Centre Number	Candidate Number

Candidate Name _____

CAMBRIDGE INTERNATIONAL EXAMINATIONS

General Certificate of Education Ordinary Level

MATHEMATICS (SYLLABUS D) 4024/1

PAPER 1 Rupee version

MAY/JUNE SESSION 2002

2 hours

Candidates answer on the question paper.
Additional materials:
Geometrical instruments

TIME 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

If working is needed for any question it must be shown in the space below that question.

Omission of essential working will result in loss of marks.

NEITHER ELECTRONIC CALCULATORS NOR MATHEMATICAL TABLES MAY BE USED IN THIS PAPER.

INFORMATION FOR CANDIDATES

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

The total of the marks for this paper is 80.

FOR EXAMINER'S USE

This question paper consists of 16 printed pages.

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Local Examinations Syndicate

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NEITHER ELECTRONIC CALCULATORS NOR MATHEMATICAL TABLES MAY BE USED IN THIS PAPER.

1 **(a)** Calculate the value of 0.1×0.06.

(b) Find the decimal number exactly halfway between 1.01 and 1.02.

Answer *(a)* ..... [1]

(b) ..... [1]

---

2 Giving the answer as simply as possible, calculate

(a) $\frac{3}{4} - \frac{1}{3}$,

(b) $\frac{2}{5}$ of $\frac{15}{16}$.

Answer *(a)* ..... [1]

(b) ..... [1]

---

3 **(a)** Calculate the value of $9^{\frac{1}{2}} + 9^0$.

(b) The reciprocal of 2^{-3} is 2^n.
Write down the value of n.

Answer *(a)* ..... [1]

(b) n = ... [1]

---

4 **(a)** Calculate the value of $16 - 8 \div 2$.

(b) Express 0.0032 in standard form.

Answer *(a)* ..... [1]

(b) ..... [1]

---

5 Mr. Smith asked the children in his class 'What is your favourite colour?'
Their replies are given below.

Green	Blue	Green	Yellow	Blue
Green	Red	Blue	Green	Blue
Yellow	Green	Yellow	Blue	Yellow
Blue	Blue	Green	Blue	Yellow
Green	Blue	Green	Yellow	Blue

(a) By making tally marks, or otherwise, obtain the frequency distribution of the colours.

Answer (*a*)

Colour	Frequency
Green	
Blue	
Red	
Yellow	

[1]

(b) State the mode of this distribution. *Answer* *(b)* ..... [1]

---

6 P is the point (1, 1) and Q is the point (5, –2).

(a) A translation maps P onto Q.
Write down the column vector which represents this translation.

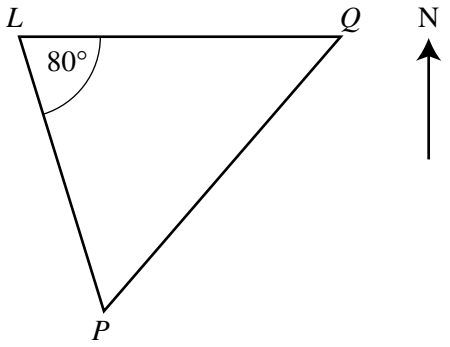
(b) Find the coordinates of the midpoint of PQ.

Answer *(a)* $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) (..... , ...) [1]

---

7 The diagram shows a lighthouse, L, and two ports P and Q.
Q is due east of L and $P\hat{L}Q = 80°$.
P and Q are each 10 km from L.



Find

(a) $L\hat{Q}P$,

(b) the bearing of Q from P,

(c) the bearing of L from P.

Answer (*a*) ..... [1]

(*b*) ..... [1]

(*c*) ..... [1]

---

8 Solve the simultaneous equations

$$2y = 3x - 13,$$
$$5x - 6y = 23.$$

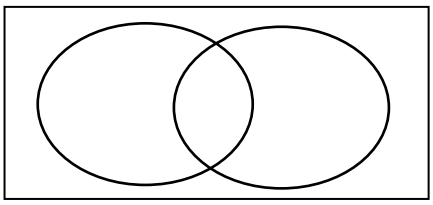
Answer x = ...

y = ... [3]

---

9 There are 50 people on a tour.
One day, 26 people went on the morning cruise and 29 to the evening barbecue.
Using Venn diagrams, or otherwise, answer the following questions.

