Cambridge OL

Mathematics

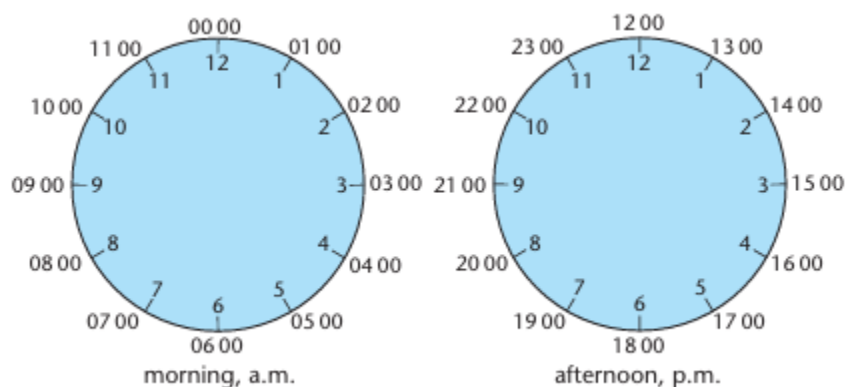*CODE: (4024)*

Chapter 15 and chapter 16

Time and money

The 24-hour clock

The time of the day can be given as a.m., p.m. or on the 24-hour clock.

Digital recorders use the 24-hour clock, so you are likely to be familiar with this. You also need to be able to change from one to the other.

morning, a.m.   afternoon, p.m.

Example 15.1

Question

Write these times using the 24-hour clock.

a   11.32 a.m.   b   9.14 a.m.   c   12.18 a.m.   d   6.55 p.m.

Note

Times between midnight and 1 a.m. start with 00 on the 24-hour clock.

Solution

a   11 32. Times using a.m. are the same as on the 24-hour clock.

b   09 14. For times before 10 a.m. you need to add a zero at the start so that there are four figures.

c   00 18. You need to add two zeros.

d   18 55. To change times using p.m. to the 24-hour clock, add 12 to the hours.

Example 15.2

Question

Write these times using the 12-hour clock.

a   11 46   b   04 21   c   14 22   d   23 05

Note

Times between 12 noon (midday) and 1 p.m. do not have 12 subtracted from them for p.m. times.

Solution

a   11.46 a.m.   Add a full stop and write a.m. 11:46 a.m. is also acceptable.

b   4.21 a.m.   As it is in the morning, just add a.m. and drop the first zero.

c   2.22 p.m.   As it is in the afternoon, subtract 12 hours and add p.m.

d   11.05 p.m.

Calculating with time

When calculating with time, remember that there are 60 minutes in an hour and 60 seconds in a minute

Example 15.3

Question

Mavis left for school at 7.45 a.m. and arrived 40 minutes later.
At what time did she arrive?

Solution

7.45 + 40 minutes = 7 hours + 85 minutes   85 minutes is 1 hour and 25 minutes
                  = 8 hours 25 minutes
She arrived at school at 8.25 a.m.

Example 15.4

Question

Carla set her digital recorder to start recording at 15 20 and to stop at 17 10.
For how long was it recording?

Solution

Count to the next hour, 16 00. This is 40 minutes.
Then, to get to 17 10, a further 1 hour and 10 minutes are needed.

So the total time is 40 minutes + 1 hour 10 minutes = 1 hour 50 minutes.

Example 15.5

Question

It takes Nathee 35 minutes to prepare some food for cooking.
He is ready to start cooking at 6.15 p.m.
At what time did he start preparing the food?

Solution

Work backwards from 6.15 p.m.
15 minutes before 6.15 is 6.00 p.m.
That leaves 35 − 15 = 20 minutes still to take off.
20 minutes before 6.00 is 5.40 p.m.
So he started preparing the food at 5.40 p.m.

Timetables

Example 15.6

Question

This is the timetable for some trains from Delhi to Agra.

