STAR Center

Simulation, Training, Assessment & Research

6 Hour Radar Observer (Unlimited) Recertification Class

INFORMATION & REVIEW PACKAGE

- Course requirements
- Instructions
- Plotting review
- Practice problems/answers

Course Requirements

Objective: Demonstrate knowledge of interpreting and analyzing radar information as required by USCG including completion of:

1. 15 question multiple-choice examination (70% required to pass).
2. 3 practice plotting exercises.
3. 2 plotting exercises on a radar simulator by transfer plotting to a radar transfer-plotting sheet (90% on each required to pass). You will plot targets graphically (e.g. rapid-radar plotting technique) to correctly derive solutions and determine own ship's position while underway.

Course Instructions

1. Review and study the attached sample plotting problems (1st and 2nd triangles).
2. It is recommended you complete the attached practice problems (1 & 2) prior to radar re-certification.
3. Tools will be provided at the time of class. If you prefer, you may bring your own.
4. You will be asked to solve for the following information:

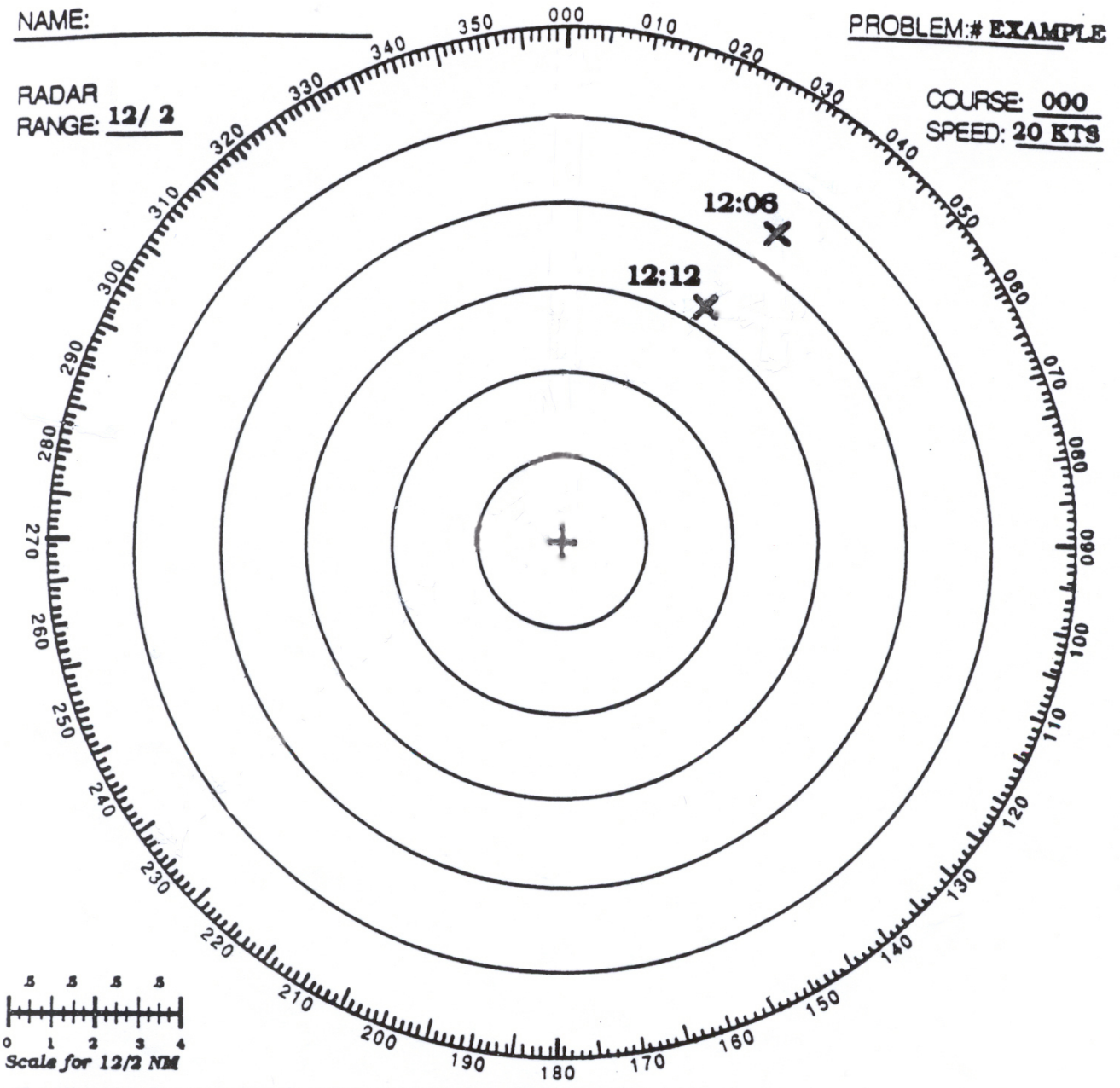
1st Triangle:

- Relative motion information (relative courses, relative speeds, CPA & TCPA).
- Targets' true course and speed, aspect and what type of traffic situation exists between own ship and target(s).

2nd Triangle:

- Plan an avoidance maneuver (i.e., solve for an own ship course and/or speed change in accordance with the Rules of the Road).
- Determine the effect of the proposed course/speed change on all targets' CPA.

Please be on time. Class begins at 0800.



Answer the following questions:

