

Concerning test material in general, the Swedish Board of Education refers to the Official Secrets Act, the regulation about secrecy, 4th chapter 3rd paragraph. For this material, the secrecy is valid until the expiration of June 2010.

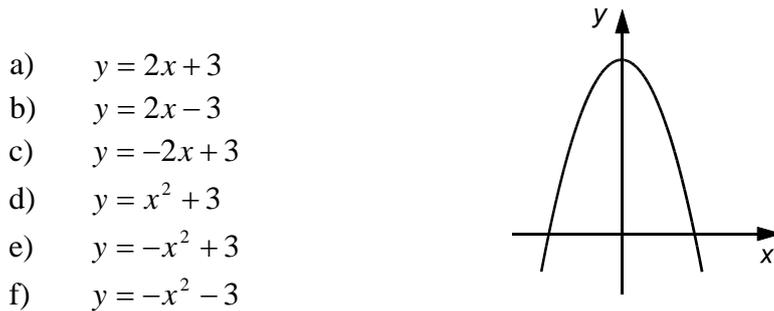
Directions

Test time	180 minutes without a break.
Resources	Calculator and collection of formulae. A formula sheet is attached to the test.
Test material	<p>The test material should be handed in together with your solutions.</p> <p>Write your name, the name of your education programme / adult education and your date of birth on all the sheets of paper you hand in.</p>
The test	<p>The test consists of 15 problems.</p> <p>In most of the problems, it is not enough to give short answers, they require</p> <ul style="list-style-type: none">• that you write down what you do• that you explain your train of thought• that you, where necessary, draw figures• that you show how you have used your resources when you have solved problems numerically / graphically. <p>For some problems (where it says <i>Only an answer is required</i>) you only need to give the answer.</p> <p>Try all of the problems. It can be relatively easy, even towards the end of the test, to receive some point for a partial solution or presentation.</p>
Score levels	The maximum score is 38 points.

1. Solve the equation $x^2 - 6x + 8 = 0$ (2p)

2. Draw a straight line in a system of co-ordinates.
Find the gradient of the line. (2p)

3. Which of the following functions can give rise to the graph you see in the figure?
Only an answer is required (1p)



4. Solve the simultaneous equations $\begin{cases} 2x + y = 11 \\ 3x - 2y = 34 \end{cases}$ (2p)

5. In some role plays, a regular four-sided dice is used (a tetrahedron). The sides are numbered 1, 2, 3 and 4.

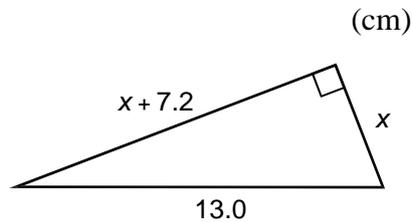
a) What is the probability to get a one when this dice is thrown?
Only an answer is required (1p)

b) What is the probability of getting an eye sum of 5 if the dice is thrown twice? (2p)

6. Find a number x such that $3x + 5 < x - 1$ *Only an answer is required* (1p)

7. The points $(3, 2)$ and $(-1, 4)$ are on the line $y = kx + m$.
Find the values of the constants k and m . (2p)

8. Calculate the length of the shortest side of the triangle. (3p)



9. Ulf and Lina are going to fish crayfish. According to the rules, you can use four cages when you fish, and only keep crayfish that has a length of at least 11 cm. Smaller crayfish has to be put back into the river.

You can assume that the length of the crayfish is normal distributed with mean value 12.2 cm and standard deviation 1.2 cm. When they have finished fishing, Ulf and Lina have 60 crayfish to take home.

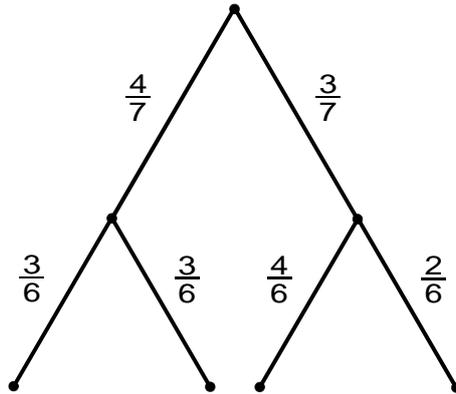
Totally, how many crayfish did they catch? (2p)

10. The giant Ferris wheel Riesenrad in Vienna has 15 gondolas, all placed on an equal distance from each other (see figure). Imagine that you ride in gondola A. You have brought a camera and want to take pictures of three other gondolas where your friends ride.

