MASSACHUSETTS
Safe Routes to School
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Mathematics Lesson Plan

Travel Tally Math Problems

Classroom:	Teachers:	Subject: Mathematics	Dates:
Grade: 6	Unit:		
State Standard(s):	Expressions and Equations 6.EE A. Apply and extend previous understandings of arithmetic to algebraic expressions. 1. Write and evaluate numerical expressions involving whole-number exponents. 2. Write, read, and evaluate expressions in which letters stand for numbers. a. Write expressions that record operations with numbers and with letters standing for numbers.		
Objective:	Students will learn how to write a mathematical expression based on a real world description of a situation.		
Key Vocabulary:	Idle Emission Equation Carpool CO_2 Equivalent Expression		
Lesson Outline: Students are asked to 1) write algebraic expressions and perform algebraic computation, and 2) determine whether riding the bus will reduce the amount of CO_2 in the air around schools.			Student groupings:
Accommodations and Modifications:			

Figure 1. No idling sign Massachusetts

Answer the following questions:

1. An idling car emits 8 pounds of CO_2 per minute in the drop-off line. Each car takes 10 seconds to move up one space, 30 seconds to unload, and 5 seconds to exit the drop-off area. This can be modeled with the expression C = 8(0.75m), with C representing the total carbon emissions for one car and m representing the total time in minutes in the drop-off line.

a) Write an equivalent expression for the total carbon emissions (C) for one car per minute (m).

b) Sawyer is in the drop-off line and there are 5 cars ahead of him. How much time will he spend in the drop-off line, from when he pulls into the line until he exits his car? How much CO_2 will his car emit?

2. At a school with 210 students being dropped off individually, each car will emit a minimum of 6 pounds of CO_2! Parents at Greentown Middle School decide to carpool, and find that if 3 students are dropped off together, it takes only 36 seconds to unload each car.

a) Instead of 210 cars, how many cars will be driven to school?

b) Write a new expression for the total carbon emissions for one car.

c) If 210 cars are driven individually, 1, 260 pounds of CO_2 will be emitted if none of the cars idle in line. Using your expression from part b, calculate the total CO_2 emissions if all students are carpooled.

d) How much CO_2 does this reduce from the air?

3. A school bus emits 18 pounds of CO_2 per minute, but can fit 30 students. Unloading from a school bus takes 6 seconds per student, and the bus still takes an additional 15 seconds in line to pull up and drive away. Does filling the bus reduce the amount of CO_2 around the school? If so, by how much? Show the expression(s) you used to calculate your answer.

Answer Key

Question 1:
An idling car emits 8 pounds of CO_2 per minute in the drop-off line. Each car takes 10 seconds to move up one space, 30 seconds to unload, and 5 seconds to exit the drop-off area. This can be modeled with the expression **C = 8(0.75m)**, with C representing the total carbon emissions for one car and m representing the total time in minutes in the drop-off line.

a) Write an equivalent expression for the total carbon emissions (C) for one car per minute (m).

Answer: C = 6m

b) Sawyer is in the drop-off line, and there are 5 cars ahead of him. How much time will he spend in the drop-off line, from when he pulls into the line until he exits his car? How much CO_2 will his car emit?

Answer: 0.75 minutes (6 cars) = 4.5 minutes
C = 6(4.5)
C = 27
Sawyer's car will emit 27 pounds of CO_2

Question 2:
At a school with 210 students being dropped off individually, each car will emit a minimum of 6 pounds of CO_2! Parents at Greentown Middle School decide to carpool, and find that if 3 students are dropped off together, it takes only 36 seconds to unload each car.

a) Instead of 210 cars, how many cars will be driven to school?
Answer 70 cars
b) Write a new expression for the total carbon emissions for one car (or, you could give them the expression)
Answer C = 8(0.85)
C = 6.8
c) If 210 cars are driven individually, 1, 260 pounds of CO_2 will be emitted if none of the cars idle in line. Using your expression from part b, calculate the total CO_2 emissions if all students are carpooled.
Answer C = 6.8(70)
d) How much CO_2 does this reduce from the air?
Answer 476 pounds

Question 3:
A school bus emits 18 pounds of CO_2 per minute, but can fit 30 students. Unloading from a school bus takes 6 seconds per student, and the bus still takes an additional 15 seconds in line to pull up and drive away. Does filling the bus reduce the amount of CO_2 around the school? If so, by how much? Show the expression(s) you used to calculate your answer.
Answer: Yes
1084.5 Fewer pounds of carbon are emitted
1260-[3*(30*6+15)/60*18]