Warm-up Maths Questions for A-level Physics (trigonometry) *ANSWERS*

BASIC TRIGONOMETRY

1. Evaluate: $\sin(30^o)$

sin 30^o = 0.50

2. Evaluate: $\cos(60^o)$

cos 60^o = 0.50

3. Find θ: If $\sin(\theta)=0.5$ and $0^o \leq \theta \leq 90^o$

θ = 30^o

4. Find θ: If $\cos(\theta)=1/2$ and $0^o \leq \theta \leq 90^o$

θ = 60^o

5. Evaluate: $\tan(45^o)$

tan 45^o = 1.0

INTERMEDIATE TRIGONOMETRY

6. Simplify: $\sin(90^o - \theta)$

sin (90º – θ) = cos θ

7. Solve for θ: $\cos(\theta) = \sqrt{3}/2$ and $0^o \leq \theta \leq 360^o$

cos θ = $\sqrt{\frac{3}{2}}$ *= 30º or 330º*

8. Simplify: $2\sin(30^o)\cdot\cos(30^o)$

2 sin 30º cos 30º = 2 x 0.5 x cos 30º = cos 30º = 0.866

**in physics we don't tend to leave numbers as fractions. We prefer to leave them as decimals so that we can see the number of significant figures that are appropriate. In maths you may leave the answer as* $\sqrt{\frac{3}{2}}$

9. Find θ: If $\tan(\theta) = 1$ and $0^o \leq \theta \leq 360^o$

θ = 45º or θ = 225º

10. Evaluate: $\sin(120^o)$

sin 120º = cos 30º = 0.866

ADVANCED TRIGONOMETRY

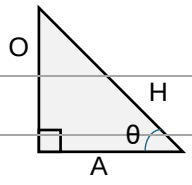
11. Solve for θ: $2\sin(\theta) = 1$ and $0^o \le \theta \le 360^o$

$2 \sin \theta = 1$

$\sin \theta = ½$

$\theta = 30^o$ or $\theta = 150^o$

12. Prove the identity: $\sin^2(\theta)+\cos^2(\theta) = 1$



From the diagram: $\sin \theta = O/H$ *and so* $\sin^2 \theta = O^2 / H^2$

also: $\cos \theta = A/H$ *and so* $\cos^2 \theta = A^2/H^2$

Therefore: $\frac{O^2}{H^2} + \frac{A^2}{H^2} = \frac{O^2+A^2}{H^2}$ *but from Pythagoras* $H^2 = O^2 + A^2$ *so :* $\frac{O^2}{H^2} + \frac{A^2}{H^2} = 1$

13. Find x: If $\sin(x)=\cos(x)$ and $0^o \le x \le 90^o$

$\sin x = \cos x$ *[but* $\sin \theta = \cos (90 – \theta)$*]*

So: $\sin x = \cos (90-x)$ *and so* $x = 45^o$

14. Solve for θ: $\cos^2(\theta)=1/4$ and $0^o \le \theta \le 360^o$

$\cos^2 \theta = ¼$

$\cos \theta = \sqrt{\frac{1}{4}}$ *so:* $\theta = 60^o$ *or* $\theta = 300^o$

15. Evaluate: $\cos^{-1}(1/2)$

$\cos^{-1} 0.5 = 60^o$

COMPLEX TRIGONOMETRY

16. Solve for θ: $2\sin^2(\theta)-1=0$ and $0^o \le \theta \le 360^o$

$\sin^2 \theta = 1/2$

$\sin \theta = \sqrt{1/2}$

$\theta = 45^o$ or $\theta = 135^o$, $\theta = 225^o$, $\theta = 315^o$

17. Find the general solution: $\tan(\theta)=\sqrt{3}$

$\tan \theta = \sqrt{3}$ so $\tan \theta = 60^o$ (for $0^o \le \theta \le 180^o$)

For a general solution: $\tan \theta = 60^o + n180^o$

[later in your studies you will learn to write this as: $\tan \theta = \pi/3 + n\pi$]

18. Simplify: $\sin(2\theta) / \cos(\theta)$

[for this question we can use the trigonometric identity $\sin 2\theta = 2\sin\theta \cos\theta$]

$\frac{\sin 2\theta}{\cos \theta} = \frac{2\sin \theta \cos \theta}{\cos \theta}$ *= 2 sin θ*

19. Solve for θ: $2\cos(\theta)+1=0$ and $0^o \le \theta \le 360^o$

Cos θ = - ½ = 120° or 240°

20. Find θ: $\sin(2\theta)=\cos(\theta)$ and $0^o \le \theta \le 360^o$

2 sin θ cos θ = cos θ

2 sin θ = cos θ / cos θ = 1

sin θ = ½ θ = 30° or 150°