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PROPRIETARY

UNIT 6 | SECTION B | LESSON 2 | PRESENTATION

WHICH WAY TO STEER?

LEARNING OBJECTIVES

At the end of this lesson, you will be able to:

- ***Calculate*** **compass headings after taking true course, wind correction angle, magnetic variation, and magnetic deviation into account.**
- ***Construct*** **a wind triangle to model the effect of wind on true course.**
- ***Apply*** **the concepts of wind and magnetic corrections in an explanation of how an aircraft compensates for those effects during flight.**

WARM-UP

Navigation Terminology

- **Get comfortable with the terms!**
- **Complete Student Activity 1.**
  - Match terms to their definitions.
  - *Which terms were intuitive? Which were confusing?*

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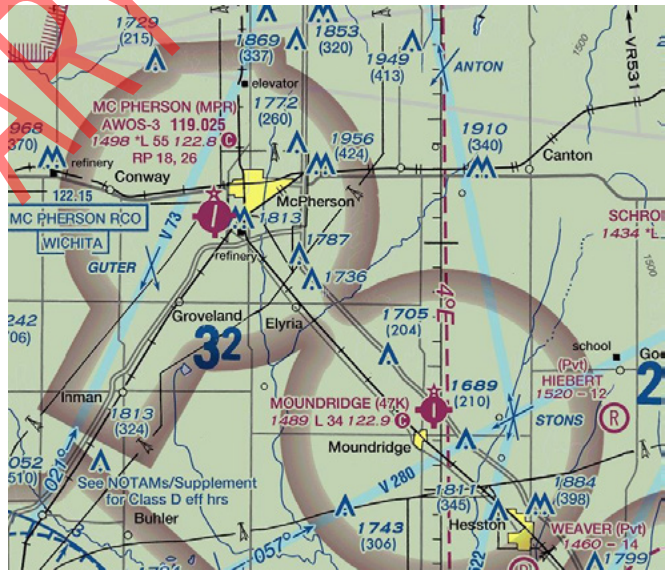
EXPLORING COURSES

Put those terms into practice.

- **Complete Student Activity 2.**
- **Find the course.**
  - True Course: Plot as shown in prior lessons.
  - Magnetic Course: Where do you find magnetic information?



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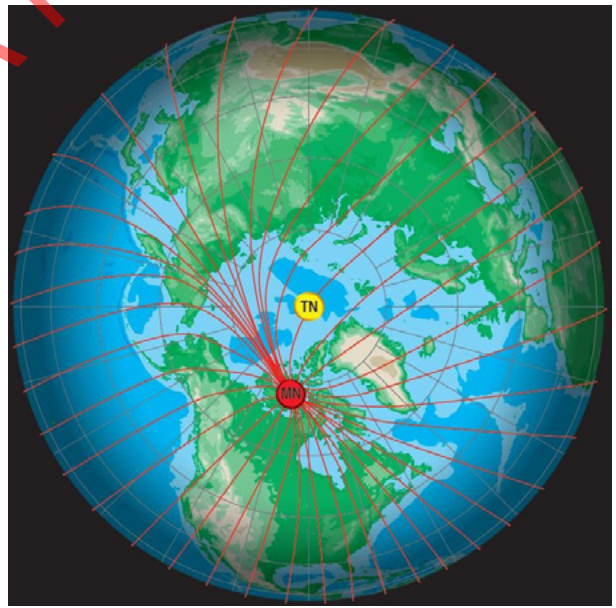
TWO POLES, TWO TYPES OF DIRECTION

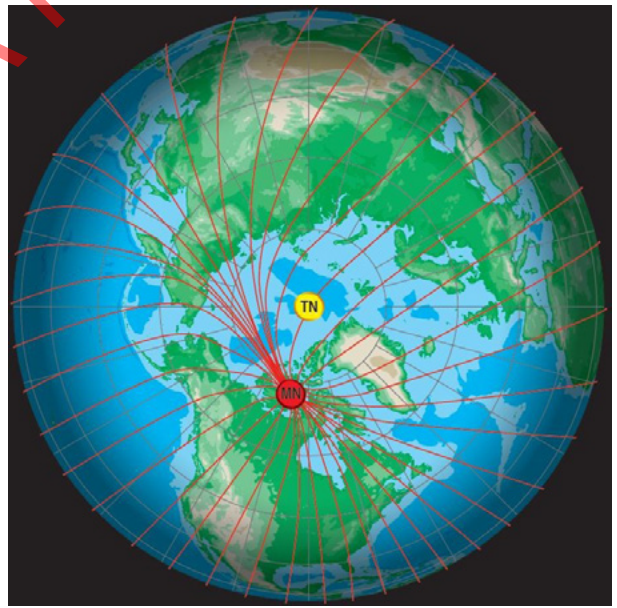
- **Geographic North Pole**
  - Where lines of longitude converge
  - The “true” North Pole
  - Earth’s rotational axis passes through here
- **Magnetic North Pole**
  - North compass needles point here
  - 300 miles from true north



Editorial credit: Pilot’s Handbook of Aeronautical Knowledge

TWO PLOTS, ONE COURSE

- **Which do pilots use?**
  - Flights are planned using *true* directions.
  - Because aircraft use compasses for guidance, flights are flown using *magnetic* directions.
  - Pilots need to convert one to the other.



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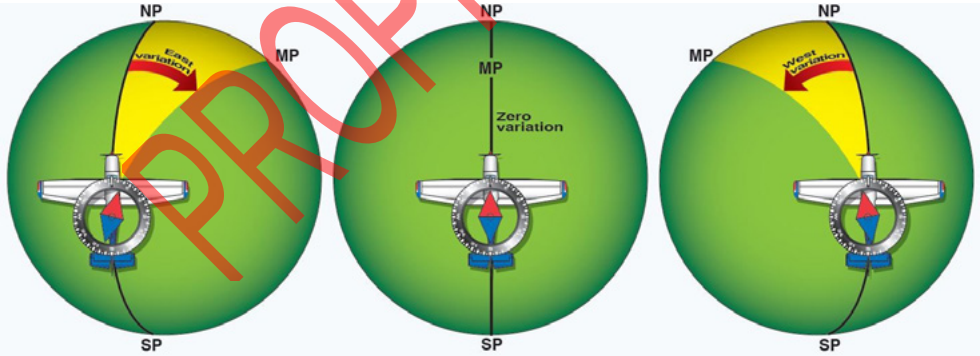
CONVERTING COURSES: TRUE VS MAGNETIC

Difference is *magnetic variation*

- **Western United States**
  - Fly toward true north (TN), but compass points east of TN (1)
- **Eastern United States**
  - Fly toward TN, but compass points west of TN (3)



