UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/31**

Paper 3 (Core) **May/June 2011**

1 hour 45 minutes

Candidates answer on the Question Paper

Additional Materials: Geometrical Instruments
Graphics Calculator

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
Do not use staples, paper clips, highlighters, glue or correction fluid.
You may use a pencil for any diagrams or graphs.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** the questions.
Unless instructed otherwise, give your answers exactly or correct to three significant figures as appropriate.
Answers in degrees should be given to one decimal place.
For π, use your calculator value.
You must show all the relevant working to gain full marks and you will be given marks for correct methods, including sketches, even if your answer is incorrect.
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 96.

For Examiner's Use

This document consists of **16** printed pages.

Formula List

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle, radius r.	$A = \pi r^2$
Circumference, C, of circle, radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Curved surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$

Answer **all** the questions.

1 Ali and Amanda are in the same class at school.

(a) In a test Ali's mark is 24 and Amanda's mark is 28.

(i) Write down the ratio.

Ali's mark : Amanda's mark.

Give your answer in its simplest form.

Answer(a)(i) ..... : ..... [1]

(ii) Calculate Amanda's mark as a percentage of Ali's mark.

Answer(a)(ii) ..... % [2]

(b) In another test Ali's mark is again 24 but the ratio of the marks changes to

Ali's mark : Amanda's mark = 8 : 7.

Calculate Amanda's mark.

Answer(b) ..... [2]

(c) Ali and Amanda share \$35 in the ratio 3 : 4.

Calculate how much Ali receives.

Answer(c) \$ ..... [2]

2 **(a)** Simplify fully.

(i) $12x^4 \times 4x^3$

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

(ii) $15x^3 \div 3x^{15}$

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

(iii) $\frac{2x}{3y} \times \frac{6y}{t}$

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

(b) Write $\frac{2c}{5} + \frac{d}{2}$ as a single fraction.

Answer(b) ..... [2]

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3 A ferry leaves Calais at 23 15.
It takes 1 h 55 min to reach Dover.

(a) Write down the arrival time of the ferry at Dover.

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

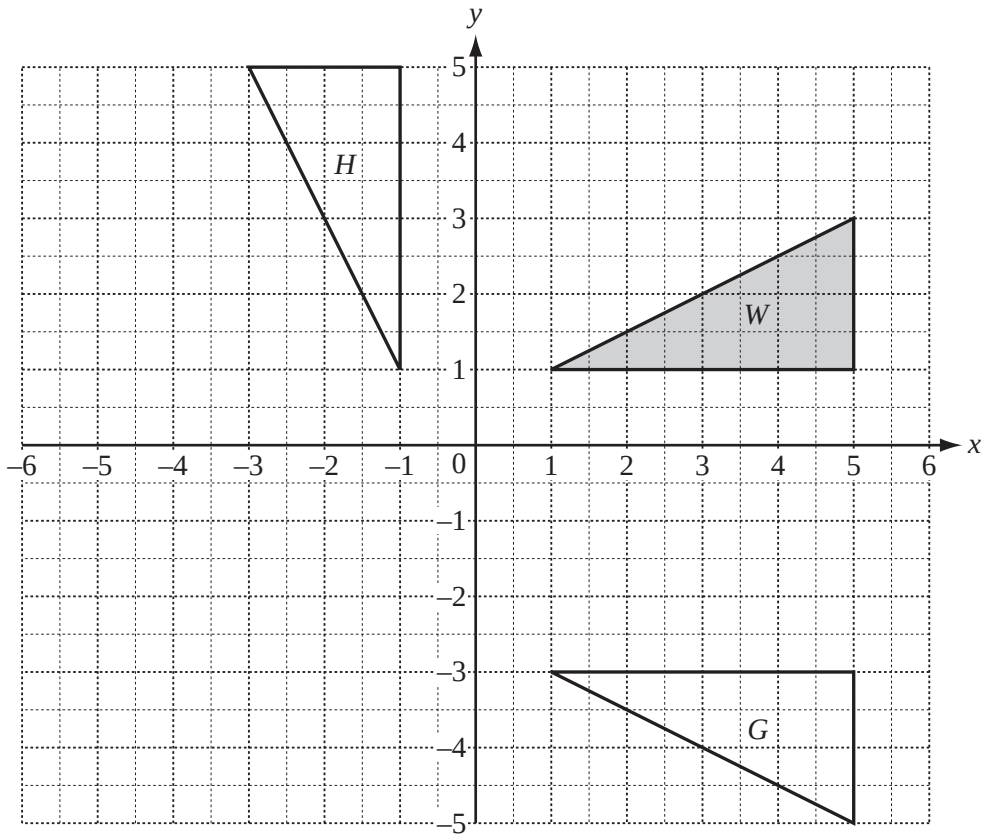
(b) The distance travelled is 43 km.
Calculate the average speed of the journey, in km/h.

