



DUNMAN SECONDARY SCHOOL

CANDIDATE
NAME

CLASS

INDEX
NUMBER

PRELIMINARY EXAMINATION 2026 SECONDARY 4 EXPRESS / 5 NORMAL ACADEMIC

MATHEMATICS

Paper 2

4052/02

25 August 2026

2 hours 15 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

Calculator Model

Answer **all** questions.

If working is needed for any question it must be shown with the answer.

Omission of essential working will result in loss of marks.

The total of the marks for this paper is 90.

The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

Total Marks

Mathematical Formulae*Compound interest*

$$\text{Total amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3} \pi r^3$$

$$\text{Area of a triangle } ABC = \frac{1}{2} ab \sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

$$\text{Standard deviation} = \sqrt{\frac{\Sigma fx^2}{\Sigma f} - \left(\frac{\Sigma fx}{\Sigma f} \right)^2}$$

TURN OVER FOR QUESTION 1

Answer **all** the questions.

- 1 (a) Find all the integers that satisfy the inequality $5 \leq 2x - 7 < 11$.

Answer [3]

- (b) Factorise $80x^2 - 45y^2$.

Answer [2]

- (c) Solve $\frac{18}{5-3x} = 4$.

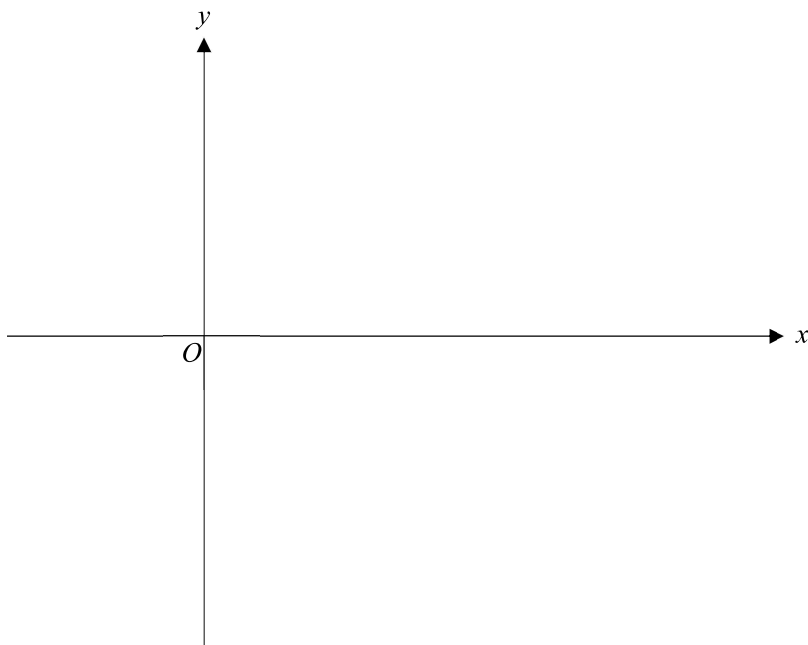
Answer $x =$ [2]

- (d) (i) Express $(x-3)^2 - 4$ in the form $(x-a)(x-b)$.

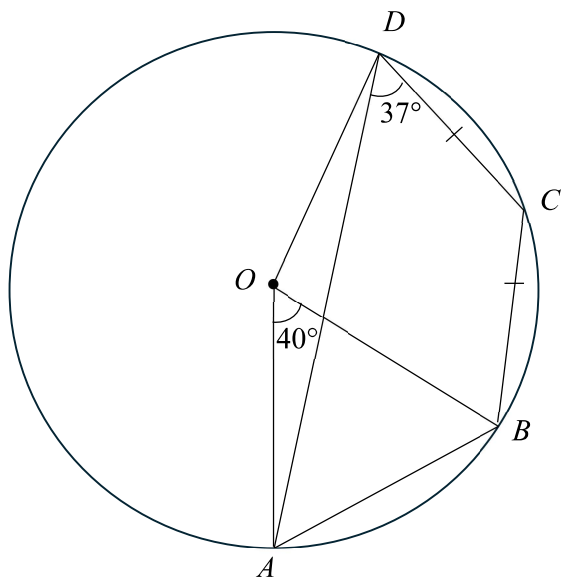
Answer[2]

- (ii) Sketch the graph of $y = (x-3)^2 - 4$ on the axes below.
Indicate clearly the coordinates of the points where the graph crosses the axes and the turning point.

