

March 1997

Question 1.

Part I

Recommended Route is Great Circle to 55°S 80° W then  
By rhumb line to Cape Horn.

$$\begin{aligned} \text{Cos AB} &= \text{Cos Lat A Cos Lat B Cos P} \pm \text{Sin Lat A Sin Lat B} \\ &= \text{Cos } 21^{\circ}17' \text{ Cos } 55^{\circ} \text{ cos } 77^{\circ}53' - \text{Sin } 21^{\circ}17' \text{ sin } 55^{\circ} \\ &= -0.185151912 \\ \text{AB} &= 100^{\circ} 40.'2 \\ &= 6040.'2 \end{aligned}$$

From	55°00'S	80°00'W	MP 3948.78
To	<u>56°04'S</u>	<u>67°15'W</u>	MP 4061.63
Dlat	1°04'S	Dlong 12°45'E	DMP 112.85
	= 64'S	= 765'E	

$$\text{Tan Co} = \frac{\text{Dlong}}{\text{DMP}}$$

$$= \frac{765}{112.85}$$

$$\text{Course} = 81^{\circ}36.'5$$

$$\text{Distance} = \frac{\text{Dlat}}{\text{Cos Co}}$$

$$= \frac{64}{\text{Cos } 81^{\circ}36.'5}$$

$$= 438.5$$

$$\begin{aligned} \text{Total distance} &= 6040.2 + 438.5 \\ &= \underline{6478.7} \end{aligned}$$

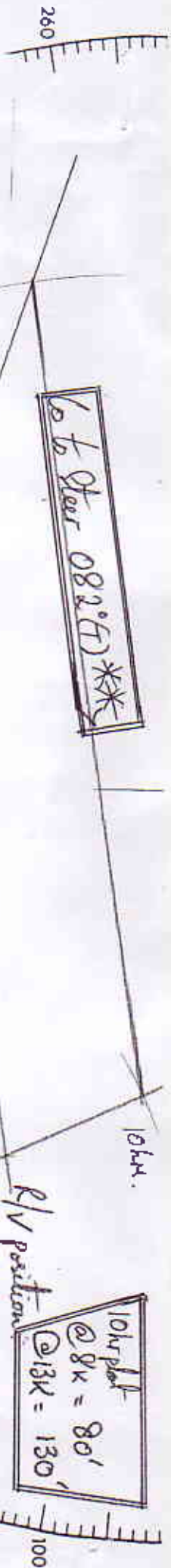
Part ii

ETD	27 Feb 0400 Ships Time	Total Dist	= 6478.7
Zone	<u>-10</u>	Speed	= <u>14.8</u>
ETD	27 Feb 1400 GMT	Time	= 437.5 hours
Time	<u>18d 5h 45m</u>		= 18d5h45m
ETA	16 Mar 1945 GMT		
Zone	<u>+4</u>		
ETA	16 Mar 1545 ST		

(NB 1976 is a Leap Year)

March 1997

2/1 SQA  
NAV.  
Mar 1997  
Q 2.



① 45°N : 1923 GMT  
40°N : 1909

42.3N : 195 GMT  
LIT 5057E : 24m  
Sunset = 18 51 GMT

Tug position R/V from fig = 92' @ 13K  
S.T. = 7hr 05m  
Start = 10hr 40m GMT  
ETA = 17hr 45m GMT  
Sunset = 18hr 51m GMT  
INTERVAL = 1hr Dem before Sunset.\*



1 unit = 10 n.m.

Pos'n @ 1040 'Pan' 41° 26' N 006° 28' E  
Kandall port 43° 18' N 005° 22' E

Dilat 1° 52' N 1° 06' W  
M. Lat 42° 22' N Dep 48.76393 W

Dep = True C =  $\frac{48.76393}{112} \therefore Co = N23°31.7'W (23.52793)$

'Pan' 1040: 41° 26' N 006° 28' E  
Tug 1040: 42° 05' N 003° 54' E

Dilat 39' N Dlg 2° 34' W  
M. Lat 41° 45.5' N  
Dep = 114.87792.