Answer(b) ..... km/h [3]

(c) In 2009 a ferry ticket cost €40.
The cost of the ferry ticket increased **each year** by 5%.
Calculate the cost of the ferry ticket in 2011.

Answer(c) € ..... [3]

4



(a) Describe fully the **single** transformation that maps triangle W onto

(i) triangle G, ...

..... [2]

(ii) triangle H. .....

..... [3]

(b) On the grid,

(i) draw the translation of triangle W by $\begin{pmatrix} 1 \\ -3 \end{pmatrix}$, [2]

(ii) draw the enlargement of triangle W, centre (0, 0), scale factor $\frac{1}{2}$. [2]

5 **(a)** $y = 3x - 8$

(i) Find the value of y when $x = -5$.

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

(ii) Make x the subject of the equation.

Answer(a)(ii) $x =$ ..... [2]

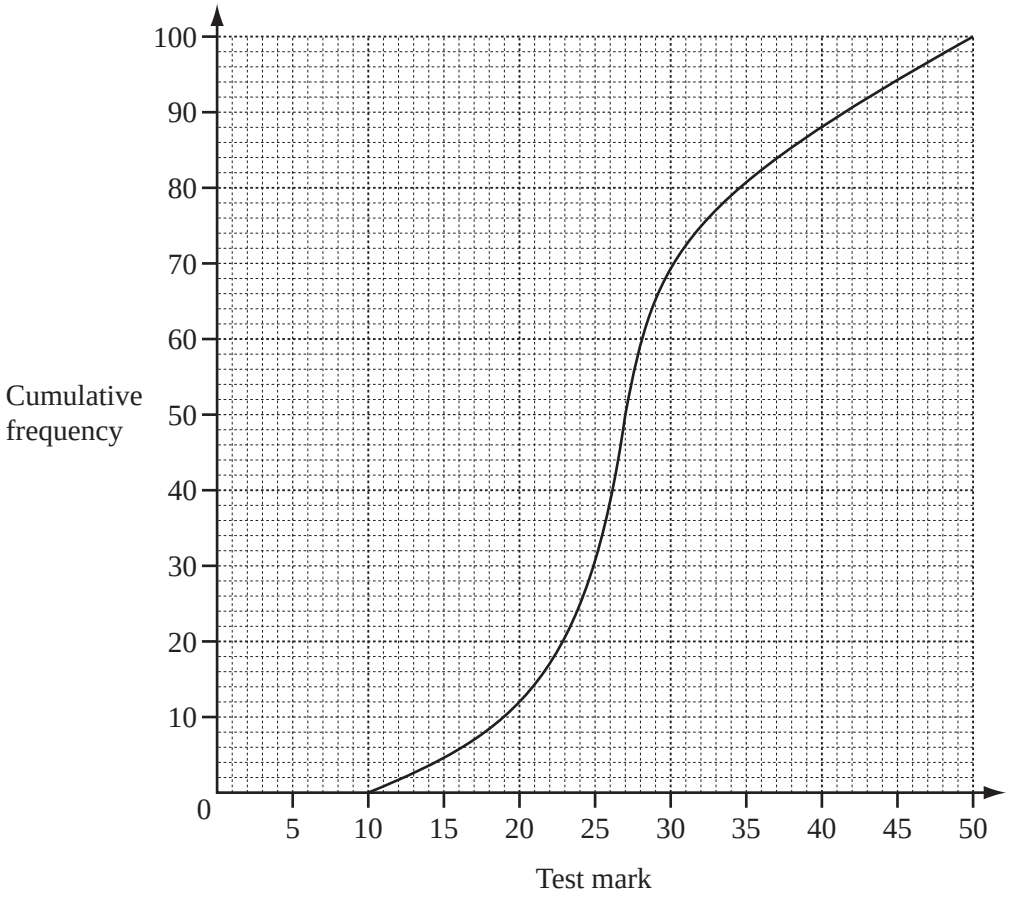
(b) Solve the simultaneous equations.
Show your method.

