Name _____

physics, technology and engineering in automobile racing
review/assessment questions

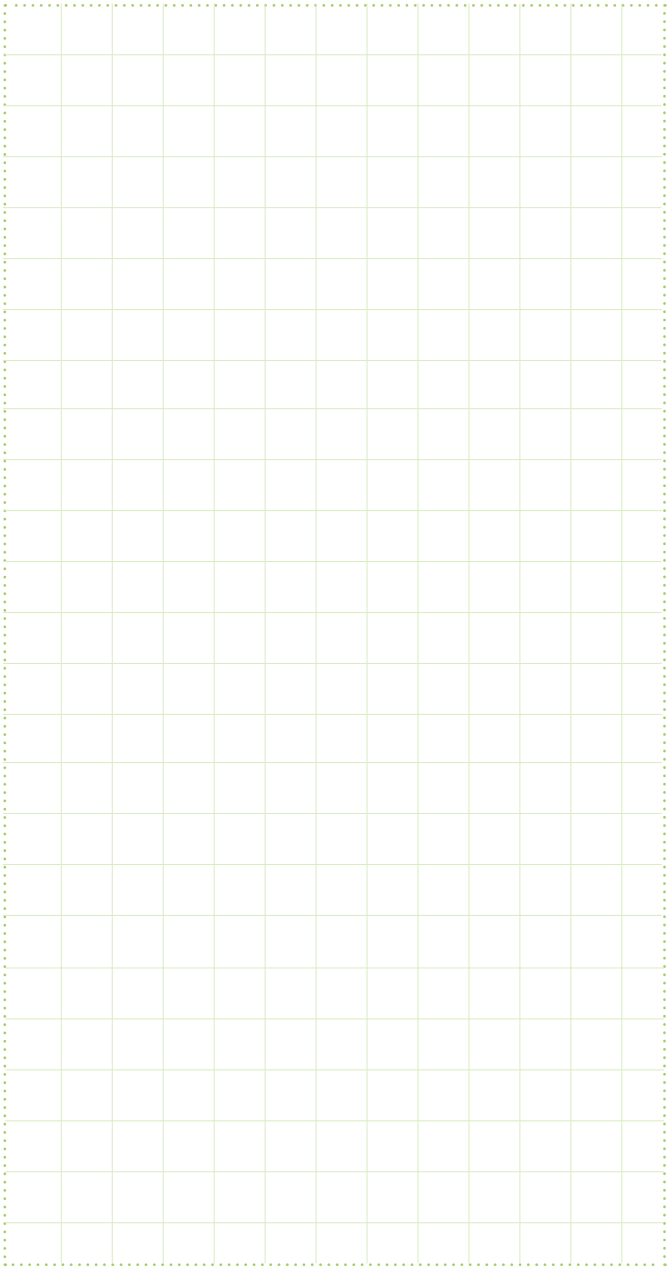
1. Draw a free-body diagram for a block being pushed across the floor.

2. Use all 3 of Newton's laws of motion to explain a race car accelerating out of the pit area and increasing to race speed.

3. How much distance could a race car and driver cover at 200 mph while her opponents are in the pits for 15 seconds?

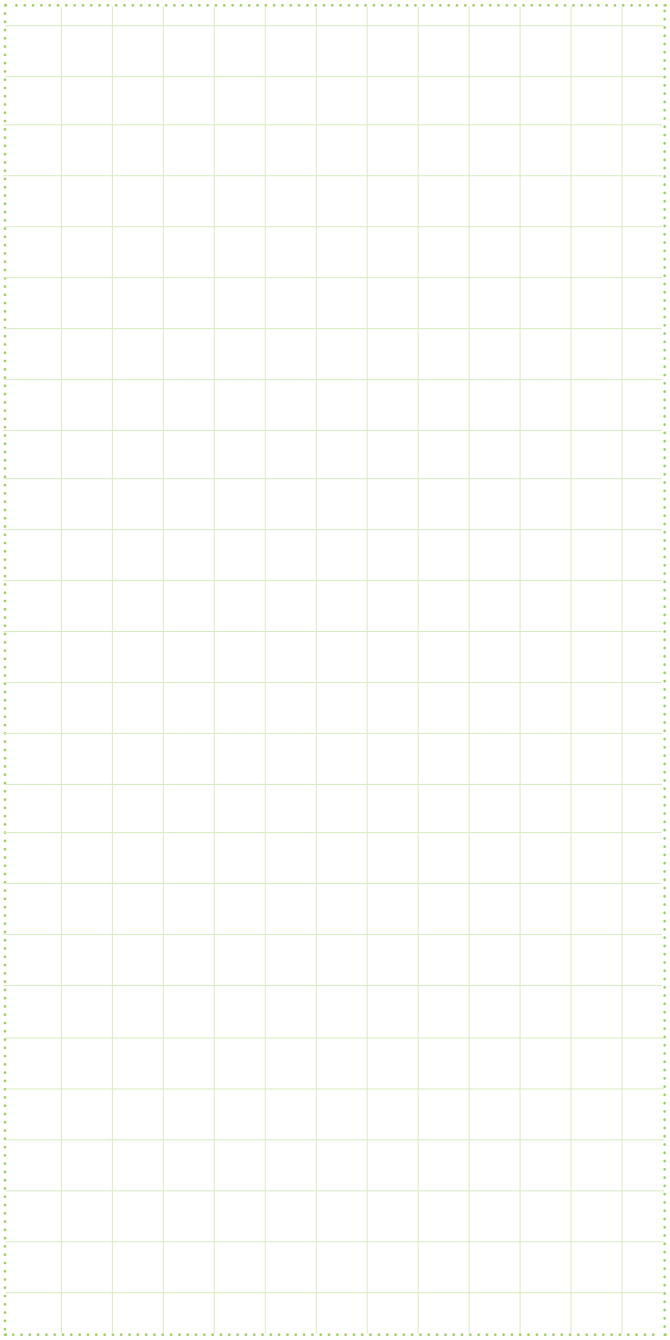
4. How much force would it take to increase the speed of a 1,400 kilogram race car from 0 to 180 miles per hour (80.5 meters/second) in 8 seconds? (Use meters/second for velocity when calculating force.)

