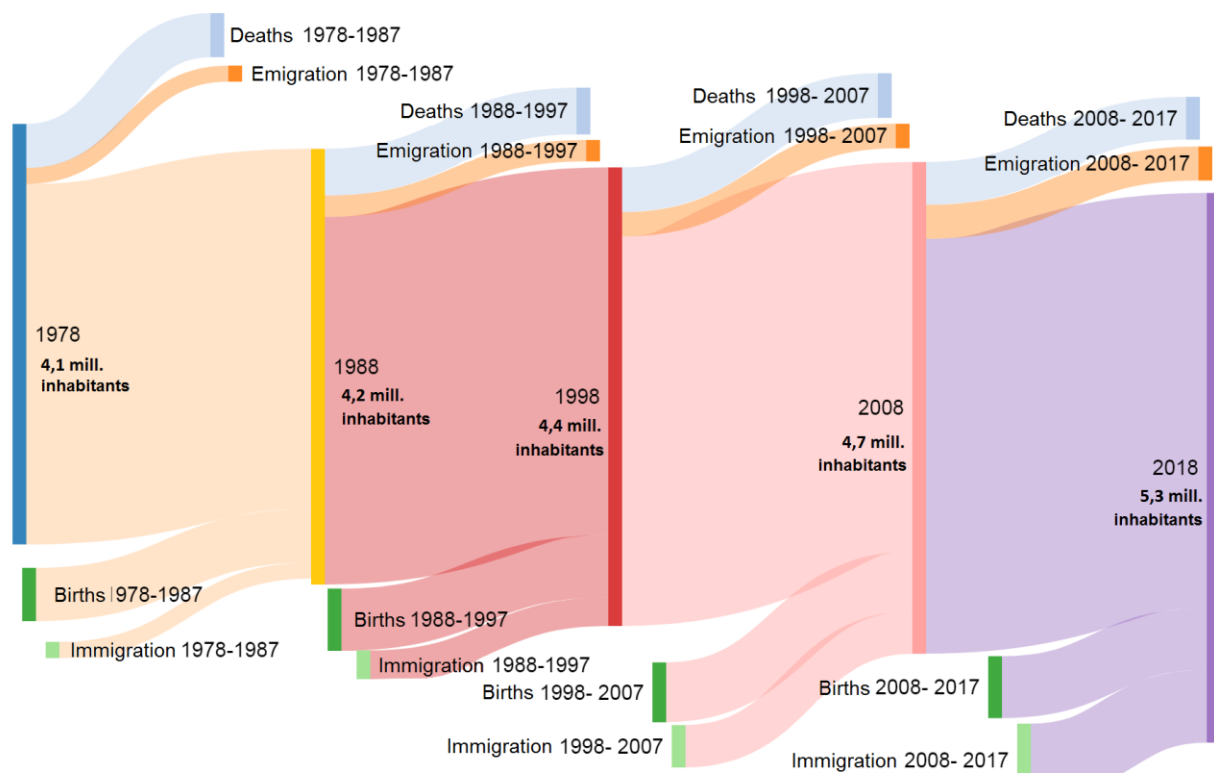


Sankey diagrams



author: Pauline Vos

Pilot-project ***Data visualization with Sankey Diagrams***

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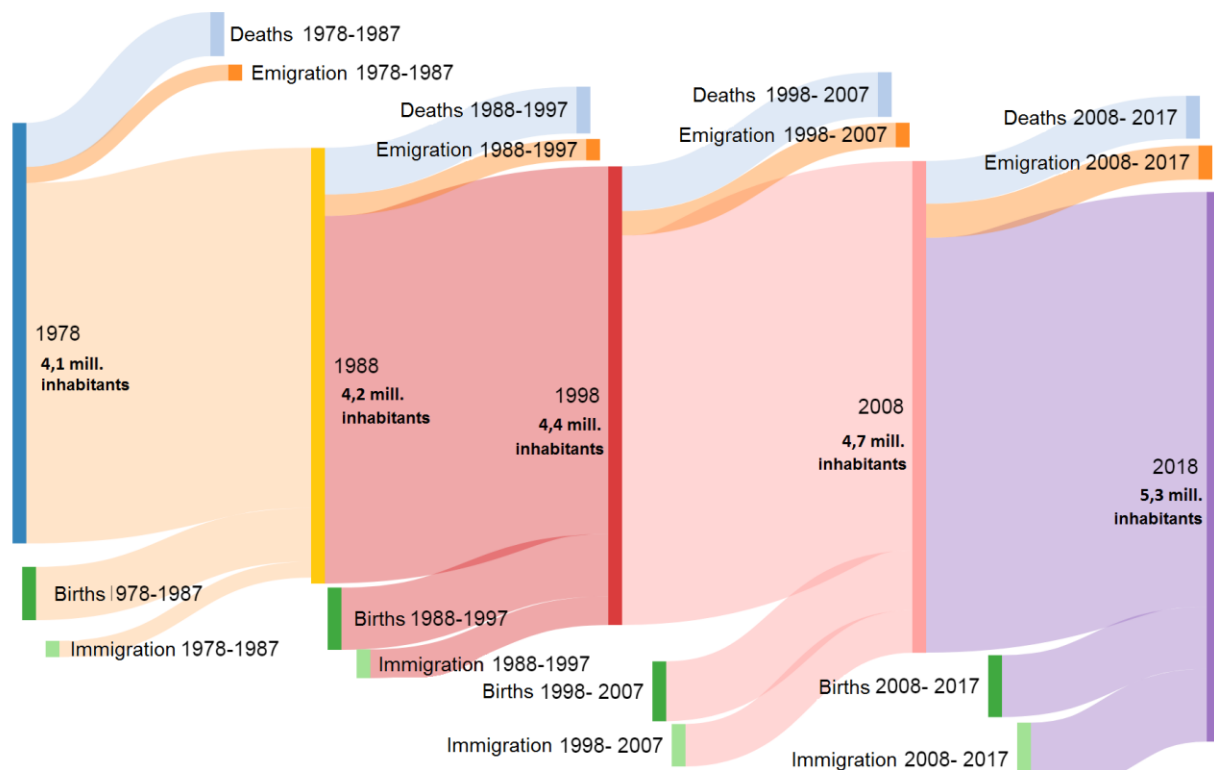
The worksheet has been designed for classroom use at grade level 7-8 (pupils aged 12-14).

