Feb 11

Distance

- measures the total length of a journey along every twist and turn of the path
- standard unit : metre (m) others → kilometer (km), centimeter (cm), millimeter (mm)
- represented as "d"

$$d_{total} = d_1 + d_2 + d_3 \ldots$$

Example:

Margret drove 15 kilometers to the store, from the store she drove 5 kilometers to the bank, from the bank she drove 9 kilometers to her sister's house. What total distance did Margret travel?

$d_1 = 15km$

$d_2 = 5km$

$d_3 = 9km$

$d_{Total} = ?$

$d_{Total} = d_1 + d_2 + d_3$

$= 15km + 5km + 9km$

$\boxed{d_{Total} = 29\ km}$

Margret travelled 29 km.

You bike to 5 kilometers to your friend's house. From there, you walk 764 m to the neighbourhood 7-Eleven. Then you walk back to your friend's house. What is your total distance?

$d_1 = 5\ km = 5000m$

$d_2 = 764m$

$d_3 = 764m$

$d_{Total} = d_1 + d_2 + d_3$

$= 5km + 764m + 764m$

$= 5000m + 764m + 764m$

$\boxed{d_{Total} = 6528m}$

OR

$6.528km$

$\frac{5km}{5000m} = \frac{1km}{1000m}$

Distance is simply the magnitude of the change in position (we don't care how you got there, we just want to know how far you traveled). An example would be the odometer on your car – shows only the distance covered.

Displacement

- measures the change in position
- standard unit : metre (m) or km, cm, mm
- represented as "Δd"

Remember: change in (Δ) means final − initial

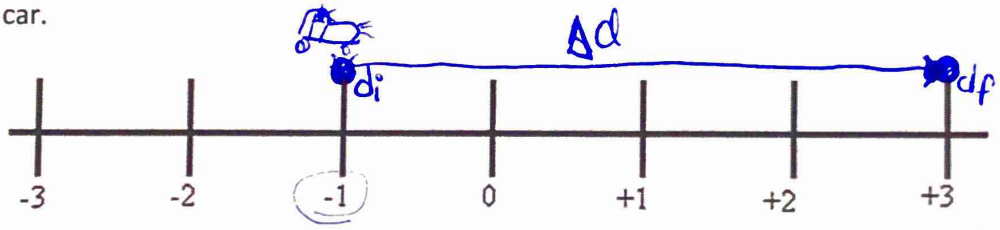
displacement ← $\Delta d = d_2 - d_1$

(d_f) final position — (d_i) initial position

*** If you are having trouble, using a number line or a drawing will help in understanding what is happening in the question.

Example 1:

A toy car moves across a table in a straight line. A number line is marked on the table and the initial position of the car is -1 cm. If the car stops at the +3 cm mark, calculate the displacement of the car.



$d_i = -1\,cm$

$d_f = +3cm$

$\Delta d = d_f - d_i$

$= 3cm + (+1cm)$ *subtract a (-ve) is adding a positive.

$= 4cm$

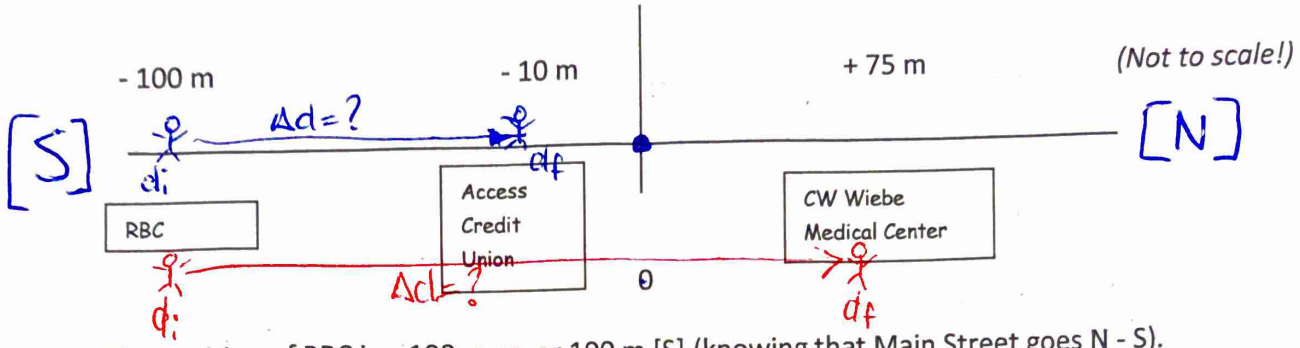
$\boxed{\Delta d = +4cm}$

OR

$\Delta d = 4cm$ [to the right]

Example 2:

Using a number line as a frame of reference we could give the positions (d) of various buildings along Main Street Winkler. Let's say we are standing at the intersection of Main Street and Mountain Ave.



