

## Trigonometric Equations - Past Paper Questions - ANSWERS

- 1)  $7 \sin x^\circ - 3 = 0$   
 $7 \sin x^\circ = 3$   
 $\sin x^\circ = \frac{3}{7}$   
 1<sup>st</sup> and 2<sup>nd</sup> quadrants  
 $x = 25 \cdot 4, 180 - 25 \cdot 4$   
 $x = 25 \cdot 4^\circ, 154 \cdot 6^\circ$
- 2)  $7 \cos x^\circ - 5 = 0$   
 $7 \cos x^\circ = 5$   
 $\cos x^\circ = \frac{5}{7}$   
 1<sup>st</sup> and 4<sup>th</sup> quadrants  
 $x = 44 \cdot 4, 360 - 44 \cdot 4$   
 $x = 44 \cdot 4^\circ, 315 \cdot 6^\circ$
- 3)  $2 \tan x^\circ + 7 = 0$   
 $2 \tan x^\circ = -7$   
 $\tan x^\circ = -\frac{7}{2}$   
 2<sup>nd</sup> and 4<sup>th</sup> quadrants  
 $x = 180 - 74 \cdot 1, 360 - 74 \cdot 1$   
 $x = 105 \cdot 9^\circ, 285 \cdot 9^\circ$
- 4)  $5 \tan x^\circ - 6 = 2$   
 $5 \tan x^\circ = 8$   
 $\tan x^\circ = \frac{8}{5}$   
 1<sup>st</sup> and 3<sup>rd</sup> quadrants  
 $x = 58 \cdot 0, 180 + 58 \cdot 0$   
 $x = 58 \cdot 0^\circ, 238 \cdot 0^\circ$
- 5)  $4 \cos x^\circ + 3 = 0$   
 $4 \cos x^\circ = -3$   
 $\cos x^\circ = -\frac{3}{4}$   
 2<sup>nd</sup> and 3<sup>rd</sup> quadrants  
 $x = 180 - 41 \cdot 4, 180 + 41 \cdot 4$   
 $x = 138 \cdot 6^\circ, 221 \cdot 4^\circ$
- 6)  $7 \sin x^\circ + 1 = -5$   
 $7 \sin x^\circ = -6$   
 $\sin x^\circ = -\frac{6}{7}$   
 3<sup>rd</sup> and 4<sup>th</sup> quadrants  
 $x = 180 + 59 \cdot 0, 360 - 59 \cdot 0$   
 $x = 239 \cdot 0^\circ, 301 \cdot 0^\circ$
- 7)  $2 \tan x^\circ - 3 = 5$   
 $2 \tan x^\circ = 8$   
 $\tan x^\circ = \frac{8}{2}$   
 1<sup>st</sup> and 3<sup>rd</sup> quadrants  
 $x = 76 \cdot 0, 180 + 76 \cdot 0$   
 $x = 76 \cdot 0^\circ, 256 \cdot 0^\circ$
- 8)  $5 \cos x^\circ - 3 = 1$   
 $5 \cos x^\circ = 4$   
 $\cos x^\circ = \frac{4}{5}$   
 1<sup>st</sup> and 4<sup>th</sup> quadrants  
 $x = 36 \cdot 9, 360 - 36 \cdot 9$   
 $x = 36 \cdot 9^\circ, 323 \cdot 1^\circ$
- 9)  $3 \tan x^\circ - 2 = 4$   
 $3 \tan x^\circ = 6$   
 $\tan x^\circ = \frac{6}{3}$   
 1<sup>st</sup> and 3<sup>rd</sup> quadrants  
 $x = 63 \cdot 4, 180 + 63 \cdot 4$   
 $x = 63 \cdot 4^\circ, 243 \cdot 4^\circ$
- 10)  $\tan 40^\circ = 2 \sin x^\circ + 1$   
