S5P6 — Exercises from `http://www.barsamian.am/mathsexams/`

Contents

1   Chapter 1 — Powers

Exercise 1 — December 2023   Calc.: ✔

The following equations are used to calculate a potential energy V and a force F.

$$V = \frac{k2q}{r} \qquad F = \frac{kq^2}{r^2}$$

where t is the time in months.

a) **Use** $k = 9 \times 10^9$, $q = 1.6 \times 10^{-19}$ and $r = 2.1 \times 10^{-10}$ to calculate V and F, giving your answers to an accuracy of 2 significant figures.   **6**

b) If the value of r was increased, would V be larger or smaller? **Justify** your answer.   **2**

Exercise 2 — December 2023   Calc.: ✘

Given that $p = 6.5 \times 10^6$, $q = 5 \times 10^{-4}$ and $r = 1.8 \times 10^3$, **evaluate** the following: **8**

a) pq b) $\dfrac{p}{q}$ c) $q^2 r$

Exercise 3 — December 2023   Calc.: ✘

Simplify the following expressions: **8**

a) $5x^3 y^2 \times 3x^4 y^3$ b) $\dfrac{20p^4 q^5}{4pq^2}$ c) $\dfrac{a^2}{a\sqrt{a}}$ d) $\left(x^2 y^4\right)^{-\frac{1}{2}}$

2 Chapter 2 — Exponential models

Miriam has saved €6000 and uses some of this money to buy a new phone. The price of the phone is increased by 18% when the purchase includes an optional insurance policy. The cost is €756.38 with the insurance policy.

a) **Calculate** how much the phone cost *without* the insurance policy.   3

Miriam places €5250 in a new savings account that pays 3% interest each year. She makes no further withdrawals or deposits to this account.
The amount of money in her account at the end of each year is calculated using the formula

$$y = 5250 \times (1.03)^t$$

where t is the number of years and y is the amount of money in her account.

b) **Complete** the table and use this to **state** how many years will pass until she has at least €6000 in her account.   5

t	0	1	2	3	4	5
y						

The number of plastic bottles found in a lake each month can be modelled by the formula

$$n = 10 \times 2^t$$

where t is the time in months.

a) **Determine** how many plastic bottles was found initially.   1

b) **Complete** the table   2

Months (t)	0	1	2	3	4
Number of bottles (n)					

c) Use the diagram below to **plot** a graph showing the relationship between n and t.   2
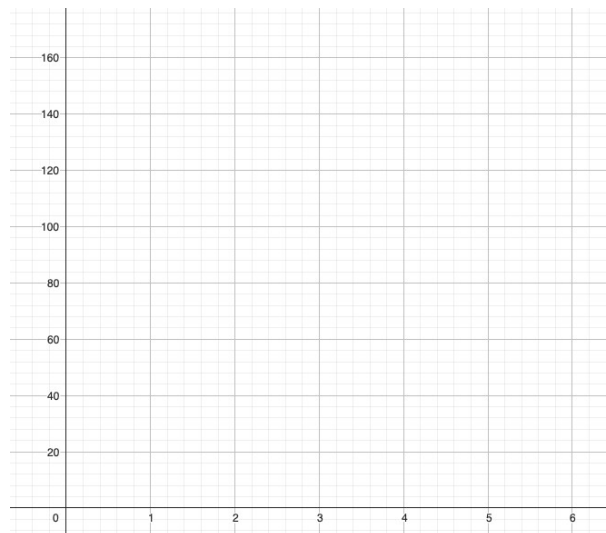
d) **Determine** the type of function for the graph.   1

e) Use your graph to **estimate** how many bottles were found after 3.5 months.   1

f) **Comment**: will this formula always give an accurate account of the number of bottles in the lake?   1

Exercise 6 — June 2023 Calc.: ✔

On the social media Twitter, we study the likes of three tweets during a period of time.
At the beginning of the study, the first tweet has 210 likes, and then, the number of its likes grows by 25% per hour.

1. **Explain** why the increase is exponential and why it can be modelled by the formula: | 1

$$T_1(t) = 210 \cdot 1.25^t$$

where t indicates number of hours after the starting time.

2. **Compute** the number of likes that the tweet has after 24 hours. | 1.5

3. On the millimeter paper provided, **draw** the graph of the function T_1 for the first twenty hours after the tweet has been written. | 1

4. According to the model, **compute** the number of hours it takes for the tweet to reach 10 000 likes. | 3

The number of likes for a second tweet, t hours after the starting time. is given by the formula:

$$T_2(t) = 1\ 240 \cdot 1.025^t$$

5. **Determine** when the first tweet overtakes the second tweet, in number of likes. | 2.5

A third tweet has at the same starting time 421 likes, and its number of likes increases by 8% per hour.

