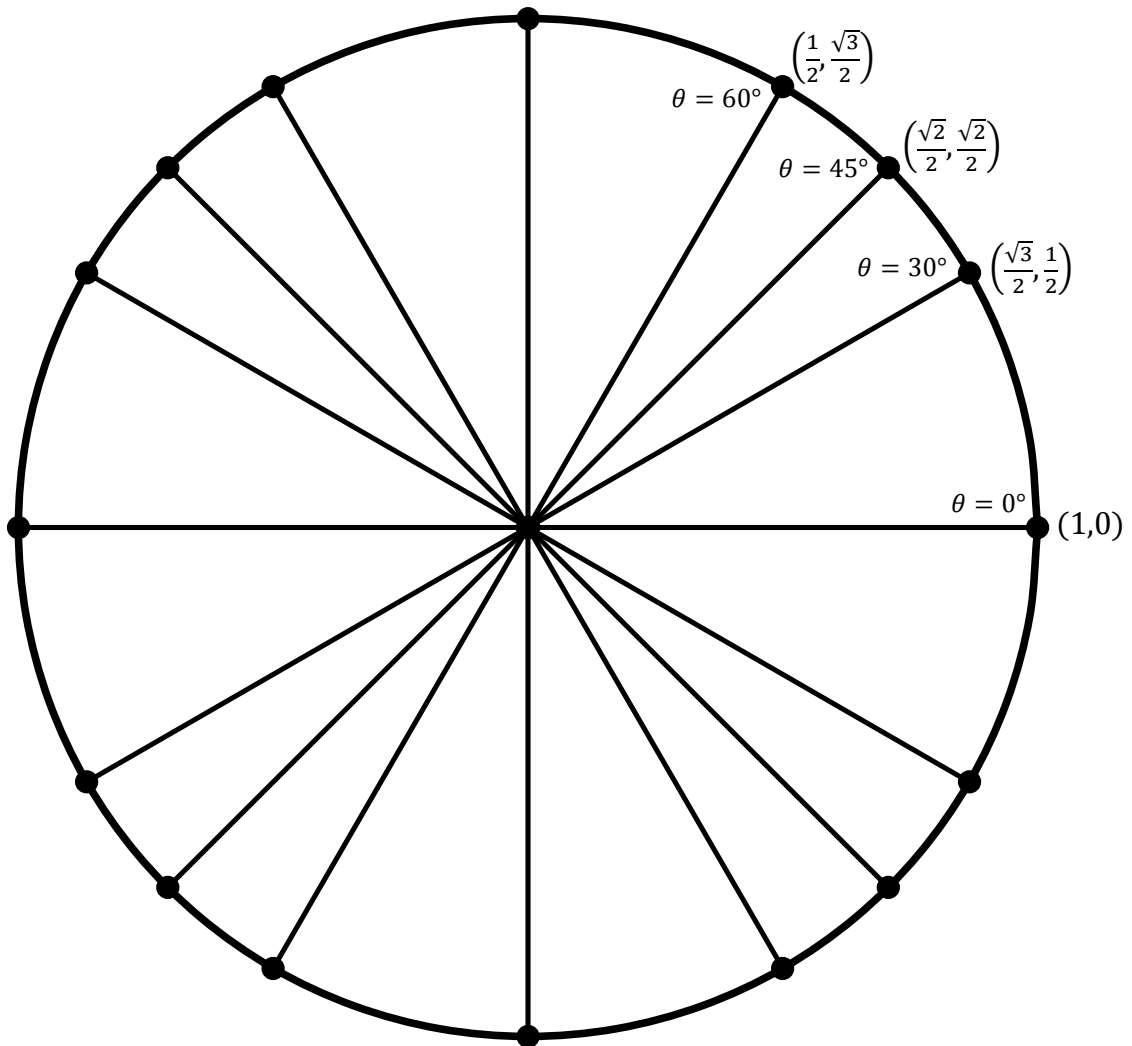


# Trigonometry and the Unit Circle (No Calculator)

Level 1 – 2

1. Point  $P$  lies on a unit circle. The following diagram shows various positions of point  $P$  for angles  $0^\circ$ ,  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ ,  $90^\circ$ ,  $120^\circ$ ,  $135^\circ$ ,  $150^\circ$ ,  $180^\circ$ ,  $210^\circ$ ,  $225^\circ$ ,  $240^\circ$ ,  $270^\circ$ ,  $300^\circ$ ,  $315^\circ$  and  $330^\circ$ .

Some of these angles along with the coordinates of point  $P$  have been written. Complete the diagram by adding all missing angles and coordinates for all points in the diagram.



2. Use your diagram from question 1 to determine the values of the following

- |                |       |                 |       |                 |       |
|----------------|-------|-----------------|-------|-----------------|-------|
| a) $\sin 90$   | ..... | b) $\cos 120$   | ..... | c) $\sin 270$   | ..... |
| d) $\cos 225$  | ..... | e) $\sin 135$   | ..... | f) $\sin 225$   | ..... |
| g) $\sin 150$  | ..... | h) $\cos 300$   | ..... | i) $\sin 240$   | ..... |
| j) $\cos 420$  | ..... | k) $\sin 540$   | ..... | l) $\cos 390$   | ..... |
| m) $\sin(-60)$ | ..... | n) $\cos(-240)$ | ..... | o) $\cos(-225)$ | ..... |

Level 3 – 4

3. Use question 1, along with the fact that  $\tan \theta = \frac{\sin \theta}{\cos \theta}$  to determine the value of the following. Show your working out.

- a)  $\tan 150$  .....
- b)  $\tan 270$  .....
- c)  $\tan 180$  .....
- d)  $\tan 210$  .....
- e)  $\tan(-360)$  .....
- f)  $\tan(-120)$  .....
- g)  $\tan 405$  .....
- h)  $\tan(-135)$  .....
- i)  $\tan 390$  .....

