Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTER NUMBER

CANDIDATE NUMBER

2690205000

MATHEMATICS (US) **0444/43**

Paper 4 (Extended) **October/November 2014**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments
Electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your Center number, candidate 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.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If work is needed for any question it must be shown in the space provided.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant digits.
Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

The number of points is given in parentheses [ ] at the end of each question or part question.
The total of the points for this paper is 130.

Write your calculator model in the box below.

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

CAMBRIDGE International Examinations

Formula List

For the equation $ax^2 + bx + c = 0$ $\quad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Lateral surface area, A, of cylinder of radius r, height h. $\quad A = 2\pi rh$

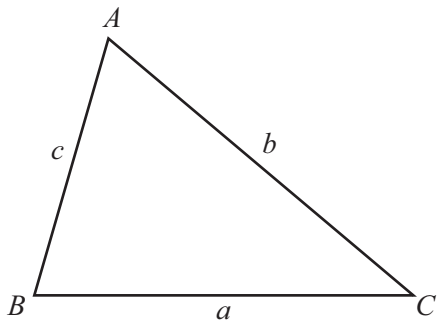
Lateral surface area, A, of cone of radius r, sloping edge l. $\quad A = \pi rl$

Surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

Volume, V, of pyramid, base area A, height h. $\quad V = \frac{1}{3}Ah$

Volume, V, of cone of radius r, height h. $\quad V = \frac{1}{3}\pi r^2 h$

Volume, V, of sphere of radius r. $\quad V = \frac{4}{3}\pi r^3$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{Area} = \frac{1}{2}bc \sin A$$

1 There are three different areas, A, B and C, for seating in a theater.
The numbers of seats in each area are in the ratio $A : B : C = 11 : 8 : 7$.
There are 920 seats in area B.

(a) (i) Show that there are 805 seats in area C.

Answer(a)(i)

[1]

(ii) Write the number of seats in area B as a percentage of the total number of seats.

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

(b) The cost of a ticket for a seat in each area of the theater is shown in the table.

Area A	\$11.50
Area B	\$15
Area C	\$22.50

For a concert 80% of area B tickets were sold and $\frac{3}{5}$ of area C tickets were sold.
The total amount of money taken from ticket sales was \$35 834.

Calculate the number of area A tickets that were sold.

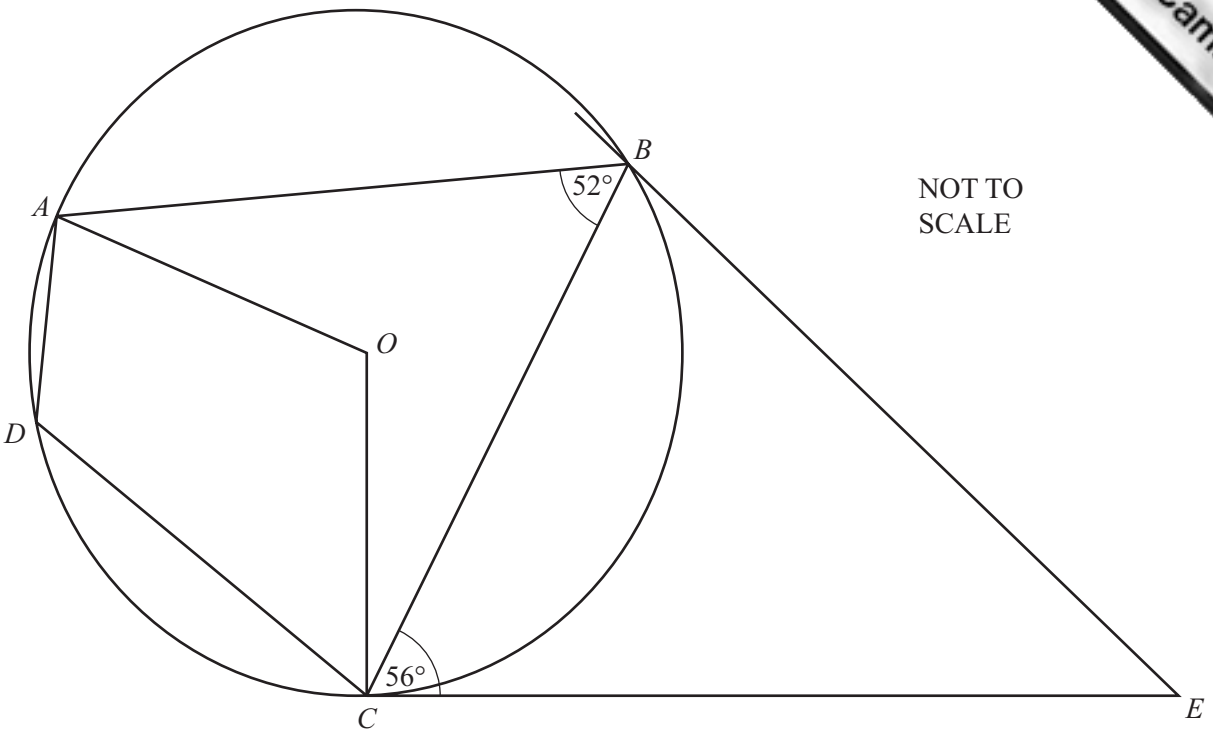
Answer(b) ..... [5]