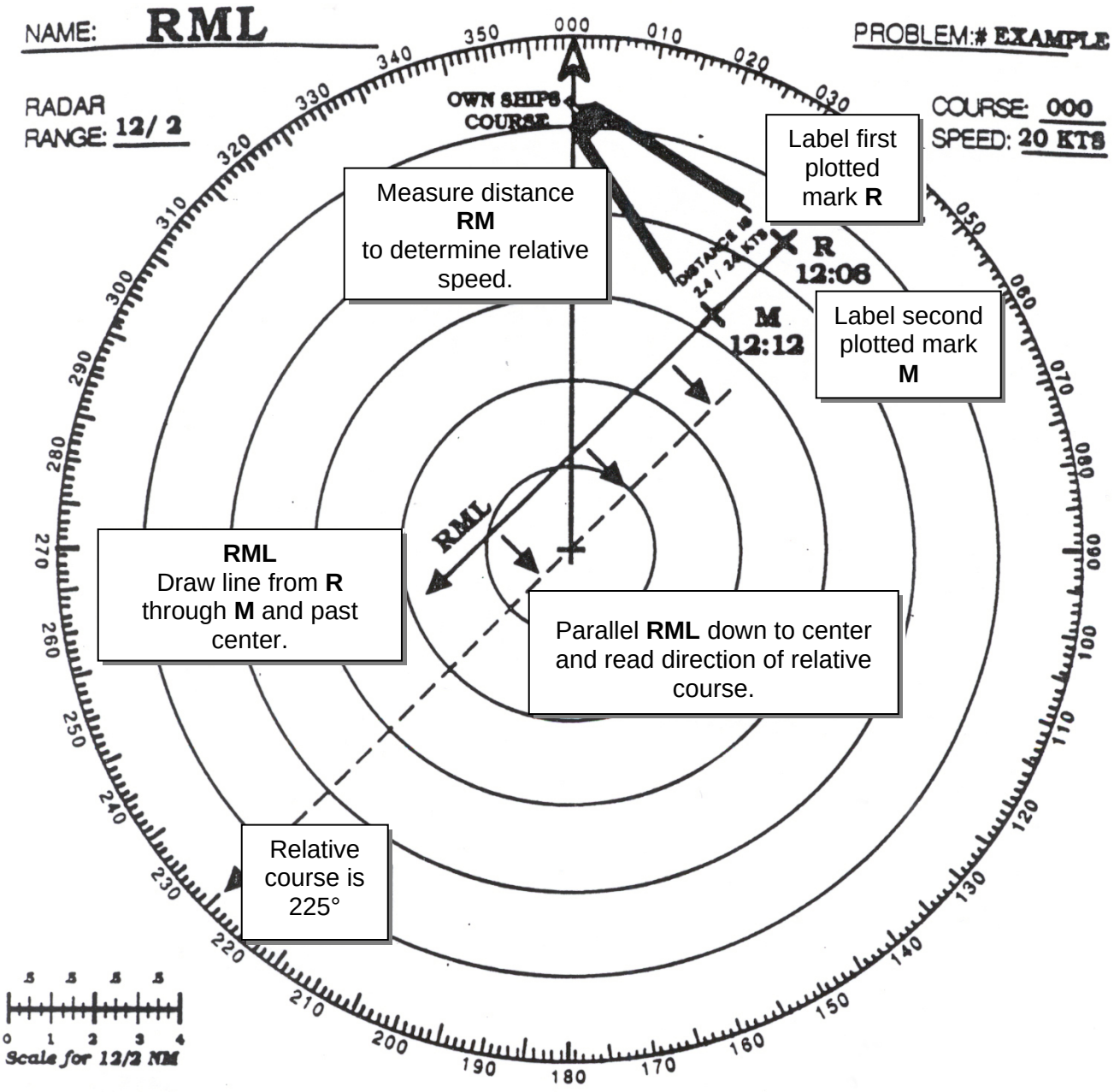
(1) The CPA of the target is:
- a. 135º @ 1.5 NM
- b. 250º @ 1.7 NM
- c. 315º @ 1.7 NM
- d. 000º @ 2.0 NM

(2) Time of CPA is:
- a. Unable to determine
- b. 12:30
- c. 12:27
- d. 12:18

(5) Will this target present a problem?
- a. Yes
- b. No
- c. Depends on Standing Orders

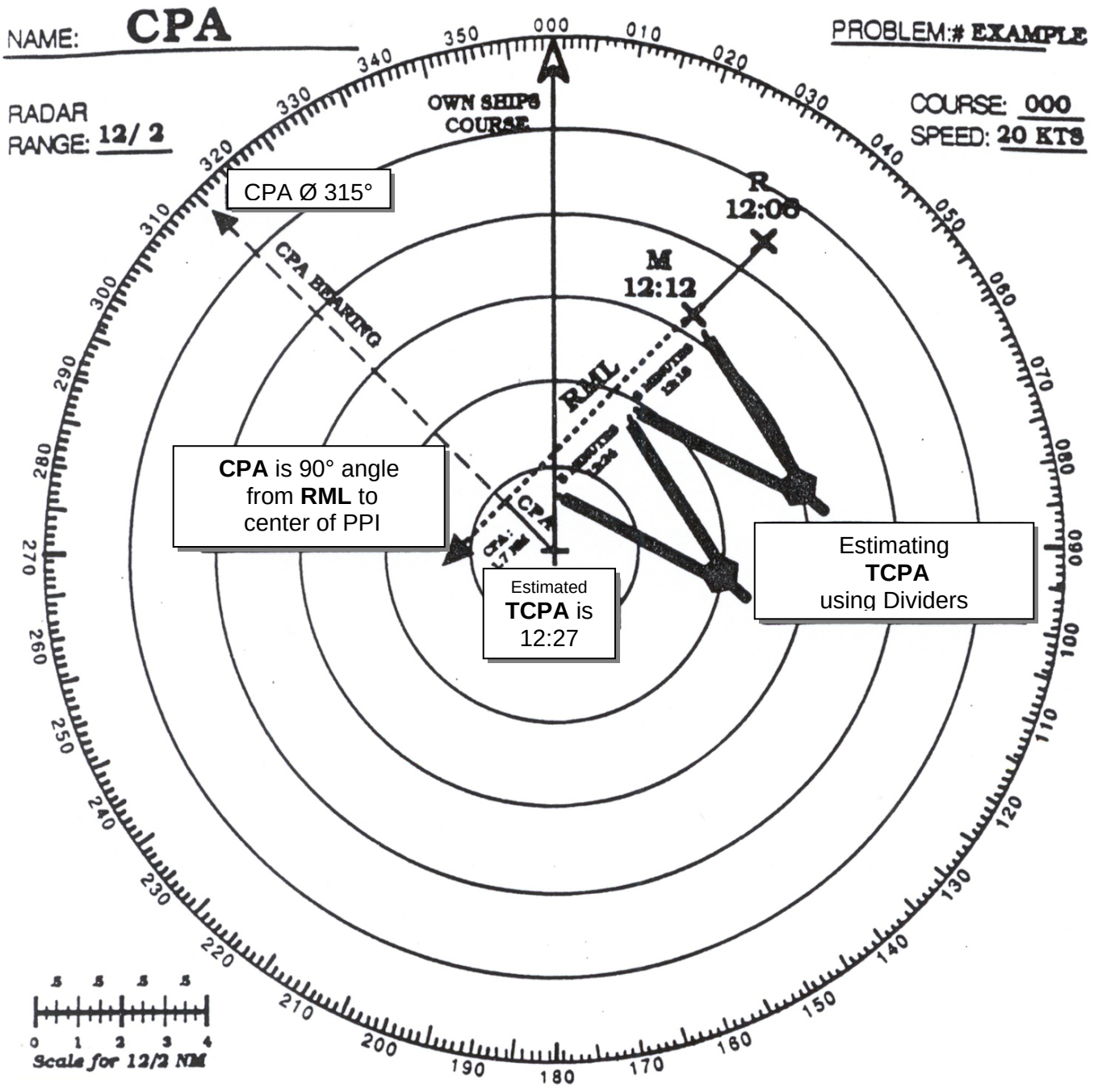
(3) Direction & Speed of Relative Motion:
- a. 237° @ 30 kts
- b. 225° @ 24 kts
- c. 036° @ 25 kts
- d. 310° @ 32 kts