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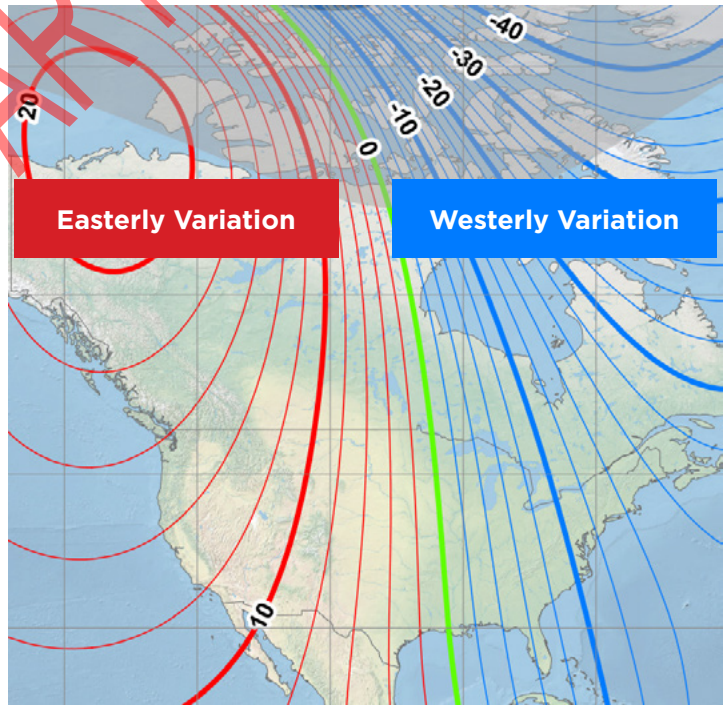
CONVERTING COURSES: AGONIC LINE

- **East/West variation is separated by the Agonic Line where variation is zero**
  - Roughly through Minneapolis, Cedar Falls, Louisiana
- **To correct from true to magnetic, pilots add or subtract the variation.**
  - Easterly: Subtract
  - Westerly: Add



CONVERTING COURSES: DOING THE MATH

“East is Least, West is Best”

- **<u>Subtract</u> easterly variation.**
  - To fly a 108-degree true course in an area of 14-degree easterly variation, what magnetic course would a pilot follow?
  - Magnetic course: 094 degrees
- **<u>Add</u> westerly variation.**
  - To fly a 309-degree true course in an area of 17-degree westerly variation, what magnetic course would a pilot follow?
  - Magnetic course: 326 degrees

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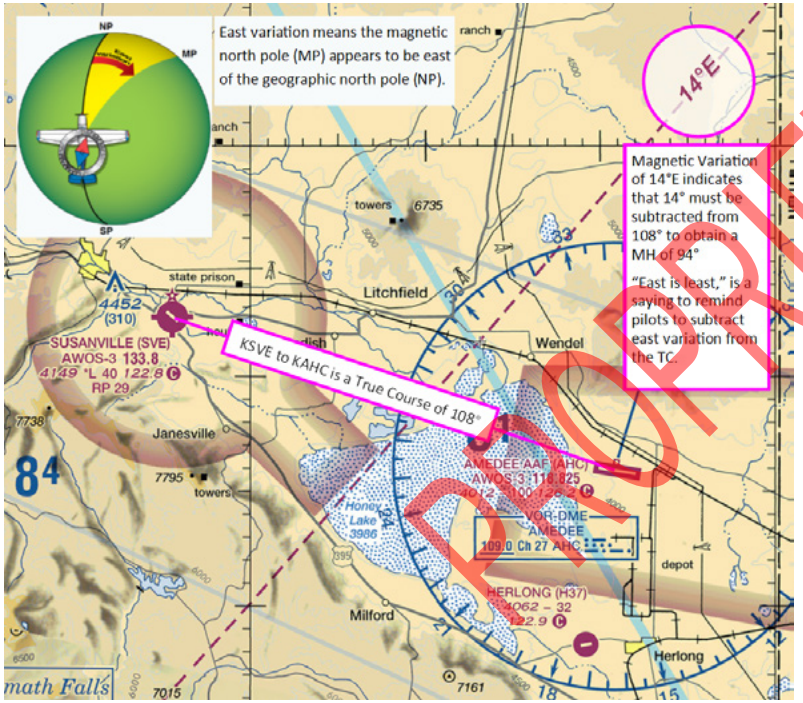
CONVERTING COURSES: EASTERLY VARIATION



"East is Least..."

- **<u>Subtract</u> easterly variation.**
  - To fly a 108 degree true course in an area of 14 degree easterly variation, what magnetic course would a pilot follow?
  - Magnetic course: 094 degrees

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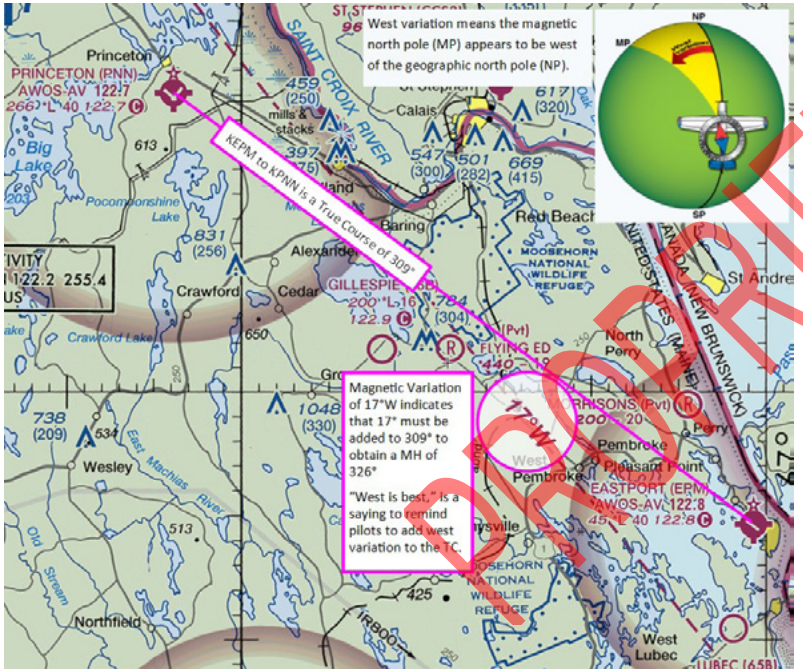
CONVERTING COURSES: WESTERLY VARIATION



"...West is Best."

- **Add westerly variation.**
  - To fly a 309-degree true course in an area of 17-degree westerly variation, what magnetic course would a pilot follow?
  - Magnetic course: 326 degrees

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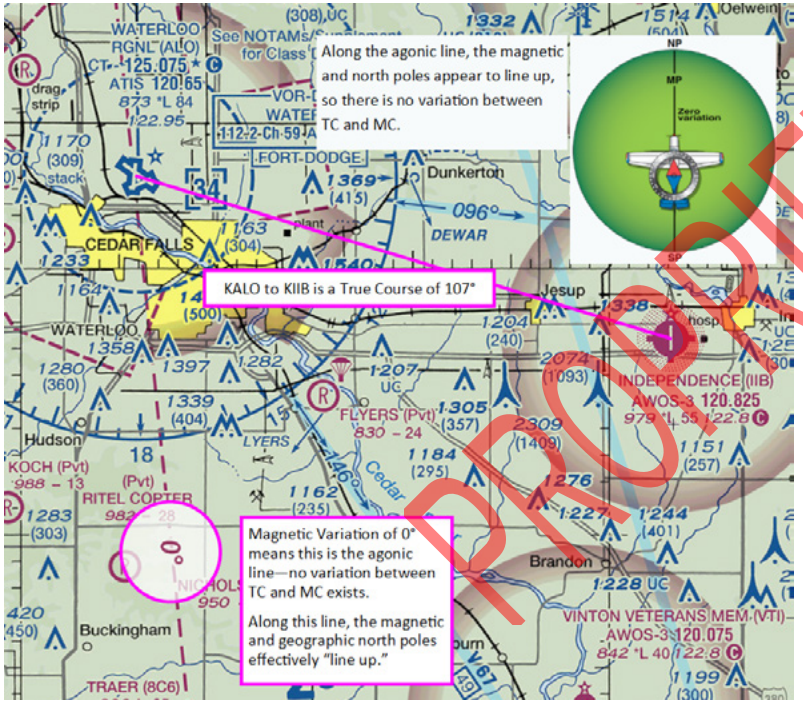
CONVERTING COURSES: NO VARIATION



No variation?

