

**Driver Education Classroom
And In-car Instruction**

Driving Procedures Unit

Anti-lock Brakes Topic

Suggested Lesson

**GRADE
HS**



Acknowledgments

The ABS Education Alliance is the industry's first coordinated effort to inform the public about the proper use and benefits of anti-lock brakes. "America Brakes for Safety" is the name of the Alliance's educational campaign geared toward consumers and the automotive, insurance and driver education industries.

The ABS Education Alliance is a coalition of four companies that are anti-lock brake manufacturers in the United States: Robert Bosch Corporation, Delphi Automotive Systems, Continental Teves and LucasVarity. The Alliance Trustees oversee full implementation of the organization's goals and are actively seeking additional partners and participants in an educational campaign.

In partnership with ADTSEA, the ABS Education Alliance developed this curriculum for driver education instructors specifically to teach the fundamentals of the ABS technology in a classroom and laboratory setting. For more information about the curriculum or to order additional copies, please contact Rosemarie Kitchin c/o the ABS Education Alliance at 919-549-4800.



Driving Procedures: Adverse Conditions

USING AN ANTI-LOCK BRAKE SYSTEM EFFECTIVELY

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4	Overview	ABS Pretest
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5	Traction	Transparency ABS-2
6	ABS Advantages	Transparency ABS-3
9	ABS Video	“Benefits of Four-wheel Anti-lock Braking Systems”
9	ABS Concerns	Worksheet ABS-A “America Brakes for Safety”
10	ABS Issues	“America Brakes for Safety”
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12	ABS Summary	“America Brakes for Safety”
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RESOURCES/MATERIALS		
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18	Worksheet ABS-A	“ABS Concerns and Issues”
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24	Transparency ABS-4	“With Anti-lock Braking Systems, Do:”
25	Transparency ABS-5	“With Anti-lock Braking Systems, Do Not:”

- Performance Outcomes** The student will be able to:
- describe four advantages of anti-lock braking systems (ABS).
 - explain how to recognize a vehicle equipped with ABS.
 - describe how ABS improves steerability and stability under all conditions.
 - list the types of surfaces where ABS will not offer a stopping distance advantage over conventional braking systems.
 - name two ways that a driver may deactivate ABS, without realizing it.
 - explain the difference between 4-wheel and 2-wheel ABS.
 - demonstrate an appropriate response to ABS in operation.

CONTENT/ACTIVITIES

Anti-lock Brakes Make Sense

OVERVIEW. Maintaining control of your vehicle is a key to safe driving. The traction between your rolling tires and the road surface will impact the amount of control you have in a given situation. Braking—whether slowing for a turn or braking for a stop—can cause a car to lose rolling traction. This can affect stopping distance and steering control. Anti-lock brake system (ABS) technology has become available to maintain rolling traction, offering skid-free stopping and steering control.

ABS allows the driver to steer his/her vehicle out of potentially damaging situations. The anti-lock brake system is engaged only under potentially dangerous conditions and engages when it detects impending wheel lock. ABS is not engaged under normal braking conditions and it will not impair normal braking actions. The following information is intended for 4-wheel ABS except where noted otherwise.

INTRODUCTION. The instructor should use the attached pretest to provide a basis for novice driver entry knowledge of this topic area (see page 14). Show Transparency ABS-1 to provide background information for ABS development (see page 21).

Use the following questions to initiate discussion about the development of an anti-lock brake system:

- When was the technology available?*

(An anti-lock brake system, which prevents wheel lock-up during braking, was first patented for passenger car application in the 1930s.)

TOPIC USING AN ANTI-LOCK BRAKE SYSTEM EFFECTIVELY GRADE HS (45 min.)

RESOURCES/MATERIALS

ABS Pretest

ABS PRETEST EVALUATION NAME _____
SECTION _____ DATE _____

Part One Directions. Circle the correct letter on the test sheet. (4 points each)

- As road conditions worsen, so does your control over which driving input:
 - braking.
 - steering.
 - accelerating.
 - all of the above.
- How do you recognize that ABS is activated when using the brake:
 - an immediate stop.
 - tire and wheel lock-up.
 - very hard pedal pressure.
 - vibration and changes in pedal pressure.
- You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is equipped with ABS, so you should:
 - shift to a lower gear.
 - brake soft, clear traffic, and steer to the right.
 - brake hard, clear traffic, and steer to the open space.
 - steer into a snowbank to the right.
- You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is not equipped with ABS, so you should:
 - shift to a lower gear, clear right lane, brake softly.
 - brake softly, clear lane, and steer to the open space.
 - brake hard, clear lane, steer to the left and maintain brake pressure.
 - brake hard, clear lane, and steer into a snowbank to the right.
- If you must stop quickly on a slippery street surface, you should apply:
 - soft braking pressure to engage ABS.
 - firm, steady pressure with ABS engaged.
 - jabbing brake with ABS engaged.
 - do not engage ABS.

Part Two Directions. Please place the correct answer on the back of this sheet. (8 points each)

- What does the abbreviation "ABS" stand for?
- What is the difference between ABS and conventional automobile brakes?
- What is the idea behind 4-wheel anti-lock brakes?
- Name two ways that the anti-lock brake system can be deactivated by the driver.
- What sensations will a driver feel when ABS engages?
- What effect does road surface have on stopping distance with ABS?
- What is the difference using 2-wheel ABS?
- How do you know that your vehicle is equipped with ABS?
- List four things one should do with ABS.
- List four things one should not do with ABS.

Transparency ABS-1

ABS DEVELOPMENT

- WHEN WAS THE TECHNOLOGY AVAILABLE?
- ON WHAT TYPE OF VEHICLE WAS THE FIRST APPLICATION OF ABS TECHNOLOGY USED?
- WHEN DID ABS BECOME READILY AVAILABLE FOR PASSENGER VEHICLES?
- WHAT ROAD VEHICLES WERE FIRST REQUIRED TO INSTALL ABS?