6. **Find** the expression of the number of likes for this third tweet as a function of t, the number of hours after the starting time. | 1.5

Exercise 7 — June 2021 Calc.: ✔

In the coffee bar *Dolce Vita* the coffee is served at a temperature of 90°C. The temperature $T(t)$ (in °C) of the coffee in the coffee cup is given by the following formula:

$$T(t) = 20 + 70 \cdot 0.87^t$$

Where t is the time (in min) after the coffee was served.
When does the coffee reach a temperature of 50°C? Write your answer accurate to the nearest minute. | 5

3 Chapter 3 — Trigonometry (1/2)

Exercise 8 — December 2023 Calc.: ✗

Complete the table showing the exact values for the following trigonometric functions | 6

Angle θ	0°	30°	45°	60°	90°
$\sin(\theta)$				$\dfrac{\sqrt{3}}{2}$	1
$\cos(\theta)$	1				
$\tan(\theta)$			1		

Exercise 9 — June 2021 Calc.: ✗

Convert:

1. $\dfrac{\pi}{12}$ rad into degrees | 1

2. 24° into radians | 1

a) **Convert** the following degrees to radians 3

$$45°, \quad 225°, \quad 720°, \quad 30°$$

b) **Draw** the angles from above in the unit circle 3
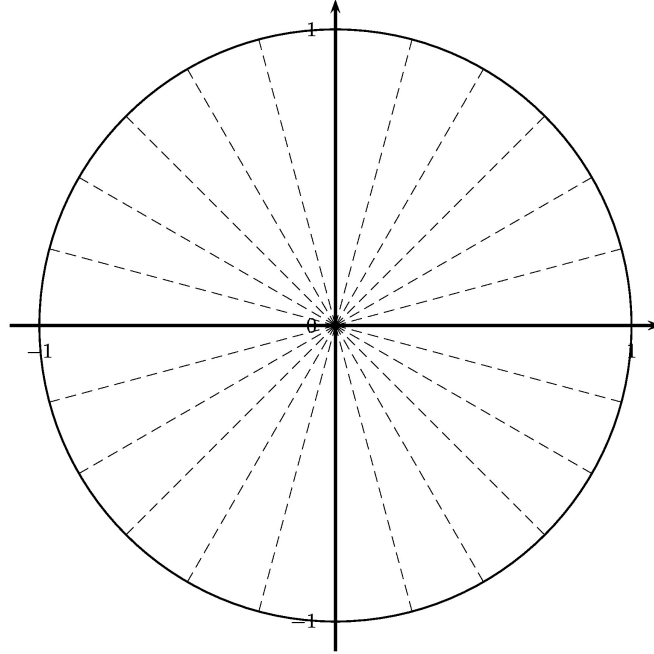
4 Chapter 4 — Statistics

The Smiths have 8 kids. Each one of the kids receives their allowances each month.
The mean value of the allowances is 54€ per month The standard deviation is 13.3€ per month.

1. This month, the eldest has received 75€. Determine the mean allowance of the other 7 children. 2

The parents offer the kids to increase their allowances. They offer two options.
Option 1: increase the allowances by 5€.
Option 2: increase the allowances by 5% thus multiplying by 1.05.

1. What are the mean value and the standard deviation with the first option? 1.5

2. What are the mean value and the standard deviation with the second option? 1.5

A class is carrying out an experiment, testing the life of two brands of batteries. 22 batteries of each brand are connected to electric fans and the class records how long the batteries last before the fan stops. The table below shows the results of the measurements for brand 1:

Battery life (hours)	Frequency of Brand 1
$0 \le h < 4$	1
$4 \le h < 8$	7
$8 \le h < 12$	10
$12 \le h < 16$	4

1. Calculate the mean and standard deviation of the life of brand 1. 3

2. Below are the results for brand 2. Show that the mean battery life is 6.5 hours and the standard deviation is 2.2 hours. 3
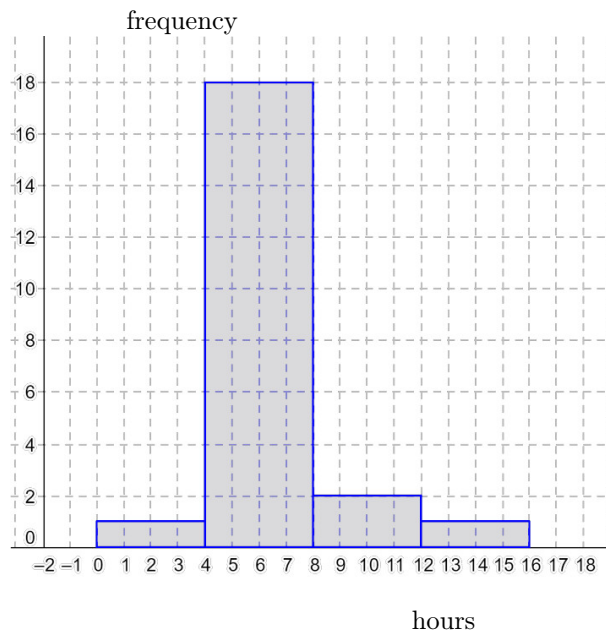
3. The slogan for one brand is "4 hours guaranteed!" and for the other brand the slogan is "The longest lasting". Which brand uses which slogan? Use your results to justify your answers. 3