Delhi (depart)	06 00	08 35	10 05	15 55	20 55	21 15	22 30
Agra (arrive)	08 06	11 00	12 43	18 08	23 35	00 02	01 07

Work out how long these trains take to do the journey.

a   The 08 35 from Delhi
b   The 15 55 from Delhi
c   The 22 30 from Delhi

Solution

a   From 08 35 to 09 00 is 25 minutes.
      09 00 to 11 00 is 2 hours.
      So the 08 35 from Delhi takes 2 hours 25 minutes.
b   From 15 55 to 16 00 is 5 minutes.
      From 16 00 to 18 00 is 2 hours.
      From 18 00 to 18 08 is 8 minutes.
      So the 15 55 from Delhi takes 2 hours 13 minutes.
c   From 22 30 to 23 00 is 30 minutes.
      From 23 00 to 01 00 is 2 hours.
      From 01 00 to 01 07 is 7 minutes.
      So the 22 30 from Delhi takes 2 hours 37 minutes.

Converting between hours and minutes and hours written as a decimal

When you are calculating with time, your calculator will often give times in hours using decimals, but many questions ask for answers in hours and minutes. Similarly, a time in a question may be given in hours and minutes, but you need to change this to a decimal number to do the calculation.

Example 15.7

Question

Write 15.36 hours in hours and minutes, correct to the nearest minute.

Solution

0.36 hours = 0.36×60 To convert hours to minutes multiply by 60.
          = 21.6 minutes
So 15.36 hours = 15 hours 22 minutes correct to the nearest minute.

Example 15.8

Question

The Beijing to Shanghai train travels 1318 km in 5 hours 37 minutes. Find the average speed of the train, correct to the nearest km/h.

Solution

37 minutes = $37 \div 60$ To convert minutes to hours divide by 60.
          = 0.6166... hours
So the total time is $5 + 0.6166... = 5.6166...$ hours.
Speed = distance ÷ time
Speed = $1318 \div 5.6166... = 234.658...$
       = 235 km/h correct to the nearest km/h

Time zones

The time of day varies in different countries, depending on their longitude. In large countries, there may even be differences within the country. Usually these differences are a whole number of hours.

Example 15.9

Question

An aircraft leaves Dubai at 08 55 local time and flies to Tokyo.
The flight takes 9 hours 25 minutes.
Local time in Tokyo is 5 hours ahead of Dubai.
What is the local time in Tokyo when the aircraft lands? ▶

Solution

08 55 + 9 hours 25 minutes = 17 55 + 25 minutes = 18 20 (Dubai time)
18 20 + 5 hours = 23 20 (Tokyo time)

Key points

- Times of day can be given as a.m. (morning), p.m. (afternoon) or in the 24-hour clock.
- Times in the morning have the same hours digits when converted to the 24-hour clock.
- Times in the afternoon have 12 added to the hours digits when converted to the 24-hour clock.
- 60 s = 1 min; 60 min = 1 h; 24 h = 1 day; 7 days = 1 week; 365 days = 1 year.
- Local time varies in different countries, depending on longitude.

Chapter 16 - Money

Value for money

When shopping, it is easy to assume that the biggest size is the best value for money, but this is not always the case.

Example 16.1

Question
A packet of Wheat-o-Flakes weighing 1.5 kg costs $4.99.
A packet of Wheat-o-Flakes weighing 500 g costs $1.70.
Which is better value for money?

Solution
Method 1
Find the price for each kilogram.
For the larger packet: $4.99 \div 1.5 = 3.326\ldots$ $/kg
For the smaller packet: $1.70 \div 0.5 = 3.40$ $/kg
The larger packet costs slightly less for each kilogram so is better value for money.
Method 2
Find how many grams you get for each cent.
For the larger packet: $1500 \div 499 = 3.006\ldots$ grams per cent
For the smaller packet: $500 \div 170 = 2.941\ldots$ grams per cent
You get slightly more for each cent with the larger packet so it is better value for money.

Note

Whichever method you use, make sure that you make the right conclusion.

The better value is the one which costs less for each kilogram, gram, litre or millilitre or the one where you get more for each dollar or cent.

Example 16.2

Question
At Mega T, if you buy two T-shirts at $7.99 each, you get a third T-shirt free.
At T World, T-shirts cost $5.50 each if you buy two or more.
Explain which is the better offer if you want to buy

a   three T-shirts   b   four T-shirts.

