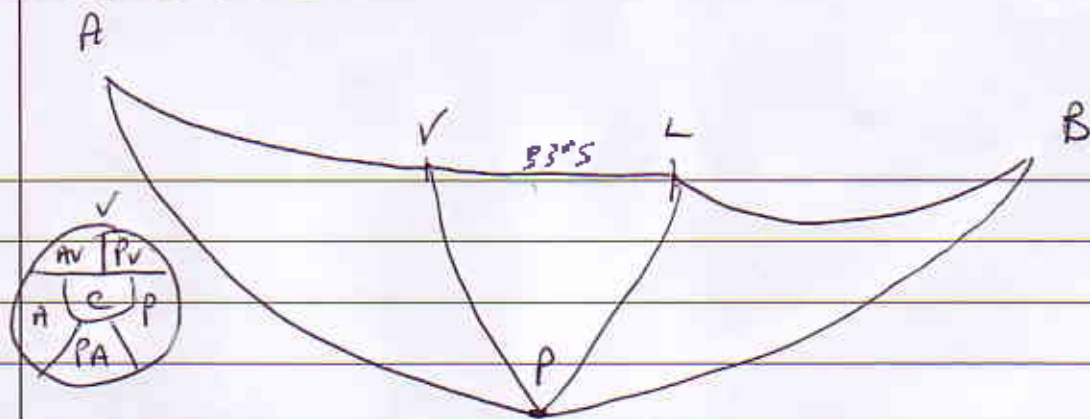


CM. SQA. March 98 Q.1.



$$420 \frac{1}{28} * 24 * 14.8 = 5328'$$

Dep 'A' $10^{\circ} 35'S$ $142^{\circ} 13'E$ PA $79^{\circ} 25'$ (79.41667)
 Arrived 'B' $29^{\circ} 47'S$ $71^{\circ} 21'W$ PB $60^{\circ} 13'$ (60.21667)
 PV = 57° AB-Dlg $146^{\circ} 26'E$ (146.43333)
 $\frac{\cos PA}{\cos PV} = \frac{\cos AV}{\cos 57} = \frac{\cos 79.41667}{\cos 57} \therefore AV = 70.29216 = 4217.5$

$$AV \cdot L = 5328$$

$$\therefore VL = 1110.5$$

Dep = Dlg = $\frac{1110.5}{\cos 33} = 1324.12 E = 22^{\circ} 04.12 E$ VL

$$\cos P = \frac{\tan PV}{\tan PA} \therefore P = 73.27884 = 73^{\circ} 16.7 E$$

Start Dlg = $142^{\circ} 13.0 E$
 $215 \quad 29.7 E$
 Lg V $144^{\circ} 30.3 W$
 Dlg VL $22^{\circ} 04.1 E$
 Lg 'L' = $122^{\circ} 26.2 W$ 122.43667
 Lg 'B' = $71^{\circ} 21.0 W$
 Dlg L-B = $51^{\circ} 05.2 E$ 51.08667

$$\cos LB = \cos P \sin PL \sin PB + \cos PL \cos PB$$

$$= \cos 51.08667 \sin 57 \sin 60.21667 + \cos 57 \cos 60.21667$$

$$\therefore LB = 43.30156 = 2598.09365 = 2598.1$$

Dist to L = 5328.0
 Total Dist = 7926.1

$$s/t = 7926.1 \div 14.8 = 535.5473 \text{ hrs} = 22 \text{ d } 7 \text{ hrs } 33 \text{ m}$$

May 02d 07h 33m		Start April 10d 10h 00m	ST.	
ST 4h		allowance	- 10h	
ETA ST 02d 03h 33m		May	10d 00h 00m	
		+s/t	22d 7h 33m	

March 1998

Question 1

Part a This is NOT a composite Great Circle question.

Shortest route can be found as follows. A composite great Circle using the Latitude of the Winter Zone as the limiting latitude. Parallel sail along this latitude until the Vessel has consumed the excess fuel and water, then a Great circle track from this point to the point of arrival.

Arrival at the limiting latitude I have called position V1, and the position for the start of the Great Circle Track I have called V2.

