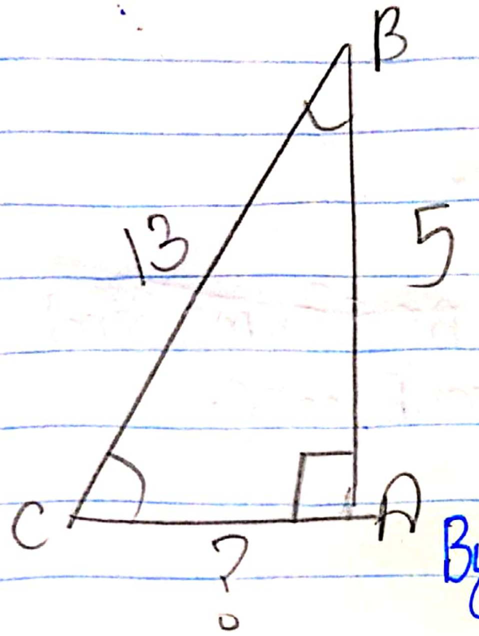


From the given figure,

In ΔABC,

$h = 13cms$

$p = ?$

$b = 5cms$

By pythagoras theorem,

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

$$or,\ 13^2 = p^2 + 5^2$$

$$or,\ p^2 = 13^2 - 5^2$$

$$or,\ p = \sqrt{169 - 25}$$

$$\therefore p = \sqrt{144} = 12cms$$

For angle B,

$p = 12$

$h = 13$

$b = 5$

So,

$$\cos B = \frac{b}{h} = \frac{5}{13}$$

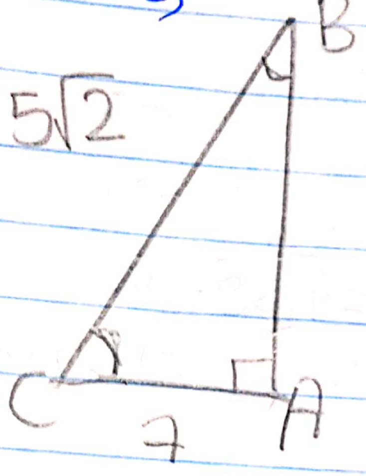
$$\operatorname{cosec} B = \frac{h}{b} = \frac{13}{5}$$

* $\tan C = \frac{p}{b} = \frac{5}{12}$

iv) If $BC = 5\sqrt{2}$ cms, $AC = 7$ cms, find $\sec B$, $\operatorname{cosec} C$, $\tan B$, $\cot C$.

→ Soln,

Here,



In $\triangle ABC$,

$h = 5\sqrt{2}$

$p = \cancel{AB} = ?$

$b = 7$

~~For~~ By pythagoras theorem,

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

or, $(5\sqrt{2})^2 = p^2 + 7^2$

or, $50 = p^2 + 49$

or, $p^2 = 50 - 49$

or, $p^2 = 1$

or, $p = \sqrt{1}$

$\therefore p = 1$

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(i) $\sec B = \frac{h}{p} = \frac{BC}{BA} = \frac{5\sqrt{2}}{1}$

(ii) $\operatorname{cosec} C = \frac{h}{p} = \frac{5\sqrt{2}}{1}$

(iii) $\tan B = \frac{p}{b} = \frac{7}{1} = 7$

(iv) $\cot C = \frac{b}{p} = \frac{7}{1} = 7$

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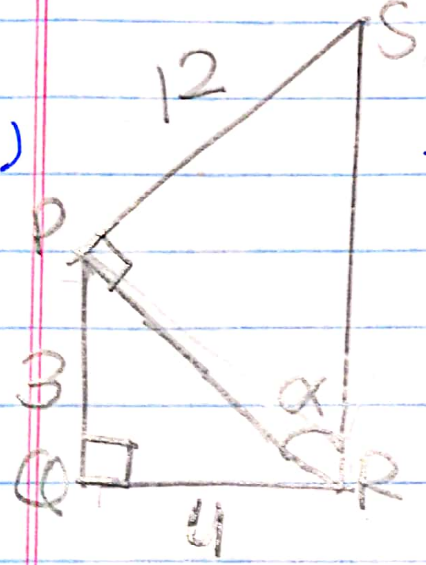
5. (i) From the given figures, prove that $\tan \alpha = \frac{12}{5}$.

a)