$$y = 2x - 7$$
$$y = 3 - 2x$$

Answer(b) $x =$ .....

$y =$ ..... [3]

6



The cumulative frequency graph shows the distribution of test marks for 100 students.

Use the graph to find

(a) the median,

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

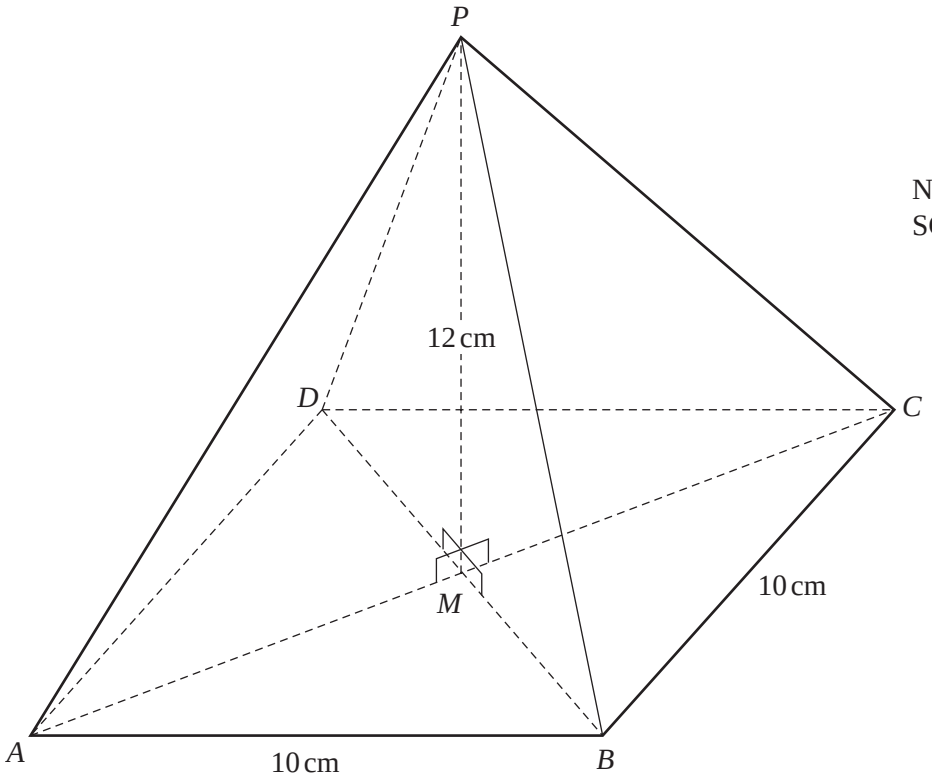
(b) the inter-quartile range,

Answer(b) ..... [2]

(c) the number of students with a mark of **at least** 20.

Answer(c) ..... [2]

7



NOT TO SCALE

The diagram shows a pyramid with a square horizontal base *ABCD*.

The diagonals of the base intersect at *M*.