(a) It was thought that 4 people went to both events and 1 person to neither.
Explain why this was not possible.



Answer (*a*) .....

.....[1]

(b) Find the least number and the greatest number of people who could have gone to both events.

Answer (*b*) Least number ..... [1]

Greatest number ..... [1]

---

10 Consider the sequence $1^3–2$, $2^3–4$, $3^3–6$, $4^3–8$, …. .

(a) Write down the 5^{th} term of the sequence.

(b) Write down, in terms of n, an expression for the nth term of the sequence.

(c) Evaluate the 10^{th} term of the sequence.

Answer (*a*) ..... [1]

(*b*) ..... [1]

(*c*) ..... [1]

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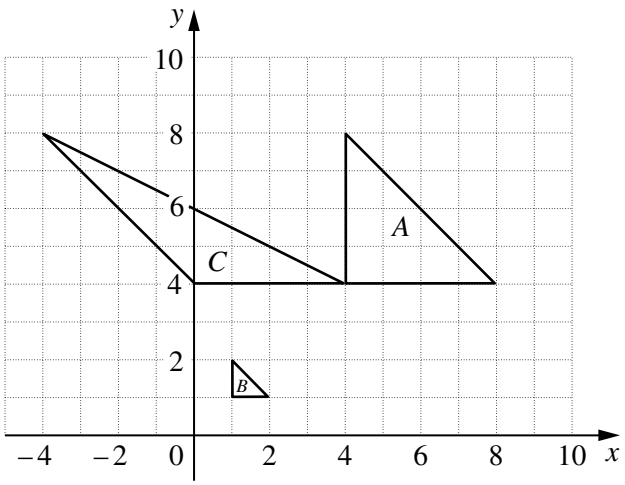
11 The diagram shows triangles A, B and C.



(a) An enlargement maps triangle A onto triangle B.
Write down the scale factor of this enlargement.

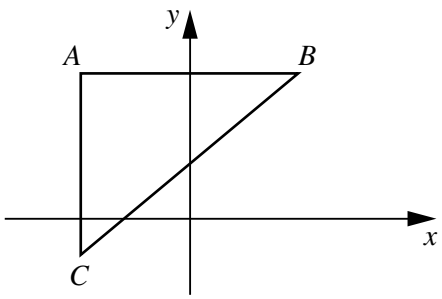
Answer (*a*) ..... [1]

(b) Describe completely the single transformation which will map triangle A onto triangle C.

Answer (*b*) .....

.....[2]

12



The triangle ABC has vertices $A(-3,5)$, $B(3,5)$ and $C(-3,-1)$.
The equation of the line BC is $y = x + 2$.
Write down the three inequalities which define the region **inside** the triangle ABC.
This region **does not include** points on the boundaries.

Answer .....

.....

..... [3]

---

13 It is given that $f : x \mapsto m + nx$, where m and n are constants.
Given also that $f(0) = 1$ and $f(4) = 21$, find the value of

(a) m,

(b) n,

(c) $f^{-1}(21)$.

Answer (*a*) $m =$ ..... [1]

(*b*) $n =$ ..... [1]

(*c*) $f^{-1}(21) =$ ..... [1]

---

14 In 2000 Esther went to a tennis tournament.
Her ticket cost Rs700.
At the tournament she bought a programme costing Rs60 and an ice cream costing Rs40.

(a) This information is to be shown on a pie chart.
Calculate the angle of the sector which represents the amount she spent on ice cream.

(b) In 2001 the cost of a ticket was Rs735.
Calculate the percentage increase in the cost of a ticket.