The exam grades (as a percentage) for maths and chemistry are given in the histograms below.
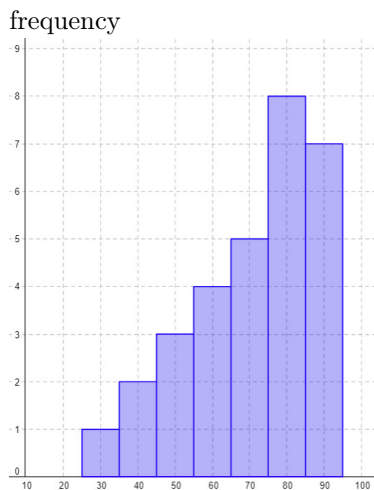
Exam grades maths   Exam grades chemistry

1. State whether the average maths exam grade is greater than/smaller than/equal to the median. Explain your answer without making any calculations.   3
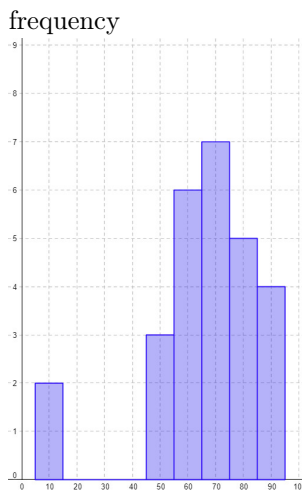
2. The chemistry teacher and the math teacher want to compare their grades. Which measure of central tendency do you recommend for such a comparison: the mean or the median? Explain your answer.   3

3. The average math exam grade is 71 percent and the standard deviation is 17 percent. When the results are published on the report card, the math teacher must rescale the results to a scale of 10. What will be the mean and standard deviation of the maths grade on the report card?   3

4. The average math exam grade is 71 percent and the standard deviation is 17 percent. The math teacher decides to give each student an extra 5 percent. What will be the new mean and standard deviation?   3

If you think of Naples, you probably picture it on a sunny day. Milan, instead, it is often imagined in the rain. But this is not an accurate description of the weather in the two cities.
The bar chart below shows the average monthly rainfall (in mm) in Naples, according to statistics of the last 30 years.

average monthly rainfall in Naples (in mm)
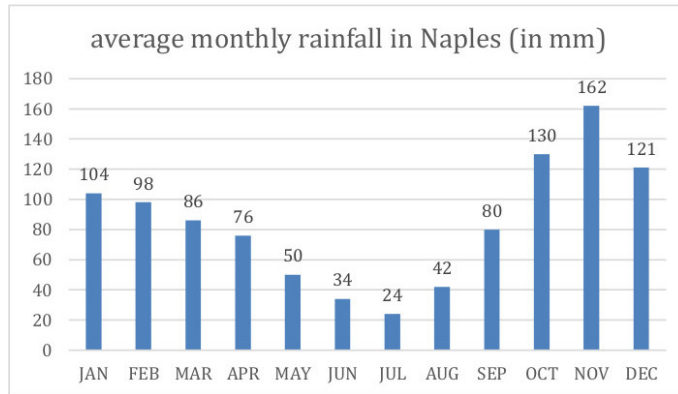
1. Determine min, Q1, median, Q3 and max of the data set shown in the bar chart.   3

2. Given the formulas   3

$$\overline{x} = \frac{1}{n} \sum_{i=1}^{n} x_i \quad \text{and} \quad \sigma = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (x_i - \overline{x})^2}$$

Calculate the mean value $\overline{x}$ and the standard deviation σ for the monthly rainfall in Naples (round to 1 dp).

The table below presents data referring to the average monthly rainfall (in mm) in Milan, according to statistics acquired over the last 30 years.

min	Q1	median	Q3	max	$\overline{x}$	σ
60.0	64.5	75.5	95.0	101	78.7	15.7

3. On the same diagram, draw the box-plots representing the average monthly rainfall in Naples and in Milan.   2

4. "Total rainfall in one year in Naples is 25% higher than in Milan". Use the information provided to explain whether this claim is correct or not.   2

The following box-plot refers to average monthly rainfall in mm as recorded in Parma over the last thirty years.

monthly rainfall in Parm (in mm)
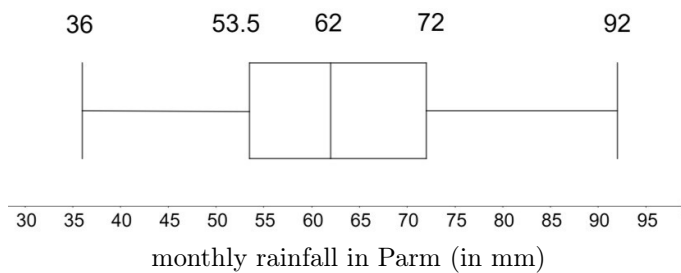
5. In which one of these three cities data referring to rainfall show highest homogeneity? Explain your answer.   2

