

Trigonometric Functions and the Unit Circle: math test, Grade 12 – download the PDF

Suggested time: 45 minutes. Out of 20 points. Calculator allowed only when the problem says so.

1 Radians and arcs

/ 4 pts

a) Convert 210° to radians. b) Convert $\frac{11\pi}{4}$ to degrees. c) Find the arc length of a sector of radius **9 in** and central angle $\frac{2\pi}{3}$. d) Find the exact area of that sector.

2 Exact values

/ 4 pts

Give the exact value (no calculator): a) $\sin \frac{5\pi}{3}$ b) $\cos \frac{3\pi}{4}$ c) $\tan \frac{7\pi}{6}$ d) $\sec \frac{11\pi}{6}$ (rationalize).

3 Using the Pythagorean identity

/ 3 pts

Suppose $\cos \theta = -\frac{8}{17}$ and θ is in quadrant III. Find $\sin \theta$, $\tan \theta$ and $\csc \theta$.

4 A ladder (calculator allowed)

/ 3 pts

A **4.5 m** ladder makes a **64°** angle with the ground. Draw a sketch, then find how high the ladder reaches and how far its foot is from the wall, to the nearest hundredth of a meter.

5 Solving an equation

/ 3 pts

Solve $2 \cos \theta + 1 = 0$ for $0 \leq \theta < 2\pi$.

6 Wind turbine (calculator allowed)

/ 3 pts

A wind turbine blade is **120 ft** long and the rotor turns at **15 rpm**. Find the angular velocity in radians per minute, the speed of the blade tip in feet per minute, and that speed in miles per hour (**1 mi = 5280 ft**), to the nearest tenth.



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