Answer



[3]



The diagram shows a circle $ABCD$, centre O .

$BC = CD$.

Angle $AOB = 40^\circ$ and angle $ADC = 37^\circ$.

- (a) Find angle BCD .
Give a reason for each step of your working.

Answer Angle $BCD = \dots\dots\dots$ [3]

- (b) Find angle BOD .
Give a reason for each step of your working.

Answer Angle $BOD = \dots\dots\dots$ [2]

- (c) The radius of the circle is 7 cm.
Calculate the area of the minor segment $ABCD$.

Answer cm^2 [4]

- 3 A tour agency sold tour packages to Japan and Korea during a weekend travel fair.
 The usual cost of each Japan package is \$3700.
 The usual cost of each Korea package is \$3000.
 This information can be represented by the matrix $\mathbf{C} = \begin{pmatrix} 3700 & 3000 \end{pmatrix}$.
 The tour agency gave a 5% discount to all the tour packages sold during the travel fair.
 The discounted costs of the packages can be represented by the matrix $\mathbf{D}$, where $\mathbf{D} = k\mathbf{C}$.

The number of tour packages sold to each of the destinations during the travel fair is shown in the table below.

Destination	Number of Packages sold		
	Fri	Sat	Sun
Japan	23	18	39
Korea	17	31	44

- (a) Represent the number of tour packages sold in a 2×3 matrix $\mathbf{N}$.

Answer $\mathbf{N} =$ [1]

- (b) State the value of k .

Answer $k = \dots\dots\dots$ [1]

- (c) Evaluate the matrix $\mathbf{R} = \mathbf{DN}$.

Answer $\mathbf{R} =$ [2]

- (d) State what the elements of **R** represent.

.....

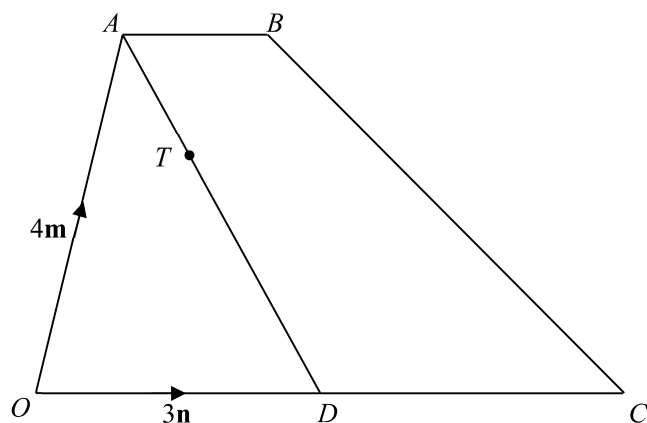
 [1]

- (e) In addition to the sales made at the travel fair, the agency sold 132 Japan tour packages and 95 Korea tour packages that month without any discount given.

Calculate the percentage of the month's overall sales revenue that came from the travel fair.

Answer % [4]

4



$OABC$ is a trapezium.

OC is parallel to AB and D is the midpoint of OC .

$\overrightarrow{OA} = 4\mathbf{m}$ and $\overrightarrow{OD} = 3\mathbf{n}$.

$3AB = 2OD$.

(a) Express $\overrightarrow{OB}$, as simply as possible, in terms of $\mathbf{m}$ and $\mathbf{n}$.

Answer $\overrightarrow{OB} = \dots\dots\dots$ [2]

T is a point on AD such that $AT : AD = 2 : 5$.

(b) Show that O , T and B are collinear.

Answer

[4]

- 5 Tap A takes x hours to fill a swimming pool.
 Tap B fills the same pool 2 hours faster than Tap A.
 Tap A and Tap B can fill up the swimming pool in 4 hours if they are both turned on together.

- (a) Write down an equation to represent this information and show that it reduces to

$$x^2 - 10x + 8 = 0$$

Answer

[3]

- (b) Solve the equation $x^2 - 10x + 8 = 0$, giving your solutions correct to two decimal places.

Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [3]

- (c) Calculate how long it would take Tap B to fill the tank alone.
 Give your answer in hours and minutes, correct to the nearest minute.

Answer $\dots\dots\dots$ hours $\dots\dots\dots$ minutes [1]

- 6 (a) The table of values for $y = \frac{5}{x} + 2x - 4$ is given below.