5   Chapter 5 — Vectors (1/2)

Exercise 15 — December 2023 Calc.: ✓

A set of vectors is given by

$$\vec{a} = \begin{pmatrix} 5 \\ 1 \end{pmatrix}, \quad \vec{b} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

a) **Determine** if the vectors are linearly independent. **Show** your working.   3

b) Does the set form a basis of $\mathbb{R}^2$? **Explain** your answer.   3

c) If possible, **express** the vector $\vec{u} = \begin{pmatrix} 7 \\ 0 \end{pmatrix}$ as a linear combination of $\vec{a}$ and $\vec{b}$.   3
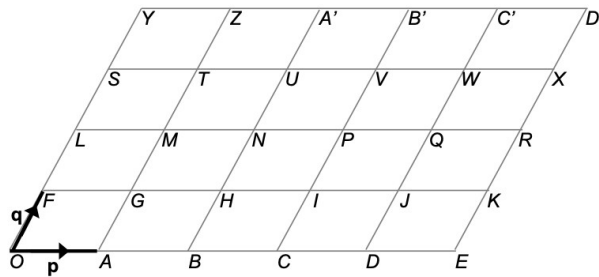
Exercise 16 — December 2023 Calc.: ✗

Two vectors $\vec{p}$ and $\vec{q}$ are shown on the grid.

a) **Write** any position vector that is equal to $\vec{p} - 2\vec{q}$.   1

b) **Write** any position vector that is equal to $-2\vec{p} - \vec{q}$.   1

c) By drawing on the grid, **show** that   3

$$(\vec{p} - 2\vec{q}) + (-2\vec{p} - \vec{q}) = -\vec{p} - 3\vec{q}$$

d) **Find** the value of c and d: 3

$$\begin{pmatrix} c \\ 5 \end{pmatrix} + 2 \begin{pmatrix} 3 \\ d \end{pmatrix} = \begin{pmatrix} d \\ 8 \end{pmatrix}$$

Exercise 17 — June 2021 Calc.: ✓

The vectors $\vec{u}$ and $\vec{v}$ are given, with $\vec{u} = \begin{pmatrix} 3 \\ -1 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$.

Express vector $\vec{w} = \begin{pmatrix} 0 \\ 4 \end{pmatrix}$ as a linear combination of vectors $\vec{u}$ and $\vec{v}$.   5

Exercise 18 — June 2021 Calc.: ✗

The vectors $\vec{u}$ and $\vec{v}$ are given, with $\vec{u} = \begin{pmatrix} -4 \\ 2 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$.

1. Calculate $\vec{u} \cdot \vec{v}$.   3

2. Determine whether the vectors $\vec{u}$ and $\vec{v}$ are parallel or not.   3

6 Chapter 6 — Quadratic models

A patient takes some medication at midday. The amount of drug, D mg, remaining in their bloodstream h hours after midday is modelled by the formula:

$$D = 0.06 + 0.5h - 0.1h^2 \qquad 0 \le h \le 5$$

a) **Determine** the amount of drug that is already naturally occurring in the patient's bloodstream at the moment they take the medication.   1

b) **Calculate** how long it takes for the amount of the drug in the patient's bloodstream to return to its natural level.   2

c) **Determine** the time when the amount of drug in the patient's bloodstream will be a maximum.   3

d) It is safe for the patient to take more medication once the amount of drug in their bloodstream falls below 0.46 mg. **Determine** the earliest time that a patient can take a second dose of the medication.   3

e) **Explain** why your answer to (d) should not be 1 PM despite this being a solution to the relevant equation.   2

Consider the functions $f(x) = x^2 - 8x + 15$ and $g(x) = (x - 4) \cdot (x + 4)$.

1. **Find** the equation of the axis of symmetry for the function f.   3

2. **Solve** the following equation showing all stages of your working: $f(x) = 0$.   3

3. **Determine** if the function g intersects with the x-axis. If yes, **find** the points of intersection.   3

4. **Solve** the following equation showing all stages of your working: $f(x) = g(x)$.   3

Solve the following equations: 8

a) $x^2 - 6x + 5 = 0$ b) $x^2 + 2x - 2 = 0$ c) $2x^2 - x - 6 = 0$

7 Chapter 7 — Trigonometry (2/2)

Solve the equation: $\cos\left(x + \dfrac{\pi}{4}\right) = \dfrac{-1}{2}$, for the interval $x \in [0; 2\pi)$.   4

The side view of the ramp represented by the image below is of a parallelogram shape. The vertical sides are 80 cm, their distance is 115 cm. The length of the other two sides is 125 cm. (We use the notation in the figure.)
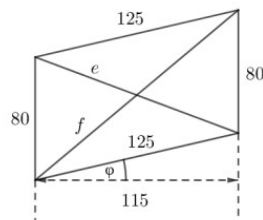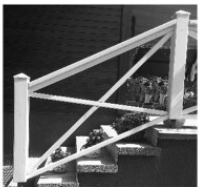
1. The angle ϕ is the angle formed by the horizontal and the lower side of the parallelogram. **Prove** with a calculation that $\phi = 23°$ (rounded to the nearest integer).   1.5

