

**A2.A.58: Reciprocal Trigonometric Relationships: Know and apply the co-function and reciprocal relationships between trigonometric ratios**

- 1 If  $\csc \theta = -2$ , what is the value of  $\sin \theta$ ?
  - 1)  $-2$
  - 2)  $2$
  - 3)  $-\frac{1}{2}$
  - 4)  $\frac{1}{2}$
- 2 If  $\sin x = \frac{1}{a}$ ,  $a \neq 0$ , which statement must be true?
  - 1)  $\csc x = a$
  - 2)  $\csc x = -\frac{1}{a}$
  - 3)  $\sec x = a$
  - 4)  $\sec x = -\frac{1}{a}$
- 3 The expression  $1 - \sec x$  is equivalent to
  - 1)  $-\tan x$
  - 2)  $\frac{\cos x - 1}{\cos x}$
  - 3)  $\frac{\sin x - 1}{\sin x}$
  - 4)  $\frac{\tan x}{\sec x - 1}$
- 4 For all values of  $x$  for which the expressions are defined,  $\sec x - \tan x$  is equivalent to
  - 1)  $1$
  - 2)  $\cos x - \cot x$
  - 3)  $\frac{1 - \sin x}{\cos x}$
  - 4)  $\frac{\cos x - \sin^2 x}{\sin x \cos x}$
- 5 The expression  $\sec^2 x + \csc^2 x$  is equivalent to
  - 1)  $1$
  - 2)  $\frac{1}{\cos x \sin x}$
  - 3)  $\cos^2 x \sin^2 x$
  - 4)  $\frac{1}{\cos^2 x \sin^2 x}$
- 6 The expression  $\sec^2 \theta - \tan^2 \theta$  is equal to
  - 1)  $1$
  - 2)  $0$
  - 3)  $\sin^2 \theta$
  - 4)  $\frac{1}{\cos^2 \theta}$
- 7 The expression  $\cot \theta \cdot \sec \theta$  is equivalent to
  - 1)  $\frac{\cos \theta}{\sin^2 \theta}$
  - 2)  $\frac{\sin \theta}{\cos^2 \theta}$
  - 3)  $\csc \theta$
  - 4)  $\sin \theta$
- 8 The expression  $(\tan \theta)(\csc \theta)$  is equivalent to
  - 1)  $\cos \theta$
  - 2)  $\sec \theta$
  - 3)  $\csc \theta$
  - 4)  $\csc \theta \cot \theta$
- 9 Expressed in simplest form,  $\csc \theta \cdot \tan \theta \cdot \cos \theta$  is equivalent to
  - 1)  $1$
  - 2)  $\sin \theta$
  - 3)  $\cos \theta$
  - 4)  $\tan \theta$

10 The expression  $(\sec^2 \theta)(\cot^2 \theta)(\sin \theta)$  is equivalent to

- 1)  $\sin \theta$
- 2)  $\cos \theta$
- 3)  $\csc \theta$
- 4)  $\sec \theta$

11 The expression  $\cos y(\csc y - \sec y)$  is equivalent to

- 1)  $\cot y - 1$
- 2)  $\tan y - 1$
- 3)  $1 - \tan y$
- 4)  $-\cos y$

12 The expression  $\sin \theta(\cot \theta - \csc \theta)$  is equivalent to

- 1)  $\cos \theta - \sin^2 \theta$
- 2)  $2 \cos \theta$
- 3)  $-\sin \theta$
- 4)  $\cos \theta - 1$

13 Express  $\cos \theta(\sec \theta - \cos \theta)$ , in terms of  $\sin \theta$ .

14 Which trigonometric expression does *not* simplify to 1?

- 1)  $\sin^2 x(1 + \cot^2 x)$
- 2)  $\sec^2 x(1 - \sin^2 x)$
- 3)  $\cos^2 x(\tan^2 x - 1)$
- 4)  $\cot^2 x(\sec^2 x - 1)$