How large must the angle ν be if you want to have a picture according to the figure? (2p)



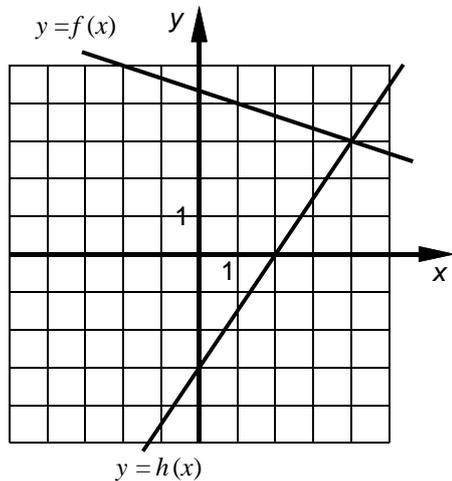
11.



- a) Above you can see a tree diagram. Give a suggestion of an event that can be described by the diagram. (2p)
- b) Formulate a question that can be answered by the calculated probability: (1p)

$$P = \frac{3}{7} \cdot \frac{2}{6} = \frac{1}{7}$$

12.

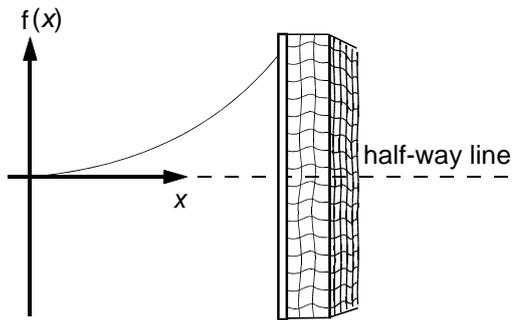


In the figure to the left, the graphs to the two equations $y = f(x)$, $y = h(x)$ can be seen.

- a) Find $h(0)$
Only an answer is required (1p)
- b) Find the x -value for which $h(x) = 0$
Only an answer is required (1p)
- c) Use the figure to find the solution of the simultaneous equations

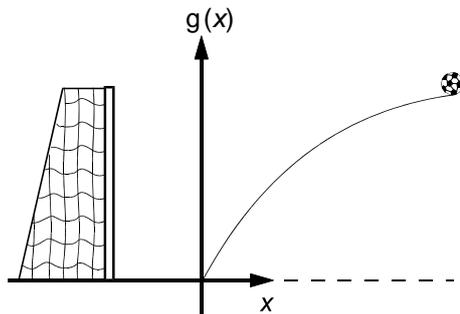
$$\begin{cases} y = f(x) \\ y = h(x) \end{cases}$$
Only an answer is required (1p)

13. Calle works as a computer game producer and produces a football game.



To describe the trajectory as seen from above for balls with a spin shot on goal, Calle chooses a function $f(x) = 0.005x^2 + 0.15x$ where x metres is the distance from the origin to the goal and $f(x)$ metres is how much the ball deviates from the “half-way line” (see figure).

- a) How many metres from the “half-way line” is the ball after 10 metres in the x -direction? (1p)
- b) How far from the goal is the goal-scorer if the ball hits the goal at the goal-keeper’s right goal-post? The goal is 7.32 metres wide. (2p)

