

مراجعة الدرس الثاني من الوحدة التاسعة Angular and Coordinates Angular انسباير منهج Displacement



تم تحميل هذا الملف من موقع المناهج الإماراتية

موقع المناهج ← المناهج الإماراتية ← الصف الحادي عشر المتقدم ← فيزياء ← الفصل الثالث ← ملفات متنوعة ← الملف

تاريخ إضافة الملف على موقع المناهج: 2025-06-08 17:46:48

ملفات اكتب للمعلم اكتب للطالب | اختبارات الكترونية | اختبارات | حلول | عروض بوربوينت | أوراق عمل
منهج انجليزي | ملخصات وتقارير | مذكرات وبنوك | الامتحان النهائي | للمدرس

المزيد من مادة
فيزياء:

التواصل الاجتماعي بحسب الصف الحادي عشر المتقدم



صفحة المناهج
الإماراتية على
فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

المزيد من الملفات بحسب الصف الحادي عشر المتقدم والمادة فيزياء في الفصل الثالث

مراجعة الدرس الأول من الوحدة التاسعة Coordinates Polar منهج انسباير

1

مراجعة الدرس الأول من الوحدة الثامنة gravity of center and mass of Center منهج انسباير

2

كل ما يخص اختبار نهاية الفصل الثالث ليوم الثلاثاء بتاريخ 2025-06-10

3

نموذج اختبار تجريبي باللغتين العربية والانجليزية بدون الحل

4

ملخص تجميعية قوانين الفيزياء منهج انسباير

5

Unit 9: Circular motion

Section 9.2

Angular Coordinates and Angular Displacement



Learning Objectives

Section 9.2

Angular Coordinates and Angular Displacement

- 1) Define the angular displacement.
- 2) Find the angular displacement in degrees and radians.
- 3) Define and calculate the arc length.



Angular displacement

Arc length

2025

2024

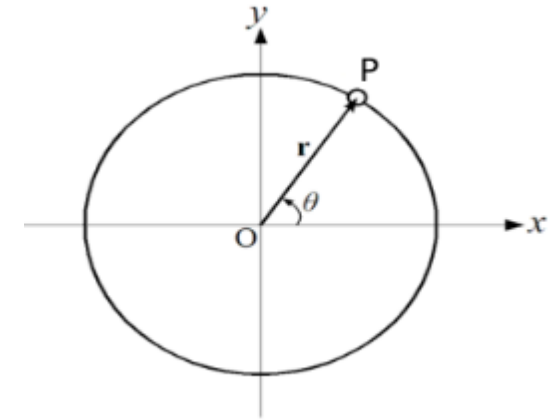
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Remember:

- How to convert from Cartesian coordinates to polar coordinates?

$$r = \sqrt{x^2 + y^2}$$

$$\theta = \tan^{-1}(y/x).$$

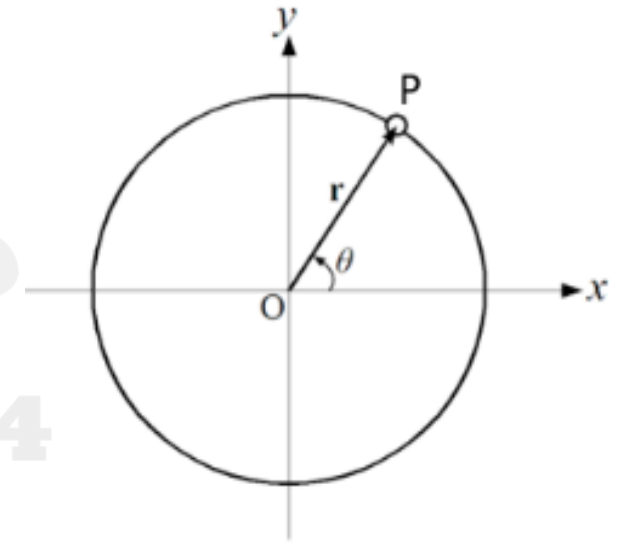


- How to convert from polar coordinates to Cartesian coordinates?

$$x = r \cos \theta$$

$$y = r \sin \theta$$

- Polar coordinates allow us to describe and analyze circular motion.
- Where the distance of the moving object from the origin (r) remains constant and the angle θ varies as a function of time.
- Angle θ is measured with respect to the positive x- axis , and any point on the positive $\theta = 0$



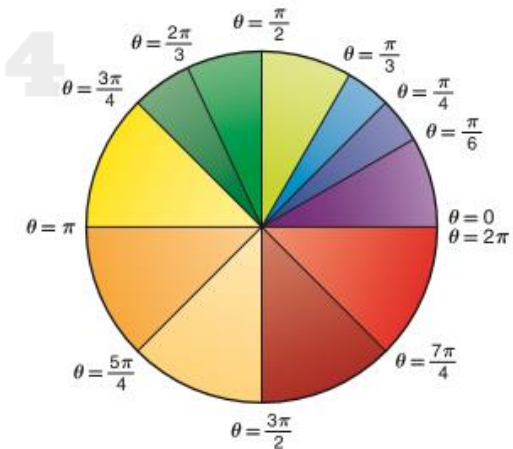
L.O: Define the angular displacement.



