

## مراجعة الدرس السابع Motion Circular for Examples More من الوحدة التاسعة منهج انسابير



### 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: 21:32:54 2025-06-09

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 السادس Motion Linear and Circular من الوحدة التاسعة منهج انسابير

1

مراجعة الدرس الخامس Force Centripetal من الوحدة التاسعة منهج انسابير

2

حل تجميعية مراجعة نهائية وفق الهيكل الوزاري منهج بريدج

3

تجميعية مراجعة نهائية وفق الهيكل الوزاري منهج بريدج بدون الحل

4

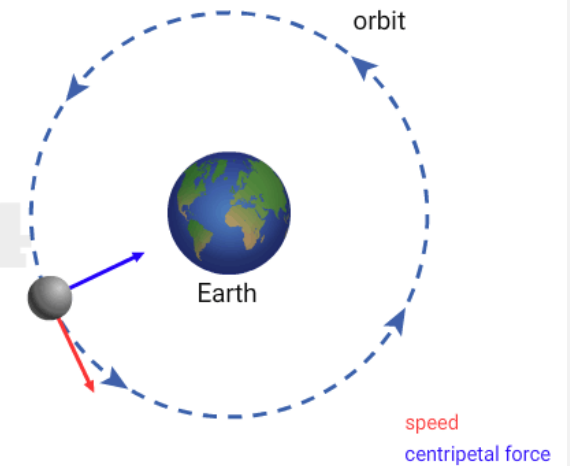
حل مراجعة نهائية وفق الهيكل الوزاري المسار C باللغتين العربية والانجليزية

5

## Unit 9: Circular motion

### Section 9.7

### More Examples for Circular Motion





Learning  
Objectives

## Section 9.7

**More Examples  
for Circular Motion**

Solve problems involving  
circular motion.

## WS # 19: (Exercise 1) \*\*

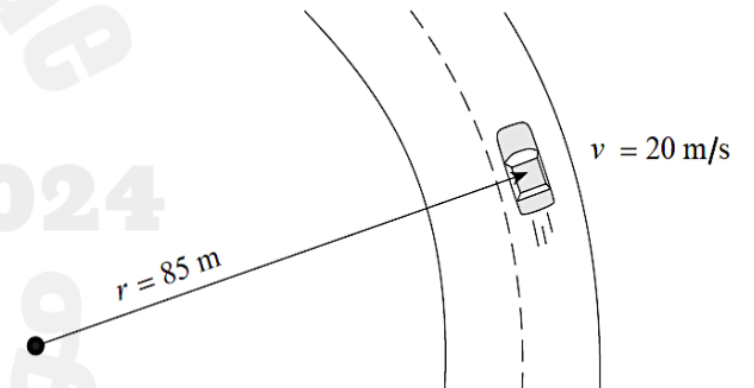
A 1200 kg car rounds a flat circular section of road of radius 85 m, at 20 m/s as shown in the figure below. What minimum friction force is required for the car to follow this curve?

$$F_c = F_f$$

$$\text{So find } F_c = m \frac{v^2}{r} = 1200 \times \frac{(20)^2}{85}$$

$$F_c = 5647 \text{ N} \\ = 5.6 \times 10^3 \text{ N} = f_f$$

$$F_f = ?$$



$$5.6 \times 10^3 \text{ N}$$

## WS # 19: (Exercise 2) \*\*

A 1300 kg car goes around a flat circular turn of radius 52 m. If frictional force between the car's tires and the road is 8900 N, what is the maximum speed of the car above which it will skid?