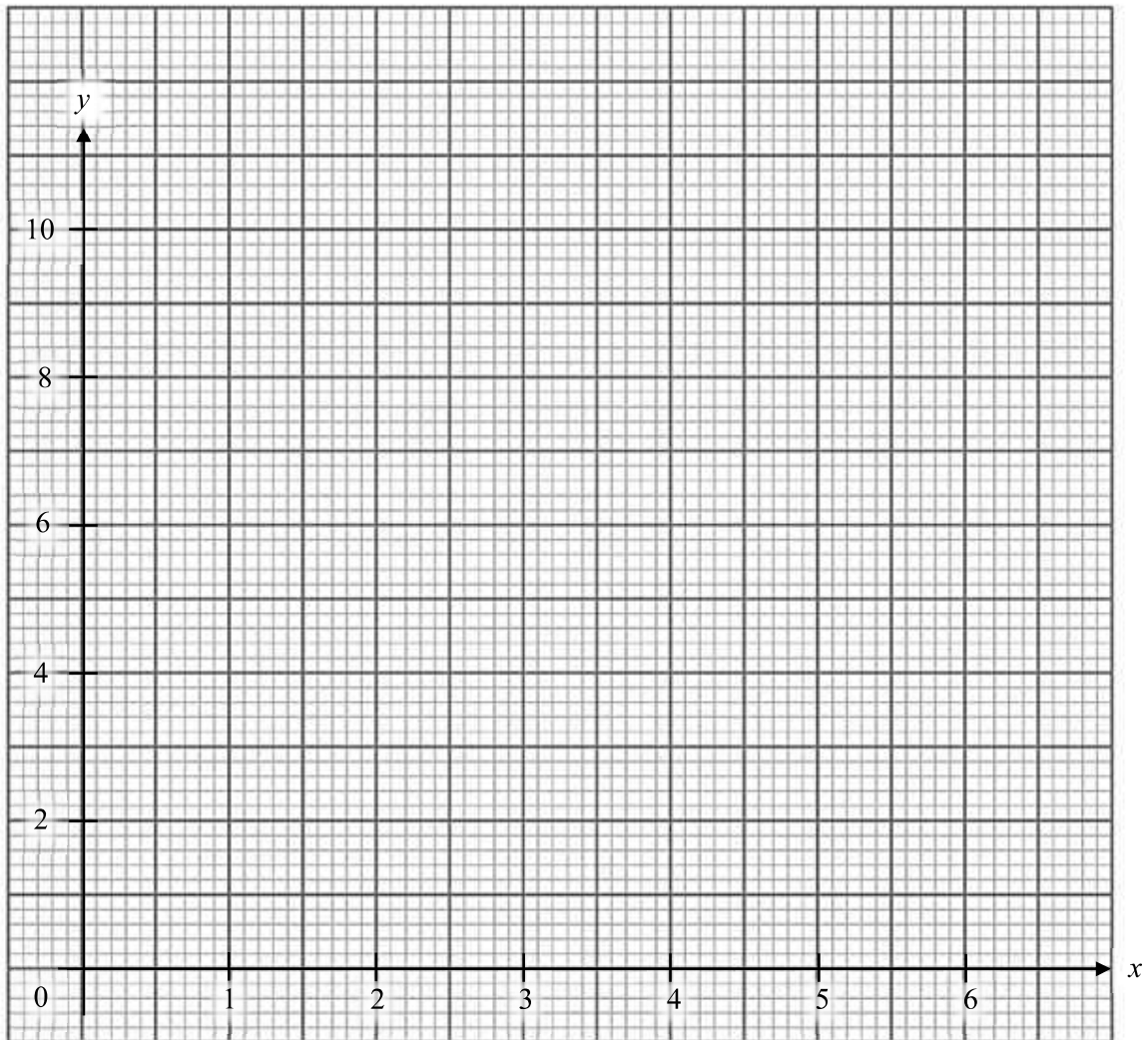
Values are given to one decimal place where appropriate.

x	0.5	1	1.5	2	2.5	3	4	5	6
y	7	3	p	2.5	3	3.7	5.3	7	8.8

Find the value of p .

Answer $p = \dots\dots\dots$ [1]

- (b) On the grid below, draw the graph of $y = \frac{5}{x} + 2x - 4$ for $0.5 \leq x \leq 6$.