What is the definition of the angular displacement ?

Angular displacement ($\Delta\theta$) : is the difference between two angles.

$$\Delta\theta = \theta_2 - \theta_1$$



L.O: Find the angular displacement in degrees and radians.

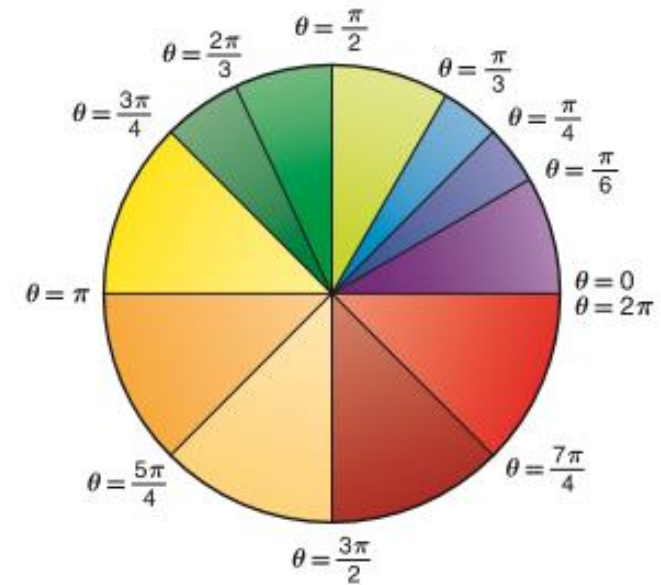
The two most commonly used units for **angles** are:

1) **Degrees (°)**

2) **radian (rad)**

These units specify that an angle measured in **one complete circle** is equal to **360°**, which is equivalent to **2π rad**.

$$360^\circ = 2\pi \text{ rad}$$



L.O: Find the angular displacement in degrees and radians.

The unit conversion between angle measures is:

$$\theta_{rad} = \frac{\pi}{180^\circ} \theta^\circ$$

L.O: Find the angular displacement in degrees and radians.

1 rad is equivalent to how many degrees?

$$\theta^{\circ} = \frac{180^{\circ}}{\pi} \theta_{rad}$$

$$\theta^{\circ} = \frac{180^{\circ}}{\pi} \times 1 = \frac{180^{\circ}}{\pi} = 57.3^{\circ}$$

$$1 \text{ rad} = \frac{180^{\circ}}{\pi} \approx 57.3^{\circ}$$

L.O: Find the angular displacement in degrees and radians.

WS # 5: (Exercise 1)

Convert the following angles from degrees to radians:

1) 60° $\frac{\pi}{3} rad = 1.05 rad$

$$\theta_{rad} = \frac{\pi}{180^\circ} \theta^\circ$$

2) 90° $\frac{\pi}{2} rad = 1.57 rad$

3) 115° $\frac{23}{36} \pi rad = 2.01 rad$

L.O: Find the angular displacement in degrees and radians.

WS # 5: (Exercise 2)

Convert the following angles from radians to degrees:

$$\theta^{\circ} = \frac{180^{\circ}}{\pi} \theta_{rad}$$

1. 2π rad

360°

2. π rad

180°

3. 0.64 rad

36.7°

L.O: Find the angular displacement in degrees and radians.

WS # 5: (Exercise 3)



كم درجة تقابل 1 راديان؟

How many **degrees** correspond to 1 radian?

57.3°

90.0°

75.0°

45.0°

2025

2024

موقع المناهج الإلكترونية

L.O: Find the angular displacement in degrees and radians.

EXAMPLE 9.1

Locating a Point with Cartesian and Polar Coordinates

A point has a location given in Cartesian coordinates as (4,3), as shown in Figure 9.5.

PROBLEM

How do we represent the position of this point in polar coordinates?

