Name:_____ ( )	Class:_____

80

GREENDALE SECONDARY SCHOOL
Preliminary Examination 2022

MATHEMATICS **4048/01**

Paper 1 **26 August 2022**

Secondary 4 EXP/ 5 NA **2 hours**

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your index number and name in the spaces at the top of this page.
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.

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 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.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total number of marks for this paper is **80.**

Question	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Strand													
Marks													

Question	Q14	Q15	Q16	Q17	Q18	Q19	Q20	Q21	Q22	Q23	Q24
Strand											
Marks											

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Mathematical Formulae

Compound interest

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

Mensuration

Curve surface area of a cone = πrl

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 θ 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

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

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

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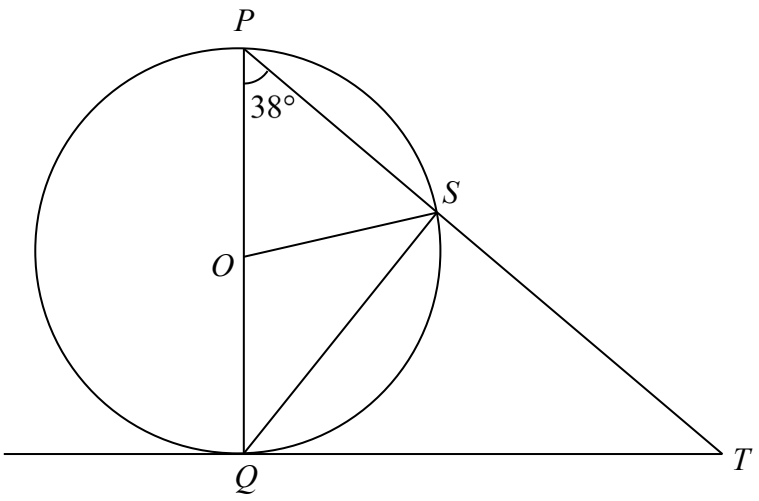
Answer **all** questions.

1 Work out $\dfrac{\sqrt[3]{-5^2-(-5)^2\times 5}}{-5\times\sqrt{5}}$.

Answer _____ [1]

2



In the diagram, O is the centre of the circle through the points P, Q and S.
The tangent to the circle at Q meets PS produced at T. POQ is a straight line and $\angle QPS = 38°$.
Find angle OSQ. State your reasons clearly.

Answer _____ ° [2]

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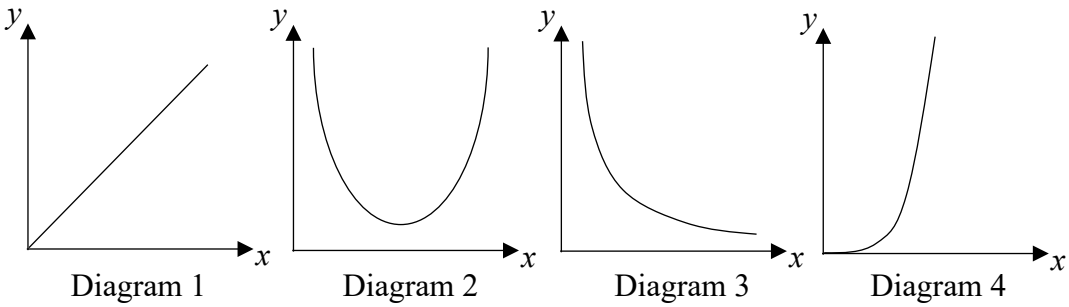
3 y is directly proportional to x^3.
Which of these diagrams best represents the graph of y against x?



Answer Diagram _____ [1]

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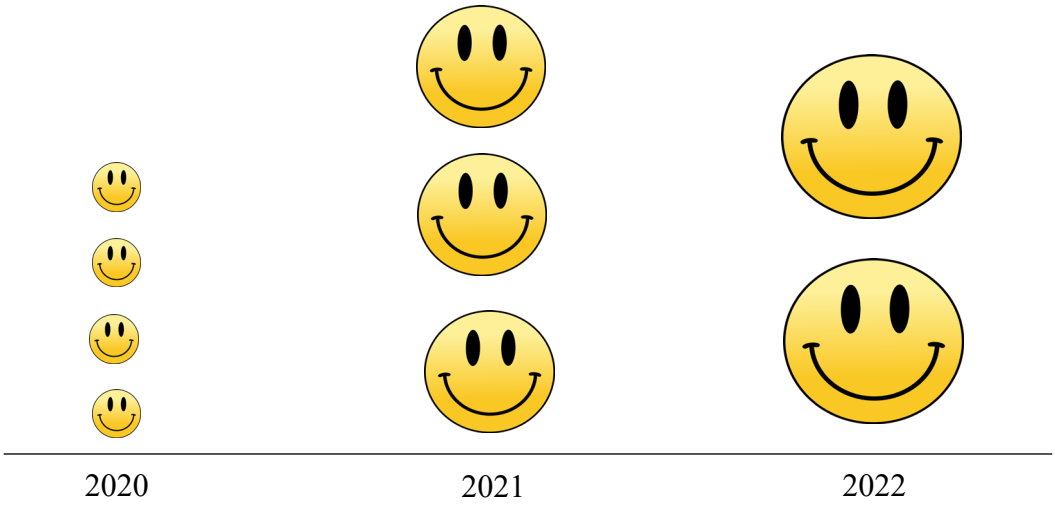
4 In a village, the number of villagers from 2020 to 2022 are given as follows:



