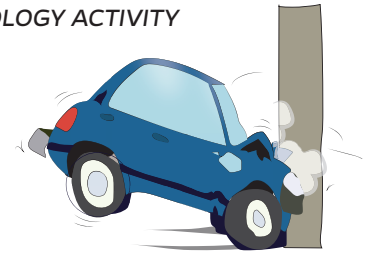
Name: _____ Class: _____ Date: _____

UNDERSTANDING CAR CRASHES: WHEN PHYSICS MEETS BIOLOGY ACTIVITY

DISTRACTED DRIVING DANGERS



MATERIALS NEEDED

For each group of 4 students

- "Distracted Driving Dangers - Student Activity" sheets (4)
- Touch Track #1 sheet (1)
- Touch Track #2 sheet (1)
- Charts 1 & 2 sheet (1)
- Charts 3 & 4 sheet (1)
- Stopwatch (1)
- Distractor Materials
  - Visual Distractors (playing cards or magazine photos)
  - Auditory Distractors (textbook, trade book, or novel)
  - Manual Distractors (Chex-mix and M&Ms or mixture of bolts, washers, and nuts)
  - Paper bowls for Manual distractors (2)
  - Cognitive Distractors (Chart 3 Mental-Math Problems)
  - All of the Above Distractors (Chart 4 Calculator-Math problems and 1 small calculator)

Key Question

- How do different types of distractions affect the time required to complete a task?
- How can driving while distracted be minimized?

Purpose

- To investigate the dangers of distracted driving behaviors in the safety of your classroom.

Pre-Activity Discussion

Have you ever witnessed someone blindly bump into somebody or something while trying to text and walk? While somewhat annoying and possibly harmful in a school hallway, this and other distracting behaviors can become part of a lethal combination when driving. As inexperienced drivers, teens are particularly vulnerable to distractions while driving.

Procedure

1. List any 6 examples of <u>voluntary</u> driving distractions.

VOLUNTARY DRIVING DISTRACTIONS	

2. Predict which combination of behaviors produces the greatest and the least amount of driving distraction (For example: Greatest = Visual + Cognitive distraction)

Great amount = _____

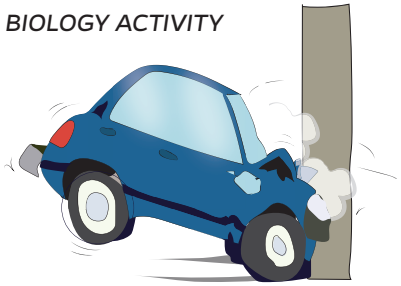
Least amount = _____

3. Using a stopwatch, measure the time it takes you to complete two practice runs with Touch Track #1. Record your time to the nearest hundredth of a second in Table 1.

PRACTICE RUN	TIME TO COMPLETE TOUCH TRACK #1 (IN SECONDS)
1	
2	

Table 1. *Data table for Touch Track #1*

DISTRACTED DRIVING DANGERS



Procedure (continued)

3. Review and agree on role assignments with your group members (see Chart 1 provided by your teacher). You may alternate roles after each trial OR after one "Driver" completes all of the distractions.
4. First, complete Touch Track #2 as quickly as possible without distractions to establish a baseline performance time. Later, you will compare this time with your distracted "driving" times. Record your times to the nearest hundredth of a second in Table 2.

DISTRACTION TYPE	TIME TO COMPLETE TOUCH TRACK #2 (IN SECONDS)*			
	TRIAL 1	TRIAL 2	TRIAL 3	AVERAGE TIME
WITHOUT DISTRACTIONS				
WITH DISTRACTIONS				
Visual				
Auditory				
Manual				
Cognitive				
All of the above				

Table 2. *Data table for Touch Track #2*

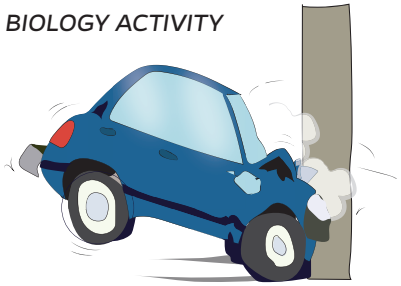
**Report time in seconds NOT minute/second combinations.*
(For example: 1 minute and 15 seconds would be recorded as 75 seconds.)

Analysis Questions

1. Review your data and rank the three types of sensory distractions from most distracting (longest completion time) to least distracting (shortest completion time). Compare your actual results with your earlier predictions in item 2.

2. What are some possible explanations for the ways different types and combinations of distractions affect the driver's ability to complete the Touch Track?