(4) True Course & Speed of Target:
- a. 110° @ 24 kts
- b. 315° @ 20 kts
- c. 000° @ 15 kts
- d. 282° @ 19 kts



Explanation for RML (Relative Motion Line) & RM Vector

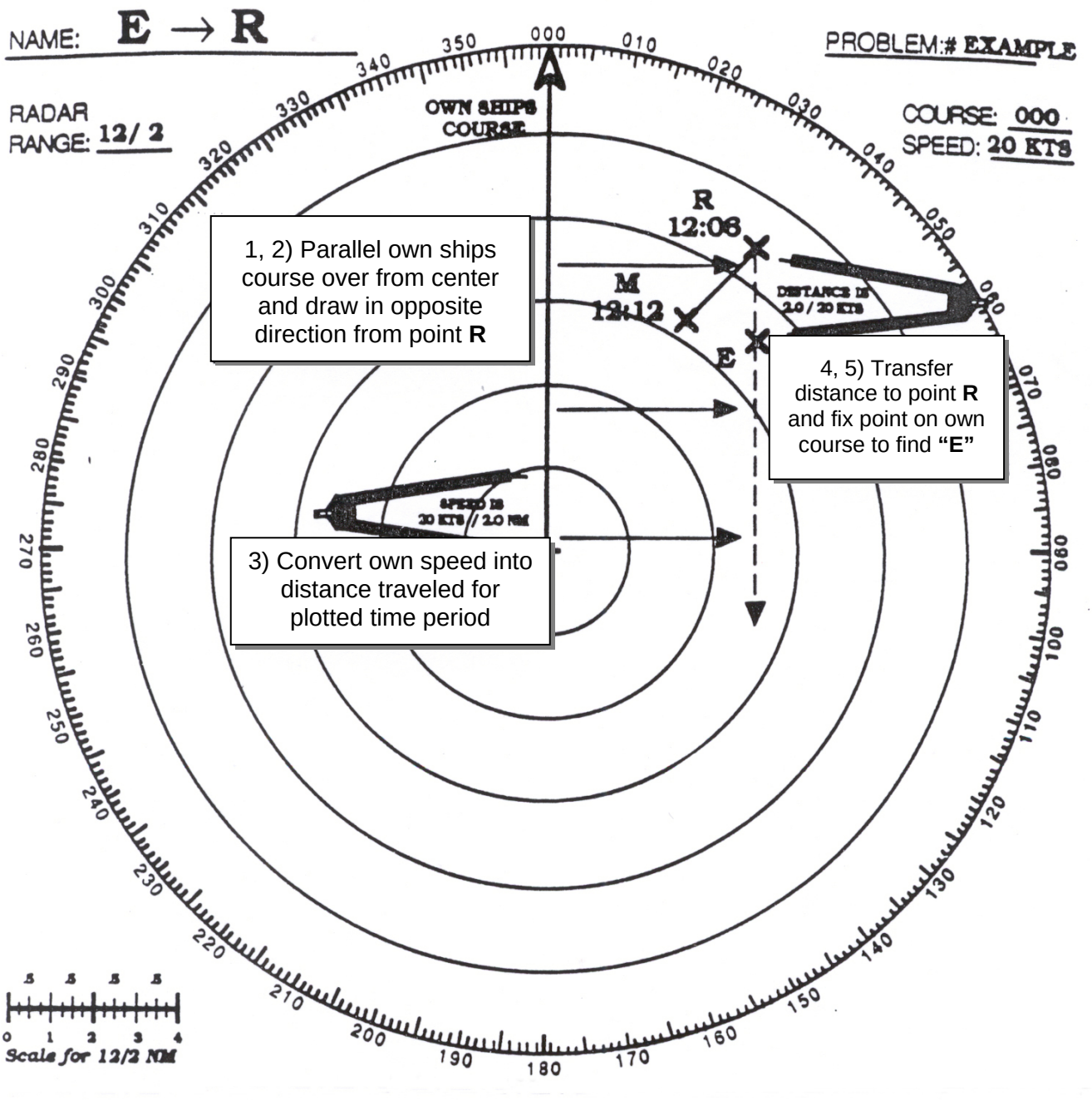
(1) To begin, draw in **OWN SHIPS** Heading Marker from center to heading.
(2) When target is initially observed, plot range & bearing, label **R,** and note time.
(3) Six (6) minutes later (or 3, 9 or 12 min intervals), plot and label target **M**.
(4) To draw **RML**, begin line at **R,** draw through **M** and continue past the center.
(5) To find Relative Course, parallel **RML** to center and read heading in direction **R to M**.
(6) To find Relative Speed, measure distance **R to M** and convert to speed.
Formula: Rate x Time = Distance (R x T=D). Example: 24 knots of relative speed on a 6 min plot (6 minutes = 1/10 hour) equals 2.4 miles run.



Explanation for CPA and TCPA (Closest Point of Approach &Time to CPA):

(1) After **RML** is drawn, use perpendicular angle (90º) from **RML** to intercept center.
(2) This line creates the predicted **CPA** (1.7 nm off portside of ownship).
(3) Bearing at **CPA** is measured from the center to the point 90° of **RML.**
(4) **TCPA** is determined by placing dividers on **R** and **M,** (using same time interval) walk dividers down to **CPA**, adding time as dividers approach **CPA**. Or use R x T = D formula. (R is relative speed)

