

## Goals



### Unit Goals for RATES

- identify common usage of rates; for example, km/h as a rate to describe speed, beats/minute as a rate to describe pulse (EMA14)
- convert units of rates occurring in practical situations to solve problems (EMA15)
- use rates to make comparisons; for example, using unit prices to compare best buys, comparing heart rates after exercise (EMA16)

## Theoretical Components

### Resources:

*PDF file:* Week 7/8 Notes and Exercises

### Knowledge Checklist

- The rate at which we use energy - kilojoules
- Converting km/h to mph and vice-versa
- Rates in use at an athletic carnival
- Heart rates ie beats per minute
- Blood pressure
- Order of operation

### Order

1. Work through the Week 7/8 notes
2. Complete all Exercises
3. Do the Portfolio Task
4. Come and see your teacher and make sure you are up to date.

## Practical Components

There are several exercises in the notes for you to complete. There are some revision questions at the end of the notes for you to complete as well.

## Portfolio Task

See the end of the notes

**QFO**

No quiz for this week.

	<b>Knowledge, Comprehension and Application</b>				
<b>CRITERIA</b>	<b>EXPECTATIONS</b>	<b>POSS</b>	<b>MULT</b>	<b>GIVEN</b>	<b>TOTAL</b>
<b>Practical</b>	Student completes practical work of the brief to an acceptable standard set by the teacher.	<b>2</b>	<b>3</b>		<b>/6</b>
<b>Portfolio Task</b>	Student completes the portfolio task of the brief to an acceptable standard set by the teacher.	<b>2</b>	<b>2</b>		<b>/4</b>
	<b>Analysis, Synthesis and Evaluation</b>	<b>SUB TOTAL</b>			<b>/10</b>
<b>Written Communication</b>	Student responses clearly demonstrate evidence of logical and comprehensive processes and thought.	<b>4</b>	<b>-</b>		<b>/4</b>
<b>Evidence of Working</b>	Student submitted task effectively uses the material learned in class to describe and complete the assigned task.	<b>4</b>	<b>-</b>		<b>/4</b>
	<b>Submission Guidelines</b>	<b>SUB TOTAL</b>			<b>/8</b>
<b>Timeliness</b>	Student submits the assignment by the set deadline. See scoring guidelines for specific details.	<b>2</b>	<b>-</b>		<b>/2</b>
		<b>SUB TOTAL</b>			<b>/2</b>
				<b>FINAL</b>	<b>/20</b>

### Using kilojoules

If you use more energy than you eat, then you will lose body weight. Similarly, if you eat more energy than your body uses, this energy will be stored as fat.

The number of kilojoules (a measurement of energy) your body requires each day depends on your age, gender and lifestyle.

Age (years)	Lifestyle	Men (kJ/day)	Women (kJ/day)
18–35	Inactive	10 500	8000
	Active	12 500	9000
	Very active	14 800	10 500
36–70	Inactive	10 000	8000
	Active	11 800	8800
	Very active	14 300	10 400
Pregnant women			10 100
Breast-feeding			11 800

#### Exercise 1

**Q1.** Estelle is 18 years old. During the week she works in an office and is inactive, but on the weekends, she is very active: jogging, swimming and cycling.

- How many kilojoules does Estelle use per day during the week?
- How many more kilojoules does Estelle use per day on the weekend than on weekdays (show working)?
- How many kilojoules does Estelle use per week (show working)?

**Q2.** How many kilojoules does a very active 40 year old male require per week (show working)?

**Q3.** According to the above table, how many more kilojoules per day does a Joanne need, now that she is pregnant, than her twin sister Assya, who is an active 20 year old woman (show working)?

**Q4.** This table shows the average length of time it takes a typical 18 year old to burn 1000 kj.

Activity	Time required to use 1000 kj
Sleeping	4 hours
Eating	3 hours
Working in class, studying, watching TV	$2\frac{1}{2}$ hours
Walking	1 hour
Bike riding	50 minutes
Swimming	30 minutes

a) How many kilojoules are used in swimming for 30 minutes (show working)?

b) How long does it take to burn 500 kj while sleeping (show working)?

c) Suzie, aged 18 years, leads a very active life. This is how she usually spends her day:

8 hours	sleeping
5 hours	working in class
3 hours	swimming training
$2\frac{1}{2}$ hours	studying
$2\frac{1}{2}$ hours	watching TV
$1\frac{1}{2}$ hours	walking
$1\frac{1}{2}$ hours	eating

(i) According to the table above, how many kilojoules does Suzie use each day(show working)?