Key: represents 100 villagers

(a) State one misleading feature of the graph.

_____

_____[1]

(b) Explain how this feature affects the reader's interpretation of the graph.

_____

_____[1]

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5 **(a)** Express 27^3 as a power of 3.

Answer _____ [1]

(b) Simplify $\frac{2x^2y^3}{5z} \div \frac{4x^4z}{25y}$

Answer _____ [2]

---

6 It takes 18 workers a total of 60 hours to construct 3 footbridges.
Find the additional number of workers needed to complete 7 footbridges in 40 hours, given that they all work at the same rate.

Answer _____ [2]

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7 A teacher asked a student to think of 5 integers which are less then 20 and gave the following information:
The mean of these numbers is 10, the median is 9 and the mode is 6.
The smallest number is a third of the largest number.
What were the 5 integers the student wrote?

Answer _____ , _____ , _____ , _____ , _____ [2]

---

8 Solve the equation $\frac{4x+1}{2}-\frac{x}{5}=-1$.

Answer x = _____ [3]

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9 A fair five-sided spinner is numbered using the prime numbers 2, 3, 5, 7 and 11.
In a game, players spin it twice and add the two numbers obtained.

(a) Complete the possibility diagram.

Answer

+	**2**	**3**	**5**	**7**	**11**
2	4		7	9	13
3	5	6	8	10	
5		8		12	16
7	9	10	12	14	18
11	13	14	16		22

[1]

(b) Find the probability that the total of the two numbers is a

(i) prime number,

Answer _____ [1]

(ii) perfect square.

Answer _____ [1]

(c) Explain why the spinner has to be fair in order to find the probabilities in (b).

Answer

_____

_____ [1]

_____

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10 **(a)** Express $x^2 - 7x + 5$ in the form $(x - p)^2 - q$.

Answer _____ [2]

(b) Write down the coordinates of the minimum point of the graph of $y = x^2 - 7x + 5$.

Answer (_____ , _____) [1]

---

11 The first four terms of a number sequence are 5, 12, 19 and 26.

(a) If the *n*th term of the number sequence can be expressed in the form of $pn + q$, find the values of p and q.

Answer p =_____ [1]

q = _____ [1]

(b) Hence, find the largest value of n such that the nth term is less than 100.

Answer _____ [1]

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12 **(a)** A sum of money is divided in the ratio 4 : 3.
The larger part is \$7.20.
Find the smaller part.

Answer \$_____ [1]

(b) Express the ratio 700 g to 1.75kg in its lowest terms.
Give your answer in the form m : n, where m and n are integers.

Answer _____ : _____ [1]

---

13 Given that $\frac{r}{7+q^2} = 1$,

(a) Evaluate r when $q = -3$.

Answer r = _____ [1]

(b) Express q in terms of r.

Answer q = _____ [2]

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14 Abdul bought a machine which included an 8% sales tax. He then sold the machine at 15% profit. The machine was sold at $465.75.
Calculate the cost price of the machine.

Answer $_____ [3]

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15 Alex invested some money in a savings account for 3 years.
The rate of compound interest was fixed at 5% per annum.
At the end of the 3 years, there was $11576.25 in his account.
How much did Alex invest in the account?

