SOLUTION OF EXERCISE # 5.1

Exercise # 5.1

Solve the right triangle ABC in which $\gamma = 90^\circ$:

Q.1: $a = 250$, $\alpha = 42^\circ\ 25'$ (IIA-2017)

Sol. Here

$a = 250$	$b = ?$	$c = ?$
$\alpha = 42^\circ 25'$	$\beta = ?$	$\gamma = 90^\circ$

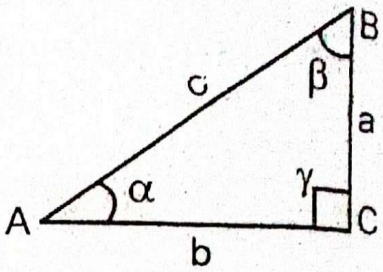
We now that

$\alpha + \beta + \gamma = 180^\circ$

$\beta = 180^\circ - \alpha - \gamma$

$\beta = 180^\circ - 42^\circ 25' - 90^\circ$

$\boxed{\beta = 47^\circ 35'}$



$\tan\alpha = \dfrac{a}{b}$

$b = \dfrac{a}{\tan\alpha}$

$b = \dfrac{250}{\tan 42^\circ 25'}$

$\boxed{b = 273.63}$

$\sin\alpha = \dfrac{a}{c}$

$c = \dfrac{a}{\sin\alpha}$

$c = \dfrac{250}{\sin 42^\circ 25'}$

$\boxed{c = 370.64}$

Q.2: $a = 482$, $\alpha = 35^\circ 36'$

Sol. Here

$a = 482$	$b = ?$	$c = ?$
$\alpha = 35^\circ 36'$	$\beta = ?$	$\gamma = 90^\circ$

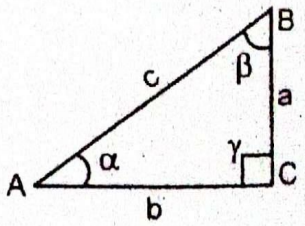
We know that

$\alpha + \beta + \gamma = 180^\circ$

$\beta = 180^\circ - \alpha - \gamma$

$\beta = 180^\circ - 35^\circ 36' - 90^\circ$

$\boxed{\beta = 54^\circ 24'}$



$\tan\alpha = \dfrac{a}{b}$

$\sin\alpha = \dfrac{a}{c}$

SOLUTION OF EXERCISE # 5.1

$$b = \frac{a}{\tan\alpha} \qquad c = \frac{a}{\sin\alpha}$$

$$b = \frac{482}{\tan 35^\circ 36'} \qquad c = \frac{482}{\sin 35^\circ 36'}$$

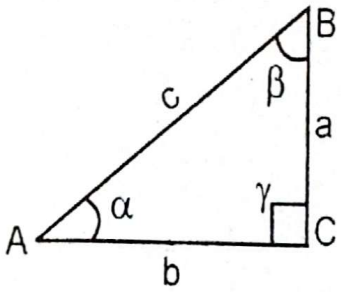
$\boxed{b = 673.25}$ $\boxed{c = 828}$

Q.3: $a = 5$, $c = 13$ (IA-2022)

Sol. Here

$a = 5$	$b = ?$	$c = 13$
$\alpha = ?$	$\beta = ?$	$\gamma = 90^\circ$

By using Pythagoras theorem.



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

$(5)^2 + b^2 = (13)^2$

$25 + b^2 = 169$

$b^2 = 169 - 25$

$b^2 = 144$

$\sqrt{b^2} = \sqrt{144} \Rightarrow \boxed{b = 12}$

$$\sin\alpha = \frac{a}{c}$$

$$\sin\alpha = \frac{5}{13}$$

$$\alpha = \sin^{-1}\left(\frac{5}{13}\right)$$

$\boxed{\alpha = 22^\circ 37'}$

We know that

$\alpha + \beta + \gamma = 180^\circ$

$\beta = 180^\circ - \alpha - \gamma$

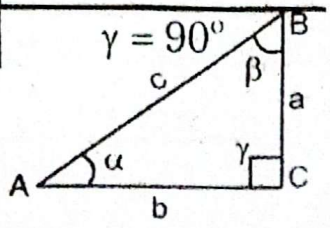
$\beta = 180^\circ - 22^\circ 37' - 90^\circ$

$\boxed{\beta = 67^\circ 23'}$

Q.4: $b = 312$, $\alpha = 23^\circ 42'$

Sol. Here

$a = ?$	$b = 312$	$c = ?$
$\alpha = 23^\circ 42'$	$\beta = ?$	$\gamma = 90^\circ$