15 The expression  $(1 + \cos x)(1 - \cos x)$  is equivalent to

- 1) 1
- 2)  $\sec^2 x$
- 3)  $\sin^2 x$
- 4)  $\csc^2 x$

16 The expression  $\frac{\cot x}{\csc x}$  is equivalent to

- 1)  $\sin x$
- 2)  $\cos x$
- 3)  $\tan x$
- 4)  $\sec x$

17 The expression  $\frac{\sec \theta}{\csc \theta}$  is equivalent to

- 1)  $\sin \theta$
- 2)  $\cos \theta$
- 3)  $\frac{\sin \theta}{\cos \theta}$
- 4)  $\frac{\cos \theta}{\sin \theta}$

18 The expression  $\frac{\tan \theta}{\sec \theta}$  is equivalent to

- 1)  $\frac{\cos^2 \theta}{\sin \theta}$
- 2)  $\frac{\sin \theta}{\cos^2 \theta}$
- 3)  $\cos \theta$
- 4)  $\sin \theta$

19 For all values of  $\theta$  for which the expression is defined,  $\frac{\csc \theta}{\sec \theta}$  is equivalent to

- 1)  $\cos \theta$
- 2)  $\sin \theta$
- 3)  $\cot \theta$
- 4)  $\tan \theta$

20 Express  $\frac{\cot x \sin x}{\sec x}$  as a single trigonometric function, in simplest form, for all values of  $x$  for which it is defined.

21 The expression  $\frac{\sin^2 x + \cos^2 x}{\cos x}$  is equal to

- 1)  $\csc x$
- 2)  $\sec x$
- 3)  $\cos x \cdot \tan x$
- 4)  $\sin x \cdot \cos x \cdot \tan x$

22 The expression  $\frac{\sin^2 \theta + \cos^2 \theta}{1 - \sin^2 \theta}$  is equivalent to

- 1)  $\cos^2 \theta$
- 2)  $\sin^2 \theta$
- 3)  $\sec^2 \theta$
- 4)  $\csc^2 \theta$

23 Show that  $\frac{\sec^2 x - 1}{\sec^2 x}$  is equivalent to  $\sin^2 x$ .

24 The expression  $\sin A + \frac{\cos^2 A}{\sin A}$  is equivalent to

- 1) 1
- 2)  $\sin A$
- 3)  $\sec A$
- 4)  $\csc A$

25 The expression  $\frac{\sin^2 B}{\cos B} + \cos B$  is equivalent to

- 1) 1
- 2)  $\frac{1}{\cos B}$
- 3)  $\frac{1}{\sec B}$
- 4)  $\sin^2 B$

26 What is the value of  $\csc \left( \text{Arc sin } \frac{3}{4} \right)$ ?

- 1)  $\frac{3}{4}$
- 2)  $\frac{4}{3}$
- 3)  $\frac{\sqrt{7}}{4}$
- 4)  $\frac{4}{\sqrt{7}}$

27 Evaluate:  $\csc \left( \text{Arc sin } \frac{\sqrt{3}}{2} \right)$

28 What is the value of  $\sec \left( \text{Arc cos } \frac{5}{7} \right)$ ?

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### Answer Section

1 ANS: 3

$$\sin \theta = \frac{1}{\csc \theta} = \frac{1}{-2}$$

REF: 080703b

2 ANS: 1

$$\sin x = \frac{1}{\csc x}.$$

REF: 060904b

3 ANS: 2

$$1 - \sec x = 1 - \frac{1}{\cos x} = \frac{\cos x - 1}{\cos x}$$

REF: 080813b

4 ANS: 3 REF: 068623siii

5 ANS: 4 REF: 089428siii

6 ANS: 1 REF: 060220siii

7 ANS: 3

$$\cot \theta \cdot \sec \theta = \frac{\cos \theta}{\sin \theta} \cdot \frac{1}{\cos \theta} = \frac{1}{\sin \theta} = \csc \theta$$