Answer $_____ [3]

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16 **(a)** $\xi = \{\text{integers } x : 3 \le x < 13\}$
$P = \{\text{prime numbers}\}$
$Q = \{\text{factors of } 20\}$

List the elements in

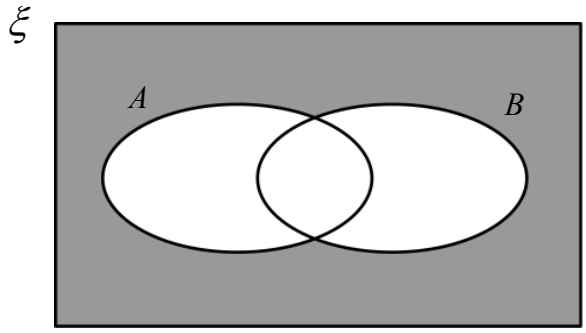
(i) $P \cup Q$,

Answer _____ [1]

(ii) $P' \cap Q$.

Answer _____ [1]

(b) Use set notation to describe the shaded region.



Answer _____ [1]

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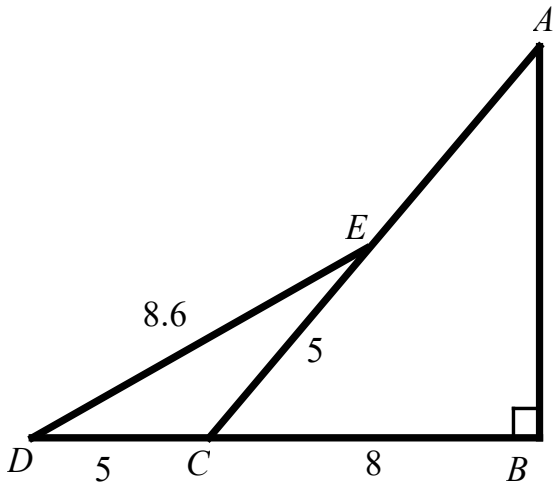
17



The diagram represents a tower AB, built on a horizontal ground.
BC = 8 m, CD = CE = 5 m and DE = 8.6 m.
Find AE.

Answer _____m [4]

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18 The map of a national park is drawn to a scale of 1 : n.
A lake which has an actual area of 7.5 km^2, is represented by an area of 4.8 cm^2 on the map.

(a) Find the value of n.

Answer $n =$ _____ [2]

(b) Calculate the actual perimeter of the lake, in km, if its perimeter on the map is 9 cm.

Answer _____km [1]

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19 **(a)** Simplify $2(2x-\frac{1}{3}y)-5(\frac{x}{2}-4y)$.

Answer _____ [2]

(b) Factorise completely $4am-5bm-16an+20bn$.

Answer _____ [2]

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20 **(a)** **(i)** Express 495 as a product of its prime factors.

Answer _____ [1]

(ii) 495 and a number N have an LCM of 4950 and a HCF of 15.
Find the number N.

Answer N = _____ [3]

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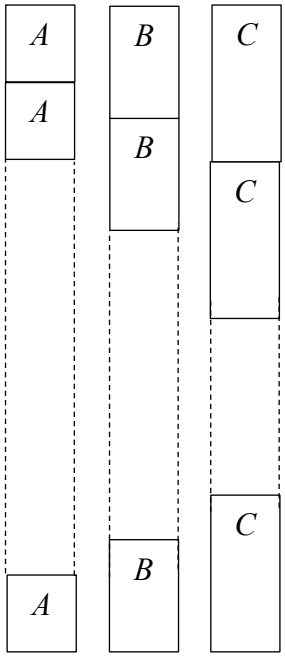
(b) Three types of cylindrical cans, A, B, and C, of the same radii, have heights 50 cm, 0.6 m and 0.72 m respectively. They are stacked to the **same height**.
Find the minimum number of cans C.



Answer _____ [2]

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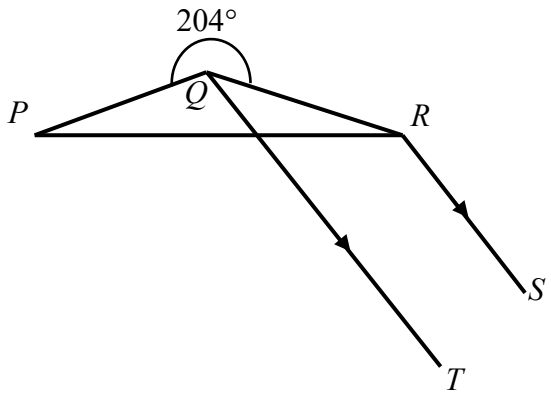
21



(a) $PQRS$ is part of a regular polygon where reflex $\angle PQR = 204°$ and RS is parallel to QT.

Find

(i) the number of sides of the polygon,

Answer _____ [2]

(ii) $\angle RQT$.

Answer _____ ° [1]

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(b) A regular polygon, X, has n sides and another regular polygon, Y, has $2n$ sides. The ratio of the sum of interior angles of polygon X to that of polygon Y is 5 : 11.

