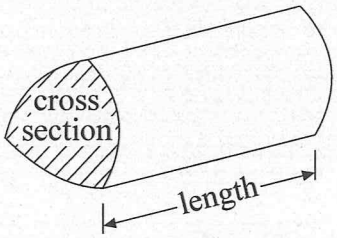
TARGET A STAR PAPER

GCSE Mathematics (Linear) 1380

Formulae: Higher Tier

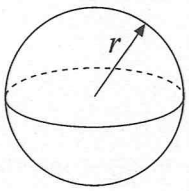
You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of a prism = area of cross section × length



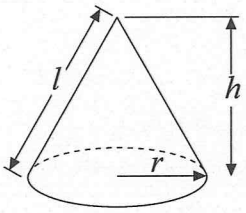
Volume of sphere $= \frac{4}{3}\pi r^3$

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

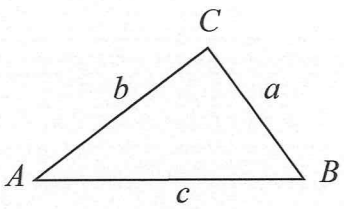


Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$



In any triangle ABC



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

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

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

The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

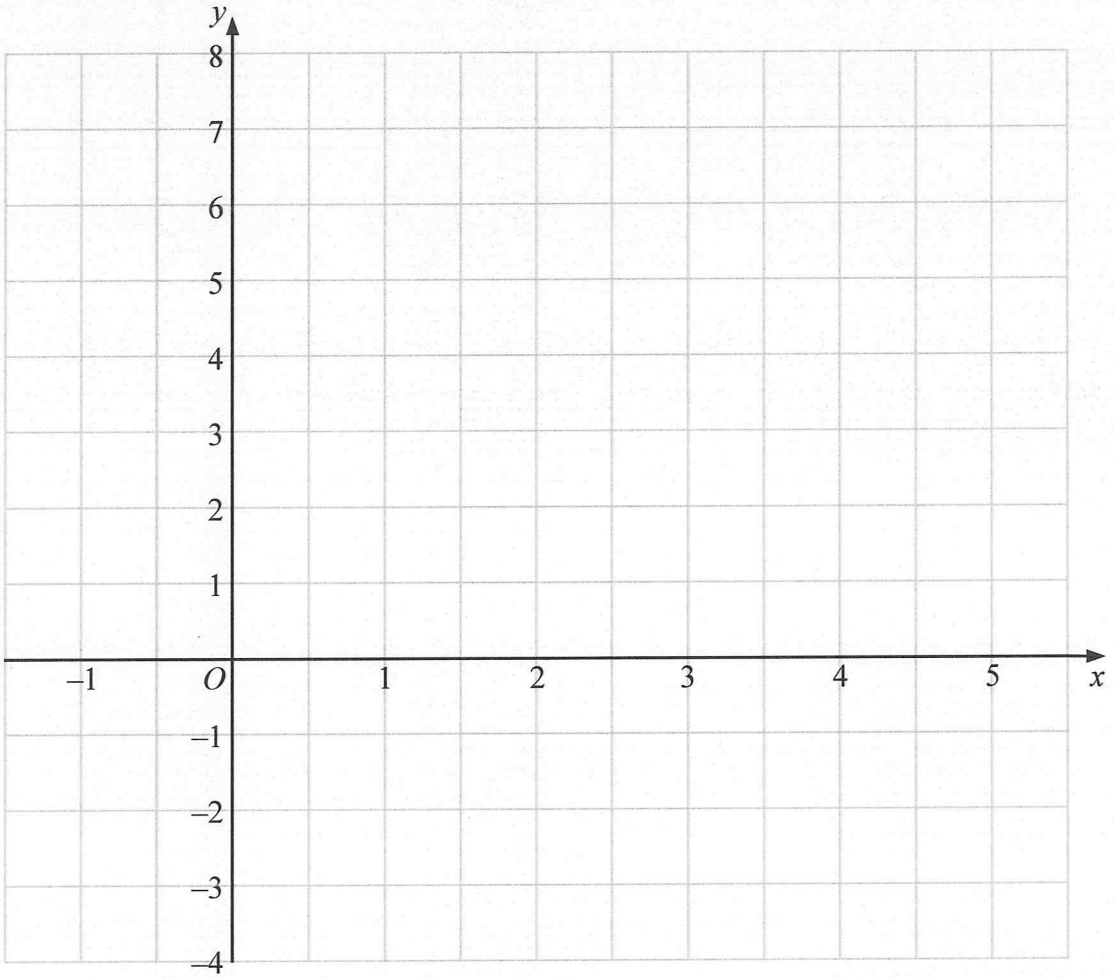
Leave blank

20. (a) Complete the table of values for $y = x^2 - 4x + 2$

x	–1	0	1	2	3	4	5
y		2	–1		–1		7

(2)

