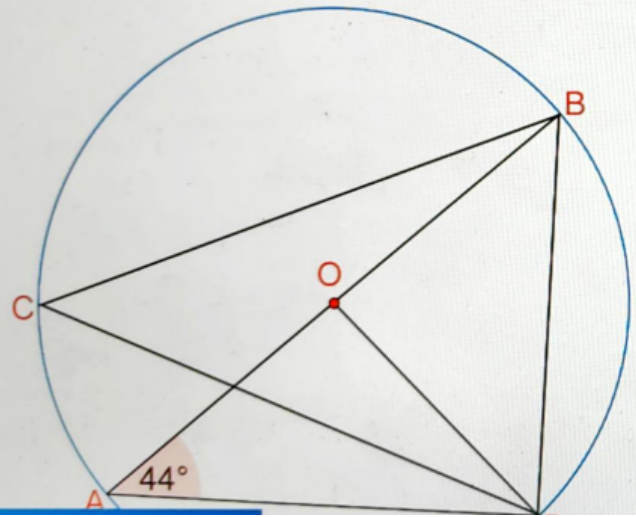
Question 1a (3 marks)

The following circle has centre O. The points A, B, C and D lie on the circumference such that O lies on AB.

Diagram not to scale

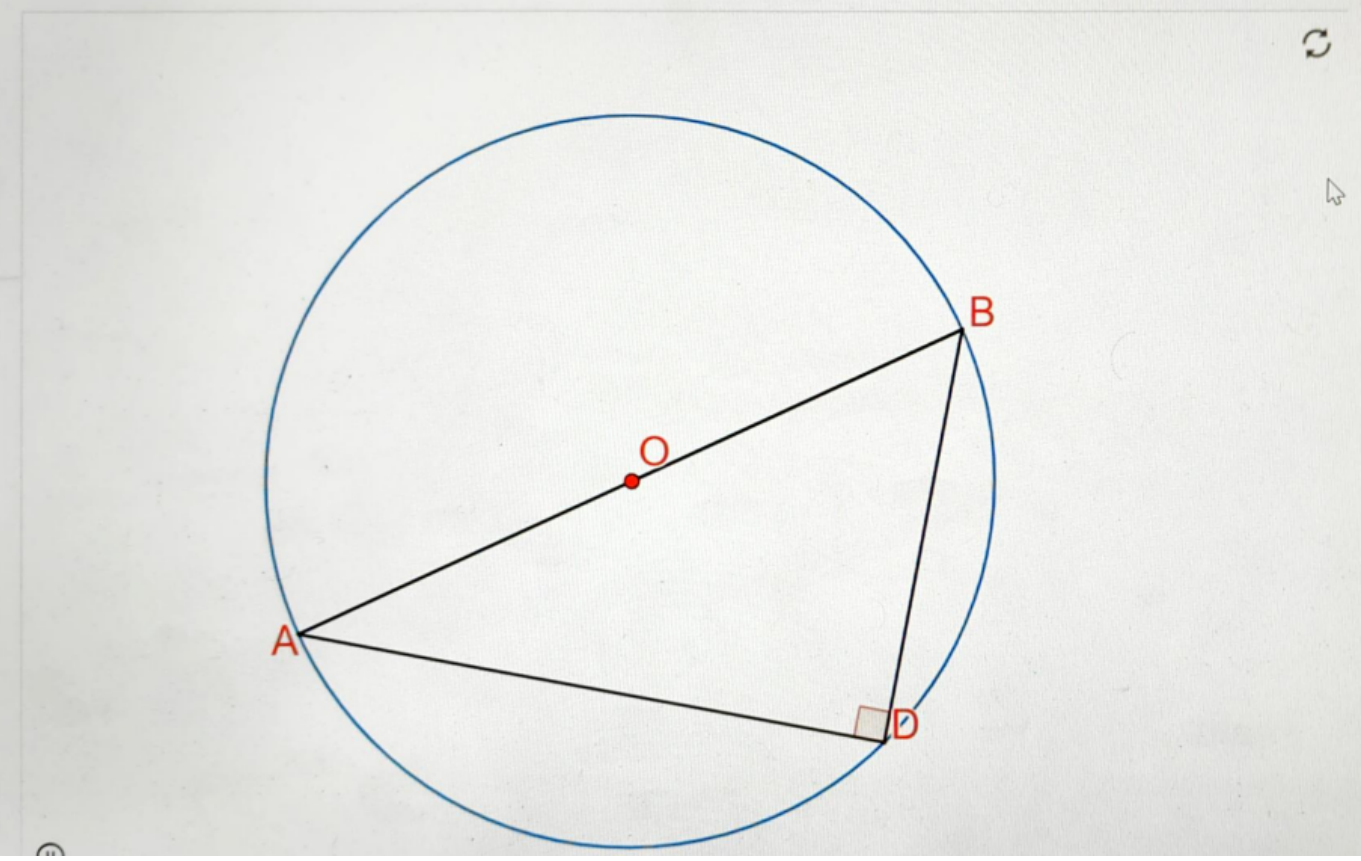


Given that angle DAB is 44°, **determine** the size of the following angles.

Angle AOD ____ °

Angle DOB ____ °

Angle DCB ____ °


B
O
A
D

Using your knowledge of circle theorems, **write down** why angle ADB is 90°.

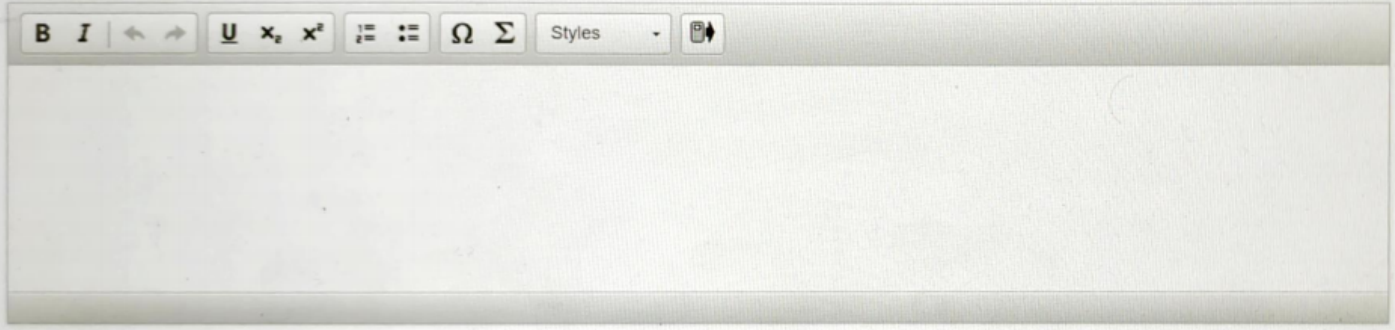
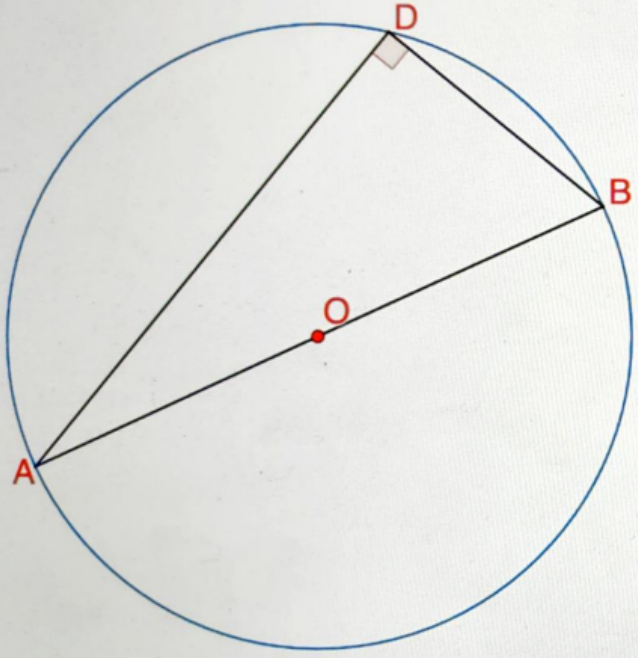