(c) The total ticket sales of \$35 834 was 5% less than the ticket sales at the previous concert.

Calculate the ticket sales at the previous concert.

Answer(c) \$..... [3]

2



NOT TO SCALE

A, *B*, *C* and *D* are points on a circle, center *O*.
CE is a tangent to the circle at *C*.

(a) Find the sizes of the following angles and give a reason for each answer.

(i) Angle *AOC* = ... because .....

..... [2]

(ii) Angle *ADC* = ... because .....

..... [2]

(iii) Angle *BCO* = ... because .....

..... [2]

(b) $CE = 8.9$ cm and $CB = 7$ cm.

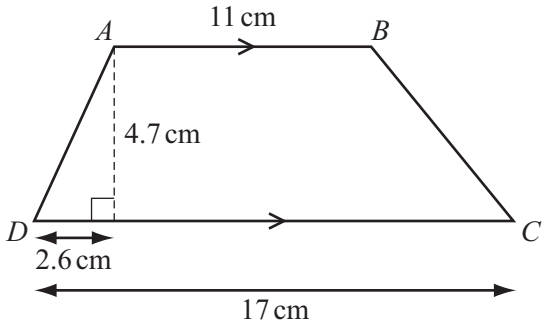
(i) Calculate the length of BE.

Answer(b)(i) BE = ... cm [4]

(ii) Calculate angle BEC.

Answer(b)(ii) Angle BEC = ... [3]

3 **(a)** *ABCD* is a trapezoid.



NOT TO SCALE

(i) Calculate the length of *AD*.

Answer(a)(i) *AD* = ... cm [2]

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

Answer(a)(ii) Angle *BCD* = ... [3]

(iii) Calculate the area of the trapezoid *ABCD*.

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

(b) A **similar** trapezoid has perpendicular height 9.4 cm.

Calculate the area of this trapezoid.

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

4 **(a)** Simplify.

(i) $x^3 \div \frac{3}{x^5}$

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

(ii) $5xy^8 \times 3x^6y^{-5}$

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

(iii) $(64x^{12})^{\frac{2}{3}}$

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

(b) Solve $3x^2 - 7x - 12 = 0$.
Show your working and give your answers correct to 2 decimal places.

Answer(b) $x =$ ..... or $x =$ ..... [4]

(c) Simplify $\frac{x^2 - 25}{x^3 - 5x^2}$.

Answer(c) ..... [3]

5 Yeung and Ariven compete in a triathlon race.

The probability that Yeung finishes this race is $\frac{3}{5}$.

The probability that Ariven finishes this race is $\frac{2}{3}$.

(a) (i) Which of them is more likely to finish this race?
Give a reason for your answer.

Answer(a)(i) ..... because .....