10hr plot  
@ 8k = 80'  
@ 13k = 130'

To Star = 082°(T)

R/V Lat 42° 18' N 005° 57.1' E  
Dilat 52' N Dlg 30.9 W  
Mean Lat 41° 52' N

Dep = 23' W

Along =  $\frac{Dep}{Cos Lat} = \frac{23}{Cos 41° 52'} = 30.88492 W$

RR

June 1997

Question 1

a) Shortest route is the Great Circle

$$\begin{aligned}\cos AB &= \cos LA \cos LB \cos P \pm \sin LA \sin LB \\ &= \cos 13^{\circ} 30' \cos 7^{\circ} \cos 135^{\circ} 15' + \sin 13^{\circ} 30' \sin 7^{\circ} \\ &= -0.685415546 + 0.028449833 \\ &= -0.656955712 \\ AB &= 131^{\circ} 04.'1 = \underline{7864.'1}\end{aligned}$$

b) Vertex

$$\begin{aligned}\cos A &= \frac{\cos PB - \cos PA \cos AB}{\sin PA \sin AB} \\ &= \frac{\cos 83^{\circ} - \cos 76^{\circ} 30' \cos 131^{\circ} 04'}{\sin 76^{\circ} 30' \sin 131^{\circ} 04'} \\ &= 0.375439869 \\ A &= N 67^{\circ} 56.'9 E\end{aligned}$$

So the Vertex lies to the East of the start position.

$$\begin{aligned}\sin PV &= \sin A \sin PA \\ &= \sin 67^{\circ} 56.'9 \times \sin 76^{\circ} 30' \\ &= 0.901237904 \\ PV &= 64^{\circ} 19.'3 \\ \text{Lat V} &= \underline{25^{\circ} 40.'7 N}\end{aligned}$$

$$\begin{aligned}\tan P &= \frac{1}{\cos PA \times \tan A} \\ \tan P &= \frac{1}{\cos 76^{\circ} 30' \times \tan 67^{\circ} 56.'9} \\ P &= 60^{\circ} 02.'8\end{aligned}$$

$$\begin{aligned}\text{Long A} &= \underline{144^{\circ} 45' E} \\ \text{Long V} &= 155^{\circ} 12.'2 W\end{aligned}$$

c)

$$\begin{aligned}\sin Co P &= \tan co PX \tan PV \\ \cos P &= \tan Lat X \tan PV \\ \tan Lat X &= \frac{\cos P}{\tan PV} = \frac{\cos 10^{\circ} 59.'8}{\tan 64^{\circ} 19.3} \\ \text{Lat X} &= 25^{\circ} 16.'0 N \\ \text{Lat Bank} &= 24^{\circ} 55.'0 N \\ \text{Distance off} &= 21.0 \text{ Miles to the North of the bank.}\end{aligned}$$

June 1997

2. a) Sunrise. 31<sup>st</sup> May 60°N 0251 GMT  
 inc 1°32' 16m  
 SR at 61°32' N 0235 LMT  
 L.I.T. + 1h 11m  
 SR 0346 GMT 31st  
 Time now 2135 GMT 30th  
 Interval 6h 11m  
 Speed 14.5 knots  
 Run 89.7 miles

Start 61° 32' N 17° 40' W  
 Run 247° 89.7 dlat 35.1 S dlong 2° 51.'5 W dep 82.5  
 DR Lat 60° 56.9 N Long 20° 31.5 W  
 M Lat 61° 14.5 N

Sunrise 31 May 60°N 0251  
 Inc 1° 13' 13m  
 SR at 61° 13' N 0238 LMT  
 L.I.T. + 1h 22m  
 SR 0400 GMT 31<sup>st</sup>  
 Time 2135 GMT 30<sup>th</sup>  
 Interval 6h 25m  
 Speed 14.5 knots  
 Run 93 miles

Start 61° 32' N 17°40' W  
 Run 247° 93' dlat 36.'3 S dlong 2° 57.'9 W dep 85.6  
 DR lat 60°55.7 N long 20°37.9 W  
 Mlat 61° 13.9 N

Sunrise 31 May 60°N 0251  
 Inc 55' -10m  
 SR at 60° 55.'7 N 0241 LMT  
 L.I.T. 1h 22m  
 SR 0403 GMT

b) R/V at sunrise when the RFA is in position 60° 55.'7 N 20° 37.'9 W



June 1997

4. Target A - Minimum alteration of course is 16° to starboard to a new course of 082°. Any further alteration of course increases the CPA up to a new course of 195°
- Target B - Minimum alteration of course is 14° to starboard to a new course of 080°(T). Any further alteration increases CPA up to a new course of 010°(T)
- Target C - Minimum alteration of course is 8° to starboard to a new course of 074°(T). Any further alteration of course increases the CPA up to a course of 163°(T).