Answer (*a*) ..... [2]

(*b*) .....% [2]

---

15 In the diagram in the answer space, *TC*, *TD* and *AB* are straight lines.

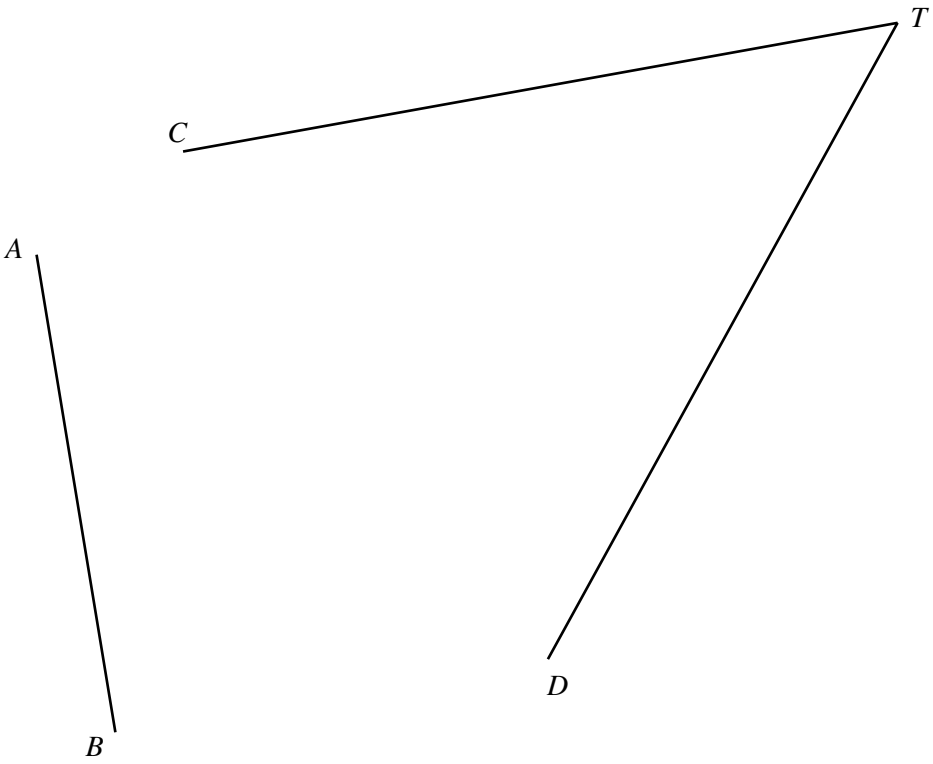
(a) Construct the locus of the points which are equidistant from *TC* and *TD*.

(b) Construct the locus of the points which are equidistant from *A* and *B*.

(c) The two loci meet at *P*.

AB is a chord of a circle, centre *P*.
Draw the circle.

Answer



[4]