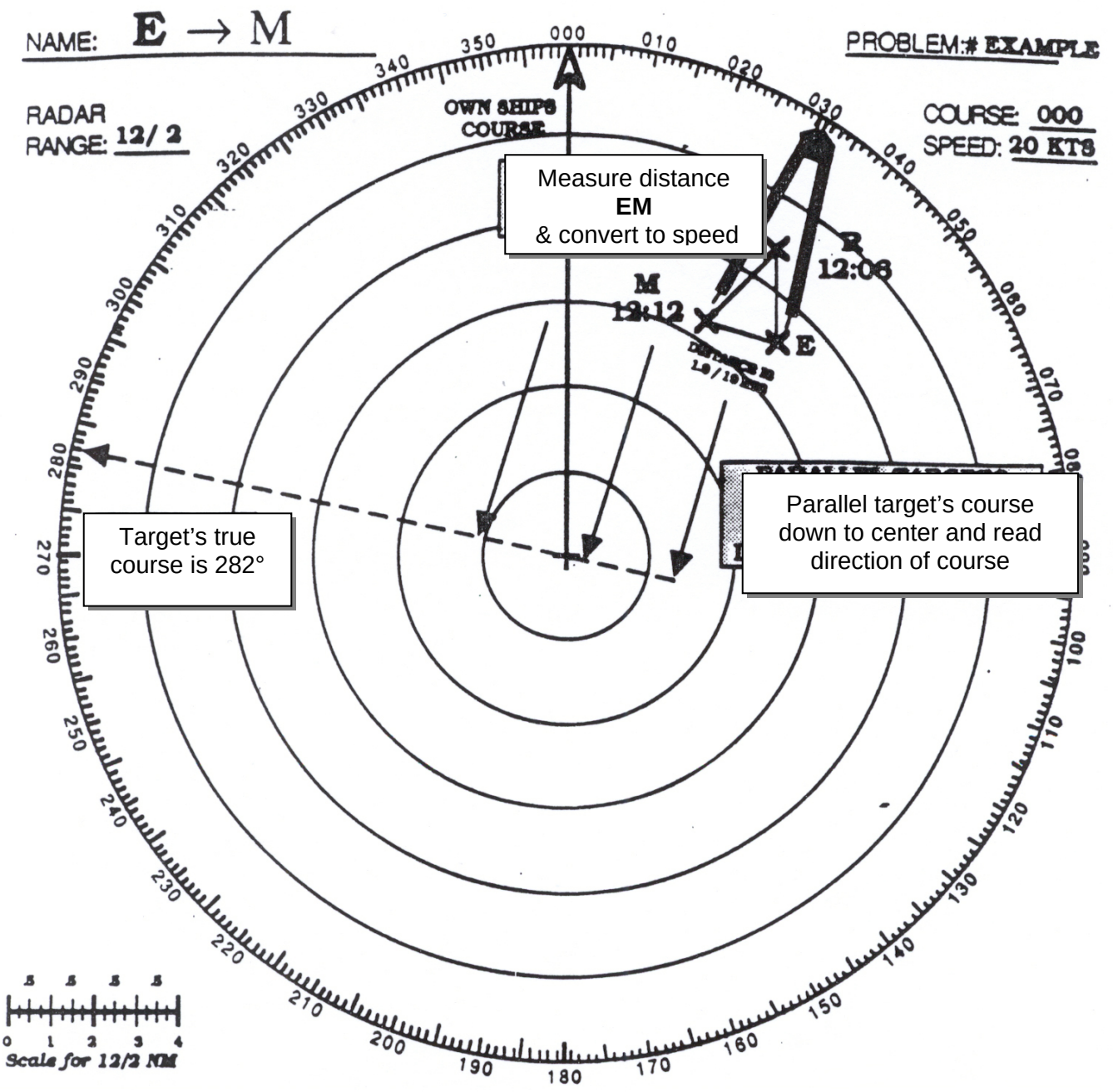
Note: Time (T) is in hours. Multiply by 60 to get minutes from starting point.



Explanation for ER vector (our course):

(1) Parallel Own Ships Course over to point **R**.
(2) Draw course in opposite or reciprocal direction from point **R**.
(3) Convert Own Ship Speed into distance traveled for plotted time interval.
(4) Using dividers, take Own Ship distance traveled and place one divider leg on **R**.
(5) Other divider leg should fall on reciprocal course, this becomes point **E**.
(6) Resultant line should always be read **E** to **R**, which represents Own Ship's course and speed.

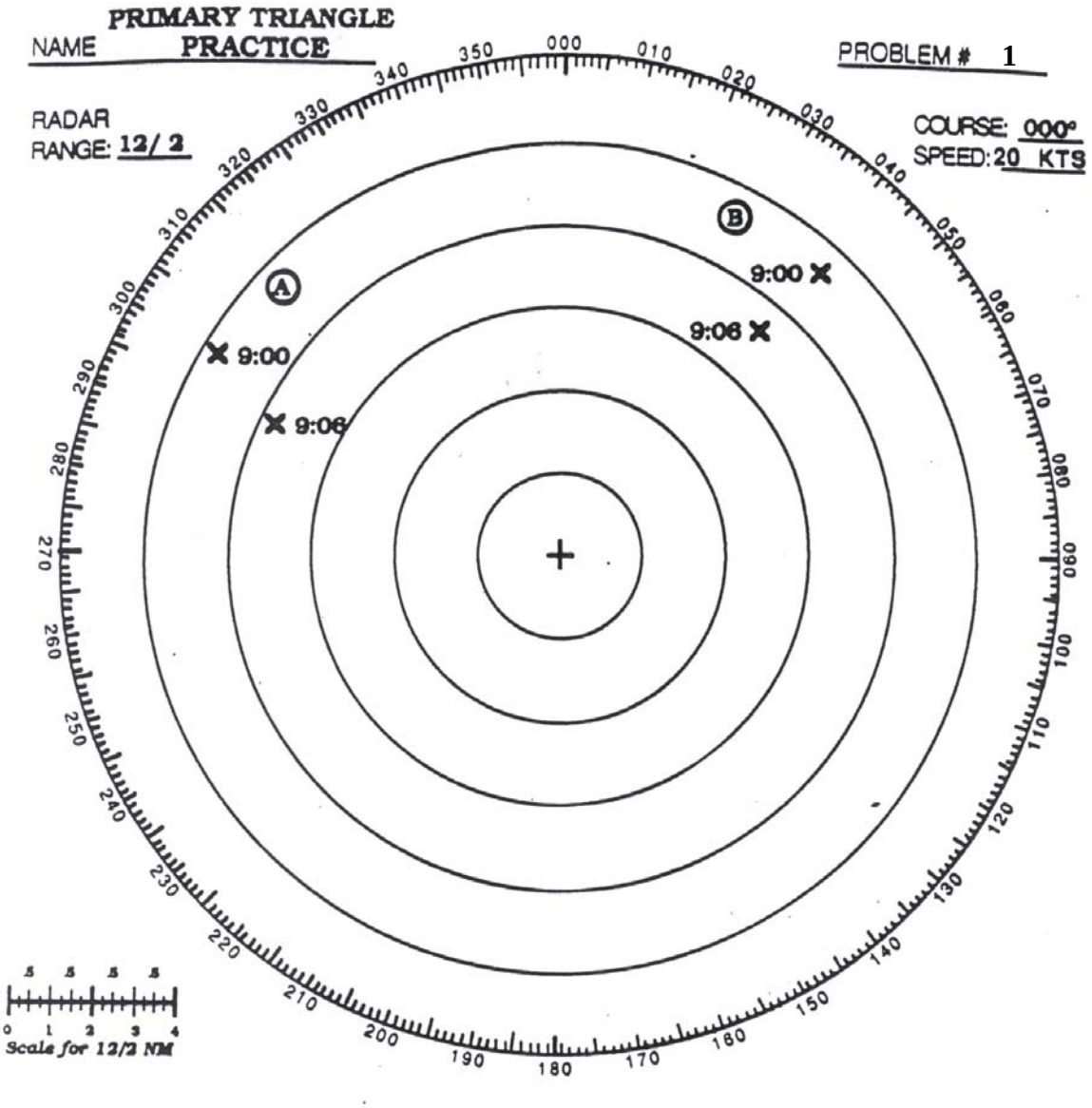
Note: All True Courses and Speeds are measured from E.