Diagram not to scale



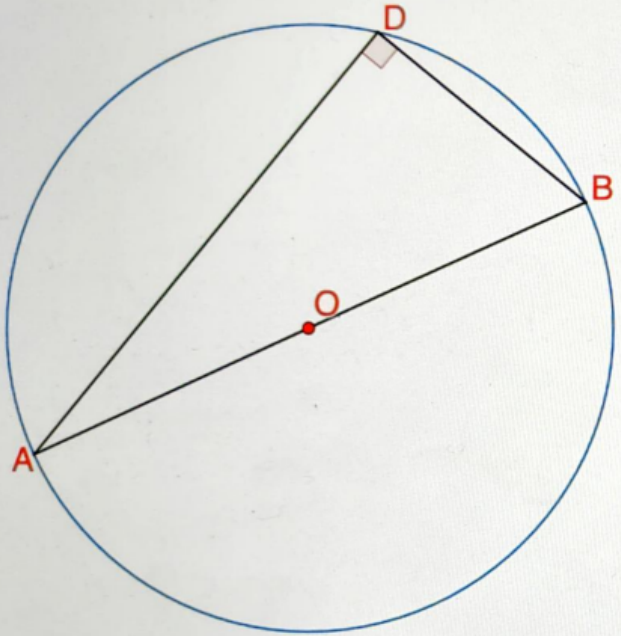
Question 1c (2 marks)

Given that, AD = 12 cm and BD = 6 cm, **find** the length of AB. Give your answer in simplified surd form $a\sqrt{b}$ where a and b are integers.

B I U x_2 x^2 Ω Σ

Styles

Diagram not to scale



Question 1d (2 marks)

Hence, **determine** the area of the circle.

B I U x_2 x^2 Ω Σ

Styles

Question 2 (7 marks)

MYP Academy is presenting a talent show for their community.

Some students from the Academy and some members of the community are performing in the show.

Question 2a (1 mark)

A total of 175 people will be at the show.

In the following Venn diagram:

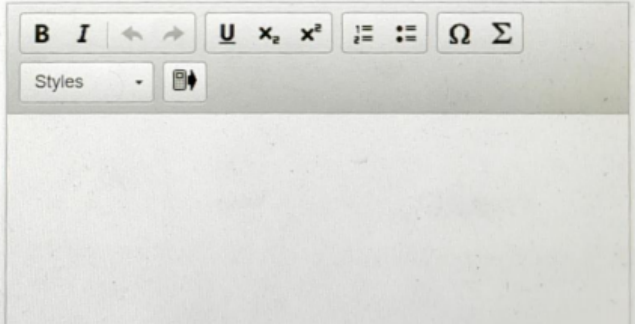
Set A represents the number of Academy students at the show.

Set B represents the number of performers in the show.

Determine the value of K.

Question 2b (1 mark)

Describe K in context.



Question 2a (1 mark)

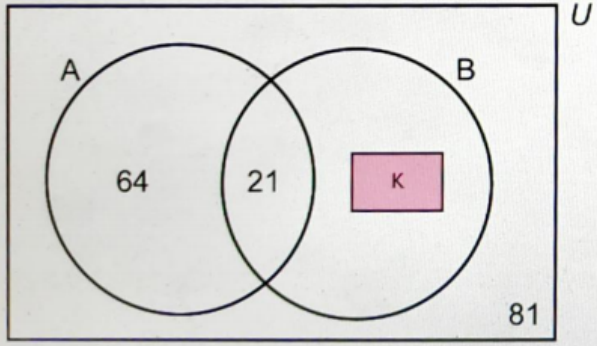
A total of 175 people will be at the show.

In the following Venn diagram:

Set A represents the number of Academy students at the show.

Set B represents the number of performers in the show.

Determine the value of K.



Question 2b (1 mark)

Describe K in context.

B I U x_2 x^2 Ω Σ

Styles

Question 2c (2 marks)

One of the performers is selected at random to introduce the show.

Determine the probability that the

Question 2a (1 mark)

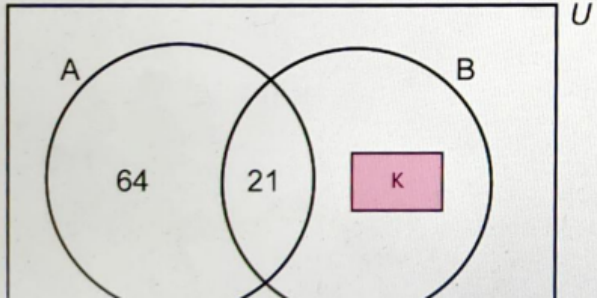
A total of 175 people will be at the show.

In the following Venn diagram:

Set A represents the number of Academy students at the show.

Set B represents the number of performers in the show.

Determine the value of K.



Question 2c (2 marks)

One of the performers is selected at random to introduce the show.

Determine the probability that the selected performer is an Academy student.

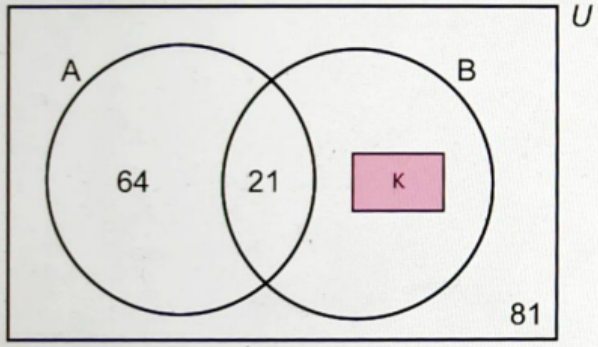
B I U x_2 x^2 Ω Σ

Styles

students at the show.

Set B represents the number of performers in the show.

Determine the value of K.



Question 2d (3 marks)

Three people at the show are selected at random.

