EXERCISE 19

1. Find the value of the following:

(i) sin 35° 22'

Solution:-

To find the value of sin 35° 22',

We read the table of natural sines in the horizontal line which begins with 35°

In the vertical column headed by 22' i.e. 22' – 18' = 4' in the difference column, the value of 4' in mean difference column is 10.

Then, value that we find in vertical column is 0.5779

Now adding the value of 18' and 4' = 0.5779 + 10

= 0.5789

Therefore, the value of sin 35° 22' is obtained as under,

sin 35° 22' = 0.5779 … [from table]

Mean difference for 4' = 10 … [to be added]

Then, sin 35° 22' = 0.5789

(ii) sin 71° 31'

Solution:-

To find the value of sin 71° 31',

We read the table of natural sines in the horizontal line which begins with 35°

In the vertical column headed by 31' i.e. 31' – 30' = 1' in the difference column, the value of 1' in mean difference column is 1.

Then, value that we find in vertical column is 0.9483

Now adding the value of 30' and 1' = 0.9483 + 1

= 0.9484

Therefore, the value of sin 71° 31' is obtained as under,

sin 71° 31' = 0.9483 … [from table]

Mean difference for 1' = 1 … [to be added]

Then, sin 71° 31' = 0.9484

(iii) sin 65° 20'

Solution:-

To find the value of sin 65° 20',

We read the table of natural sines in the horizontal line which begins with 35°

In the vertical column headed by 20' i.e. 20' – 18' = 2' in the difference column, the value of 2' in mean difference column is 2.

Then, value that we find in vertical column is 0.9085
Now adding the value of 18' and 2' = 0.9085 + 2
= 0.9087
Therefore, the value of sin 65° 20' is obtained as under,
sin 65° 20' = 0.0985 … [from table]
Mean difference for 2' = 2 … [to be added]
Then, sin 65° 20' = 0.9087

(iv) sin 23° 56'
Solution:-
To find the value of sin 23° 56',
We read the table of natural sines in the horizontal line which begins with 23°
In the vertical column headed by 56' i.e. 56' – 54' = 2' in the difference column, the value of 2' in mean difference column is 5.
Then, value that we find in vertical column is 0.4051
Now adding the value of 54' and 4' = 0.4051 + 5
= 0.4056
Therefore, the value of sin 23° 56' is obtained as under,
sin 23° 56' = 0.4051 … [from table]
Mean difference for 2' = 5 … [to be added]
Then, sin 23° 56' = 0.4056

2. Find the value of the following:
(i) cos 62° 27'
Solution:-
We know that as θ increase, the value of cos θ decreases, therefore, the numbers in the mean difference columns are to be subtracted.
To find the value of cos 62° 27',
We read the table of natural sines in the horizontal line which begins with 62°
In the vertical column headed by 27' i.e. 27' – 24' = 3' in the difference column, the value of 3' in mean difference column is 8.
Then, value that we find in vertical column is 0.4633
Now adding the value of 24' and 3' = 0.4633 - 8
= 0.4625
Therefore, cos 62° 27' is 0.4625.

(ii) cos 3° 11’

Solution:-

We know that as θ increase, the value of cos θ decreases, therefore, the numbers in the mean difference columns are to be subtracted.

To find the value of cos 3° 11’,

We read the table of natural sines in the horizontal line which begins with 3°

In the vertical column headed by 27’ i.e. 11’ – 6’ = 5’ in the difference column, the value of 5’ in mean difference column is 1.

Then, value that we find in vertical column is 0.9985

Now adding the value of 6’ and 5’ = 0.9985 - 1

= 0.9984

Therefore, cos 3° 11’ is 0.9984.

(iii) cos 86° 40’

Solution:-

We know that as θ increase, the value of cos θ decreases, therefore, the numbers in the mean difference columns are to be subtracted.

To find the value of cos 86° 40’,

We read the table of natural sines in the horizontal line which begins with 86°

In the vertical column headed by 40’ i.e. 40’ – 36’ = 4’ in the difference column, the value of 4’ in mean difference column is 12.

Then, value that we find in vertical column is 0.0593

Now adding the value of 36’ and 4’ = 0.0593 - 12

= 0.0581

Therefore, cos 86° 40’ is 0.0581.

(iv) cos 45° 58’.

Solution:-

We know that as θ increase, the value of cos θ decreases, therefore, the numbers in the mean difference columns are to be subtracted.

To find the value of cos 45° 58’,

We read the table of natural sines in the horizontal line which begins with 45°

In the vertical column headed by 58’ i.e. 58’ – 54’ = 4’ in the difference column, the value of 4’ in mean difference column is 8.