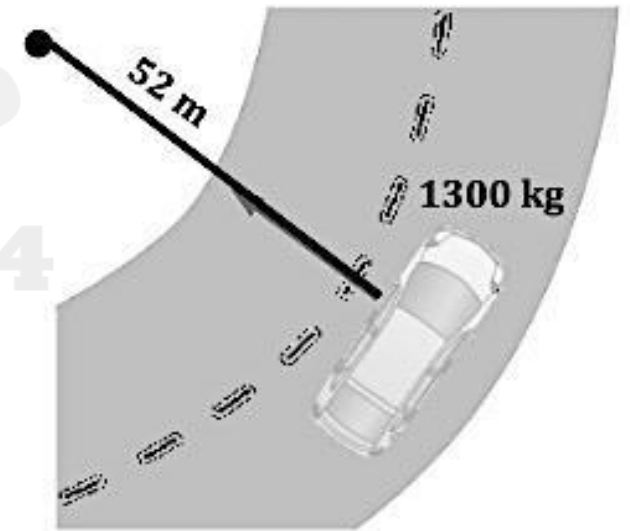
$v = ?$

$$F_c = m \frac{v^2}{r}$$

$$8900 = \frac{1300 \times v^2}{52}$$

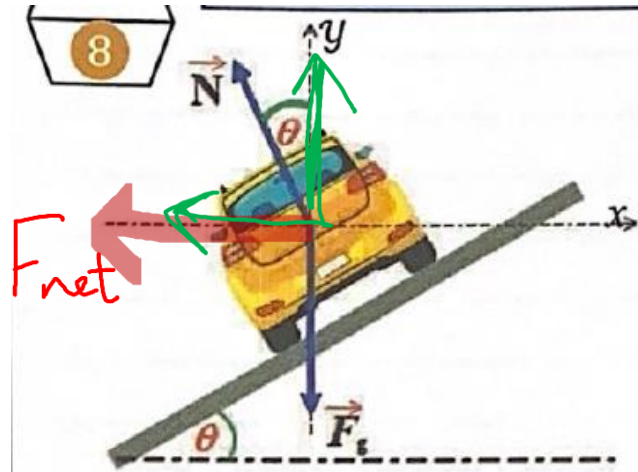
$$v = 18.9 \text{ m/s}$$

$$f_f = F_c$$



19 m/s

## WS # 19: (Exercise 3) \*\*



يرغب مهندس مدني في تصميم طريق منحنٍ بحيث يمكن للسيارة التحرك عليه بسرعة محددة دون إنزلاق عندما يكون مغطى بالجليد. فيصمم الطريق بحيث يكون مائلاً نحو الجزء الداخلي من المنحنى كما هو في الشكل. افترض أن السرعة المحددة للطريق  $59 \text{ km/h}$ ، ونصف قطر المنحنى  $40 \text{ m}$ .  
(اهمل جميع قوى الاحتكاك)



A civil engineer wants to design a curved roadway so that the car can move without skidding at a specified speed. He designs the road to be tilted toward the inside of the curve, as shown in the figure. Suppose the specified speed for the road is  $59 \text{ km/h}$ , the radius of the curve is  $40 \text{ m}$ .

(Ignore all friction forces)

Draw a vector on the figure showing the direction of the net force on the car.

At what angle ( $\theta$ ) should the curve be banked?

convert  $59 \times 10^3$   $\rightarrow v = 16.4 \text{ m/s}$   
3600  
a) ارسم على الشكل متجه يدل على اتجاه القوة المحصلة المؤثرة على السيارة.  
b) بأي زاوية ( $\theta$ ) يجب أن يكون المنحنى مائلاً؟

$$F_{\text{net}} = F_N \sin \theta = F_c$$

find  $F_N$

$$F_{\text{net}y} = F_N \cos \theta - F_g$$

$$0 = F_N \cos \theta - mg$$

$$F_N \cos \theta = mg$$

$$F_N = \frac{mg}{\cos \theta}$$

$$F_N \sin \theta = F_c$$

$$\frac{mg}{\cos \theta} \sin \theta = \frac{mv^2}{r}$$

$$g \tan \theta = \frac{v^2}{r}$$

$\rightarrow$  next

$$g \tan \theta = \frac{v^2}{r}$$

$$\tan \theta = \frac{v^2}{rg}$$

$$\tan \theta = \frac{(16.4)^2}{40 \times 9.81}$$

$$\Rightarrow \tan \theta = 0.6854$$

$$\theta = \tan^{-1}(0.6854)$$

$$\theta = 34.4^\circ$$



## WS # 19: (Exercise 4) \*\*

The raceway of a car race is banked at an angle  $\theta$  above the horizontal. What must the value of  $\theta$  be if a race car, moving with a speed of  $45 \text{ m/s}$ , maintains a circular motion of radius  $320 \text{ m}$ , assuming it is raining and the friction between the tires and the road is negligible?

