

Exercise 1

Calc. : ✓

(Give your answers to this question accurate to 4 decimal places where appropriate)

Many squirrels live in the forest around the ESK in Waldstadt.

When a squirrel leaves the forest to go to the trees inside the school grounds, the probability of it being seen by a student is $\frac{1}{3}$.

One morning, 10 squirrels decide to go to the trees inside the school grounds.

Let X represent the number of squirrels which are seen by a student.

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| 1. Calculate the probability that exactly 7 squirrels will manage to get to the trees in the school grounds without being seen by a student. | 4 marks |
| 2. Calculate the probability that less than two squirrels will be seen by a student. | 4 marks |
| 3. Calculate $E(X)$. Interpret this result. | 4 marks |
| 4. Calculate the standard deviation of X . | 3 marks |

Exercise 2

Calc. : ✓

A fair coin is tossed three times in a row and the results obtained are noted.

For example, "Heads, Heads, Tails" is an outcome that may be noted HHT.

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| 1. Determine the probability of getting Heads at least twice. | 3 marks |
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For each toss, 20 points are awarded for Heads and 10 points for Tails.

Let X represent the sum of the points obtained after the three tosses.

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| 2. Calculate $P(X = 40)$. | 3 marks |
| 3. Copy and complete the probability distribution table for X shown below. | 4 marks |

x	30			60
$P(X = x)$	$\frac{1}{8}$			$\frac{1}{8}$

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|---|---------|
| 4. Calculate the expected value of X and interpret this result. | 4 marks |
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Exercise 3

Calc. : ✓

In a village with 700 inhabitants, 14 of them decide to start a rumour at the same time. After 15 hours the rumour has been heard by all of the inhabitants. A linear function is proposed to model this problem.

1. **Explain**, why the function

$$f(t) = 45,73 \cdot t + 14$$

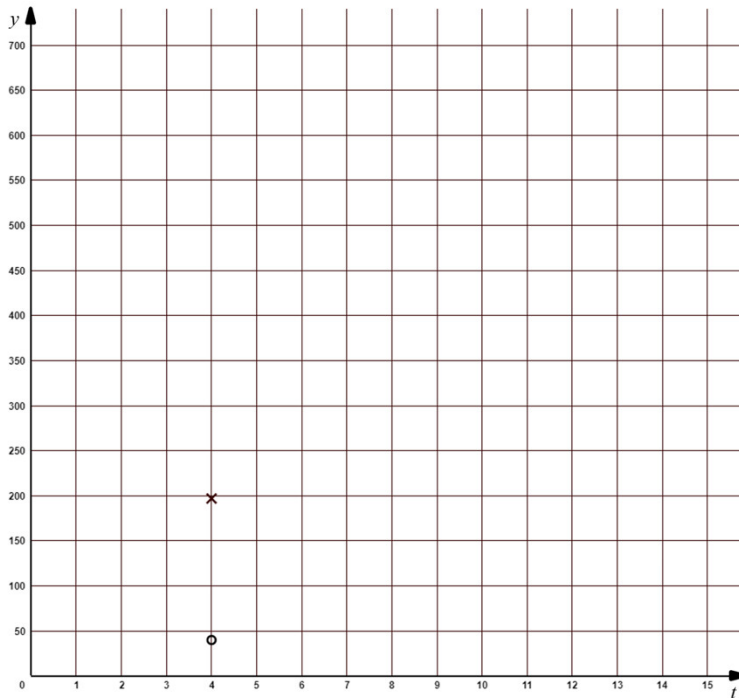
could be used to model this problem, what the variables f and t represent with units, and what the numbers represent.

2. **Determine** the domain of the function.

3. Use this function to **calculate** the time taken for half of the inhabitants to have heard the rumour.

4. **Copy** the graph below onto your 5 mm square answer paper using a scale of 1 cm for 1 unit on the horizontal axis and 1 cm for 50 units on the vertical axis.

Draw the line representing the function f on your copy of the graph. One of the points has already been marked for you with an X (the point marked O is used later in the question).



(This question continues on the next page)

5 marks

2 marks

3 marks

3 marks

Another function is now proposed to model this problem

$$g(t) = 14 \cdot 1,298^t$$

5. **Give** the name of the type of model represented by function g .

6. **Draw** the line representing the function g on the same graph as for f above. One of the points has already been marked for you with an O.

7. Using your graph or otherwise, **determine** also for this function the time taken for half of the inhabitants to have heard the rumour.

8. **Compare** the two functions f and g and **decide**, with a reason, which is the better model for this situation.

1 mark

3 marks

3 marks

4 marks

Exercise 4

Calc. : ✓

The depth of water at a landing jetty in a small harbour on the North Sea varies according to time due to the tide. There are two tides every day at this harbour.

The depth was measured at 3-hour intervals on 15th June and the following figures were recorded.

Time	00:00	03:00	06:00	09:00	12:00
Depth (<i>m</i>)	3.6	5.2	3.6	2.0	3.6

The depth of water can be modelled by a sine function.

1. **Show that** the function

$$h(t) = 1.6 \cdot \sin(0.5236 \cdot t) + 3.6$$

can be used to model the depth of water h (metres), at time t (hours), **explaining** how each of the three constants can be found from the data in the table.

A large ferry from a nearby island requires a minimum depth of 4 m to be able to dock at the jetty.

2. **Show that** the earliest time that the ferry can dock at the jetty on 15th June is 00:29 (rounded to the nearest minute). 3 marks
3. **Find** the latest time before midday when the ferry can dock at the jetty. 3 marks