16

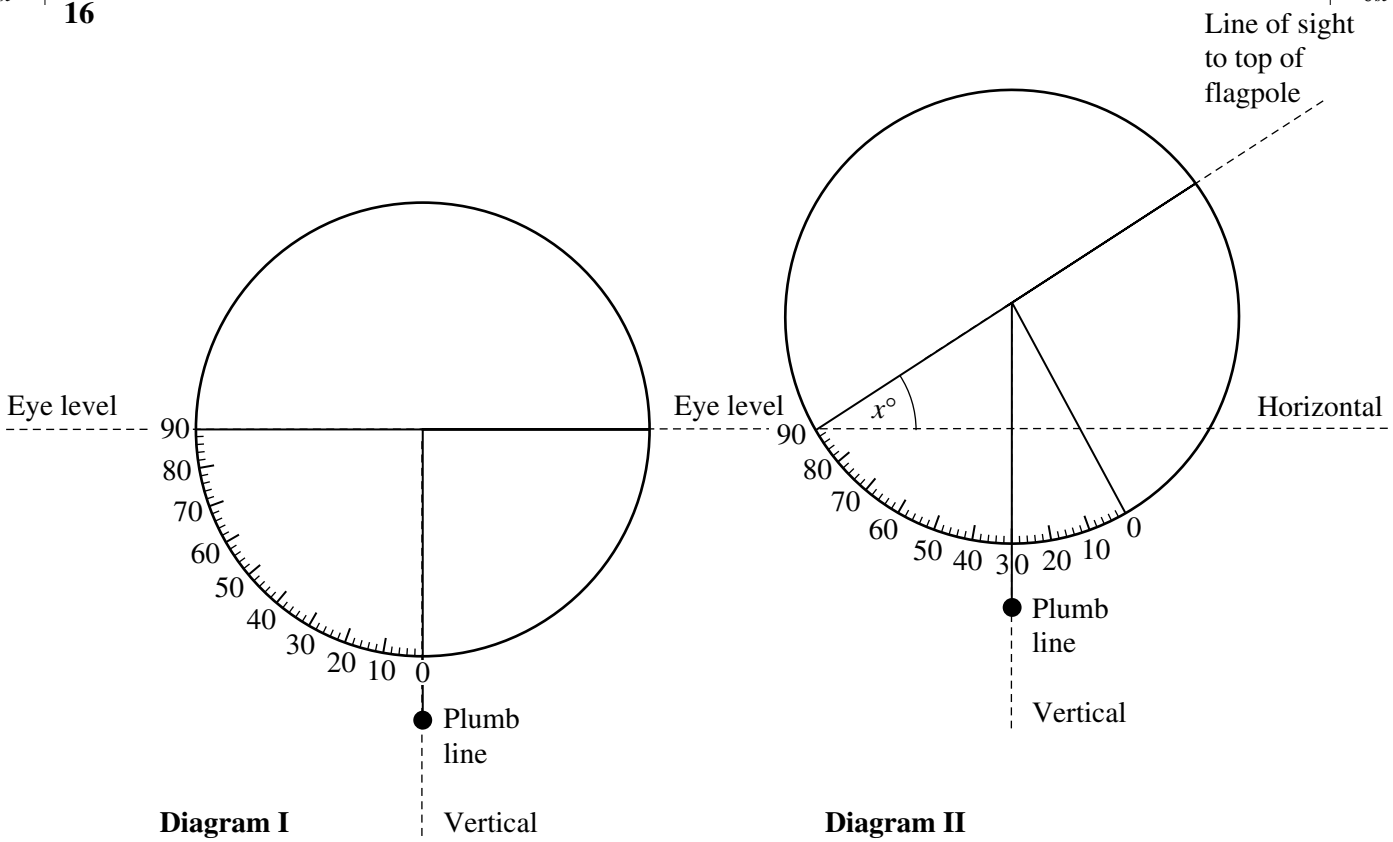


Diagram I shows a device for measuring angles in a vertical plane.
Diagram II shows the device being used by a surveyor.
He views the top of a flagpole at an angle $x°$ to the horizontal.

(a) Write down the value of x.

Answer (*a*) x = ... [1]

(b) The surveyor stands on horizontal ground 50 m from the vertical flagpole.
His eye level is 1.8 m above the ground.
Using a scale of 1 cm to 5 m, make an accurate scale drawing and use it to find the height of the flagpole.

Answer (*b*)

Height of flagpole .....m [3]

17 **(a)** Factorise completely $18rc - 3rd - 6tc + td$.

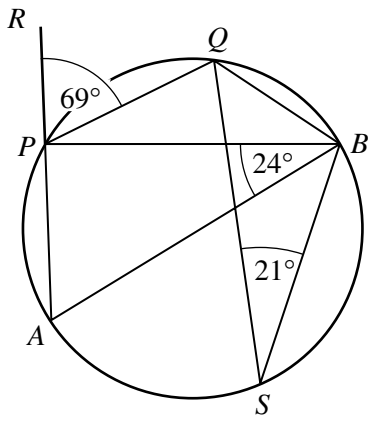
(b) Solve the equation $\frac{4}{x+3} = \frac{3}{2x}$.