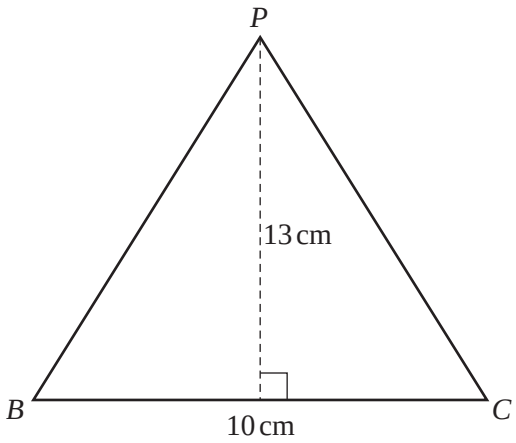
The vertex, *P*, of the pyramid is vertically above *M*.

AB = *BC* = 10 cm and *PM* = 12 cm.

(a) Calculate the volume of the pyramid.

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

(b)



NOT TO SCALE

The diagram shows one of the faces of the pyramid, triangle *PBC*.

The distance from *P* to the midpoint of *BC* is 13 cm.

Calculate

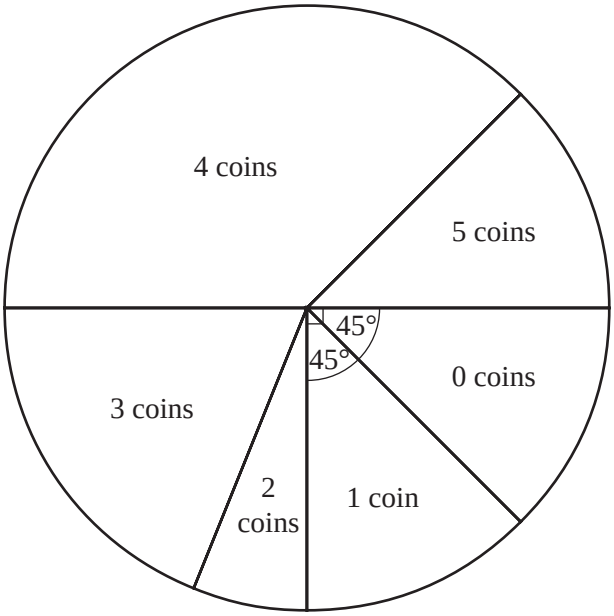
(i) the area of triangle *PBC*,

Answer(b)(i) ..... cm^2 [2]

(ii) the **total** surface area of the pyramid.

Answer(b)(ii) ..... cm^2 [2]

8 32 students are asked how many coins they have.
The results are shown in the pie chart.



(a) **(i)** Measure the angle which shows the number of students who have 4 coins.

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

(ii) Calculate the number of students who have 4 coins.

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

(iii) Calculate the number of students who have more than one coin.

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

(b) Complete the frequency table.

Number of coins	0	1	2	3	4	5
Number of students (frequency)			2	6		

[2]

(c) Find

(i) the mean, *Answer(c)*(i) ..... [1]

(ii) the mode, *Answer(c)*(ii) ..... [1]

(iii) the median. *Answer(c)*(iii) ..... [1]

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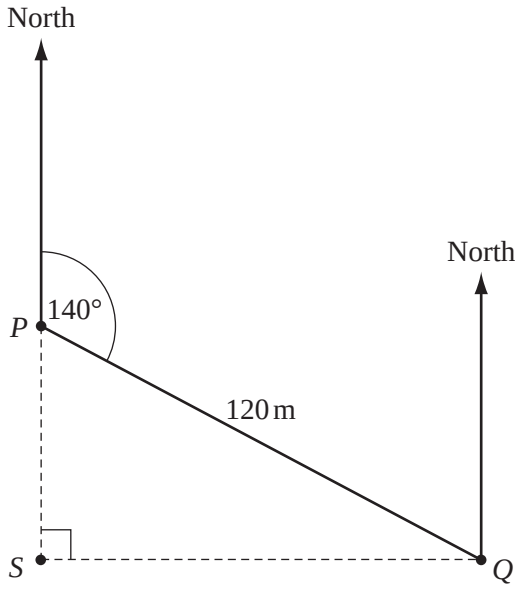


Q is 120 m from P, on a bearing of 140°.

