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## Radians and reference angles worksheet answers

Find the reference angles for the following angle measures. 1)  $5\pi/3$  2)  $240^\circ$  3)  $870^\circ$  4)  $8\pi/35$  5)  $-135^\circ$  6)  $-13\pi/4$  Detailed Answer Key 1. Answer : The given angle  $5\pi/3$  (or  $150^\circ$ ) is less than  $2\pi$  (or  $360^\circ$ ). The reference angle is the acute angle formed by the terminal side of the angle  $5\pi/3$  and the x-axis (see the figure shown below).The angle  $5\pi/3$  has its terminal side in quadrant IV, as shown below. So, the reference angle is=  $2\pi - 5\pi/3 = \pi/3$ . Answer : The given angle  $240^\circ$  is less than  $360^\circ$ . The angle  $240^\circ$  has its terminal side in quadrant III, as shown below. So, the reference angle is=  $240^\circ - 180^\circ = 60^\circ$ . Answer : The given angle  $870^\circ$  is greater than  $360^\circ$ . Find the positive angle between  $0^\circ$  and  $360^\circ$  that is coterminal with  $870^\circ$ . Divide  $870^\circ$  by  $360^\circ$  and take the remainder.  $870^\circ \div 360^\circ \rightarrow$  Remainder =  $150^\circ$ The positive angle between  $0^\circ$  and  $360^\circ$  that is coterminal with  $870^\circ$  is  $150^\circ$ . The angle  $150^\circ$  has its terminal side in quadrant II, as shown below. So the reference angle is=  $180^\circ - 150^\circ = 30^\circ$ . Answer : The given angle  $8\pi/3$  is greater than  $2\pi$ . Find the positive angle between 0 and  $2\pi$  that is coterminal with  $8\pi/3$ . To make the process easier, convert  $8\pi/3$  radians to degrees.  $8\pi/3 = 8(180^\circ)/3 = 480^\circ$ Divide  $480^\circ$  by  $360^\circ$  and take the remainder. $480^\circ \div 360^\circ \rightarrow$  Remainder =  $120^\circ$ The terminal side of the angle  $120^\circ$  is in quadrant II.  $120^\circ \cdot \pi/180^\circ = 2\pi/3$  radiansSo, the reference angle is=  $\pi - 2\pi/3 = \pi/3$ . Answer : The given angle  $-135^\circ$  is negative. Add multiples of  $360^\circ$  to  $-135^\circ$  to make the angle as positive such that it is between  $0^\circ$  and  $360^\circ$ .  $-135^\circ + 360^\circ = 225^\circ$  $225^\circ$  is positive and less than  $360^\circ$ . The terminal side of the angle  $225^\circ$  is in quadrant III. So, the reference angle is=  $225^\circ - 180^\circ = 45^\circ$ . Answer : The given angle  $-13\pi/4$  is negative.Add multiples of  $2\pi$  to  $-13\pi/4$  to make the angle as positive such that it is between 0 and  $2\pi$ .  $-13\pi/4 + 2(2\pi) = -13\pi/4 + 4\pi = 3\pi/4$  $3\pi/4$  is positive and less than  $2\pi$ . The terminal side of the angle  $3\pi/4$  (or  $135^\circ$ ) is in quadrant II. So, the reference angle is=  $\pi - 3\pi/4 = \pi/4$  Apart from the stuff given above, if you need any other stuff in math, please use our google custom search here. Kindly mail your feedback to v4formath@gmail.comWe always appreciate your feedback. ©All rights reserved. onlinemath4all.com Find the reference angles for the following angle measures. 1)  $5\pi/3$  2)  $240^\circ$  3)  $870^\circ$  4)  $8\pi/35$  5)  $-135^\circ$  6)  $-13\pi/4$  Detailed Answer Key 1. Answer : The given angle  $5\pi/3$  (or  $150^\circ$ ) is less than  $2\pi$  (or  $360^\circ$ ). The reference angle is the acute angle formed by the terminal side of the angle  $5\pi/3$  and the x-axis (see the figure shown below).The angle  $5\pi/3$  has its terminal side in quadrant IV, as shown below. So, the reference angle is=  $2\pi - 5\pi/3 = \pi/3$ . Answer : The given angle  $240^\circ$  is less than  $360^\circ$ . The angle  $240^\circ$  has its terminal side in quadrant III, as shown below. So, the reference angle is=  $240^\circ - 180^\circ = 60^\circ$ . Answer : The given angle  $870^\circ$  is greater than  $360^\circ$ . Find the positive angle between  $0^\circ$  and  $360^\circ$  that is coterminal with  $870^\circ$ . Divide  $870^\circ$  by  $360^\circ$  and take the remainder.  $870^\circ \div 360^\circ \rightarrow$  Remainder =  $150^\circ$ The positive angle between  $0^\circ$  and  $360^\circ$  that is coterminal with  $870^\circ$  is  $150^\circ$ . The angle  $150^\circ$  has its terminal side in quadrant II, as shown below. So the reference angle is=  $180^\circ - 150^\circ = 30^\circ$ . Answer : The given angle  $8\pi/3$  is greater than  $2\pi$ . Find the positive angle between 0 and  $2\pi$  that is coterminal with  $8\pi/3$ . To make the process easier, convert  $8\pi/3$  radians to degrees.  $8\pi/3 = 8(180^\circ)/3 = 480^\circ$ Divide  $480^\circ$  by  $360^\circ$  and take the remainder. $480^\circ \div 360^\circ \rightarrow$  Remainder =  $120^\circ$ The terminal side of the angle  $120^\circ$  is in quadrant II.  $120^\circ \cdot \pi/180^\circ = 2\pi/3$  radiansSo, the reference angle is=  $\pi - 2\pi/3 = \pi/3$ . Answer : The given angle  $-135^\circ$  is negative. Add multiples of  $360^\circ$  to  $-135^\circ$  to make the angle as positive such that it is between  $0^\circ$  and  $360^\circ$ .  $-135^\circ + 360^\circ = 225^\circ$  $225^\circ$  is positive and less than  $360^\circ$ . The terminal side of the angle  $225^\circ$  is in quadrant III. So, the reference angle is=  $225^\circ - 180^\circ = 45^\circ$ . Answer : The given angle  $-13\pi/4$  is negative.Add multiples of  $2\pi$  to  $-13\pi/4$  to make the angle as positive such that it is between 0 and  $2\pi$ .  $-13\pi/4 + 2(2\pi) = -13\pi/4 + 4\pi = 3\pi/4$  $3\pi/4$  is positive and less than  $2\pi$ . The terminal side of the angle  $3\pi/4$  (or  $135^\circ$ ) is in quadrant II. So, the reference angle is=  $\pi - 3\pi/4 = \pi/4$  Apart from the stuff given above, if you need any other stuff in math, please use our google custom search here. Kindly mail your feedback to v4formath@gmail.comWe always appreciate your feedback. ©All rights reserved. onlinemath4all.com

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