Outcome 1 – Double angle sine formula

$$\sin 2A = 2\sin A\cos A$$

Bronze example

Example… SOH CAH TOA

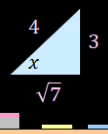
If x is an acute angle with $\sin x = \frac{3}{4}$ find the exact value of $\sin 2x$.

$\sin 2x = 2\sin x \cos x$ — 1. Formula Sheet

$= 2 \times \frac{3}{4} \times \frac{\sqrt{7}}{4}$ — 2. Draw a right angled triangle

$= \frac{6\sqrt{7}}{16}$ ÷ 2

$= \frac{3\sqrt{7}}{8}$ ÷ 2



Use Pythag!

16 - 9 = 7

Bronze questions

For each of the following, determine the exact value of…

1. If A is an acute angle with $\tan A = \frac{4}{3}$ find the exact value of $\sin 2A$.
2. If x is an acute angle with $\sin x = \frac{12}{13}$ find the exact value of $\sin 2x$.
3. If K is an acute angle with $\cos K = \frac{1}{6}$ find the exact value of $\sin 2K$.
4. If p is an acute angle with $\sin p = \frac{5}{9}$ find the exact value of $\sin 2p$.
5. If M is an acute angle with $\tan M = \frac{1}{7}$ find the exact value of $\sin 2M$.
6. If α is an acute angle with $\cos\alpha = \frac{9}{10}$ find the exact value of $\sin 2\alpha$.

Outcome 2 – Double angle cosine formula

$$\cos 2A = \cos^2 A - \sin^2 A$$
$$= 2\cos^2 A - 1$$
$$= 1 - 2\sin^2 A$$

Silver example

Example…

If x is an acute angle with $\cos x = \frac{1}{\sqrt{5}}$ find the exact value of $\cos 2x$.

$\cos 2x = 2\cos^2 x - 1$ — 1. Formula Sheet (you can use any formula)

$= 2\left(\frac{1}{\sqrt{5}}\right)^2 - 1$

$= 2\left(\frac{1}{5}\right) - 1$ — 2. Square it, double it and take away 1!

$= \frac{2}{5} - \frac{5}{5} = -\frac{3}{5}$

Silver questions

For each of the following, determine the exact value of…

1. If A is an acute angle with $\cos A = \frac{1}{4}$ find the exact value of $\cos 2A$.
2. If x is an acute angle with $\tan x = \frac{3}{8}$ find the exact value of $\cos 2x$.
3. If y is an acute angle with $\sin y = \frac{1}{\sqrt{7}}$ find the exact value of $\cos 2y$.
4. If Z is an acute angle with $\cos Z = \frac{2}{7}$ find the exact value of $\cos 2Z$.
5. If A is an acute angle with $\tan B = \frac{\sqrt{2}}{8}$ find the exact value of $\cos 2B$.
6. If A is an acute angle with $\sin p = \frac{9}{11}$ find the exact value of $\cos 2p$.

Outcome 3 – Addition formulae

$$\sin(A \pm B) = \sin A\cos B \pm \cos A\sin B$$
$$\cos(A \pm B) = \cos A\cos B \mp \sin A\sin B$$

Gold example

Example… SOH CAH TOA

If A and B are acute angles with $\sin A = \frac{3}{5}$ and $\cos B = \frac{12}{13}$ find the exact value of $\sin(A + B)$.

1. Formula Sheet 2. Draw RAT's

$\sin(A + B) = \sin A\cos B + \cos A\sin B$

$= \frac{3}{5} \times \frac{12}{13} + \frac{4}{5} \times \frac{5}{13}$

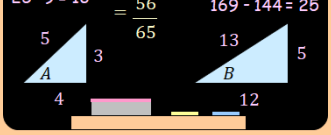
$= \frac{36}{65} + \frac{20}{65}$

$= \frac{56}{65}$

Use Pythag!

25 - 9 = 16

169 - 144 = 25



Gold questions

1. If A and B are acute angles with $\sin A = \frac{1}{5}$ and $\cos B = \frac{5}{6}$ find the exact value of $\sin(A + B)$.
2. If A and B are acute angles with $\sin A = \frac{5}{13}$ and $\cos B = \frac{2}{\sqrt{7}}$ find the exact value of $\sin(A - B)$.
3. If A and B are acute angles with $\sin A = \frac{1}{4}$ and $\cos B = \frac{1}{\sqrt{10}}$ find the exact value of $\cos(A + B)$.
4. If A and B are acute angles with $\sin A = \frac{1}{10}$ and $\cos B = \frac{2}{3}$ find the exact value of $\cos(A - B)$.

Bronze Answers

1 $\frac{24}{25}$ 2 $\frac{120}{169}$

3 $\frac{\sqrt{35}}{18}$ 4 $\frac{20\sqrt{14}}{81}$

5 $\frac{7}{25}$ 6 $\frac{9\sqrt{19}}{50}$

Silver Answers

1 $-\frac{7}{8}$ 2 $\frac{55}{73}$

3 $\frac{5}{7}$ 4 $-\frac{41}{49}$

5 $\frac{31}{33}$ 6 $-\frac{41}{121}$

Gold Answers

1 $\frac{5+2\sqrt{66}}{30}$ 2 $\frac{10-12\sqrt{3}}{13\sqrt{7}}$

3 $\frac{\sqrt{15}-3}{4\sqrt{10}}$ 4 $\frac{6\sqrt{11}+\sqrt{5}}{30}$