(a) Find the bearing of P from Q.

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

(b) S is due south of P and due west of Q.

Calculate the distance SQ.

Answer(b) ..... m [3]

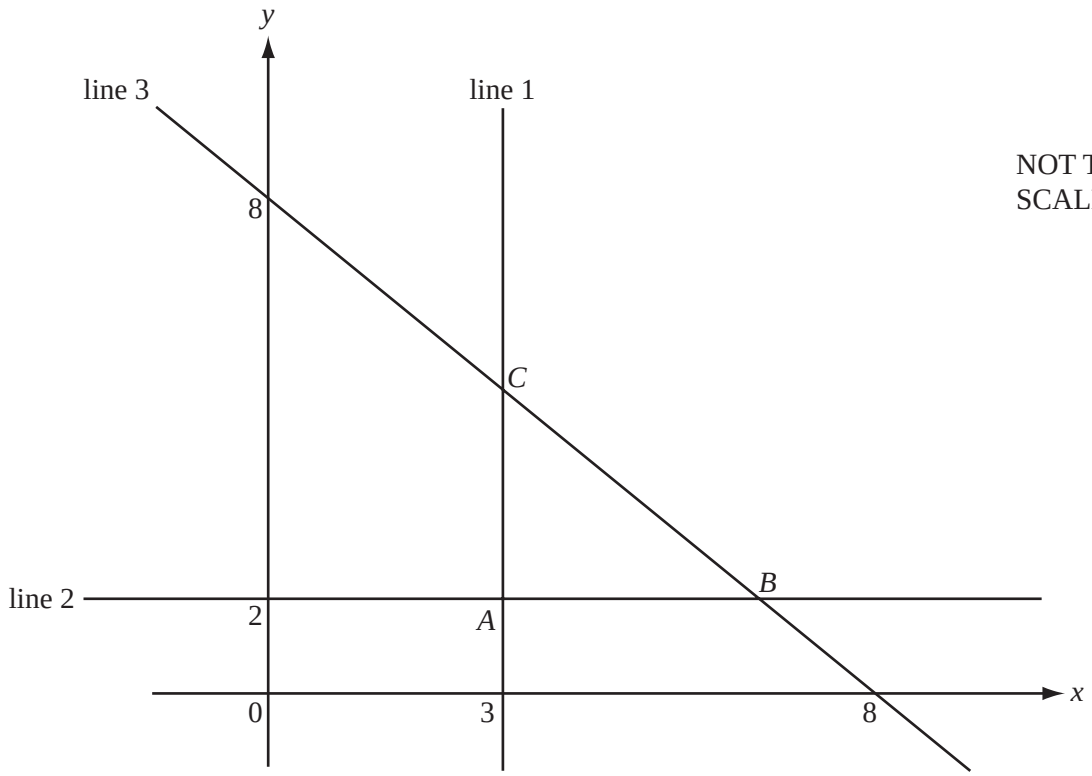
(c) **(i)** R is also 120 m from P and is due west of S.

Show R and the line PR on the diagram. [1]

(ii) Find the bearing of R from P.

Answer(c)(ii) ..... [1]

10



The diagram shows three lines, line 1, line 2 and line 3.

Line 1 is parallel to the y-axis and passes through (3, 0).

Line 2 is parallel to the x-axis and passes through (0, 2).

Line 3 passes through (8, 0) and (0, 8).

(a) Find the equation of

(i) line 1,

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

(ii) line 2,

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

(iii) line 3.

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

(b) The lines intersect at the points A, B and C as shown in the diagram.

(i) Work out the co-ordinates of B.

Answer(b)(i) (..... , ...) [2]

(ii) Work out the co-ordinates of the midpoint of AB.

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

(iii) Calculate the length of BC.