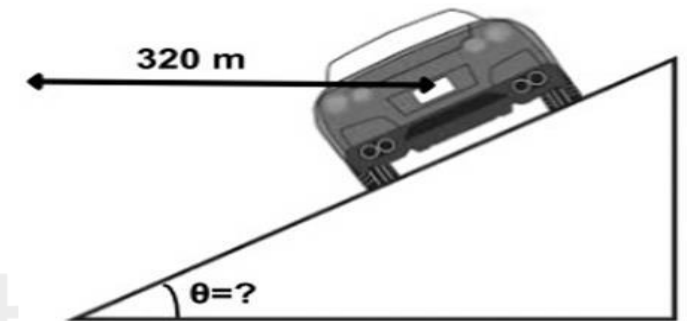
$$\tan \theta = \frac{v^2}{rg}$$

$$\tan \theta = \frac{(45)^2}{320 \times 9.81}$$

$$\tan \theta = 0.65$$

$$\theta = \tan^{-1}(0.65)$$

$$\theta = 33^\circ$$



✓ B.  $33^\circ$



**SOLVED PROBLEM 9.4****NASCAR Racing**

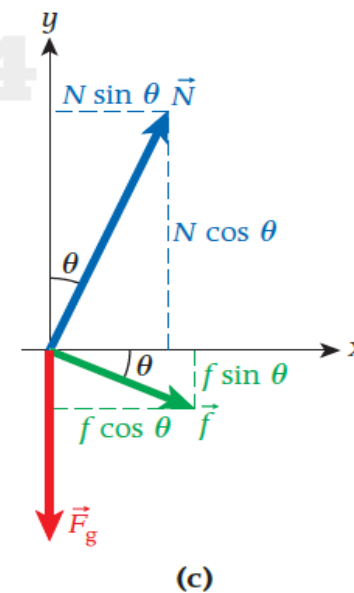
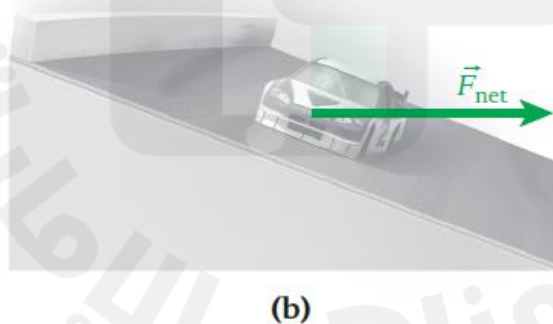
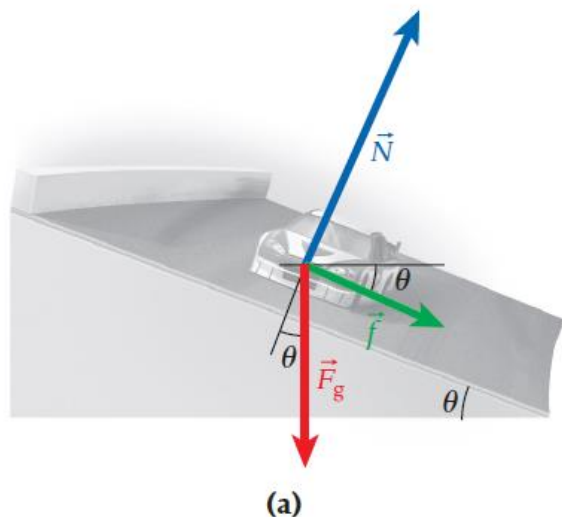
As a NASCAR racer moves through a banked curve, the banking helps the driver achieve higher speeds. Let's see how. Figure 9.25 shows a race car on a banked curve.

**PROBLEM**

If the coefficient of static friction between the track surface and the car's tires is  $\mu_s = 0.620$  and the radius of the turn is  $R = 110. \text{ m}$ , what is the maximum speed with which a driver can take a curve banked at  $\theta = 21.1^\circ$ ? (This is a fairly typical banking angle for NASCAR tracks. Indianapolis has only  $9^\circ$  banking, but there are some tracks with banking angles over  $30^\circ$ , including Daytona ( $31^\circ$ ), Talladega ( $33^\circ$ ), and Bristol ( $36^\circ$ ).)



