Warm up

State the exact values of the following trig angles.

1. $\tan\frac{\pi}{6}$
2. $\sin 30°$
3. $\cos\frac{\pi}{4}$
4. $\tan 60°$
5. $\cos 30°$
6. $\sin\frac{\pi}{3}$

Dec 20-8:17 AM

GO COUGARS!

p 265 Homework Questions

In Exercises 11–14, determine two coterminal angles in radian measure (one positive and one negative) for each angle. (There are many correct answers.)

11. (a) (b)

13. (a) $\frac{9\pi}{4}$ (b) $-\frac{2\pi}{15}$

14. (a) $\frac{7\pi}{8}$ (b) $\frac{8\pi}{45}$

In Exercises 15–20, find (if possible) the complement and supplement of the angle.

15. $\frac{\pi}{3}$ 16. $\frac{3\pi}{4}$

17. $\frac{\pi}{6}$ 18. $\frac{2\pi}{3}$

19. 1 20. 2

In Exercises 31–34, determine two coterminal angles in degree measure (one positive and one negative) for each angle. (There are many correct answers.)

31. (a) (b) $\theta = -36°$

$\theta = 52°$

32. (a) (b) $\theta = -390°$

$\theta = 114°$

33. (a) 300° (b) 230°

34. (a) $-445°$ (b) $-740°$

In Exercises 35–38, find (if possible) the complement and supplement of the angle.

35. 24° 36. 129°

37. 87° 38. 167°

In Exercises 39–42, rewrite each angle in radian measure as a multiple of π. (Do not use a calculator.)

39. (a) 30° (b) 150°

40. (a) 315° (b) 120°

41. (a) $-20°$ (b) $-240°$

42. (a) $-270°$ (b) 144°

In Exercises 43–46, rewrite each angle in degree measure. (Do not use a calculator.)

43. (a) $\frac{3\pi}{2}$ (b) $-\frac{7\pi}{6}$

44. (a) -4π (b) 3π

45. (a) $\frac{7\pi}{3}$ (b) $-\frac{13\pi}{60}$

46. (a) $-\frac{15\pi}{6}$ (b) $\frac{28\pi}{15}$

In Exercises 47–52, convert the angle measure from degrees to radians. Round your answer to three decimal places.

47. 115° 48. 83.7°

49. 216.35° 50. $-46.52°$

51. $-0.78°$ 52. 395°

In Exercises 53–58, convert the angle measure from radians to degrees. Round your answer to three decimal places.

53. $\frac{\pi}{7}$ 54. $\frac{5\pi}{13}$

55. 5.5π 56. -4.2π

57. -2 58. 0.48

In Exercises 59–64, use the angle-conversion capabilities of a graphing utility to convert the angle measure to decimal degree form. Round your answer to three decimal places if necessary.

59. 64° 45′ 60. −124° 30′

61. 85° 18′ 30″ 62. −408° 16′ 25″

63. −125° 36′ 64. 330° 25′

In Exercises 65–70, use the angle-conversion capabilities of a graphing utility to convert the angle measure to D° M′ S″ form.

65. 280.6° 66. −115.8°

67. 345.12° 68. 310.75°

69. −0.355 70. 0.7865

$-0.48 \cdot \frac{180}{\pi} = -27.5°$

$330° 0' 25''$

$7.865 \cdot \frac{180}{\pi} \rightarrow$ DMS

Feb 2-9:51 PM

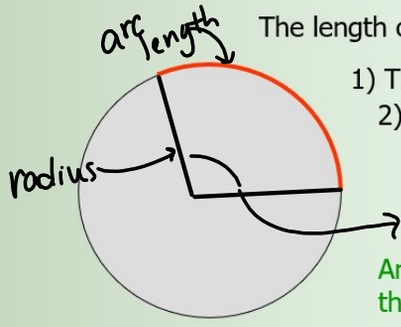
4-1 Angular Speed and Linear Speed

- arc length
- converting angular speed to linear speed and linear speed to angular speed

Jan 11-2:50 PM

Arc Length

- The length of part of the circumference.



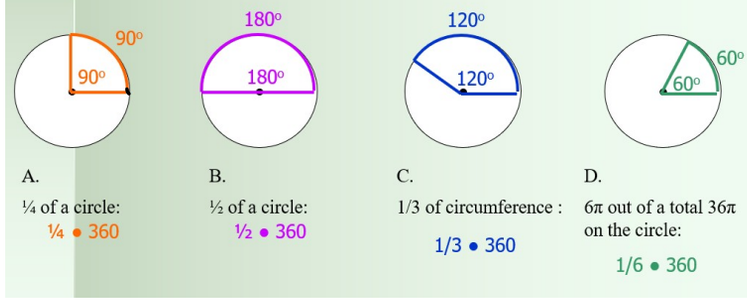
The length of the arc depends on what two things?

1) The measure of the arc.
2) The size of the circle. ⇒ radius

An arc length measures distance while the measure of an arc is in degrees.

Arc Length Formula

➔ **Portions of a Circle:** Determine the Arc measure based on the portion given.



