F.TF.A.2: Reference Angles

1 Which diagram represents an angle, \( \alpha \), measuring \( \frac{13\pi}{20} \) radians drawn in standard position, and its reference angle, \( \theta \)?

2 \( \sin 190^\circ \) is equal to
   1) \( \sin 10^\circ \)
   2) \( \cos 10^\circ \)
   3) \( -\sin 10^\circ \)
   4) \( -\cos 10^\circ \)

3 Which expression is equivalent to \( \sin(200^\circ) \)?
   1) \( -\sin 20^\circ \)
   2) \( \cos 20^\circ \)
   3) \( \cos 70^\circ \)
   4) \( -\sin 70^\circ \)

4 Expressed as a function of a positive acute angle, \( \sin 230^\circ \) is equal to
   1) \( -\sin 40^\circ \)
   2) \( -\sin 50^\circ \)
   3) \( \sin 40^\circ \)
   4) \( \sin 50^\circ \)

5 The expression \( \sin 240^\circ \) is equivalent to
   1) \( \sin 60^\circ \)
   2) \( \cos 60^\circ \)
   3) \( -\sin 60^\circ \)
   4) \( -\cos 60^\circ \)

6 Which expression is equivalent to \( \sin(-120^\circ) \)?
   1) \( \sin 60^\circ \)
   2) \( -\sin 60^\circ \)
   3) \( \cos 30^\circ \)
   4) \( -\cos 60^\circ \)

7 Expressed as a function of a positive acute angle, \( \sin(-230^\circ) \) is equal to
   1) \( \sin 50^\circ \)
   2) \( -\sin 50^\circ \)
   3) \( \cos 50^\circ \)
   4) \( -\cos 50^\circ \)

8 Which expression is \textit{not} equivalent to \( \sin 150^\circ \)?
   1) \( \sin 30^\circ \)
   2) \( -\sin 210^\circ \)
   3) \( \cos 60^\circ \)
   4) \( -\cos 60^\circ \)
9. Which expression is equivalent to \( \cos 120^\circ \)?
   1) \( \cos 60^\circ \)
   2) \( \cos 30^\circ \)
   3) \( -\sin 60^\circ \)
   4) \( -\sin 30^\circ \)

10. Two straight roads intersect at an angle whose measure is 125°. Which expression is equivalent to the cosine of this angle?
   1) \( \cos 35^\circ \)
   2) \( -\cos 35^\circ \)
   3) \( \cos 55^\circ \)
   4) \( -\cos 55^\circ \)

11. Expressed as a function of a positive acute angle, \( \cos(-305^\circ) \) is equal to
   1) \( -\cos 55^\circ \)
   2) \( \cos 55^\circ \)
   3) \( -\sin 55^\circ \)
   4) \( \sin 55^\circ \)

12. The expression \( \tan(-240^\circ) \) is equivalent to
   1) \( \tan 60^\circ \)
   2) \( -\tan 30^\circ \)
   3) \( -\tan 60^\circ \)
   4) \( \tan 30^\circ \)

13. Expressed as a function of a positive acute angle, \( \cot(-120^\circ) \) is equivalent to
   1) \( -\cot 60^\circ \)
   2) \( \cot 60^\circ \)
   3) \( -\cot 30^\circ \)
   4) \( \cot 30^\circ \)

14. The expression \( \cot(-200^\circ) \) is equivalent to
   1) \( -\tan 20^\circ \)
   2) \( \tan 70^\circ \)
   3) \( -\cot 20^\circ \)
   4) \( \cot 70^\circ \)

15. Express \( \sin(-170^\circ) \) as a function of a positive acute angle.

16. Express \( \sin(-215^\circ) \) as a function of a positive acute angle.

17. Express \( \cos(-155^\circ) \) as a function of a positive acute angle.

18. Express \( \cos(-220^\circ) \) as a function of a positive acute angle.

19. Express \( \tan 230^\circ \) as a function of a positive acute angle.

20. Express \( \tan(-140^\circ) \) as a function of a positive acute angle.

21. Sketch an angle of 250° in standard position and then express \( \cos 250^\circ \) as a cosine function of a positive acute angle.
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Answer Section

1 ANS: 4 REF: 081707aii
2 ANS: 3 REF: 068429siii
3 ANS: 1 REF: 088915siii
4 ANS: 2 REF: 081515a2
5 ANS: 3 REF: 010418siii
6 ANS: 2
   The choices were originally: 1) sin 60°; 2) −sin 60°; 3) cos 30°; 4) −cos 30°, so that (2) and (4) were correct responses.
   REF: 018919siii
7 ANS: 1
   Expressed as a positive angle, sin(−230) = sin 130. −230 + 360 = 130. For the reference angle of a Quadrant II angle, sin θ = sin(180 − θ) = sin(180 − 130) = sin 50.
   REF: 060503b
8 ANS: 4 REF: 010120siii
9 ANS: 4 REF: 060215siii
10 ANS: 4
   \[ \cos \theta = -\cos(180° - \theta) \]
   The terminal side of the angle lies in Quadrant II. \[ \cos 125 = -\cos(180 - 125) \]
   \[ = -\cos 55° \]
   REF: 080511b
11 ANS: 2
   \[ \cos(-305° + 360°) = \cos(55°) \]
   REF: 061104a2
12 ANS: 3 REF: 068535siii
13 ANS: 2 REF: 080330siii
14 ANS: 3 REF: 069933siii
15 ANS:
   −sin 10° or −cos 80°
   REF: 068014siii
16 ANS:
   sin 35° or cos 55°
   REF: 068617siii
17 ANS:
   −sin 65° or −cos 25°
   REF: 088416siii
18 ANS: 
\(-\cos 40^\circ \) or \(-\sin 50^\circ \)

REF: 018406siii

19 ANS:
\(\tan 50^\circ \) or \(\cot 40^\circ \)

REF: 068811siii

20 ANS:
\(\tan 40^\circ \) or \(\cot 50^\circ \)

REF: 068912siii

21 ANS: 

\(-\cos 70^\circ \)

REF: 011734a2