

# Mathematics

Part D  
Student Booklet

1C

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Elevens namn och klass/grupp



## Instructions – Part D

**Time for the test** 120 minutes for Part D.

**Aids** Digital devices, formula sheet and ruler.

**Part D** For most of the tasks in this part it is not enough to only give an answer, you also have to

- show your solutions
- explain/motivate your thinking
- draw figures when required.

For some tasks only the answer needs to be given. They are marked with “*Only answer required*”.

**Grading limits** The test (Part A–D) gives a total maximum of 91 points.

*Lower limit for test grade*

E: At least 18 points.

D: At least 30 points of which at least 11 points at level C or higher.

C: At least 40 points of which at least 20 points at level C or higher.

B: At least 54 points of which at least 8 points at level A.

A: At least 64 points of which at least 15 points at level A.

**Write your name, date of birth and secondary program on the papers you hand in.**

Illustration: Jens Ahlbom

## Del D

15. For a car with good tyres and brakes the approximate braking distance on dry asphalt is calculated using the formula:

$$s = \frac{v^2}{200}$$



where  $s$  is the braking distance in metres and  $v$  is the speed in km/h.

How much longer is the braking distance according to the formula if you drive at a speed of 70 km/h compared with if you drive at 50 km/h?

(2/1/0)

- 16.

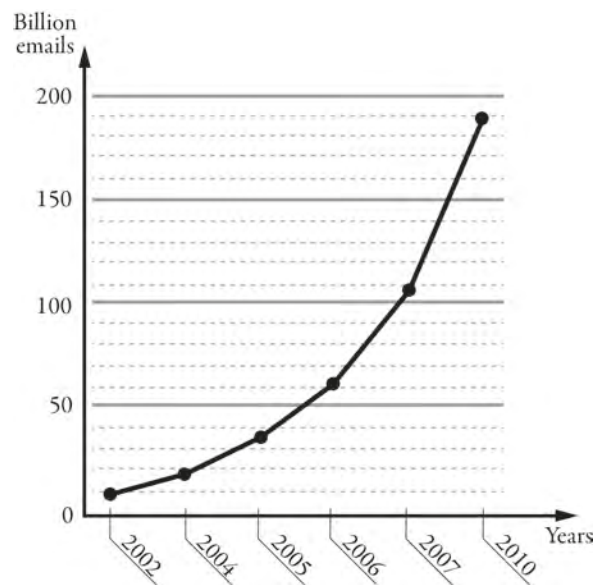


The picture is not drawn according to scale.

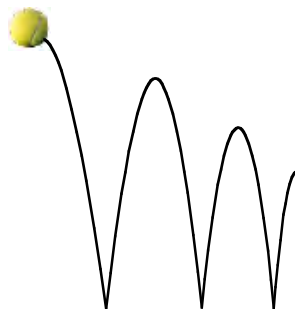
The angle of incidence of the sun rays to the ground plane is 8.2 degrees. The shadow of the spruce is 30 metres long. How tall is the spruce?

(2/0/0)

17. The diagram shows the number of billion emails sent on average in the world every day.
- a) Out of all the emails sent, it is estimated that about 82 per cent are spam (unwanted email). About how many spam were sent in a day in 2010? (2/0/0)
  - b) The diagram is misleading. What is misleading in the diagram? (1/1/0)
  - c) If the diagram was drawn correctly, how would this affect the appearance of the diagram? (1/1/0)