Topic Goal: To develop the novice driver knowledge needed to effectively use anti-lock brake systems under normal and adverse driving conditions.

Performance Outcomes The student will be able to:

- describe four advantages of anti-lock braking systems (ABS).
- explain how to recognize a vehicle equipped with ABS.
- describe how ABS improves steerability and stability under all conditions.
- list the types of surfaces where ABS will not offer a stopping distance advantage over conventional braking systems.
- name two ways that a driver may deactivate ABS, without realizing it.
- explain the difference between 4-wheel and 2-wheel ABS.
- demonstrate an appropriate response to ABS in operation.

CONTENT/ACTIVITIES

• *On what type of vehicle was the first application of ABS technology used?*

(ABS was first introduced in the 1930s for use on aircraft.)

• *When did ABS become readily available for passenger vehicles?*

(Interest in developing ABS for production automobiles emerged at about the same time as that for aviation. Several suppliers became interested in ABS, but interest waned and research was discontinued for several years. In the 1980s, interest was renewed as many vehicle safety technologies were developed for use in passenger vehicles.)

• *What road vehicles were first required users of ABS technology?*

(ABS regulations for heavy duty trucks were first introduced in the United States (1975-76) to reduce crashes due to traction loss. This technology advancement allowed for fewer jackknifing situations due to brake traction losses. The mandate, although revoked, has been reinstated in early 1997.)

TRACTION. When drivers use improper braking, steering, or acceleration techniques, a vehicle can lose traction. Use Transparency ABS-2 to review the conditions that contribute to increasing or decreasing a stopping distance (see page 22). In other parts of the curriculum, students should have discussed road surface, weather conditions, tires, braking techniques, and speed as potential problem areas.

TOPIC USING AN ANTI-LOCK BRAKE SYSTEM EFFECTIVELY GRADE HS (45 min.)

RESOURCES/MATERIALS

Transparency ABS-1

ABS DEVELOPMENT

- WHEN WAS THE TECHNOLOGY AVAILABLE?
- ON WHAT TYPE OF VEHICLE WAS THE FIRST APPLICATION OF ABS TECHNOLOGY USED?
- WHEN DID ABS BECOME READILY AVAILABLE FOR PASSENGER VEHICLES?
- WHAT ROAD VEHICLES WERE FIRST REQUIRED TO INSTALL ABS ?

Transparency ABS-2

TRACTION DEPENDS ON:

ROAD SURFACE

WEATHER CONDITIONS



TIRES

BRAKING TECHNIQUES

SPEED

Topic Goal: To develop the novice driver knowledge needed to effectively use anti-lock brake systems under normal and adverse driving conditions.

- Performance Outcomes** The student will be able to:
- describe four advantages of anti-lock braking systems (ABS).
 - explain how to recognize a vehicle equipped with ABS.
 - describe how ABS improves steerability and stability under all conditions.
 - list the types of surfaces where ABS will not offer a stopping distance advantage over conventional braking systems.
 - name two ways that a driver may deactivate ABS, without realizing it.
 - explain the difference between 4-wheel and 2-wheel ABS.
 - demonstrate an appropriate response to ABS in operation.

CONTENT/ACTIVITIES

Now it is time to consider braking as a potential to increase or decrease stopping distance based on braking principles and techniques. There are several appropriate techniques to brake a modern automobile. Drivers must understand that locking the brakes is dangerous, because when wheels stop rolling, tires lose traction, stopping distance may increase, and steering ability is lost.

ABS ADVANTAGES. On most roadway surfaces, ABS controls the brakes better than driver “pumping” or “jabbing” techniques. Use Transparency ABS-3 to identify the four advantages of ABS technology (see page 23).

ENHANCED BRAKING ACTION. With the advent of caliper-disc brake technology in the late 1960s, drivers were discouraged from using pumping brake actions. Instead, they were encouraged to use squeeze braking techniques, similar to the process used on a hand brake bicycle, to slow the vehicle. Transparency ABS-3 may be used to illustrate the ABS advantages (see page 23).

Due to the difficulty in applying the squeeze braking techniques, drivers tended to lock the wheels causing the tires to skid. ABS was developed to assist driver braking actions when impending wheel lock-up could occur. Advances in computer and sensory technology allowed ABS to become a practical feature.

TOPIC USING AN ANTI-LOCK BRAKE SYSTEM EFFECTIVELY GRADE HS (45 min.)

RESOURCES/MATERIALS

Transparency ABS-3

ABS ADVANTAGES

ENHANCED BRAKING ACTION



Topic Goal: To develop the novice driver knowledge needed to effectively use anti-lock brake systems under normal and adverse driving conditions.

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 - describe how ABS improves steerability and stability under all conditions.
 - list the types of surfaces where ABS will not offer a stopping distance advantage over conventional braking systems.
 - name two ways that a driver may deactivate ABS, without realizing it.
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CONTENT/ACTIVITIES

In some reduced traction situations when wheel lock-up occurred, drivers were trained to use jab-braking actions to enhance steerability and reduce stopping distance. ABS allows this braking action to occur in a more efficient manner by providing the jabbing action automatically while the driver maintains steady brake pressure.

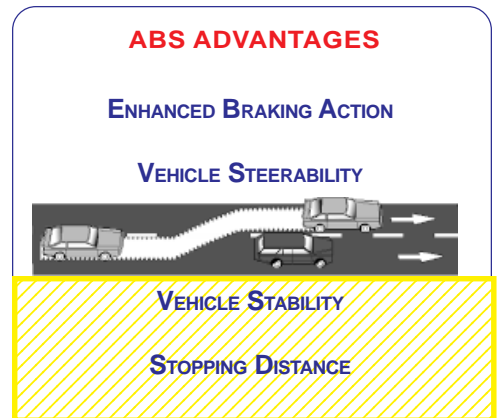
VEHICLE STEERABILITY. Steerability refers to the ability to move the vehicle where the driver wants it to go. With rolling traction, a driver is able to steer the car to the right or left in a lane change or make a smooth adjustment when entering a curve. In each of these driving situations, sudden steering actions can cause a sudden shift in vehicle balance and traction loss. This lack of steerability may take the vehicle off the normal traveled section of the roadway.

