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FORMULA SHEET

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MODULE 1 / NUMBER PATTERNS

Andrew's swim time is recorded during a rigorous training program. The time to the nearest second for the first three laps is shown in the table below.

Lap	1	2	3
Time (seconds)	50	48.5	47

Question 1

Andrew's trainer believes that the swim time will form a decreasing arithmetic sequence.

- a. Show that Andrew's trainer is correct.

1 MARK

- b. An expression for Andrew's swim time in the n th lap can be written as $A_n = b - 1.5n$. Determine the value of b .

1 MARK

- c. Andrew's fastest swim time is 17 seconds for one lap of the pool. If he continues in this sequence, how many laps does he swim to achieve his fastest time?

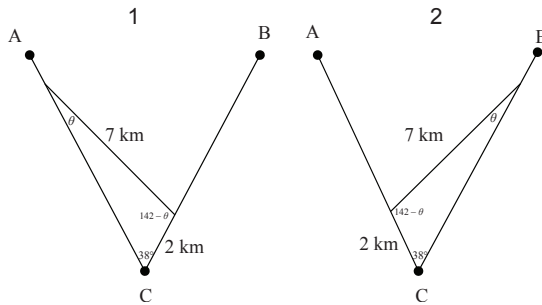
1 MARK

- d. Find the total time he swam to complete his fastest and final lap. Give your answer in seconds correct to one decimal place.

1 MARK

Question 2b:

2 marks



The solution starts with triangle 2:

Using the sine rule:

$$\frac{7}{\sin 38^\circ} = \frac{2}{\sin \theta}$$

$$\sin \theta = \frac{2 \times \sin 38^\circ}{7}$$

$\theta = 10^\circ$ (to the nearest degree)

The angle between the bypass and the track from C to B in triangle 2 is 10° .

As triangle 1 is a reflection of triangle 2, its angle θ will be the same as in triangle 2.

This means that the angle made by the bypass and the track from C to B in triangle 1 will be given by the following formula:

$$\begin{aligned} \angle &= 180 - (38 + \theta) \\ &= 142 - \theta \\ &= 142 - 10 \\ &= 132^\circ \text{ (to the nearest degree)} \end{aligned}$$

Marks

1 mark for each answer

TIP

This question looks like an instance of the ambiguous case of the sine rule, but is in fact not. The two triangles are reflections of each other, and the question asks for the value of two different angles in them.

MODULE 3 / GRAPHS AND RELATIONS

Question 1a:

1 mark

	Iron	Niacin	Vitamin D
Betta-life	30 mg	50 mg	10 mg
Foodie-fix	20 mg	20 mg	20 mg
Additional daily requirement	160 mg	200 mg	80 mg

Marks

1 mark for correct values

Question 1b:

2 marks

niacin: $50x + 20y \geq 200$

vitamin D: $10x + 20y \geq 80$

Marks

1 mark for the correct value in each equation

1 mark for the correct constraints

Question 1c:

1 mark

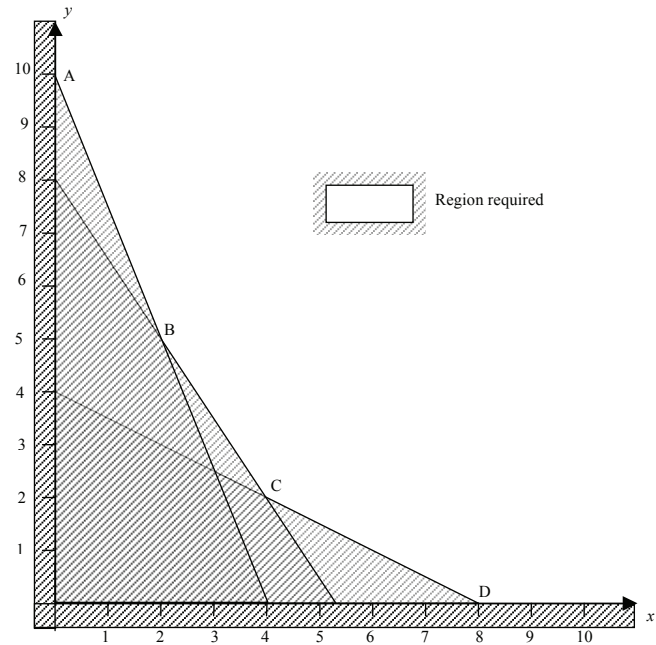
$x \geq 0$ and $y \geq 0$

Marks

1 mark for correct constraints

Question 1d:

3 marks



Nutrient	Constraint line	Calculate x-intercept (y = 0)	Calculate y-intercept (x = 0)	Test point (0,0)
Niacin	$50x + 20y \geq 200$	$50x + 20(0) = 200$ $50x = 200$ $x = 4$ x-intercept: (4,0)	$50(0) + 20y = 200$ $20y = 200$ $y = 10$ y-intercept: (0,10)	$50(0) + 20(0) \geq 200$ $0 + 0 \geq 200$ $0 \geq 200$ (false) So the required region does <i>not</i> include the point (0,0)
Vitamin D	$10x + 20y \geq 80$	$10x + 20(0) = 80$ $10x = 80$ $x = 8$ x-intercept: (8,0)	$10(0) + 20y = 80$ $20y = 80$ $y = 4$ y-intercept: (0,4)	$10(0) + 20(0) \geq 80$ $0 + 0 \geq 80$ $0 \geq 80$ (false) So the required region does <i>not</i> include the point (0,0)

Marks

1 mark for the correct lines

1 mark for the correct shading (must include non-negative shading)

1 mark for the key

TIP

Alternatively, this can be solved using a graphics calculator.