| Candidate Name | Form Class | Index Number |
|---|---|---|
| | | |

# ANG MO KIO SECONDARY SCHOOL
# PRELIMINARY EXAMINATION 2023
# SECONDARY FOUR NORMAL ACADEMIC

**MATHEMATICS SYLLABUS A** **4045/02**
**Paper 2** **03 August 2023**
**2 hours**

Candidates answer on the Question Paper.

**READ THESE INSTRUCTIONS FIRST**

Write your class, index number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

**Section A**
Answer **all** questions.

**Section B**
Answer **one** question.

The number of marks is given in brackets [ ] at the end of each question or part question.

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 70.

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 $\pi$, use either your calculator value or 3.142.

| For Examiner's Use |
|---|
| 70 |

This document consists of **19** printed pages and **1** blank page.

**[Turn Over**

## *Mathematical Formulae*

*Compound interest*

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

*Mensuration*

Curve surface area of a cone = $\pi rl$

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

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

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

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

Arc length = $r\theta$, where $\theta$ 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*

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

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

**Section A** (62 marks)

Answer **all** the questions in this section.

**1** At the beginning of 2022, Hannah found a job as a temporary clerk and was paid a basic wage of $342 for a 36-hour week.

**(a)** Calculate the basic hourly rate of pay.

*Answer* $ ..... [1]

**(b)** For working overtime (above the 36 hours), Hannah would be paid one and a half times the basic hourly rate per hour for the first 10 hours and double the basic hourly rate for the remaining hours.

**(i)** Calculate Hannah's total wage for a week in which she worked 48 hours.

*Answer* $ ..... [2]

**(ii)** In a certain week, Hannah's total wage was $636.50, calculate the number of hours she worked during the week.

*Answer* ..... hours [2]

**2** The petrol consumption of a car is shown in the table below.

| **Type of road** | **Petrol used per 100 km** |
|---|---|
| Main roads | 9.2 litres |
| Other roads | 8.0 litres |

**(a)** How much petrol is used on a journey of 350 km on a main road?

*Answer* ..... *litres* [2]

**(b)** On other roads, how far can the car travel on 44 litres of petrol?

*Answer* ..... km [2]

**(c)** A journey consists of 200 km on a main road and 160 km on other roads. Find the average amount of petrol used per kilometre of this journey.

*Answer* ..... *litres* [2]

**3** **(a)** The scale of a map is 1 : 200 000.

**(i)** If a road has a length of 5 cm on the map, find its actual length in km.

*Answer* ..... km [1]

**(ii)** If a plot of land has an area of 3 $cm^2$ on the map, find its actual area in $km^2$.

*Answer* ..... $km^2$ [2]

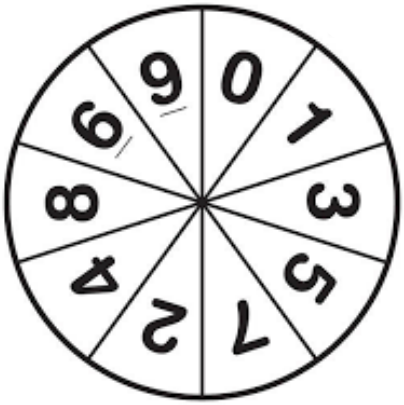
**(iii)** If the actual area of a lake is 18 000 000 $m^2$, calculate its area, in $cm^2$, on the map.

*Answer* ..... $cm^2$ [2]

**(b)** Mr Tan signed up for a 10 years savings plan of $50000 with a compound interest of 5% per annum. Calculate the amount of interest he would receive at the end of the savings plan. Give your answer correct to the nearest cent.

*Answer* $ ..... [3]

**4** **(a)** The spinner in the diagram has an equal chance of landing on each of the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9.