SOLUTION

Using equation 9.1, we can calculate the radial coordinate:

$$r = \sqrt{x^2 + y^2} = \sqrt{4^2 + 3^2} = 5.$$

Using equation 9.2, we can calculate the angular coordinate:

$$\theta = \tan^{-1}(y/x) = \tan^{-1}(3/4) = 0.64 \text{ rad} = 37^\circ.$$

Therefore, we can express the position of point P in polar coordinates as $(r, \theta) = (5, 0.64 \text{ rad}) = (5, 37^\circ)$. Note that we can specify the same position by adding (any integral multiple of) $2\pi \text{ rad}$, or 360° , to θ :

$$(r, \theta) = (5, 0.64 \text{ rad}) = (5, 37^\circ) = (5, 2\pi \text{ rad} + 0.64 \text{ rad}) = (5, 360^\circ + 37^\circ).$$

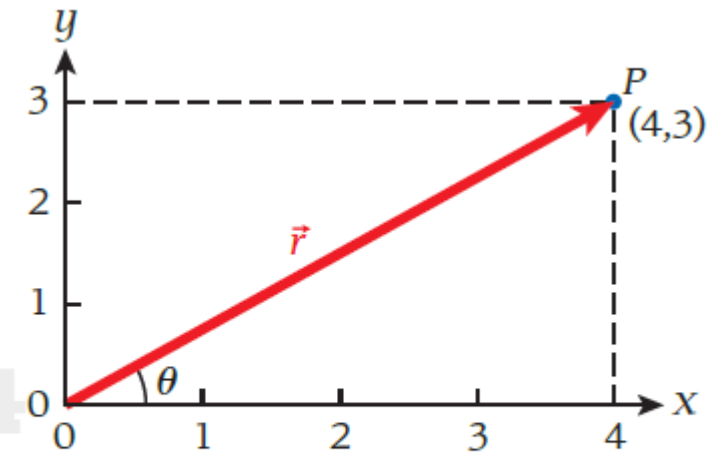


FIGURE 9.5 A point located at (4,3) in a Cartesian coordinate system.

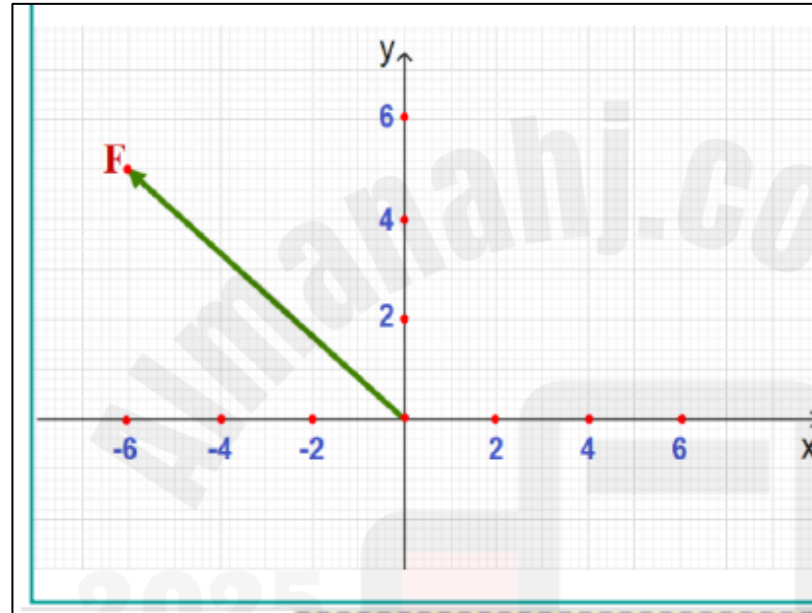
Answer:

$$(r, \theta) = (5, 0.64 \text{ rad})$$

L.O: Find the angular displacement in degrees and radians.



WS # 5: (Exercise 4)



النقطة **F** لها موقع محدد بالإحداثيات الديكارتية، كما هو موضح في الشكل.
كيف نمثل موضع النقطة **F** في الإحداثيات القطبية؟

A point **F** has a location given in cartesian coordinates, as shown in Figure.
How do we represent the position of point **F** in **polar coordinates**?

→ $(r, \theta) = (\sqrt{61}, 2.447 \text{ rad})$

$(r, \theta) = (\sqrt{11}, 2.447 \text{ rad})$

$(r, \theta) = (\sqrt{61}, 0.876 \text{ rad})$

$(r, \theta) = (\sqrt{11}, 0.876 \text{ rad})$



L.O: Define and calculate the arc length.

Arc length

- The figure shows (in green) the path on the circumference of the circle traveled by the tip of the vector r as it moves from angle zero to angle θ .

- This path is called the Arc length s .

- The radius and angle are related by the relationship:

$$s = r\theta$$

- The angle must be in **radians** when substituting this relationship to calculate the arc length.
- The arc length has the same unit as the radius.