Minimum alteration of course at 0358 for all three targets to pass at least 2 miles off is an alteration of 16° to starboard new course 082° (T)

## OPTIONS

- |                    |  |
|--------------------|--|
| A/c to starboard - | ok for Vsl. A, and Vsl. B, but altering towards Vsl C  |
| A/c to Port -      | Not OK for VsIs A and B, OK for C                      |
| Slow down -        | OK for Vsl B, but reduces CPA VsIs A and C             |
| Stop -             | Collision Vsl A, OK Vsl B, v.close quarters with Vsl C |

Best option is to alter 90° to starboard since this will be readily apparent to a vessel observing by Radar alone, and will also retain the manoeuvrability of the vessel. Although we are altering towards a vessel abaft the beam, the rules say as far as is possible it is to be avoided, and in this case our options are limited. If we do alter 90° to starboard, then the CPA's will be as follows:-

Target A	3.8'
Target B	4.6'
Target C	2.6'

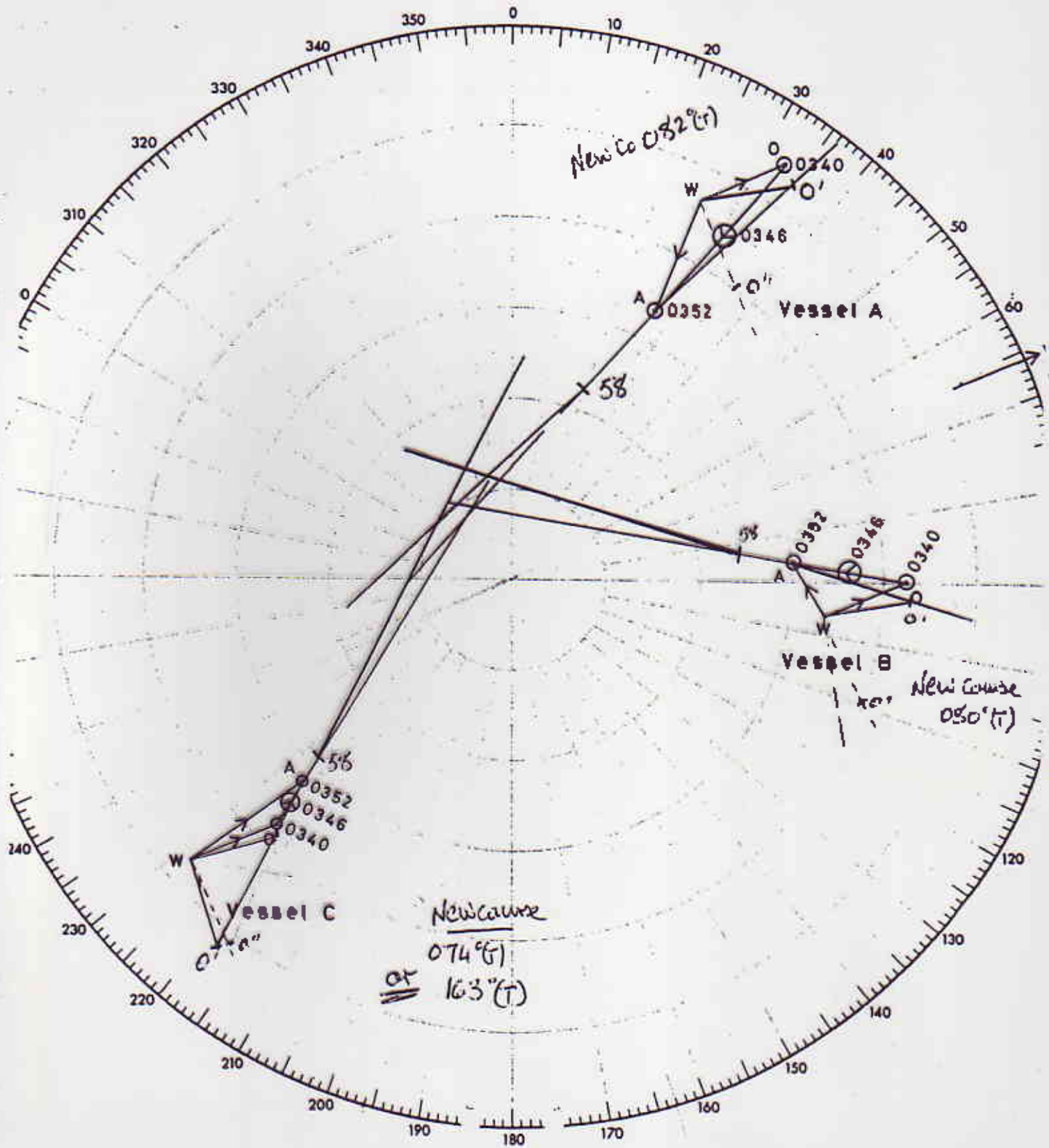
If we try an alternative of leaving the avoiding action until Target c is astern, thereby avoiding the problem of altering towards a vessel abaft the beam, this action will not be taken until 0431. By this time, Targets A and B will be passed their CPA's, and will have passed within 2 miles of us. Therefore the action should be taken as early as possible.

