TEST 1

- The test consists of two sections. In section A calculators are **not allowed**. Graphic display calculator is required for section B.

- Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.

- The maximum mark for this test is [**36 + 36 marks**].

- Time allowed is **90 minutes**.

- Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to **show all working**.

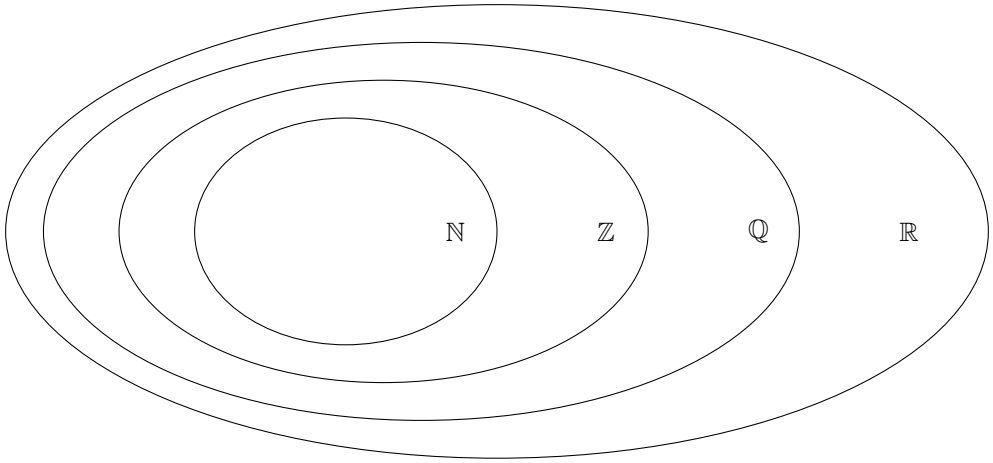
SECTION A

1. [4 *points*]

Consider the following numbers:

$a = (\sqrt{7})^6$, $b = \dfrac{5111999999999999333}{3}$, $c =$ negative reciprocal of $\dfrac{1}{2}$, $d = \left(\dfrac{1}{9}\right)^{-\frac{1}{2}}$

Classify these numbers by placing them in appropriate regions of the diagram below.



2. [4 *points*]

(a) Write 252 as a product of prime factors and hence find the number of all factors of 252. [2]

(b) Find the highest common factor of 72 and 600. [2]

3. [4 *points*]

(a) Write $0.\dot{2}\dot{1}$ as a proper fraction in simplified form. [2]

(b) Write $\frac{7}{27}$ as a recurring decimal. [2]

4. [4 *points*]

A certain amount of money has been divided among 4 people in the ratio 2:3:4:6. If the person who received the most, received \$3600 less than the other three people combined, calculate how much each person received.

5. [3 *points*]

Round:

(a) 25781 to the nearest thousand, [1]

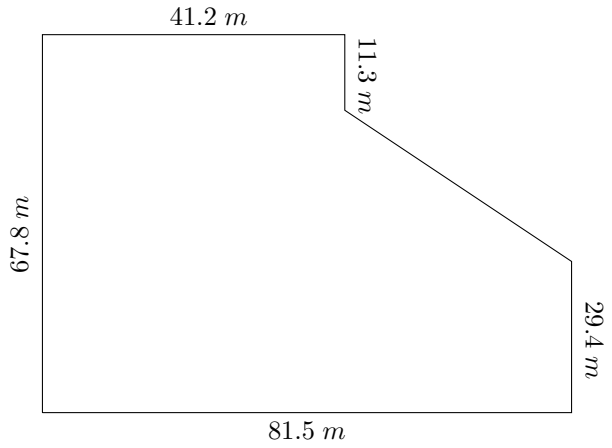
(b) 125.8991 to 2 d.p., [1]

(c) 0.00206735 to 3 s.f. [1]

NO GDC

6. [4 *points*]

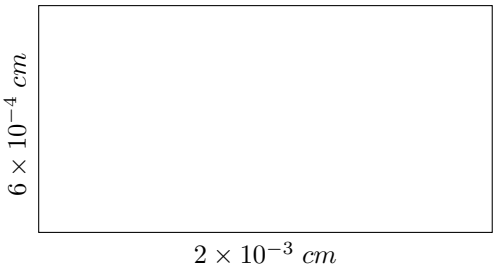
Consider the following figure (diagram not to scale):



By rounding all lengths to 1 s.f. estimate the area of the figure. Write your answer in m^2 in standard form.

7. [4 *points*]

Consider the following rectangle (diagram not to scale):



Find the perimeter and the area of this rectangle. Give your answers in standard form in centimetres.