Ship is overloaded	=	420 t
Consumption	=	28 tpd
Duration	=	15d
Service speed	=	14.8 Kts
Distance to travel	=	15 x 24 x 14.8
	=	5328 miles

Composite GC dist to L.L.		
Cos AV1	=	$\frac{\text{Sin Lat A}}{\text{Sin Limiting lat.}}$

$$= \frac{\text{Sin } 10^{\circ}35'}{\text{Sin } 33^{\circ}}$$

Distance	=	4217.5
----------	---	--------

Dist. To run along 33°S	=	5328 - 4217.5
	=	1110.5 miles

We now need to find the position of V1, so that we can calculate the position of V2

Longitude V1

Cos P	=	$\frac{\text{Tan Lat A}}{\text{Tan Lat V}}$
	=	$\frac{\text{Tan } 10^{\circ}35'}{\text{Tan } 33^{\circ}}$
P	=	73°16.'8 E
Long A	=	142°13'E
Long V1	=	144°30.'2W

March 1998

To find Dlong V1 to V2

$$\text{Departure} = \text{Dlong} \times \cos M \text{ Lat}$$

$$\text{Dlong} = \frac{1110.5}{\cos 33^\circ}$$

$$\text{Dlong} = 22^\circ 04.1' \text{E}$$

$$\text{Long V1} = 144^\circ 30.2' \text{W}$$

$$\text{Long V2} = 122^\circ 26.1' \text{W}$$

Great Circle from V2 to B

$$\begin{aligned} \cos AB &= \cos \text{lat A} \cos \text{lat B} \cos P \pm \sin \text{lat A} \sin \text{lat B} \\ &= \cos 33^\circ \cos 29^\circ 47' \cos 51^\circ 05.1' + \sin 33^\circ \sin 29^\circ 47' \\ &= 0.4572 + 0.27053 \\ &= 0.72777 \end{aligned}$$

$$\begin{aligned} AB &= 43^\circ 18.0 \\ &= 2598 \text{ miles} \end{aligned}$$

$$\begin{aligned} \text{Total Distance} &= 5328 + 2598 \\ &= 7926 \text{ miles} \end{aligned}$$

Part b

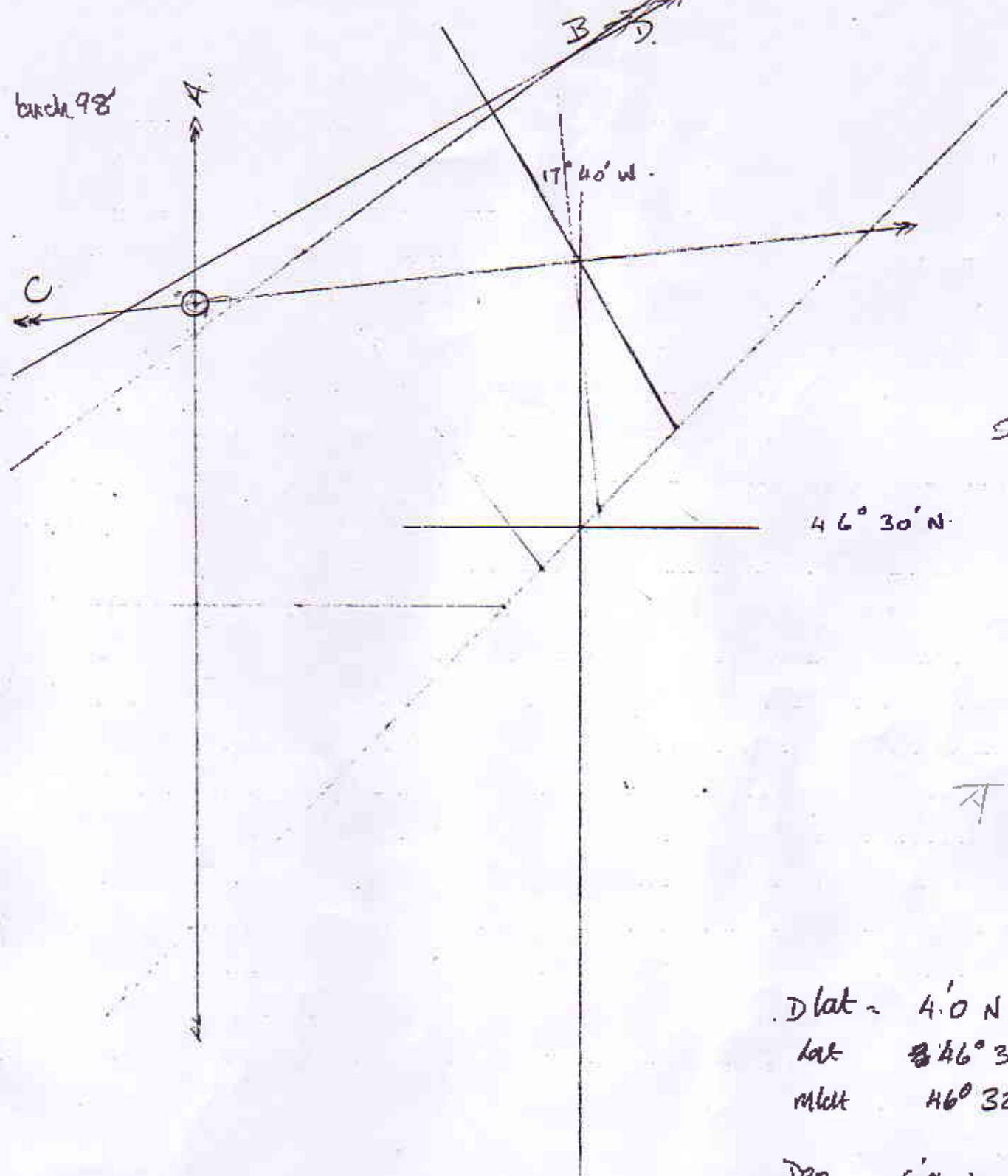
$$\begin{aligned} 7926 \text{ miles at } 14.8 \text{ knots} &= 535 \text{h } 32 \text{m} \\ &= 22 \text{d } 7 \text{h } 32 \text{m} \end{aligned}$$