**FIGURE 9.25** Race car on a banked curve.



$$N \sin \theta + f \cos \theta = F_{\text{net}}$$

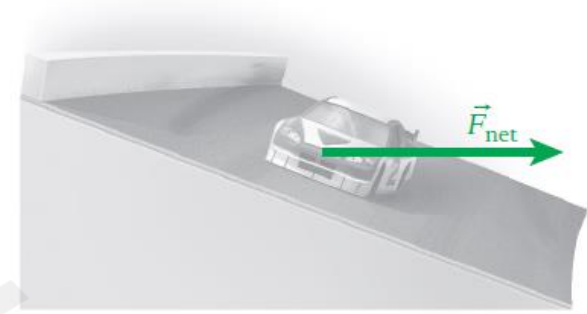
$$N \cos \theta - F_g - f \sin \theta = 0.$$

$$F_{\text{net}} = F_c = m \frac{v^2}{R},$$

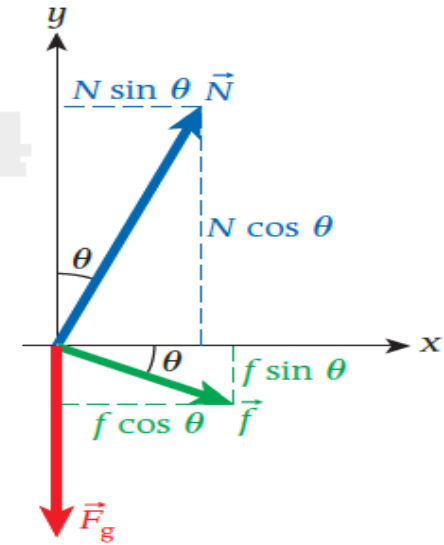
$$N \sin \theta + \mu_s N \cos \theta = m \frac{v^2}{R} \Rightarrow N(\sin \theta + \mu_s \cos \theta) = m \frac{v^2}{R}$$

$$N \cos \theta - mg - \mu_s N \sin \theta = 0 \Rightarrow N(\cos \theta - \mu_s \sin \theta) = mg.$$

$$v = \sqrt{\frac{Rg(\sin \theta + \mu_s \cos \theta)}{\cos \theta - \mu_s \sin \theta}}.$$



(b)



(c)

## WS # 20: (Exercise 1) \*\*\*

If the coefficient of static friction between the track surface and the car's tires shown in the figure is  $\mu_s = 0.62$  and the radius of the turn is  $R = 110$  m, what is the maximum speed with which a driver can take a curve banked at  $\theta = 25^\circ$ ?  $v = ?$

A. 41 m/s

B. 37 m/s

C. 32 m/s

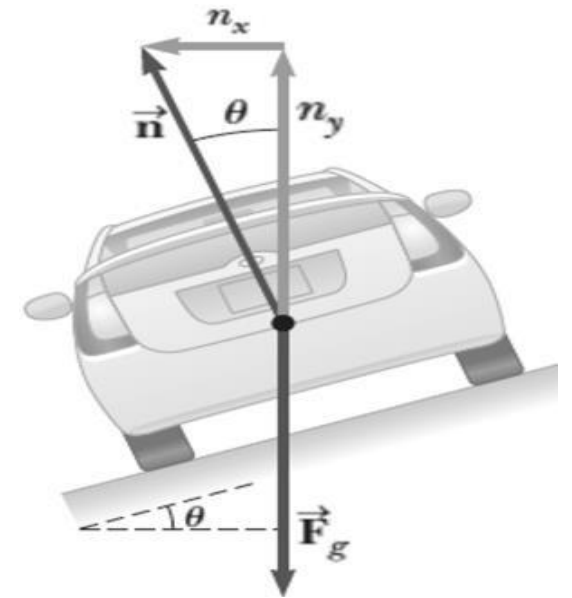
D. 28 m/s



$$v = \sqrt{\frac{Rg(\sin \theta + \mu_s \cos \theta)}{\cos \theta - \mu_s \sin \theta}} = \sqrt{\frac{110 \times 9.81 (\sin 25^\circ + 0.62 \cos 25^\circ)}{\cos 25^\circ - 0.62 \sin 25^\circ}} = 40.6 \text{ m/s}$$

## WS # 20: (Exercise 2) \*\*\*

A car of mass  $m$  moving with speed  $v$  enters a banked curved with radius of curvature  $r$ , as shown below. What is the speed that the car should be traveling such that it will be able to make the turn even in the absence of friction?