Explanation for EM vector (them):

(1) Two sides of the triangle are finished. Complete triangle by drawing **E** to **M**.
(2) Parallel completed line (vector) **EM** down to center.
(3) Extend line to outer circle, read in direction **E** to **M** for targets TRUE COURSE.
(4) To find targets TRUE SPEED, measure distance **E** to **M** and convert to speed.

Remember: All True Courses and Speeds originate at (measured from) E.



Answer the following questions:

(1) The CPA of target A is:
- a. 302º @ 3.5 NM
- b. 230º @ 3.1 NM
- c. Collision
- d. 050º @ 3.3 NM

(2) The CPA of target B is:
- a. 315º @ .8 NM
- b. 135º @ .8 NM
- c. 000º @ .9 NM
- d. Collision

(3) Direction & Speed of A's Relative Motion:
- a. 155º @ 30 kts
- b. 320º @ 22 kts
- c. 030º @ 20 kts
- d. 139º @ 21 kts

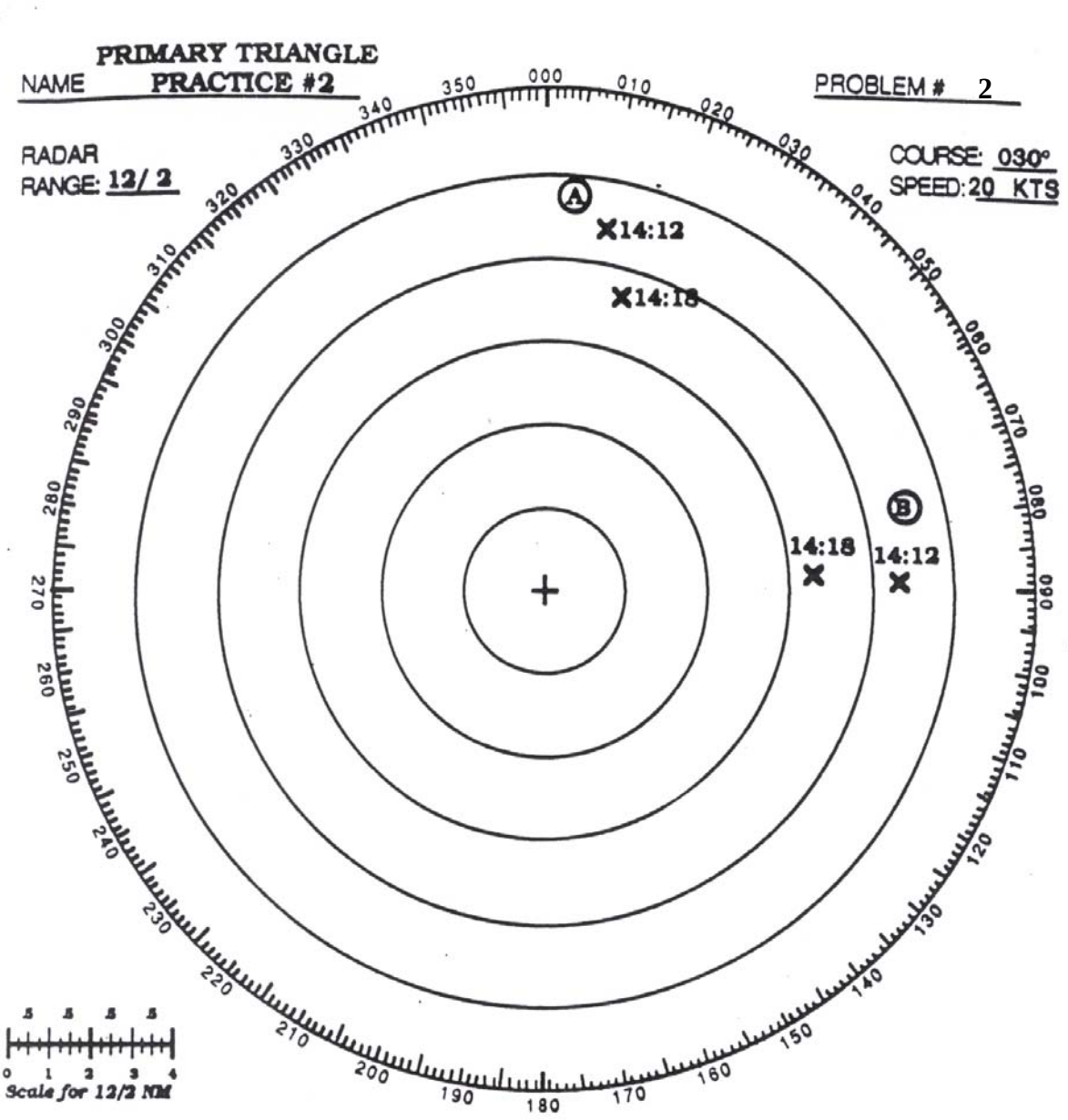
(4) Direction & Speed of B's Relative Motion:
- a. 230º @ 20 kts
- b. 278º @ 20 kts
- c. 045º @ 20 kts
- d. 225º @ 29 kts

(5) True Course & Speed of target A:
- a. 080º @ 17.5 kts
- b. 060º @ 20 kts
- c. Stationary
- d. 260º @ 17.5 kts

(6) True Course & Speed of target B:
- a. 325º @ 20 kts
- b. 005º @ 10 kts
- c. 110º @ 15 kts
- d. 290º @ 18 kts

(7) Which target represents the greatest danger?

a. A b. B c. Neither



Answer the following questions:

(1) The CPA of target A is:
- a. 150º @ 2.7 NM
- b. 030º @ 5.0 NM
- c. Collision
- d. 077º @ 3.4 NM

(2) The CPA of target B is:
- a. 277º @ .75 NM
- b. 030º @ .9 NM
- c. 004º @ 1.0 NM
- d. Collision

(3) Direction & Speed of A's Relative Motion:
- a. 151º @ 22 kts
- b. 167º @ 18 kts
- c. 225º @ 18 kts
- d. 003º @ 22 kts