Answer (*a*) ..... [2]

(*b*) $x =$ ..... [2]

---

18 The points A, P, Q, B and S lie on a circle.
AP is produced to R.
$R\hat{P}Q = 69°$, $P\hat{B}A = 24°$ and $Q\hat{S}B = 21°$.



(a) Find $Q\hat{P}B$, giving your reasons.

(b) Given that M is the midpoint of AB, find $P\hat{M}A$.
Give all your reasons.

Answer (*a*) $Q\hat{P}B =$ ..... because .....

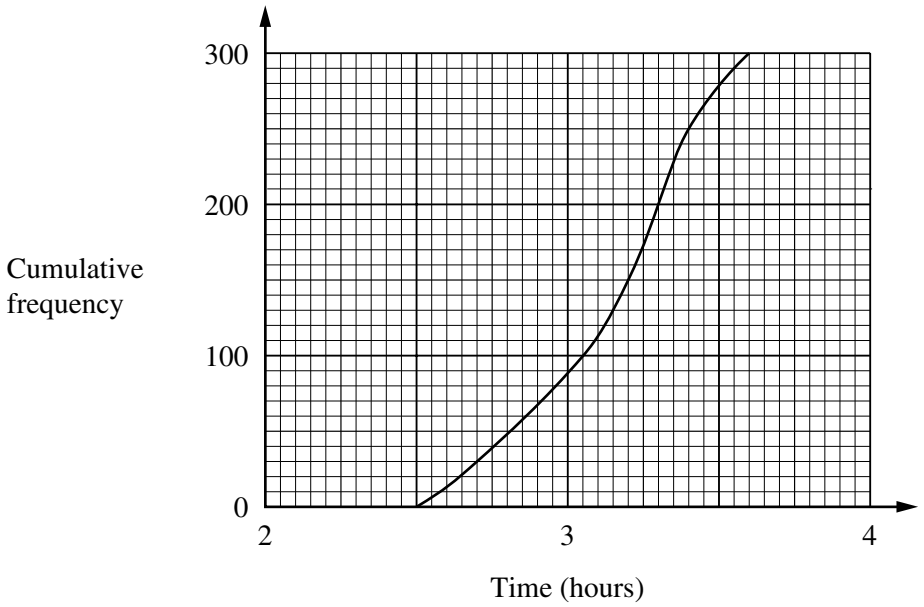
.....[1]

(*b*) $P\hat{M}A =$ ..... because .....

.....[3]

---

19 The cumulative frequency curve shows the distribution of the times of 300 competitors in a women's marathon race.



Use the curve to answer the following questions.

(a) The race was won by Tegla.
Find her time, giving your answer in hours **and** minutes.

(b) Find the median time in hours **and** minutes.

(c) The qualifying time for the Olympic Games was achieved by ten percent of the runners.
The race began at 11.30.
At what time did the last qualifying athlete finish the race?
Express your answer using the 24 hour clock.

Answer *(a)* ..... h ..... min [1]

(b) ..... h ..... min [1]

(c) ..... [2]

20 V varies inversely as P.
When $P = 3$, $V = 1$.

(a) Express V in terms of P.

(b) Complete the table in the answer space.

Answer (*a*) ..... [2]

(*b*)

P	3	5	
V	1		9

[2]