A. ¼ of a circle: ¼ • 360

B. ½ of a circle: ½ • 360

C. 1/3 of circumference : 1/3 • 360

D. 6π out of a total 36π on the circle: 1/6 • 360

Arc length = $\frac{\text{deg}}{360} \bullet 2\pi r$

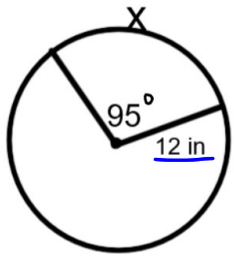
arc length = radians · radius

$\frac{2\pi}{360} \cdot \text{deg} \cdot r$

deg → rad ← $\frac{\pi}{180} \cdot \text{deg} \cdot r$

radians

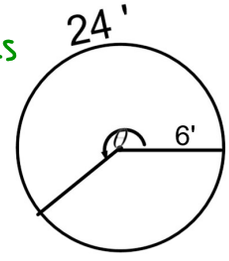
Arc Length



$AL = \text{radians} \cdot \text{radius}$

$(95 \cdot \frac{\pi}{180})(12\text{ in})$

19.9 in



$\frac{24'}{6'} = \frac{\theta \cdot 6'}{6'}$

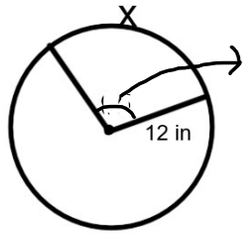
$4\text{rad} = \theta$

indeg?? $4 \cdot \frac{180}{\pi} = \theta$

$229.18° = \theta$

Jan 7-4:10 PM

Find the value of x.



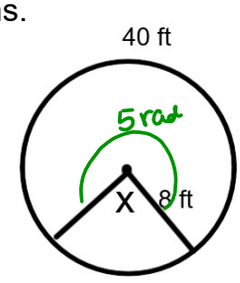
$\frac{2\pi}{3}$

$x = \frac{2\pi}{3} \cdot 12 \text{ in}$

$= 24\frac{\pi}{3} \text{ in}$

$= 8\pi \text{ in}$

Find x in radians.



θ (already in radians)

$x = 5$ rad.

$x = 1.28$ rad

$6.28 - 5 = 1.28$

Angular Speed - the rate at which an angle grows
- measured in radians/time
(rad/sec, rad/hr, etc)

Linear Speed - the rate at which the arc length grows
- measured in length/time
(ft/sec, m/hr, meters/min, etc)
- also can be referred to as velocity

Jan 9-7:26 AM

A wheel rotates 200 revolutions per minute. Find the angular speed (rad/min) of the wheel.
(remember for every 1 revolution there are 2π rad.)

$$AS = 200 \frac{\text{rev}}{\text{min}} \cdot \frac{2\pi \text{ rad}}{1 \text{ rev}}$$
$$= 400\pi \frac{\text{rad}}{\text{min}}$$
$$= 1256.64 \frac{\text{rad}}{\text{min}}$$

Jan 9-7:33 AM

To convert angular speed:

1 revolution = 2π radians

1 radian = length of a radius

The wheel from the previous problem has a radius of 7 inches. Find the linear speed of a point on the wheel in in/sec.

$LS = AS \cdot \text{radius}$

$LS = \text{radians} \cdot \text{radius}$

$$LS = 400\pi \frac{\text{rad}}{\text{min}} \cdot \frac{7 \text{ in}}{1 \text{ rad}}$$
$$LS = 2800\pi \frac{\text{in}}{\text{min}} \cdot \frac{1 \text{ min}}{60 \text{ sec}}$$
$$= 146.61 \frac{\text{in}}{\text{sec}}$$

How fast is the wheel moving in mph?

$$2800\pi \frac{\text{in}}{\text{min}} \cdot \frac{1 \text{ ft}}{12 \text{ in}} \cdot \frac{1 \text{ mi}}{5280 \text{ ft}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} =$$

8.33 mph

Jan 9-7:35 AM

A 12-inch diameter wheel is traveling 35 mph. What is the angular speed of the wheel? What is the rate of revolution in seconds? LS = radians · radius

r = 6in

LS = 35mph

? = $\frac{rev}{sec}$

$\frac{12\,in}{1\,ft} \cdot \frac{5280\,ft}{1\,mi} \cdot 35\frac{mi}{h} = AS \cdot 6in$

$\frac{2217600\,in/hr}{6in} = \frac{AS \cdot 6in}{6in}$

$\frac{1\,min}{60\,sec} \frac{1\,hr}{60\,min} \cdot \frac{1\,rev}{2\pi\,rad} \cdot 369600\,\frac{rad}{hr} = AS$ (2π rad = 1 rev)

$\rightarrow 16.34\frac{rev}{sec}$

The second hand of a clock is 10.2 cm. long. Find the linear speed of the tip of the second hand.

r = 10.2 cm

LS = AS · radius

$= \frac{1\,rev}{min} \cdot \frac{2\pi\,rad}{1\,rev} \cdot \frac{10.2cm}{1\,rad}$

$= 64.09\,cm/min$

$\frac{1\,rev}{min}$

Jan 9-7:42 AM

HOMEWORK

Section 4.1 parts 3 and 4

p 266 (71-91 odd, 76, 92-100 even)

Workbook p 96 1-4

Workbook answers

1. 52.36 mph
2. 387.85 rev/min
3. 12566 teeth

4a. 14.137 rad/sec

b. 16.96 meters/sec

c. 8.48 meters/sec

Aug 29-6:38 AM