(b) On the grid, draw the graph of $y = x^2 - 4x + 2$



(2) **Q20**

(Total 4 marks)

2008-05-H-NC

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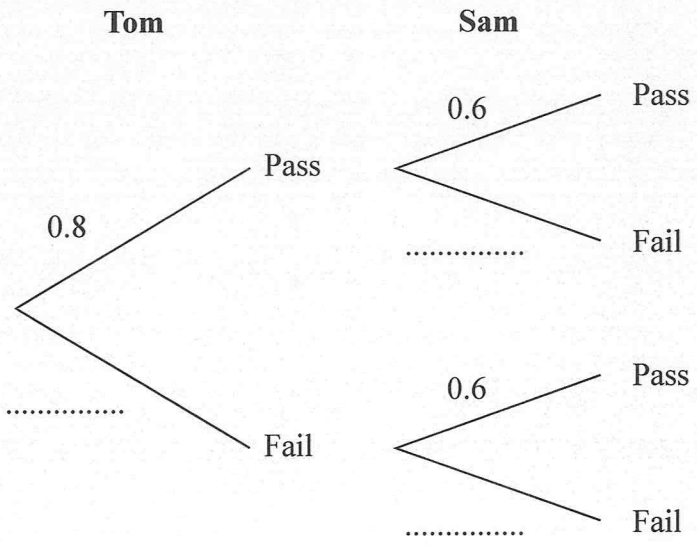
21. Tom and Sam each take a driving test.

The probability that Tom will pass the driving test is 0.8

The probability that Sam will pass the driving test is 0.6

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that both Tom and Sam will pass the driving test.

.....

(2)

(c) Work out the probability that only one of them will pass the driving test.

.....

(3)

Q21

(Total 7 marks)

Leave blank

22. Make b the subject of the formula $a = \dfrac{2-7b}{b-5}$

.....

Q22

(Total 4 marks)

23. (a) Rationalise the denominator of $\dfrac{1}{\sqrt{3}}$

.....

(1)

(b) Expand $(2+\sqrt{3})(1+\sqrt{3})$

Give your answer in the form $a+b\sqrt{3}$, where a and b are integers.

.....

(2)

Q23

(Total 3 marks)

2008-05-H-NC

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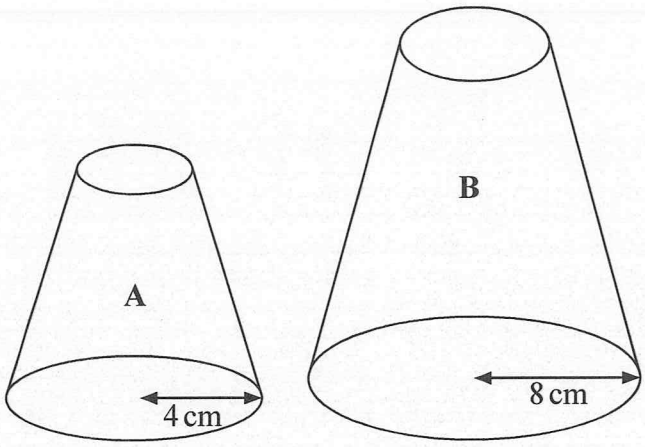
24.

Diagrams **NOT** accurately drawn



Two solid shapes, **A** and **B**, are mathematically similar.
The base of shape **A** is a circle with radius 4 cm.
The base of shape **B** is a circle with radius 8 cm.

The surface area of shape **A** is 80 cm^2.

(a) Work out the surface area of shape **B**.

..... cm^2
(2)

The volume of shape **B** is 600 cm^3.

(b) Work out the volume of shape **A**.

..... cm^3
(2) **Q24**

(Total 4 marks)

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25.