(ii) If Suzie restricts her daily kilojoule intake to the amount shown in the table on page 3, would she have a sufficient amount of kilojoules to meet her energy requirements (explain)?

**Q5.** This table shows another way of calculating kilojoule requirements.

Activity	Energy used (kJ/min)
Sleeping	4
Cleaning	15
Ironing	17
Bricklaying	17
Playing tennis	31
Gardening	23
Circuit training	53
Walking	23

a) How many kilojoules would you use doing these activities?

(i) Cleaning for one hour

(ii) Bricklaying for 30 minutes

(iii) Circuit traing for 2 hours

b) How long would it take you to use 230 kj walking?

c) Jodie uses 1240 kj playing tennis. For how long does she play tennis?



**Q3.** Kangaroos can bound at a top speed of 48 km/h. Approximately how many metres can they bound in a second?

**Q4.** A Peregrine falcon's top flying speed is 200 miles per hour. Use the formula

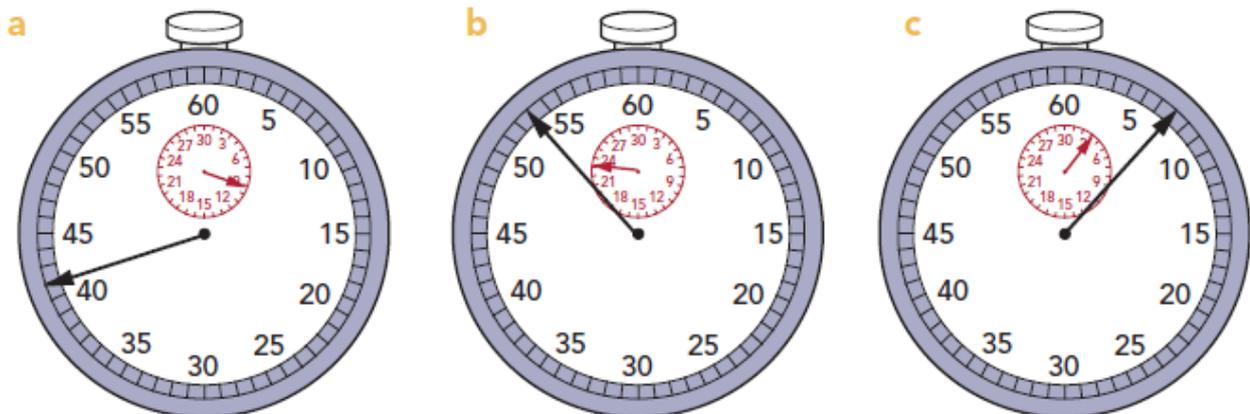
$$\text{m/s} = \text{miles/h} \times 1.609 \times 0.278$$

to convert this speed into m/s (show working).

## ■ The athletics carnival

### Exercise 3

**Q1.** Analogue stopwatches have two dials on their faces. The large dial measures seconds and the small dial measures minutes. What times are showing on these analogue stopwatches?



**Q2.** Brian takes 5 minutes and 48 seconds to complete a three lap event. What is the average time he takes to complete each lap? (answer in seconds)

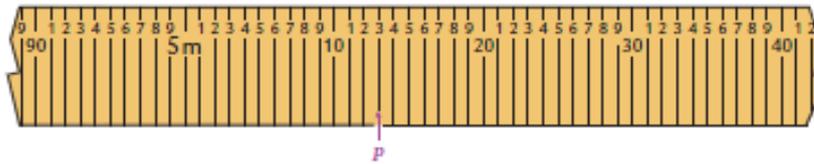
**Q3.** The track events at the carnival include 36 sprint races and 20 hurdle races. Brian's mother is a time-keeper for  $\frac{2}{3}$  of the sprint races and  $\frac{3}{5}$  of the hurdle races. For how many races is Brian's mother a time-keeper (show working)?