→ Sol^n,

Here,

In $\triangle PQR$,

$p = 3$

$b = 4$

$h = ?$

by pythagoras theorem,

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

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$$\text{or, } PR^2 = 3^2+4^2$$
$$\text{or, } PR = \sqrt{3^2+4^2}$$
$$\text{or, } PR = \sqrt{9+16} = \sqrt{25}$$
$$\therefore PR = 5 \text{ cms.}$$

In ΔSPR,

$p = 12$
$b = 5$
$h = ?$

by using pythagoras theorem,

$$h^2 = 12^2+5^2$$
$$\text{or, } h^2 = 144+25$$
$$\text{or, } h = \sqrt{144+25} = \sqrt{169}$$
$$\therefore h = 13 \text{ cms.}$$

To prove,

$$\tan\alpha = \frac{12}{5}$$

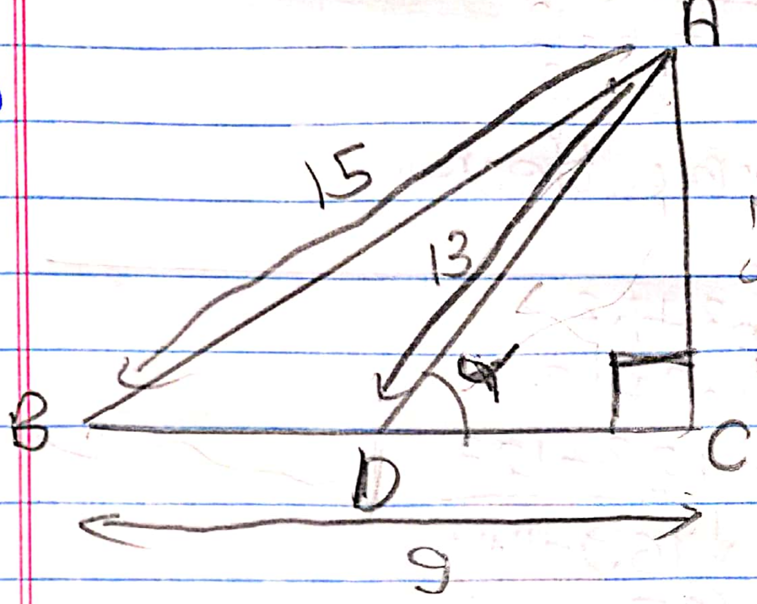
$$L.H.S = \tan\alpha$$
$$= \frac{p}{b}$$

$= \frac{PS}{PR}$

$= \frac{12}{5}$

∴ Proved ##

b)



→ Soln,

Here,

In $\triangle ABC$,

$h = 15$

$b = 9$

$p = ?$

by using pythagoras theorem,

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

or, $15^2 = p^2 + 9^2$

or, $p^2 = 15^2 - 9^2$

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$$or,\ p = \sqrt{144}$$
$$\therefore p = 12cms.$$

In Δ ACD,

$\cancel{h=12}$ $h = 13$

$\cancel{p=12}$ $p = 12$

$b = ?$

by pythagoras theorem,

$$h^2 = p^2 + b^2$$
$$or,\ 13^2 = 12^2 + b^2$$
$$or,\ b^2 = 13^2 - 12^2$$
$$or,\ b = \sqrt{169-144}$$
$$or,\ b = \sqrt{25}$$
$$\therefore b = 5 units$$

Now,

To prove,

$$\tan\alpha = \frac{12}{5}$$

$$L.H.S. = \tan\alpha = \frac{p}{b} = \frac{AC}{DC} = \frac{12}{5}$$

proved #

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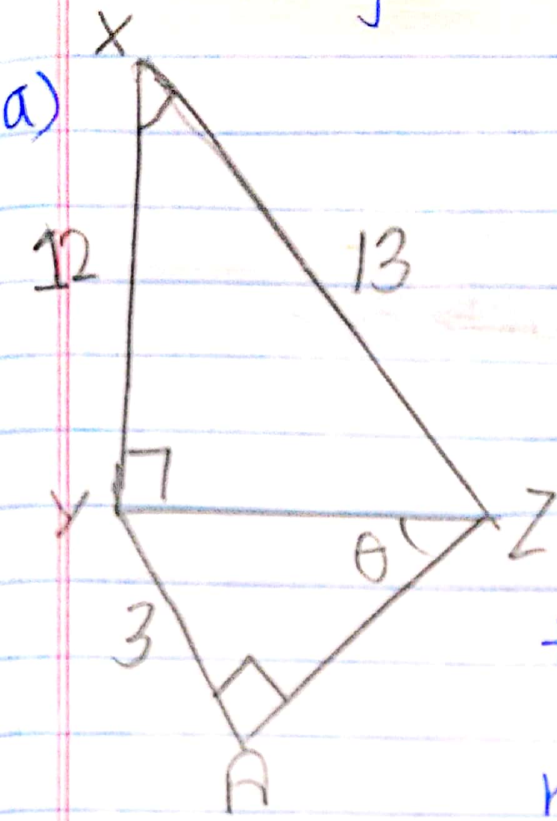
ii) From the given figures, prove that $\sin\theta = \frac{3}{5}$

