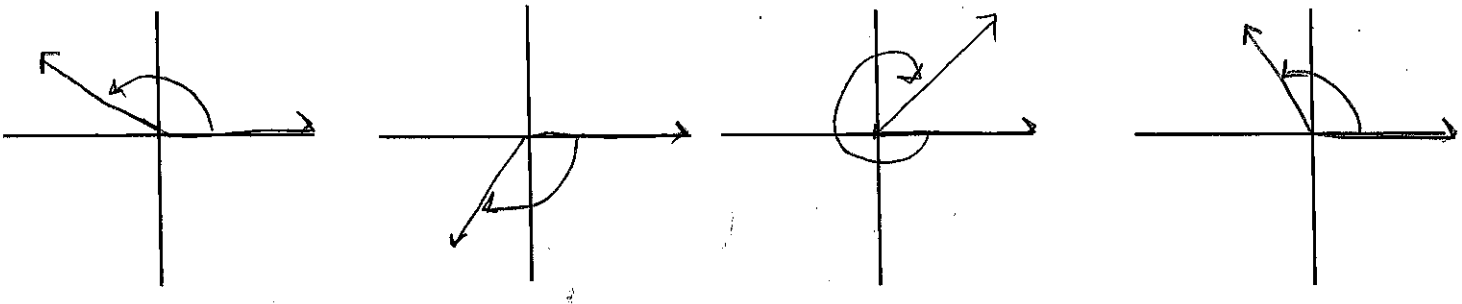
TRIG WORKSHEET—ANGLES NAME Key

I. Sketch each of the following angles in standard position.

1. 150° 2. -120° 3. $-\frac{7\pi}{4}$ 4. $\frac{2\pi}{3} = \frac{4\pi}{6}$



II. Determine the quadrant in which the terminal side of the angle lies. II | I / III | IV

5. 130° II 6. -336° I 7. 285° IV

8. -260° II 9. $\frac{22\pi}{3}$ III $\frac{44\pi}{6}$ 10. $\frac{7\pi}{5}$ III $\frac{7\pi}{5}\cdot\frac{180}{\pi} = 252^\circ$

11. $-\frac{17\pi}{3}$ I $-\frac{34\pi}{6}$ 12. $-\frac{\pi}{12}$ IV $-\frac{\pi}{12}\cdot\frac{180}{\pi} = -15^\circ$ 13. 3.5 III $3.5\cdot\frac{180}{\pi} = 200.5^\circ$

14. -1 IV $-1\cdot\frac{180}{\pi} = -57.3^\circ$

III. Give 2 coterminal angles, one positive and one negative for each of the following. ± 360 / $\pm 2\pi$

15. 34° 394° -326°

16. -45° 315° 420° $420-360=$ -405° $60-360=$

17. -120° 240° -480°

18. 300° 60° -300° $\frac{11\pi}{6}+\frac{12\pi}{6}$ $\frac{11\pi}{6}-\frac{12\pi}{6}$

19. $\frac{4\pi}{3}$ $\frac{10\pi}{3}$ $\frac{-2\pi}{3}$ $\frac{4\pi}{3}+\frac{6\pi}{3}$ $\frac{4\pi}{3}-\frac{6\pi}{3}$ $-\frac{7\pi}{6}+\frac{12\pi}{6}$ $-\frac{7\pi}{6}-\frac{12\pi}{6}$

20. $\frac{11\pi}{6}$ $\frac{23\pi}{6}$ $\frac{-\pi}{6}$ $\frac{\pi}{4}+\frac{8\pi}{4}$ $\frac{\pi}{4}-\frac{8\pi}{4}$

21. $-\frac{7\pi}{6}$ $\frac{5\pi}{6}$ $\frac{-19\pi}{6}$

22. $-\frac{11\pi}{4}$ $\frac{5\pi}{4}$ $\frac{-3\pi}{4}$ $-\frac{11\pi}{4}+\frac{8\pi}{4} = -\frac{3\pi}{4}+\frac{8\pi}{4}$

IV. Express each of the following in radian measure. Leave your answer in terms of π.

23. 150° $\frac{5\pi}{6}$ $150\cdot\frac{\pi}{180}$ 24. 315° $\frac{7\pi}{4}$ $315\cdot\frac{\pi}{180}$ 25. -240° $-\frac{4\pi}{3}$ $-240\cdot\frac{\pi}{180}$

26. 115° $\frac{23\pi}{36}$ $115\cdot\frac{\pi}{180}$ 27. 345° $\frac{23\pi}{12}$ $345\cdot\frac{\pi}{180}$ 28. -216° $-\frac{6\pi}{5}$ $-216\cdot\frac{\pi}{180}$

