

Trigonometry Worksheet - Year 12  
(Answers)

Ex. B

①

$$(a) \quad 1 - \cos^2 \frac{1}{2} \theta = \underline{\underline{\sin^2 \frac{1}{2} \theta}}$$

$$(b) \quad 5 \sin^2 3\theta + 5 \cos^2 3\theta = 5 (\sin^2 3\theta + \cos^2 3\theta) \\ = 5 \times 1 \\ = \underline{\underline{5}}$$

$$(c) \quad \sin^2 A - 1 = -1 (\sin^2 A + 1) \\ = -1 (1 - \sin^2 A) \\ = -1 \times \cos^2 A \\ = \underline{\underline{-\cos^2 A}}$$

$$(d) \quad \frac{\sin \theta}{\tan \theta} = \sin \theta \div \tan \theta \\ = \sin \theta \div \frac{\sin \theta}{\cos \theta} \\ = \cancel{\sin \theta} \times \frac{\cos \theta}{\cancel{\sin \theta}} \\ = \underline{\underline{\cos \theta}}$$

$$(e) \quad \frac{\sqrt{1 - \cos^2 x}}{\cos x} = \frac{\sqrt{\sin^2 x}}{\cos x} \\ = \frac{\sin x}{\cos x} \\ = \underline{\underline{\tan x}}$$

$$\begin{aligned}
 (f) \quad \frac{\sqrt{1 - \cos^2 3A}}{\sqrt{1 - \sin^2 3A}} &= \frac{\sqrt{\sin^2 3A}}{\sqrt{\cos^2 3A}} \\
 &= \frac{\sin 3A}{\cos 3A} \\
 &= \underline{\underline{\tan 3A}}
 \end{aligned}$$

$$\begin{aligned}
 (g) \quad &(1 + \sin x)^2 + (1 - \sin x)^2 + 2 \cos^2 x \\
 &= 1 + 2\sin x + \sin^2 x + 1 - 2\sin x + \sin^2 x + 2\cos^2 x \\
 &= 2 + 2\sin^2 x + 2\cos^2 x \\
 &= 2 + 2(\sin^2 x + \cos^2 x) \\
 &= 2 + 2 \times 1 \\
 &= \underline{\underline{4}}
 \end{aligned}$$

Note :- In the question above, I have used the short-cuts,

$$(a+b)^2 = a^2 + 2ab + b^2$$

and

$$(a-b)^2 = a^2 - 2ab + b^2$$

$$\begin{aligned}
 (h) \quad \sin^4 \theta + \sin^2 \theta \cos^2 \theta &= \sin^2 \theta (\sin^2 \theta + \cos^2 \theta) \\
 &= \sin^2 \theta \times 1 \\
 &= \underline{\underline{\sin^2 \theta}}
 \end{aligned}$$

$$\begin{aligned}
 (i) \quad \sin^4 \theta + 2\sin^2 \theta \cos^2 \theta + \cos^4 \theta \\
 &= (\sin^2 \theta + \cos^2 \theta)^2 \\
 &= 1^2 \\
 &= \underline{\underline{1}}
 \end{aligned}$$

[Using the short-cut for  $(a+b)^2$ ]

②

$$2 \sin \theta = 3 \cos \theta$$

$(\div \cos \theta)$

$(\div \cos \theta)$

$$\frac{2 \sin \theta}{\cos \theta} = 3$$

$$2 \times \frac{\sin \theta}{\cos \theta} = 3$$

$$2 \tan \theta = 3$$

$$\underline{\underline{\tan \theta = \frac{3}{2}}}$$

③

~~$$\sin x \cos y = 3 \cos x \sin y$$~~

 ~~$(\div \sin x \cos y)$~~  ~~$(\div \sin x \cos y)$~~ 

~~$$\frac{\sin x \cos y}{\sin x}$$~~

③

$$\sin x \cos y = 3 \cos x \sin y$$

$(\div \cos x)$

$(\div \cos x)$

$$\frac{\sin x}{\cos x} \times \cos y = 3 \sin y$$

$$\tan x \cos y = 3 \sin y$$

$(\div \cos y)$

$(\div \cos y)$

$$\tan x = 3 \frac{\sin y}{\cos y}$$

$$\underline{\underline{\tan x = 3 \tan y}}$$

$$(4)(a) \quad \cos^2 \theta = \underline{\underline{1 - \sin^2 \theta}}$$

$$(b) \quad \tan^2 \theta = \frac{\sin^2 \theta}{\cos^2 \theta} \\ = \frac{\sin^2 \theta}{\underline{\underline{1 - \sin^2 \theta}}}$$

$$(c) \quad \cos \theta \tan \theta = \cancel{\cos \theta} \times \frac{\sin \theta}{\cancel{\cos \theta}} \\ = \underline{\underline{\sin \theta}}$$

$$(d) \quad \frac{\cos \theta}{\tan \theta} = \cos \theta \div \tan \theta \\ = \cos \theta \div \frac{\sin \theta}{\cos \theta} \\ = \cos \theta \times \frac{\cos \theta}{\sin \theta} \\ = \frac{\cos^2 \theta}{\sin \theta} \\ = \underline{\underline{\frac{1 - \sin^2 \theta}{\sin \theta}}}$$

$$(e) \quad (\cos \theta - \sin \theta)(\cos \theta + \sin \theta) = \cos^2 \theta - \sin^2 \theta \\ = \underline{\underline{0}} \\ = 1 - \sin^2 \theta - \sin^2 \theta \\ = \underline{\underline{1 - 2\sin^2 \theta}}$$

