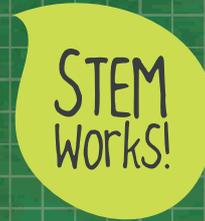


# STEM FUTURES

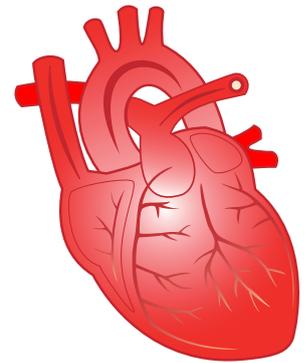
## Using Maths Tasks



Northern Ireland  
Curriculum

## Healthy Hearts

In this task, you are a **research scientist** in the health care industry. You will need to use your mathematical skills to help your team solve some problems.



### About Your Research Area

In many countries, including Northern Ireland, heart disease is a major cause of death. Heart disease occurs when coronary arteries become clogged. This can restrict blood flow around the body and lead to strokes, heart attacks and even death.

Cholesterol is a waxy substance that your body uses to protect nerves, make cell tissues and produce certain hormones. Scientists have found that too much of a particular type of cholesterol increases the risk of heart disease.

Molecules called lipoproteins carry cholesterol through the body in the blood. Two types of lipoproteins are:

- **Low Density Lipoproteins (LDL)** – the main transporter of cholesterol in the body. Too much LDL cholesterol can lead to a build-up of cholesterol in the inner artery walls, causing the arteries to narrow. LDL cholesterol is sometimes called 'bad' cholesterol.
- **High Density Lipoproteins (HDL)** – these remove excess cholesterol from the bloodstream, carrying it away from the cells. HDL is often called 'good' cholesterol.

To reduce the risk of heart disease, it's very important to get the balance between 'good' and 'bad' cholesterol.

Drugs, called statins, can reduce cholesterol, but people can sometimes prevent the need for using statins by making healthy lifestyle choices.

A healthy diet is important for reducing 'bad' cholesterol. People should avoid eating too many foods that are high in **saturated fats**, such as red meats, butter, cheese, cream and pastries. These tend to increase levels of LDL cholesterol in the bloodstream. On the other hand, eating foods with **unsaturated fats**, such as oily fish, nuts, seeds and olive oil, can help to lower cholesterol. Unsaturated fats help to break down the build-up of cholesterol.

### About Your Task

Your team is investigating possible connections between cholesterol and fats, as well as body mass index (BMI). BMI takes into account a person's weight and height. If a person's BMI is 25 kg/m<sup>2</sup> or over, they are considered overweight.

The team has asked you to investigate, analyse and interpret some data that a local doctor has collected. You will need to look at the evidence she has recorded for some of her patients, make judgements and draw conclusions about it.

The following table gives general information about cholesterol levels that you will need to refer to.

**Table 1: Cholesterol Limits within the Bloodstream**

<b>LDL Cholesterol</b>	$LDL < 2.5 \text{ mmol/l}^*$	Optimal
	$2.5 \leq LDL < 3.3 \text{ mmol/l}$	Near optimal
	$3.3 \leq LDL < 4.0 \text{ mmol/l}$	Borderline
	$4.0 \leq LDL < 4.85 \text{ mmol/l}$	High
	$LDL \geq 4.85 \text{ mmol/l}$	Very high
<b>HDL Cholesterol</b>	$HDL < 1.01 \text{ mmol/l}$	Low
	$1.01 \leq HDL < 1.54 \text{ mmol/l}$	Borderline
	$HDL \geq 1.54 \text{ mmol/l}$	Desirable
<b>Total Cholesterol</b>	$T < 5.1 \text{ mmol/l}$	Desirable
	$5.1 \leq T < 6.1 \text{ mmol/l}$	Borderline
	$T \geq 6.1 \text{ mmol/l}$	High

\* Cholesterol is measured in millimoles per litre of blood, a unit written as mmol/l.

# ACTIVITY

The doctor recorded the levels of LDL and HDL cholesterol of 20 of her patients.

The same 20 patients noted how many grams of saturated and unsaturated fats they ate each day for one month.

From these values, one of your colleagues has calculated the mean average for each patient. This gives you an estimate of the amount of fat each patient eats every day.

Finally, the doctor measured and recorded the patients' BMI. Table 2 shows the results.

Table 2: Patients' Results

Patient	LDL Cholesterol (mmol/l)	HDL Cholesterol (mmol/l)	Saturated Fats (g)	Unsaturated Fats (g)	BMI (kg/m <sup>2</sup> )
1	7.1	0.6	52	18	29.4
2	3.7	1.5	34	26	24.2
3	4.9	2.2	47	23	25.7
4	2.6	1.6	31	53	32.5
5	5.1	0.9	15	20	17.9
6	2.4	1.8	22	42	22.8
7	3.9	1.4	29	29	21
8	2.3	2.2	54	54	24.6
9	2.8	1.5	33	34	23
10	4.4	1.1	29	33	23.1
11	1.8	2.6	28	60	24.9
12	4.8	0.8	37	12	19.2
13	2.6	0.6	21	23	20.5
14	6.3	0.4	58	10	26.9
15	2	2.2	19	47	22.4
16	3.4	1.9	25	51	23
17	3.8	1.3	23	33	18.7
18	4.2	1	34	58	28.3
19	4.5	1.4	51	42	27.5
20	3.1	1.3	36	27	24.2

Now, you need to investigate whether there appear to be connections between cholesterol levels, fats and BMI for these patients. You will need to refer to Tables 1 and 2.

For questions 1 to 4, consider the following:

- What connection do you think there will be?
- If you find a connection, how strong is it?
- Are there any unexpected results? If so, what would that suggest?
- What conclusions can you gather from your test?

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1. Do you think there is a connection between LDL (bad) cholesterol and HDL (good) cholesterol?
  2. Do you think there is a connection between LDL cholesterol and saturated fats?
  3. Do you think there is a connection between HDL cholesterol and unsaturated fats?
  4. Do you think there is a connection between cholesterol and BMI?
  5. You have been told that another patient had their cholesterol measured and recorded, but they didn't have time to record how much fat they had consumed. What could you do with this information? Show examples. How confident would you be with your results?
  6. Take all your findings into account, as well as the background information about your research area. Do you think any of the 20 patients might have or might end up with heart disease? Explain your answer.

## Evaluating Your Learning and Success Criteria

At the end of the task, you could work in pairs or as part of a group to review and evaluate your own and each other's work. You can gauge how successful you were in this task by considering how well you were able to demonstrate that you can:

- plan an activity, explaining your reasons for your chosen structure and approach;
- consider and identify, with some justification, the materials/equipment, mathematical techniques and problem-solving strategies involved;
- make and test predictions and justify your generalisations;
- consider, identify, obtain and analyse data/information from more than one source;
- select and use the most appropriate methods to present findings, following accepted conventions; and
- use appropriate mathematical language/notation to justify your findings or solutions.

You could also consider the following:

- how your approach to the task compared with others;
- your strengths and weaknesses;
- what you might do differently if you were to repeat the task;
- what aspects of your work you can improve upon; and
- setting targets and focus for development.