DISTRACTED DRIVING DANGERS



Analysis Questions (continued)

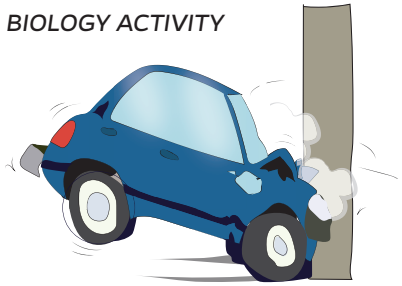
3. Imagine you are an engineer trying to design an automated in-the-car system to detect distracted driving. As part of the engineering design process you must first clearly define the problem: distracted driving. Work with your team members to create a comprehensive yet brief (one-sentence) definition of distracted driving.

Crash Question

1. You are driving a steady 89 km/hr (55 mph) on a highway and you receive a text from a friend. You decide to read the text and text back to your friend while driving. Subtract the time average of your "Without Distraction" trials from the time average of your "All of the Above" Distractions trials to determine the average amount of time sending and receiving a text could distract you and then use this time measurement and your velocity to calculate the distance traveled while distracted. Show your calculations in the box below.

Show your calculations here.

DISTRACTED DRIVING DANGERS



GROUP MEMBER ROLES*	RESPONSIBILITIES
Driver	Drives the Touch Track by touching all numbers in the correct sequence using the index finger on their dominant hand
Checker	Observes Driver to ensure he/she touches the numbers on the Touch Track in the correct sequence
Timer	Uses stopwatch to measure and record the time it takes the Driver to touch all numbers in the correct sequence
Distractor	Distracts the Driver by following the directions in Chart 2.

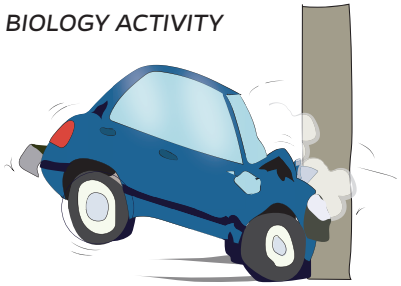
**For groups of three, combine the Checker and Timer roles*

Chart 1. *Group Member Roles*

TYPES OF DRIVING DIRECTIONS	DIRECTIONS FOR DISTRACTING THE DRIVER
Visual = looking at something other than the road	Inform the "Driver" that as they drive the Touch Track you will show them various items. They must look at the item and identify it by name. You will show them a different item every 3-5 seconds until they complete the Touch Track. (Possible items: playing cards or magazine photos).
Auditory = listening to something not related to driving	Inform the "Driver" that as they perform the Touch Track you will read them short sentences or parts of sentences from a book. They must repeat aloud exactly what you read to them.
Manual = manipulating something other than the wheel	Inform the "Driver" that as they perform the Touch Track they will remove uniquely shaped items from one bowl and place them in a second bowl. For example, you may ask them to remove the M&Ms from a bowl filled with a mixture of nuts, pretzels, and M&Ms.
Cognitive = thinking about something other than driving	Inform the "Driver" that as they perform the Touch Track you will ask them to mentally calculate a long addition problem (see Chart 3). They must give you their answer at the end of the problem.
All of the Above = combining Types 1-4	Inform the "Driver" that as they complete the Touch Track with one hand you will ask them to hold a small calculator in the other hand to input a long math problem into the calculator as you read it to them (see Chart 4) and then show their answer.

Chart 2. *Directions for distracting the "Driver"*

DISTRACTED DRIVING DANGERS



MENTAL-MATH PROBLEMS	ANSWERS
1 + 9 + 3 + 8 + 2 + 5 + 6 = ?	34
2 + 10 + 6 + 3 + 2 + 7 + 8 + 2 = ?	40
3 + 3 + 2 + 13 + 3 + 100 + 2 = ?	126
4 + 10 + 7 + 3 + 10 + 50 + 2 = ?	86
5 + 3 + 5 + 2 + 3 + 3 + 2 = ?	23
6 + 15 + 3 + 3 + 3 + 10 + 2 = ?	42
7 + 4 + 5 + 1 + 2 + 6 + 7 = ?	32
8 + 2 + 10 + 6 + 5 + 5 + 7 = ?	43
9 + 9 + 9 + 10 + 10 + 10 + 9 = ?	66

Chart 3. *Mental-Math Problems for Type #4 - Cognitive Distration*
Directions: Inform the "Driver" that as they perform Touch Track #2 you will ask them to mentally calculate one of the long addition problems below. They must give you their answer at the end of the problem.