The position of RBC is – 100 m or, or 100 m [S] (knowing that Main Street goes N - S).

If we were to walk from RBC to Access Credit Union, we would undergo a change in position. What is the change in position, or the displacement (Δd) of the object?

$d_i = -100m$

$d_f = -10m$

$\Delta d = d_f - d_i$

$= (-10m) + (+100m)$

$\Delta d = +90m$ or $\Delta d = 90m\,[N]$

What would our displacement be if we moved from the RBC to the CW Wiebe Medical Center?

$d_i = -100m$

$d_f = +75m$

$\Delta d = d_f - d_i$

$= 75m + (+100m)$

$\Delta d = +175m$ OR $\Delta d = 175m\,[N]$

Example 3:

Anne traveled 20 km [N] to the grocery store, and then 5 km [S] to the bank. What is the distance that Anne traveled? What is Anne's displacement? Are these the same, or different? Why?

*distance - direction doesn't matter!

$d_{Total} = d_1 + d_2$

$= 20km + 5km$

$d_T = 25km$

*displacement - change in position (direction matters!)

~~$\Delta d = d_f - d_i$~~

$\Delta d = +20km + (-5km)$

$= +15km$ or $\Delta d = 15km\,[N]$

DATE: NAME: CLASS:

CHAPTER 9 REINFORCEMENT **BLM 9-10**

Calculating Time Intervals and Displacements

Goal • Practise calculating change in time and displacement.

What to Do

Answer each question in the space provided.

*Feb 10 → answer time interval questions only!

*Feb 11 → complete whole practice (p. 162+163)

1. Complete each table below.

(a) t_i t_f

t_i	t_f	Δt
1.0 s	5.0 s	4 s
4.56 s	19.71 s	
0 h	3.5 h	
5 s	14.0 s	9.0 s
3 min	8 min	5 min

14 − x = 9

x − 3 = 5

(b) $\vec{d}_i$ $\vec{d}_f$

$\vec{d}_i$	$\vec{d}_f$	$\Delta\vec{d}$
+3.4 m	+7.8 m	+4.4 m
+14.7 m	+3.1 m	−11.6 m
+12.0 km	+15.7 km	
+13.1 m		+102.3 m
	+14.8 cm	+9.1 cm

2. Solve the following problems.

(a) A runner is moving along a straight road. At a time of 0.62 s, the runner's position is +10.6 m. Later, at a time of 9.93 s, the runner's position is +73.9 m. Find the time interval and displacement for the runner.

$t_i = 0.62\text{ s}$ $\Delta t = t_f - t_i$ $\Delta d = d_f - d_i$

$t_f = 9.93\text{ s}$

$d_i = +10.6\text{ m}$

$d_f = +73.9\text{ m}$

(b) A person is driving a car along a straight highway. The car's position at 9:00 a.m. is 13 km from home. Its position at 10:30 a.m. is 137 km from home. Find the time interval and displacement for this section of the journey.

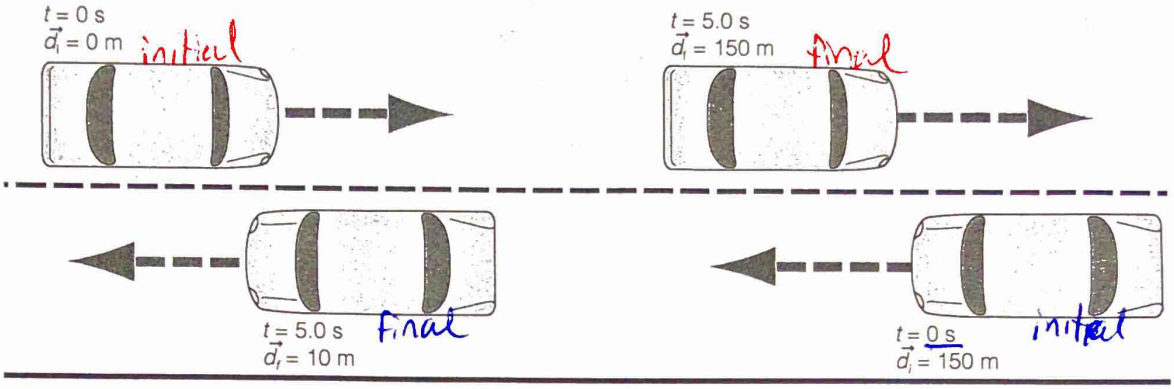
DATE: NAME: CLASS:

CHAPTER 9
REINFORCEMENT

BLM 9-10

Calculating Time Intervals and Displacements (continued)

3. The diagram below shows two cars passing each other on opposite sides of a road.



(a) Complete the following table for both cars.