4. a) Write down the smallest positive value of  $\theta$  so that  $\sin \theta$  is equal to

- |                       |                        |
|-----------------------|------------------------|
| i) $\sin 95$ .....    | ii) $\sin(-15)$ .....  |
| iii) $\sin 293$ ..... | iv) $\sin(-200)$ ..... |
| v) $\sin 162$ .....   | vi) $\sin 400$ .....   |

b) Write down the smallest positive value of  $\theta$  so that  $\cos \theta$  is equal to

- |                       |                        |
|-----------------------|------------------------|
| i) $\cos(-10)$ .....  | ii) $\cos 200$ .....   |
| iii) $\cos 307$ ..... | iv) $\cos(-120)$ ..... |
| v) $\cos 490$ .....   | vi) $\cos 263$ .....   |

c) Write down the largest negative value of  $\theta$  so that  $\sin \theta$  is equal to

- |                         |                        |
|-------------------------|------------------------|
| i) $\sin 200$ .....     | ii) $\sin 354$ .....   |
| iii) $\sin(-100)$ ..... | iv) $\sin 170$ .....   |
| v) $\sin 0$ .....       | vi) $\sin(-123)$ ..... |

Level 5 – 6

5. Solve the following equations.

a)  $\sin 3x = \frac{\sqrt{3}}{2}$  for  $0 \leq x < 270$  .....

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.....  
.....

b)  $\cos\left(\frac{x}{2}\right) = 1$  for  $-720 \leq x \leq 720$  .....

.....  
.....  
.....

c)  $\sin(x - 90) = -1$  .....

for  $0 \leq x < 540$  .....

.....  
.....

6. Show that  $\sin^2 \theta + \cos^2 \theta = 1$ .

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.....  
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7. If  $\cos A = \frac{2}{5}$  and  $0 < A < 180$  determine the value of  $\sin A$ .

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8. If  $\sin A = \frac{12}{13}$  and  $90 < A < 270$  determine the value of  $\cos A$ .

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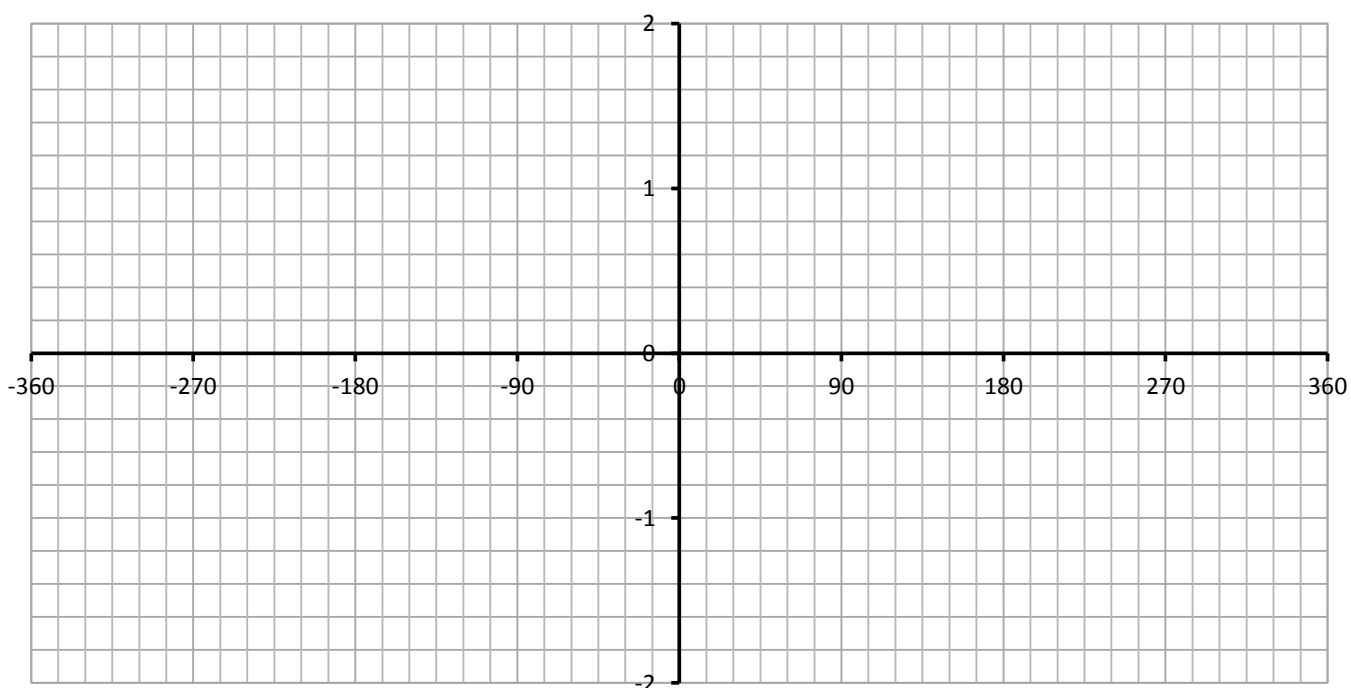
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*Level 7 – 8*

9. Given that

$$\sqrt{3} \approx 1.73 \quad \frac{\sqrt{3}}{3} \approx 0.578$$

sketch the graph of  $y = \tan x$  for  $-360 \leq x \leq 360$ .



*Use this space for any notes you need to make*

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10. Solve the following

a)  $\sin \theta = \sqrt{3} \cos \theta$  for  $0 \leq \theta \leq 540$

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b)  $2 \sin^2 \theta - 9 \sin \theta + 4 = 0$  for  $0 \leq \theta \leq 360$

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