Teachers can print pages 3-10 as a worksheet for an introductory lesson. More mature students can be given pages 11-12



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Sankey diagrams



Name of the students in your group:

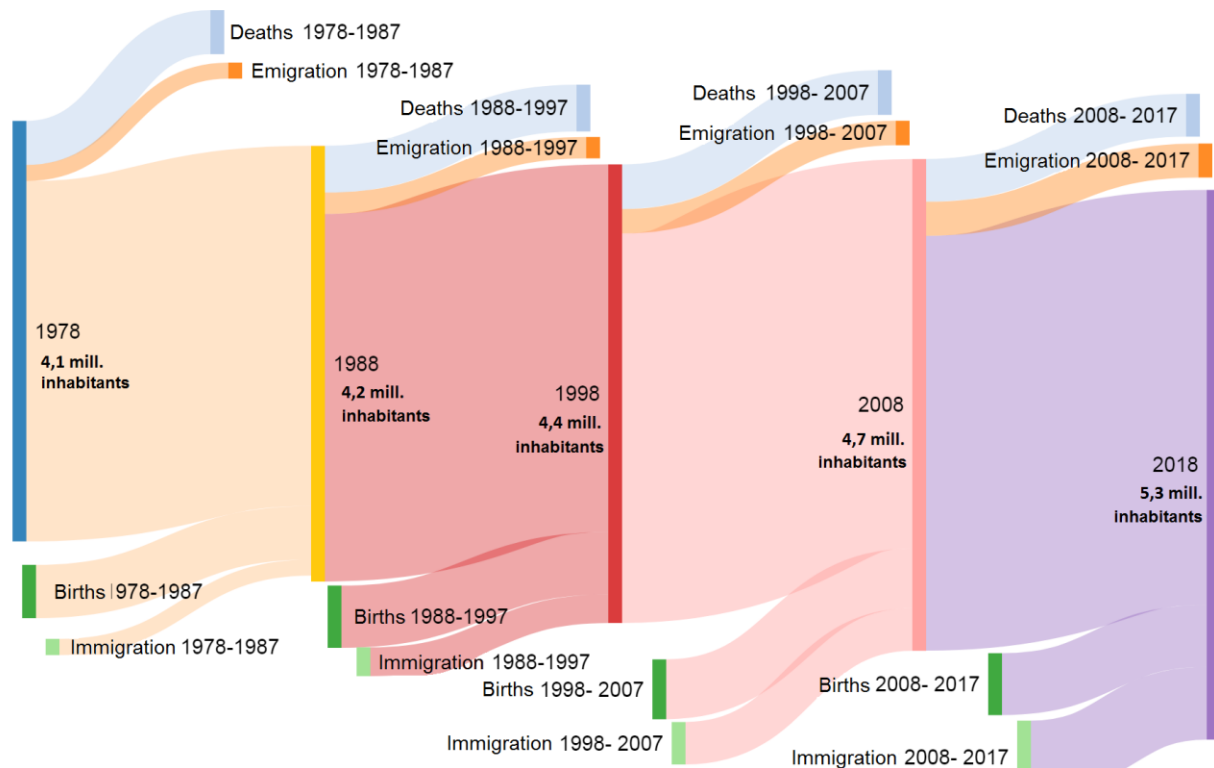
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Norway's population growth 1978 - 2018

