

Høsten 2015

# FYS100 Fysikk

## Problems week 34

Have a go at these. Don't use a calculator except perhaps for the last problem.

**Problem 1:** Compute the sums:

a)  $\frac{1}{2} + \frac{1}{3}$ .       $\frac{1}{2} + \frac{1}{4}$ .       $\frac{1}{2} + \frac{1}{5}$ .       $\frac{1}{2} + \frac{1}{6}$ .

b)  $\frac{1}{3} + \frac{1}{4}$ .       $\frac{1}{3} + \frac{1}{5}$ .       $\frac{1}{3} + \frac{1}{6}$ .

c)  $\frac{1}{4} + \frac{1}{5}$ .       $\frac{1}{4} + \frac{1}{6}$ .

d)  $\frac{1}{5} + \frac{1}{6}$ .

e)  $\frac{1}{m} + \frac{1}{n}$ , for  $n, m$  integer.

f)  $\frac{r}{m} + \frac{s}{n}$ , for  $n, m, r, s$  integer.

g) Do the numbers have to be integer?

**Problem 2:** Solve the following quadratic equations:

a)  $x^2 - 3x + 4 = 0$ .

b)  $-6y^2 + 8y = 0$ .

c)  $2v^2 + 4v - 5 = 0$ .

**Problem 3:** Find all the solutions for  $\theta$  to the following equations, expressed in both radians and degrees. Draw the solutions on a unit circle:

a)  $\cos \theta = 1$ .

b)  $\sin \theta = 0.4$ .

c)  $\tan \theta = -2$ .

d)  $\cos \theta + \sin \theta = 0$ .

e)  $\cos \theta + 3 \sin \theta = 0$ .

**Problem 4:** Consider a right triangle with sides  $a$  and  $b$ , and hypotenuse  $c$ . Expressed in  $a, b, c$ , what is:

- a) The sine, cosine and tangent of the angle opposite  $a$ ?
- b) The sine, cosine and tangent of the angle opposite  $b$ ?
- c) The sine, cosine and tangent of the angle opposite  $c$ ?

**Problem 5:** You have two glasses of wine: One is red wine, the other is white wine. There is exactly the same amount of red and white wine. Now you take a spoonful of wine from the red wine glass and transfer to the white wine glass. You mix. Then you take an equal spoonful of the mixture and put it back into the red wine glass.

Is the red wine now more diluted by white wine? Or the white wine more diluted by red wine? Why?

**Problem 6:** There are 8 people at a party. As they get up to leave, everybody shakes the hand of everybody else.

How many handshakes are exchanged, all in all?

What if there would have been  $n$  persons there ( $n$  integer)?

**Problem 7:** Consider a perfectly spherical planet of radius  $R = 6378$  km, and density  $\rho = 7800$  kg/m<sup>3</sup>.

- a) How big is its diameter?
- b) How big is its surface?
- c) How big is its volume?
- d) What is its mass?
- e) Which way is "up"?
- f) What colour is the planet?