Under driver panic braking conditions where limited steering actions are required, ABS technology will enhance driver control capabilities. ABS technology is designed to maintain rolling traction and steering. The rolling action may produce longer stopping distances on some surfaces, such as freshly fallen snow or loose gravel. The ABS steering advantage outweighs any braking disadvantage on these surfaces. Evasive steering techniques are designed to allow the driver to steer the vehicle clear of danger.

By maintaining a speed reduction without wheel lock-up, ABS increases steerability of the vehicle. The driver should use just enough steering movement to adjust the vehicle to a clear space on the roadway. It is important to emphasize looking where the driver

RESOURCES/MATERIALS

Transparency ABS-3



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CONTENT/ACTIVITIES

wants to steer the vehicle in order to avoid an obstacle. Too much steering movement may take the car off the roadway. The driver must recognize that the ABS system does not influence normal braking operations, and the driver has the responsibility to maintain a safe following time or distance interval.

VEHICLE STABILITY. The vehicle stability concept refers to maintaining a vehicle's tire traction on the roadway surface. Current traction control principles, with conventional brakes, ask the driver to remove the foot from the brake or accelerator when traction is lost in order to regain vehicle stability. Simply stated, when too much braking is applied to the vehicle, the tires lose traction with the road surface. The driver releases brake pressure to allow wheel movement. ABS allows the wheels to roll while the driver maintains full brake pressure on the brake pedal. The rolling action helps to regain traction control (stability) to the front or rear tires.

STOPPING DISTANCE. Stopping distance is **generally** reduced by ABS technology. Training a driver using conventional brakes on limited traction surfaces often called for a braking technique designated as **jabbing** the brake. This fast application of full braking on and full release off was designed to enhance steerability and stability of the vehicle and reduce the stopping distance. ABS technology is designed to perform this jabbing the brake technique automatically, using wheel speed sensors with more efficiency than a driver can apply the process. This

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RESOURCES/MATERIALS

Transparency ABS-3

ABS ADVANTAGES

ENHANCED BRAKING ACTIONS

VEHICLE STEERABILITY



VEHICLE STABILITY

STOPPING DISTANCE

Topic Goal: To develop the novice driver knowledge needed to effectively use anti-lock brake systems under normal and adverse driving conditions.

Performance Outcomes The student will be able to:

- describe four advantages of anti-lock braking systems (ABS).
- explain how to recognize a vehicle equipped with ABS.
- describe how ABS improves steerability and stability under all conditions.
- list the types of surfaces where ABS will not offer a stopping distance advantage over conventional braking systems.
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CONTENT/ACTIVITIES

action allows the technology to perform the braking action while the driver maintains a constant firm pressure on the brake pedal and concentrates on finding an open lane steering option.

ABS VIDEO. Use the video entitled “Benefits of Four-wheel Anti-lock Braking Systems” to demonstrate the significance of enhanced vehicle stability, steerability, and reduced stopping distance. The video will provide examples of poor driving and braking techniques and follow up with the advantages of four-wheel ABS. The technology will be explained and examples of the technology at work will be displayed. The video will mention the increased ability to stop the car on most surfaces, but the primary issue is the increased vehicle stability and the ability to steer the vehicle out of harm’s way.

ABS CONCERNS. Use Worksheet ABS-A (see page 18) to identify student knowledge of concerns presented by the ABS industry regarding incorrect use of the technology. Hand out the pamphlet entitled “America Brakes for Safety” sponsored by the ABS Education Alliance to aid in answering the questions on the student worksheet. (If time permits, this may be completed as a class activity, or used as a homework assignment with a follow up discussion.)

TOPIC USING AN ANTI-LOCK BRAKE SYSTEM EFFECTIVELY GRADE HS (45 min.)

RESOURCES/MATERIALS



“Benefits of Four-wheel Anti-lock Braking Systems” 8 min.

produced by
ABS Education Alliance
Contact person:
Rosemarie Kitchin
(919) 549-4800



Worksheet ABS-A

WORKSHEET ABS-A “ABS CONCERNS AND ISSUES”

Class Activity 1-1 DRIVING UNDER ADVERSE CONDITIONS

Name _____ Date _____

Answer the following questions to the best of your ability using the “America Brakes for Safety” pamphlet provided by the ABS Education Alliance.

- What does the abbreviation “ABS” stand for?
- What is the difference between ABS and conventional automobile brakes?
- What is the idea behind anti-lock brakes?
- Name two ways that the anti-lock brake system can be inadvertently disengaged by the driver.
- What sensations will a driver feel when ABS is engaged?
- What surfaces may produce a longer stopping distance with ABS?
- What is the difference using 2-wheel ABS?
- How do you know that your vehicle is equipped with ABS?
- List four things one should do with ABS.
- List four things one should not do with ABS.

Topic Goal: To develop the novice driver knowledge needed to effectively use anti-lock brake systems under normal and adverse driving conditions.



- Performance Outcomes** The student will be able to:
- describe four advantages of anti-lock braking systems (ABS).
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CONTENT/ACTIVITIES

- *What effect does road surface have on stopping distance with ABS?*

[Stopping distance may be longer on some surfaces, such as freshly fallen snow or loose gravel, but the ability to steer the vehicle remains (see page 7, Curriculum; Inside Column 1-2, Pamphlet)].