- **True course and magnetic are the same.**

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CONVERTING COURSES: EXAMPLES

- **Planned true course: 085 degrees**
  - *What would the magnetic course be?*
- **Check the charts: Pick an airport.**
  - Try to find an airport in each region of variation.
  - *How would the variation affect the course near that airport?*

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MORE MAGNETIC FORCES

Other Sources of Magnetic Influence

- **Aircraft can affect the magnetic instruments.**
  - Circuits, radios, engine, magnetized parts, and more can all influence the local magnetic field.
- **Some compass errors can be corrected.**
  - Adjustment screws can correct some error.
  - Any remaining errors are measured and displayed on compass deviation card.

COMPASS DEVIATIONS

Unique to Every Aircraft

- **Different for different headings**
  - Normally measured every 30 degrees
- **"To fly XXX degrees, Steer YYY degrees"**
  - Card may show error (+1, –2, etc.) or corrected value (271 for West, etc.)

For (Magnetic)	N	30	60	E	120	150
Steer (Compass)	0	28	57	86	117	148
For (Magnetic	S	210	240	W	300	330
Steer (Compass)	180	212	243	274	303	332

Editorial credit: Pilot's Handbook of Aeronautical Knowledge

Editorial credit: Define Aviation

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COURSES: PUT IT ALL TOGETHER I

For no-wind conditions:

- **MC = TC +/– MV**

  - Magnetic Course = True Course +/– Magnetic Variation

- **CH = MC +/– DEV**

  - Compass Heading = Magnetic Course +/– Compass Deviation

- **Summarized: CH = TC +/– MV +/– DEV**

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COURSES: PUT IT ALL TOGETHER 2

For no-wind conditions:

- **CH = TC +/– MV +/– DEV**

- ***If TC = 238 degrees and the MV is 5 deg W, what is the CH?***

For (Magnetic)	N	30	60	E	120	150
Steer (Compass)	0	28	57	86	117	148
For (Magnetic	S	210	240	W	300	330
Steer (Compass)	180	212	243	274	303	332

Editorial credit: Pilot's Handbook of Aeronautical Knowledge

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COURSES: PUT IT ALL TOGETHER 3

For no-wind conditions:

- **CH = TC +/– MV +/– DEV**

- ***If TC = 238 degrees and the MV is 5 deg W, what is the CH?***

  - CH = 238 + 5 + 3 = 246 degrees

For (Magnetic)	N	30	60	E	120	150
Steer (Compass)	0	28	57	86	117	148
For (Magnetic	S	210	240	W	300	330
Steer (Compass)	180	212	243	274	303	332

Editorial credit: Pilot's Handbook of Aeronautical Knowledge

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COURSES: PUT IT ALL TOGETHER 4

For no-wind conditions:

- **CH = TC +/– MV +/– DEV**

- ***If TC = 090 degrees and the MV is 3 deg E, what is the CH?***

For (Magnetic)	N	30	60	E	120	150
Steer (Compass)	0	28	57	86	117	148
For (Magnetic	S	210	240	W	300	330
Steer (Compass)	180	212	243	274	303	332

Editorial credit: Pilot's Handbook of Aeronautical Knowledge

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COURSES: PUT IT ALL TOGETHER 5

For no-wind conditions:

- **CH = TC +/– MV +/– DEV**

- ***If TC = 090 degrees and the MV is 3 deg E, what is the CH?***

  - CH = 090 – 3 – 4 = 083 degrees

For (Magnetic)	N	30	60	E	120	150
Steer (Compass)	0	28	57	86	117	148
For (Magnetic	S	210	240	W	300	330
Steer (Compass)	180	212	243	274	303	332

Editorial credit: Pilot's Handbook of Aeronautical Knowledge

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COURSES: PUT IT ALL TOGETHER 6

Try it out!

- **Complete Student Activity 3.**
  - Determine the compass heading required to fly the true course based on the magnetic variation and compass deviation.
  - Assume no wind.

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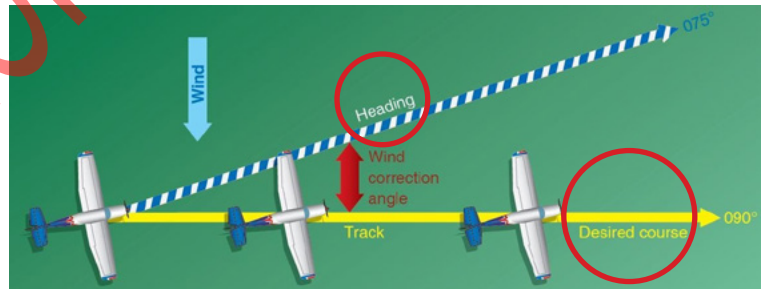
“HEADING” VS “COURSE”

What’s the difference?

- **Course**
  - Intended path of the aircraft over the ground
- **Heading**
  - Direction the aircraft nose points during flight—not necessarily the direction the aircraft is traveling. This is the value on the compass.

They’re the same if there’s no wind!



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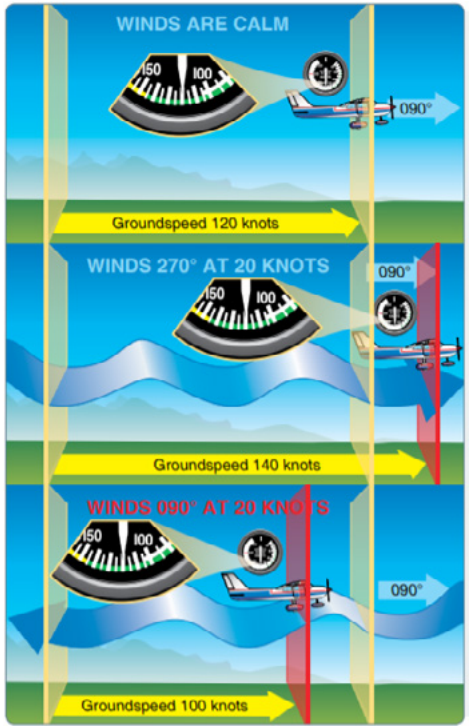
THE EFFECT OF WIND

Big Picture

- **The aircraft is flying through an air mass.**
  - The air mass is also moving across the ground.
  - The aircraft's path through the air mass is the *same*, regardless of the speed/direction of the air mass.
  - The aircraft's path across the ground *varies* based on the speed/direction of the air mass.



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THE EFFECT OF WIND EXAMPLE

Example

- **Aircraft speed: 100 knots**
- **Air mass/wind speed: 10 knots**
  - 10 knot headwind: aircraft groundspeed is 90 knots
  - 10 knot tailwind: aircraft groundspeed is 110 knots

    Airspeed = 100 knots in both cases
  - In a direct headwind or tailwind, only speed is affected, not course.

