

## MATHEMATICS

The main ideas of the calculations must be shown.

### SOME EXAMPLES of PROBLEMS:

1. Simplify the expressions.

a)  $\frac{3^3}{\sqrt{3^5}}$

b)  $4\ln(\sqrt{x}) + 6\ln(x^{1/3})$

c)  $\frac{3x+6}{x^2+3x+2} \times \frac{x+1}{2x+8}$ .

2. Solve the equations.

a)  $\frac{1}{2-t} + \frac{1}{2+t} = 2$

b)  $|x-1| + |x+1| - 1 = |x|$

c)  $\cos(3x) + \frac{1}{2} = 0$ .

3. Solve the following inequalities.

a)  $\frac{3|x|}{x-1} < 2$

b)  $|3x-2| < 1$

c)  $2^{2x-1} < 3^{3x-2}$

4. The product of two numbers is 30 and the average 6. What are these numbers?

5. Consider two straight lines L1 ( $y = 2x + 1$ ) and L2 ( $y=x$ ).

a) What is the slope of line L1 in respect to line L2?

b) What is the equation of line L1 in respect to line L2?

NOTE. Think that the original xy co-ordinate system has been rotated in respect to the origin so that line L2 defines the new x-axis  $x'$  and  $y'$  is the new y-axis!

6. Two cyclists drive a distance of 15 kilometres. One of the cyclists drives  $10\text{ km/h}$  faster than the other one and arrives at their destination 20 minutes earlier. What are the speeds of the cyclists?

7. What is the (closest) distance from the curve  $y = x^2$  to the point  $(x, y) = (16, 1/2)$  ?

8. Find out the angle ABD when the angle BCD is  $60^\circ$  and the length of side BC is 1.0 m and the length of side AC is 6.6 m.