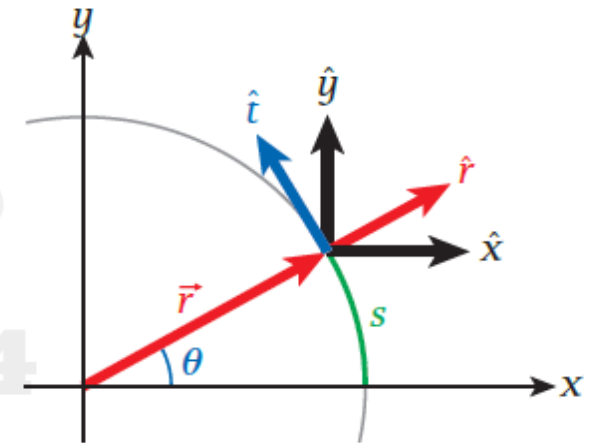


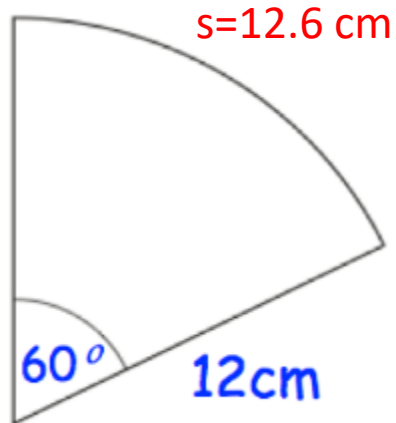
FIGURE 9.3 Polar coordinate system for circular motion.

L.O: Define and calculate the arc length.

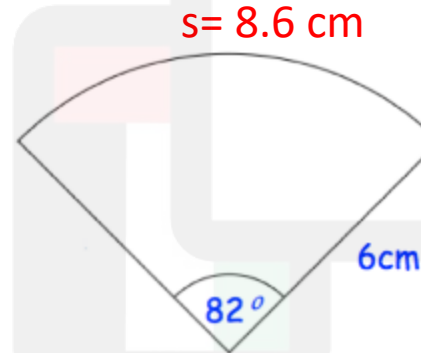
WS # 5: (Exercise 5)

Based on the adjacent shapes, calculate the arc length of each.

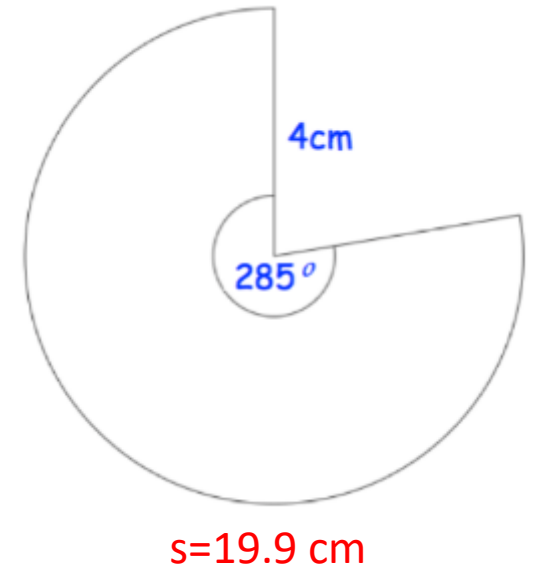
1.



2.



3.



L.O: Define and calculate the arc length.



WS # 5: (Exercise 6)

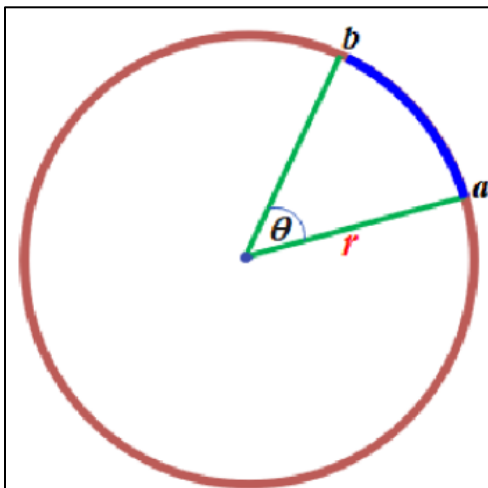
A wheel rotates so that a point on its outer edge moves a distance of 1.5 m. If the radius of the wheel is 2.5 m as shown in the figure, what is the angle (in radians) through which the wheel has rotated?

$$s = r\theta$$

$$1.5 = 2.5 \times \theta$$

$$\theta = 0.6 \text{ rad}$$





طول المسار (ab) المبين على الرسم المجاور يساوي 73.4 cm ، ونصف قطر المسار الدائري 0.56 m .
ما مقدار الزاوية θ المبينة في الرسم؟

The length of the path (ab) as shown in the figure equal 73.4 cm , and the radius of the circular path is 0.56 m .
What is the value of angel θ in the figure?

- ☐ 0.417 rad
- ☐ 2.40 rad
- ☐ 0.767 rad
- ☒ 1.31 rad