..... [1]

(ii) Find the probability that they both finish this race.

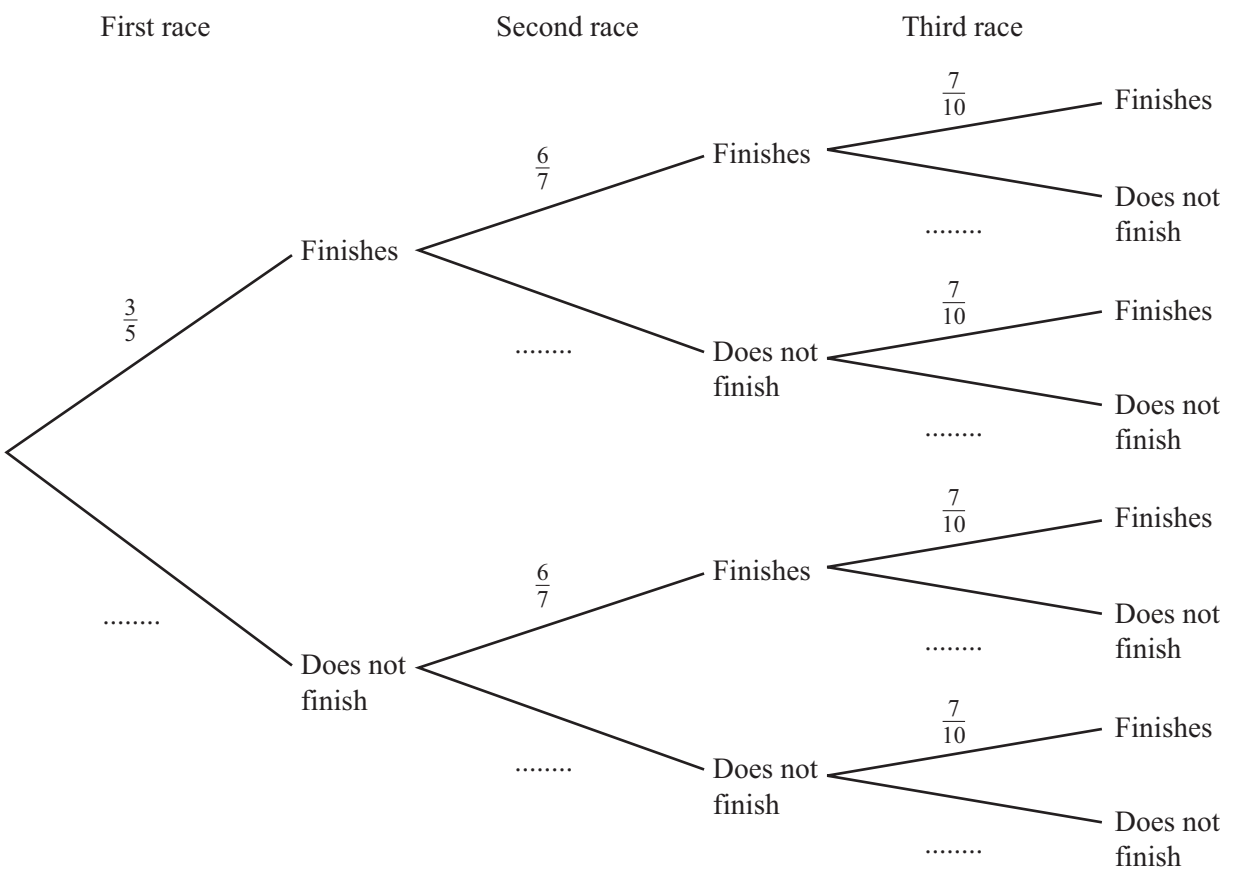
Answer(a)(ii) ..... [2]

(iii) Find the probability that only one of them finishes this race.

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

(b) After the first race, **Yeung** competes in two further triathlon races.

(i) Complete the tree diagram.