5. Calculate the time it takes to complete a 500-mile race at Daytona International Speedway if a race car covers 350 miles at 180 miles per hour and 150 miles at 200 miles per hour.



6. Explain at least 5 examples of Newton's laws of motion as they apply to an accident during an automobile race.

7. How much work and power does a race car exert if the car creates a force of 400 Newtons through 100 meters over 4 seconds?



8. Explain which single innovation in race car engineering you feel has been the most important.

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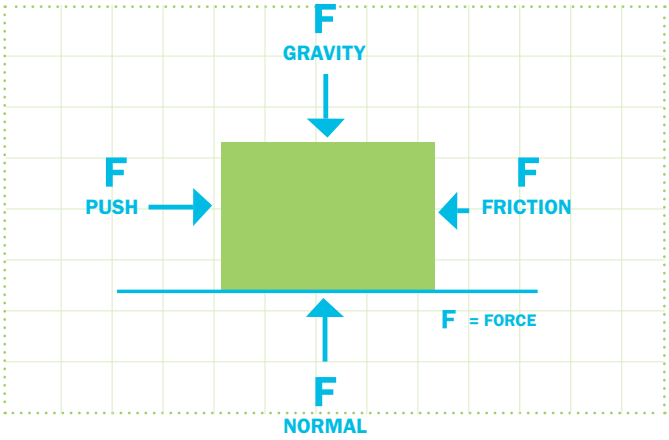
1. Draw a free-body diagram for a block being pushed across the floor.



2. Use all 3 of Newton's laws of motion to explain a race car accelerating out of the pit area and increasing to race speed.

Possibilities include

1st law

A. Car begins at rest, but an outside force causes it to accelerate.

B. Once a race car is moving, it keeps moving.

C. Driver feels the seat push on his back and neck during acceleration as she tends to remain where she was.

2nd law

A. The force of the engine causes acceleration.

B. The lighter the car, the faster it accelerates.

C. Forces from friction on tires and wind force try to slow the race car.

3rd law

A. The tires push backward, and the track pushes forward.

B. If there is gravel or dirt on the track, the gravel or dirt will fly back as a car accelerates forward.

C. The car's seat pushes on the driver and the driver pushes back on the seat.

3. How much distance could a race car and driver cover at 200 mph while her opponents are in the pits for 15 seconds?

First convert seconds of time to hours

*15 sec * 1 hr/3,600 sec = .00417 hr*

*D = v * t = 200 mi/ hr * .00417 hr = .83 mi*

Her car would cover .83 miles while her opponents are in the pits.

4. How much force would it take to increase the speed of a 1,400 kilogram race car from 0 to 180 miles per hour (80.5 meters/second) in 8 seconds? (Use meters/second for velocity when calculating force.)

Acceleration a =

$\Delta v / \Delta t$ = 80.5 m/sec / 8 sec = 10.06 m/sec^2

F = ma =

*1,400 kilogram * 10.06 m/sec^2 = 14,087 Newtons*

5. Calculate the time it takes to complete a 500-mile race at Daytona International Speedway if a race car covers 350 miles at 180 miles per hour and 150 miles at 200 miles per hour.

Calculate the time for each section

T = d/v = 350 mi/ 180 mi/hr = 1.944 hours
T = d/v = 150 mi / 200 mi/hr = .75 hour
Total time = 1.944 hr + .75 hr = 2.69 hours

6. Explain at least 5 examples of Newton's laws of motion as they apply to an accident during an automobile race.

Examples include

A. *1st law: Once in motion, the car and driver tend to keep going.*
B. *1st law: All the cars tend to keep going forward.*
C. *1st law: 5-point seat belt keeps the driver from flying forward.*
D. *1st law: If the tires hit the infield track while the car is sideways, the top of the car keeps going, and car flips.*
E. *2nd law: The brakes on a car will decelerate the car.*
F. *2nd law: If a car hits another car, it will push and accelerate the car in another direction.*

7. How much work and power does a race car exert if the car creates a force of 400 Newtons through 100 meters over 4 seconds?

Work = *F * d = 400N * 100 m = 40,000 j*

Power = *Work / time =*
40,000 j / 4 sec = 10,000 joules

8. Explain which single innovation in race car engineering you feel has been the most important.

There are numerous possibilities, including safety devices, such as the HANS device, seat belts and roll bars; and engineering improvements, including aerodynamics and stronger engines.