

**F.TF.C.9: Angle Sum and Difference Identities 2**

- 1 If  $A$  and  $B$  are positive acute angles,  $\sin A = \frac{5}{13}$ , and  $\cos B = \frac{4}{5}$ , what is the value of  $\sin(A + B)$ ?
- 1)  $\frac{56}{65}$
  - 2)  $\frac{63}{65}$
  - 3)  $\frac{33}{65}$
  - 4)  $-\frac{16}{65}$
- 2 If  $\sin x = \frac{12}{13}$ ,  $\cos y = \frac{3}{5}$ , and  $x$  and  $y$  are acute angles, the value of  $\cos(x - y)$  is
- 1)  $\frac{21}{65}$
  - 2)  $\frac{63}{65}$
  - 3)  $-\frac{14}{65}$
  - 4)  $-\frac{33}{65}$
- 3 If  $\sin A = \frac{3}{5}$ ,  $\sin B = \frac{5}{13}$ , and angles  $A$  and  $B$  are acute angles, what is the value of  $\cos(A - B)$ ?
- 1)  $-\frac{12}{65}$
  - 2)  $\frac{16}{65}$
  - 3)  $\frac{33}{65}$
  - 4)  $\frac{63}{65}$
- 4 If  $A$  and  $B$  are both acute angles,  $\sin A = \frac{5}{13}$  and  $\sin B = \frac{4}{5}$ , then  $\sin(A - B)$  is
- 1)  $-\frac{33}{65}$
  - 2)  $\frac{63}{65}$
  - 3)  $\frac{33}{65}$
  - 4)  $\frac{43}{65}$
- 5 If  $\cos x = \frac{12}{13}$  and  $\sin y = \frac{4}{5}$ , then  $\sin(x - y)$  equals
- 1)  $\frac{72}{65}$
  - 2)  $\frac{56}{65}$
  - 3)  $-\frac{16}{65}$
  - 4)  $-\frac{33}{65}$
- 6 Given angle  $A$  in Quadrant I with  $\sin A = \frac{12}{13}$  and angle  $B$  in Quadrant II with  $\cos B = -\frac{3}{5}$ , what is the value of  $\cos(A - B)$ ?
- 1)  $\frac{33}{65}$
  - 2)  $-\frac{33}{65}$
  - 3)  $\frac{63}{65}$
  - 4)  $-\frac{63}{65}$

Regents Exam Questions

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- 7 If  $\sin A = \frac{4}{5}$ ,  $\tan B = \frac{5}{12}$ , and angles  $A$  and  $B$  are in Quadrant I, what is the value of  $\sin(A + B)$ ?
- 1)  $\frac{63}{65}$
  - 2)  $-\frac{63}{65}$
  - 3)  $\frac{33}{65}$
  - 4)  $-\frac{33}{65}$
- 8 If  $\tan A = 8$  and  $\tan B = \frac{1}{2}$ , what is the value of  $\tan(A + B)$ ?
- 1)  $\frac{4}{3}$
  - 2)  $\frac{17}{10}$
  - 3)  $-\frac{15}{6}$
  - 4)  $-\frac{17}{6}$
- 9 If  $\tan A = \frac{2}{3}$  and  $\tan B = \frac{1}{2}$ , what is the value of  $\tan(A + B)$ ?
- 1)  $\frac{1}{8}$
  - 2)  $\frac{7}{8}$
  - 3)  $\frac{1}{4}$
  - 4)  $\frac{7}{4}$
- 10 If  $\tan A = \frac{2}{3}$  and  $\sin B = \frac{5}{\sqrt{41}}$  and angles  $A$  and  $B$  are in Quadrant I, find the value of  $\tan(A + B)$ .
- 11 If  $\tan A = \frac{2}{3}$  and  $\tan B = 3$ , express  $\tan(A - B)$  as a fraction in simplest form.
- 12 When  $\sin x = -\frac{8}{17}$  and  $x$  lies in Quadrant III and  $\cos y = -\frac{4}{5}$  and  $y$  lies in Quadrant II, what is  $\cos(x - y)$ ?
- 13 Using the formula for  $\cos(x - y)$ , find the exact value of  $\cos 15^\circ$  in radical form if  $m\angle x = 45$  and  $m\angle y = 30$ .
- 14 Express as a single fraction the exact value of  $\sin 75^\circ$ .
- 15 If  $\sin x = \frac{4}{5}$ , where  $0^\circ < x < 90^\circ$ , find the value of  $\cos(x + 180^\circ)$ .