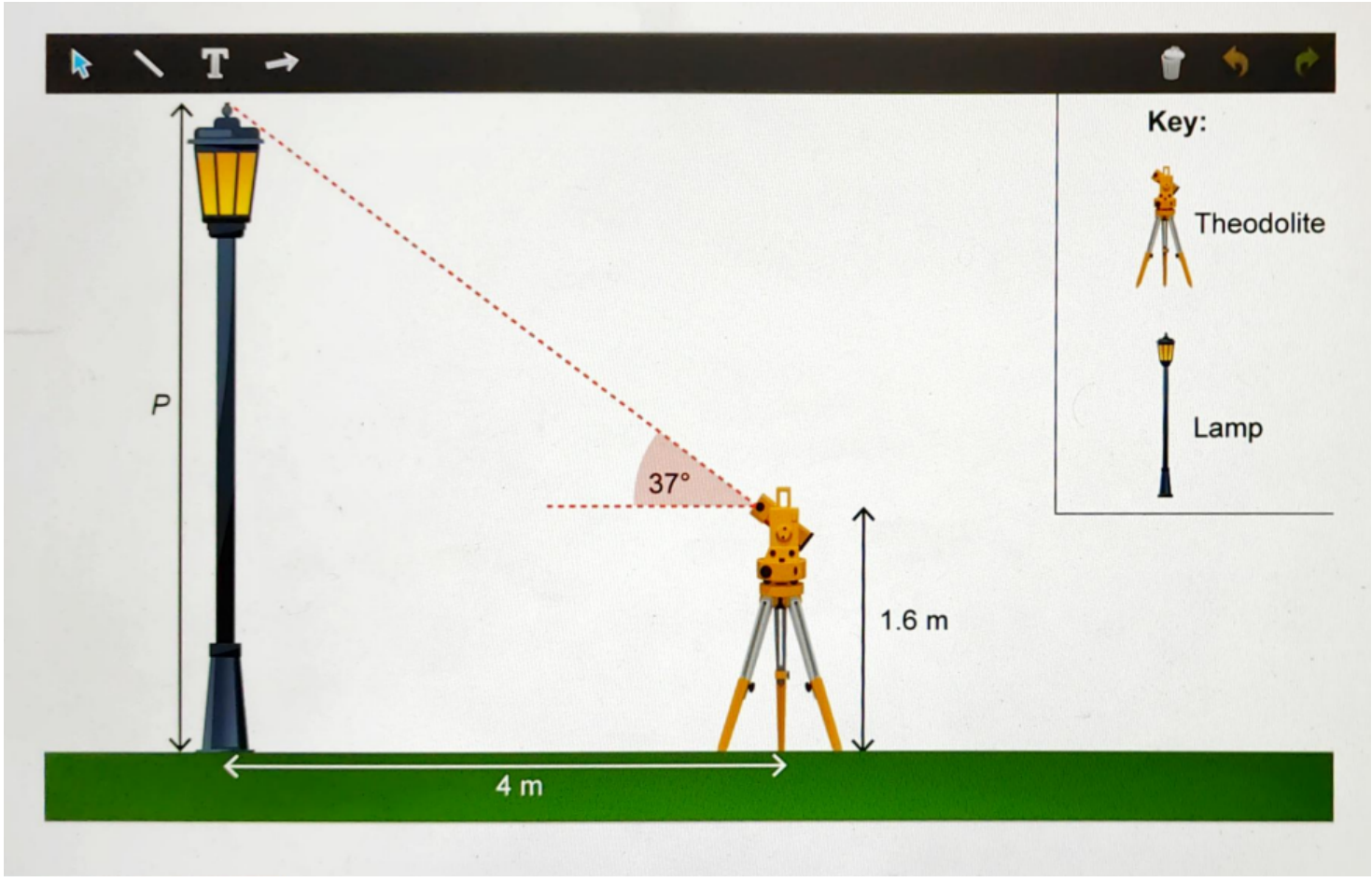
Calculate the probability that the three people are performers.

B I U x_2 x^2 Ω Σ

Styles

Question 3a (3 marks)

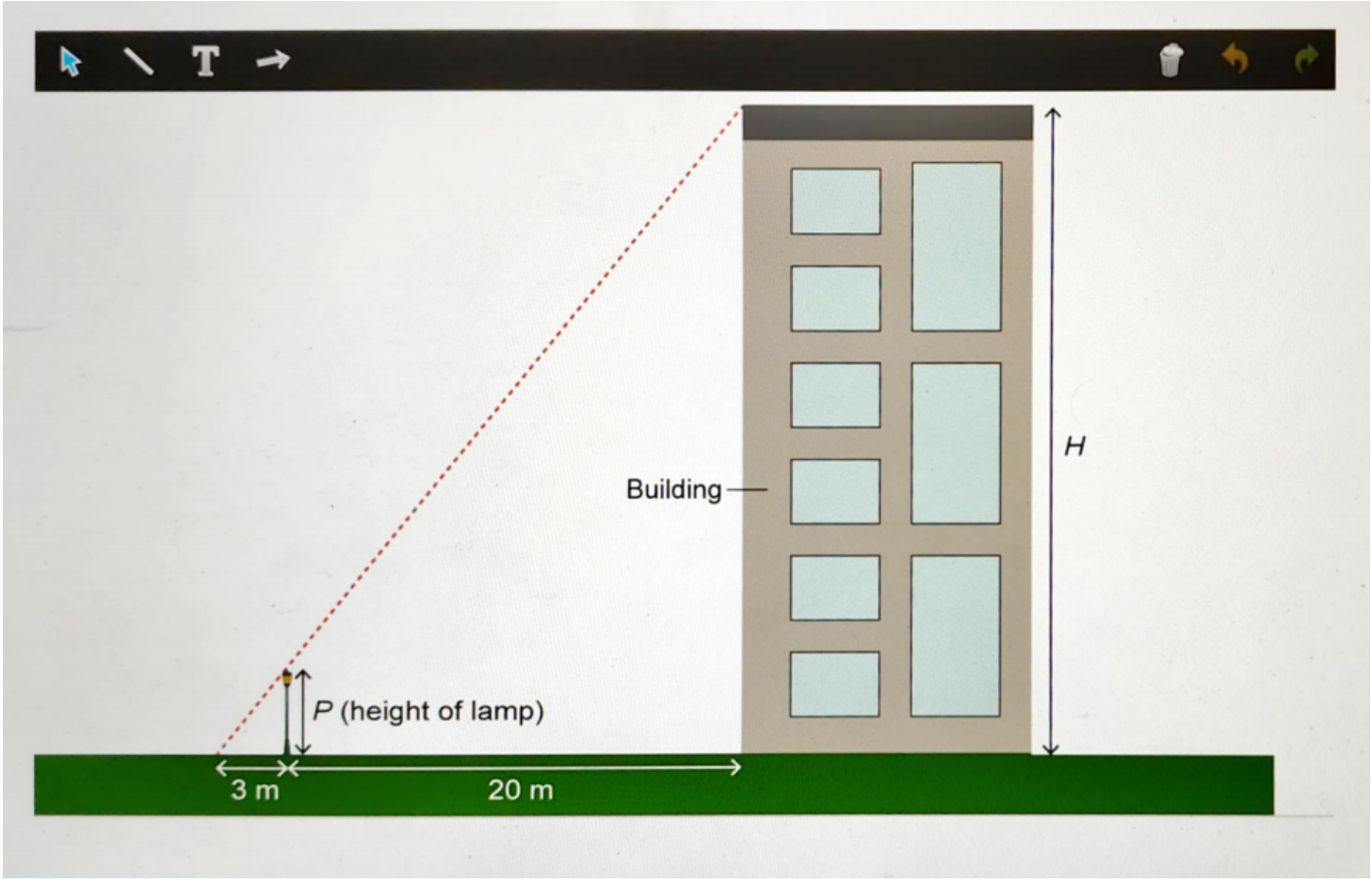
The height of a lamp is calculated using a measuring instrument called a theodolite.
The theodolite measures angles. The theodolite has a height of 1.6 metres and is positioned 4 metres from the lamp. The angle of elevation to the top of the lamp is 37 degrees.
The measurements are shown on the following diagram.


Key:
Theodolite
Lamp
P
37°
1.6 m
4 m

Calculate the height of the lamp *P*.

Question 3b (4 marks)

The lamp is 20 metres from a building as shown in the diagram.


Building
H
P (height of lamp)
3 m
20 m

Calculate the height (H) of the building. Write your answer to the nearest metre (m).

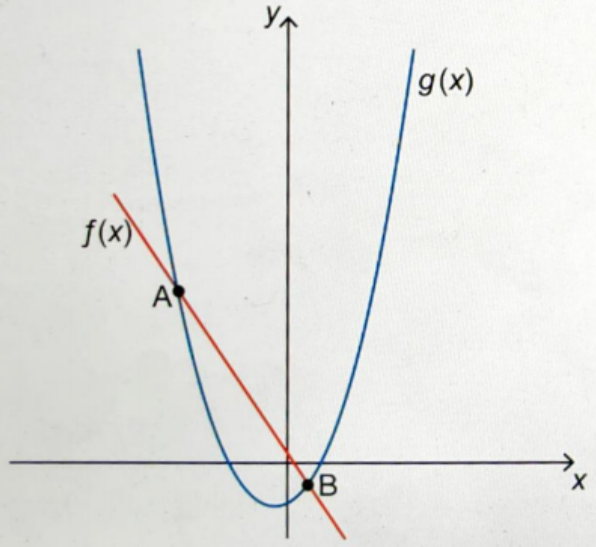
Question 4a (3 marks)

Given that, $f(x) = 1 - 3x$ and $g(x) = x^2 + x - 4$

Solve $f(x) = g(x)$

Question 4b (3 marks)

The solutions of the equation $f(x) = g(x)$ are the x coordinates of the points A and B shown on the following graph.