Look at the diagram below.

- How many inhabitants lived i Norway in 1978 ?
- How many inhabitants lived i Norway in 1988 ?
- What was the population growth between 1978 and 1988 ?
- Between 1978 and 1988 there were 0.2 million immigrants,
0.2 million emigrants and
0.4 million deaths.

How many newborns were there between 1978 and 1988 ?



- How many inhabitants lived i Norway in 2008 ?
- How many inhabitants lived i Norway in 2018 ?
- What was the population growth between 2008 and 2018 ?
- Between 2008 and 2018 there were 0.7 million immigrants,
0.3 million emigrants and
0.4 million deaths.

How many newborns were there between 2008 and 2018 ?

The diagram is about people.

- i) Thea Steen was a Norwegian journalist. She was elected as Example of the Year by the journal Se og Hør and she received the Honorary Award of the Cancer Association. She was born in 1989 and died of cancer in 2016.

Put a **T** into the diagram where she was born, where she was an inhabitant and where she died.



- j) Yama Wolasmal is a program presenter of the NRK Daily News. He was born in Afganistan in 1982. He and his family were among the first Afganian refugees who got political asylum in Norway in 1987.

Put a **Y** into the diagram where he moved into Norway and where he was an inhabitant.



- k) You can also put signs where you yourself fit into the diagram, or your parents, or others that you know.

- l) In the past 40 years, there was nearly no change in the birth and the death rates. How can you see that in the diagram?