- *What is the difference using 2-wheel ABS?*

[2-wheel ABS, found only on light trucks, is designed to eliminate rear wheel skid which may produce a loss of vehicle stability such as a sudden movement to the right or left. The front wheels may still lock up. The driver must recognize that although the vehicle has 2-wheel ABS on the rear wheels, he/she must use conventional braking techniques with this 2-wheel anti-lock brake system (see Inside Column 4, Pamphlet)].

- *How do you know that your vehicle is equipped with ABS?*

[There may be a marking on the vehicle, but ABS-equipped cars have a dashboard alert system that lights briefly at start-up (see Inside Column 1-2, Pamphlet)].

- *List four things one should do with ABS.*

[Add to your following time or distance interval in poor weather as with conventional brakes, practice using ABS, keep your foot firmly on brake, and check the owner's manual for special concerns (see Transparency ABS-4, p. 24; Inside Column 2, Pamphlet)].

RESOURCES/MATERIALS

Transparency ABS-4

WITH ANTI-LOCK BRAKING SYSTEMS, DO:



ADD TO YOUR FOLLOWING INTERVAL IN POOR WEATHER SAME AS CONVENTIONAL BRAKES...

PRACTICE USE OF ABS...



KEEP YOUR FOOT FIRMLY ON BRAKE...

CHECK THE OWNER'S MANUAL FOR SPECIAL CONCERNS...

Topic Goal: To develop the novice driver knowledge needed to effectively use anti-lock brake systems under normal and adverse driving conditions.

- Performance Outcomes** The student will be able to:
- describe four advantages of anti-lock braking systems (ABS).
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CONTENT/ACTIVITIES

- *List four things one should not do with ABS.*

[Don't drive more aggressively, don't pump the brakes, don't forget to steer after checking for clearance, and don't be alarmed by noise and vibration which may occur (see Transparency ABS-5, p. 25; Inside Column 3, Pamphlet)].

ABS SUMMARY. The keys to proper use of the ABS technology are to recognize how the vehicle is equipped, recognize when ABS is functioning, and perform techniques of firm braking and limited steering. Knowing these key factors and elements will allow the driver to take full advantage of this braking technology. The instructor should emphasize that ABS technology does not affect the normal operation of the conventional braking system in any manner. The vehicle's brakes will feel and operate like a conventional system until any impending wheel lock occurs to activate the ABS system.

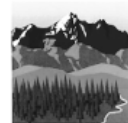
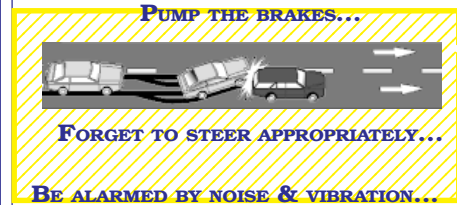
**TOPIC
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(45 min.)**

RESOURCES/MATERIALS

Transparency ABS-5

WITH ANTI-LOCK BRAKING SYSTEMS, DO NOT:

DRIVE MORE AGGRESSIVELY...



pamphlet provided by

ABS Education Alliance

(919) 549-4800

Robert Bosch Corp.

Delphi Chassis Systems

ITT Automotive

LucasVarity

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- Performance Outcomes** The student will be able to:
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 - name two ways that a driver may deactivate ABS, without realizing it.
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ASSESSMENT ACTIVITIES

RESOURCES/MATERIALS

SESSION ASSESSMENT

The evaluation pages contain a pretest evaluation as well as assessments that may be used as a topic quiz or part of a unit evaluation.

Activities:

- Students will use reading and comprehension skills to complete Worksheet ABS-A, while reading a pamphlet entitled “America Brakes for Safety” from the ABS Education Alliance.
- Students will demonstrate knowledge skills by improving pretest to posttest skills

Note: The instructor may determine percentage of knowledge gain by subtracting pretest score from post-test score and dividing that score by the pretest score.
Example: Pretest = 45; Posttest = 81 then,

$$81-45 = 36: 36/45 = 80\% \text{ (gain)}$$

$$\text{Pretest} = 70; \text{Posttest} = 72 \text{ then,}$$

$$72-70 = 2: 2/70 = 2.8\% \text{ (gain)}$$

Performance Indicators:

- Students will be asked to demonstrate skills of ABS operation in the attached in-car lesson objectives.
- Students will share worksheet, pamphlet information, and performance skills with parents.

Topic Evaluation

ABS TOPIC EVALUATION	NAME _____
	SECTION _____ DATE _____
Part One Directions. Circle the correct letter on the test sheet. (4 points each)	
1. As road conditions worsen, so does your control over which driving input: a. braking. b. steering. c. accelerating. d. all of the above.	
2. How do you recognize that ABS is activated when using the brake: a. an immediate stop. b. tire and wheel lock-up. c. very hard pedal pressure. d. vibration and changes in pedal pressure.	
3. You are driving in the right lane of a key, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is equipped with ABS, so you should: a. shift to a lower gear. b. brake soft, clear traffic, and steer to the right. c. brake hard, clear traffic, and steer to the open space. d. steer into a snowbank to the right.	
4. You are driving in the right lane of a key, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is not equipped with ABS, so you should: a. shift to a lower gear, clear right lane, brake softly. b. brake softly, clear lane, and steer to the open space. c. brake hard, clear lane, steer to the left and maintain brake pressure. d. brake hard, clear lane, and steer into a snowbank to the right.	
5. If you must stop quickly on a slippery street surface, you should apply: a. soft braking pressure to engage ABS. b. firm, steady pressure with ABS engaged. c. jabbing brake with ABS engaged. d. do not engage ABS.	
Part Two Directions: Please place the correct answer on the back of this sheet. (8 points each)	
6. What does the abbreviation “ABS” stand for?	
7. What is the difference between ABS and conventional automobile brakes?	
8. What is the idea behind 4-wheel anti-lock brakes?	
9. Name two ways that the anti-lock brake system can be deactivated by the driver.	
10. What sensations will a driver feel when ABS engages?	
11. What effect does road surface have on stopping distance with ABS?	
12. What is the difference using 2-wheel ABS?	
13. How do you know that your vehicle is equipped with ABS?	
14. List four things one should do with ABS.	
15. List four things one should not do with ABS.	