2. **Calculate** the length of the diagonal e of the parallelogram.   2

3. A reed windbreak is installed on the ramp. **Calculate** the area of the reed breakthrough covering the parallelogram-shaped part. **Discuss** whether the area of the reed windbreak is less than 1 m^2.   2.5

Exercise 24 — June 2024   Calc.: ✓

Using the data in the picture:
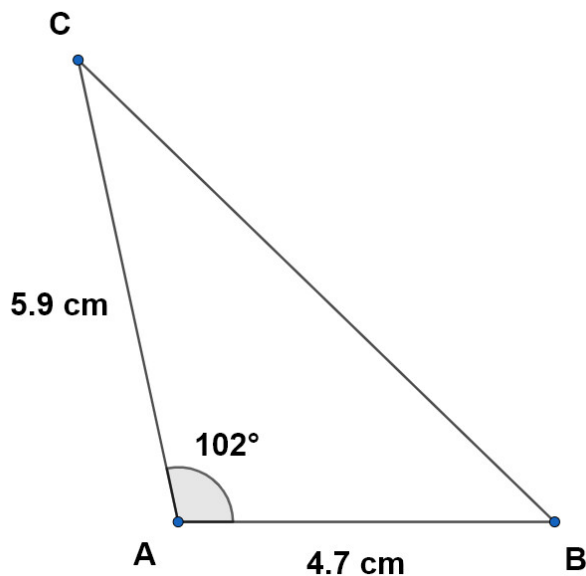
1. **Give** the length of the missing side accurate to one decimal place.   3

2. **Calculate** the sizes of the angles of the triangle, giving the results to an accuracy of one decimal place.   5

3. **Calculate** the area of this triangle, giving the result to an accuracy of one decimal place.   3

Exercise 25 — June 2023   Calc.: ✗

1. **Solve** the equation $\cos(x) = -\dfrac{1}{2}$, for $x \in \mathbb{R}$.   2

2. **Solve** the equation $\sin\left(x - \dfrac{\pi}{5}\right) = \dfrac{-\sqrt{2}}{2}$, for $x \in [0; 2\pi]$.   2

3. **Solve** the equation $2\sin^2 x + \sin x - 1 = 0$, for $x \in [0; 2\pi]$.   3

Exercise 26 — June 2021   Calc.: ✗

Given $\alpha \in \left[\dfrac{\pi}{2}, \pi\right]$ and $\sin(\alpha) = \dfrac{1}{5}$, determine $\cos\left(\alpha - \dfrac{\pi}{6}\right)$.   4

Exercise 27 — June 2021   Calc.: ✗

Answer the following questions.

1. Determine $\cos\left(\dfrac{11}{3}\pi\right)$ 1

2. Use addition formulas to determine $\sin(30° + 45°)$.   2

Exercise 28 — June 2021   Calc.: ✗

Solve in $\mathbb{R}$:

1. $\sin(x) = -\dfrac{\sqrt{3}}{2}$ 1

2. $\tan\left(2x - \dfrac{\pi}{5}\right) = -1$ 3

3. $\cos^2(x) - \cos(x) - 2 = 0$ 3

Martina wants to decorate her bedroom door with the outline of a cat, as shown in the figure below.
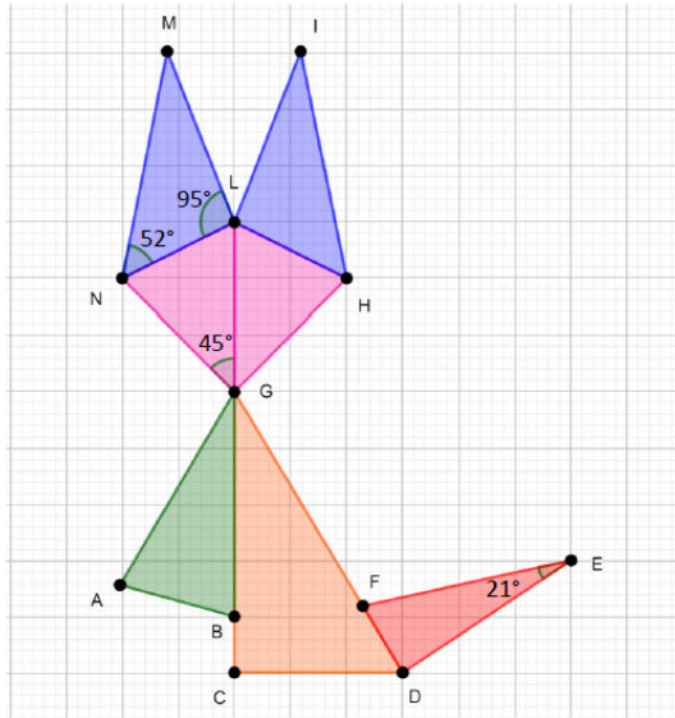
The cat's ears are two congruent triangles **MLN** and **ILH**, with **MN** = 40 cm, $\widehat{\text{MLN}}$ = 95° and $\widehat{\text{MNL}}$ = 52°.
Martina wants to edge the two ears with blue ribbon.