8. [5 *points*]

Calculate and arrange in ascending order:

$$1.2\% \text{ of } 25, \qquad 32^{\frac{2}{5}}, \qquad \frac{4\times10^{-6}}{2\times10^{-7}}, \qquad \sqrt[3]{-8}, \qquad \frac{\frac{1}{2}-\frac{1}{3}}{\frac{1}{4}+\frac{2}{5}}$$

9. [4 *points*]

(a) Write as a power of 3: [2]

$$\frac{(\frac{1}{3})^{-5}\times(3\sqrt{3})^4}{(27)^{\frac{4}{3}}\times(\frac{1}{81})^2}=$$

(b) Simplify: [2]

$$\frac{(8x^3y)^2\times(\frac{y}{4x})^{-3}}{(\sqrt[3]{2}x^2y^{-3})^6}$$

NO GDC

SECTION B

1. [4 *points*]

Tomasz invests his savings into an account that pays 12% annual interest rate compounded quarterly (every 3 months).

(a) How much does he need to invest in order to have \$120 000 in his account in 4 years? Give your answer correct to 2 decimal places. [2]

(b) If he invests \$40 000, how long will it take for him to reach \$120 000? Give your answer in quarters. [2]

2. [3 *points*]

The base of a triangle has been increased by 30%. By how much does the height need to be decreased in order for the area to decrease by 22%?

3. [4 *points*]

Wanda exchanged 5 000 PLN into USD at a rate 4.11PLN = 1USD (no comission) for her vacation in USA. She spent 900 USD while there and exchanged the remaining dollars into zlotys at a rate 4.07PLN = 1USD with 2% commission. Calculate the amount of money in PLN she brings back from her vacation. Give your answer correct to 2 decimal places.

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4. [3 *points*]

The universal set U consists of all positive integers smaller than 10. Consider the following subsets of U:

$$A = \{1, 2, 3, 4, 5\} \qquad B = \{x \mid x \text{ is a factor of } 12\} \qquad C = \{x \mid 3x > 17\}$$

State whether the following statements are true or false. Justify your answers. Answers without justification will earn no marks.

(a) $A \cap C = \varnothing$ (b) $A \subseteq B$ (c) $3 \in B$

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5. [3 *points*]

Write the following expression in the form $a + b\sqrt{2}$, where $a, b \in \mathbb{Z}$:

$$2\sqrt{50} + \frac{6}{\sqrt{2}} - \frac{10}{2 - \sqrt{2}} =$$

6. [4 *points*]

Population of a certain town grows by 3% each year. The population of this town in 2024 is 65 000.

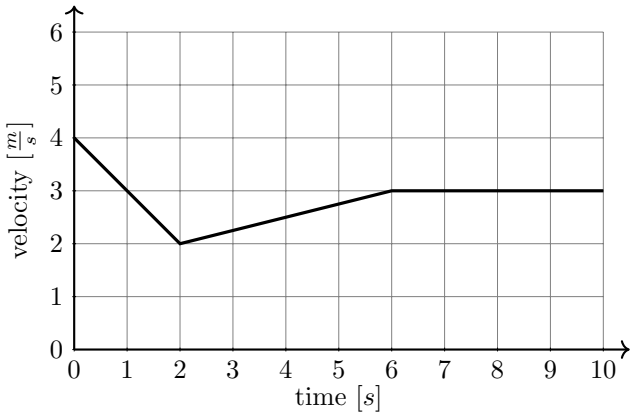
(a) Write down the population of this town in 2025. [1]

(b) Write down the formula for population P of this town t years after 2024. [1]

(c) In what year will the population exceed 95 000? [2]

7. [5 *points*]

The following diagram shows the velocity-time graph of a moving object.



(a) Write down the initial velocity of the object (at time $t = 0$). [1]

(b) Find the acceleration of the object at $t = 4$ [1]

(c) For what values of t was the object at rest? [1]

(d) Find the total distance traveled by the object during the 10 seconds of the journey. [2]

8. [3 *points*]

The pressure of a gas is inversely proportional to volume and directly proportional to temperature. If the pressure is 120 kPa when the temperature is 200 K and the volume is 3 m^3. Find the pressure when the temperature is 500 K and the volume is 4 m^3.

9. [2 *points*]

Calculate the value of the following expression. Give your answer in standard form rounded to 4 s.f.:

$$\frac{(2.564 \times 10^6) \times (9.334 \times 10^{-1})}{(2.221 \times 10^3) - (3.437 \times 10^2)} =$$

10. [5 *points*]

30 students were asked about their knowledge of foreign languages. Some of the results are given below.

20 know English,
15 know Spanish,
10 know German,
4 know English and German,
7 know Spanish and German,
2 do not know any of the 3 languages.

The number of students who know English and Spanish turns out to be 3 times the number of students who know all three of the mentioned languages.

Let x represent the number of students who know all three languages.

(a) Represent the above information on a Venn diagram. [2]

(b) Calculate the value of x. [2]

(c) Find the number of people who know exactly one of the three languages. [1]