---

21 Given that $S = \frac{RV}{3V - 1}$,

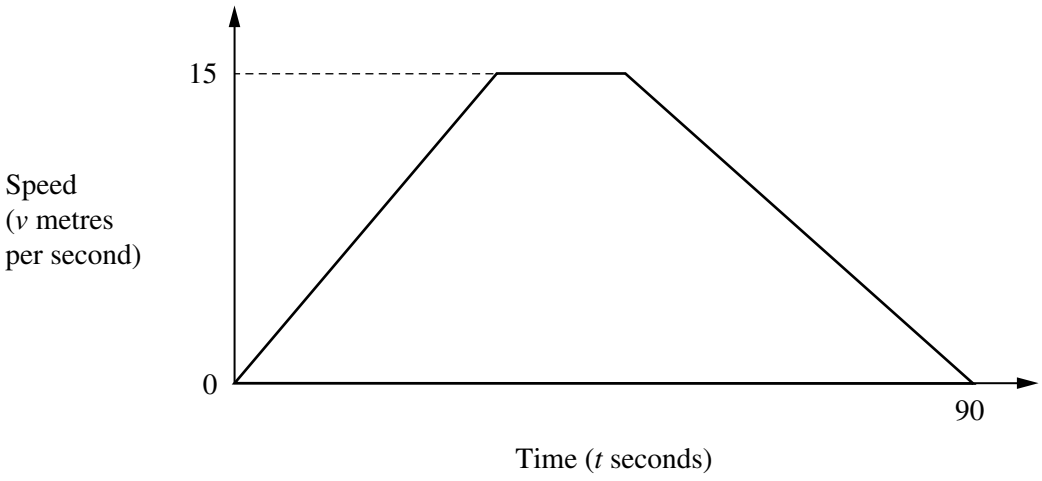
(a) calculate the value of S when $R = 100$ and $V = -13$,

(**b**) express V in terms of R and S.

Answer (*a*) S = ... [1]

(*b*) V = ... [3]

22



The diagram shows the speed – time graph of a bus over a period of 90 seconds.
The bus reaches a maximum speed of 15 metres per second.

(a) Express 15 metres per second in kilometres per hour.

(b) Given that the acceleration was $0.5\,m/s^2$, calculate the time taken, in seconds, to reach its maximum speed.

(c) The total distance travelled during the 90 seconds was 750 metres.
Calculate the length of time that the bus was travelling at its maximum speed.

Answer *(a)* ..... km/h [1]

(b) ..... s [1]

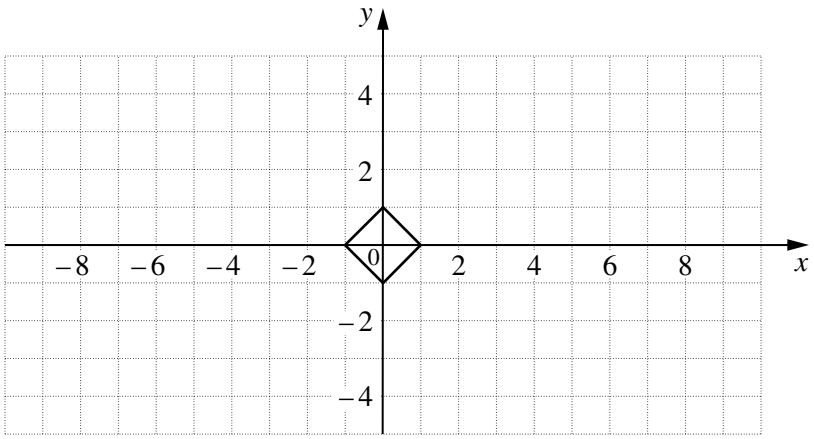
(c) ..... s [2]

23 A transformation S is represented by the matrix $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$.

(a) The shape *A* has vertices (1,0), (0,1), (–1,0) and (0,–1).
Shape *A* is shown on the grid in the answer space.

By calculating $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} 1 & 0 & -1 & 0 \\ 0 & 1 & 0 & -1 \end{pmatrix}$, or otherwise, draw and label the shape S(*A*).

