IM-011 · Time: units, the 24-hour clock, timetables and time zones

IGCSE Mathematics (0580) · HomiLabs: Maths · Ep 011

All places, timetables and time differences on this sheet are invented. In the exam, 1 year = 365 days.

Set A · Fluency

1. (a) How many minutes are there in 4 hours?
   (b) Write 9000 seconds in minutes, and then in hours and minutes.
   (c) How many hours are there in 3 weeks?

2. Write 3.35 hours in hours and minutes.

3. Write 2 hours 48 minutes as a decimal number of hours.

4. (a) Change to the 24-hour clock: (i) 8.40 p.m. (ii) 12.05 a.m. (iii) 11.30 a.m.
   (b) Change to the 12-hour clock: (i) 14 25 (ii) 00 50

5. How long is it from 21 25 on Sunday to 03 10 on Monday?

6. A lesson starts at 13 40 and lasts 1 hour 35 minutes. At what time does it finish?

7. City R is 7 hours ahead of City S.
   (a) It is 16 30 on Wednesday in City S. What is the local time in City R?
   (b) It is 05 00 on Thursday in City R. What is the local time and day in City S?

8. (a) How many days are there in 6 years?
   (b) How many minutes are there in 0.4 of a day?

Set B · Exam style

1. (Paper 1/2 · no calculator) (C) Part of a train timetable is shown.

	Train 1	Train 2	Train 3
Northgate	06 50	07 35	08 20
Elm Park	07 08	07 53	08 38
Southbridge	07 31	08 16	09 01

   (a) Work out how long Train 2 takes from Northgate to Southbridge. [1]
   (b) Priya arrives at Elm Park at 07 40 and catches the next train. How long does she wait, and at what time does she reach Southbridge? [2]
   (c) One day Train 3 is 25 minutes late at every station. At what time does it reach Southbridge? [1]

2. (Paper 1/2 · no calculator) (C) A plane leaves Kestra at 16 45 on Saturday, local time. It lands in Velmor at 08 20 on Sunday, local time. The local time in Velmor is 5 hours ahead of the local time in Kestra.
   (a) Work out the flight time. [3]
   (b) Write the landing time using the 12-hour clock. [1]

3. (Paper 3/4 · calculator) (C) A machine fills one bottle every 2.4 seconds.
(a) How many bottles does it fill in 7 hours 15 minutes? [3]
(b) How long does it take to fill 4000 bottles? Give your answer in hours and minutes. [2]

4. (Paper 3/4 · calculator) (C) A calculator shows a runner's time as 1.38 hours.
(a) Write this time in hours, minutes and seconds. [2]
(b) A second runner takes 1 hour 26 minutes 15 seconds. How much longer is this than the first runner's time? Give your answer in minutes and seconds. [2]

Challenge

(Extended; links to Ep 8, standard form) A computer carries out 6×10^{9} operations every second.
(a) How many operations does it carry out in one day? Give your answer in standard form.
(b) A task needs 1.2×10^{17} operations. How long does it take? Give your answer in seconds, in standard form, and then in days, hours, minutes and seconds.

Answers

Set A

1. (a) 4 × 60 = 240 min. (b) 9000 ÷ 60 = 150 min = 2 h 30 min. (c) 3 × 7 × 24 = 504 h.

2. 0.35 × 60 = 21, so 3 h 21 min.

3. 48 ÷ 60 = 0.8, so 2.8 h.

4. (a) (i) 20 40 (ii) 00 05 (iii) 11 30. (b) (i) 2.25 p.m. (ii) 12.50 a.m.

5. 21 25 → 22 00 is 35 min; 22 00 → 03 00 is 5 h; 03 00 → 03 10 is 10 min: 5 h 45 min.

6. 13 40 + 1 h = 14 40; + 35 min = 15 15.

7. (a) 16 30 + 7 h = 23 30 on Wednesday. (b) 05 00 − 7 h = 22 00 on Wednesday.

8. (a) 6 × 365 = 2190 days. (b) 0.4 × 24 = 9.6 h = 9.6 × 60 = 576 min.

Set B

1. (a) 07 35 → 08 16: 41 min B1.
   (b) Next train at Elm Park is 07 53: wait 13 min B1; reaches Southbridge at 08 16 B1.
   (c) 09 01 + 25 min = 09 26 B1.

2. (a) Landing time on Kestra's clock: 08 20 − 5 h = 03 20 on Sunday M1; 16 45 → 17 00 = 15 min, 17 00 → 03 00 = 10 h, 03 00 → 03 20 = 20 min M1; 10 h 35 min A1.
   (b) 8.20 a.m. B1.

3. (a) 7 h 15 min = 7.25 h = 7.25 × 3600 = 26 100 s M1 A1; 26 100 ÷ 2.4 = 10 875 bottles A1.
   (b) 4000 × 2.4 = 9600 s M1; 9600 ÷ 60 = 160 min = 2 h 40 min A1.

4. (a) 0.38 × 60 = 22.8 min M1; 0.8 × 60 = 48 s, so 1 h 22 min 48 s A1.
   (b) 1 h 26 min 15 s − 1 h 22 min 48 s M1 = 3 min 27 s A1.

Challenge

(a) 1 day = 24 × 60 × 60 = 86 400 s; $6 \times 10^9 \times 86\,400 = 5.184 \times 10^{14}$ operations.
(b) $1.2 \times 10^{17} \div (6 \times 10^9) = 2 \times 10^7$ s. $2 \times 10^7 \div 86\,400 = 231$ remainder 41 600 s, so 231 days and 41 600 s; 41 600 s = 11 h 33 min 20 s. Answer: 231 days 11 h 33 min 20 s.