Time Calculations

Measuring and Writing Time - Days / Hours / Minutes

Review of the Basics

1 day = 24 hours

1 hour = 60 minutes

So,

- 90 minutes would be 1 hour and 30 minutes; (90 ÷ 60 = 1 remainder 30)
- 154 minutes would be 2 hours and 34 minutes; (154 ÷ 60 = 2 remainder 34)
- 27 hours would be 1 day and 3 hours; (27 ÷ 24 = 1 remainder 3)
- 76 hours would be 3 days and 4 hours; (76 ÷ 24 = 3 remainder 4)

Writing the Time

We can write time in two ways:

- 12-hour time with “am” for the first 12 hours of the day and “pm” for the second 12 hours of the day. In this way of writing the time which follows the dial of a clock as above, the day starts at 12:00 am, goes to 12:59 am in the first hour, and then from 1.00 am through to 11:59 am in the morning for the next 11 hours. Then, in the afternoon / evening, it goes from 12:00 pm to 12:59 pm and then from 1:00 pm to 11:59 pm. Starting at 12:00 is a little strange really but it is just a convention – a rule which has developed over time. People could have made clocks with a “0” where the “12” is, but for some reason they didn’t and the rule has just “stuck” and it doesn’t look like changing.

- 24-hour time – which in many ways is much simpler, going from 0:00 through to 23:59.

Converting from 12-hour time to 24-hour time works like this:

From 12:00 am to 12:59 am – take away 12 from the hours and leave the minutes the same

From 1:00 am to 11:59 am – leave both hours and minutes the same

From 12:00 pm to 12:59 pm – leave both hours and minutes the same

From 1:00 pm to 11:59 pm – add 12 to the hours (and leave the minutes the same)

Examples:

1) 7:15 am in 24-hour time is 7:15
2) 1:40 pm in 24-hour time is 13:40
3) 11:30 am in 24-hour time is 11:30
4) 10:25 pm in 24-hour time is 22:25
5) 12:17 am in 24-hour time is 00:17
6) 12:52 pm in 24-hour time is 12:52

The following worksheets from the internet will give you good practice:

http://teachingimage.com/time-worksheets/time-24-hour-clock.pdf

http://mathworksheetwizard.com/grade5/grade5time.html (Draw the Times)

http://www.teachingideas.co.uk/maths/worksheets/convertingtimews.htm

Answers to the above worksheet:

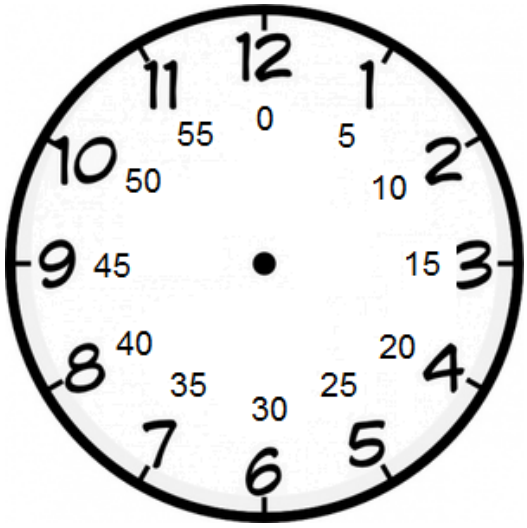
http://www.teachingideas.co.uk/maths/convertingtime.htm

Another Tip

Apart from starting at “12” instead of “0”, analogue (the old-fashioned ones as above) clocks are also a bit strange because there are really two things happening on the clock face.

The “little” hand is pointing at the hours (from 12 to 1 to 11 as above) but the “big hand” is pointing at the minutes which range from 0 to 59. Analogue clocks really should have another scale written near the hour numbers to help you read the minutes – the 12 should have a 0 underneath, the 1 should have a 5, the 2 a 10 and so on until you get to the 11 which should have 55 written underneath (see below).

However, by convention again, most clocks don’t have this added scale and you just have to work it out yourself, and over time you just remember that when you’re looking at the minute hand, you multiply the numbers on the clock face by 5 to work out how many minutes past the hour you are talking about.



Calculations – Adding hours and minutes to a time and finding a new time

There are many situations where you know the time that some event starts and how long it goes for and want to calculate the time that it will finish.

Example 1

Say someone starts school at 8:45 am, and the school day is 6 hours and 15 minutes long, we can work out that the school day will end at 3:00 pm.

Understanding how a clock works at the changes between 12:59 and 1:00 can really help with working out this kind of problem but perhaps the easiest method is to use 24-hour time. We could proceed as follows:

8:45 + 6:15 = (8+6) : (45+15) = 14:60 (adding the hours and minutes separately at first)

But since there 60 minute in an hour and by convention we never write the time with more than 60 minutes, we would say it is 15:00 in 24-hour time, which is 3:00 pm in 12-hour time by the rules above.

Example 2

If someone begins work at 8:30 am, and works for 8 hours and has a 40 minute lunch break, what time would they finish work?

Working as above:

8:30 + 8:00 + 0:40 = (8+8+0) : (30+0+40) = 16:70 = 17:10 = 5:10 pm

Example 3

The next “tricky” type of problem happens when the starting time and finishing time cross over a day.

Say a shift worker starts work at 11:00 pm and works an 8 hour shift.

Using the 24 hour time method as above, we have:

23:00 + 8:00 = 31:00

Since 31 is bigger than 24, what this means is that we are into the next day. If we "convert" 24 of the hours into 1 day, we will see that it is 7:00 (am) on the next day (since 31-24=7)

Practice Questions (give answers in 12-hour time)

Q1. If a woman goes to the dentist at 11:00 am and is there for 1 hour and 40 minutes, what time will it be when she leaves?

Q2. If she then goes into the department store next door to the dentist and is there for 2 hours and 25 minutes, what time will it be when she leaves?

Q3. She rushes to school to pick up her children and they all get home at 3:35 pm. The children have a break for 50 minutes and then spend another 55 minutes doing their homework. What time do they finish their homework?

Q4. The family has dinner and the children get to bed by 8:00 pm. If they sleep for 10 hours and 30 minutes, what time do they get up?

Q5. Challenge: If they have to be at school by 8:15 am, how much time do they have to have breakfast, get dressed and finally get to school?

Answers to Practice Questions: 1) 12:40 pm 2) 3:05 pm 3) 5:20 pm 4) 6:30 am (the next day)
5) 1 hour and 45 minutes