Topic Goal: To develop the novice driver knowledge needed to effectively use anti-lock brake systems under normal and adverse driving conditions.



**Driver Education Classroom
And In-car Instruction**

Driving Procedures Unit

Anti-lock Brakes Topic

Resource Materials

**GRADE
HS**



Evaluation and Assessment

ABS Pretest Evaluation

Name _____

Section _____ Date _____

Part One Directions. Circle the correct letter on the test sheet. (4 points each)

1. As road conditions worsen, so does your control over which driving input:
 - a. braking.
 - b. steering.
 - c. accelerating.
 - d. all of the above.
2. How do you recognize that ABS is activated when using the brake:
 - a. an immediate stop.
 - b. tire and wheel lock-up.
 - c. very hard pedal pressure.
 - d. vibration and changes in pedal pressure.
3. You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is equipped with ABS, so you should:
 - a. shift to a lower gear.
 - b. brake soft, clear traffic, and steer to the right.
 - c. brake hard, clear traffic, and steer to the open space.
 - d. steer into a snowbank to the right.
4. You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is not equipped with ABS, so you should:
 - a. shift to a lower gear, clear right lane, brake softly.
 - b. brake softly, clear lane, and steer to the open space.
 - c. brake hard, clear lane, steer to the left and maintain brake pressure.
 - d. brake hard, clear lane, and steer into a snowbank to the right.
5. If you must stop quickly on a slippery street surface, you should apply:
 - a. soft braking pressure to engage ABS.
 - b. firm, steady pressure with ABS engaged.
 - c. jabbing brake with ABS engaged.
 - d. do not engage ABS.

Part Two Directions: Please place the correct answer on the back of this sheet. (8 points each)

6. What does the abbreviation "ABS" stand for?
7. What is the difference between ABS and conventional automobile brakes?
8. What is the idea behind 4-wheel anti-lock brakes?
9. Name two ways that the anti-lock brake system can be deactivated by the driver.
10. What sensations will a driver feel when ABS engages?
11. What effect does road surface have on stopping distance with ABS?
12. What is the difference using 2-wheel ABS?
13. How do you know that your vehicle is equipped with ABS?
14. List four things one should do with ABS.
15. List four things one should not do with ABS.

ABS Topic Assessment

Name _____

Section _____ Date _____

Part One Directions. Circle the correct letter on the test sheet. (4 points each)

1. As road conditions worsen, so does your control over which driving input:
 - a. braking.
 - b. steering.
 - c. accelerating.
 - d. all of the above.

2. How do you recognize that ABS is activated when using the brake:
 - a. an immediate stop.
 - b. tire and wheel lock-up.
 - c. very hard pedal pressure.
 - d. vibration and changes in pedal pressure.

3. You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is equipped with ABS, so you should:
 - a. shift to a lower gear.
 - b. brake soft, clear traffic, and steer to the right.
 - c. brake hard, clear traffic, and steer to the open space.
 - d. steer into a snowbank to the right.

4. You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is not equipped with ABS, so you should:
 - a. shift to a lower gear, clear right lane, brake softly.
 - b. brake softly, clear lane, and steer to the open space.
 - c. brake hard, clear lane, steer to the left and maintain brake pressure.
 - d. brake hard, clear lane, and steer into a snowbank to the right.

5. If you must stop quickly on a slippery street surface, you should apply:
 - a. soft braking pressure to engage ABS.
 - b. firm, steady pressure with ABS engaged.
 - c. jabbing brake with ABS engaged.
 - d. do not engage ABS.

Part Two Directions: Please place the correct answer on the back of this sheet. (8 points each)

6. What does the abbreviation "ABS" stand for?

7. What is the difference between ABS and conventional automobile brakes?

8. What is the idea behind 4-wheel anti-lock brakes?

9. Name two ways that the anti-lock brake system can be deactivated by the driver.

10. What sensations will a driver feel when ABS engages?

11. What effect does road surface have on stopping distance with ABS?

12. What is the difference using 2-wheel ABS?

13. How do you know that your vehicle is equipped with ABS?

14. List four things one should do with ABS.

15. List four things one should not do with ABS.

Evaluation and Assessment

Driving Unit ABS Topic Sample Evaluation

Name _____

Section _____ Date _____

Part One: Directions. Please place the correct letter on the answer sheet provided.

- As road conditions worsen, so does your control over which driving input:
 - a. braking.
 - b. steering.
 - c. accelerating.
 - d. all of the above.* (Curriculum, p. 5)**
- How do you recognize that ABS is activated when using the brake:
 - a. an immediate stop.
 - b. tire and wheel lock-up.
 - c. very hard pedal pressure.
 - d. vibration and changes in pedal pressure.* (Curriculum, p. 12)**
- You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is equipped with ABS, so you should:
 - a. shift to a lower gear.
 - b. brake soft, clear traffic, and steer to the right.
 - c. brake hard, clear traffic, and steer to the open space.* (Curriculum, p. 7)**
 - d. steer into a snowbank to the right.
- You are driving in the right lane of an icy, two-way, four lane street when you see a car in your lane is stopped for a stop sign. Your car is not equipped with ABS, so you should:
 - a. shift to a lower gear, clear right lane, brake softly.
 - b. brake softly, clear lane, and steer to the open space.* (Curriculum, p. 7)**
 - c. brake hard, clear lane, steer to the left and maintain brake pressure.
 - d. brake hard, clear lane, and steer into a snowbank to the right.
- If you must stop quickly on a slippery street surface, you should apply:
 - a. soft braking pressure to engage ABS.
 - b. firm, steady pressure with ABS engaged.* (Curriculum, p. 9)**
 - c. jabbing brake with ABS engaged.
 - d. do not engage ABS.