Car	t_i	t_f	Δt	$\vec{d}_i$	$\vec{d}_f$	$\Delta\vec{d}$	Direction (left or right)
1							
2							

(b) Why is the displacement negative for car 2 and positive for car 1?

DATE: NAME: KEY CLASS:

CHAPTER 9 REINFORCEMENT BLM 9-10

Calculating Time Intervals and Displacements

/20

Goal • Practise calculating change in time and displacement.

What to Do

Answer each question in the space provided.

1. Complete each table below.

(a)

t_i	t_f	Δt
1.0 s	5.0 s	4.0 s
4.56 s	19.71 s	15.15 s
0 h	3.5 h	3.5 h
5.0 s	14.0 s	9.0 s
3 min	8 min	5 min

/5

(b)

$\vec{d}_i$	$\vec{d}_f$	$\Delta\vec{d}$
+3.4 m	+7.8 m	+4.4 m
+14.7 m	+3.1 m	−11.6 m
+12.0 km	+15.7 km	+3.7 km
+13.1 m	+115.4 m	+102.3 m
+5.7 cm	+14.8 cm	+9.1 cm

2. Solve the following problems.

(a) A runner is moving along a straight road. At a time of 0.62 s, the runner's position is +10.6 m. Later, at a time of 9.93 s, the runner's position is +73.9 m. Find the time interval and displacement for the runner.

$t_i = 0.62\text{s}$ $t_f = 9.93\text{s}$

$d_i = +10.6\text{m}$ $d_f = +73.9\text{m}$

$\Delta t = 9.93\text{s} - 0.62\text{s} = 9.31\text{s}$

$\Delta d = +73.9\text{m} - +10.6\text{m} = +63.3\text{m}$

/4

(b) A person is driving a car along a straight highway. The car's position at 9:00 a.m. is 13 km from home. Its position at 10:30 a.m. is 137 km from home. Find the time interval and displacement for this section of the journey.

$t_i = 9{:}00\text{am}$ $d_i = +13\text{km}$

$t_f = 10{:}30\text{am}$ $d_f = +137\text{km}$

$\Delta t = 1.5\text{hr}$

$\Delta d = 137 - 13 = +124\text{km}$

/4

DATE: NAME: CLASS:

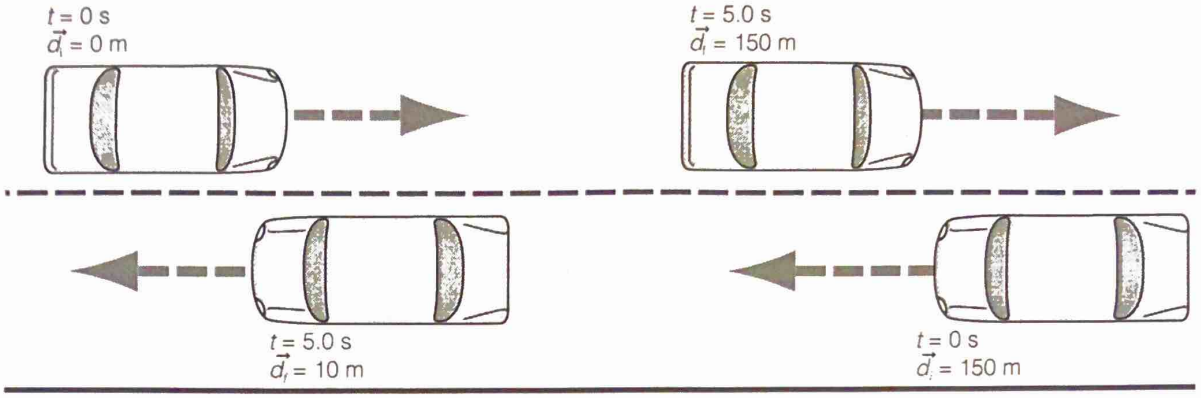
CHAPTER 9 REINFORCEMENT **BLM 9-10**

Calculating Time Intervals and Displacements (continued)

3. The diagram below shows two cars passing each other on opposite sides of a road.

CAR 1

CAR 2



(a) Complete the following table for both cars.

/5

Car	t_i	t_f	Δt	$\vec{d}_i$	$\vec{d}_f$	$\Delta\vec{d}$	Direction (left or right)
1	0	5.0s	5s	0m	+150m	+150m	Right
2	0	5.0s	5s	+150m	10m	-140m	Left

/2

(b) Why is the displacement negative for car 2 and positive for car 1?

Car 1 is moving in the positive direction, while car 2 is moving in the negative direction.