Answer(b)(iii) ..... [3]

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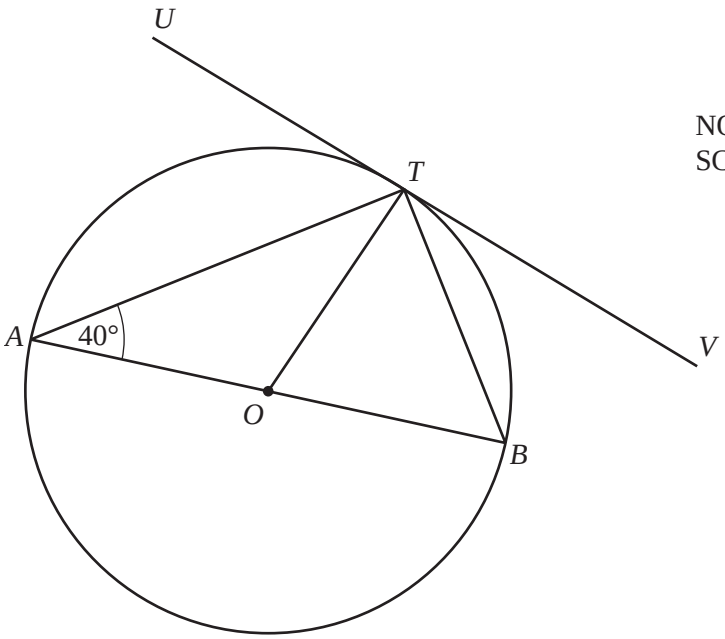

NOT TO SCALE

AB is a diameter of a circle, centre *O*.
T is a point on the circle and angle *TAB* = 40°.
UTV is a tangent to the circle at *T*.

(a) Complete the following statements.

(i) Angle *ATB* = ..., because ..... [1]

(ii) Angle *OTV* = ..., because ..... [1]

(b) Find the size of

(i) angle *ATO*,

Answer(b)(i) ..... [1]

(ii) angle *TOB*,

Answer(b)(ii) ..... [1]

(iii) angle *UTB*.

Answer(b)(iii) ..... [1]

(c) *AB* and *UV* are extended to meet at *X*.

(i) Show this on the diagram. [1]

(ii) **Calculate** the size of angle *TXO*.

Answer(c)(ii) ..... [1]

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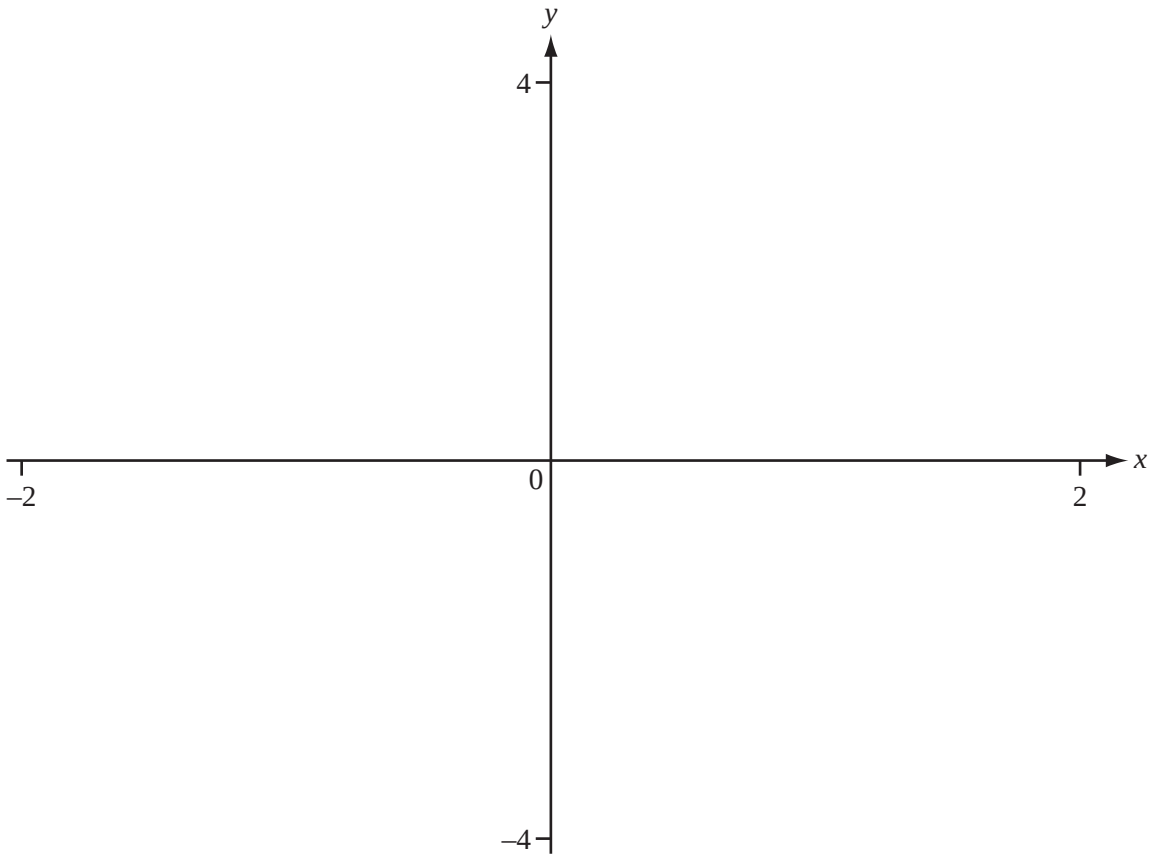