$$\begin{array}{r} \text{ETD } 10 \text{ Apr } 1000 \text{ ST} \\ \text{Zone } \underline{-10} \\ \text{10 Apr } 0001 \text{ GMT} \\ \text{Run } \underline{22 \text{d } 0732} \\ \text{ETA } 02 \text{ May } 0732 \text{ GMT} \\ \text{Zone } \underline{+4} \\ \text{ETA } 02 \text{ May } 0332 \text{ Zone Time} \end{array}$$

$$2. \quad \text{MPP is } 46^\circ 34' \text{N} \quad 017^\circ 49.9' \text{W}$$

(see Plot attached)

batch 98



Scale 1 cm = 1'

46° 30' N

obs pos

AT 46° 34' N.
 LONG. 17° 49' W.

- 8 miles at 15 kts = 2.0
- 4 miles at 15 kts = 1.0
- 2 miles at 15 kts = 0.5
- 10 miles at 15 kts = 2.5

D lat ~ 4.0 N.
 Lat ~~8~~ 46° 36' N.
 Mkt 46° 32' N.
 Dep. 6.8 W
 dl long. 9.9 W
 long 17° 49' W

2/1 SQA March 98 Q3.

1976 May 15d 18h 30m GMT
handfall

38° 26' N 052° 44' W MP 2486.8

40° 45' N 074° 00' W MP 2066.4

Dlat 2 19 21° 16' W

True Co = Dlg / AMP = 1276 / 179.68 = N 82° W = 278° T. 139' N 1276' W AMP 179.68

R/V @ CT on 16th

CT. 40° N 04 13

1st Approx run 13h 19m @ 24K
= 319.6 Co 278° T.

CT. 35° N 04 28 ∴ 38.45 = 04 18 LM

LT. 052° 44' W = 3h 31m

Dlat = Dist Cos Co = 319.6 Co 278 = 44.5' N

1st Approx GMT. 16d 07h 49m

Dep = Dist Sin Co = 319.6 Sin 278 = 316.49 W

Start GMT. 15d 18h 30m

Dlg = Dep / Cos Lat = 316.49 / Cos 38° 48' 2 = 406.1 W

1st approx run 13h 19m

Start 38° 26' N 052° 44' W

2nd run @ 13h 43m @ 24K = 329.2

1st Dlat 44.5' N 6° 46.1' W

Dlat = 329.2 Co 278 = 45.82 N

1st approx pos in 39° 10.5' N 059° 30.1' W

Dep = 329.2 Sin 278 = 326.0 W

Mlat 38° 48.2

Dlg = 326 / Cos 38° 48.9 = 418.4 W

CT 40° N 04 13 35° N 04 28 39° 10' N = 04 15 LM

New Dlg gives long that does not change time by more than 1 minute. ∴ Second Approx position is acceptable.

1st Approx 059° 30.1' W = 3 58

2nd Approx GMT = 16d 08h 13m

Start GMT = 15d 18h 30m

2nd Approx run = 13h 43m

R/V Posn 39° 11.8' N 059° 42.4' W

Start 38° 26' N 052° 44' W

O/V Posn 36° 50.0' N 058° 25' W

Dlat 45.8' N 6° 58.4' W

2nd Approx pos in 39° 11.8' 059° 42.4' W

Mlat 38° 48.9

Dlat 2 21.8' N Dlg 1° 17.4' W

Mlat 38° 01' N 141.8' N 77.4' W

Dep = Dlg Cos Mlat = 77.4 Co 38° 01' = 60.98 W

True Co = $\frac{Dep}{Dlat} = \frac{60.98}{141.8} = N 23.26975 W$
= 336.7 T

Dist = $\frac{Dlat}{Cos Co} = \frac{141.8}{Cos 23.26975} = 154.36$
= 154.4

$\frac{154.4}{13.71667} = 11.26 K$