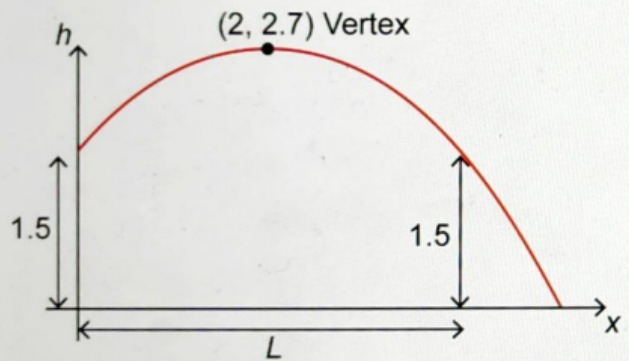
Using your answers from (a), **find** the values of the y coordinates of points A and B.

B I U x_2 x^2 Ω Σ

Styles

Question 5 (7 marks)

A basketball is thrown in the air from a height of 1.5 metres (m). The path of the basketball is represented by a parabola.



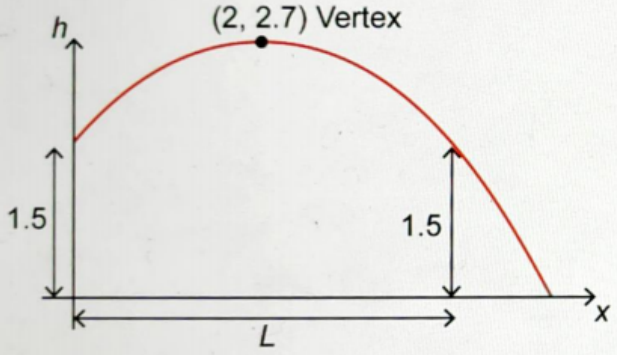
Question 5a (1 mark)

The ball is at the height 1.5 m again when its distance from the starting point is L. **Determine** the value of L.

B I U x_2 x^2 Ω Σ

Styles

A basketball is thrown in the air from a height of 1.5 metres (m). The path of the basketball is represented by a parabola.



Question 5b (2 marks)

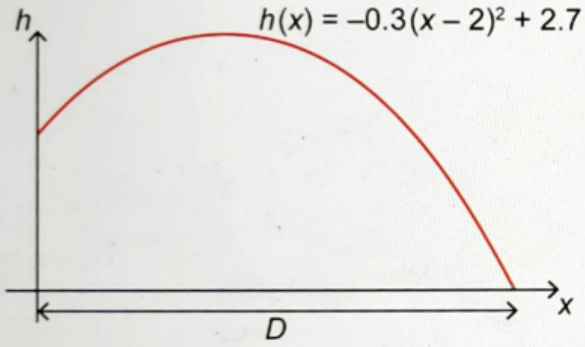
The path of the basketball is represented by a parabola in the form $h(x) = a(x - 2)^2 + 2.7$.

Show that $a = -0.3$.

B I U x_2 x^2 Ω Σ

Styles

Question 5c (4 marks)



The ball hits the ground at distance D.

Find the value of D.

B I U x_2 x^2 Ω Σ

Styles

Around the time of the French revolution, in 1790, French scientists created the metric system to measure weights and distances.

For a few years, the French abandoned the Gregorian 24 hour measure of time and adopted a metric measure of time.

This metric time was called 'The French Revolutionary time' and began officially on the 24 of November 1793.

Humans have evolved to live within the routine of a day.

Metric time uses 10 hours for one day instead of 24 hours for one day. Each metric hour has 100 minutes and each metric minute has 100 seconds.

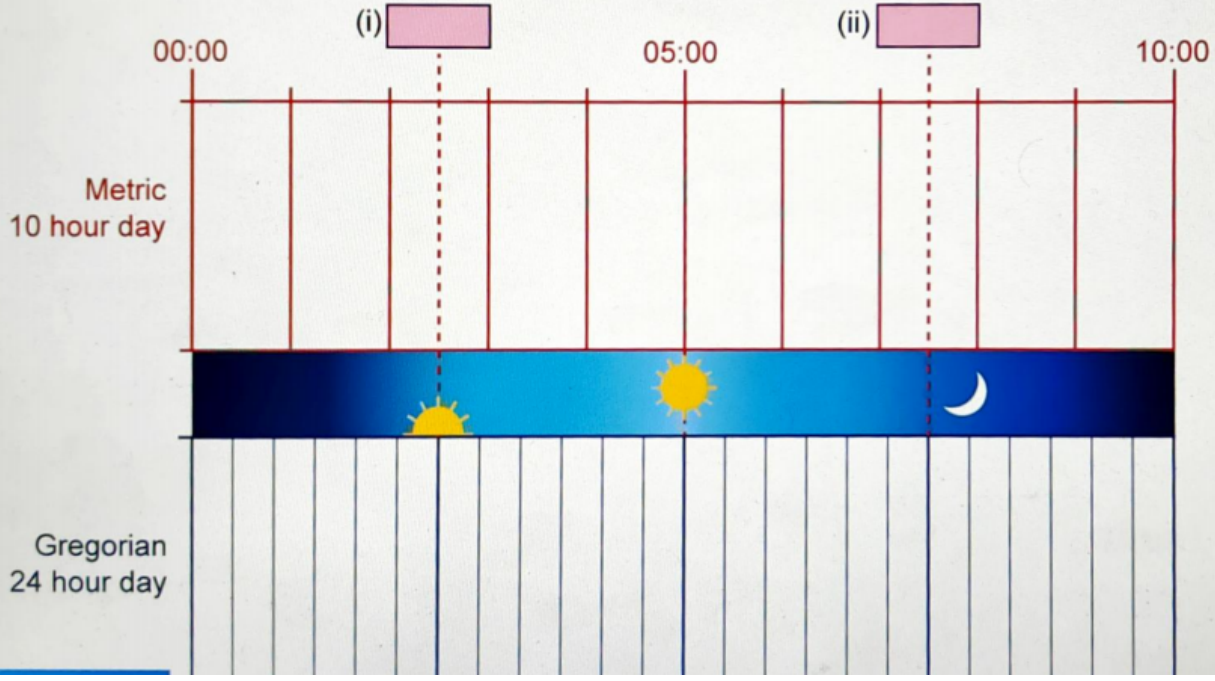
Despite its simplicity, the new system was not at all popular. Replacing all clocks was expensive and it became increasingly difficult to trade with other countries which did not adopt the metric time.

In this question you will make comparisons between Gregorian and metric time and observe how simple calculations are in terms of metric time.