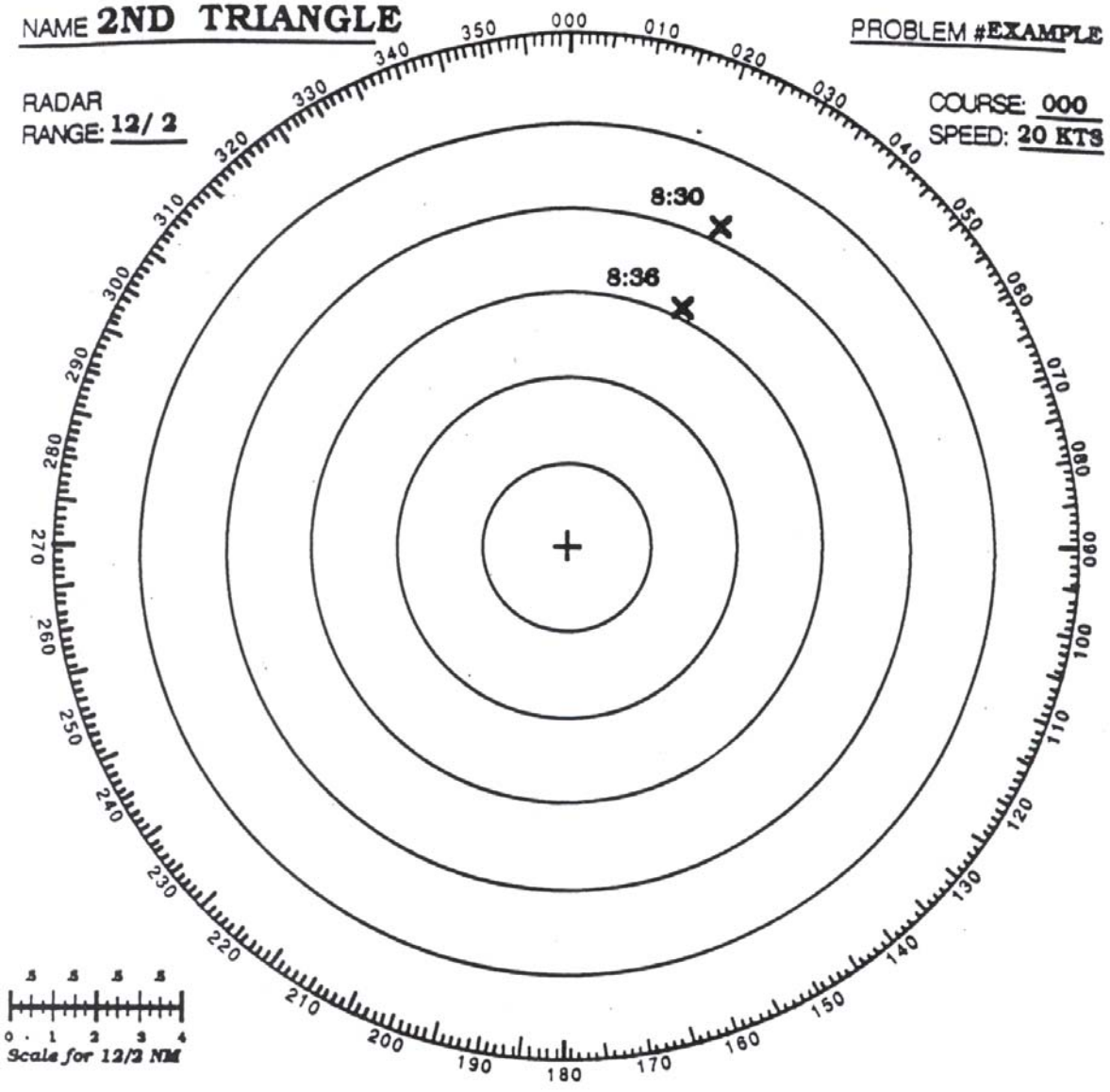
(4) Direction & Speed of B's Relative Motion:
- a. 170º @ 20 kts
- b. 278º @ 20 kts
- c. 090º @ 23 kts
- d. 273º @ 21 kts

(5) True Course & Speed of target A:
- a. 052º @ 17.5 kts
- b. 086º @ 15 kts
- c. Stationary
- d. 303º @ 15 kts

(6) True Course & Speed of target B:
- a. 328º @ 22 kts
- b. 000º @ 25 kts
- c. 278º @ 20 kts
- d. Stationary

(7) What is the TCPA of target B?
a. 14:31 b. 14:34 c. 14:37 d. 14:40

(8) Which target represents the greatest danger?
a. A b. B c. Neither



Answer the following questions:

(1) The CPA of the target is:
- a. 135º @ 0 NM
- b. 250º @ 1.0 NM
- c. Collision
- d. 000º @ 2.0 NM

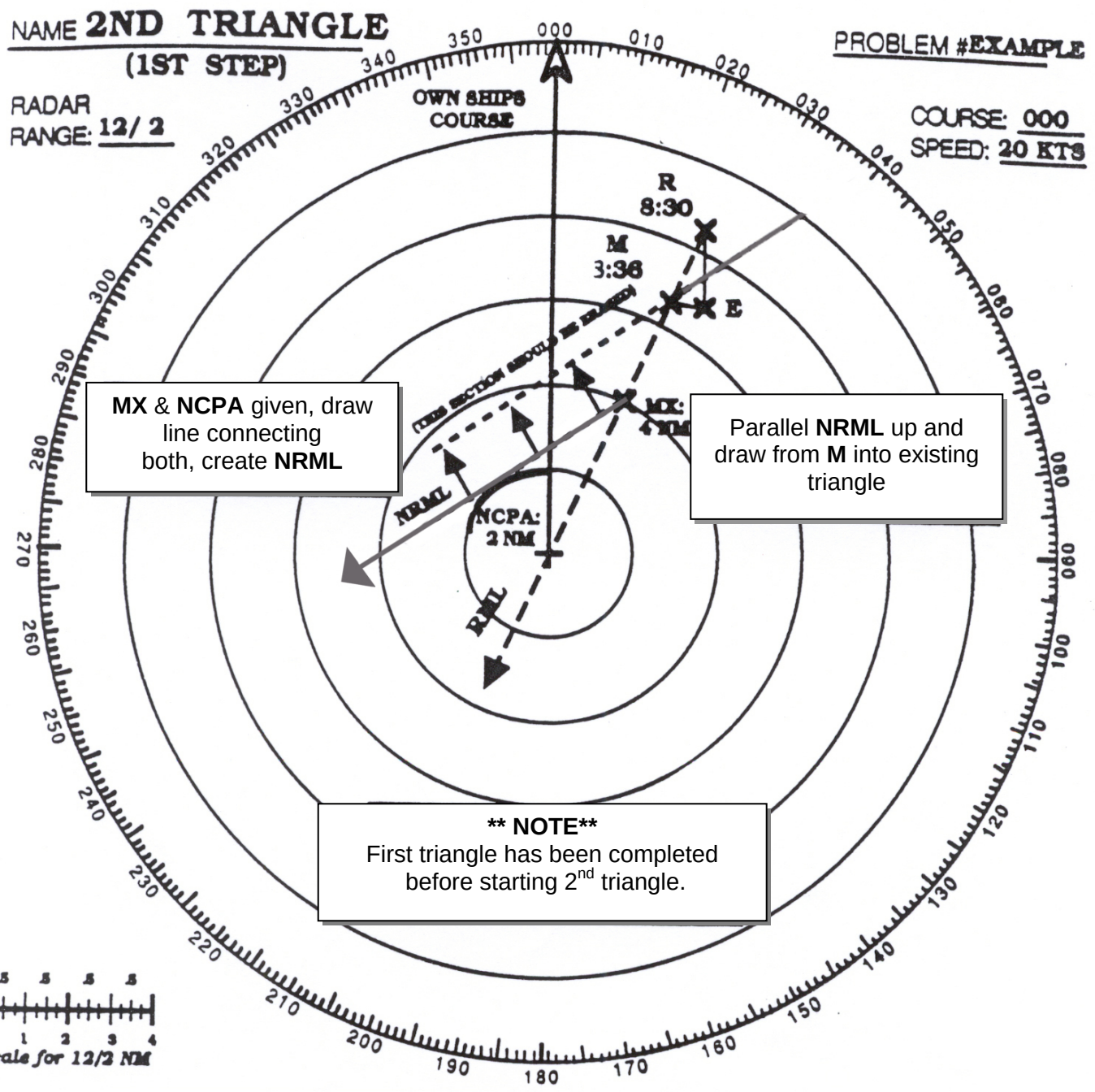
(2) Time of CPA is:
- a. Unable to determine
- b. 8:50
- c. 8:54
- d. 8:58