REF: 010915b

8 ANS: 2 REF: 010122siii

9 ANS: 1 REF: 069921siii

10 ANS: 3 REF: 010427siii

11 ANS: 1 REF: 068731siii

12 ANS: 4 REF: 060018siii

13 ANS:

$$\cos \theta \cdot \frac{1}{\cos \theta} - \cos^2 \theta = 1 - \cos^2 \theta = \sin^2 \theta$$

REF: 061230a2

14 ANS: 3

$$\sin^2 x \left( 1 + \frac{\cos^2 x}{\sin^2 x} \right) = \sin^2 x + \cos^2 x = 1 \cdot \frac{1}{\cos^2 x} (\cos^2 x) = 1 \cdot \cos^2 x \left( \frac{\sin^2 x}{\cos^2 x} - 1 \right) = \sin^2 x - \cos^2 x \neq 1$$

$$\frac{\cos^2 x}{\sin^2 x} \left( \frac{1}{\cos^2 x} - 1 \right) = \frac{1}{\sin^2 x} - \frac{\cos^2 x}{\sin^2 x} = \csc^2 x - \cot x = 1$$

REF: 011515a2

15 ANS: 3

$$(1 + \cos x)(1 - \cos x) = 1 - \cos x + \cos x - \cos^2 x = 1 - \cos^2 x = \sin^2 x$$

REF: 010608b

16 ANS: 2

$$\frac{\cot x}{\csc x} = \frac{\frac{\cos x}{\sin x}}{\frac{1}{\sin x}} = \cos x$$

REF: 061410a2

17 ANS: 3

$$\frac{\sec \theta}{\csc \theta} = \frac{\frac{1}{\cos \theta}}{\frac{1}{\sin \theta}} = \frac{\sin \theta}{\cos \theta}$$

REF: 010402b

18 ANS: 4

$$\frac{\tan \theta}{\sec \theta} = \frac{\frac{\sin \theta}{\cos \theta}}{\frac{1}{\cos \theta}} = \sin \theta$$

REF: 010508b

19 ANS: 3

REF: 080318siii

20 ANS:

$$\frac{\cot x \sin x}{\sec x} = \frac{\frac{\cos x}{\sin x} \sin x}{\frac{1}{\cos x}} = \cos^2 x$$

REF: 061334a2

21 ANS: 2

REF: 089316siii

22 ANS: 3

$$\frac{\sin^2 \theta + \cos^2 \theta}{1 - \sin^2 \theta} = \frac{1}{\cos^2 \theta} = \sec^2 \theta$$

REF: 061123a2

23 ANS:

$$\frac{\frac{1}{\cos^2 x} - 1}{\frac{1}{\cos^2 x}} \cdot \frac{\cos^2 x}{\cos^2 x} = \frac{1 - \cos^2 x}{1} = \sin^2 x$$

REF: 081533a2

24 ANS: 4

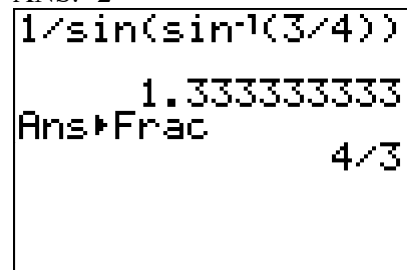
$$\sin A + \frac{\cos^2 A}{\sin A} = \frac{\sin^2 A}{\sin A} + \frac{\cos^2 A}{\sin A} = \frac{\sin^2 A + \cos^2 A}{\sin A} = \frac{1}{\sin A} = \csc A$$

REF: 060720b

25 ANS: 2

REF: 019530siii

26 ANS: 2



Calculator screen showing the expression  $1/\sin(\sin^{-1}(3/4))$  and its results:

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1/sin(sin^-1(3/4))
1.333333333
Ans>Frac
4/3

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REF: 080817b

27 ANS:

$$\frac{2}{\sqrt{3}}$$

REF: 069410siii

28 ANS:

$$\frac{7}{5}$$

REF: 010315siii