CALCULATE THE EFFECT OF WIND

What is the groundspeed?

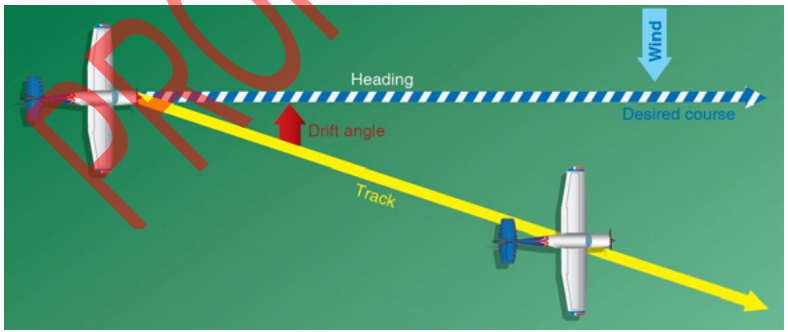
- **Cessna 172 at 125 knots, 13 knot headwind**

- **Boeing 777 at 270 knots, 110 knot tailwind**

THE EFFECT OF CROSSWINDS

What if the wind isn't a direct tailwind or headwind?

- **Balsa glider demonstration**
  - Fly the gliders from Point A to B with no wind.
  - Turn on the fan and fly the gliders from A to B: *What happens to the flight path?*
  - *How might a pilot compensate for the wind?*



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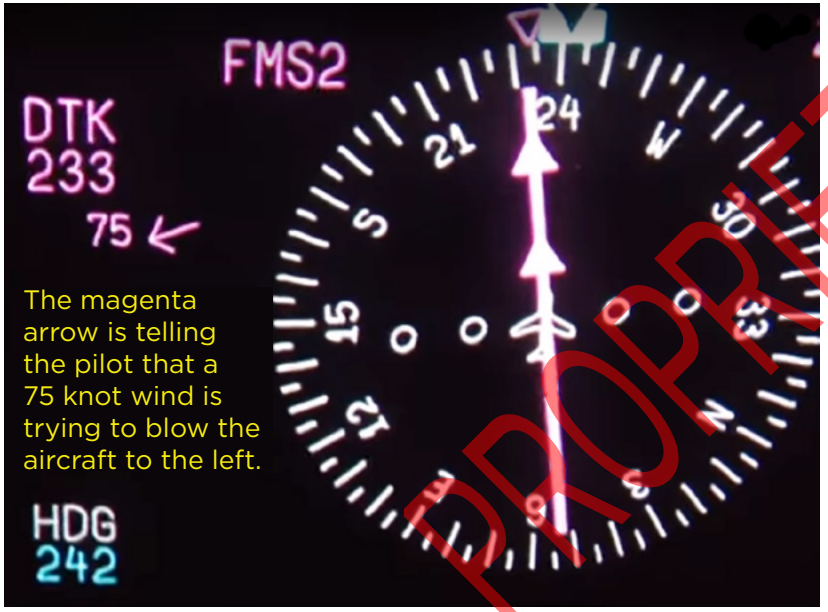
FROM THE FLIGHT DECK AT 43,000 FEET



The magenta arrow is telling the pilot that a 75 knot wind is trying to blow the aircraft to the left.

The aircraft's heading is 242°

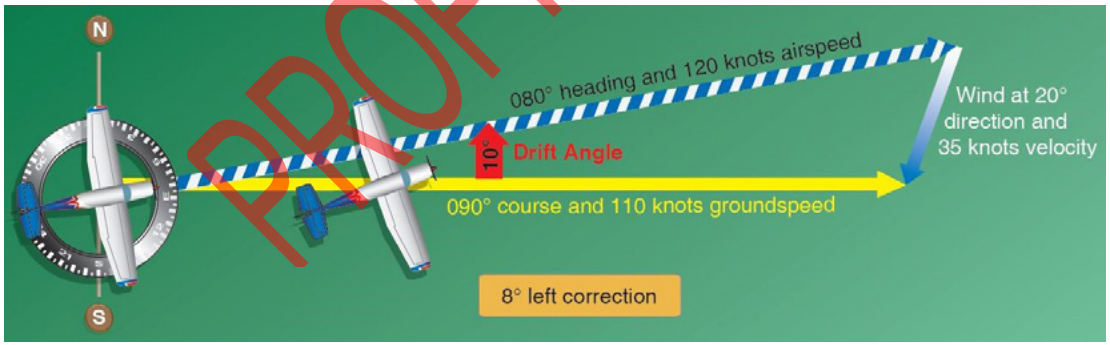
The aircraft's track of 233° is represented by the straight white line.

How many degrees has the pilot altered the heading to account for the winds?

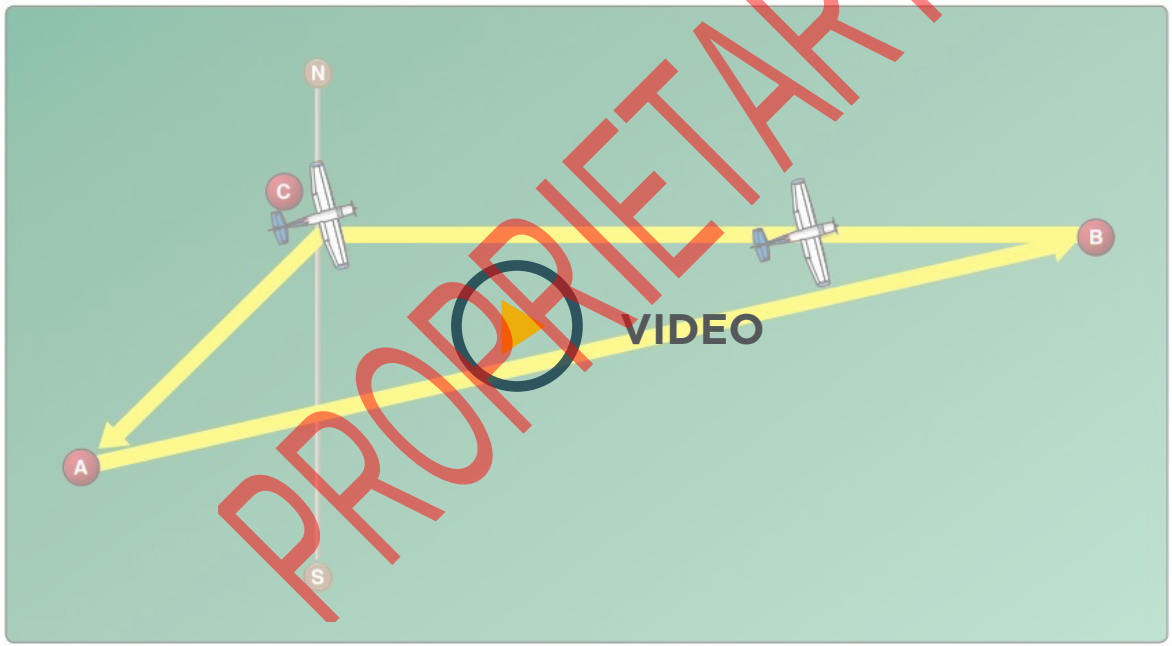
FINDING THE WIND CORRECTION

Wind Correction: Using Wind Triangles

- **Every wind triangle has three legs.**
  - Direction and speed (velocity) of aircraft *(blue hashed line)*
  - Direction and speed (velocity) of wind *(blue gradient line)*
  - Resultant vector *(yellow line)*



THREE LEGS OF THE WIND TRIANGLE



Editorial credit: Airman Knowledge Testing Supplement for Sport Pilot, Recreational Pilot, Remote Pilot, and Private Pilot

IMPORTANT NOTE ON WINDS!