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### Answer Section

1 ANS: 1

If  $\sin A = \frac{5}{13}$  and  $A$  is a positive acute angle,  $\cos A = \frac{12}{13}$ . If  $\cos B = \frac{4}{5}$  and  $B$  is a positive acute angle,  $\sin B = \frac{3}{5}$ .

$$\sin(A + B) = \frac{5}{13} \cdot \frac{4}{5} + \frac{12}{13} \cdot \frac{3}{5} = \frac{56}{65}$$

REF: 060312b

2 ANS: 2

If  $\sin x = \frac{12}{13}$  and  $x$  is an acute angle,  $\cos x = \frac{5}{13}$ . If  $\cos y = \frac{3}{5}$  and  $y$  is an acute angle,  $\sin y = \frac{4}{5}$ .

$$\cos(x - y) = \frac{5}{13} \cdot \frac{3}{5} + \frac{12}{13} \cdot \frac{4}{5} = \frac{63}{65}$$

REF: 080316b

3 ANS: 4

REF: 018620siii

4 ANS: 1

REF: 069020siii

5 ANS: 4

REF: 089432siii

6 ANS: 1

$$\cos(A - B) = \left(\frac{5}{13}\right)\left(-\frac{3}{5}\right) + \left(\frac{12}{13}\right)\left(\frac{4}{5}\right) = -\frac{15}{65} + \frac{48}{65} = \frac{33}{65}$$

REF: 011214a2

7 ANS: 1

If  $\sin A = \frac{4}{5}$  and angle  $A$  is in Quadrant I,  $\cos A = \frac{3}{5}$ . If  $\tan B = \frac{5}{12}$ , and angle  $B$  is in Quadrant I, then

$$\tan^2 B + 1 = \sec^2 B$$

$$\left(\frac{5}{12}\right)^2 + 1 = \sec^2 B$$

$$\frac{25}{144} + 1 = \sec^2 B$$

$$\frac{169}{144} = \sec^2 B$$

$$\frac{13}{12} = \sec B$$

$$\frac{12}{13} = \cos B$$

$$\cos^2 B + \sin^2 B = 1$$

$$\left(\frac{12}{13}\right)^2 + \sin^2 B = 1$$

$$\frac{144}{169} + \sin^2 B = 1$$

$$\sin^2 B = \frac{25}{169}$$

$$\sin B = \frac{5}{13}$$

$$\text{Then } \sin(A + B) = \frac{4}{5} \cdot \frac{12}{13} + \frac{3}{5} \cdot \frac{5}{13} = \frac{63}{65}$$

REF: 080409b

8 ANS: 4

REF: 069525siii

9 ANS: 4

REF: 010018siii

10 ANS:

$$\begin{aligned} \frac{23}{2} \cos^2 B + \sin^2 B &= 1 & \tan B &= \frac{\sin B}{\cos B} = \frac{\frac{5}{\sqrt{41}}}{\frac{4}{\sqrt{41}}} = \frac{5}{4} & \tan(A+B) &= \frac{\frac{2}{3} + \frac{5}{4}}{1 - \left(\frac{2}{3}\right)\left(\frac{5}{4}\right)} = \frac{\frac{8+15}{12}}{\frac{12-10}{12}} = \frac{\frac{23}{12}}{\frac{2}{12}} = \frac{23}{2} \\ \cos^2 B + \left(\frac{5}{\sqrt{41}}\right)^2 &= 1 \\ \cos^2 B + \frac{25}{41} &= \frac{41}{41} \\ \cos^2 B &= \frac{16}{41} \\ \cos B &= \frac{4}{\sqrt{41}} \end{aligned}$$

REF: 081037a2

11 ANS:

$$-\frac{7}{9}$$

REF: 088405siii

12 ANS:

$$\frac{36}{85}$$

REF: 060141siii

13 ANS:

$$\frac{\sqrt{6} + \sqrt{2}}{4}$$

REF: 089041siii

14 ANS:

$$\sin(45 + 30) = \sin 45 \cos 30 + \cos 45 \sin 30$$

$$= \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2} + \frac{\sqrt{2}}{2} \cdot \frac{1}{2} = \frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \frac{\sqrt{6} + \sqrt{2}}{4}$$

REF: 061136a2

15 ANS:

$$\begin{aligned} -\frac{3}{5}. \text{ If } \sin x &= \frac{4}{5} \text{ and } 0^\circ < x < 90^\circ, \text{ then } \cos x = \frac{3}{5}. & \cos(A+B) &= \cos x \cos 180^\circ - \sin x \sin 180^\circ \\ & & &= \frac{3}{5}(-1) - \frac{4}{5}(0) \\ & & &= -\frac{3}{5} \end{aligned}$$

REF: 080126b