Part Two: Directions. Please place the correct answer on the answer sheet provided.

- What does the abbreviation “ABS” stand for?

[THE ABBREVIATION STANDS FOR ANTI-LOCK BRAKE SYSTEM (SEE PAGE 4, CURRICULUM; OUTSIDE COVER, PAMPHLET)].

- What is the difference between ABS and conventional automobile brakes?

[CONVENTIONAL BRAKES ALLOW WHEELS TO BE LOCKED BY THE DRIVER AND PRODUCE A LOSS OF ROLLING TRACTION. ABS ENGAGES WHEN A WHEEL SPEED SENSOR DETECTS IMPENDING WHEEL LOCK-UP, ALLOWING THE VEHICLE TO BE STEERED WHILE HELPING MAINTAIN VEHICLE STABILITY (SEE PAGE 6, CURRICULUM; INSIDE COLUMN 4, PAMPHLET)].

Unit ABS Topic Evaluation

- What is the idea behind 4-wheel anti-lock brakes?

[4-WHEEL ABS IS DESIGNED TO PREVENT SKIDDING AND MAINTAIN LIMITED STEERING CONTROL DURING EMERGENCY BRAKING (SEE PAGE 7, CURRICULUM; COVER, PAMPHLET)].

- Name two ways that the anti-lock brake system can be deactivated by the driver.

[BY REMOVING THE HARD PRESSURE FROM THE BRAKE PEDAL OR BY PUMPING THE BRAKES (SEE PAGE 10, CURRICULUM; INSIDE COLUMN 1, PAMPHLET)].

- What sensations will a driver feel when ABS engages?

[BRAKES MAY FEEL HARDER TO PUSH, HAVE A VIBRATION, AND NOISES MAY OCCUR (SEE PAGE 12, CURRICULUM; INSIDE COLUMN 1, PAMPHLET)].

- What effect does road surface have on stopping distance with ABS?

[STOPPING DISTANCE MAY BE LONGER ON SOME SURFACES, SUCH AS FRESHLY FALLEN SNOW OR LOOSE GRAVEL, BUT THE ABILITY TO STEER THE VEHICLE REMAINS (SEE PAGE 7, CURRICULUM; INSIDE COLUMN 1-2, PAMPHLET)].

- What is the difference using 2-wheel ABS?

[2-WHEEL ABS, FOUND ONLY ON LIGHT TRUCKS, IS DESIGNED TO ELIMINATE REAR WHEEL SKID WHICH MAY PRODUCE A LOSS OF VEHICLE STABILITY SUCH AS A SUDDEN MOVEMENT TO THE RIGHT OR LEFT. THE FRONT WHEELS MAY STILL LOCK-UP. THE DRIVER MUST RECOGNIZE THAT ALTHOUGH THE VEHICLE HAS 2-WHEEL ABS ON THE REAR WHEELS, HE/SHE MUST USE CONVENTIONAL BRAKING TECHNIQUES WITH THIS 2-WHEEL ANTI-LOCK BRAKE SYSTEM (SEE INSIDE COLUMN 4, PAMPHLET)].

- How do you know that your vehicle is equipped with ABS?

[THERE MAY BE A MARKING ON THE VEHICLE, BUT ABS-EQUIPPED CARS HAVE A DASHBOARD ALERT SYSTEM THAT LIGHTS BRIEFLY AT START-UP (SEE INSIDE COLUMN 1-2, PAMPHLET)].

- List four things one should do with ABS.

[ADD TO YOUR FOLLOWING TIME OR DISTANCE INTERVAL IN POOR WEATHER AS WITH CONVENTIONAL BRAKES, PRACTICE USING ABS, KEEP YOUR FOOT FIRMLY ON BRAKE, AND CHECK THE OWNER'S MANUAL FOR SPECIAL CONCERNS (SEE TRANSPARENCY ABS-4, P. 24; INSIDE COLUMN 2, PAMPHLET)].

- List four things one should not do with ABS.

[DON'T DRIVE MORE AGGRESSIVELY, DON'T PUMP THE BRAKES, DON'T FORGET TO STEER AFTER CHECKING FOR CLEARANCE, AND DON'T BE ALARMED BY NOISE AND VIBRATION WHICH MAY OCCUR (SEE TRANSPARENCY ABS-5, P. 25; INSIDE COLUMN 3, PAMPHLET)].

WORKSHEET ABS-A “ABS CONCERNS AND ISSUES”

Class Activity 1-1 DRIVING UNDER ADVERSE CONDITIONS

Name _____ Date _____

Answer the following questions to the best of your ability using the “America Brakes for Safety” illustrated pamphlet provided by the ABS Education Alliance.

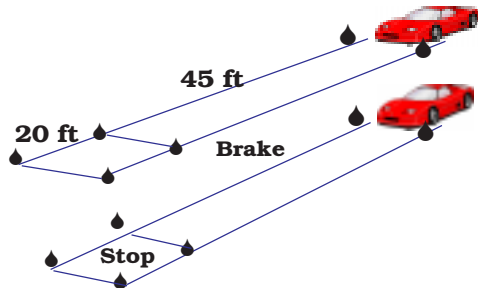
- What does the abbreviation "ABS" stand for?
- What is the difference between ABS and conventional automobile brakes?
- What is the idea behind 4-wheel anti-lock brakes?
- Name two ways that the anti-lock brake system can be deactivated by the driver.
- What sensations will a driver feel when ABS engages?
- What effect does road surface have on stopping distance with ABS?
- What is the difference using 2-wheel ABS?
- How do you know that your vehicle is equipped with ABS?
- List four things one should do with ABS.
- List four things one should **not** do with ABS.