[3]

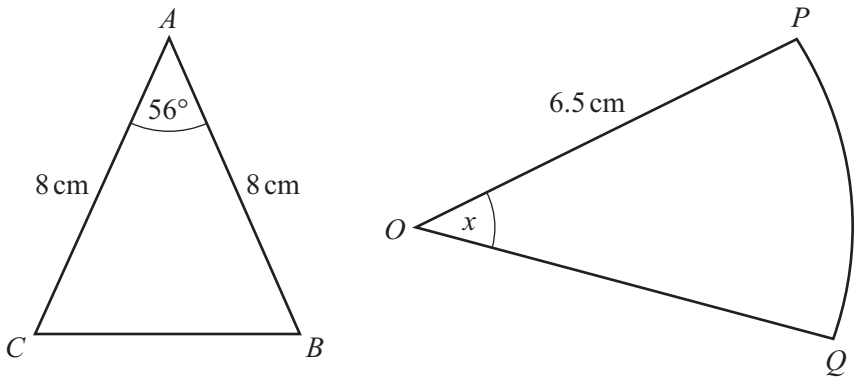
(ii) Calculate the probability that Yeung finishes all three of his races.

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

(iii) Calculate the probability that Yeung finishes at least one of his races.

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

6



NOT TO SCALE

The diagram shows a triangle and a sector of a circle.
In triangle ABC, $AB = AC = 8$ cm and angle $BAC = 56°$.
Sector OPQ has center O, sector angle x and radius 6.5 cm.

(a) Show that the area of triangle ABC is 26.5 cm^2 correct to 1 decimal place.

Answer(a)

[2]

(b) The area of sector OPQ is equal to the area of triangle ABC.

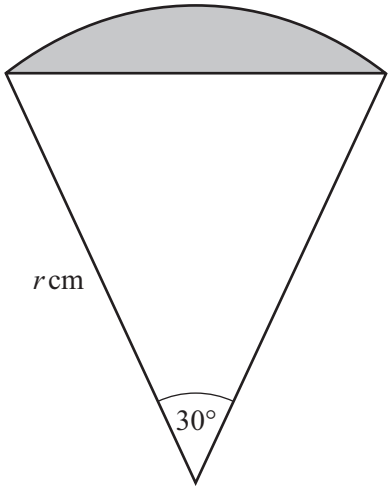
(i) Calculate the sector angle x.

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

(ii) Calculate the perimeter of the sector OPQ.

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

(c) The diagram shows a sector of a circle, radius r cm.



NOT TO SCALE

(i) Show that the area of the shaded segment is $\frac{1}{4}r^2\left(\frac{1}{3}\pi - 1\right)$ cm^2.

Answer(c)(i)

[4]

(ii) The area of the segment is 5 cm^2.

Find the value of r.

Answer(c)(ii) r = ... [3]

7 **(a)** A straight line joins the points (–1, –4) and (3, 8).

(i) Find the midpoint of this line.

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

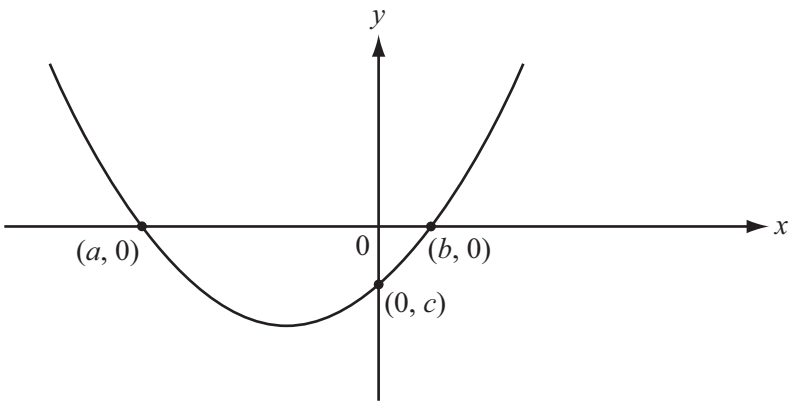
(ii) Find the equation of this line.
Give your answer in the form $y = mx + b$.