Find the probability that the spinner lands on

**(i)** 11,

*Answer* ..... [1]

**(ii)** a prime number,

*Answer* ..... [1]

**(iii)** a number more than 3.

*Answer* ..... [1]

**(b)** A man took 5 hours 49 minutes to drive from Nara to Tokyo.

**(i)** He arrived at Tokyo at 14 15. At what time did he start his journey?

*Answer* ..... [1]

**(ii)** The distance from Nara to Tokyo is 484 km.
Find the average speed of the journey in metres per second.

*Answer* ..... m/s [3]

**5** **(a)** Factorise

**(i)** $x^2 - 81y^2$,

*Answer* ..... [1]

**(ii)** $10px - 15qx + 6py - 9qy$.

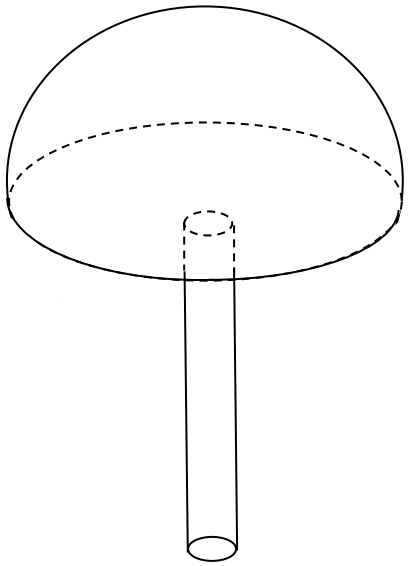
*Answer* ..... [2]

**(b)** Solve $\frac{3}{x-2} - \frac{5}{2x+1} = 1$.

You must show all your working.

*Answer* $x =$ ..... or ..... [5]

**6** A mushroom-shaped shelter, fixed onto the ground, is made by joining a solid hemisphere of radius 3 m to a circular pole of radius 0.25 m and height 2 m, as shown in the diagram below.



**(a)** The solid hemisphere is filled with insulation materials.
Calculate the volume of hemisphere.

*Answer* ..... $cm^3$ [2]

**(b)** A painter is hired to paint the exposed area of the mushroom-shaped shelter. The painter thinks that he only requires 8 litres of paint to paint the shelter. Do you agree with him? Show your workings clearly.

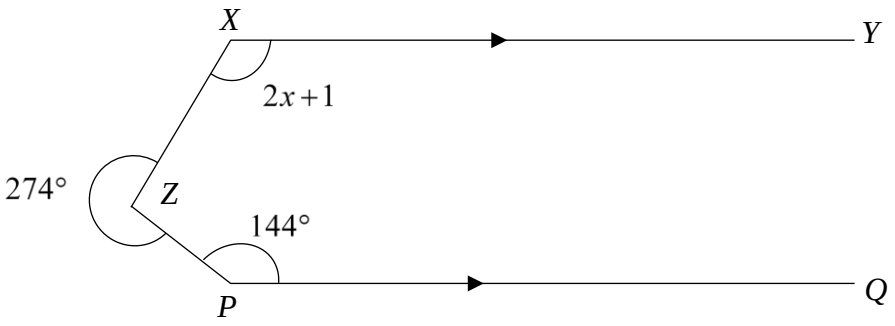
A litre of paint generally covers $10m^2$.

*Answer* 1 agree / disagree with him because .....

.....

..... [5]

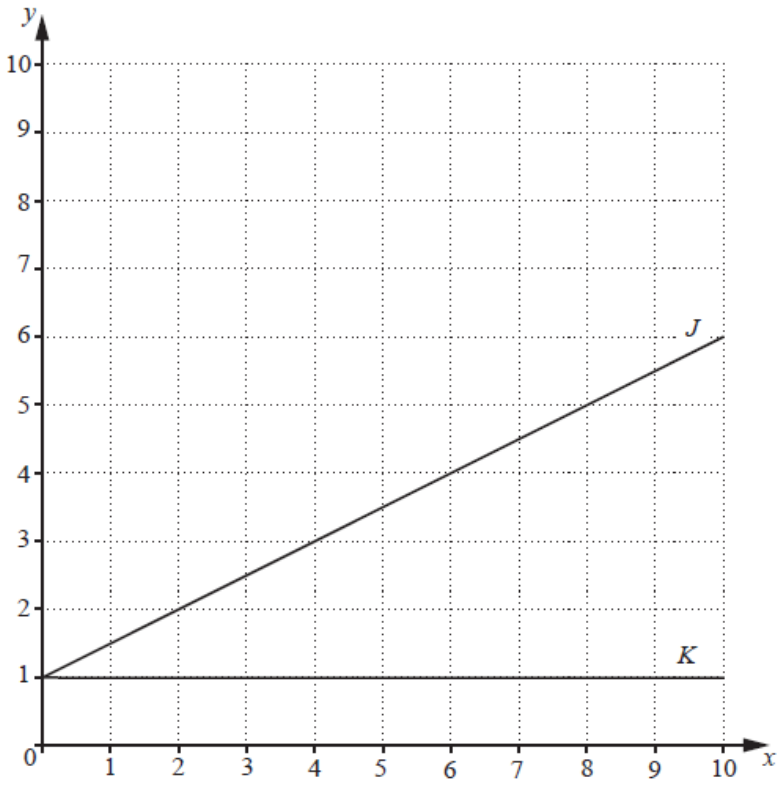
**7** In the diagram, $XY$ is parallel to $PQ$.