(i) Find the value of n.

Answer $n =$ _____ [2]

(ii) Hence, find the size of each exterior angle of polygon Y.

Answer _____° [1]

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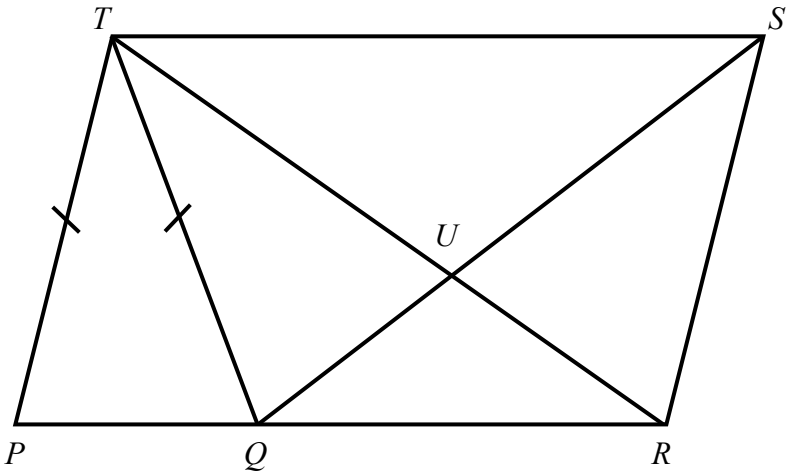
22 In the figure, $PRST$ is a parallelogram and Q is a point on PR such that $PT = QT$. The lines RT and QS intersect at U.



(a) Show that triangle TPR is congruent to triangle QTS.

Answer

_____

_____

_____

_____ [2]

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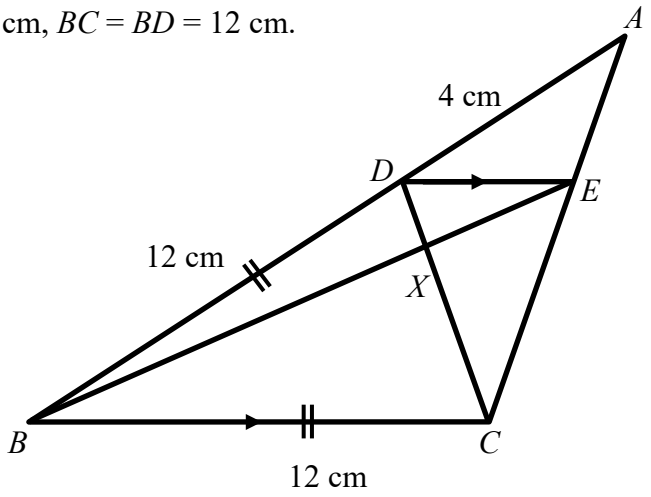
(b) In the figure, DE is parallel to BC. DC and BE meet at the point X.
$AD = 4$ cm, $BC = BD = 12$ cm.



(i) Find the length of DE.

Answer _____cm [1]

(ii) Show that triangle DXE is similar to triangle CXB.