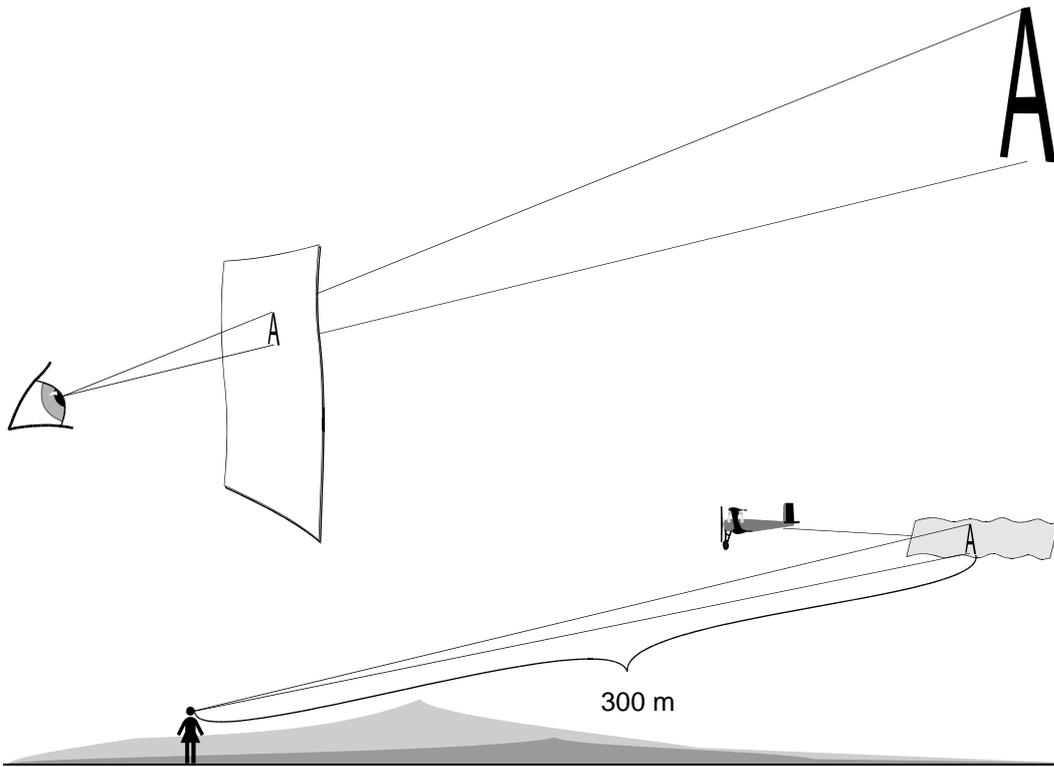


Calle is going to use another function that describes the trajectory of the ball as seen from the side for e.g. goal kicks. He chooses the function $g(x) = ax^2 + bx$, where x is the distance from the origin measured along the ground, and $g(x)$ is the height of the ball above the ground.

- c) Calculate a and b , if the ball after 10 metres in the x -direction is 4 metres above the ground and after 20 metres in the x -direction hits the ground again. (3p)

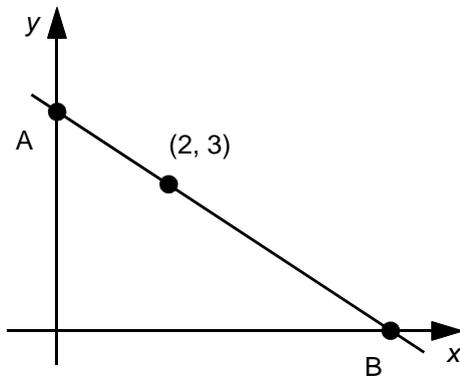
14. When Karin is on Gran Canaria she sees a small aeroplane with a commercial banner behind. She starts thinking of how tall the letters must be if the message is to be readable from the ground. Karin estimates that the plane flies on a distance of 300 metres.

Do your own estimations of the measures you need and help Karin calculate an approximate value of the height of the letters. (3p)



The figures are not drawn to scale

- 15.



A straight line through the point $(2, 3)$ passes through the positive y -axis at A and the positive x -axis at B , see figure. The x -coordinate of point B is three times as large as the y -coordinate of point A . Calculate an exact value of the y -coordinate of point A . (3p)

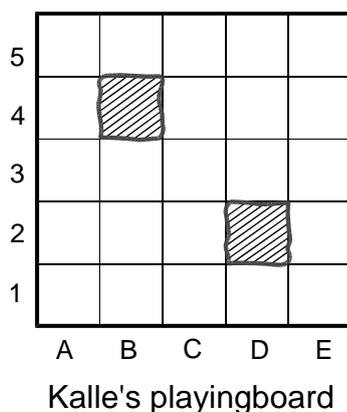
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Instructions

Test period	Weeks 4 – 22 2000.
Test time	According to local decision at the school.
Resources	Calculator and table of formulae.
Test material	<p>The test material should be handed in together with your solutions.</p> <p>Write your name, the name of your education programme / adult education, and your date of birth on all the sheets you hand in.</p>
The test	<p>The Open-Solutions part consists of two alternative exercises of which you should choose one.</p> <p>The questions in the exercise may be of such kind that you have to decide on the possible interpretations. You should give an account for the bases on which your calculations and conclusions are based.</p> <p>Even a partial solution may be a basis for the teacher's evaluation of your work.</p> <p>A description of what the teacher may consider when evaluating your work is attached to each exercise.</p> <p>If anything is unclear, ask your teacher.</p>
Working methods	The responsible teacher will inform you about the working methods concerning the Open-Solutions part of the test.