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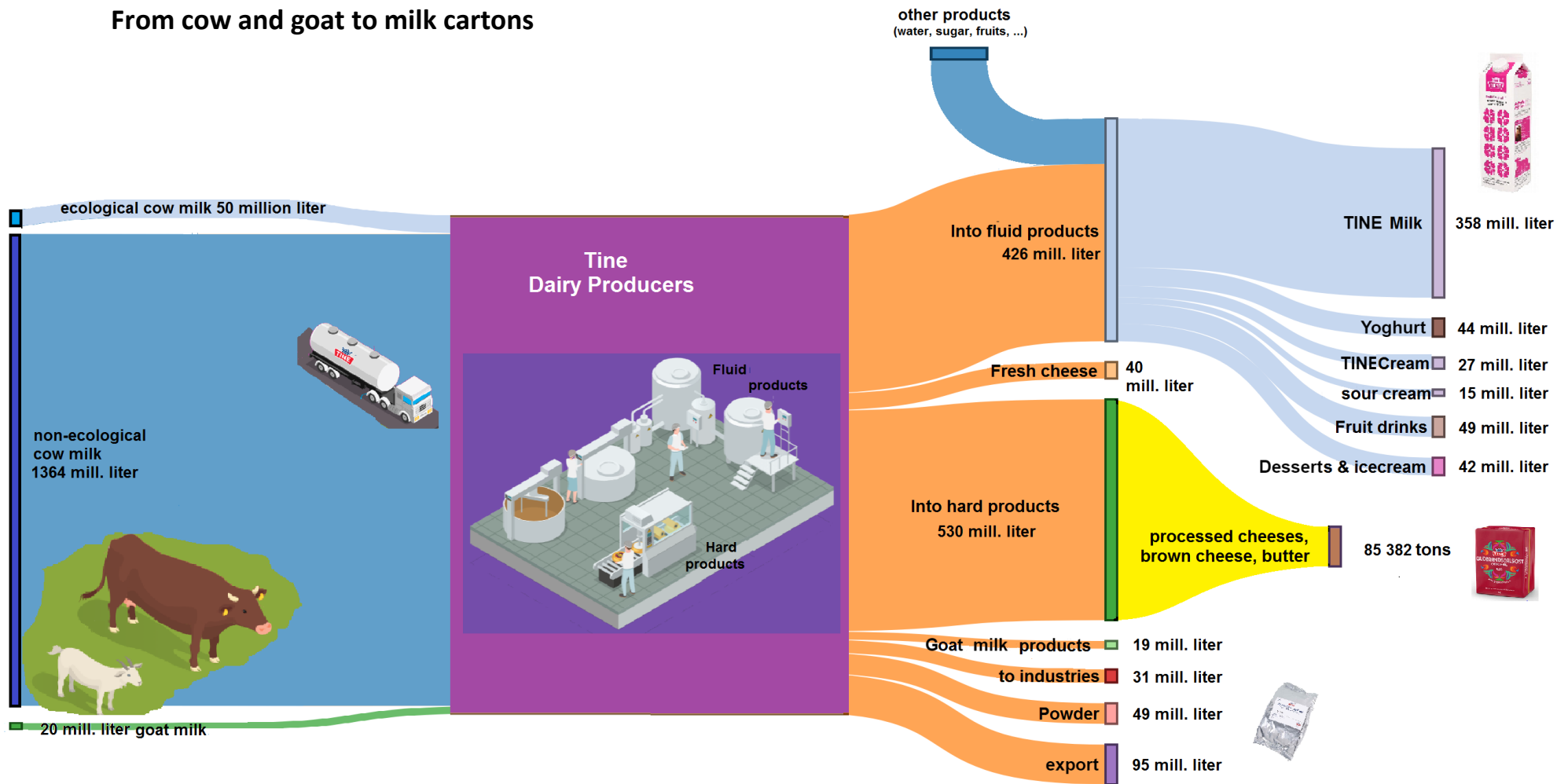
- m) In the past 40 years, there were people who moved out of Norway, for example to work or study in America. How can you see that the emigration numbers increased?

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- n) Give a reason why Norway's population has grown from 4.1 million inhabitants to 5.3 million inhabitants in 2018.

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.....
.....

From cow and goat to milk cartons



Tine milk

TINE SA is a Norwegian enterprise that produces and sells milk, cheese and other dairy products. Each year, they write an annual report about their production. The Sankey diagram on the other page is based on the annual report of 2017.

- a) Check with a ✖ the parts that come into the Tine factories.
Check with a ✓ the parts that come out of the Tine factories.

<input checked="" type="checkbox"/> cow milk	<input type="checkbox"/> yoghurt	<input type="checkbox"/> goat milk	<input type="checkbox"/> cream
<input checked="" type="checkbox"/> brown cheese	<input type="checkbox"/> sour cream	<input type="checkbox"/> ice cream	<input type="checkbox"/> sugar
<input type="checkbox"/> processed cheese	<input type="checkbox"/> powder	<input type="checkbox"/> ecological cow milk	<input type="checkbox"/> fruit drinks

- b) Tine bought cow and goat milk from farmers. All together, it was 1434 million milk in 2017. That is 1 434 000 000 liter milk.

The farmers delivered three types of milk: 1) ecological cow milk, 2) non-ecological cow milk, 3) goat milk.

Non-ecological cow milk was 95 % of all the milk. The other two types of milk were 1½ % and 3½ %.

Without calculating, what percentage was the goat milk ?

Goat milk %

Ecological cow milk %

How can you see in the Sankey diagram that the goat milk is nearly half of the ecological cow milk?

.....

- c) Tine used much more milk to produce hard products than to produce fluid products. How can you see that in the Sankey diagram?