Answer

_____

_____

_____

_____ [2]

_____

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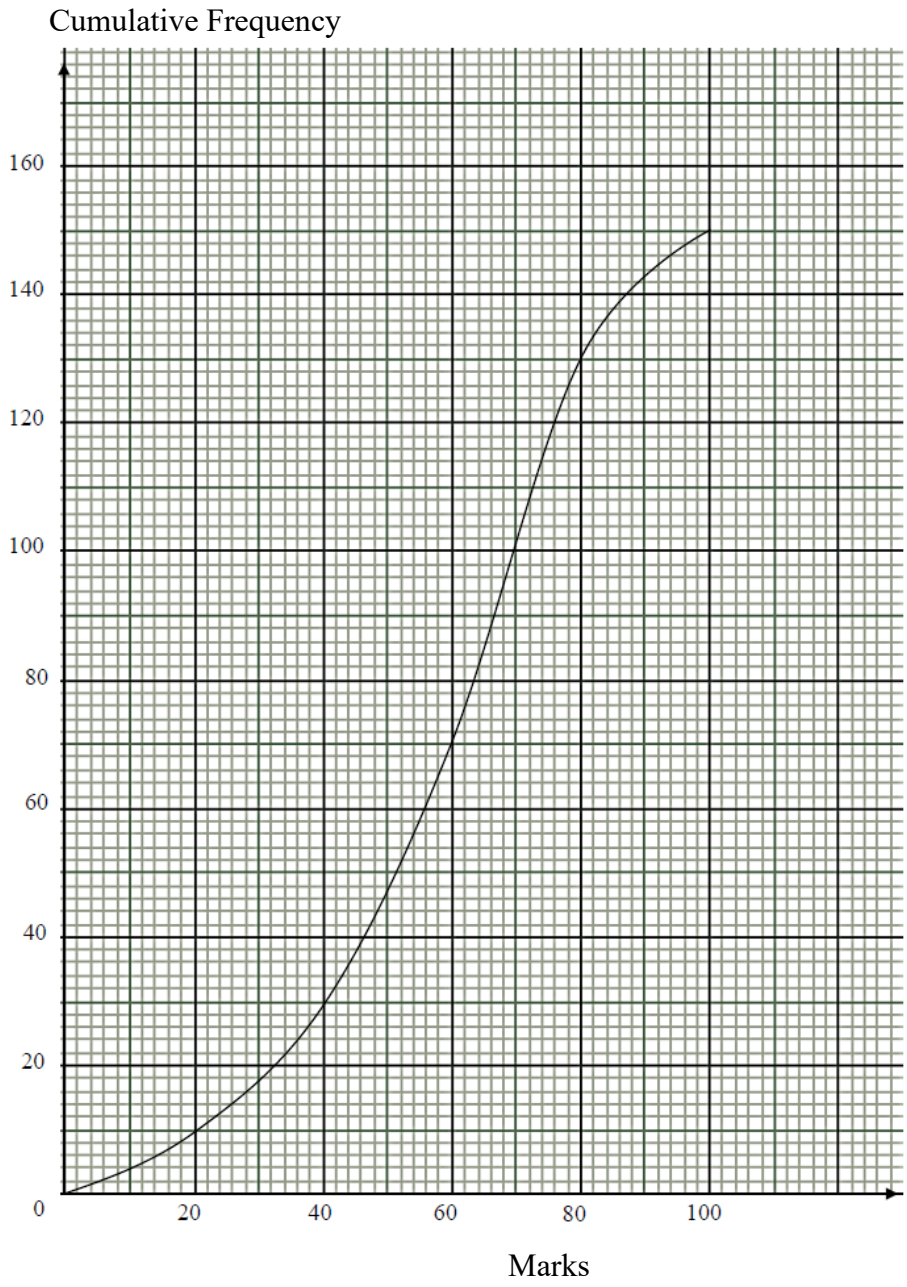
23 The frequency table shows information about the distribution of marks of 150 students in a Mathematics examination.

x (marks)	$0 < x \leq 20$	$20 < x \leq 40$	$40 < x \leq 60$	$60 < x \leq 80$	$80 < x \leq 100$
Frequency	10	20	40	60	20

(a) Calculate an estimate of the mean marks for the Mathematics examination.

Answer _____marks [1]

(b) This cumulative frequency graph shows the same information.



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(i) Use the graph to estimate the number of students who score more than 36 marks.

Answer _____ [1]

(ii) Two students are chosen at random.
Find the probability that

(a) both students score more than 36 marks,

Answer _____ [1]

(b) one student scores at most 64 marks while the other scores more than 80 marks.

Answer _____ [2]

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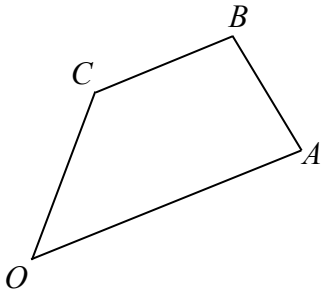
24



OABC is a quadrilateral. The position vectors of the points *A*, *B* and *C* are given by $\overrightarrow{OA} = \begin{pmatrix} 6 \\ 2 \end{pmatrix}$, $\overrightarrow{OB} = \begin{pmatrix} 4 \\ 4 \end{pmatrix}$ and $\overrightarrow{OC} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$.

(a) Express $\overrightarrow{BC}$ as a single column vector.

Answer $\overrightarrow{BC} = \begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) Explain why *OABC* is a trapezium.

Answer

[2]

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(c) The lines OC and AB produced meet at X.

(i) Given that $\overrightarrow{OX} = k\overrightarrow{OC}$, express $\overrightarrow{AX}$ as a single column vector, in terms of k,

Answer $\overrightarrow{AX} = \begin{pmatrix} \\ \end{pmatrix}$ [2]

(ii) Given that $\overrightarrow{AX} = \begin{pmatrix} -4 \\ 4 \end{pmatrix}$, find k.

Answer $k =$ _____ [1]

(iii) Find $\dfrac{\text{area of triangle } OAX}{\text{area of triangle } CBX}$.

Answer _____ [1]

End - of – Paper