1. Determine the length of the sides **ML** and **NL** and calculate how many centimetres of blue ribbon are needed to edge both ears.   4

The cat's face **NGHL** is formed by two congruent triangles **NGL** and **HGL**, with **NG** = 28 cm, **GL** = 30 cm and $\widehat{\text{NGL}}$ = 45°. Martina wants to paint the cat's face pink.

2. Determine the surface area of the cat's face (round to the nearest unit).   2

The cat's tail consists of the triangle **FDE**, with **FE** = 38 cm, **DE** = 36 cm and $\widehat{\text{FED}}$ = 21°. Martina cuts the tail from a piece of cardboard and then glues the base **FD** to the cat's body.

3. Determine the length of the base **FD** (round to 1 dp).   2

8   Chapter 8 — Probabilities

In a manufacturing company, employee satisfaction is studied in relation to two aspects: working conditions (**C**) and career opportunities (**O**). A study shows that 60% of employees are satisfied with their working conditions, 50% are satisfied with their career opportunities and 40% are satisfied with both their working conditions and career opportunities.

1. **Construct** a suitable diagram to summarize the results of the survey.   3

2. **Calculate** the probability that a randomly selected employee is satisfied with their career opportunities given that they are also satisfied with their working conditions.   2

3. **Calculate** $P(\overline{\text{O}})$.   1

4. The director of the company claims that whether an employee is satisfied with their working conditions is independent from their satisfaction of career opportunities. **Is the director correct? Justify** your answer.   3

Exercise 31 — June 2024 Calc.: ✗

12 out of 28 students on a course are boys. 1/3 of the boys run a YouTube channel. 50% of all students are neither male nor YouTubers.

1. **Set up** a fully completed four-field table for the situation described above. | 4

2. A pupil is selected at random. Given that the pupil runs a YouTube channel, **calculate** the probability that this student is a girl. | 2

Exercise 32 — June 2023 Calc.: ✓

40% of a dentist's patients are men. The agenda of this dentist shows that 20% of men and 10% of women who make an appointment do not come to this appointment.
A person makes an appointment.

1. **Determine** the probability:

   (a) that person is a woman present at the appointment; | 2

   (b) that person comes to the appointment; | 2

   (c) that person is a man given that this person does not come to the appointment. | 2

53% patients of another dental practice are under 18 years old, 71% of patients wear glasses of which 47% are 18 years of age or older.
The following events are considered:
A: "The patient is 18 years of age or olderèè
L: "The patient wears glassesèè

2. **Determine** whether events A and L are independent. **Justify** your answer. | 2

Exercise 33 — June 2023 Calc.: ✗

A hospital group has two retirement homes named "Mouette" and "Rossignol".

These two houses have 120 residents in total including 80 at the residence "Mouette".

Caregivers in this hospital group assess residents' ability to dress independently according to a three-level A, B and C grid.
   45 residents of the "Mouette" house are assessed at level A;
   50% of the residents of the "Rossignol" house are rated at level B;
   A total of 20 residents are assessed at level C, half of whom reside at the "Mouette" house.

One of the residents of these houses is randomly selected and the following events are considered:
   M : "the person is a resident of the Mouette house";
   A : "the person is assessed at level A";
   B : "the person is assessed at level B";
   C : "the person is assessed at level C".

1. **Complete** the following table: | 1

	A	B	C	Total
"Mouette"	45			80
"Rossignol"				
Total			20	120

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2. In the following questions, answers must give results as simplified fractions.

   (a) **Determine** the probability of event **M** and the probability of event **C**. | 1

   (b) **Describe** the M ∩ A event with one sentence and **calculate** the probability of this event. | 1.5

   (c) **Calculate** the probability that the randomly selected person will reside in the "Mouette" house given that they have been assessed at level A. | 1

   (d) **Calculate** the probability $P(\text{C}|\text{M}')$. **Interpret** this probability in the context of the exercise. | 1.5

Exercise 34 — June 2021 Calc.: ✓

Sandro has four possible ways home from school.

From school he takes either a bus or a train. The probability that he will go by train is $\frac{3}{5}$.

If he goes by train, he completes the second part of the journey by walking or by getting a lift. The probability that he gets a lift is $\frac{1}{4}$.

If he catches a bus, the second part of his journey can be complete by catching another bus or he can walk. The probability that he will walk is $\frac{7}{8}$.