.....

.....

- d) Tine sold 358 mill. liter milk in cartons. In the diagram this is drawn with a blue strip that is 2.5 cm high. How many liters of milk is a strip that is 1 cm high?

.....

- e) Calculate the height of the strip that says that Tine used 530 million milk to produce hard products.

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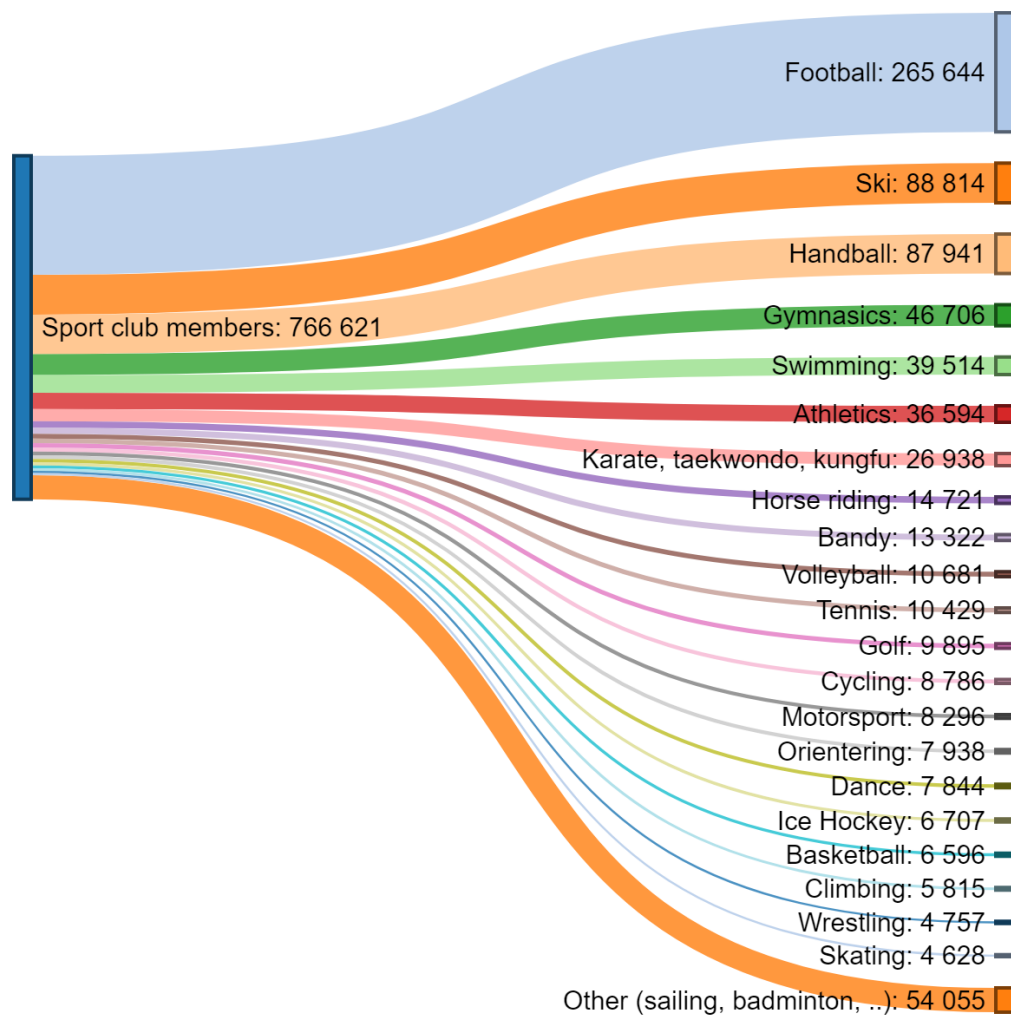
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Young people in Norway and their membership in sports clubs

In 2012, in total 766 621 members of official sports clubs in Norway were 6-19 years of age. In the Sankey diagram below you see the different sports and their number of club members.