**Q4.** The athletics carnival recorder writes these times for the 200 metre sprint.

Lucia	25.03 s
Priya	27.45 s
Kerry	27.13 s
Helen	27.51 s
Rene	24.63 s

- What is the fastest time?
- How much faster is the winner than the person in second place?
- The race record is 22.78 seconds. How much slower than the record is the winning time?
- Write the names of the girls in the order in which they finish the race.

**Q5.** The diagram shows the measuring tape used in the long jump competition.



a) Rene jumps to point P. How long is her jump?

b) Mark these distances on the diagram above.

- (i) 5 m 23 cm      (ii) 5.17 m      (iii) 4.98 m      (iv) 5.04 m

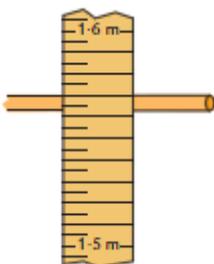
**Q6.** During the carnival, Rene and Brian keep a record of their individual championship points. First place is awarded 4 points, second place 3 points, third place 2 points and fourth place 1 point.

Rene scores 5 first places, 1 second place and 3 fourth places.

Brian has 2 firsts, 4 seconds, 4 third places and he finishes unplaced in 2 other events.

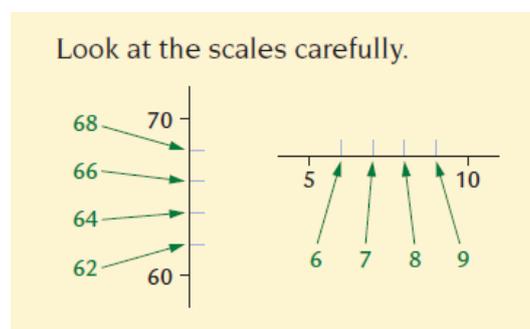
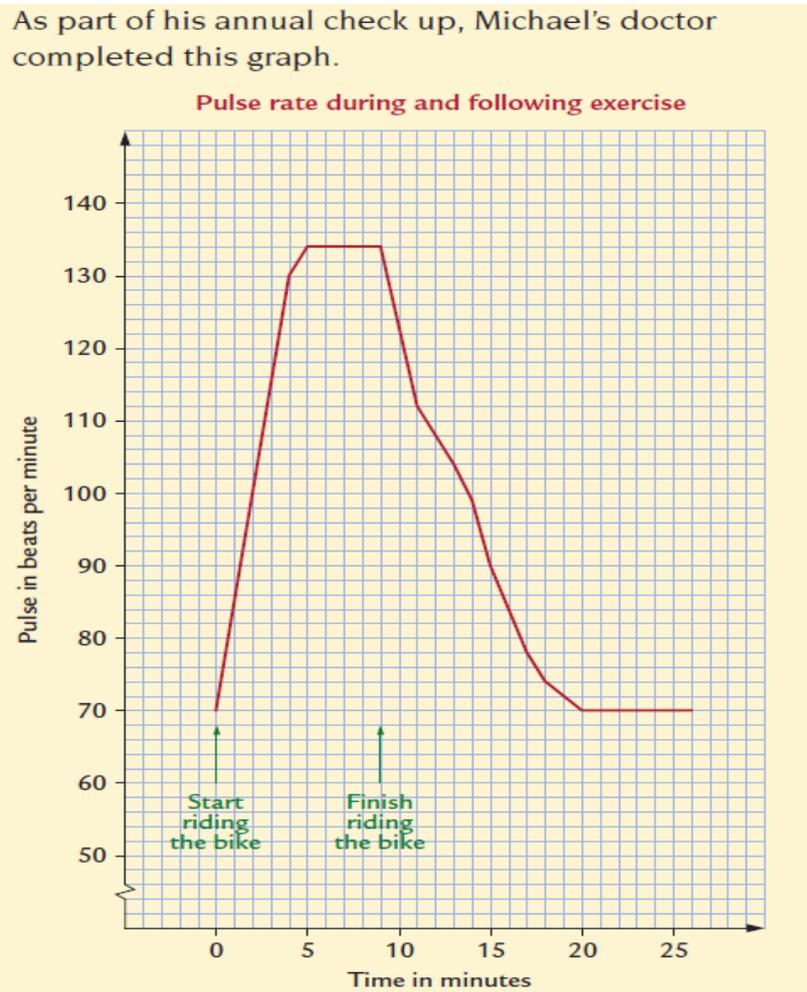
Does Rene or Brian have the larger number of championship points? How many more points does this person have (show all working?)