We know that

$\alpha + \beta + \gamma = 180^\circ$

$\beta = 180^\circ - \alpha - \gamma$

SOLUTION OF EXERCISE # 5.1

$\beta = 180^\circ - 23^\circ 42' - 90^\circ$

$\boxed{\beta = 66^\circ 18'}$

$\tan\alpha = \frac{a}{b}$

$b\tan\alpha = a$

$a = b\tan\alpha$

$a = 312\tan 23^\circ 42'$

$a = 136.96$

$\boxed{a = 136.96}$

$\cos\alpha = \frac{b}{c}$

$c = \frac{b}{\cos\alpha}$

$c = \frac{312}{\cos 23^\circ 42'}$

$\boxed{c = 340.74}$

Q.5: $a = 212$, $\beta = 40^\circ 55'$

Sol. Here

$a = 212$	$b = ?$	$c = ?$
$\alpha = ?$	$\beta = 40^\circ 55'$	$\gamma = 90^\circ$

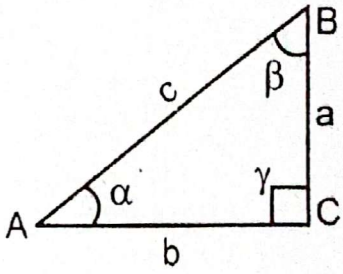
We know that

$\alpha + \beta + \gamma = 180^\circ$

$\alpha = 180^\circ - \beta - \gamma$

$\alpha = 180^\circ - 40^\circ 55' - 90^\circ$

$\Rightarrow \boxed{\alpha = 49^\circ 05'}$



$\tan\alpha = \frac{a}{b}$

$b = \frac{a}{\tan\alpha}$

$b = \frac{212}{\tan 49^\circ 5'}$

$\boxed{b = 183.75}$

$\sin\alpha = \frac{a}{c}$

$c = \frac{a}{\sin\alpha}$

$c = \frac{212}{\sin 49^\circ 5'}$

$\boxed{c = 280.55}$

Q.6: $c = 232$, $\beta = 52^\circ 46'$

Sol. Here

$a = ?$	$b = ?$	$c = 232$
$\alpha = ?$	$\beta = 52^\circ 46'$	$\gamma = 90^\circ$

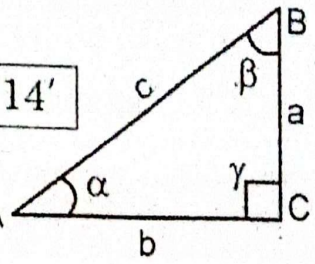
SOLUTION OF EXERCISE # 5.1

We know that

$\alpha + \beta + \gamma = 180^\circ$

$\alpha = 180^\circ - \beta - \gamma$

$\alpha = 180^\circ - 52^\circ 46' - 90^\circ \Rightarrow \boxed{\alpha = 37^\circ 14'}$



$\sin\alpha = \frac{a}{c}$

$c\sin\alpha = a$

$232(\sin 37^\circ 14') = a$

$140.37 = a$

$\boxed{a = 140.37}$

$\cos\alpha = \frac{b}{c}$

$c\cos\alpha = b$

$232(\cos 37^\circ 14') = b$

$184.71 = b$

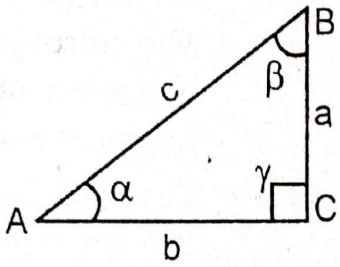
$\boxed{b = 184.71}$

Q.7: $c = 540$, $a = 380$

Sol. Here

$a = 380$	$b = ?$	$c = 540$
$\alpha = ?$	$\beta = ?$	$\gamma = 90^\circ$

By using Pythagoras Theorem



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

$(380)^2 + b^2 = (540)^2$

$144400 + b^2 = 291600$

$b^2 = 291600 - 144400$

$b^2 = 147200$

$\sqrt{b^2} = \sqrt{147200} \Rightarrow \boxed{b = 383.67}$

$\sin\alpha = \frac{a}{c} = \frac{380}{540}$

$\alpha = \sin^{-1}\left(\frac{380}{540}\right)$

$\Rightarrow \boxed{\alpha = 44^\circ 43'}$

$\alpha + \beta + \gamma = 180^\circ$

$\beta = 180^\circ - \alpha - \gamma$

$\beta = 180^\circ - 44^\circ 43' - 90^\circ$

$\boxed{\beta = 45^\circ 17'}$