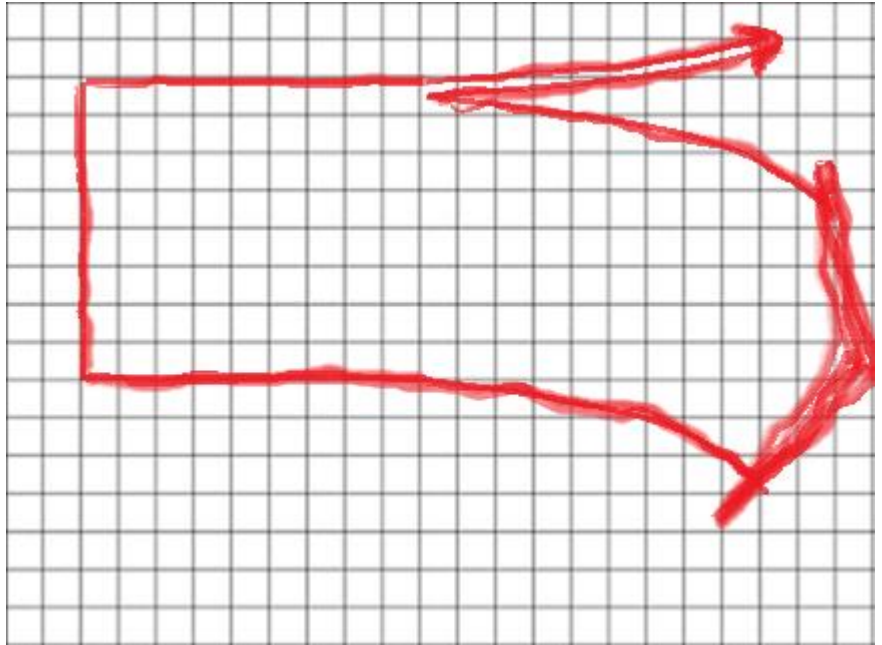
- What sports are you interested in ?
.....
- What sports in the list above are you unfamiliar with ?
.....
- Which sport in Norway has most club members?
- Which sport in Norway has more than 5 000 but fewer than 6 000 club members?
.....
- In Football, 32% of the members are girls. Draw this into the Sankey diagram above.
- In Handball, 30% of the members are boys. Draw this into the Sankey diagram.

Light bulbs

The light bulb below is a classical light bulb, which uses 40 Joule electrical energy . It gives 2 Joule light energy and the remainder is heat energy.



Here you see the Sankey diagram that shows the energy conversion in this light bulb.
Here, 1 Joule = 1 mm

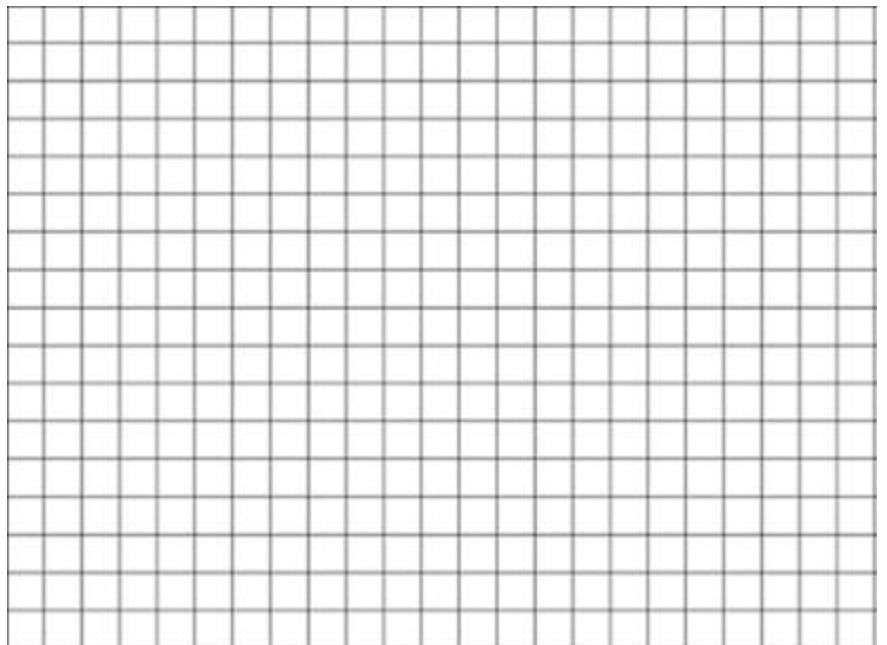


- a) Draw into the diagram where the electrical energy goes in, and where the heat energy and the light energy come out of the light bulb.