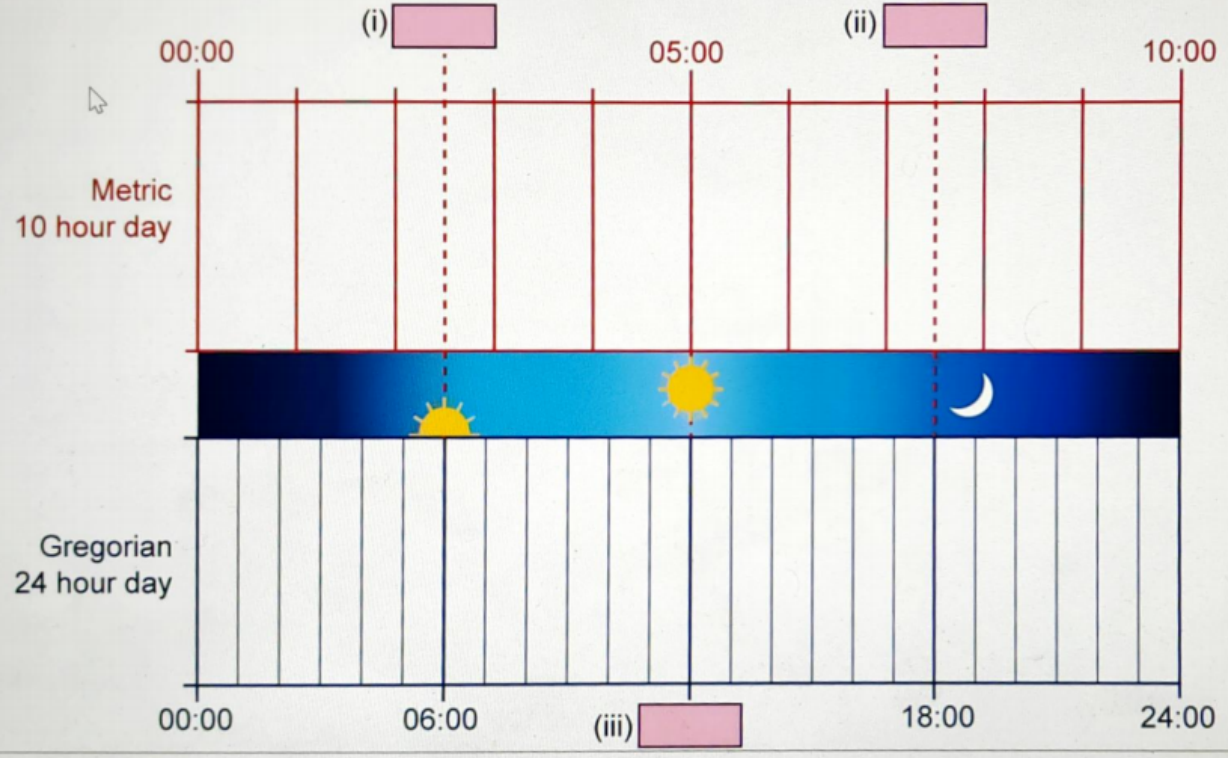
Question 6a (2 marks)

The following diagram shows one day in two systems of time, metric and Gregorian.

Write down the missing times on the diagram.



Write down the missing times on the diagram.



Question 6b (2 marks)

Determine the number of Gregorian hours and minutes in one metric hour.

B I U x_2 x^2 Ω Σ Styles

Metric system	Gregorian system
1 hour(s) 0 minute(s)	____ hour(s) ____ minute(s)

Question 6c (4 marks)

Metric time conversions are shown in the following infographic.

This media is interactive

Stage 1

Stage control

For example: 528 030 metric seconds is equivalent to:

Question 6c (4 marks)

Metric time conversions are shown in the following infographic.

This media is interactive

Stage 1

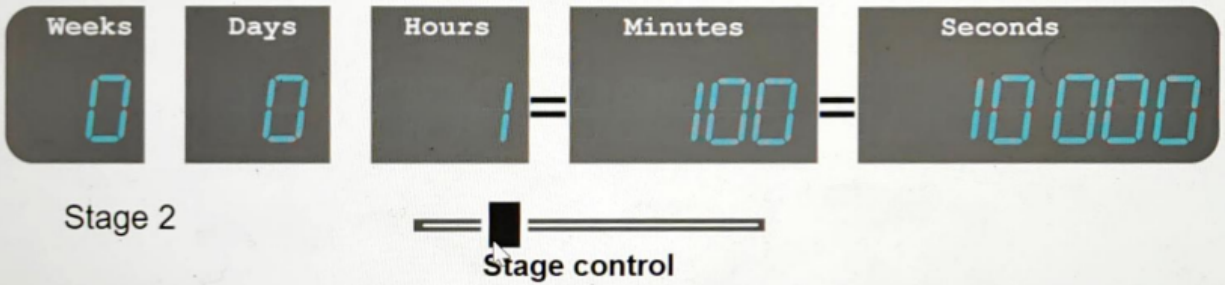
Stage control

For example: 528 030 metric seconds is equivalent to:

Question 6c (4 marks)

Metric time conversions are shown in the following infographic.

This media is interactive

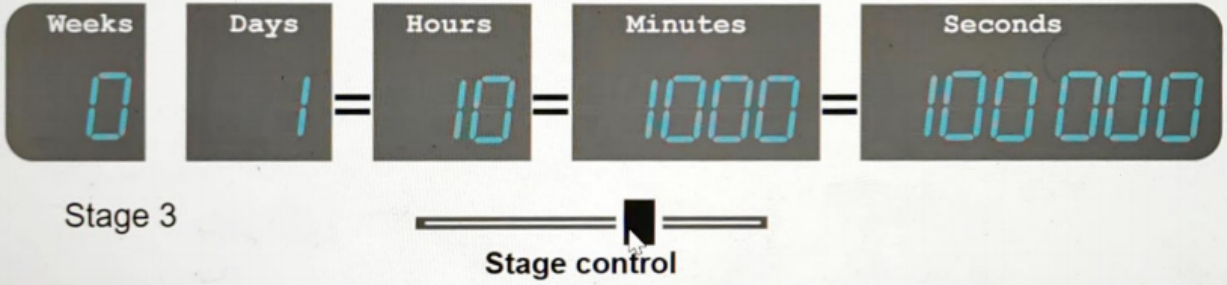


For example: 528 030 metric seconds is equivalent to:

Question 6c (4 marks)

Metric time conversions are shown in the following infographic.

This media is interactive



For example: 528 030 metric seconds is equivalent to:

Question 6c (4 marks)

Metric time conversions are shown in the following infographic.

This media is interactive

Stage 4

Stage control

For example: 528 030 metric seconds is equivalent to:

For example: 528 030 metric seconds is equivalent to:

Write down the missing times in the following table.

School event	Metric time	Metric seconds in standard form
Examination	90 minutes	$\square \times \square^{\square}$
School day	2 hours and 40 minutes	$\square \times \square^{\square}$
Time to run 10 kilometres		5.3×10^3
Climbing mount Kilimanjaro	4 days, 2 hours and 5 minutes	$\square \times \square^{\square}$

Question 6d (2 marks)

A school timetable is created using metric time. All the following questions are in the context of metric time.

The timetable has a number of single lessons and a number of double lessons.

The mathematics department is requested to plan the lessons for the year with the following information:

- S represents the number of single lessons
- D represents the number of double lessons
- S + D = 160
- Single lessons are 20 metric minutes long
- Double lessons are 40 metric minutes long
- 20S + 40D = 4000

Describe the equations in the table in words.

Describe the equations in the table in words.

Equation	Description in words
$S + D = 160$	
$20S + 40D = 4000$	

Question 6e (4 marks)

By solving simultaneous equations, **find** the values of S and D.

B I U x_2 x^2 Ω Σ Styles

The MYP 5 chemistry class is creating copper sulphate crystals from a solution.

It takes **one** metric day for the solution to form 2.987 grams of copper sulphate crystal.

Question 6f (1 mark)

Show that the rate of production is 2.987 milligrams per minute.

B I U x_2 x^2 Ω Σ Styles

Question 6g (3 marks)

Calculate the maximum number of grams that can be produced from 04:00 on Day 1 to 04:90 on Day 2. Give your answer to the nearest gram.

B I U x_2 x^2 Ω Σ Styles

Question 6f (1 mark)

Show that the rate of production is 2.987 milligrams per minute.

B I U x_2 x^2 Ω Σ

Styles

Question 6g (3 marks)

Calculate the maximum number of grams that can be produced from 04:00 on Day 1 to 04:90 on Day 2. Give your answer to the nearest gram.