Are your winds TRUE or MAGNETIC?

- **True**
  - Forecast winds, winds aloft, TAFs, METARs
- **Magnetic**
  - Winds reported on the radio (via ASOS, ATIS, ATC, etc.)

"If it's written, it's true."

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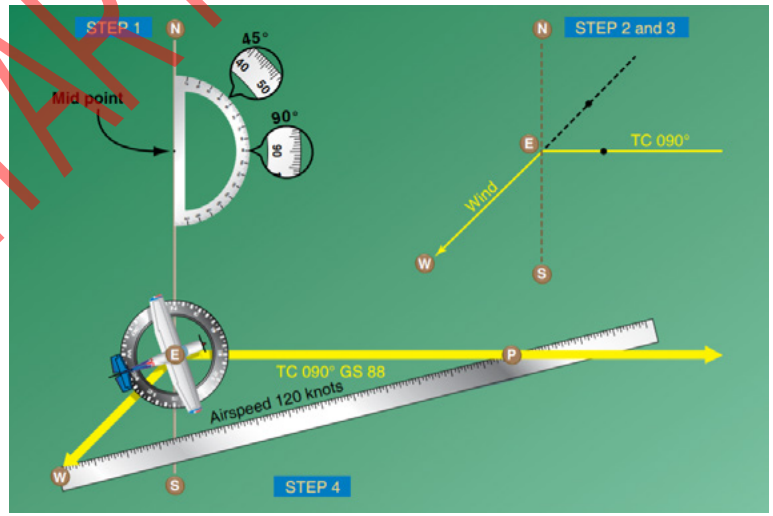
DRAWING A WIND TRIANGLE I

1. Draw a north/south line and label the flight's origin as Point E. Place the protractor on the line and make marks for TC and wind direction.
2. Draw a line from Point E through the TC mark to the edge of your paper.
3. Align ruler with wind mark and Point E. Starting at Point E, draw wind line in the direction the wind is blowing. Wind line length should be relative to wind speed using your chosen scale.



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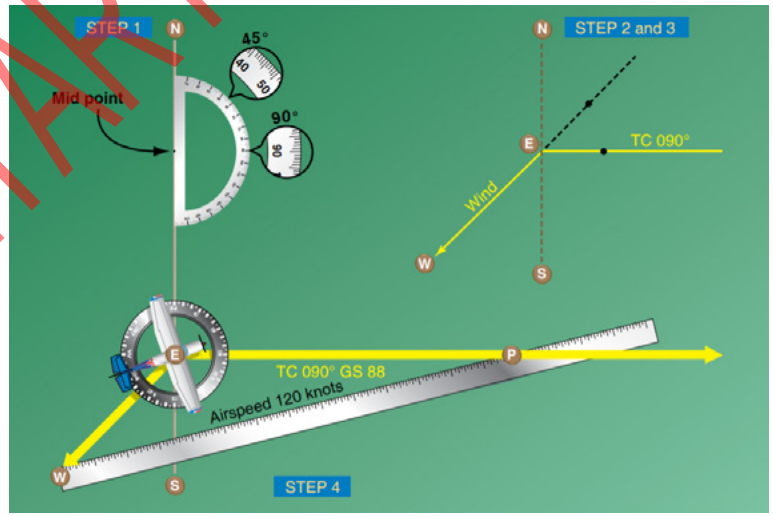
DRAWING A WIND TRIANGLE 2

4. Mark the ruler with the airspeed using the same scale chosen for the wind. Put the origin of the ruler on Point W, then rotate the ruler until the airspeed mark on the ruler intersects the TC line. Draw the line and mark the intersection as Point P.
5. Measure the TC line from Point E to Point P. Use the same scale you chose for the other lines; convert the scale units to speed. This is your groundspeed.



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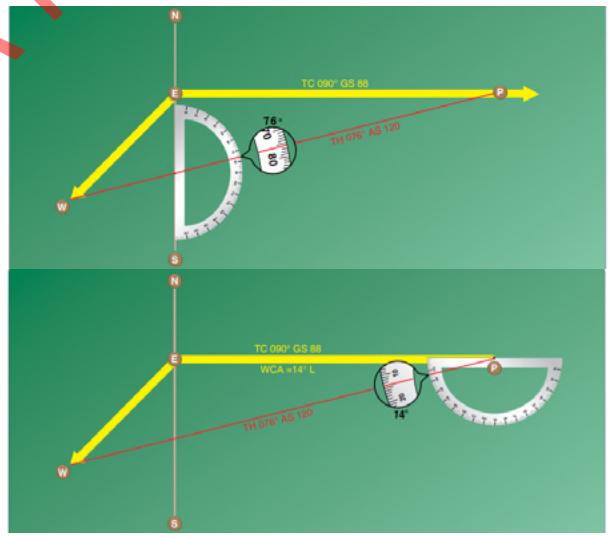
DRAWING A WIND TRIANGLE 3

6. Find true heading using one of two methods:

   (1) Use protractor to read angle between north/ south line and airspeed line; this is your TH.

   (2) Place protractor on TC line at Point P, and measure angle between AS and TC lines. This is your WCA. Add or subtract WCA from TC to get TH.

7. Common sense check: Does TH make sense for the scenario?



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8. Correct TH for magnetic variation and compass deviation to obtain compass heading to fly.

SOLVING THE WIND TRIANGLE

Your turn!

- **In pairs, practice using wind triangles to figure out the compass heading and groundspeed required to fly the planned course.**
- **Complete Student Activity 4.**

FINDING FLIGHT TIMES I

How long will it take you to get there?

- **The wind triangle provides the groundspeed.**
- **Flight Time = Distance / Groundspeed**

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FINDING FLIGHT TIMES 2

How long will it take you to get there?

- ***If the distance between two airports is 150 NM and you fly at 100 knots groundspeed, what will be your approximate flight time?***

- ***You pass over your final checkpoint at a groundspeed of 120 knots. You have 40 miles to go to your destination. How much flight time do you have until you land?***

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FINDING FLIGHT TIMES 2 (ANSWERS)

How long will it take you to get there?

- ***If the distance between two airports is 150 NM and you fly at 100 knots groundspeed, what will be your approximate flight time?***

  - Flight Time = 150/100 = 1.5 hours

- ***You pass over your final checkpoint at a groundspeed of 120 knots. You have 40 miles to go to your destination. How much flight time do you have until you land?***

  - Flight Time = 40/120 = 1/3 hour (20 minutes)

FINDING DISTANCE I

How far can you go?

- **Distance = Groundspeed x Flight Time**

- ***Based on the current winds and the performance of your aircraft, your groundspeed is 140 knots. You have 40 minutes until sunset, and your destination airport is 60 NM away. Will you land before or after sunset?***
  - Distance = 140 x (2/3) = 93.3 NM
  - Since you can travel 93 NM in 40 minutes, and you only have to go 60 NM, you'll arrive at the airport before sunset.