The light bulb below is a energy saving light bulb. It uses 20 Joule electrical energy . It gives 2 Joule light energy and the remainder is heat energy.

- b) Draw a Sankey diagram that shows the energy conversion in this light bulb.

Take 1 J = 1 mm



- c) What can you say about the energy usage of the two light bulbs? (the *classical light bulb* and the *energy saving light bulb*)?

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.....

Sankey diagrams

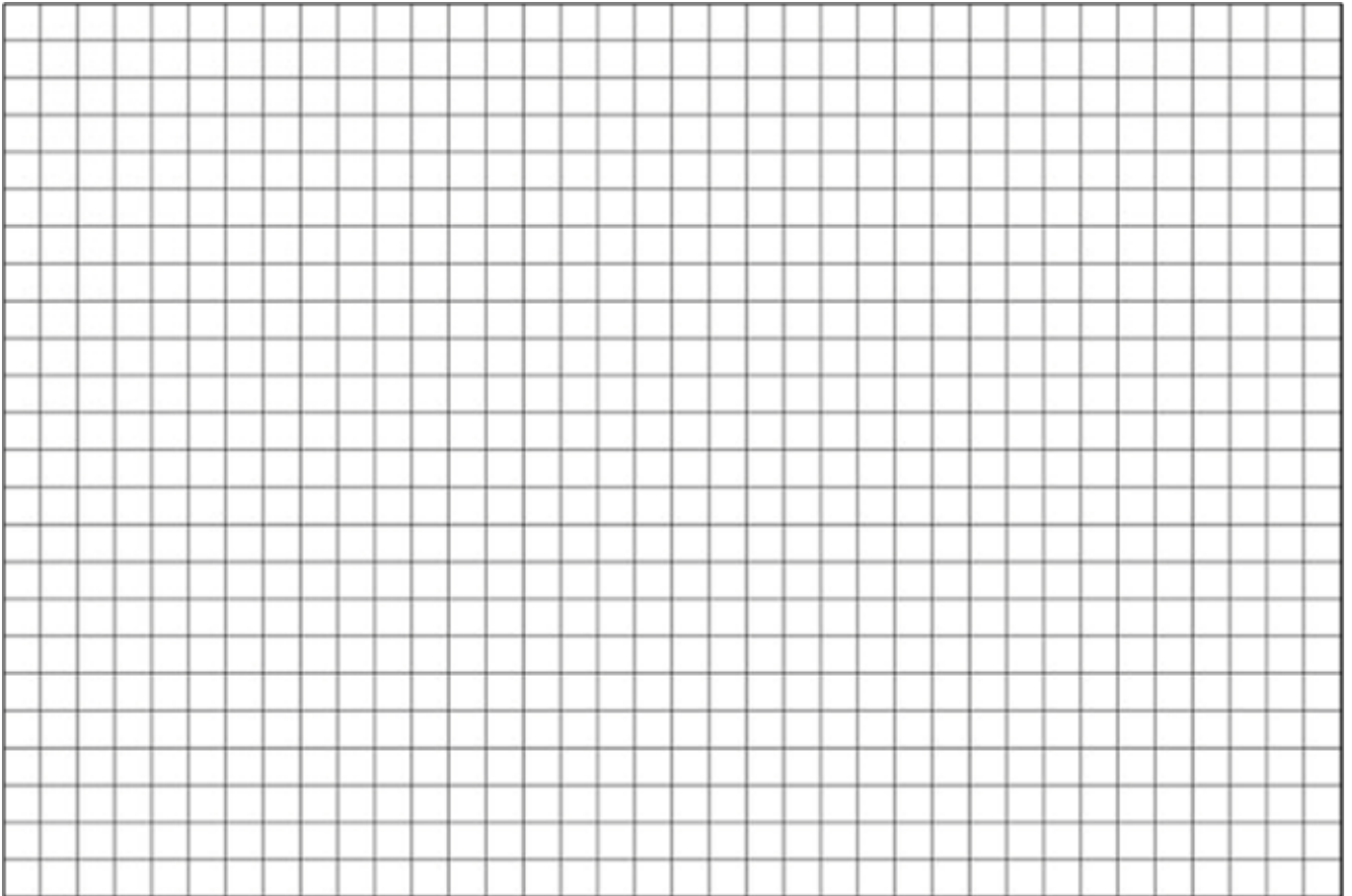
a) Describe what a Sankey diagram is and for what you can use it.