1. Draw a tree diagram showing all of the possible outcomes of Sandro's journey from school. | 3

Using the tree diagram calculate the probability that Sandro:

2. Catches a bus from school and then walks | 3

3. Walks for part of his journey home | 3

4. Given that he walks the second part of the journey, what is the probability that he caught the bus? | 3

Exercise 35 — June 2021 Calc.: ✓

Independent events A and B are such that $P(A) = 0.45$ and $P(A \cap B) = 0.18$. Find:

1. $P(B)$ | 3

2. $P(A \cup B)$ | 3

3. $P(B|A)$ | 3

Exercise 36 — June 2021 Calc.: ✗

In a certain country 20% of the population suffers from hay fever. People can undergo a skin prick test to find out whether they have hay fever.
The skin prick test has a sensitivity of 75%. This means that 75% of the people with hay fever, test positive on the skin prick test.
The skin prick test has a specificity of 90%. This means that 90% of the people who don't have hay fever, test negative on the skin prick test.
A person chosen at random undergoes the skin prick test. What is the probability that this person has a positive test result? | 4

9 Chapter 9 — Vectors (2/2)

Exercise 37 — June 2024 Calc.: ✓

In a 2-dimensional orthogonal coordinate system, the coordinates of the points A, B and C are A(1, 4), B(5, 5) and C(−1, 6) respectively.

1. **Determine** the vector $\overrightarrow{AB}$ and **calculate** its magnitude. | 2

2. **Determine** the magnitude of the vector $\overrightarrow{AC}$. | 2

3. **Calculate** the size of the angle between $\overrightarrow{AB}$ and $\overrightarrow{AC}$ giving your answer in degrees to 1 dp. | 3

4. **Determine** the value of k that makes the vector $\binom{k}{1}$ perpendicular to vector $\overrightarrow{BC}$. | 3

Exercise 38 — June 2023 Calc.: ✓

Consider a triangle ABC whose points have the coordinates: A(0; 0), B(−2; 4) and C(4; 5).

1. **Calculate** the coordinates of the vectors $\overrightarrow{BA}$ and $\overrightarrow{BC}$. | 1

2. **Show that** the angle at the vertex B of the triangle ABC is 72.9° rounded to the nearest tenth. | 1

3. **Calculate** the area of the triangle ABC. | 1

Exercise 39 — June 2023 Calc.: ✔

Let k be a real number. We consider the vectors:
$\vec{u} = \begin{pmatrix} 1 \\ 2k - 3 \end{pmatrix}$ and $\vec{v} = \begin{pmatrix} k - 1 \\ 3 \end{pmatrix}$.

1. **Find** the parameter k, so the vectors $\vec{u}$ and $\vec{v}$ are colinear. | 1.5

2. **Find** the parameter k, so the vectors $\vec{u}$ and $\vec{v}$ are orthogonal. | 1.5

From now on, we take $k = 5$.

3. **Find** the measure of the angle between the vectors $\vec{u}$ and $\vec{v}$. | 1.5

4. **Express** vector $\vec{w} = \begin{pmatrix} -10 \\ 5 \end{pmatrix}$ as a linear combination of vectors $\vec{u}$ and $\vec{v}$. | 2.5

5. **Find** the coordinates of the vertices of the parallelogram ABCD, knowing A = $(-2; 1)$, $\overrightarrow{AB} = \vec{u}$, and $\overrightarrow{AD} = \vec{w}$. | 2.5

Exercise 40 — June 2021 Calc.: ✔

The points A$(2, 5)$ and B$(7, -7)$ are given.

1. Calculate $\left\| \overrightarrow{AB} \right\|$. | 3

2. Find the coordinates of point C if you know that $\overrightarrow{AC} = \begin{pmatrix} -1 \\ 9 \end{pmatrix}$. | 4

3. Find the angle between vectors $\overrightarrow{AB}$ and $\overrightarrow{AC}$ if you know that $\overrightarrow{AC} = \begin{pmatrix} -1 \\ 9 \end{pmatrix}$. Write your answer in degrees, accurate to two decimal places. | 4

4. Find the parameter k, so that the vector $\vec{u} = \begin{pmatrix} 12 \\ k \end{pmatrix}$ is perpendicular to $\overrightarrow{AB}$. | 4

10   Chapter 10 — Logarithms

Exercise 41 — June 2024 Calc.: ✔

Consider the following equation: $\log(x - 2) + \log(x + 3) = 2$.

1. **Solve** the equation showing all stages of your working and **give** the solution(s) as exact value(s). | 5

2. **Write** the solution(s) of the equation as a decimal giving your answer(s) to an accuracy of 1 decimal place. | 1

Exercise 42 — June 2024 Calc.: ✗

Solve the following equation: $\log_2(x) + \log_2(4) = 6$. | 5

Exercise 43 — June 2023 Calc.: ✔

1. **Solve** the equation $\log_5 x + \log_5 3 = \log_5 6$. | 1.5

2. **Solve** the equation $\log_2 x + \log_2(x - 1) = 2\log_2 x$. | 2.5

**Exercise 44** — June 2023 Calc.: ✗

1. If $a = \log 8 + \log 5 - 2\log \sqrt{4}$, $b = 3^{\frac{1}{2}\log_3(2)}$ and $c = \log_3(27)$, **justify** that $a < b < c$. **Present** your reasoning. | 3

2. **Solve** in the real numbers the following equations: | 3

   (a) $\left(3^{x-1}\right)^2 = 3^{x-5}$; $\qquad\qquad$ (b) $4^{x-2} = 8^x$.