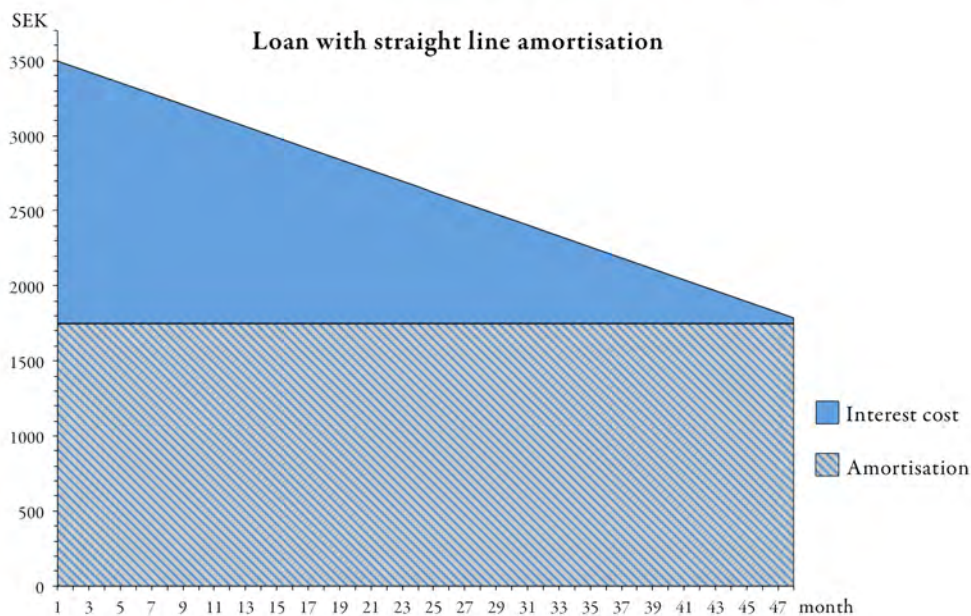
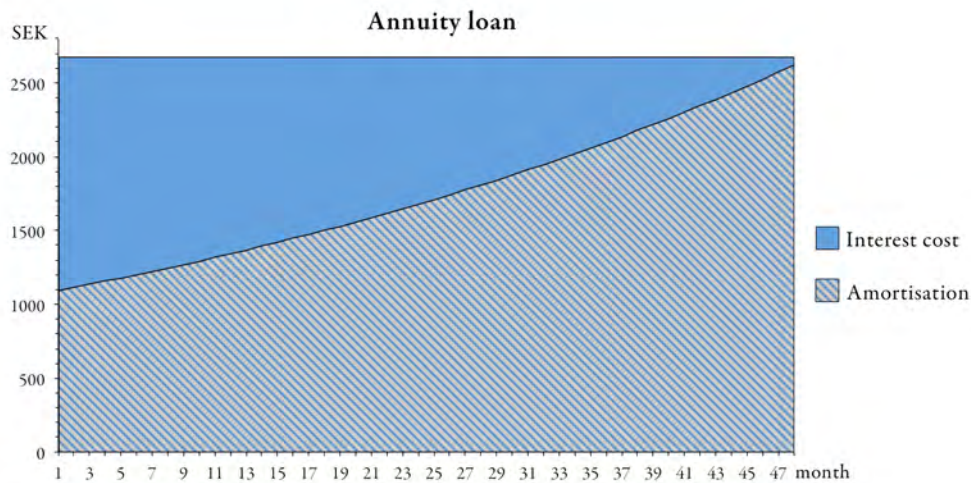


18. A ball is released from a height of 100 cm to fall to a floor. After the first bounce the ball bounces up 80 cm above the floor. The ball continues to bounce in the same way, so that every new height is 80 % of the height immediately before.



- a) After how many bounces is the bounce height lower than 20 cm? (1/1/1)
- b) From what fall height must the ball be released if it is to reach 108 cm above the floor after the first bounce? (0/2/0)
- c) Describe in words or a formula the relation between the ball's fall height, the number of bounces and the bounce height. (0/1/1)

19. Two loans are described in the diagrams shown below, an annuity loan and a loan with straight line amortisation. Payments (interest cost and amortisation) are made every month for 4 years. Each diagram presents the amortisation and interest cost every month. The loan amounts and the interest rates are the same for both loans.



- a) Use the diagrams to determine the size of the first and last payment for each loan? *Only answer required.* (1/1/0)
- b) The loan amount is the same size for both loans. Use either one of the diagrams to show that the loan amount is SEK 84 000. (0/2/0)
- c) Even though the interest rate and loan amount are the same for both loans, the interest cost is different. Determine the interest cost for each loan. (0/2/3)
- d) The interest cost is different for the two loans even though the interest rate and the loan amount are the same. Explain why. (0/2/0)

20. Three positive whole numbers, all greater than 1, have the product of 210. Examine how many different combinations of numbers there are. (1/1/1)

21. The associative law, i.e.  $(a + b) + c = a + (b + c)$  applies to the addition of numbers.

For example  $(3 + 2) + 5 = 5 + 5 = 10$  and  $3 + (2 + 5) = 3 + 7 = 10$ .

The associative law also applies to the addition of vectors.

Show using your own example that it also applies to the vectors  $\vec{u}, \vec{v}$  and  $\vec{w}$ . (0/1/2)

22. PRIMa coffee is sold in jars of four different sizes, as shown below.



300 g  
65.70 SEK



200 g  
45.70 SEK



100 g  
23.90 SEK



50 g  
12.95 SEK

- a) Calculate what 100g of PRIMa coffee costs in each jar. (1/0/0)

- b) The coffee company is planning to introduce another size, a jar that contains 450 g. Josefin and Mikael make an estimate of what that jar will cost. (See their calculations below.) Explain why Mikael and Josefin get different answers. (2/2/2)

*Josefin's solution*

$$100 \text{ g costs } \frac{21.9 + 22.85 + 23.9 + 25.9}{4} \approx \text{SEK } 23.6$$

$$450 \text{ g costs } 4.5 \cdot 23.6 \approx \text{SEK } 106.50$$

*Mikael's solution*