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$$\begin{aligned} \text{(a)} \quad (\sin \theta + \cos \theta)^2 &\equiv \sin^2 \theta + 2 \sin \theta \cos \theta + \cos^2 \theta \\ &\equiv (\sin^2 \theta + \cos^2 \theta) + 2 \sin \theta \cos \theta \\ &\equiv \underline{\underline{1 + 2 \sin \theta \cos \theta}} \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad \frac{1}{\cos \theta} - \cos \theta &\equiv \frac{1}{\cos \theta} - \frac{\cos \theta}{1} \\ &\equiv \frac{1 - \cos^2 \theta}{\cos \theta} \\ &\equiv \frac{\sin^2 \theta}{\cos \theta} \\ &\equiv \sin \theta \times \frac{\sin \theta}{\cos \theta} \\ &\equiv \underline{\underline{\sin \theta \times \tan \theta}} \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad \tan x + \frac{1}{\tan x} &\equiv \frac{\sin x}{\cos x} + \frac{1}{\sin x / \cos x} \\ &\equiv \frac{\sin x}{\cos x} + 1 \div \frac{\sin x}{\cos x} \\ &\equiv \frac{\sin x}{\cos x} + 1 \times \frac{\cos x}{\sin x} \\ &\equiv \frac{\sin x}{\cos x} + \frac{\cos x}{\sin x} \\ &\equiv \frac{\sin^2 x + \cos^2 x}{\sin x \cos x} \end{aligned}$$

$$\equiv \frac{\cancel{\sin x} \cancel{\cos x}}{\cancel{\sin x} \cancel{\cos x}} = \underline{\underline{\frac{1}{\sin x \cos x}}}$$

$$\begin{aligned}
 (d) \quad \cos^2 A - \sin^2 A &\equiv \cos^2 A - (1 - \cos^2 A) \\
 &\equiv \cos^2 A - 1 + \cos^2 A \\
 &\equiv \underline{\underline{2\cos^2 A - 1}}
 \end{aligned}$$

$$\begin{aligned}
 \cos^2 A - \sin^2 A &\equiv (1 - \sin^2 A) - \sin^2 A \\
 &\equiv 1 - \sin^2 A - \sin^2 A \\
 &\equiv \underline{\underline{1 - 2\sin^2 A}}
 \end{aligned}$$

$$\therefore \cos^2 A - \sin^2 A \equiv 2\cos^2 A - 1 \equiv 1 - 2\sin^2 A //$$

$$\begin{aligned}
 (e) \quad (2\sin\theta - \cos\theta)^2 + (\sin\theta + 2\cos\theta)^2 \\
 &\equiv 4\sin^2\theta - 4\sin\theta\cos\theta + \cos^2\theta + \sin^2\theta + 4\sin\theta\cos\theta \\
 &\quad + 4\cos^2\theta \\
 &\equiv 5\sin^2\theta + 5\cos^2\theta \\
 &\equiv 5(\sin^2\theta + \cos^2\theta) \\
 &\equiv 5 \times 1 \\
 &\equiv \underline{\underline{5}}
 \end{aligned}$$

$$\begin{aligned}
 (f) \quad 2 - (\sin\theta - \cos\theta)^2 &\equiv 2 - (\sin^2\theta - 2\sin\theta\cos\theta + \cos^2\theta) \\
 &\equiv 2 - (\sin^2\theta + \cos^2\theta - 2\sin\theta\cos\theta) \\
 &\equiv 2 - (1 - 2\sin\theta\cos\theta) \\
 &\equiv 2 - 1 + 2\sin\theta\cos\theta \\
 &\equiv 1 + 2\sin\theta\cos\theta \\
 &\equiv (\sin^2\theta + \cos^2\theta) + 2\sin\theta\cos\theta \\
 &\equiv \sin^2\theta + 2\sin\theta\cos\theta + \cos^2\theta \\
 &\equiv \underline{\underline{(\sin\theta + \cos\theta)^2}}
 \end{aligned}$$

$$(9) \quad \sin^2 x \cos^2 y - \cos^2 x \sin^2 y$$

$$\equiv \sin^2 x (1 - \sin^2 y) - (1 - \sin^2 x) \sin^2 y$$

$$\equiv \sin^2 x - \sin^2 x \sin^2 y - \sin^2 y (1 - \sin^2 x)$$

$$\equiv \sin^2 x - \cancel{\sin^2 x \sin^2 y} - \sin^2 y + \cancel{\sin^2 x \sin^2 y}$$

$$\equiv \underline{\underline{\sin^2 x - \sin^2 y}}$$