**Q7.** The qualifying jump height for the girls' high jump is shown. What is the qualifying jump height?



# Graphs

Doctors and nurses are very busy people. By glancing at a patient's graph, they can obtain a lot of information quickly. A graph is a visual summary of information.

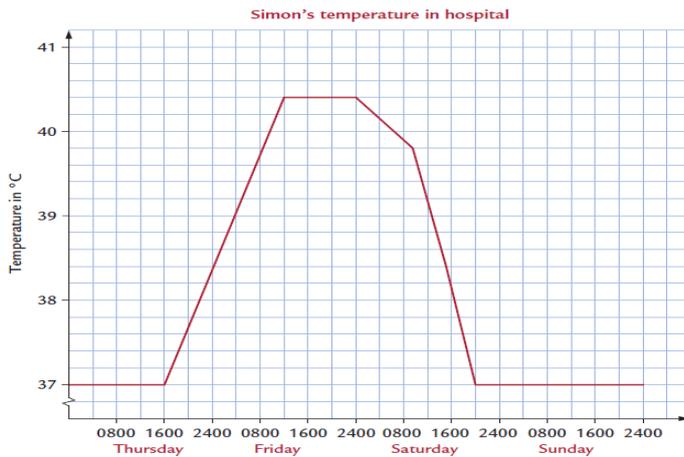


The title of the graph 'Pulse rate during and following exercise' tells us what the graph is about. The labels on the horizontal scale, 'Time in minutes', and the vertical scale, 'Pulse in beats per minute', tells us how the pulse rate was measured.

Check the scale carefully. On the horizontal scale each interval represents 1 minute. On the vertical scale each interval represents 2 beats.

## Exercise 4

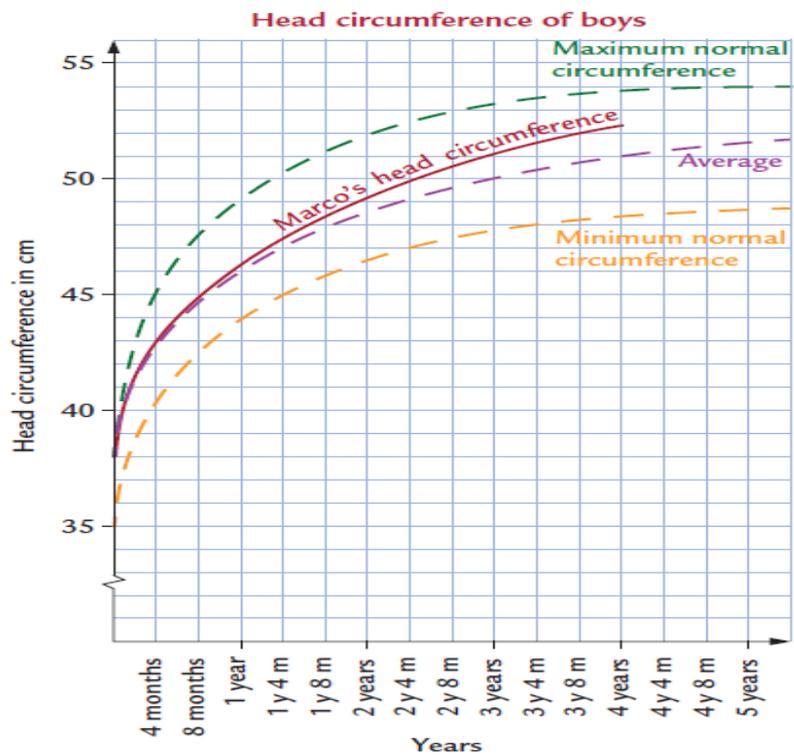
**Q1.** Simon was in hospital recovering from having his tonsils removed.