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FINDING DISTANCE 2

How far can you go?

- ***You've had a long day and decide you'll only fly for 30 more minutes. Your groundspeed is 120 knots. When you check your chart, you see there are airports 30, 60, and 90 miles in front of you. At which airport should you plan to land?***

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FINDING DISTANCE 2 (ANSWER)

How far can you go?

- **Distance = Groundspeed x Flight Time**

- ***You've had a long day and decide you'll only fly for 30 more minutes. Your groundspeed is 120 knots. When you check your chart, you see there are airports 30, 60, and 90 miles in front of you. At which airport should you plan to land?***

  - Distance = 120 x 0.5 = 60 NM

  - You should plan for the airport that is 60 NM in front of you.

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FINDING SPEED I

How fast do you need to go?

- **Groundspeed = Distance / Flight Time**

- ***You are 120 NM from your destination. Your passenger has an engagement that requires them to be on the ground in 20 minutes. What groundspeed would you need to fly to arrive at your destination in time?***

  - 20 minutes = 1/3 hour

  - Groundspeed = 120 / (1/3) = 360 knots

Common sense check: Your passenger may miss the engagement unless you're flying a jet!

FINDING SPEED 2

How fast do you need to go?

- ***You've logged 199.5 flight hours. You'd like your next flight to get you to exactly 200 hours. Your favorite airport is 35 NM away. What groundspeed would you need to fly to land with exactly 200 hours?***

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FINDING SPEED 2 (ANSWER)

How fast do you need to go?

- **Groundspeed = Distance / Flight Time**

- ***You've logged 199.5 flight hours. You'd like your next flight to get you to exactly 200 hours. Your favorite airport is 35 NM away. What groundspeed would you need to fly to land with exactly 200 hours?***

  - 30 minutes = 0.5 hour

  - Groundspeed = 35 / 0.5 = 70 knots

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FUEL PLANNING I

How much fuel will it take you to get there?

- **Aircraft performance charts provide fuel burn rate.**
- **Wind triangle provides groundspeed, and pilots can calculate time.**
  - Aircraft use a constant rate of fuel over time, not distance.
  - The most common units for general aviation fuel usage: gallons per hour (GPH).
- **Fuel Used = GPH x Flight Time.**
  - A common training aircraft fuel burn rate is approximately 8 GPH.

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FUEL PLANNING 2

How much fuel do you need?

- ***Based on a fuel burn rate of 8 GPH, how much fuel would be required to fly for 2.5 hours?***

  - Fuel Used = 8 x 2.5 = 20 gallons

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FUEL PLANNING 3

How much fuel do you need?

- ***With a fuel burn rate of 8 GPH, if a pilot calculates a flight time of 2.5 hours to the destination, what is the minimum fuel they should take off with? Remember, the FAA requires pilots to plan day VFR flights with 30 minutes of reserve fuel (see FAR 91.151(a)(1)).***

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FUEL PLANNING 3 (ANSWER)

How much fuel do you need?

- ***Fuel Used = GPH x Flight Time***
- ***With a fuel burn rate of 8 GPH, if a pilot calculates a flight time of 2.5 hours to the destination, what is the minimum fuel they should take off with? Remember, the FAA requires pilots to plan day VFR flights with 30 minutes of reserve fuel (see FAR 91.151(a)(1)).***

  - Reserve of 0.5 hour
  - Fuel Used = 8 x 0.5 = 4 gallons
  - 20 + 4 = 24 gallons with reserve

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PUT IT ALL TOGETHER: FLIGHT PLANNING I

All these calculations support a pilot's flight planning.

- ***A pilot has 12 gallons of fuel available (in addition to reserves) and a fuel burn rate of 8 GPH. If the aircraft flies at 110 knots groundspeed, how far can the pilot fly?***
  - Flight Time = Fuel used / GPH = 12 / 8 = 1.5 hours
  - Distance = Groundspeed x Flight Time = 110 x 1.5 = **165 NM**

PUT IT ALL TOGETHER: FLIGHT PLANNING 2

All these calculations support a pilot's flight planning.

- ***A pilot has 20 gallons of fuel available, in addition to reserves. At a groundspeed of 150 knots, their aircraft will use 20 GPH. At 100 knots, they will use 10 GPH. If the pilot needs to fly to an airport 200 NM away, what speed should they plan to use? Assume no wind in this example.***

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PUT IT ALL TOGETHER: FLIGHT PLANNING 2 (ANSWER)

All these calculations support a pilot's flight planning.

- ***A pilot has 20 gallons of fuel available, in addition to reserves. At a groundspeed of 150 knots, their aircraft will use 20 GPH. At 100 knots, they will use 10 GPH. If the pilot needs to fly to an airport 200 NM away, what speed should they plan to use?***

  - Option 1: Flight time = 200 / 150 = 1 hr 20 min.
    Fuel used = 20 x 1.3 = 26 gal

  - Option 2: Flight time = 200 / 100 = 2 hours.
    Fuel used = 10 x 2.0 = 20 gal

- **Option 2 is the correct choice in this scenario. In order to preserve the reserve fuel, Option 1 is not correct since the pilot would use more than the available fuel (26 gallons are required, but 20 gallons are available).**

NOTE ON UNITS

Nautical or Statute Miles?

- **The examples in this lesson have used nautical miles (NM).**
- **Some older aircraft use statute miles (SM) in their flight manuals and have MPH rather than knots on their airspeed indicators.**
- **Make sure you use the correct units!**

  - Helpful hint: 1 NM = 1.15 SM

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MILES VS. MILES

- **You and a friend are planning to fly together on a cross country trip. They're in their 1998 Cessna 172 and planning to fly 115 knots. You'll be flying a 1968 PA-28 Cherokee, with an airspeed indicator in miles per hour. What airspeed will you need to use to fly alongside your friend?**

- **The radius of Class D airspace is 4 SM. How many NM is that?**

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MILES VS MILES (ANSWERS)

- **You and a friend are planning to fly together on a cross country trip. They're in their 1998 Cessna 172 and planning to fly 115 knots. You'll be flying a 1968 PA-28 Cherokee, with an airspeed indicator in miles per hour. What airspeed will you need to use to fly alongside your friend?**

  - 115 x 1.15 = 133 mph

- **The radius of Class D airspace is 4 SM. How many NM is that?**

  - 4 / 1.15 almost equal to 3.5 NM

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PUT IT INTO PRACTICE

It’s time to plan a flight.

- **Complete Student Activity 5.**
  - You’re traveling cross country on a two-leg trip.
  - You’ll need to calculate your headings, time, fuel used, etc.—everything you need to know to safely execute the flight.

HIGH SCHOOLS
POWERED BY AOPA

EXPERIENCE THE WINDS

Execute a flight in the flight simulator.

- **Complete Student Activity 6.**
  - Observe the impacts of varying winds on your flight-planned course.
  - Discuss how pilots can compensate for winds in flight.

Editorial credit: ShainEast via Shutterstock

PRIVATE PILOT KNOWLEDGE TEST QUESTION

USING THE SECTIONAL CHART EXCERPT BELOW, WHAT IS THE MAGNETIC COURSE FROM FIRST FLIGHT AIRPORT (KFFA) TO CHESAPEAKE REGIONAL AIRPORT (KCPK)?