Then, value that we find in vertical column is 0.6959

Now adding the value of 54’ and 4’ = 0.6959 - 8

= 0.6951

Therefore, cos 45° 58′ is 0.6951.

3. Find the value of the following :

(i) tan 15° 2′

Solution:-

To find the value of tan 15° 2′,

We read the table of natural sines in the horizontal line which begins with 15°

In the vertical column headed by 2′, the value of 2′ in mean difference column is 6.

Then, value that we find in vertical column is 0.2679

Now adding the values = 0.2685 + 6

= 0.2685

Therefore, tan 15° 2′ is 0.2685.

(ii) tan 53° 14′

Solution:-

To find the value of tan 53° 14′,

We read the table of natural sines in the horizontal line which begins with 53°

In the vertical column headed by 14′ i.e. 14′ – 12′ = 2′ in the difference column, the value of 2′ in mean difference column is 16.

Then, value that we find in vertical column is 1.3367

Now adding the value of 12′ and 2′ = 1.3367 + 16

= 1.3383

Therefore, tan 53° 14′ is 1.3383.

(iii) tan 82° 18′

Solution:-

To find the value of tan 82° 18′,

We read the table of natural sines in the horizontal line which begins with 82°

Then, value that we find in vertical column is 7.3962

Therefore, tan 82° 18′ is 7.3962

(iv) tan 6° 9′.

Solution:-

To find the value of tan 6° 9′,

We read the table of natural sines in the horizontal line which begins with 6°

In the vertical column headed by 9′ i.e. 9′ – 6′ = 3′ in the difference column, the value of 3′ in mean difference column is 9.

Then, value that we find in vertical column is 0.1069
Now adding the value of 6' and 3' = 0.1069 + 9
= 0.1078
Therefore, tan 6° 9' is 0.1078.

4. Use tables to find the acute angle θ, given that:
(i) sin θ = .5789
Solution:-
In the table of natural sines, look for a value (≤ .5789) which is sufficiently close to .5789. We find the value .5779 occurs in the horizontal line beginning with 35° and in the column headed by 18' and in the mean difference, we see .5789 - .5779 = .0010 in the column of 4'.
So we get, θ = 35° 18' + 4' = 35° 22'.

(ii) sin θ = .9484
Solution:-
In the table of natural sines, look for a value (≤ .9484) which is sufficiently close to .9484. We find the value .9483 occurs in the horizontal line beginning with 71° and in the column headed by 30' and in the mean difference, we see .9484 - .9483 = .0001 in the column of 1'.
So we get, θ = 71° 30' + 1' = 71° 31'.

(iii) sin θ = .2357
Solution:-
In the table of natural sines, look for a value (≤ .2357) which is sufficiently close to .2357. We find the value .2351 occurs in the horizontal line beginning with 13° and in the column headed by 36' and in the mean difference, we see .2357 - .2351 = .0006 in the column of 2'.
So we get, θ = 13° 36' + 2' = 13° 38'.

(iv) sin θ = .6371.
Solution:-
In the table of natural sines, look for a value (≤ .6371) which is sufficiently close to .6371. We find the value .6361 occurs in the horizontal line beginning with 39° and in the column headed by 30' and in the mean difference, we see .6371 - .6361 = .0010 in the column of 4'.
So we get, θ = 39° 30' + 4' = 39° 34'.

5. Use the tables to find the acute angle θ, given that:
(i) cos θ = .4625
Solution:-
In the table of cosines, look for a value (≤ .4625) which is sufficiently close to .4625.
We find the value .4617 occurs in the horizontal line beginning with 62° and in the column headed by 30' and in the mean difference, we see .4625 - .4617 = .0008 in the column of 3'.
So we get, θ = 62° 30' - 3' = 62° 27'.

(ii) cos θ = .9906
Solution:-
In the table of cosines, look for a value (≤ .9906) which is sufficiently close to .9906.
We find the value .9905 occurs in the horizontal line beginning with 7° and in the column headed by 54' and in the mean difference, we see .9906 - .9905 = .0001 in the column of 3'.
So we get, θ = 70° 54' - 3' = 70° 51'.

(iii) cos θ = .6951
Solution:-
In the table of cosines, look for a value (≤ .6951) which is sufficiently close to .6951.
We find the value .6947 occurs in the horizontal line beginning with 46° and in the mean difference, we see .6951 - .6947 = .0004 in the column of 2'.
So we get, θ = 46°' - 2' = 45° 58'.