Solution
a   At Mega T, three T-shirts cost $2 \times \$7.99 = \$15.98$
     At T World, three T-shirts cost $3 \times \$5.50 = \$16.50$
     So Mega T has the better offer.
b   At Mega T, you need to buy the fourth T-shirt at $7.99.
     Total cost $= \$15.98 + \$7.99 = \$23.97$
     At T World, four T-shirts cost $4 \times \$5.50 = \$22.00$
     So T World has the better offer.

Although the methods shown in Example 16.1 will always work, sometimes there is an obvious easier method. For example, in Example 16.1, the larger packet weighs three times as much as the smaller packet.

When you buy three of the smaller packets, you get 0.5 kg × 3 = 1.5 kg for $1.70 × 3 = $5.10. $4.99 is less than $5.10 so the larger packet is better value for money

Currency conversion

Currency exchange rates tell you what one of the units of one currency is equal to in the other currency.

Key points
- To compare which item or offer is better value, either:
  - find the price for each unit (such as price per kilogram), or
  - find the amount for each unit of money (such as grams per dollar).
- To convert between currencies, multiply or divide by the exchange rate, as appropriate (for example, if $1 = €0.88, $100 = 100 × 0.88 = €88.00 and €100 = 100 ÷ 0.88 = $113.64).

Example 16.3

Question
The exchange rate between dollars and euros is $1 = €0.88.
a   Sam changes $135 into euros.   b   Françoise changes €340 into dollars.
     How much will he receive in euros?   How much will she receive in dollars?

Solution
a   You know what each dollar is worth in euros, so you multiply.
     $135 \times 0.88 = €118.80$

Note
The answer on the calculator was 118.8. When you write answers to money questions, you use two decimal places as the two decimal places give the number of the smaller unit, in this case, cents.

b   You do not know how much in dollars each euro is worth.
     You need to know how many 0.88s there are in $340, so you divide.
     $€340 \div 0.88 = \$386.36$ correct to the nearest cent.

Note
When you are given an exchange rate, the only decision is whether to multiply or divide by that rate.
You can check you have chosen correctly.
If $1 = €0.88 then the number of dollars will be greater than the number of euros.

Revision questions

1. Aimee changes 250 euros into dollars. The exchange rate is 1 euro = $1.10.
Calculate the number of dollars Aimee receives.

2. A train journey takes 5 hours 54 minutes. The journey starts at 0915.
Find the time that the journey ends.

3. Carlos starts work at 21 20 and finishes at 06 15 the next day.
Calculate how long Carlos is at work.

4. Linda is going on holiday to the Czech Republic. She needs to change some money into koruna.
She can only change her money into 100-koruna notes.
Linda only wants to change up to £200 into koruna. She wants as many 100-koruna notes as possible.
The exchange rate is £1 = 25.82 koruna.
How many 100-koruna notes should she get?

5. One morning, Marcia works from 08 20 to 11 15.
Find how long she works for.
Give your answer in hours and minutes.

6. A train leaves Zurich at 22 40 and arrives in Vienna at 07 32 the next day.
Work out the time the train takes.

7. Jodi swims 22 lengths of a swimming pool to raise money for charity.
She receives $15 for each length she swims.
Calculate how much money Jodi raises for charity.

8. Two villages, Foxby and Glanton, are joined by a footpath and a road.
Abdul walks along the footpath from Foxby to Glanton.
He walks for 2 hours 14 minutes and arrives at Glanton at 1510.
Calculate the time Abdul left Foxby.
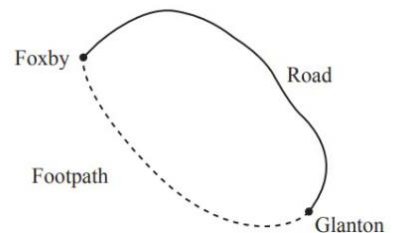
9. The sign shows the fees charged at a campsite. Today there are 54 tents and 18 caravans on the site.
Calculate the fees charged today.

10.

Convert 0.17m² into cm².

Campsite fees
(per day)

Tent $15.00
Caravan $25.00