Answer(a)(ii) $y =$ ..... [3]

(b) **(i)** Factor $x^2 + 3x - 10$.

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

(ii) The graph of $y = x^2 + 3x - 10$ is sketched below.



NOT TO SCALE

Write down the values of a, b and c.

Answer(b)(ii) $a =$ .....

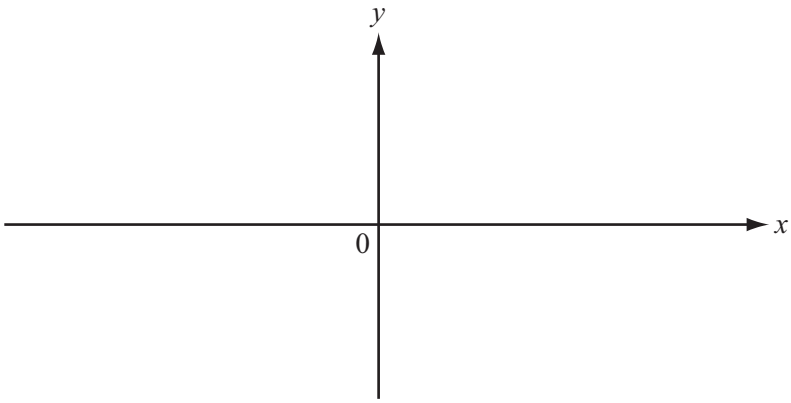
$b =$ .....

$c =$ ..... [3]

(iii) Write down the equation of the line of symmetry of the graph of $y = x^2 + 3x - 10$.

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

(c) Sketch the graph of $y = 18 + 7x - x^2$ on the axes below.
Indicate clearly the values where the graph crosses the x and y axes.



NOT TO SCALE

[4]

(d) (i) $x^2 + 12x - 7 = (x + p)^2 - q$

Find the value of p and the value of q.

Answer(d)(i) p = ...

q = ... [3]

(ii) Write down the minimum value of y for the graph of $y = x^2 + 12x - 7$.

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

8 **(a)** Ricardo asks some motorists how many liters of fuel they use in one day.
The numbers of liters, correct to the nearest liter, are shown in the table.

Number of liters	16	17	18	19	20
Number of motorists	11	10	p	4	8

(i) For this table, the mean number of liters is 17.7 .

Calculate the value of p.

Answer(a)(i) p = ... [4]

(ii) Find the median number of liters.

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

(b) Manuel completed a journey of 320 km in his car.
The fuel for the journey cost \$1.28 for every 6.4 km traveled.

(i) Calculate the cost of fuel for this journey.

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

(ii) When Manuel traveled 480 km in his car it used 60 liters of fuel.
Manuel's car used fuel at the same rate for the journey of 320 km.

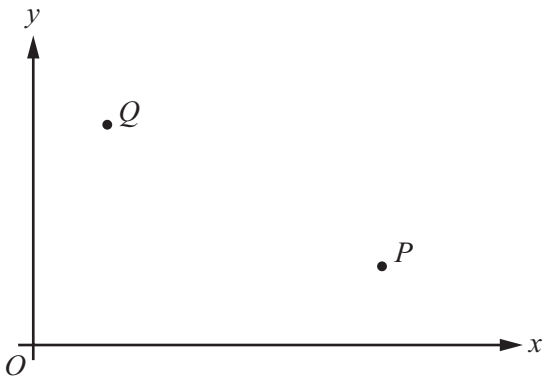
Calculate the number of liters of fuel the car used for the journey of 320 km.

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

(iii) Calculate the cost per liter of fuel used for the journey of 320 km.

Answer(b)(iii) \$..... [2]

9



NOT TO SCALE

P is the point (5, 3) and Q is the point (1, 5).
O is the origin.

(a) Find $\overrightarrow{PQ}$.

Answer(a) $\overrightarrow{PQ} =$ $\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

(b) Calculate $|\overrightarrow{OP}|$.