Calculate the value of $x$ in the diagram.

*Answer* $x =$ ..... [3]

**8** Line $K$ and line $J$ are shown in the grid below.




**(a)** Write down the equation of line $K$.

*Answer* ..... [1]

**(b)** **(i)** Find the gradient of line $J$.

*Answer* ..... [1]

**(ii)** Find the equation of line $J$.

*Answer* ..... [1]

**(c)** Draw another line $L$ such that it passes through (6, 1) and the area enclosed between $J$, $K$ and $L$ is 15 $cm^2$. [2]

**9** **(a)** Complete the table of values for $y = \frac{x^2}{3} + \frac{3}{x} - 6$.

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| $y$ | –2.7 | –3.2 | | 0.1 | 2.9 | | 10.8 |

[2]

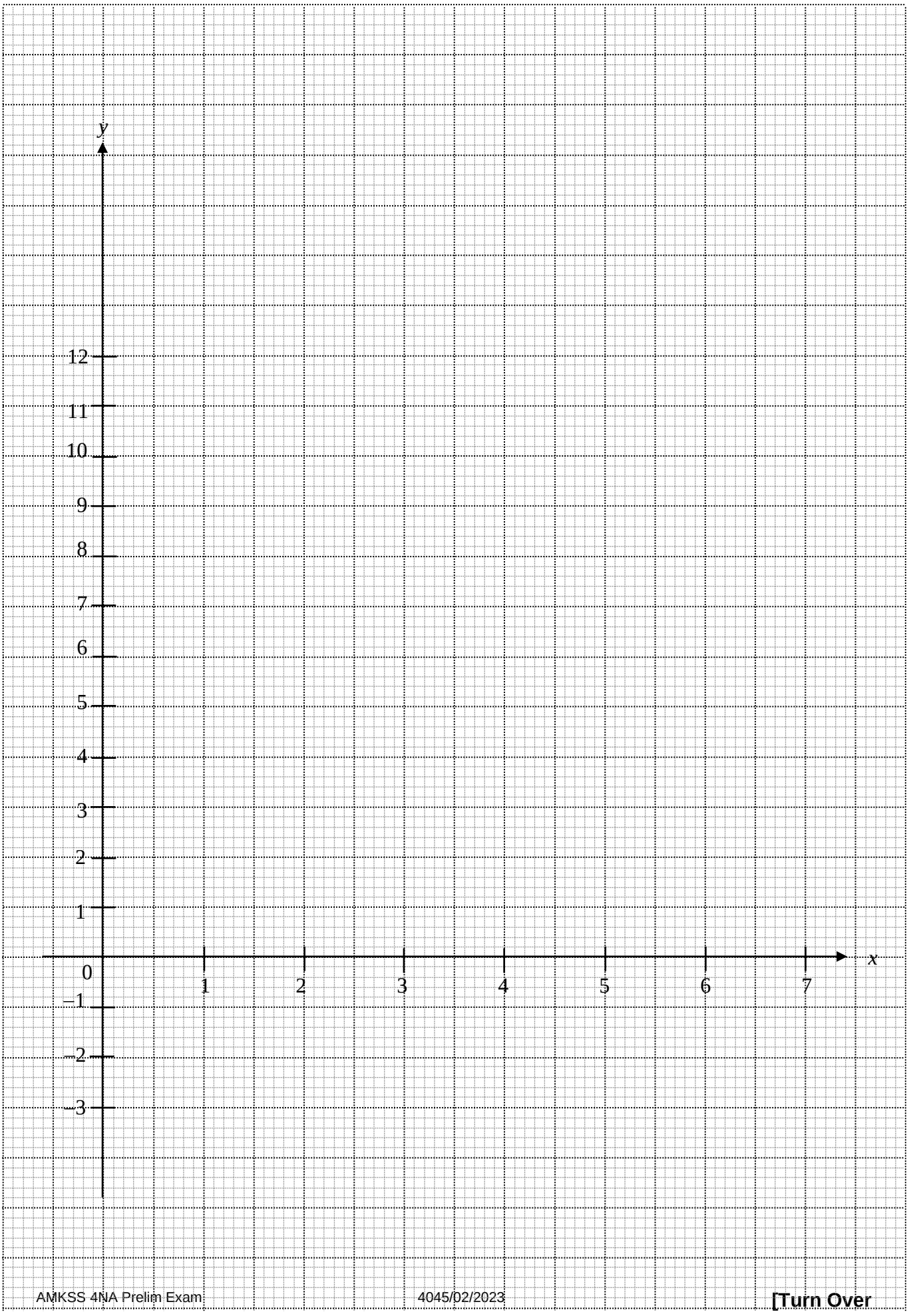
**(b)** On the grid on the next page, plot the graph for $y = \frac{x^2}{3} + \frac{3}{x} - 6$ for $1 \le x \le 7$. [3]

