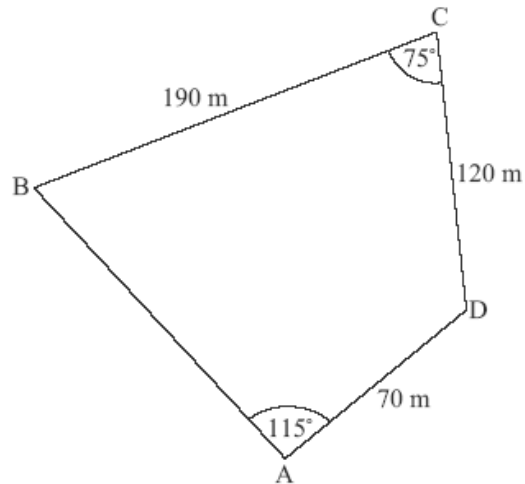**SHOW ALL WORK!!**

1.   Pauline owns a piece of land ABCD in the shape of a quadrilateral. The length of BC is 190 m, the length of CD is 120 m, the length of AD is 70 m, the size of angle BCD is 75° and the size of angle BAD is 115°.

diagram not to scale

Pauline decides to sell the triangular portion of land ABD. She first builds a straight fence from B to D.

(a)   Calculate the length of the fence.

(3)

The fence costs 17 USD per metre to build.

(b)   Calculate the cost of building the fence. Give your answer correct to the nearest USD.

(2)

(c)   Show that the size of angle ABD is 18.8°, correct to three significant figures.

(3)

(d)   Calculate the area of triangle ABD.

(4)

She sells the land for 120 USD per square metre.

(e)   Calculate the value of the land that Pauline sells. Give your answer correct to the nearest USD.

(2)

Pauline invests 300 000 USD from the sale of the land in a bank that pays compound interest compounded annually.

(f)   Find the interest rate that the bank pays so that the investment will double in value in 15 years.

(4)

(Total 18 marks)

2. A geometric sequence has 1024 as its first term and 128 as its fourth term.

(a) Show that the common ratio is $\dfrac{1}{2}$.

(2)

(b) Find the value of the eleventh term.

(2)

(c) Find the sum of the first eight terms.

(3)

(d) Find the number of terms in the sequence for which the **sum** first exceeds 2047.968.

(3)

(Total 10 marks)

3. One day the number of customers at three cafés, "Alan's Diner" (*A*), "Sarah's Snackbar" (*S*) and "Pete's Eats" (*P*) was recorded and are given below.

    17 were customers of Pete's Eats only
    27 were customers of Sarah's Snackbar only
    15 were customers of Alan's Diner only
    10 were customers of Pete's Eats **and** Sarah's Snackbar **but not** Alan's Diner
    8 were customers of Pete's Eats **and** Alan's Diner **but not** Sarah's Snackbar

(a) Draw a Venn Diagram, using sets labelled *A, S* and *P,* that shows this information.

(3)

There were 48 customers of Pete's Eats that day.

(b) Calculate the number of people who were customers of all three cafés.

(2)

There were 50 customers of Sarah's Snackbar that day.

(c) Calculate the total number of people who were customers of Alan's Diner.

(3)

(d) Write down the number of customers of Alan's Diner that were also customers of Pete's Eats.

(1)

(e) Find $n[(S \cup P) \cap A']$.

(2)
(Total 11 marks)

4. Consider the function $f(x) = x^3 + \dfrac{48}{x}$, $x \neq 0$.

    (a)   Calculate $f(2)$.

                (2)

    (b)   Sketch the graph of the function $y = f(x)$ for $-5 \leq x \leq 5$ and $-200 \leq y \leq 200$.

                (4)

    (c)   Find $f'(x)$.

                (3)

    (d)   Find $f'(2)$.

                (2)

    (e)   Write down the coordinates of the local maximum point on the graph of f.

                (2)

(f)   Find the range of *f*.

(3)

(g)   Find the gradient of the tangent to the graph of *f* at *x* = 1.

(2)

There is a second point on the graph of *f* at which the tangent is parallel to the tangent at *x* = 1.

(h)   Find the *x*-coordinate of this point.

(2)
(Total 20 marks)

5.   A shipping container is a cuboid with dimensions 16 m, $1\frac{3}{4}$ m and $2\frac{2}{3}$ m.

(a)   Calculate the **exact** volume of the container. Give your answer as a fraction.

(3)

Jim estimates the dimensions of the container as 15 m, 2 m and 3 m and uses these to estimate the volume of the container.

(b)   Calculate the percentage error in Jim's estimated volume of the container.

(3)

(Total 6 marks)

6. 31 pupils in a class were asked to estimate the number of sweets in a jar.
The following stem and leaf diagram gives their estimates.

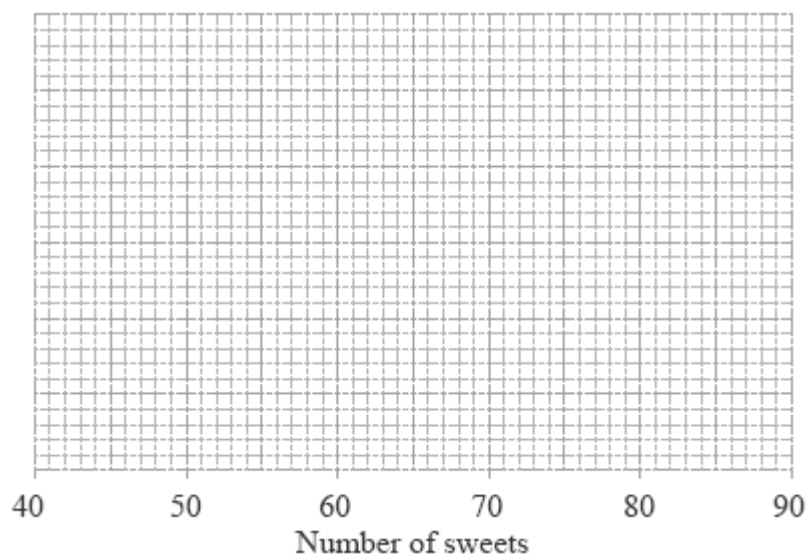| Stem	Leaf
4	2, 4, 7, 8, 9
5	1, 1, 2, 3, 8, 9
6	0, 2, 2, 4, 6, 6, 7, 8, 8
7	0, 0, 1, 3, 4, 5, 5, 7
8	1, 2, 2

Key: 4 | 7 represents 47 sweets

(a) For the pupils' estimates, write down

    (i)   the median;

    (ii)   the lower quartile;

    (iii) the upper quartile.

(3)

(b) Draw a box and whisker plot of the pupils' estimates using the grid below.

Number of sweets

(3)
(Total 6 marks)

7.   A manufacturer in England makes 16 000 garden statues. 12 % are defective and cannot be sold.

   (a)   Find the number of statues that are non-defective.

(2)

   The manufacturer sells each non-defective statue for 5.25 British pounds (GBP) to an American company. The exchange rate from GBP to US dollars (USD) is 1 GBP = 1.6407 USD.

   (b)   Calculate the amount in USD paid by the American company for all the non-defective statues. Give your answer correct to **two decimal places**.

(2)

   The American company sells one of the statues to an Australian customer for 12 USD.
   The exchange rate from Australian dollars (AUD) to USD is 1 AUD = 0.8739 USD.

   (c)   Calculate the amount that the Australian customer pays, in AUD, for this statue.
         Give your answer correct to **two decimal places**.

(2)
(Total 6 marks)