Answer (*a*)



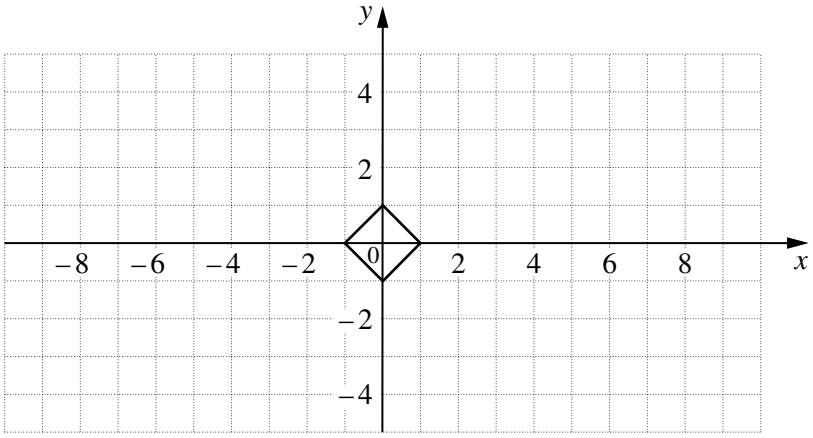
[2]

(b) Find the matrix which represents the transformation S^2.

Answer (*b*) $\begin{pmatrix} & \\ & \end{pmatrix}$ [1]

(c) On the grid below, draw and label $S^2(A)$.

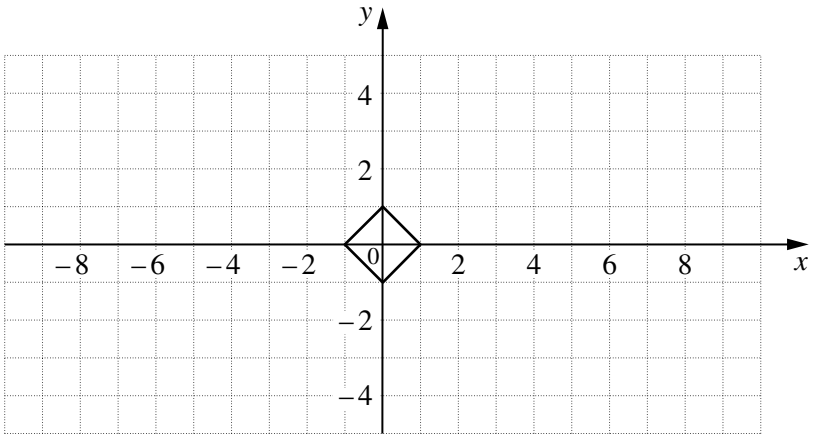
Answer (*c*)



[1]

(d) On the grid below, draw and label $S^3(A)$.

Answer (*d*)

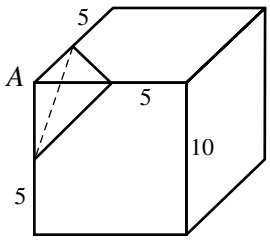


[1]

(e) Write down the matrix which represents S^n.

Answer (*e*) $\begin{pmatrix} & \\ & \end{pmatrix}$ [1]

24 (a)



The diagram shows a 10 cm cube.

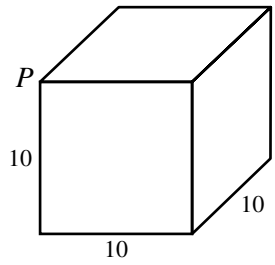
(i) A triangular pyramid is cut from the corner of the cube at *A*.
The cut is made halfway along each of the edges meeting at *A* as shown.
Calculate the volume, in cubic centimetres, of the pyramid.

[The volume of a pyramid = $\frac{1}{3}$ × area of base × height]

(ii) From another 10 cm cube, shown in the answer space, a second similar pyramid is cut from the corner at *P*.
The volume is 8 times the volume of the first pyramid.
On the diagram in the answer space, draw the lines where the cut is made.

Answer *(a)* (i) ..... cm^3 [2]

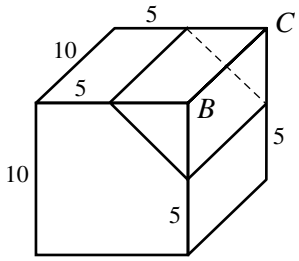
(ii)



[1]

(b) Another 10 cm cube is cut as shown.

A prism containing the corners *B* and *C* is removed.
Calculate the volume which **remains**.



Answer *(b)* ..... cm^3 [2]