Use the graph to answer these questions.

- a) What does each unit represent on the
  - (i) horizontal axis?
  - (ii) vertical axis?
  
- b) What was Simon's temperature at 0800 hours Friday?
  
- c) When did Simon's temperature first reach 38.3°C?
  
- d) How many degrees did Simon's temperature go up between 1600 hours Thursday and 1200 hours Friday?
  
- e) What was Simon's maximum temperature?
  
- f) Increase in temperature can indicate an infection. Simon's doctor prescribed antibiotics.
  - (i) When do you think Simon started taking antibiotics? Give a reason for your answer.
  
  - (ii) When did his temperature return to normal?
  
  - (iii) When was Simon's temperature falling the fastest?

**Q2.** Marco is a 4-year-old boy in a Developing country. His mother regularly brings him to the local health centre to have his progress checked. The nurse always measures his circumference. Abnormal head circumferences are an early indication of health problems.



- What is the graph's title?
- What is measured on the horizontal axis?
- What does one unit represent on the horizontal and vertical axis of the graph?
- How old was Marco when his head circumference was 50 cm?
- How much did his head circumference increase between his second and fourth birthday?

f) During the following year the sister took these measurements.

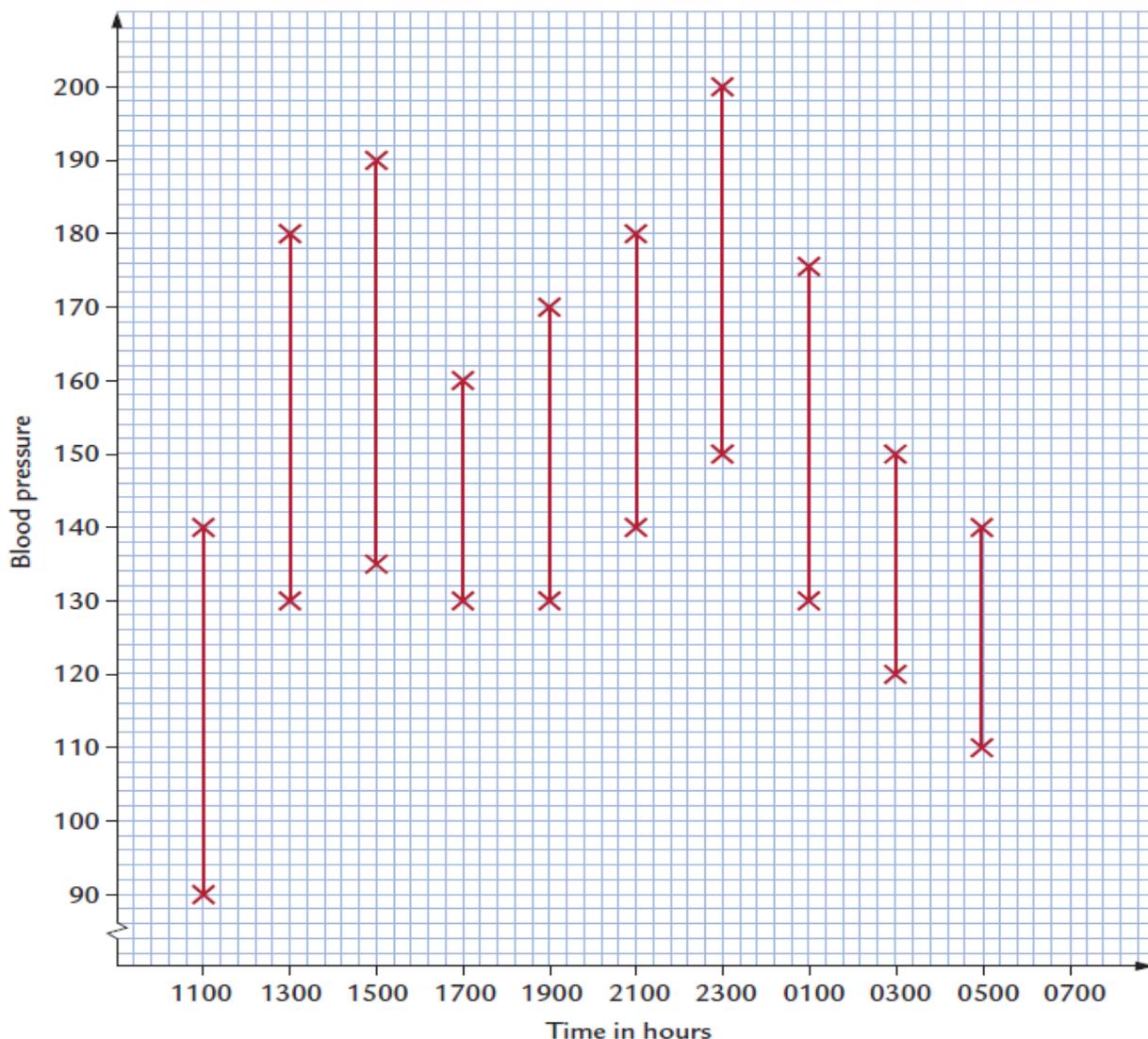
	4 years 4 months	4 years 8 months	5 years
Marco's head circumference	53 cm	54 cm	54.9 cm