V. Express each of the following in degree measure.

29. $\frac{5\pi}{9}$ 100° — $\frac{5\pi}{9} \cdot \frac{180}{\pi}$

30. $-\frac{7\pi}{12}$ -105° — $-\frac{7\pi}{12} \cdot \frac{180}{\pi}$

31. $\frac{11\pi}{5}$ 396° — $\frac{11\pi}{5} \cdot \frac{180}{\pi}$

VI. Find the angle in radian measure **between 0 and 2π** which is coterminal with the following. $\pm 2\pi$

32. $\frac{11\pi}{4}$ $\frac{3\pi}{4}$ — $\frac{11\pi}{4} - \frac{8\pi}{4}$

33. $\frac{23\pi}{4}$ $\frac{7\pi}{4}$ — $\frac{23\pi}{4} - \frac{8\pi}{4} = \frac{15\pi}{4} - \frac{8\pi}{4}$

34. $\frac{31\pi}{6}$ $\frac{7\pi}{6}$ — $\frac{31\pi}{6} - \frac{12\pi}{6} = \frac{19\pi}{6} - \frac{12\pi}{6} =$

35. $\frac{40\pi}{3}$ $\frac{4\pi}{3}$ — $\frac{40\pi}{3} - \frac{6\pi}{3} = \frac{34\pi}{3} - \frac{6\pi}{3} = \frac{28\pi}{3} - \frac{6\pi}{3} = \frac{22\pi}{3} - \frac{6\pi}{3} = \frac{16\pi}{3} - \frac{6\pi}{3} = \frac{10\pi}{3} - \frac{6\pi}{3} =$

36. $-\frac{19\pi}{3}$ $\frac{5\pi}{3}$ — $-\frac{19\pi}{3} + \frac{6\pi}{3} = -\frac{13\pi}{3} + \frac{6\pi}{3} = -\frac{7\pi}{3} + \frac{6\pi}{3} = -\frac{\pi}{3} + \frac{6\pi}{3} =$

37. 121π π — $121\pi - 60(2\pi)$

38. $\frac{62\pi}{5}$ $\frac{2\pi}{5}$ — $\frac{62\pi}{5} - \frac{10\pi}{5} = \frac{52\pi}{5} - \frac{10\pi}{5} = \frac{42\pi}{5} - \frac{10\pi}{5} = \frac{32\pi}{5} - \frac{10\pi}{5} = \frac{22\pi}{5} - \frac{10\pi}{5} = \frac{12\pi}{5} - \frac{10\pi}{5} =$

VII. Find the reference angle for each of the following.

39. 208° 28° — $208 - 180 = 28$

40. $\frac{7\pi}{4}$ $\pi/4$ — $-\frac{10\pi}{6}$ $2\pi/6$

41. $\frac{14\pi}{5}$ $\pi/5$

42. -292° 68° — $360 - 292$

43. $-\frac{5\pi}{3}$ $\pi/3$ — $517 - 360 = 157$; $180 - 157$

44. -445° 85°

45. $\frac{13\pi}{9}$ $\frac{4\pi}{9}$ — $\frac{13\pi}{9} \cdot \frac{180}{\pi} = 260^\circ$; $260 - 180 = 80^\circ$; $80^\circ \cdot \frac{\pi}{180} =$

* $\frac{13\pi}{9} - \pi$; $\frac{13\pi}{9} - \frac{9\pi}{9} = \frac{4\pi}{9}$

46. 517° 23°

47. -165° 15°

48. $\frac{17\pi}{6}$ $\pi/6$

49. 322° 38° — $360 - 322$

50. $-\frac{12\pi}{7}$ $\frac{2\pi}{7}$

41. $\frac{14\pi}{5} \cdot \frac{180}{\pi} = 504^\circ$; $504 - 360 = 144^\circ$; $180 - 144 = 36^\circ$; $36 \cdot \frac{\pi}{180} =$

* 44. $3\pi - \frac{14\pi}{5}$; $\frac{15\pi}{5} - \frac{14\pi}{5} = \frac{\pi}{5}$

44. $445 - 360 = 85^\circ$

47. $180 - 165$

50. $-\frac{12\pi}{7} \cdot \frac{180}{\pi} = -308\frac{4}{7}^\circ$; $360^\circ - 308\frac{4}{7}^\circ = 51\frac{3}{7}^\circ = \frac{300^\circ}{7} \cdot \frac{\pi}{180} = \frac{2\pi}{7}$

* 50. $2\pi - \frac{12\pi}{7}$; $\frac{14\pi}{7} - \frac{12\pi}{7} = \frac{2\pi}{7}$