B I U x_2 x^2 Ω Σ

Styles

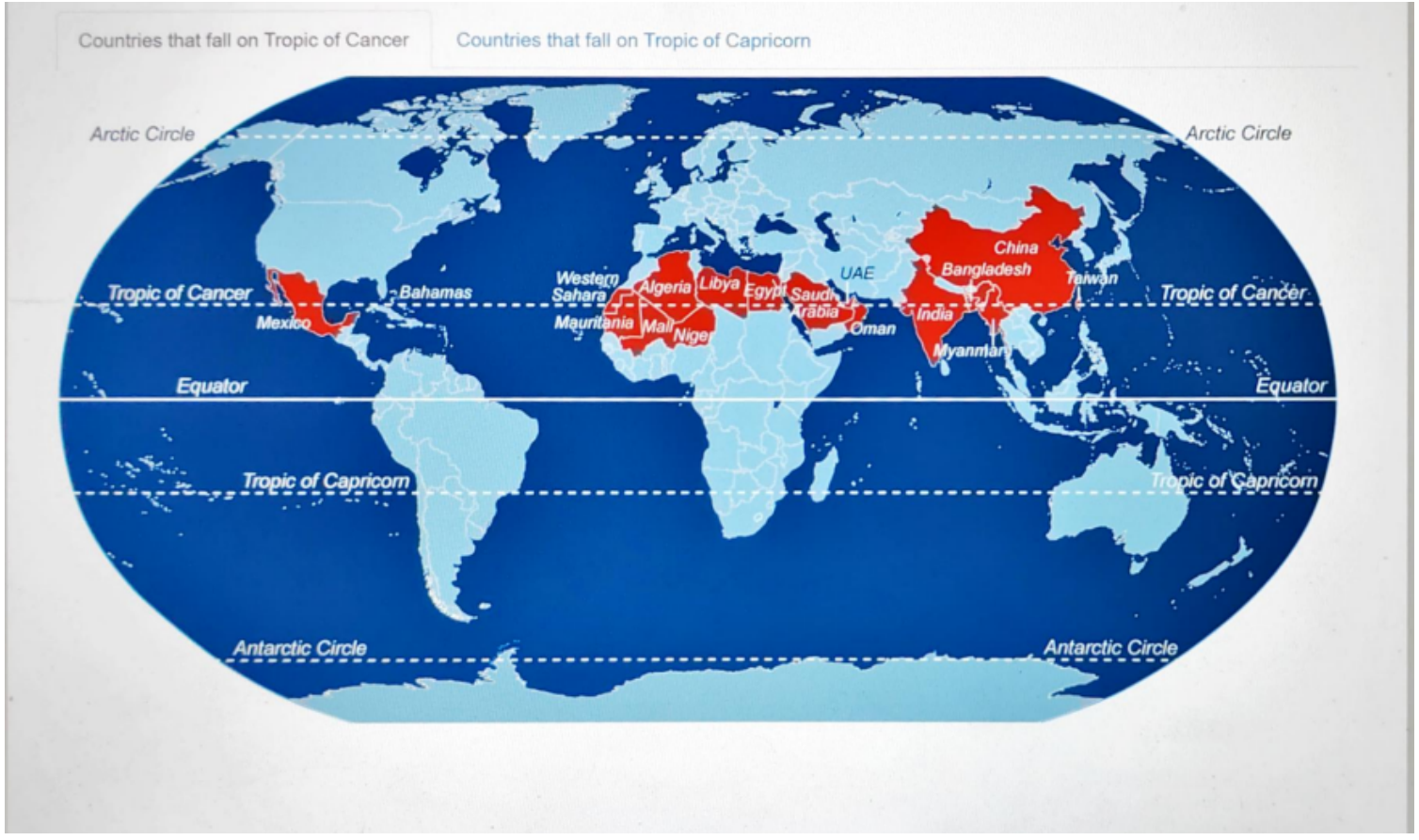
Question 7 (17 marks)

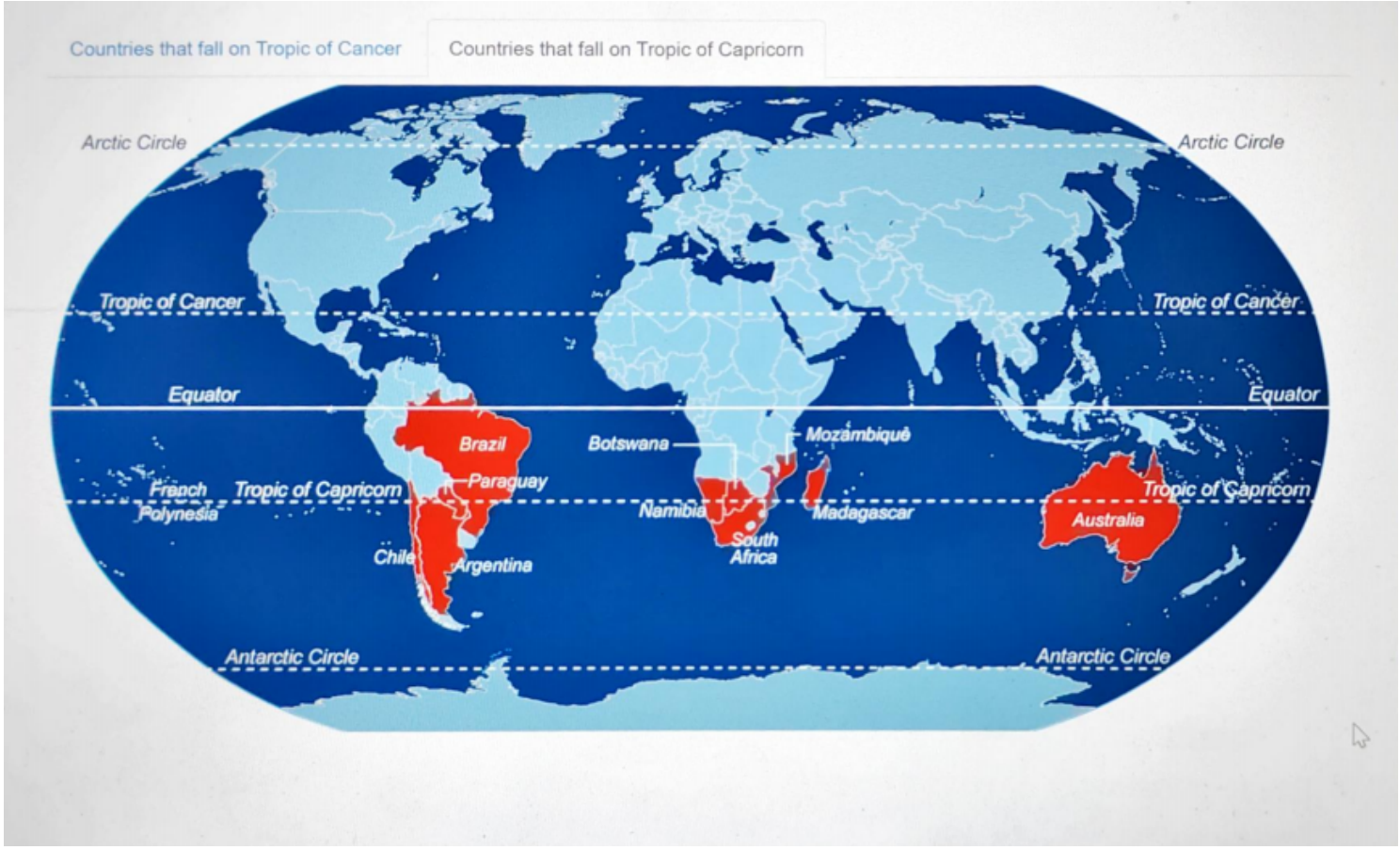
The Tropics of Cancer and Capricorn are lines of latitude that are parallel to the equator of the Earth.

There are eleven countries on the Tropic of Capricorn and seventeen countries in the Tropic of Cancer.

In this question, you will analyse the data on the life expectancies of countries on the two Tropics.

Click on the tab titles to switch between the Tropics.


