LESSON MAKER PRO

Angle Value Estimates

Use reference angles to estimate sine and cosine.

HIGH SCHOOL · PC.T.1.6

PC.T.1.6 "Estimate trigonometric values of any angle."

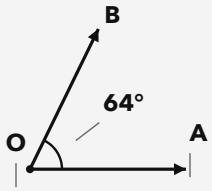
NAME _____ DATE _____

ESTIMATE FROM BENCHMARKS

At 30°, 45°, and 60°, sine is about 0.5, 0.7, and 0.87. Cosine at those angles is about 0.87, 0.7, and 0.5. For any angle, find its reference angle, use the nearest benchmark, and choose the sign from the quadrant.

WORKED EXAMPLE

Use the angle shown to estimate its cosine.

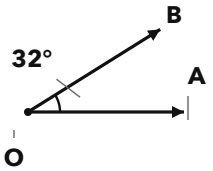


1. 64° is in quadrant I, so its cosine is positive.
2. Its reference angle, 64°, is closest to 60°.
3. Use cos 60° ≈ 0.5.

Answer: cos 64° ≈ 0.5

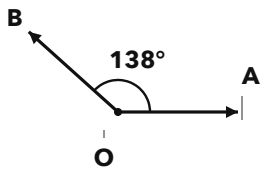
PRACTICE 6 problems

1 Use the angle shown to estimate its sine.



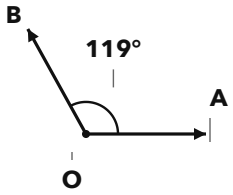
ANSWER _____

2 Use the angle shown to estimate its cosine.



ANSWER _____

3 Use the angle shown to estimate its sine.



ANSWER _____

4 Estimate sin 211° using the nearest benchmark reference angle.

ANSWER _____

5 Estimate cos 316° using the nearest benchmark reference angle.

ANSWER _____

6 Estimate sin(-59°) using the nearest benchmark reference angle.

ANSWER _____

APPLY IT Show your work

1 In a video game, a character moves at 10 meters per second in a direction 238° counterclockwise from the positive horizontal axis. Estimate the character's horizontal velocity. Include a sign to show direction.

WORK SPACE

ANSWER _____

2 A drone flies 20 meters at a heading of 133° counterclockwise from east. Estimate how far north it travels.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Estimate sin(-227°) + cos 493°. Explain why you chose the signs of your estimates.

WORK SPACE AND ANSWER

Angle Value Estimates

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Use the angle shown to estimate its sine.	**sin 32° ≈ 0.5**
2	Use the angle shown to estimate its cosine.	**cos 138° ≈ -0.7**
3	Use the angle shown to estimate its sine.	**sin 119° ≈ 0.87**
4	Estimate sin 211° using the nearest benchmark reference angle.	**sin 211° ≈ -0.5**
5	Estimate cos 316° using the nearest benchmark reference angle.	**cos 316° ≈ 0.7**
6	Estimate sin(-59°) using the nearest benchmark reference angle.	**sin(-59°) ≈ -0.87**

PART 2 · APPLY IT

1. **About -5 meters per second** The reference angle is 58°, near 60°. In quadrant III, cosine is negative, so the horizontal velocity is about 10(-0.5) = -5 meters per second.
2. **About 14 meters north** The reference angle is 47°, near 45°. Sine is positive in quadrant II, so the northward displacement is about 20(0.7) = 14 meters.

CHALLENGE

About 0. Both angles are coterminal with 133°, which is in quadrant II. Its reference angle is 47°, near 45°, so sine is about 0.7 and cosine is about -0.7.

Accept estimates based on the stated benchmark values and correct quadrant signs. Equivalent wording for signed horizontal velocity is acceptable.