[3]

- (c) The equation $x^2 - 9x + 5 = 0$ can be solved by finding the points of intersection of the straight line $y = ax + b$ and the curve $y = \frac{5}{x} + 2x - 4$.

- (i) Find the values of a and b .

Answer $a = \dots\dots\dots$

$b = \dots\dots\dots$ [3]

- (ii) On the same grid, draw the straight line $y = ax + b$. [2]

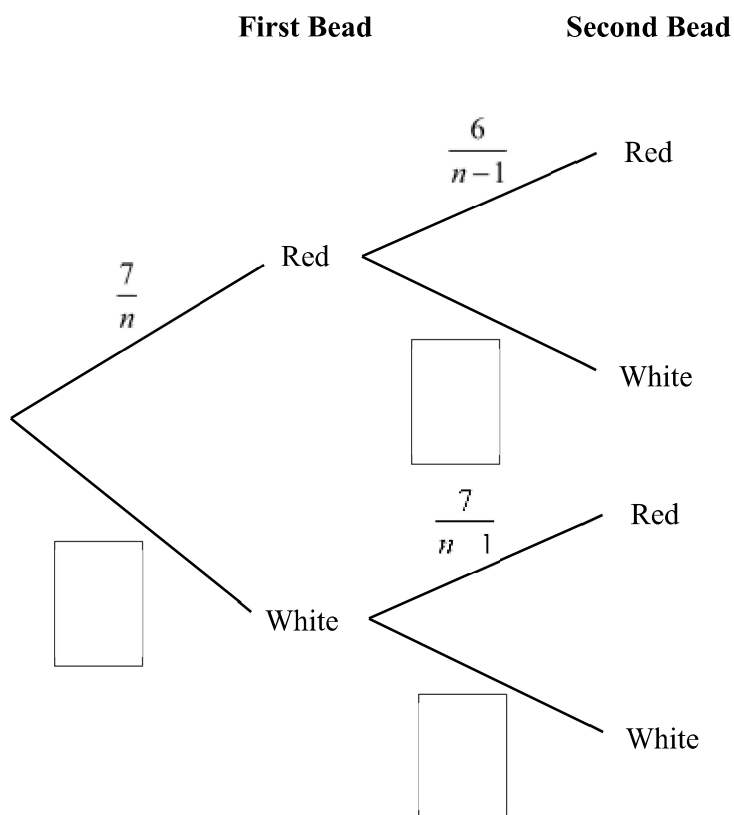
- (iii) Hence, from the graph, state the solution of $x^2 - 9x + 5 = 0$ for $0.5 \leq x \leq 6$.

Answer $x = \dots\dots\dots$ [1]

- 7 A bag contains n beads.
 7 of the beads are red and the rest are white.
 There are more white beads than red beads.
 Two beads are taken from the bag, at random, without replacement.

(a) Complete the tree diagram.

Answer



[3]

- (b) The probability that both beads taken are of the same colour is $\frac{11}{18}$.

Show that $n^2 - 37n + 252 = 0$.

Answer

[3]

- (c) By factorising $n^2 - 37n + 252 = 0$, find the values of n .

Answer $n = \dots\dots\dots$ or $\dots\dots\dots$ [2]

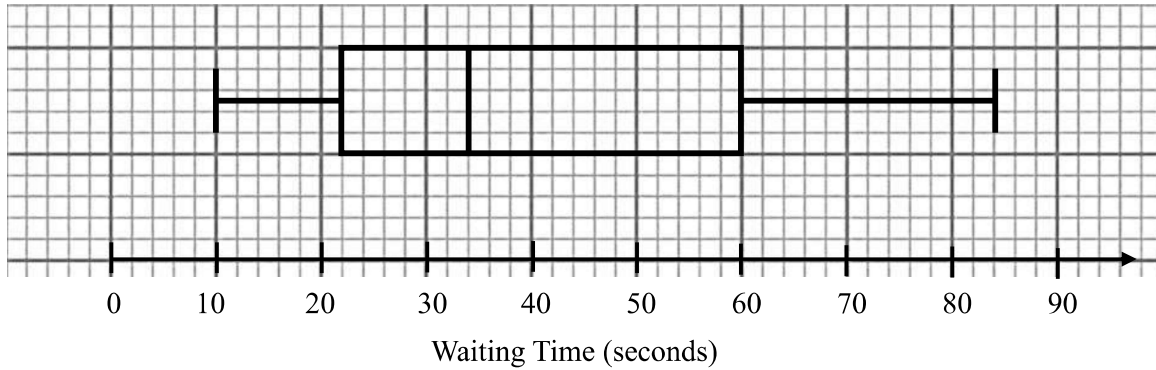
- (d) Explain why one of the solutions in **part (c)** must be rejected.