A.  $v = \sqrt{gr}$

B.  $v = gr$

C.  $v = gr \cos \theta$

D.  $v = \sqrt{gr \tan \theta}$

$$\tan \theta = \frac{v^2}{rg}$$

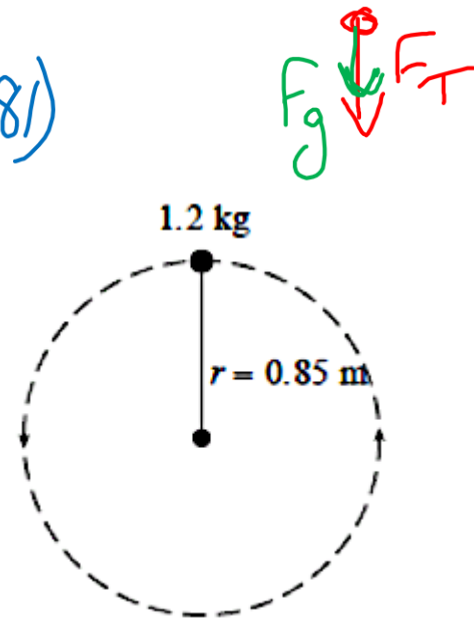
$$v^2 = rg \tan \theta$$

$$v = \sqrt{rg \tan \theta}$$

## WS # 20: (Exercise 3) \*\*\*

A 1.2 kg mass on the end of a string is rotated in a vertical circle of radius 0.85 m. If the speed of the mass at the top of the circle is 3.6 m/s, what is the tension in the string at this location?

$$\begin{aligned} F_{\text{net}} &= F_T + F_g \\ F_T &= F_c - F_g \\ &= m \frac{v^2}{r} - mg \end{aligned}$$
$$F_T = \frac{1.2 \times (3.6)^2}{0.85} - (1.2 \times 9.8)$$
$$F_T = 6.5 \text{ N}$$



6.5 N

# WS # 14: (Exercise 4)

**Centripetal Force** The 40.0-g stone in Figure 12 is whirled horizontally at a speed of

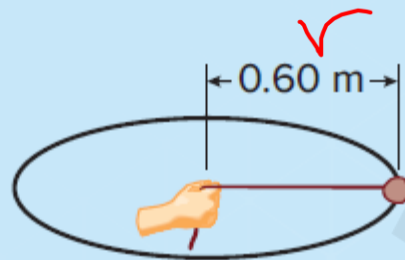


Figure 12

2.2 m/s. What is the tension in the string?

$$m = \frac{40}{1000} = 0.04 \text{ kg}$$

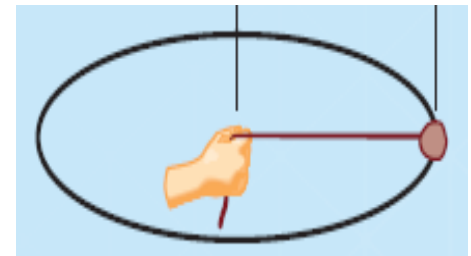
$$F_c = m \frac{v^2}{r}$$

$$F_c = 0.04 \times \frac{(2.2)^2}{0.60}$$

$$F_c = 0.32 \text{ N}$$

A block of mass 3 kg is swung on a cord in **a horizontal** circle of radius 2 m.  
The speed of the block is 6 m/s. Find the magnitude of the acceleration of  
the block.

$$a_c = \frac{v^2}{r} = \frac{(6)^2}{2} = 18 \text{ m/s}^2$$



$18 \text{ m/s}^2$