(iv) cos θ = .3412.
Solution:-
In the table of cosines, look for a value (≤ .3412) which is sufficiently close to .3412.
We find the value .3404 occurs in the horizontal line beginning with 70° and in the column headed by 6' and in the mean difference, we see .3412 - .3404 = .0008 in the column of 3'.
So we get, θ = 70° 6' - 3' = 70° 3'.

6. Use tables to find the acute angle θ, given that:
(i) tan θ = .2685
Solution:-
In the table of natural tangent, look for a value (≤ .2685) which is sufficiently close to

.2685.
We find the value .2679 occurs in the horizontal line beginning with 15^o and in the mean difference, we see .2685 - .2679 = .0006 in the column of 2'.
So we get, $\theta = 15^o + 2' = 15^o\ 2'$.

(ii) tan θ = 1.7451
Solution:-
In the table of natural tangent, look for a value (≤ 1.7451) which is sufficiently close to 1.7451.
We find the value 1.7391 occurs in the horizontal line beginning with 60^o and in the column headed by 6' and in the mean difference, we see 1.7451 - 1.7391 = .0060 in the column of 5'.
So we get, $\theta = 60^o\ 6' + 5' = 60^o\ 11'$.

(iii) tan θ = 3.1749
Solution:-
In the table of natural tangent, look for a value (≤ 3.1749) which is sufficiently close to 3.1749.
We find the value 3.1716 occurs in the horizontal line beginning with 72^o and in the column headed by 30' and in the mean difference, we see 3.1749 - 3.1716 = .0033 in the column of 1'.
So we get, $\theta = 72^o\ 30' + 1' = 72^o\ 31'$.

(iv) tan θ = .9347
Solution:-
In the table of natural tangent, look for a value (≤ .9347) which is sufficiently close to .9347.
We find the value .9325 occurs in the horizontal line beginning with 43^o and in the mean difference, we see .9347 - .9325 = .0022 in the column of 4'.
So we get, $\theta = 43^o + 4' = 43^o\ 4'$.

7. Using trigonometric table, find the measure of the angle A when sin A = 0.1822.
Solution:-
In the table of natural sines, look for a value (≤ 0.1822) which is sufficiently close to 0.1822.
We find the value 0.1822 occurs in the horizontal line beginning with 10^o and in the column headed by 30'.

So we get, A = 10° 30'.

8. Using tables, find the value of 2 sin θ – cos θ when (i) θ = 35° (ii) tan θ = .2679.
Solution:-
(i) We have to find the value of 2 sin θ – cos θ
From the question it is given that, value of θ = 35°
So, substitute the value of θ,
= 2 sin 35° – cos 35°
From the table value of sin 35° = .5736 and cos 35° = .8192
= (2 × .5736) - .8192
= 0.3280
(ii) from the question it is given that, tan θ = .2679
In the table of natural sines, look for a value (≤ .2679) which is sufficiently close to .2679.
We find the value column headed by 15°.
So we get, θ = 15°
So, substitute the value of θ,
= 2 sin 15° – cos 15°
From the table value of sin 15° = .2588 and cos 15° = .9659
= (2 × .2588) - .9659
= -0.4483

9. If sin x° = 0.67, find the value of (i) cos x° (ii) cos x° + tan x°.
Solution:-
From the question it is given that, sin x° = 0.67.
In the table of natural sines, look for a value (≤ 0.67) which is sufficiently close to 0.67.
We find the value 0.6691 occurs in the horizontal line beginning with 42° and in the mean difference, we see 0.6700 - 0.6691 = .0009 in the column of 4'.
So we get, θ = 42° + 4' = 42° 4'.
Then,
(i) cos x° = cos 42° 4'
From the table
= .7431 – .0008
= 0.7423
(ii) cos x° + tan x° = cos 42° 4' + tan 42° 4'
= 0.7423 + .9025
= 1.6448

10. If θ is acute and cos θ = .7258, find the value of (i) θ (ii) 2 tan θ – sin θ.

Solution:-

From the question, cos θ = .7258

In the table of cosines, look for a value (≤ .7258) which is sufficiently close to .7258.

We find the value .7254 occurs in the horizontal line beginning with 43° and in the column headed by 30' and in the mean difference, we see .7258 - .7254 = .0004 in the column of 2'.

So we get, θ = 43° 30' - 2' = 43° 28'.

(i) θ = 43° 30' – 2'

= 43° 28'.

(ii) 2 tan θ – sin θ

Substitute the value θ,

= 2 tan43°28' – sin43°28'

= 2 (.9479) – .6879

= 1.8958 – .6879

= 1.2079

Therefore, the value of 2 tan θ – sin θ is 1.2079