What observations and recommendations do you think the sister will make about Marco's progress?

**Q3.** Ian's usual blood pressure is 140/90 (which reads 140 over 90). Two numbers are always used to record blood pressure. The first number which is known as systolic pressure and is always the bigger number measures the pressure when the heart is pumping. The diastolic pressure, the second number, is the pressure when the heart is relaxed.

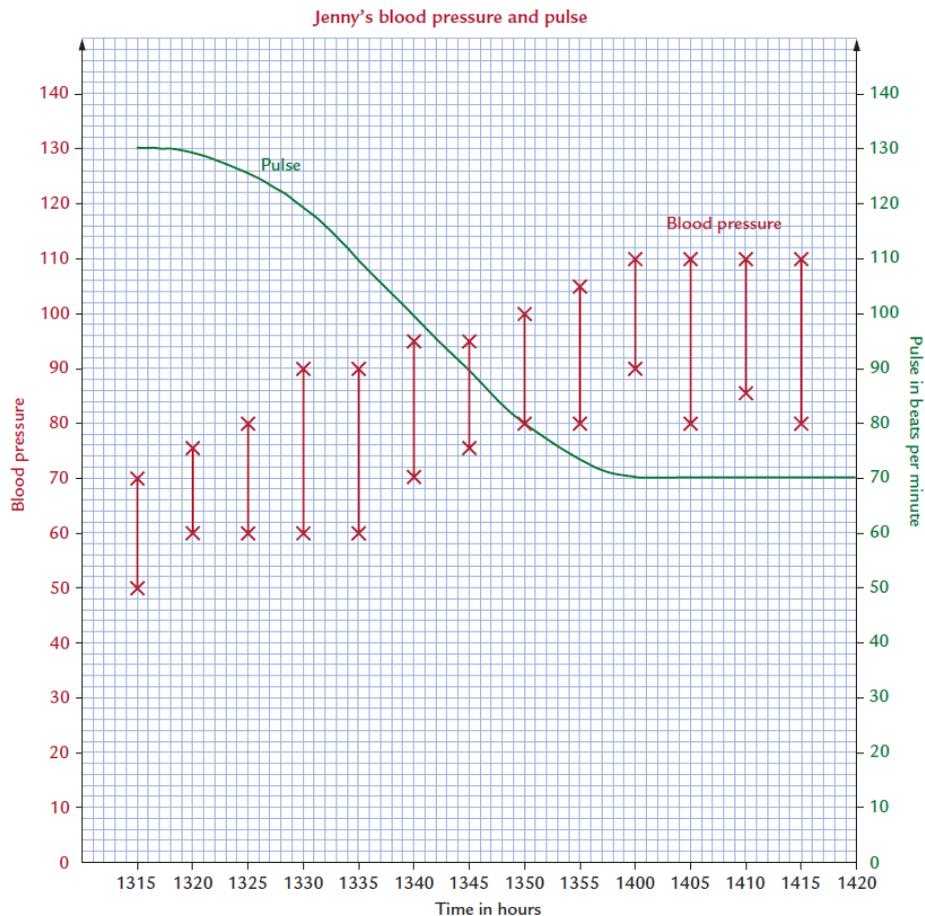
On a graph showing blood pressure, the systolic and diastolic pressures are both graphed with an X and joined together.