A. 320°.

B. 331°.

C. 151°.

PRIVATE PILOT KNOWLEDGE TEST ANSWER

USING THE SECTIONAL CHART EXCERPT BELOW, WHAT IS THE MAGNETIC COURSE FROM FIRST FLIGHT AIRPORT (KFFA) TO CHESAPEAKE REGIONAL AIRPORT (KCPK)?

A. 320°.

B. 331°.

C. 151°.

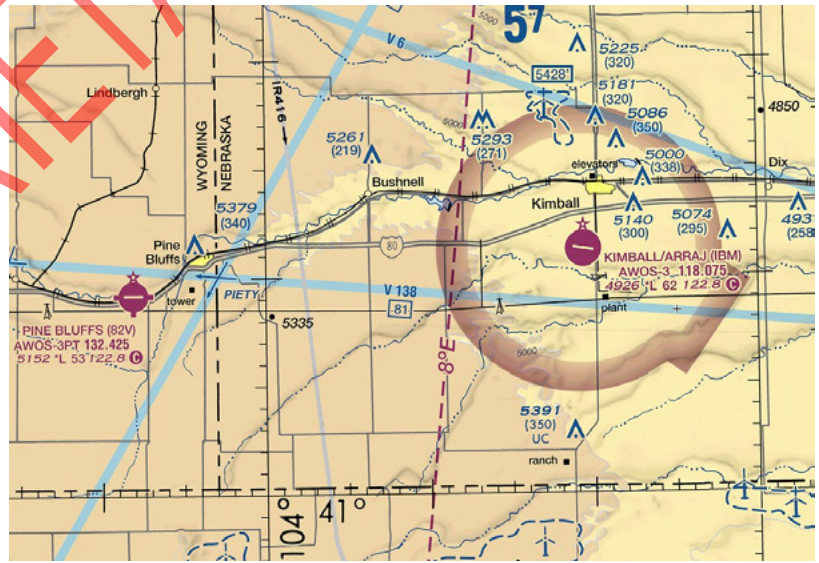
PRIVATE PILOT KNOWLEDGE TEST QUESTION

USING THE SECTIONAL CHART EXCERPT BELOW, WHAT IS THE MAGNETIC COURSE FROM KIMBALL/ARRAJ AIRPORT (KIBM) TO PINE BLUFFS AIRPORT (82V)?

A. 264°.

B. 272°.

C. 256°.



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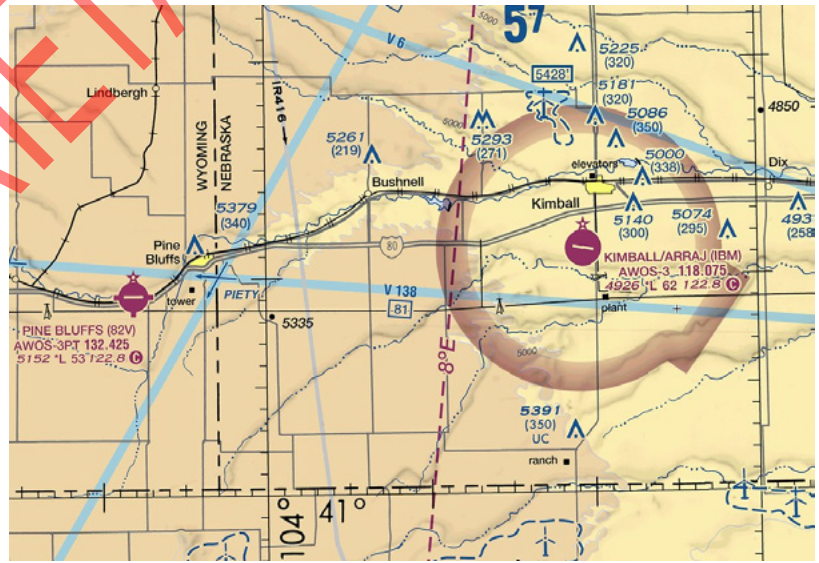

PRIVATE PILOT KNOWLEDGE TEST QUESTION

WHEN USING A PLOTTER TO MEASURE A COURSE ON A SECTIONAL CHART COMPARED TO A LINE OF LATITUDE OR LONGITUDE, A PILOT IS MEASURING THE

A. True course.

B. Magnetic course.

C. Compass heading.

HIGH SCHOOLS
POWERED BY AOPA

PRIVATE PILOT KNOWLEDGE TEST ANSWER

WHEN USING A PLOTTER TO MEASURE A COURSE ON A SECTIONAL CHART COMPARED TO A LINE OF LATITUDE OR LONGITUDE, A PILOT IS MEASURING THE

A. True course.

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HIGH SCHOOLS
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PRIVATE PILOT KNOWLEDGE TEST QUESTION

IF A PILOT COMPENSATES PROPERLY FOR WINDS ALOFT WHILE FLYING A COURSE, THEN THE AIRCRAFT'S GROUND TRACK WILL MATCH THE

A. Drift angle.

B. Magnetic heading.

C. True course.

HIGH SCHOOLS
POWERED BY AOPA

PRIVATE PILOT KNOWLEDGE TEST ANSWER

IF A PILOT COMPENSATES PROPERLY FOR WINDS ALOFT WHILE FLYING A COURSE, THEN THE AIRCRAFT'S GROUND TRACK WILL MATCH THE

A. Drift angle.

B. Magnetic heading.

C. True course.

HIGH SCHOOLS
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PRIVATE PILOT KNOWLEDGE TEST QUESTION

AN AIR MASS IS MOVING OVER THE SURFACE OF THE EARTH AT 25 KNOTS. AN AIRCRAFT FLYING IN THAT AIR MASS HAS A TRUE AIRSPEED OF 110 KNOTS. WHAT IS THE SPEED OF THE AIRCRAFT IN THE AIR MASS?

A. 135 knots.

B. 110 knots.

C. 85 knots.

HIGH SCHOOLS
POWERED BY AOPA

PRIVATE PILOT KNOWLEDGE TEST ANSWER

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HIGH SCHOOLS
POWERED BY AOPA

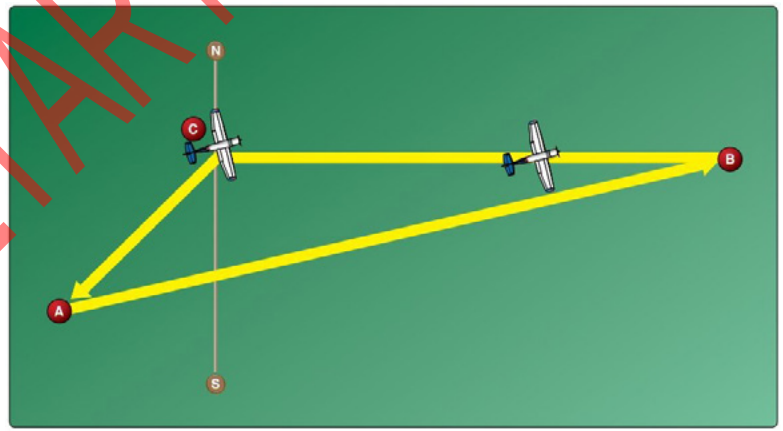
PRIVATE PILOT KNOWLEDGE TEST QUESTION

THE LINE FROM POINT C TO POINT A OF THE WIND TRIANGLE REPRESENTS

A. Wind direction and speed.

B. True course and ground speed.

C. True heading and ground speed.



Editorial credit: Airman Knowledge Testing Supplement for Sport Pilot, Recreational Pilot, Remote Pilot, and Private Pilot