**(c)** Use your graph to solve the equation $\frac{x^2}{3} + \frac{3}{x} - 6 = 2$ for $1 \le x \le 7$.

*Answer* $x =$ ..... [2]

**(d)** By drawing a tangent, find the gradient of the graph at the point where $x = 3.5$.

*Answer* ..... [2]


y
12
11
10
9
8
7
6
5
4
3
2
1
0
–1
–2
–3
1
2
3
4
5
6
7
x

**10**

| Ultra Short Throw Projector |
| --- |
| 4K UHD HDR |
| Promotion Price: **$4990** |
| Hire Purchase available |

Robbie wants to buy the projector on hire purchase.
He pays a deposit of 20% and a monthly instalment of $212 for 24 months.
Find the extra amount Robbie has to pay as a percentage of the cash price.

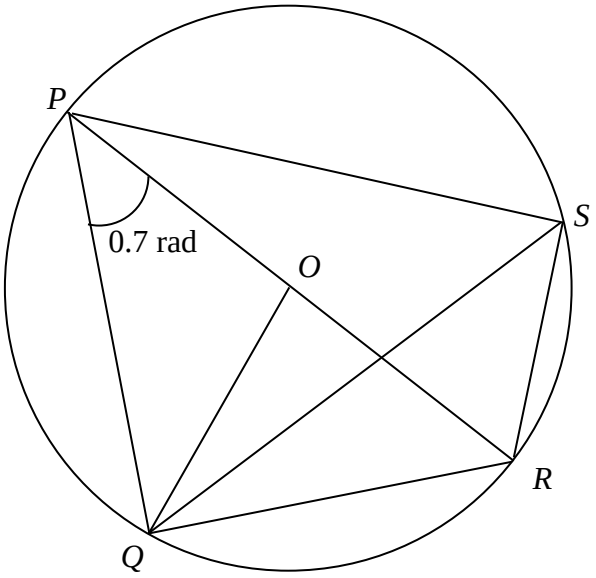
*Answer* ..... % [4]

**TURN OVER FOR QUESTION 11**

**Section B** (8 marks)

Answer one question from this section. Each question carries 8 marks.

**11**




In the figure above, $PR$ is a diameter of the circle whose centre is $O$.
$\angle QPR = 0.7$ **radians**.

**(a)** Giving your answer in radians, find

**(i)** $\angle QSR$,

*Answer* $\angle QSR =$ ..... *Reason* ..... [2]

**(ii)** $\angle QOR$.

*Answer* $\angle QOR =$ ..... *Reason* ..... [2]