Ian's blood pressure





**Q4.** When Jane was 9 weeks pregnant, she had a miscarriage and lost a lot of blood. At 13:15 hours when she arrived at hospital by ambulance, the hospital staff began to treat her low blood volume. The nursing staff recorded her blood pressure and pulse on the same graph.



- How often was Jane's blood pressure recorded?
- What was Jane's blood pressure at 13:15 hours?
- How long did it take from the beginning of treatment at 13:15 hours for Jane's pulse to return to her normal 70 beats per minute?
- Jane's normal blood pressure is 110/80. When did her blood pressure first return to normal?
- What general observation can you make about the blood pressure and pulse of a person who has lost a lot of blood?

REMEMBER: ODER OF OPERATIONS

To avoid possible ambiguity or two different answers to the same calculation, mathematicians have a specific order in which calculations are completed. ie  $3+ 4 \times 5$  cannot be allowed to equal both 35 and 23 (23 is the correct answer).

This is the agreed way to complete a calculation.

- Do what is inside the brackets first.
- Then do any multiplication ( $\times$ ) or division ( $\div$ ). Always start at the left and work to the right.
- Then do any additions (+) and subtractions (-), again working from left to right.

Example: What is the value of  $12 \div 3 + 4 \times 5$  ? Do multiplication and division first from left to right, then addition.

$$12 \div 3 = 4 \text{ and } 4 \times 5 = 20 \text{ and } 4 + 20 = 24.$$

Example: Simplify  $6 \times (2 + 3) \div 10$  Do brackets first, then multiplication and division from left to right.

$$2 + 3 = 5 \text{ and } 6 \times 5 \div 10 \text{ is } 30 \div 10 = 3$$

**Revision Exercise 1**

**Q1.** Which of these statements are true and which are false?

a)  $8 + 2 \times 3 = 14$

d)  $(42 - 36) \times 2 = 12$

b)  $12 - 4 \times 3 = 16$

e)  $24 \div 6 \times 2 = 2$

c)  $5 \times 2^2 = 100$

f)  $\frac{10+8}{7-5} = 9$

**Q2.** What is the value of following expressions:

a)  $3 \times (5 + 4)$

d)  $(18 + 3) \div 2 \times 3$

b)  $8 \times 2 - 3 \times 5$

e)  $\frac{16+9}{5}$

c)  $(12 - 9) \times (7 - 2)$

f)  $\frac{5+3 \times 10}{5}$

## Revision Exercise 2

1. Express 43% as a fraction in simplest form.
2. Express 90% as a fraction in simplest form.
3. Write the fraction  $\frac{7}{10}$  as a percentage.
4. Express the fraction  $\frac{15}{71}$  as a percentage, correct to two decimal place.
5. Consider the fraction  $\frac{114}{400}$ .
  - a. first, convert to a fraction with a denominator of 100.
  - b. now, convert to a percentage.
6. Express 4.5% as a fraction in simplest form.
7. David is paying for a meal with lots of friends. They received great service, so he is giving a 20% tip. The meal cost \$182.30, how much will David leaves as a tip? Show working.
8. Tobias works at a restaurant that automatically charges 25% service to groups of 8 or more people. He has just served a group of 8 people. Before sales tax, their meal came to \$238.51. How much of a tip is Tobias going to get from this bill? Round your answer to the nearest cent.

## Question 1

At the 2012 Olympic games, the qualifying standards for the women's 100 metres race was 11.29s. How does this compare with the speed of a bus travelling at 40km/h through a school zone?

## Question 2

Imagine that you raced in the 200m with Usain Bolt. By what length would he beat you?  
(Note: In the 2009 IAAF World championship, Usain Bolt ran the 100m in 9.58s.)