Answer(b) $|\overrightarrow{OP}| =$ ..... [2]

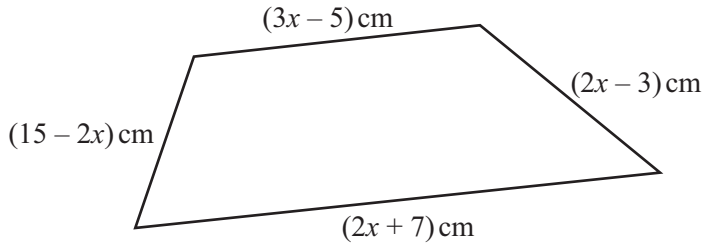
(c) **(i)** Find the slope of OP.

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

(ii) Find the equation of the line perpendicular to OP which passes through the point (0, 2).

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

10 (a)



NOT TO SCALE

(i) Write an expression, in terms of x, for the perimeter of the quadrilateral.
Give your answer in its simplest form.

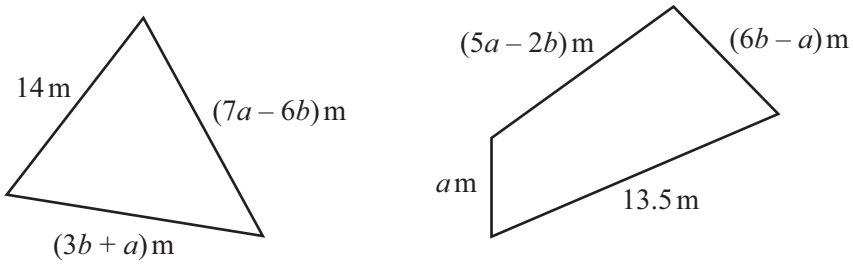
Answer(a)(i) ..... cm [2]

(ii) The perimeter of the quadrilateral is 32 cm.

Find the length of the longest side of the quadrilateral.

Answer(a)(ii) ..... cm [3]

(b)



NOT TO SCALE

The triangle has a perimeter of 32.5 m.
The quadrilateral has a perimeter of 39.75 m.

Write two equations in terms of a and b and simplify them.
Use an algebraic method to find the values of a and b.
Show all your work.

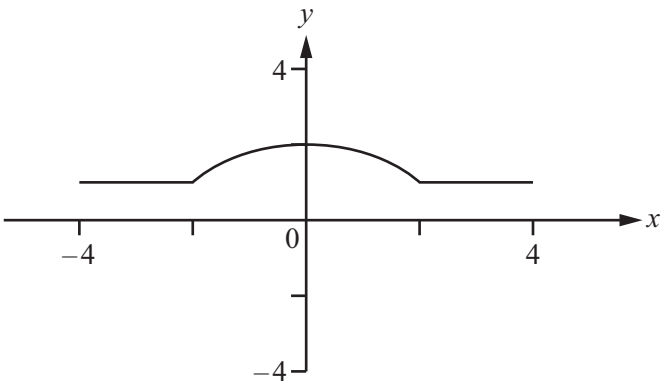
Answer(b) a = ...

b = ... [6]

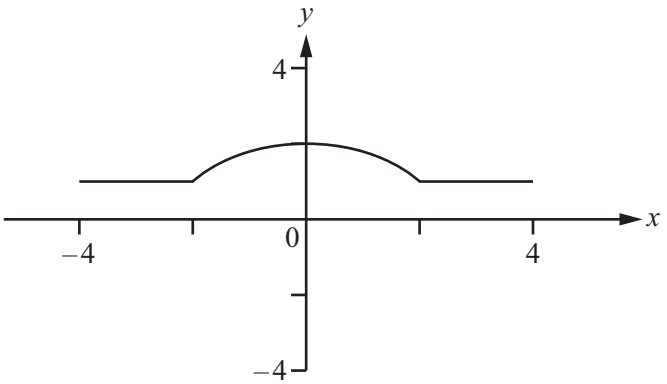
11 **(a)** Each diagram shows a sketch of the graph of $y = f(x)$.

On each diagram, sketch the graph of the function indicated.