“BRAKING AND STEERING TECHNIQUES INSTRUCTION”

Performance Skill Activity 1-1. Squeeze Braking, Limited Steering, and ABS

PERFORMANCE ACTIVITIES

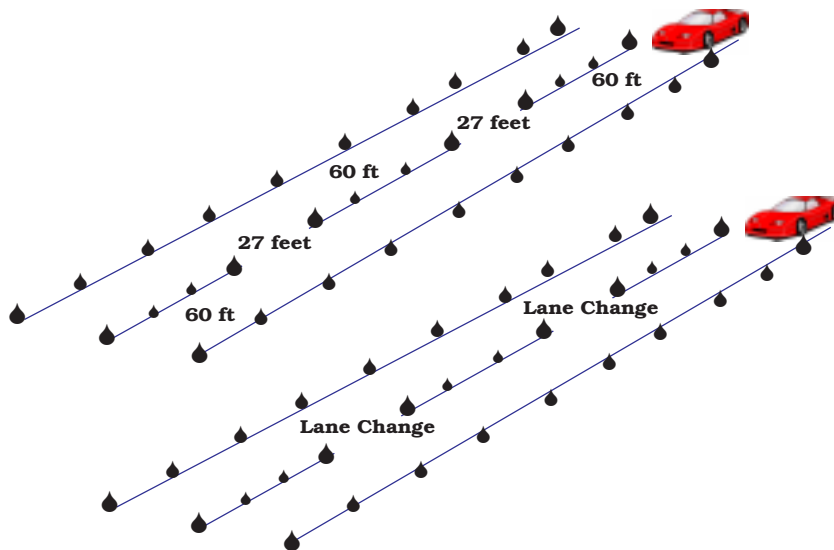
Exercise A. Squeeze Braking and ABS Skills



Exercise. Set up an exercise that would allow 45 feet of braking distance and 20 feet to stop within a box. Enter the exercise at 40 mph and use a controlled braking effort to stop. Second effort use 40 to 45 mph and a threshold brake to stop the vehicle. Third effort use 40 to 45 mph and activate the ABS system to stop the vehicle. If an ABS-equipped vehicle is not available, try using brake lock at 40 to 45 mph to illustrate the differences in the braking skill stopping distances.

Instructor Activities. Demonstrate two squeeze braking techniques, controlled and threshold, to the students prior to having students perform any task. The goals are to enhance squeeze braking skills and demonstrate the activation of the anti-lock brake system. Controlled braking is defined as maintaining firm brake pressure while keeping the heel of your foot on floorboard to stabilize braking actions. Threshold braking is applying the maximum squeeze braking pressure that does not produce a traction loss. ABS will automatically engage when full maximum brake pressure is applied and maintained on brake pedal. Speeds may be started at 30 mph with limited experience drivers.

Exercise B. Limiting Steering Skills

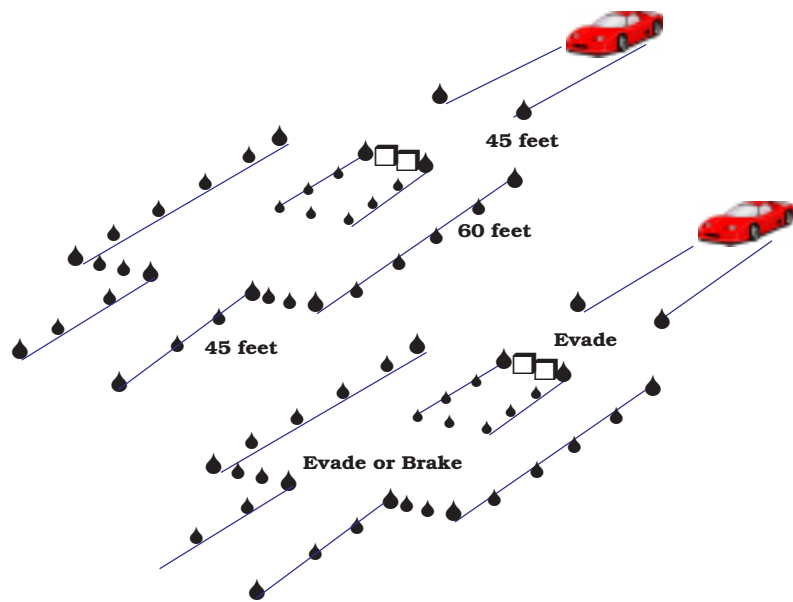


Exercise. Set up an exercise that would allow 60 feet between lane changing efforts and 27 feet of space to change lane position. Try first entry using too much steering input like hand-over-hand to notice the changes in vehicle balance caused by excessive steering. Second effort use evasive action steering with limited steering inputs for vehicle balance during the lane change. Visually targeting the open lane is critical prior to any steering move-

ment. This exercise may be accomplished with a shuffle steering effort but may not be as efficient in moving the vehicle to the center of each 10 or 12 foot lane. This exercise may be used in reverse to understand vehicle balance and one hand steering inputs. Backing speeds must be reduced to allow time for visual targeting skills and limiting steering inputs to change lanes as needed.

Instructor Activities. Demonstrate the effects of limited steering inputs that allow the vehicle to move exactly where the driver wants it to go. Exaggerate a hand-over-hand maneuver or how too much steering input rapidly changes car balance and allows the vehicle to lose traction or skid. Demonstrate the need for speed reduction and limited steering when traveling in reverse or on limited traction surfaces. Emphasize the need to establish a target area to develop a good sightline before steering the vehicle. Several evasive steering techniques are used from full 180 degree inputs to more limiting slide or shuffle steering techniques. The instructor should use either technique to demonstrate the effects of steering on balance and lane position. This will lead into teaching the real benefit of ABS, as limited steering techniques may be used while ABS is activated.