Countries that fall on Tropic of Cancer
Countries that fall on Tropic of Capricorn
Arctic Circle
Arctic Circle
Tropic of Cancer
Tropic of Cancer
Equator
Equator
Tropic of Capricorn
Tropic of Capricorn
Antarctic Circle
Antarctic Circle
Mexico
Bahamas
Western Sahara
Mauritania
Mali
Niger
Algeria
Libya
Egypt
Saudi Arabia
UAE
Oman
China
Bangladesh
Taiwan
India
Myanmar


Countries that fall on Tropic of Cancer
Countries that fall on Tropic of Capricorn
Arctic Circle
Arctic Circle
Tropic of Cancer
Tropic of Cancer
Equator
Equator
Brazil
Botswana
Mozambique
Paraguay
French Polynesia
Tropic of Capricorn
Namibia
Madagascar
Tropic of Capricorn
Australia
South Africa
Chile
Argentina
Antarctic Circle
Antarctic Circle

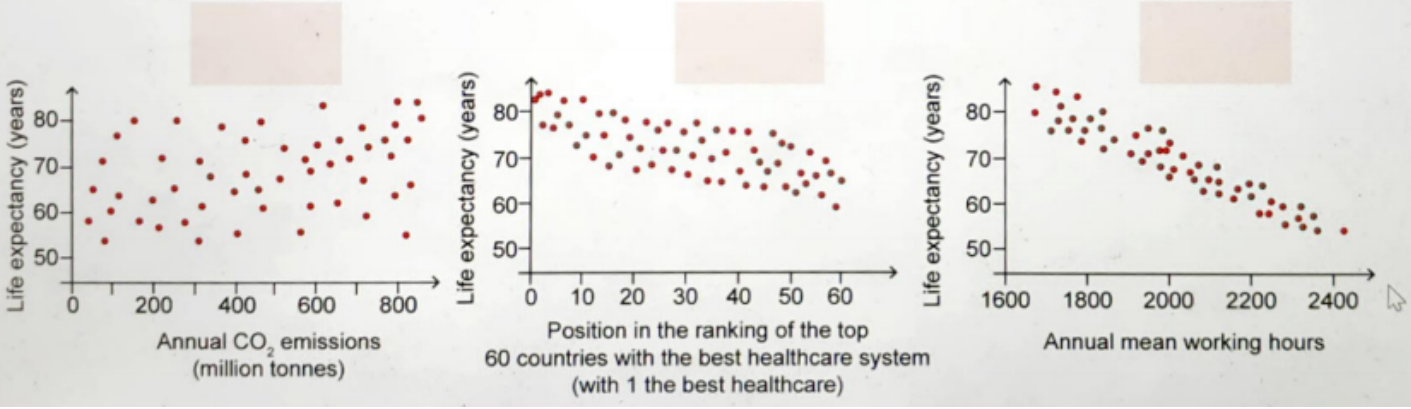
Question 7a (2 marks)

The relationship between life expectancy and other factors is represented on the following scatter graphs.

Identify the correlation for each of the scatter graphs.

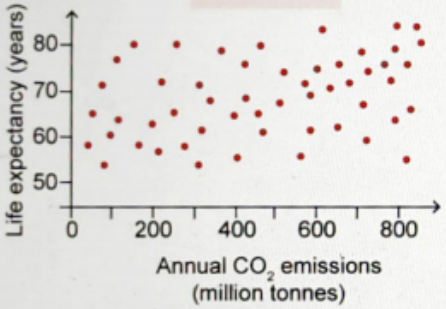
Draggable correlation description:

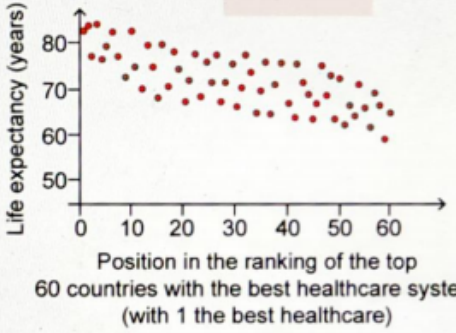
Strong negative	None	Strong positive	Positive	Negative

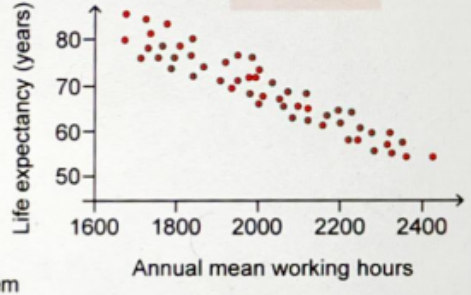


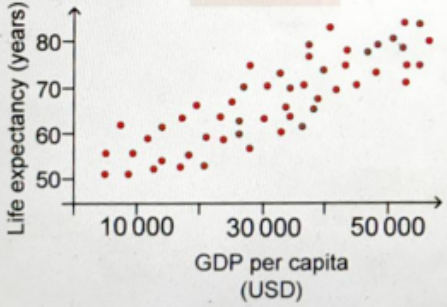
Draggable correlation description:

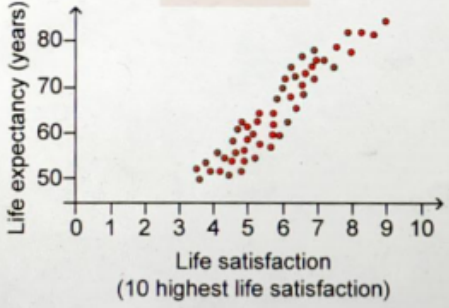
Strong negative | None | Strong positive | Positive | Negative











There are **eleven** countries positioned on the **Tropic of Capricorn**. The life expectancies in 2021 for these (11) countries are as follows.

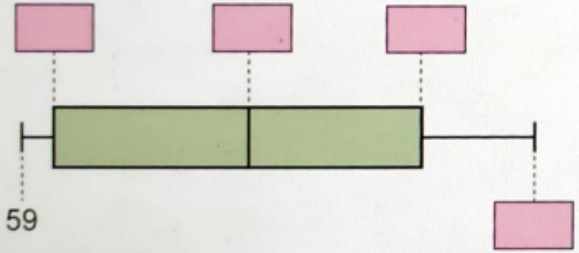
Life expectancy (Age in years)										
59	59	61	62	65	71	73	75	79	80	85

Question 7b (3 marks)

Write down the missing values in the box and whisker plot.

Box-and-whisker plot for life expectancy in 2021

Tropic of Capricorn

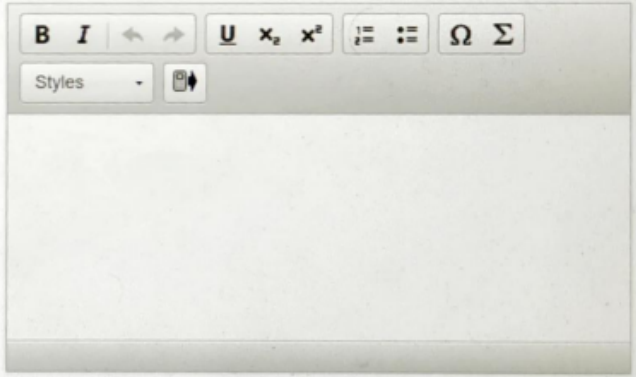


Mode: ☐

Question 7c (2 marks)

Hence, **determine** the following measures of dispersion.