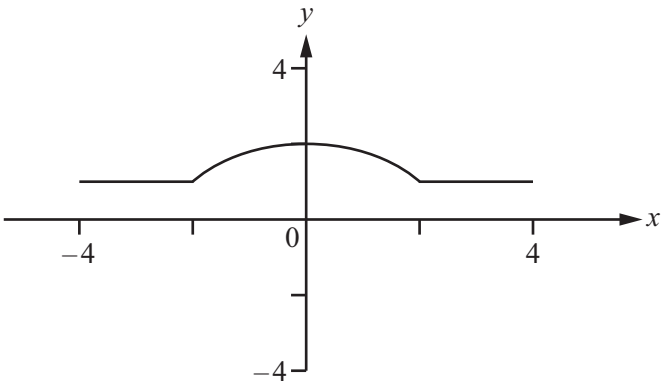
$y = f(x - 1)$



$y = f(x) + 1$



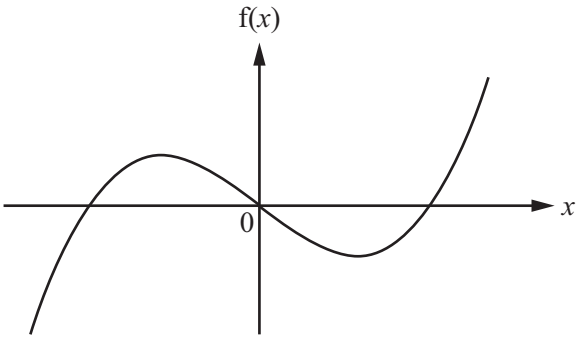
$y = 2f(x)$



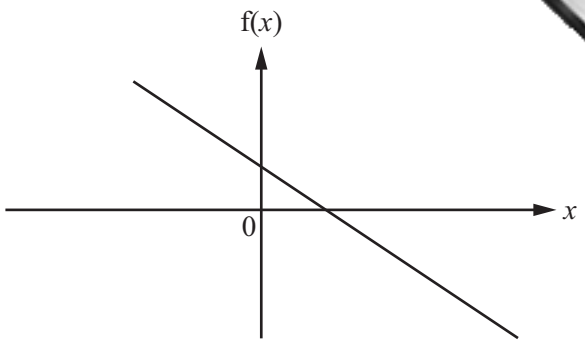
[4]

(b) The diagrams A, B, C and D show the sketches of the four functions in the table below.

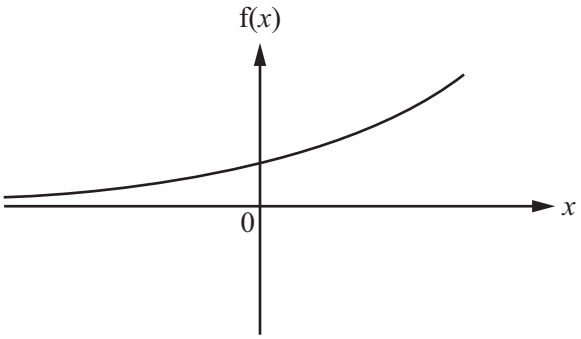
Complete the table by writing the diagram label against the correct function.



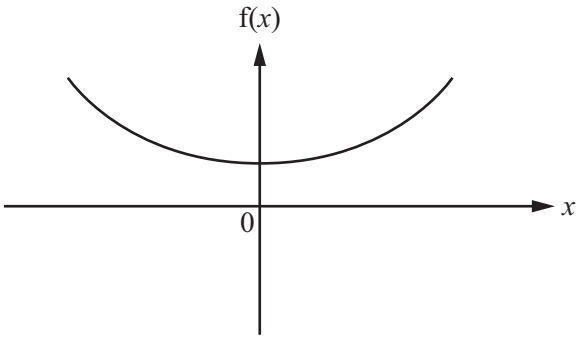
A



B



C



D

f(x)	Diagram label
2^x	
$x^3 - x$	
$x^2 + 1$	
$-2x + 1$	

[4]

BLANK PAGE