a)



→ Soln, Here,
In ΔXYZ,
$XZ = h = 13$
$XY = p = 12$
$YZ = b = ?$

by using pythagoras theorem,

$h^2 = p^2 + b^2$
or, $13^2 = 12^2 + b^2$
or, $b^2 = \sqrt{13^2 - 12^2}$
or, $b = \sqrt{169 - 144}$
$\therefore b = \sqrt{25} = 5$

In ΔAYZ,
$h = YZ = 5$
$p = AY = 3$
$b = AZ = ?$

~~We have,~~ Using pythagoras theorem,

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

or, $5^2 = 3^2 + b^2$

or, $b^2 = 5^2 - 3^2$

or, $b = \sqrt{5^2 - 3^2}$

or, $b = \sqrt{25-9}$

$\therefore b = \sqrt{16} = 4$ ~~units~~ cms.

To prove,

$\sin\theta = \frac{3}{5}$

$L.H.S = \sin\theta$

$= \frac{p}{h}$

$= \frac{AY}{YZ}$

$= \frac{3}{5}$

proved #

$\longrightarrow$

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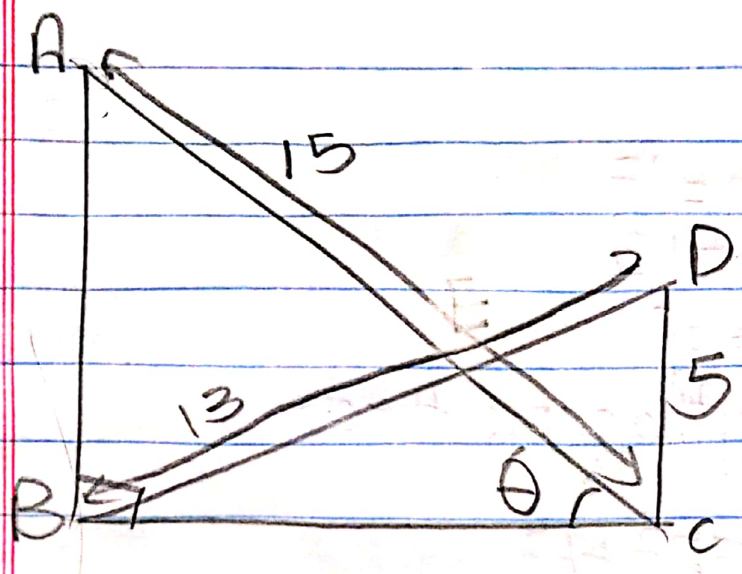
b)



→ Soln

Here,

In ΔBCD,

$h = \cancel{13}\ 13$

$p = 5$

$b = ?$

Using pythagoras theorem,

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

or, $13^2 = 5^2 + b^2$

or, $b^2 = 13^2 - 5^2$

or, $b = \sqrt{13^2 - 5^2}$

or, $b = \sqrt{169 - 25} = \sqrt{144}$

$\therefore b = 12$

In ΔABC,

$$h = 15$$
$$b = 12$$
$$p = ?$$

Using pythagoras theorem,

$$h^2 = p^2 + b^2$$
$$or,\ 15^2 = 12^2 + b^2$$
$$or,\ b^2 = \sqrt{15^2 - 12^2}$$
$$or,\ b = \sqrt{81}$$
$$\therefore b = 9$$

Now,

To prove,

$$\sin\theta = \frac{3}{5}$$

$$L.H.S = \sin\theta$$
$$= \frac{p}{h}$$
$$= \frac{AB}{AC}$$
$$= \frac{\cancel{9}\,3}{\cancel{15}\,5} = \frac{3}{5}$$

proved #