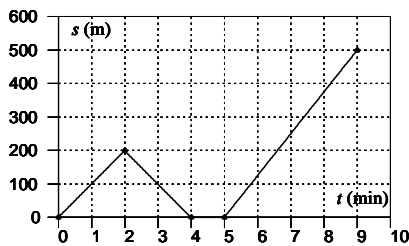


At most ten problems may be answered. There are several items [marked **a**), **b**), etc.] in some of the problems; all of them are to be considered for a complete answer.

1. A house-owning company increased the rent by 8.5%. How much was the new rent for a 64.5 square meter flat per month when the earlier rent had been 12.00 mk for a square meter per month?
2. Solve the equation $\frac{2x}{2x+3} = \frac{2x+1}{8}$.
3. The height, the length and the width of a rectangular gravestone is 80 cm, 2.10 m and 32 cm, respectively. Is it possible to move the gravestone by means of a crane which is able to lift 2 tons? The density of the gravestone is $2.7 \cdot 10^3 \text{ kg/m}^3$.
4. The following graph represents William's trip from his home to school. Time (in minutes) is on the horizontal axis and distance (in meters) from home on the vertical axis. William starts walking on a Monday morning at 8.00 from home to school. After a while he notices that he has left his schoolbag at home and he returns to pick it up. Then he starts walking again from his home and walks briskly in order to get to school in time.



a) Find the distance from William's home to the school. Find the time when William arrived at school. Find the speed (km/h) William walked after fetching his schoolbag.

- b)** Draw a corresponding graph representing the situation where a cyclist starts to ride a bicycle to a camping place at a distance of 6 000 meters. The cyclist travels 2 500 meters in ten minutes, stops at a kiosk for 6 minutes and then rides the rest of the trip in 20 minutes.
5. The length and the width of a ridge-roofed house are 12.0 m and 8.0 m, respectively. The gable of the house consists of a $3.0 \text{ m} \times 8.0 \text{ m}$ rectangle and an isosceles triangle whose base is 8.0 m. The roof continues 0.5 m outside the walls on each side of the house forming the eaves. The height of the gable triangle was planned to be 2.0 m. However, the constructor extended the height to 2.5 m. How much per cent did the area of the roof increase because of this change?
 6. Peter knows by experience that he will hit the ten with a probability of 8% in a Finnish game of darts. Peter throws five darts. Find the probability that he will hit the ten **a)** with the first dart only, **b)** with at least one dart, **c)** with exactly one dart.
 7. According to the statistical bureau of Finland mobile phones became more common than ordinary phones in July 1999. At the time, 78.5% of households had a mobile phone and 75.8% an ordinary phone; 22.9% of households had a mobile phone only. Find the number of households, expressed as a percentage, which had only an ordinary phone. How many, expressed as a percentage, of those households which had an ordinary phone, also had a mobile phone?

8. The centres of Helsinki and Moisio lie on the same longitude of $24^{\circ}56'$ E. The center of Helsinki has the latitude of $60^{\circ}9'$ N and the center of Moisio has $62^{\circ}26'$ N. **a)** How far are the centres from each other? **b)** Find the altitude of an airplane above Moisio so that one can in principle see Helsinki from it when the weather is clear. The circumference of the globe is 40 000 km.

9. The table gives some figures describing the world population during the last 50 years.

year	world population (billions)
1950	2.5
1970	3.7
2000	6.0

a) Find the average annual growth of the population, expressed as a percentage, in 1950–1970. Find the same figure for 1970–2000.

b) Find the year when the world population will reach 9.0 billions provided that the annual growth is 1.0% from the year 2000.

10. The binary number system has the addition rules

$$0+0=0, \quad 0+1=1+0=1, \quad 1+1=10.$$

Give the corresponding multiplication rules. **a)** Compute, using the aforementioned rules, $110+1011$ and $11 \cdot 101$ in the binary system. **b)** Write the binary representation for the number 33 of the decimal system.

11. Conclude that the polynomial $f(x) = x^3 - 4x - 2$ has a zero in the interval $]2, 3[$. Find this zero by the bisection method with two correct decimals.
12. The base of an acute triangle is a and the altitude perpendicular to the base is h . Derive the formula for the area of the triangle using the formula for the area of a rectangle and the fact that a diagonal of a rectangle divides the rectangle into two equal parts.
13. A golf player gets a hole in one and the ball falls into the hole 50.0 meters away. Find the angle at which the ball hits the hole. It is assumed that the trajectory of the ball is a parabola with a top altitude of 20.0 meters.
14. A person is planning to set up a fish pond as a business enterprise. According to the plan 5 000 rainbow trout are put into the pond at the beginning of May. Each week 20% of the rainbow trout will be fished out and at the beginning of the next week 100 new rainbow trout will be put into the pond. The gross market price for a rainbow trout is 10 mk. How many fishes are there in the pond after 20 weeks when the summer season is over? Find the price for a rainbow trout such that the enterprise would have 50 000 mk after 20 weeks when the price of the fishes has been taken into account and the remaining fishes have been sold at 13 mk each to a smoked fish factory.
15. On a summer day an automatic traffic control system in Laukaa provided information on 9 235 cars. It was found that 89.25% of the drivers travelled at a speed of 80 km/h or more and 12.29% at a speed of 100 km/h or more. Assume that the speeds are normally distributed. Find the mean and the standard deviation of the speeds and the 95% confidence interval for the mean value.