(3) Direction & Speed of relative motion:
- a. 205º @ 30 kts
- b. 225º @ 24 kts
- c. 030º @ 20 kts
- d. 205º @ 20 kts

(4) True Course & Speed of target:
- a. 277º @ 20 kts
- b. 322º @ 24 kts
- c. 000º @ 15 kts
- d. 279º @ 9 kts

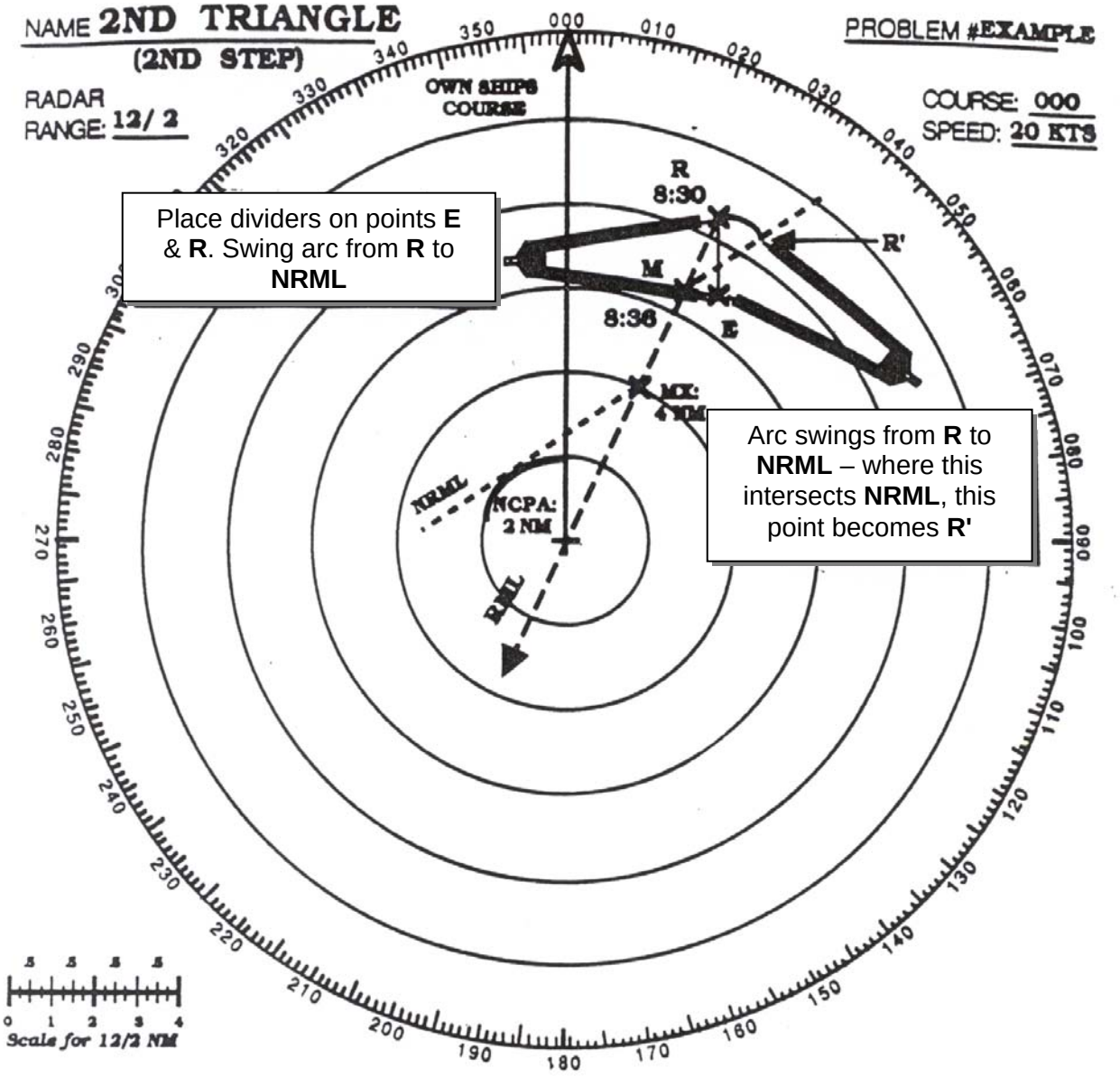
(5) Will this target present a problem?
- a. Yes
- b. No

(6) When range of target vessel decreases to 4 miles alter course to allow target to pass ahead w/a new PA of 2 miles. Your new course will be?
- a. 030º
- b. 033º
- c. 038º
- d. 043º



Explanation for 2nd Triangle. Desired New CPA & New Relative Motion Line (NRML)

(1) Time or point of maneuver (need time) established on **RML** of target vessel(s).
(2) Label point **MX** (point of execution).
(3) **NCPA** (New desired CPA per orders). **NCPA** from Own Ship (use compass or range ring)
(4) **NRML** formed by drawing line connecting points **MX** and **New CPA.**
(5) Parallel **NRML** up to point **M** in existing triangle, beginning at point **M**, draw new Relative Course Vector in opposite direction of NRML into and beyond existing triangle.