**(b)** The radius of the circle is 6 cm,

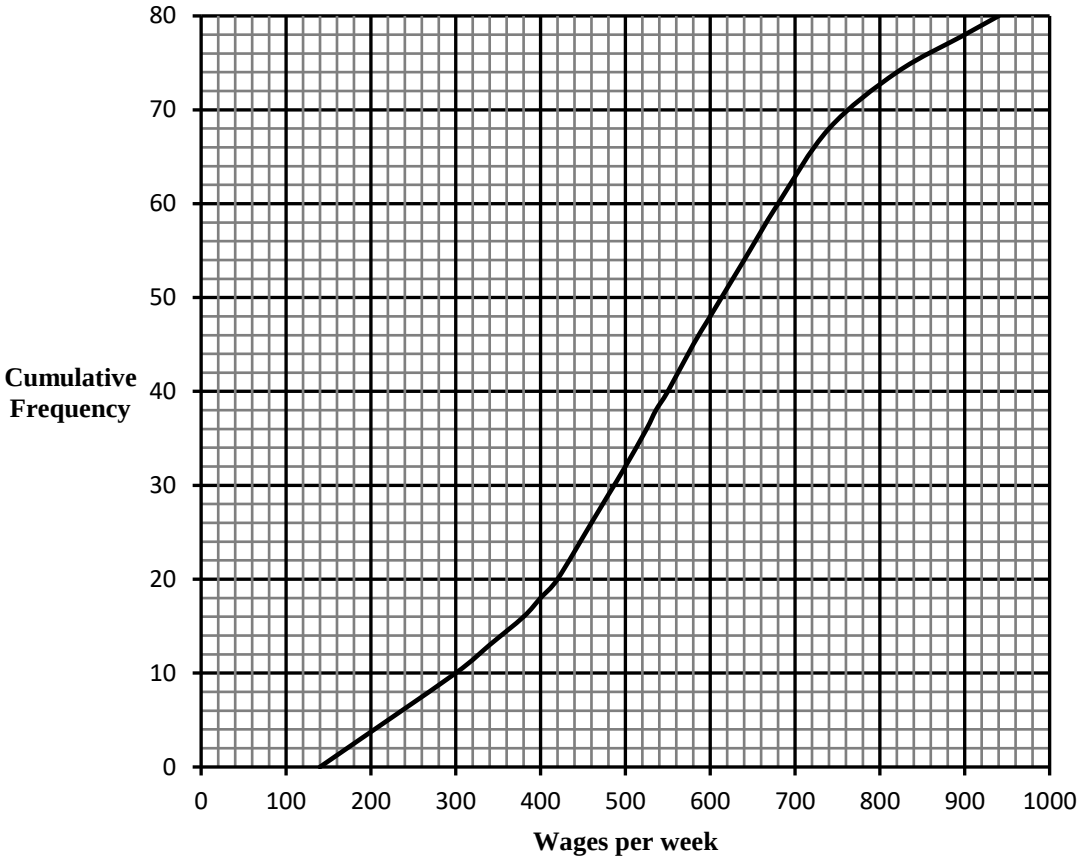
**(i)** find the area of the minor sector $QOR$,

*Answer* ..... $cm^2$ [2]

**(ii)** find the area of triangle $PQR$, given that $PQ = 10.76$ cm.

*Answer* ..... $cm^2$ [2]

**12** The cumulative frequency graph shows the wages per week of 80 workers in Factory *A*.




**(a)** Use the graph to find

**(i)** the number of workers who earn more than \$460 a week,

*Answer* ..... workers [1]

**(ii)** the median wage,

*Answer* \$ ..... [1]

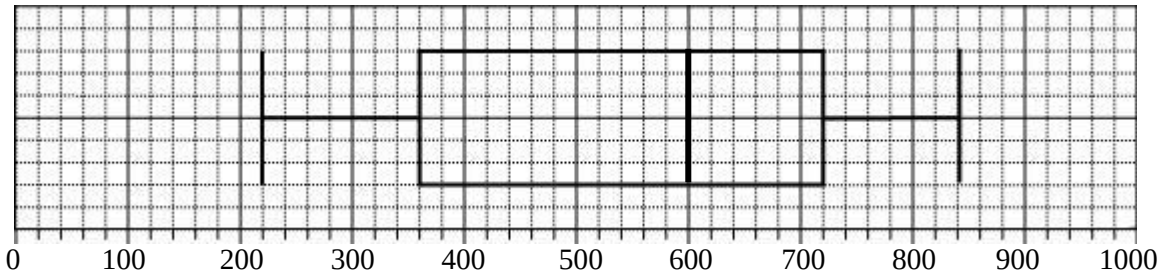
**(iii)** the interquartile range.

*Answer* \$ ..... [2]

**(b)** Two workers are selected at random. Find the probability that one earns less than \$300 and the other earns at least \$640.

*Answer* ..... [2]

**(c)** The box-and-whisker plot shows the distribution of wages per week of the workers in Factory *B*.




Wages per week

Compare the weekly wages of the workers in the two factories in two different ways.

*Answer* .....

.....

.....

.....

..... [2]

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**END OF PAPER**

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