.....
 [1]

- (e) Find, as a fraction in its simplest form, the probability that at least one of the two beads chosen is white colour.

Answer [1]

- 8 A survey was carried out among the residents of HDB Block 301 Dunman Hill Road to find out about the waiting times, in seconds, for the lift during peak hours.
The box-and-whisker plot below represents these waiting times.



(a) State

(i) the median waiting time,

Answer seconds [1]

(ii) the interquartile range of the waiting times.

Answer seconds [1]

(b) 30 residents surveyed experienced a waiting time of more than 1 minute.

Calculate the total number of residents surveyed in Block 301.

Answer residents [1]

- (c) A similar survey was also carried out at the next block, Block 302.
The table shows the waiting times of the residents surveyed.

Waiting Time (t seconds)	$0 < t \leq 15$	$15 < t \leq 30$	$30 < t \leq 45$	$45 < t \leq 60$	$60 < t \leq 75$	$75 < t \leq 90$
Number of residents	8	27	10	13	5	2

- (i) Find the interval that contains the median waiting time for the lift at Block 302 during peak hours.

Answer $< t \leq$ [1]

- (ii) Calculate an estimate of the mean waiting time.

Answer seconds [1]

- (iii) Calculate an estimate of the standard deviation of the waiting time.

Answer seconds [1]

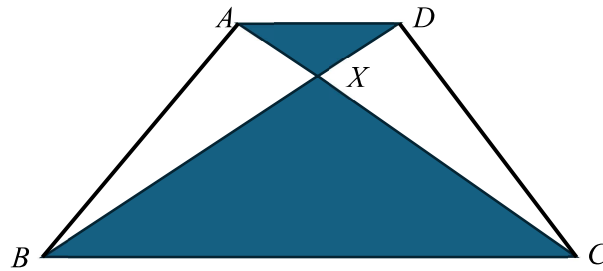
- (iv) The lift is considered more efficient if the average waiting time is shorter.

Make a comment comparing the efficiency of the lifts at the two blocks during peak hours.

.....

 [1]

- 9 In the diagram below, $ABCD$ is a trapezium such that AD is parallel to BC . Lines AC and BD intersect at point X .



- (a) Show that triangle CBX is similar to triangle ADX .

Answer

[2]

- (b) The ratio $AD : BC = 2 : 5$.

Find the ratio of

- (i) area of triangle ADX : area of triangle CBX ,

Answer : [1]

- (ii) area of triangle ABD : area of triangle ABC ,

Answer : [1]

- (iii) area of triangle ABX : area of trapezium $ABCD$.

Answer : [2]

- (c) Given that the area of triangle ABX is 8 cm^2 , find the area of the shaded region.

Answer cm^2 [2]

- (d) State an additional condition for triangle BAX and triangle CDX to be congruent.
Support your answer with reasons.

Answer [2]

- 10 Green Delights Cafe allows customers to create their own healthy salad bowl where they choose :

- 1 base,
- 2 toppings,
- 1 main and
- 1 dressing.

GREEN DELIGHTS CAFÉ

1 STEP 1: Choose Your Foundation Bowl		BASES (CHOOSE 1)			Energy (kcal)	Protein (g)	Sodium (mg)	2 STEP 2: Add Your Main		MAIN (CHOOSE 1)			Energy (kcal)	Protein (g)	Sodium (mg)
		Brown Rice	250	6.5	5			Grilled Salmon Fillet	130	22.0	90				
		Romaine Lettuce	20	1.2	10			Smoked Duck Slices	210	18.0	450				
		Quinoa	220	8.0	5			Teriyaki Chicken	160	20.0	380				
		Soba Noodles	190	5.5	40			Tofu Medley	110	9.0	20				
		TOPPINGS (CHOOSE 2)			Energy (kcal)	Protein (g)	Sodium (mg)			DRESSING (CHOOSE 1)			Energy (kcal)	Protein (g)	Sodium (mg)
			Hard-boiled Egg	70	6.0	60				Balsamic Vinaigrette	45	0.2	120		
			Roasted Corn	65	2.0	5				Creamy Caesar	160	1.0	310		
			Parmesan Cheese	40	3.5	150				Sesame Ginger	90	0.5	250		
			Avocado Slices	120	1.5	5				Honey Mustard	120	0.3	280		
			Sunflower Seeds	80	2.5	2									

- (a) Karen selected romaine lettuce, parmesan cheese, sunflower seeds, smoked duck slices with creamy caesar dressing for her own salad bowl combination.