1. Sink the Ship

Sink the Ship is a game between two persons where you place your ships in a grid on your playing board. The players are not allowed to see each other's playing boards. You can place your ships anywhere on your own playing board, but the ships cannot touch each other, not even corner to corner. The players are then trying to hit each other's ships by guessing where the ships are. The opponent answers *hit* or *miss*. The winner is the first one to have hit all the opponent's ships.



Lisa and Kalle play Sink the Ship. Kalle has placed two ships on his playing board (see figure).

Lisa then guesses randomly where he has placed his ships.

If Lisa guesses B4 Kalle answers *hit*.

If Lisa guesses A1 Kalle answers *miss*.

- What is the probability that Lisa's first guess is a hit?
- Lisa's first guess is a hit (B4). What is then the probability that her second guess is a hit? (Lisa is clever, she does not guess on impossible positions.)
- What is the probability that Lisa hits both of Kalle's ships in two guesses? The ships are placed according to the figure above.
- Kalle wants to place his two ships so that it is as hard as possible for Lisa to hit them. Investigate and describe the strategies that Kalle can use to place his two ships. For each strategy, calculate the probability that Lisa hits Kalle's ships with her first two guesses.

When evaluating your work, the teacher will take into consideration:

- What mathematical knowledge you present
- How well you carry out your calculations
- How well you investigate and describe the strategies
- How well you present and comment on your work

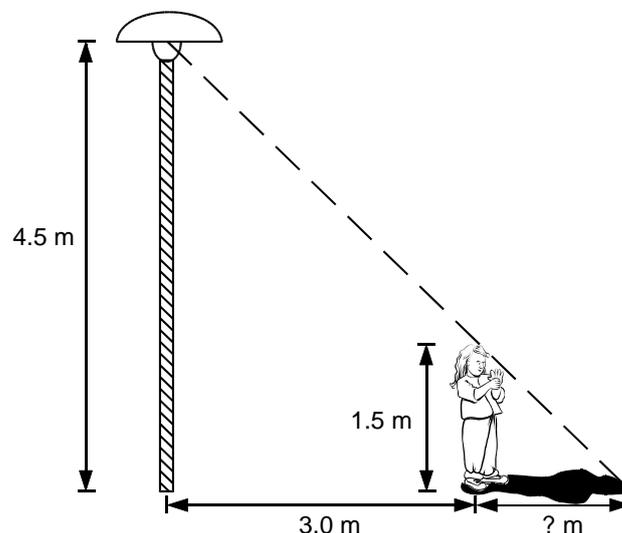
2. The Shadow

Anna is 150 centimetres tall. She stands 3.0 metres from the foot of a lamppost (see figure).

The lamp is placed 4.5 metres above the ground.

- a) How tall is Anna's shadow?

Solve the problem with an equation or by measuring in a figure drawn to scale.

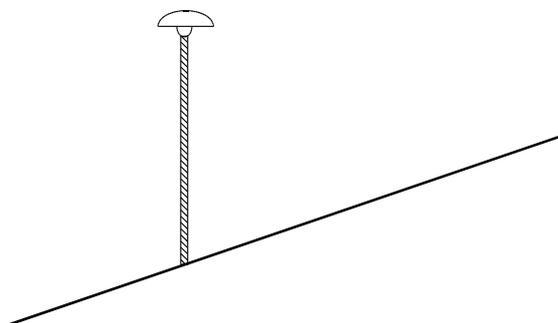


If Anna's distance to the lamppost changes, the length of the shadow will also change.

- b) Describe the relationship between the length of the shadow and Anna's distance to the lamppost in words, with a graph and with a formula.

Another person places himself next to the lamppost.

- c) Investigate how the relationship between the length of the shadow and the distance to the lamppost depends on the length of the person.
- d) Investigate how the relationship between the length of the shadow and the distance to the lamppost depends on the length of the person if the lamppost is placed in a slope.



When evaluating your work, the teacher will take into consideration:

- What mathematical knowledge you present
- The plainness of the figures you have drawn
- How well you carry out your calculations
- How well you present and comment on your work