Range:



Tropic of Capricorn

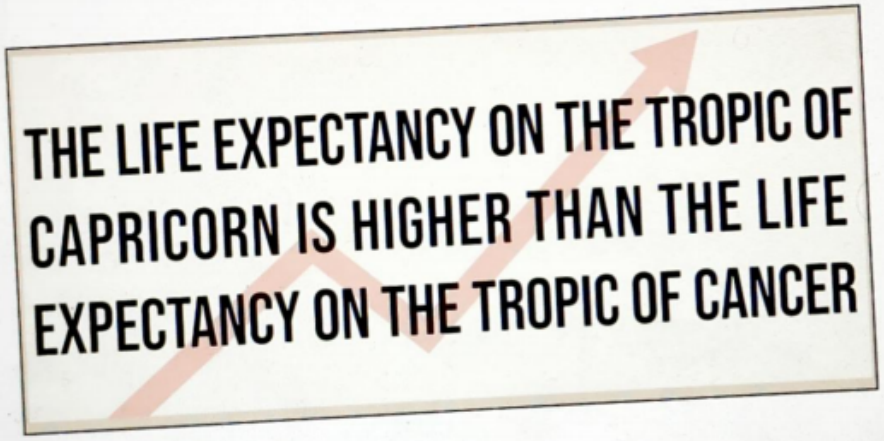
Mode:

Interquartile range (IQR):

B I U Styles Ω Σ

Question 7d (10 marks)

News Headline:

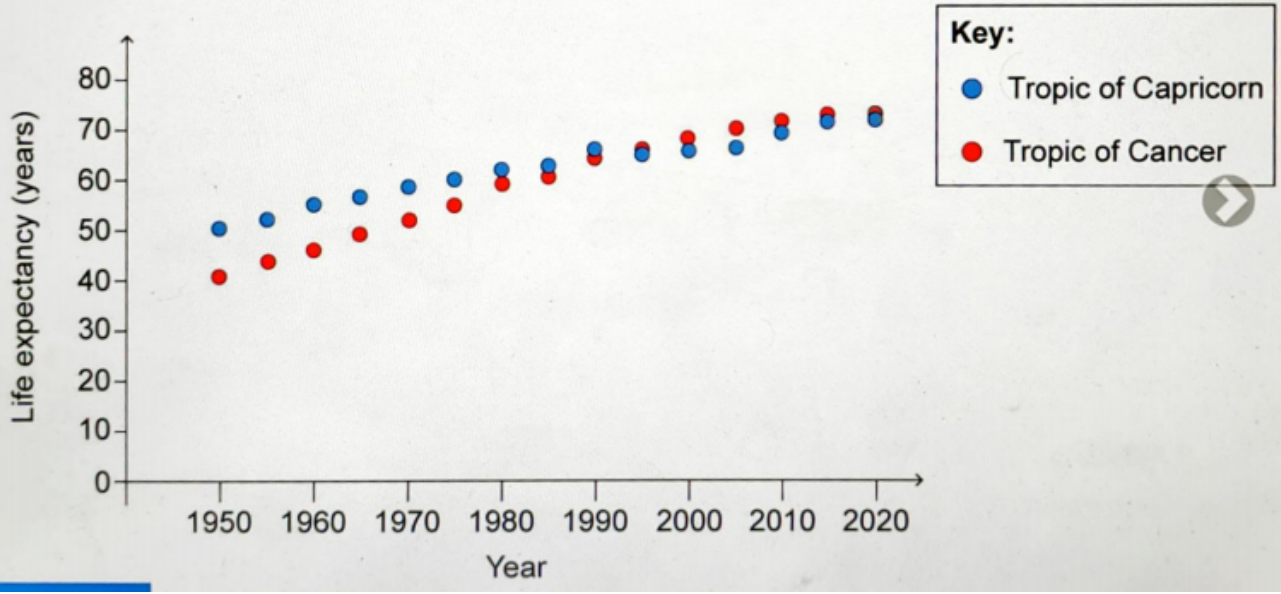


Scroll through the image gallery to see life expectancy data for the Tropic of Cancer and the Tropic of Capricorn.

Scroll through the image gallery to see life expectancy data for the Tropic of Cancer and the Tropic of Capricorn.

Image 1

Life expectancy from 1950 to 2020 for Tropic of Capricon and Tropic of Cancer



Analyse the data on life expectancy and comment on the headline. In your answer you should:

- identify the elements relevant to your comparison
- compare measures of central tendency, measures of dispersion, and any other relevant information
- comment on the headline
- justify the degree of accuracy of your results.

Elements relevant to your comparison.

B I U x_2 x^2 Ω Σ Styles

Comparison, comment and justification.

B I U x_2 x^2 Ω Σ Styles

Question 8 (30 marks)

A diagonal line starts at point A(0,10) and reaches point B(1,0).

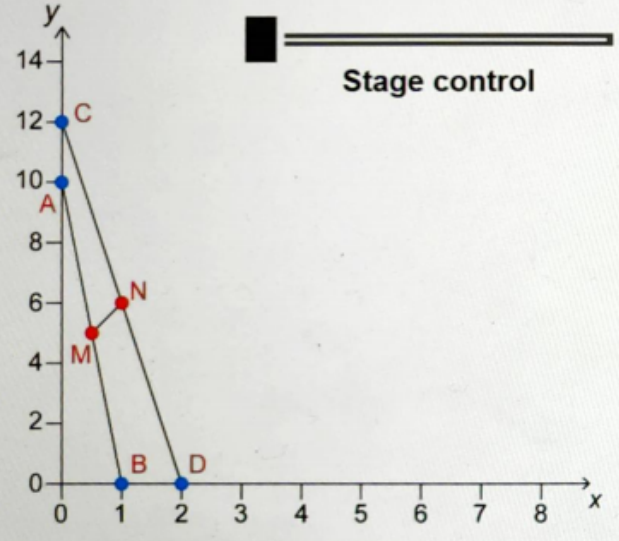
A second diagonal line starts at point C(0,12) and reaches point D(2,0).

M is midpoint of AB and N is midpoint of CD.

B will move to the right **one** unit each stage and D will move to the right **two** units each stage.

Use the slider to see the different stages.

Question 8a (1 mark)



Stage control

Stage	B	D	M	N
1	(1 , 0)	(2 , 0)	(0.5 , 5)	(1 , 6)

Show that the gradient of MN in stage 4 is $\frac{1}{2}$

B I U x_2 x^2 Ω Σ

Styles

Question 8b (2 marks)

Write down the missing values in the table up to row 6.

n	B	D	M	N	Gradient MN (G)
1	(1 , 0)	(2 , 0)	(0.5 , 5)	(1 , 6)	$\frac{2}{1}$
2	(2 , 0)	(4 , 0)	(1 , 5)	(2 , 6)	$\frac{2}{2}$
3	(3 , 0)	(6 , 0)	(1.5 , 5)	(3 , 6)	$\frac{2}{3}$
4	(4 , 0)	(8 , 0)	(2 , 5)	(4 , 6)	$\frac{2}{4}$
5	(5 , 0)	(10 , 0)			
6	(6 , 0)	(12 , 0)			

Question 8c (2 marks)

Describe in words two patterns you see in the table for the gradient (G).

B I | U x_2 x^2 | Ω Σ

Styles

Question 8d (2 marks)

Write down a general rule for G in terms of n.

B I | U x_2 x^2 | Ω Σ

Styles

Question 8e (3 marks)

Verify your general rule for G.

B I U x_2 x^2 Ω Σ Styles

Question 8f (20 marks)

You will now consider how the length of MN changes in each stage.

n	B	D	M	N	Length MN (L)
1	B (1 , 0)	D (2 , 0)	(0.5 , 5)	(1 , 6)	$\sqrt{\frac{5}{4}}$
2	B (2 , 0)	D (4 , 0)	(1 , 5)	(2 , 6)	$\sqrt{\frac{8}{4}}$
3	B (3 , 0)	D (6 , 0)	(1.5 , 5)	(3 , 6)	$\sqrt{\frac{13}{4}}$
4	B (4 , 0)	D (8 , 0)	(2 , 5)	(4 , 6)	$\sqrt{\frac{20}{4}}$
5	B (5 , 0)	D (10 , 0)			
6	B (6 , 0)	D (12 , 0)			

Investigate the values in the table to find a relationship for the length L in terms of n. In your answer, you should communicate the following in an organized and coherent manner:

- predict more values and record these in the table
- describe in words a pattern in the table for the length (L)
- write down a general rule for L in terms of n
- test and verify your general rule for L
- justify your general rule for L.