(a) On the axes, sketch the graph of

(i) $y = x^2 - 2$ for $-2 \leqslant x \leqslant 2$, [2]

(ii) $y = 2^x$ for $-2 \leqslant x \leqslant 2$. [2]

(b) Write down the zeros of $y = x^2 - 2$.

Answer(b) $x =$ ..... and $x =$ ..... [2]

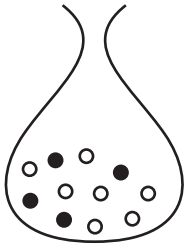
(c) Solve the equation $2^x = x^2 - 2$ for $-2 \leqslant x \leqslant 2$.

Answer(c) $x =$ ..... [1]

(d) For the domain $-2 \leqslant x \leqslant 2$, write down the range of the function 2^x.

Answer(d) ..... [2]

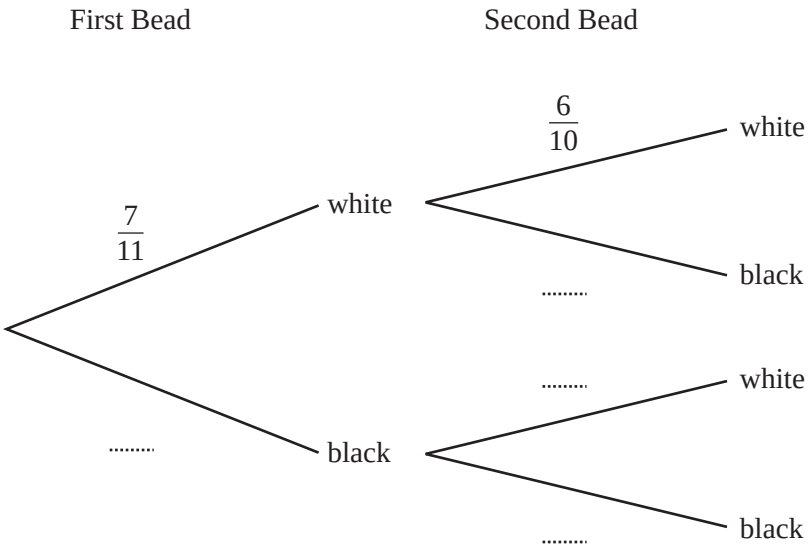
13



A bag contains 7 white beads and 4 black beads.

Two beads are taken out of the bag at random (without replacement).

(a) Complete the tree diagram by putting the probabilities in the spaces.



[2]

(b) Calculate the probability that

(i) both beads are white,

Answer(b)(i) ..... [2]

(ii) exactly one bead is white.

Answer(b)(ii) ..... [3]