WORKSHEET Q.4

N.B. This Worksheet must be returned with your answer book

12

# RADAR PLOTTING SHEET



(This is not a metric scale)

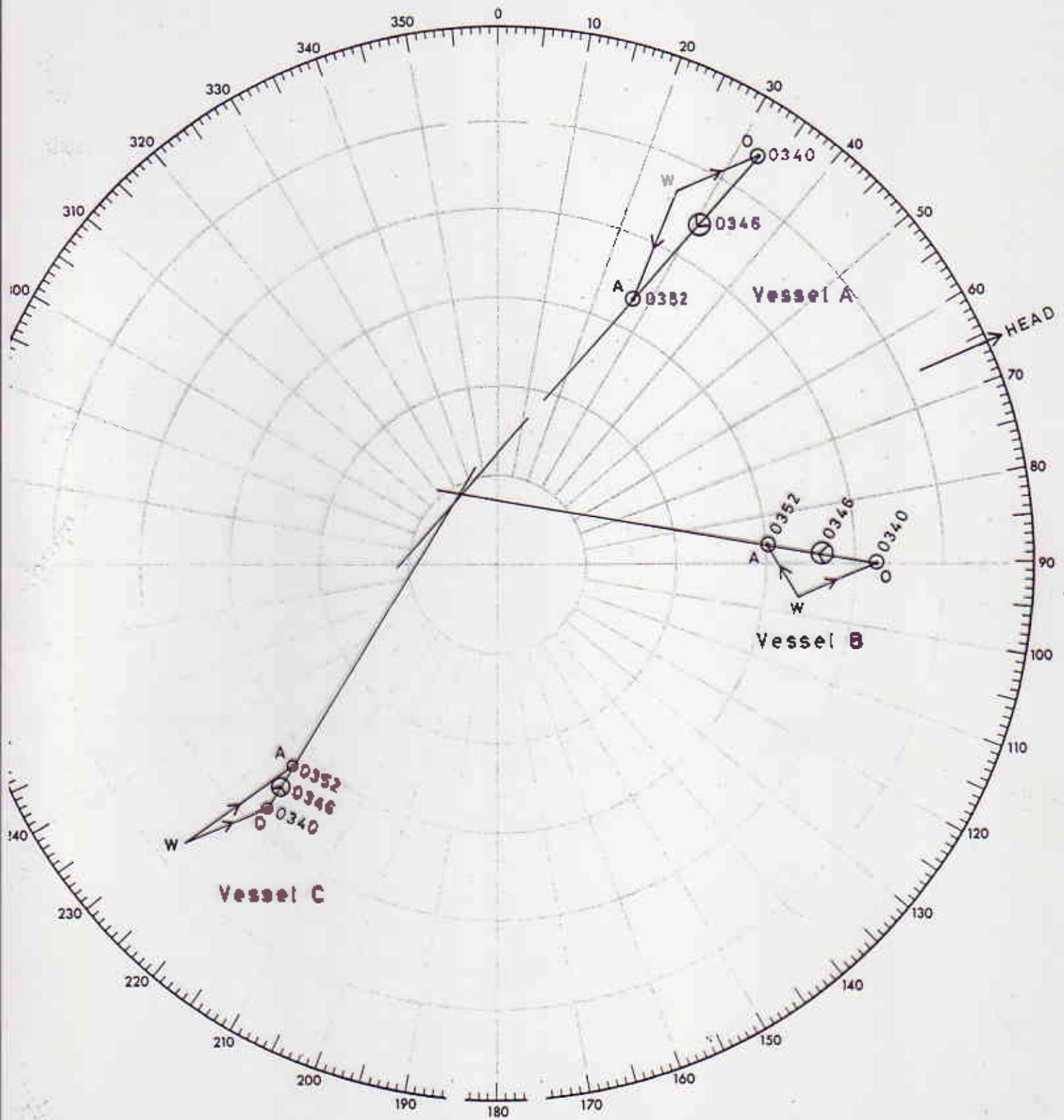
Signature of Candidate.....

Examination Centre.....

WORKSHEET Q4

N.B. This Worksheet must be returned with your answer book

# RADAR PLOTTING SHEET



(This is not a metric scale)

Signature of Candidate.....

Examination Centre.....