- (i) Calculate the total protein content in Karen's choice of salad bowl.

Answer g [1]

- (ii) Calculate the amount of energy (in kcal) Karen will gain from her choice of salad bowl.

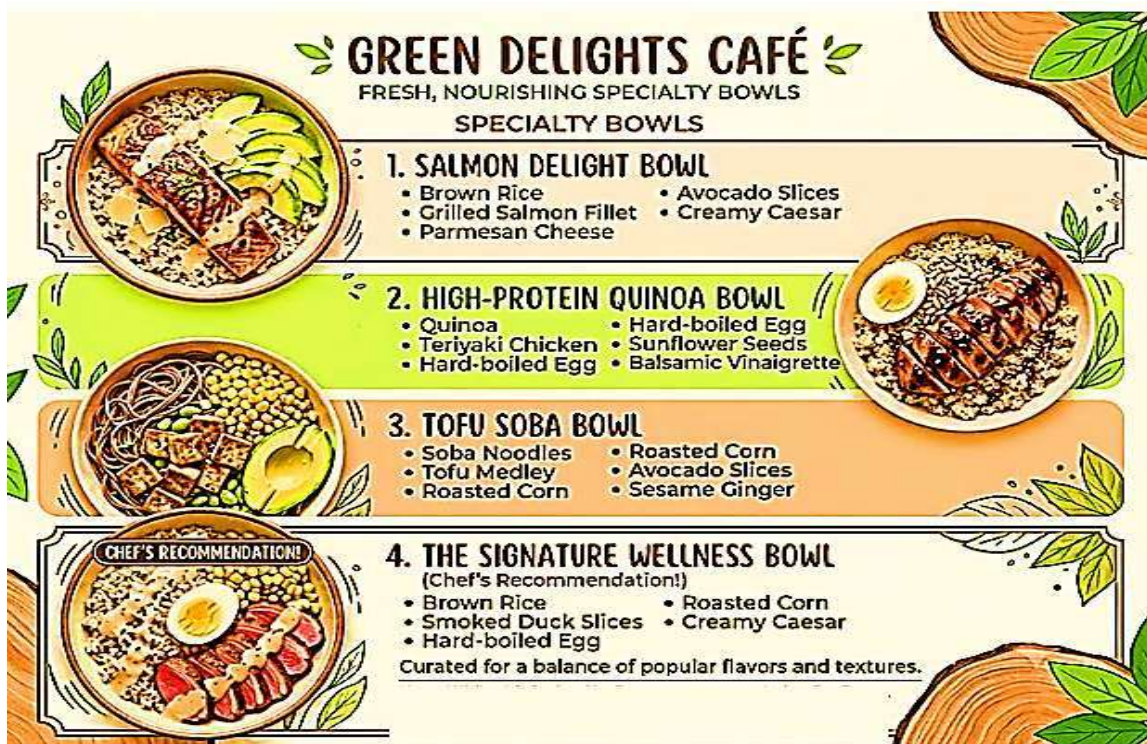
Answer kcal [1]

- (b) Propose the ingredients to select for a healthy salad bowl that offers the lowest amount of sodium content possible.

.....

 [2]

The cafe also offers a few specialty bowl combinations.



- (c) A dish that meets the following three key nutritional standards is awarded a "Healthy Choice Label" by the Health Promotion Board.

Nutritional Category	Standard Requirement (per meal)
Energy	Between 500 kcal and 700 kcal
Protein	At least 25 g
Sodium	No more than 600 mg

The cafe would like to obtain the "Healthy Choice Label" for its chef's recommendation "Signature Wellness Bowl".

However, the chef commented that it did not meet the nutritional standards requirements.

Show that the chef's comment is correct and state which requirement(s) are not met.

Suggest 1 replacement (either base, topping, main or dressing) to the combination so that it will meet all the nutritional standards requirements.

Support your answers with appropriate calculations.

Answer Space for Question 10c

.....

..... [6]

24
BLANK PAGE