Questions

Q1.

Answer the questions with a cross in the boxes you think are correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A sundial in the United Kingdom shows 11:15 am on a day when the Equation of Time is -6 minutes.

The sundial's longitude is 3° W.

These observations mean that:

(i) A clock at the sundial's location would show:

☐ A 11:15
☐ B 11:21
☐ C 11:27
☒ D 11:33

① −6 means, solar time is behind clock time so need to add on 6 mins (1)

(ii) Greenwich Mean Time is:

☐ A 11:15
☐ B 11:21
☐ C 11:27
☒ D 11:33 ← *This is the correct clock time which the corrected Sundial reading should match*

② 3°W is later than GMT by 3 × 4mins = 12mins so need to add 12 min to solar time

③ So 11·15 + 12 + 6 = 11·33 (1)

(iii) The Local Mean Time at the sundial's location is: *Sundial time with EOT correction added*

☐ A 11:15
☒ B 11:21
☐ C 11:27
☐ D 11:33

(1)

(iv) The Apparent Solar Time at the sundial's location is: *Uncorrected time shown by the sundial*

☒ A 11:15
☐ B 11:21
☐ C 11:27
☐ D 11:33

(1)

Feedback:
Learn the meanings of the terms used in this question.

(Total for question = 4 marks)

Q2.

Figure 7 shows a clock and a sundial on a church wall in the UK.
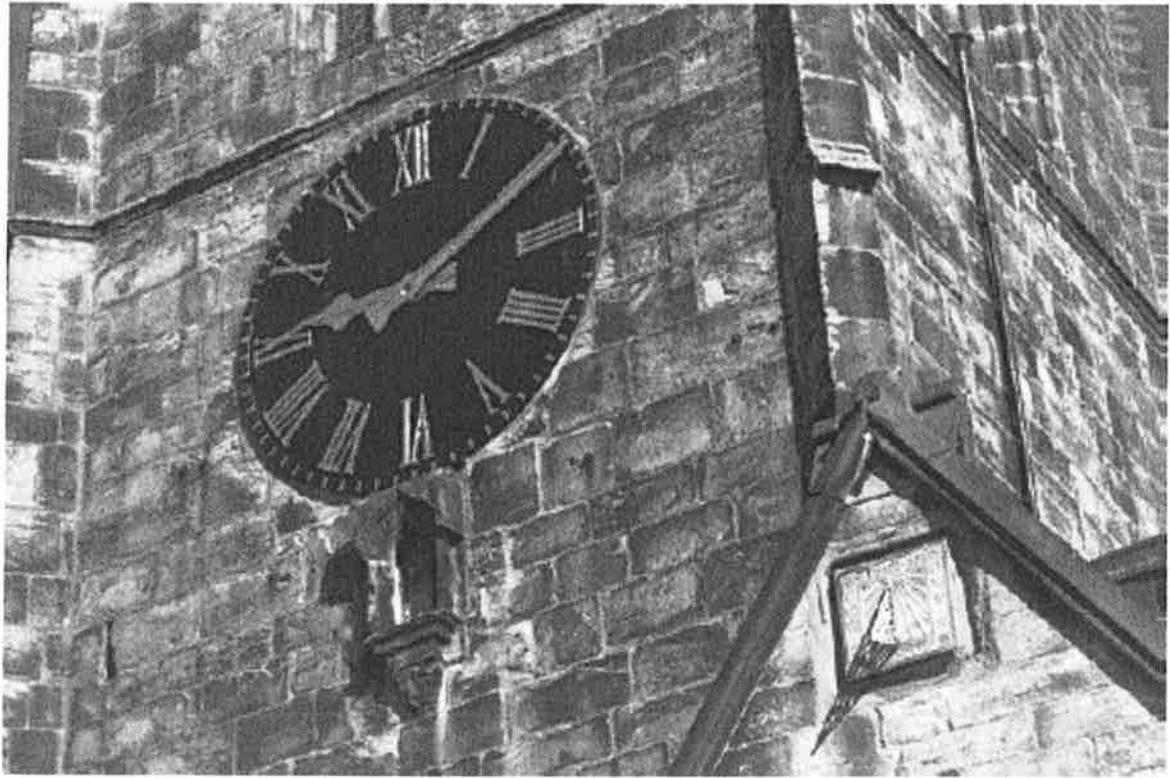

Figure 7

— Clock 10 mins ahead of
The clock is showing a time of 09:10 GMT while the shadow on the sundial indicates a time of 9 am. Sundial

(i) State the Apparent Solar Time when this photograph was taken. (given by the shadow) (1)

9 am ✓

(ii) If the Equation of Time on the day when this photograph was taken was –2 minutes, calculate the Mean Solar Time at this location.
Use the equation:
Equation of Time = Apparent Solar Time – Mean Solar Time

(clock is ahead, negative) (2)

EOT = 9 – (– 2) ✓

= 9:02 am ✓

← Workings needed

(iii) Hence show that the longitude of the location where the photograph was taken is 2°W. (2)

Clock shows 9:10 so 8 mins ahead of Sundial
8 mins = 2 × 4 mins ✓ ✓
So 2°W is correct longitude

(Total for question = 5 marks)

Mark Scheme

Q1.

Question number	Answer	Mark
	(i) **D** 11:33	(1)
	A is incorrect because it is the Apparent Solar Time	(1)
	B is incorrect because it is the Local Mean Time	(1)
	C is incorrect because it is not related to the question	(1)
	(ii) **D** 11:33	
	A is incorrect because it is the Apparent Solar Time	
	B is incorrect because it is the Local Mean Time	
	C is incorrect because it is not related to the question	
	(iii) **B** 11:21	
	A is incorrect because it is the Apparent Solar Time	
	C is incorrect because it is not related to the question	
	D is incorrect because it is the Greenwich Mean Time	
	(iv) **A** 11:15	
	B is incorrect because it is the Local Mean Time	
	C is incorrect because it is not related to the question	
	D is incorrect because it is the Greenwich Mean Time	

Q2.

Question number	Answer	Notes	Marks
(i)	09:00 / 9 o'clock / 9a.m.		1
(ii)	09:00 − −2m = **09:02** (08:58)	Reject: 09:08 or 09.12	2 **(1)**
(iii)	09:10 − 09:02 = **8 mins,** 8m / 4 i.e. evidence of 4 mins representing 1° of longitude (= 2°W)	NB: No mark for answer (2°W)	1 1