1. Evaluate $2 \cdot \log_4(3) + \log_4(4) - \log_4(36)$ 3

2. Solve $\log(2x) - \log(6 - x) = 0$ 3

11   Chapter 11 — 3d geometry

Exercise 46 — June 2024   Calc.: ✓

Consider the following block of feta cheese with the dimensions 6 cm × 10 cm × 4 cm as shown in the rectangular cuboid below:
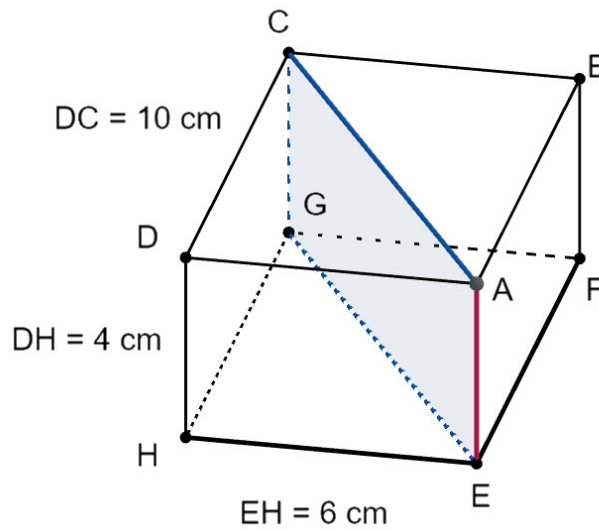
To decorate a salad, the cheese is cut in half diagonally from **AC** vertically downwards.

1. **Show** that the length of the cut |**AC**| accurate to two decimal places is 11.66 cm.   2

2. **Determine** the length of the diagonal |**AG**| accurate to two decimal places.   2

When the cheese is cut, 0.5% of the volume is lost on the knife.

3. **Calculate** the volume of the cheese after the cut.   3
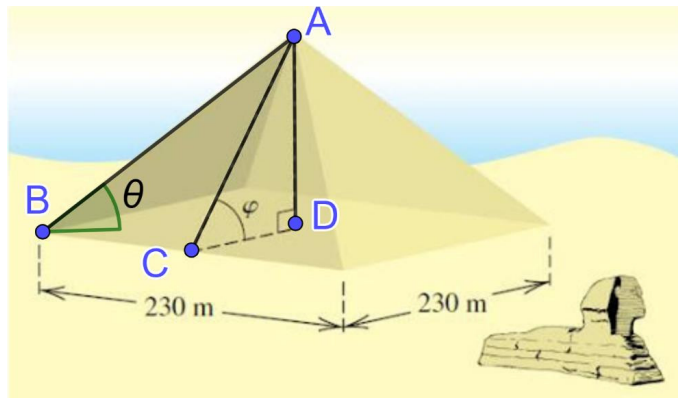
Exercise 47 — June 2021   Calc.: ✗
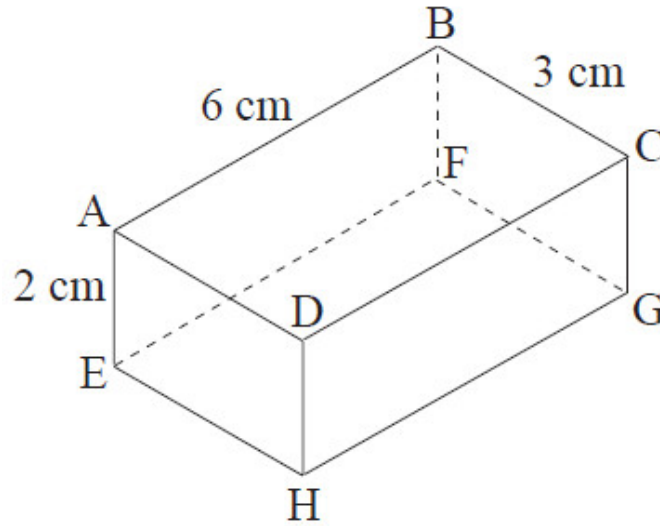
The diagram represents a rectangular box. Given that **AB** = 6 cm, **BC** = 3 cm and **AE** = 2 cm, calculate the length | 7
of the diagonal **AG**.

Exercise 48 — June 2021   Calc.: ✓

The Great Pyramid of Giza is a square-base pyramid, with base-length 230 m.
The angle formed by the slant height **AC** with the plane of the base is ϕ = 50.3°.

1. Determine the slant height **AC** of the pyramid (round to the nearest metre). | 3

2. Show that the height **AD** of the pyramid is 138.5 m. | 2

3. Determine the edge **AB** of the pyramid (round to the nearest metre). | 3

4. Determine the angle θ formed by the edge **AB** with the plane of the base. | 2