HIGH SCHOOLS
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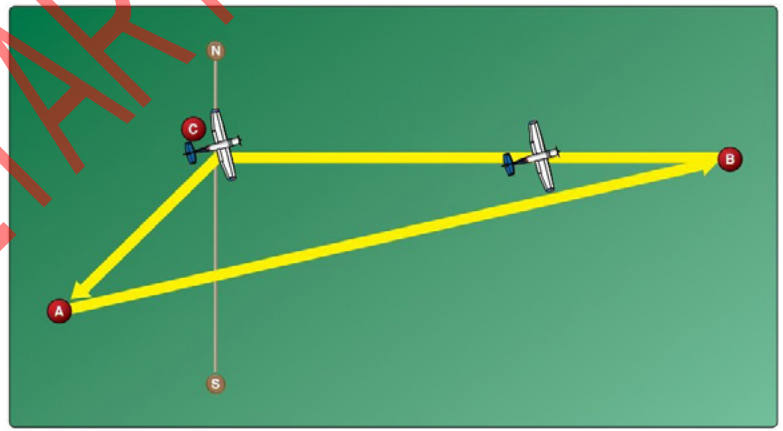

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HIGH SCHOOLS
POWERED BY AOPA

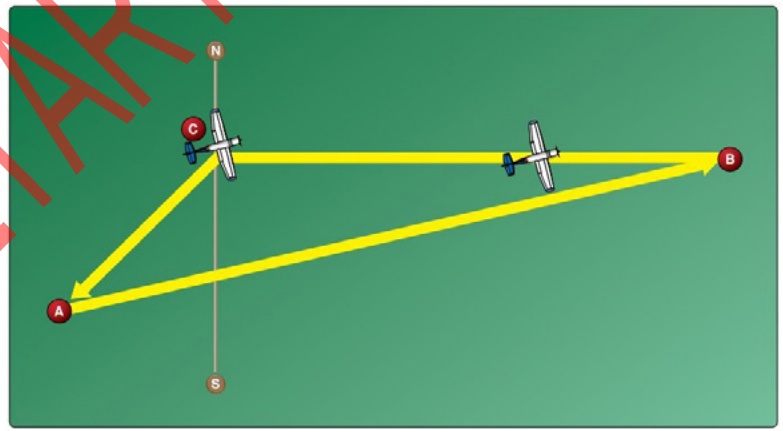
PRIVATE PILOT KNOWLEDGE TEST QUESTION

THE LINE FROM POINT A TO POINT B OF THE WIND TRIANGLE REPRESENTS

A. Wind direction and wind speed.

B. True course and ground speed.

C. True heading and true airspeed.



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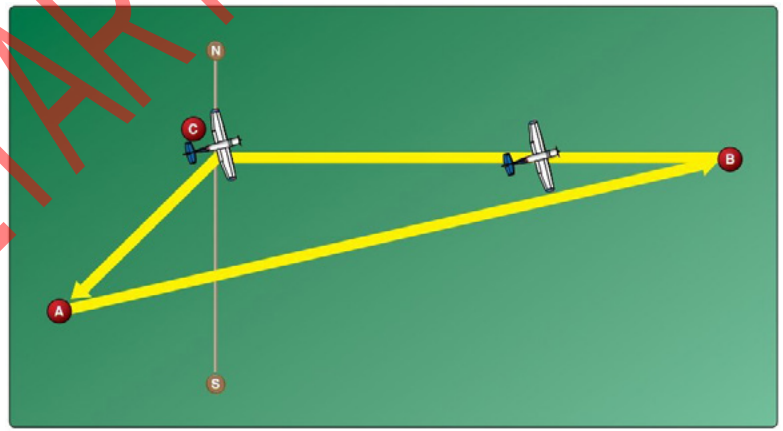

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HIGH SCHOOLS
POWERED BY AOPA

PRIVATE PILOT KNOWLEDGE TEST QUESTION

AN AIRCRAFT IS FLYING ON A COMPASS HEADING OF 110° AT 120 KNOTS. THE WINDS ALOFT ARE FROM THE NORTH AT 30 KNOTS. IF THE PILOT DOES NOT COMPENSATE FOR THE EFFECTS OF THE WIND, THE AIRCRAFT WILL HAVE A

A. Track in a northeasterly direction.

B. Track in a southeasterly direction.

C. Groundspeed of 150 knots.

HIGH SCHOOLS
POWERED BY AOPA

PRIVATE PILOT KNOWLEDGE TEST ANSWER

AN AIRCRAFT IS FLYING ON A COMPASS HEADING OF 110° AT 120 KNOTS. THE WINDS ALOFT ARE FROM THE NORTH AT 30 KNOTS. IF THE PILOT DOES NOT COMPENSATE FOR THE EFFECTS OF THE WIND, THE AIRCRAFT WILL HAVE A

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B. Track in a southeasterly direction.

C. Groundspeed of 150 knots.

HIGH SCHOOLS
POWERED BY AOPA

PRIVATE PILOT KNOWLEDGE TEST QUESTION

AN AIRCRAFT IS FLYING 100 KNOTS ON A HEADING OF 180° AND THE WINDS ALOFT ARE FROM THE SOUTH AT 17 KNOTS. WHAT IS THE AIRCRAFT'S APPROXIMATE GROUNDSPEED?

A. 83 knots.

B. 117 knots.

C. 163 knots.

HIGH SCHOOLS
POWERED BY AOPA

PRIVATE PILOT KNOWLEDGE TEST ANSWER

AN AIRCRAFT IS FLYING 100 KNOTS ON A HEADING OF 180° AND THE WINDS ALOFT ARE FROM THE SOUTH AT 17 KNOTS. WHAT IS THE AIRCRAFT'S APPROXIMATE GROUNDSPEED?

A. 83 knots.

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C. 163 knots.

HIGH SCHOOLS
POWERED BY AOPA

PRIVATE PILOT KNOWLEDGE TEST QUESTION

GIVEN THE FOLLOWING DATA AND THE COMPASS CARD, WHAT IS THE COMPASS HEADING THE PILOT SHOULD FOLLOW?

TC = 254° VAR = 8°E WCA = 13° TAS = 150 KNOTS WIND = 000° AT 35 KNOTS

A. 237°.

B. 275°.

C. 263°.

For	N	30	60	E	120	150
Steer	0	27	56	85	116	148
For	S	210	240	W	300	330
Steer	181	214	244	274	303	332

Editorial credit: Airman Knowledge Testing Supplement for Sport Pilot, Recreational Pilot, Remote Pilot, and Private Pilot

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GOING FURTHER: TRIG BEHIND THE TRIANGLE

Complete Student Activity 7 by watching a video and practicing the trigonometry method described in the video.

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UNIT 6 | SECTION B | LESSON 2 | PRESENTATION

WHICH WAY TO STEER?

HIGH SCHOOLS
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