Exercise C. Braking and Steering Skills



Exercise. Set up an exercise which allows for space to change lanes in avoidance of a stationary object. On initial entry, the student should use only evasive steering efforts at speeds under 30 mph. During second attempt, increase speed and add a threshold brake after the first steer to stop at the second blocked area. On third attempt, increase speed to 40 mph and activate ABS while using an evasive steer to slow and evade the problem areas. Emphasize the importance

of finding a safe lane position and how limiting steering inputs are critical when avoiding a problem area.

Instructor Activities. Demonstrate the effects of combining the braking and steering techniques. Using conventional brakes, great care is needed not to employ brakes and steering at the same time due to immediate traction loss. ABS allows the driver to avoid hazards while maintaining full brake pressure. Care is needed to recognize that a safe and open area must be determined prior to steering the vehicle. The driver must recognize the surrounding traffic conditions and respond with conventional squeeze braking and limited steering techniques to avoid a problem. Full braking pressure must be maintained when ABS is activated.

INSTRUCTOR PRECAUTIONS

Each exercise should be demonstrated by the instructor prior to any student efforts. Exercises should be free from obstructions and crossing vehicular traffic during operation of the skill development session. An off-street parking area is required for safe development of the performance skills required. Student errors may produce traction losses and the instructor must be prepared to take corrective verbal, braking, or steering measures.

ABS DEVELOPMENT

- **WHEN WAS THE ABS TECHNOLOGY AVAILABLE?**
- **ON WHAT VEHICLES WAS THE FIRST COMMERCIAL APPLICATION OF ABS TECHNOLOGY USED?**
- **WHEN DID ABS BECOME AVAILABLE FOR PASSENGER VEHICLES?**
- **WHAT ROAD VEHICLES WERE FIRST REQUIRED TO INSTALL ABS ?**

TRACTION DEPENDS ON:

ROAD SURFACE

WEATHER CONDITIONS

TIRES

BRAKING TECHNIQUES

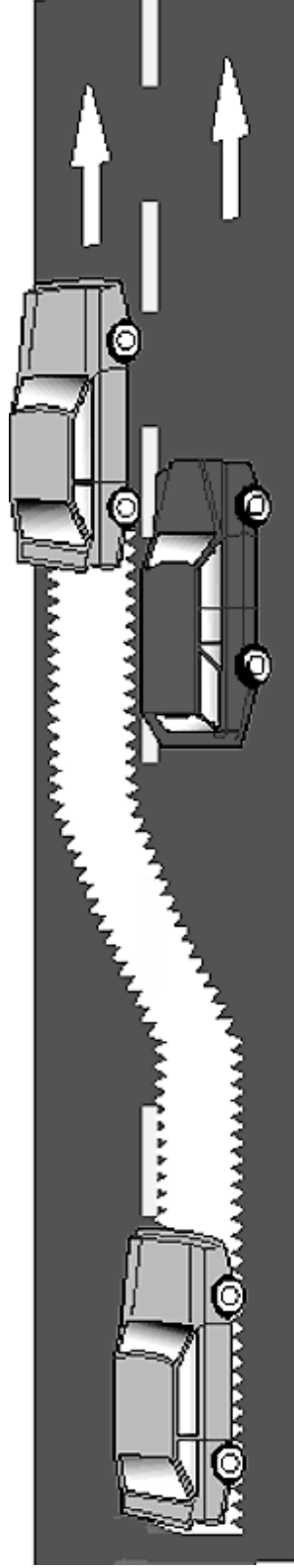
SPEED



ABS ADVANTAGES

ENHANCED BRAKING ACTION

VEHICLE STEERABILITY



VEHICLE STABILITY

STOPPING DISTANCE

WITH ANTI-LOCK BRAKING SYSTEMS, DO:

ADD TO YOUR FOLLOWING INTERVAL IN POOR WEATHER SAME AS CONVENTIONAL BRAKES...



PRACTICE USE OF ABS...



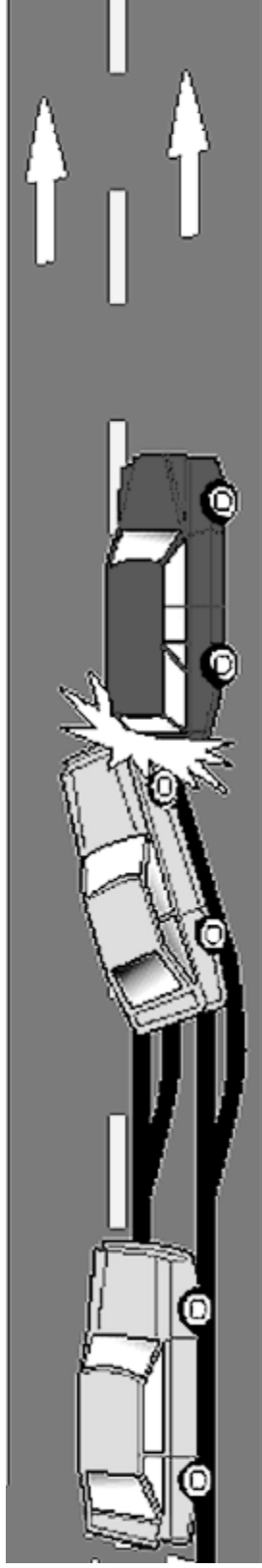
KEEP YOUR FOOT FIRMLY ON BRAKE...

CHECK THE OWNER'S MANUAL FOR SPECIAL CONCERNS...

WITH ANTI-LOCK BRAKING SYSTEMS, DO NOT:

DRIVE MORE AGGRESSIVELY...

PUMP THE BRAKES...



FORGET TO STEER APPROPRIATELY...

BE ALARMED BY NOISE & VIBRATION...