CALCULATOR-MATH PROBLEMS	ANSWERS
1 × 9 + 3 + 8 ÷ 2 + 25 + 6 = ?	41
2 + 10 – 6 ÷ 3 × 2 + 8 + 8 × 2 = ?	40
3 × 3 + 2 + 13 ÷ 3 + 100 + 2 = ?	110
4 + 10 – 7 + 3 × 10 + 50 ÷ 2 = ?	75
5 × 3 + 5 ÷ 2 + 33 – 3 × 2 = ?	80
6 + 15 ÷ 3 + 3 × 9 + 10 ÷ 2 = ?	50
7 × 4 + 5 + 1 + 2 ÷ 6 × 7 = ?	42
8 ÷ 2 + 10 + 6 + 5 ÷ 5 × 7 = ?	35
9 × 9 + 9 + 10 ÷ 10 + 10 + 9 = ?	29

Chart 4. *Calculator-Math Problems for Type #5 - All of the Above Distraction*
Directions: Inform the "Driver" that as they complete Touch Track #2 with one hand you will ask them to hold a small calculator in their other hand and input one of the long math problems below into the calculator as you read the problem to them and then they must show you their answer.

7

9

3

10

6

1

8

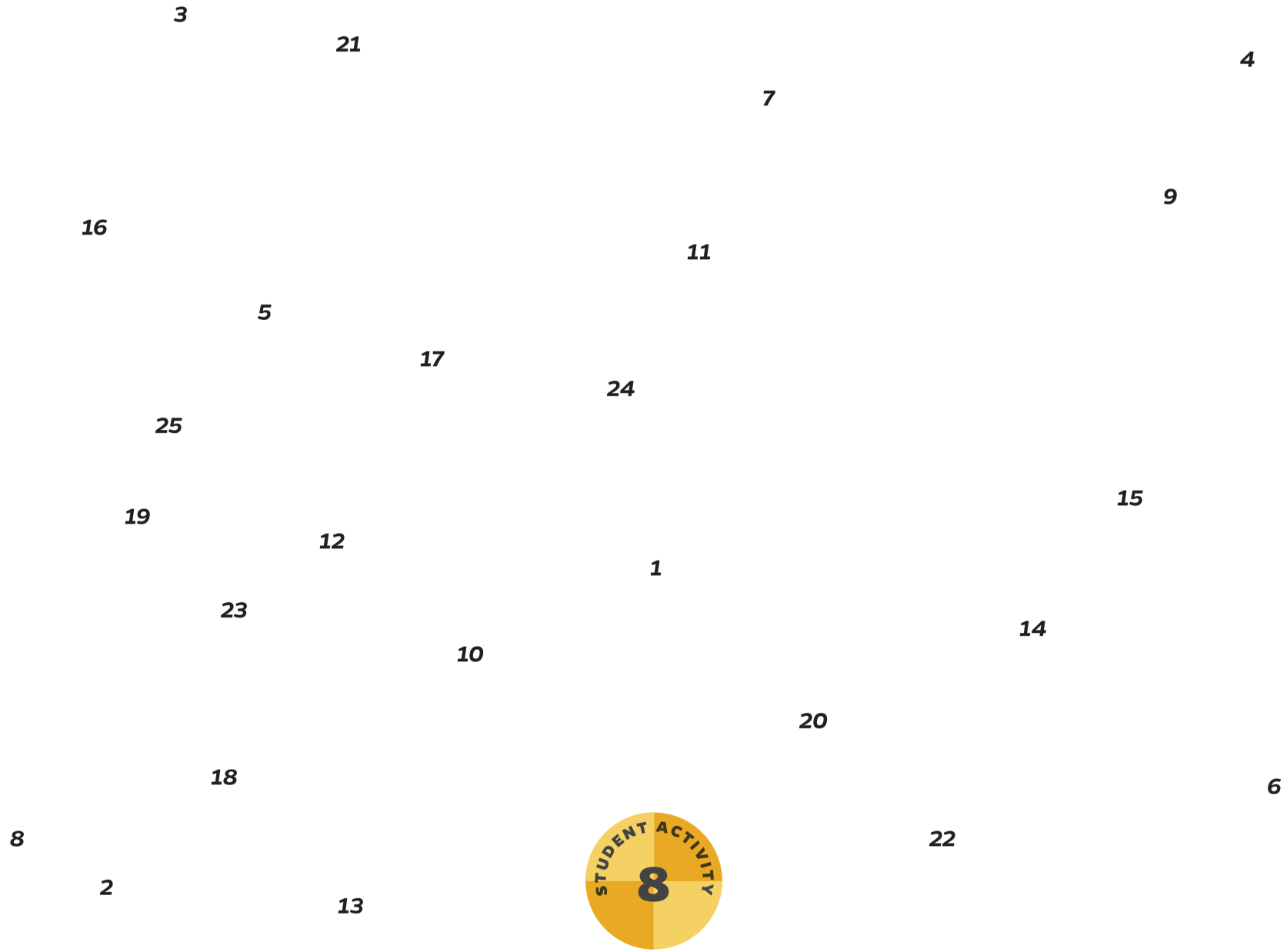
5

4

2

STUDENT ACTIVITY 8

DISTRACTED DRIVING DANGERS TOUCH TRACK #1



STUDENT ACTIVITY 8

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DISTRACTED DRIVING DANGERS TOUCH TRACK #2