 $0 \cdot 839 = 2 \sin x^\circ + 1$   
 $-0 \cdot 161 = 2 \sin x^\circ$   
 $\sin x^\circ = -0 \cdot 0805$   
 3<sup>rd</sup> and 4<sup>th</sup> quadrants  
 $x = 180 + 4 \cdot 6, 360 - 4 \cdot 6$   
 $x = 184 \cdot 6^\circ, 355 \cdot 4^\circ$
- 11)  $4 \sin x^\circ + 1 = -2$   
 $4 \sin x^\circ = -3$   
 $\sin x^\circ = -\frac{3}{4}$   
 3<sup>rd</sup> and 4<sup>th</sup> quadrants  
 $x = 180 + 48 \cdot 6, 360 - 48 \cdot 6$   
 $x = 228 \cdot 6^\circ, 311 \cdot 4^\circ$
- 12)  $5 \cos x^\circ + 4 = 0$   
 $5 \cos x^\circ = -4$   
 $\cos x^\circ = -\frac{4}{5}$   
 2<sup>nd</sup> and 3<sup>rd</sup> quadrants  
 $x = 180 - 36 \cdot 9, 180 + 36 \cdot 9$   
 $x = 143 \cdot 1^\circ, 216 \cdot 9^\circ$
- 13)  $11 \cos x^\circ - 2 = 3$   
 $11 \cos x^\circ = 5$   
 $\cos x^\circ = \frac{5}{11}$   
 1<sup>st</sup> and 4<sup>th</sup> quadrants  
 $x = 63 \cdot 0, 360 - 63 \cdot 0$   
 $x = 63 \cdot 0^\circ, 297 \cdot 0^\circ$
- 14a)  $\sqrt{3} \sin x^\circ - 1 = 0$   
 $\sqrt{3} \sin x^\circ = 1$   
 $\sin x^\circ = \frac{1}{\sqrt{3}}$   
 1<sup>st</sup> and 2<sup>nd</sup> quadrants  
 $x = 35 \cdot 3, 180 - 35 \cdot 3$   
 $x = 35 \cdot 3^\circ, 144 \cdot 7^\circ$
- 14b)  $x = 35 \cdot 3 \div 2^\circ, 144 \cdot 7 \div 2^\circ$   
 $x = 17 \cdot 7^\circ, 72 \cdot 4^\circ$
- 15a)  $f(270) = 3 \sin 270^\circ$   
 $= 3 \times (-1) = -3$
- 15b)  $f(t) = 3 \sin t^\circ = 0 \cdot 6$   
 $\sin t^\circ = \frac{0 \cdot 6}{3}$   
 1<sup>st</sup> and 2<sup>nd</sup> quadrants  
 $t = 11 \cdot 5, 180 - 11 \cdot 5$   
 $t = 11 \cdot 5^\circ, 168 \cdot 5^\circ$
- 16a)  $\tan x^\circ = 5$   
 1<sup>st</sup> and 3<sup>rd</sup> quadrants  
 $x = 78 \cdot 7, 180 + 78 \cdot 7$   
 $x = 78 \cdot 7^\circ, 258 \cdot 7^\circ$
- 16b)  $x = 258 \cdot 7^\circ + 180$   
 $x = 438 \cdot 7^\circ$
- 17)  $\sin x^\circ = 0 \cdot 4$   
 1<sup>st</sup> and 2<sup>nd</sup> quadrants  
 $x = 23 \cdot 6, 180 - 23 \cdot 6$   
 $x = 23 \cdot 6^\circ, 156 \cdot 4^\circ$
- 18)  $1 + \sin x^\circ = 1 \cdot 7$   
 $\sin x^\circ = 0 \cdot 7$   
 1<sup>st</sup> and 2<sup>nd</sup> quadrants  
 $x = 44 \cdot 4, 180 - 44 \cdot 4$   
 $x = 44 \cdot 4^\circ, 135 \cdot 6^\circ$