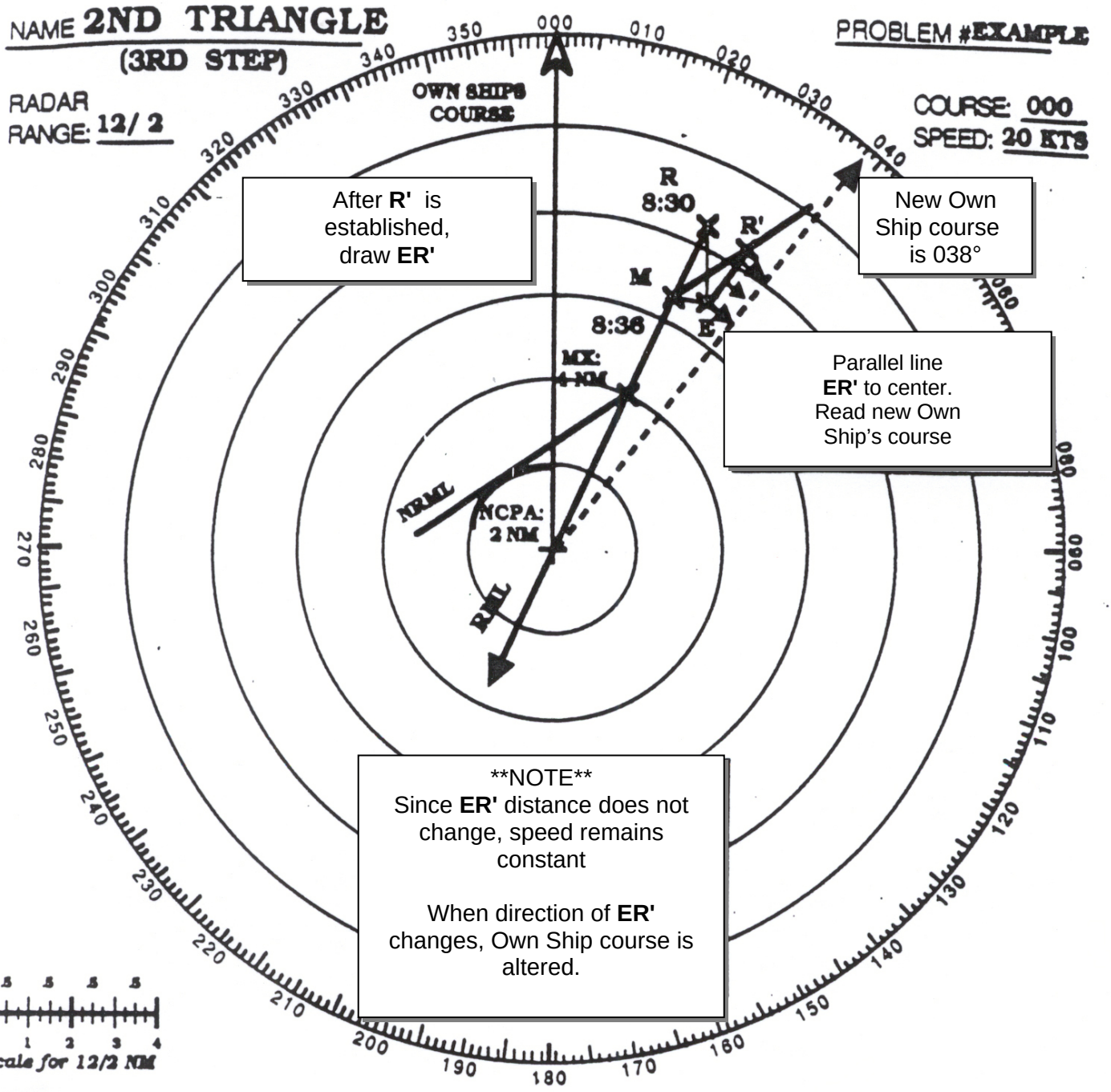


Explanation for 2nd Triangle establishing R' (new course or new speed)

(1) Place divider legs on points **E** and **R** (no change in length means no change in speed)
(2) Keep divider leg on point **E**, swing or arc other leg from point **R** to **NRML.** (change in Own Ship direction means change in course).
(3) Where other divider leg from point **R** intersects **NRML**, call this point **R'** (the new R).
(4) **ER' is the new course to steer to achieve the new desired CPA if executed at MX.**
(5) **E** to the **NRML** is the new speed to achieve the new desired CPA if executed at MX.

NOTE

DIRECTION of **ER** (**EM** and **ER'**) represents True COURSE
LENGTH of **ER (EM)** represents True SPEED



Explanation for 2nd triangle, new course ER' (cont.):

1) Draw line connecting point **E to R'**.
2) Parallel line **E to R'** down to center.
3) Extend line to outer circle, read heading in direction **E to R'**.
4) Vector **ER'** represents new Own Ship course to achieve desired **CPA** with dangerous target if done at time **MX**.

PROBLEM ANSWERS

First problem:

1. c
2. c
3. b
4. d
5. c

Secondary (2nd) triangle problem:

1. c
2. c
3. d
4. d
5. a
6. c

Primary triangle practice # 1

1. b
2. a
3. d
4. a
5. a
6. d
7. b

Primary triangle practice # 2

1. d
2. c
3. b
4. d
5. b
6. a
7. c
8. b

Secondary Triangle Job Aid

This sheet should be consulted for plotting of the **Secondary Triangle** in rapid radar plotting, **where the Own Ship is to change course or speed.** (See examples on previous page).

PROBLEM ASKS FOR:

NEW COURSE TO STEER FOR A DESIRED CPA:

a. Find out what time course change will take place and plot it as **MX.**
b. Draw a line from **MX** tangent to the range ring for **desired CPA**
c. Parallel this line back to point **M** and draw in the reverse direction.
d. Now measure the length of vector **ER**.
e. Keep one point of the dividers on **E**, *swing on arc* from **R** to where dividers intersect new relative motion line **(NRML)**
f. Call the new vector **ER'**
g. This vector will be **the new course to steer**.

NEW CPA WHEN YOU KNOW THE NEW COURSE: (Need time of MX)

a. Find time of course change and plot it as **MX.**
b. Lay down the new course from point **E**. (make long enough to measure off speed)
c. Put dividers on vector **ER** and measure length of that vector (no speed change).
d. Leave one point of the dividers on **E** and swing arc over to new course line.
e. The new point along the new course line is called **R'**.
f. Call new vector **ER'** (represents new course/speed solved for on 1st target).
g. Connect **R'** and **M.** This line represents new relative course and relative speed.
h. Parallel this new relative motion line down to point **MX (where the target will be when you maneuver)**.
i. Draw **NRML** past center.
j. **This shows the new CPA and how the target will pass**.

NEW SPEED FOR A SPECIFIC CPA:

a. Find out what time speed change will take place and plot it as **Mx**.
b. Draw a line from **Mx** tangent to range ring for desired **CPA**.
c. Parallel this line back to point **M**, in the reverse direction.
d. Now measure the length of the **ER** vector. Keep one point of the dividers on **E**.
e. Measure from **E** to where the new relative motion line crosses the **ER** vector.
f. Label that crossing point as **R'**.
g. From **E** to **R'** is your new speed required.