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b) Draw a Sankey diagram about something you choose.



Extra task - Infected or not?

After a holiday overseas, you are being informed that on average **10%** of the travelers are infected by a new kind of disease. The disease starts off without any clear symptoms, so you will not notice whether you are infected or not.

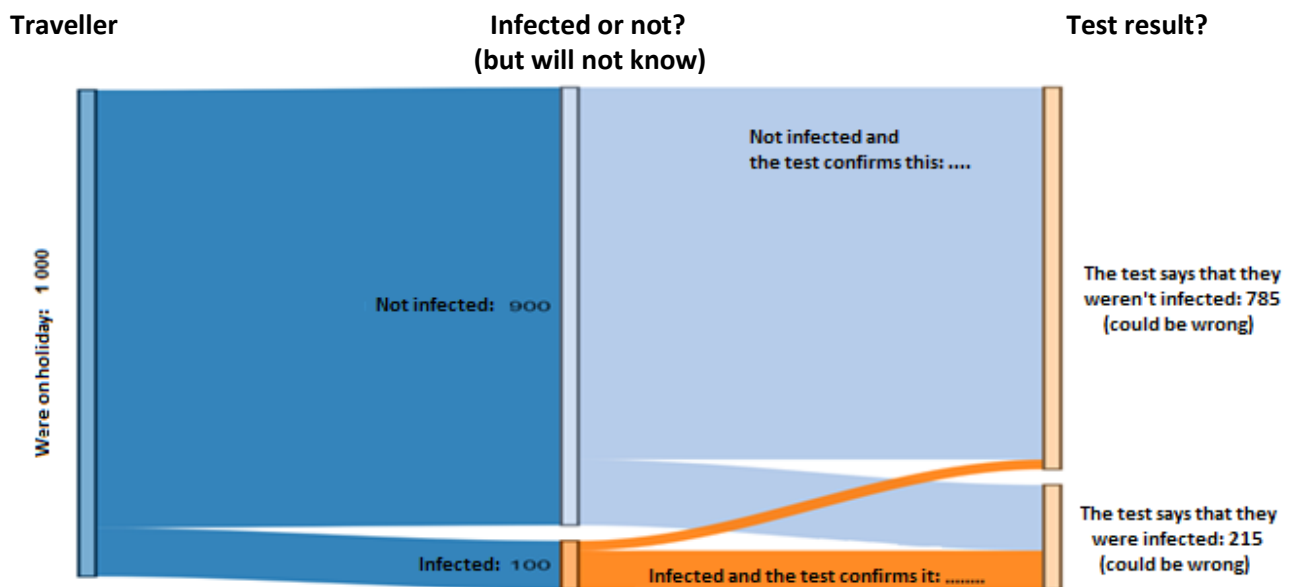


A medical test has been developed, which has the following properties:

80% of the infected get a positive result.

85% of the non-infected people get a negative result.

1000 travelers take the test. Thereafter, the doctors draw the following diagram.



a) Explain to each other what this diagram is about and write down your explanation.

.....

.....

b) Fill the numbers on the empty spots in the diagram.

c) How many of the infected people will get a negative test result ?

d) How many of the not-infected people will get a positive test result ?

e) If you did the test and got a positive test result. Would you believe you were infected? (explain)

Resources

- . https://en.wikipedia.org/wiki/Sankey_diagram
- . To create the Sankey diagrams <http://sankeymatic.com/>
- Tine AS Annual Report 2017 (in Norwegian)
- Statistics Norway
- https://no.wikipedia.org/wiki/Thea_Steen and https://no.wikipedia.org/wiki/Yama_Wolasmal
- The energy calculation for the light bulbs has been adapted to simplify the task. The autential product details were:

classical light bulb	40 Watt	420 lumen
energy saving bulb	18 Watt	420 lumen
Conversion:	1 Watt = 1 Joule per sekund = 683 Lumen	