19a)  $P(90,1)$

19b)  $0 = 4 \sin x^\circ - 3$

$$4 \sin x^\circ = 3$$

$$\sin x^\circ = \frac{3}{4}$$

1<sup>st</sup> and 2<sup>nd</sup> quadrants

$$x = 48 \cdot 6, 180 - 48 \cdot 6$$

$$x = 48 \cdot 6^\circ, 131 \cdot 4^\circ$$

20)  $A = \frac{1}{2} ab \sin C^\circ$

$$38 = \frac{1}{2} \times 14 \times 9 \sin B^\circ$$

$$38 = 63 \times \sin B^\circ$$

$$\sin B^\circ = \frac{38}{63}$$

1<sup>st</sup> quadrant

$$B = 37 \cdot 1^\circ$$

21)  $A = \frac{1}{2} ab \sin C^\circ$

$$12 = \frac{1}{2} \times 5 \times 6 \times \sin P^\circ$$

$$12 = 15 \times \sin P^\circ$$

$$\sin P^\circ = \frac{12}{15}$$

2<sup>nd</sup> quadrant

$$P = 180 - 53 \cdot 1$$

$$P = 126 \cdot 9^\circ$$

22a)  $D = 3 + 1 \cdot 75 \sin 30 \times 5^\circ$

$$D = 3 + 1 \cdot 75 \sin 150^\circ$$

$$D = 3 + 1 \cdot 75 \times 0 \cdot 5$$

$$D = 3 + 0 \cdot 875 = 3 \cdot 875m$$

22b) max depth  $D = 3 + 1 \cdot 75 \times 1$

$$= 4 \cdot 75$$

min depth  $D = 3 + 1 \cdot 75 \times (-1)$

$$= 1 \cdot 25$$

$$\text{max difference} = 4 \cdot 75 - 1 \cdot 25 = 3 \cdot 5m$$

23a)  $H = 10 + 5 \sin t^\circ$

$$H = 10 + 5 \sin 10$$

$$H = 10 + 0 \cdot 868$$

$$H = 10 \cdot 868m$$

b)  $12 \cdot 5 = 10 + 5 \sin t^\circ$

$$2 \cdot 5 = 5 \sin t^\circ$$

$$\sin t^\circ = \frac{2 \cdot 5}{5}$$

1<sup>st</sup> and 2<sup>nd</sup> quadrants

$$t = 30, 180 - 30$$

$$t = 30sec, 150sec$$

24a)  $h = 8 + 4 \sin t^\circ$

$$h = 8 + 4 \sin 30$$

$$h = 8 + 2 = 10m$$

24b)  $10 \cdot 5 = 8 + 4 \sin t^\circ$

$$2 \cdot 5 = 4 \sin t^\circ$$

$$\sin t^\circ = \frac{2 \cdot 5}{4}$$

1<sup>st</sup> and 2<sup>nd</sup> quadrants

$$t = 38 \cdot 7, 180 - 38 \cdot 7$$

$$t = 38 \cdot 7sec, 141 \cdot 3sec$$

25a)  $h = 15 \tan x^\circ + 1 \cdot 7$

$$h = 15 \tan 25^\circ + 1 \cdot 7$$

$$h = 6 \cdot 99 + 1 \cdot 7$$

$$h = 8 \cdot 69m$$

25b)  $18 \cdot 4 = 15 \tan x^\circ + 1 \cdot 7$

$$16 \cdot 7 = 15 \tan x^\circ$$

$$\tan x^\circ = \frac{16 \cdot 7}{15}$$

1<sup>st</sup> quadrant

$$x = 48 \cdot 1^\circ$$

26)  $h = 320 \sin x^\circ + 150$

$$458 = 320 \sin x^\circ + 150$$

$$308 = 320 \sin x^\circ$$

$$\sin x^\circ = \frac{308}{320}$$

1<sup>st</sup> quadrant

$$x = 74 \cdot 3^\circ$$