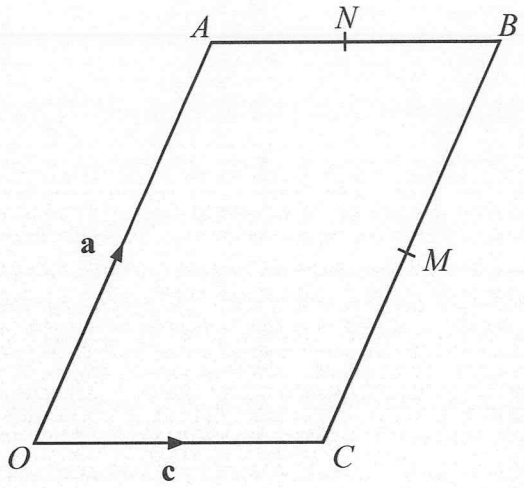

Diagram **NOT** accurately drawn

OABC is a parallelogram.
M is the midpoint of *CB*.
N is the midpoint of *AB*.

$\overrightarrow{OA} = \mathbf{a}$

$\overrightarrow{OC} = \mathbf{c}$

(a) Find, in terms of **a** and/or **c**, the vectors

(i) $\overrightarrow{MB}$,

.....

(ii) $\overrightarrow{MN}$.

.....

(2)

(b) Show that *CA* is parallel to *MN*.

(2) **Q25**

(Total 4 marks)

2008-05-H-NC

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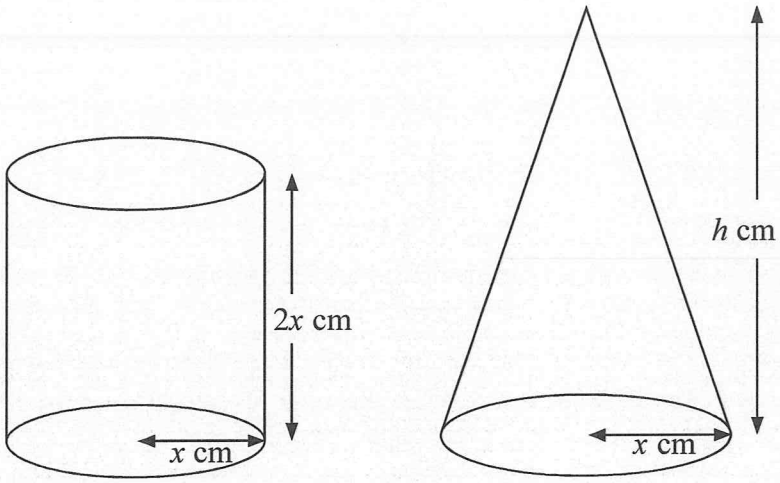
26.



Diagrams **NOT** accurately drawn

A cylinder has base radius x cm and height $2x$ cm.

A cone has base radius x cm and height h cm.

The volume of the cylinder and the volume of the cone are equal.

Find h in terms of x.
Give your answer in its simplest form.

$h =$ .....

Q26

(Total 3 marks)

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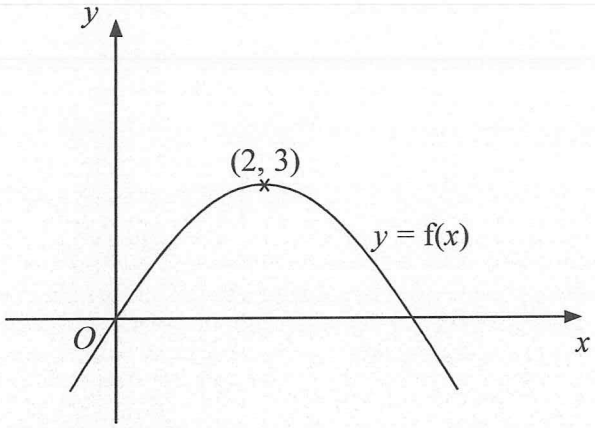
27.



The diagram shows part of the curve with equation $y = f(x)$.
The coordinates of the maximum point of this curve are (2, 3).

Write down the coordinates of the maximum point of the curve with equation

(a) $y = f(x - 2)$

(..... , ...)
(1)

(b) $y = 2f(x)$

(..... , ...)
(1) **Q27**

(Total 2 marks)

28. Simplify fully $\dfrac{x^2 + x - 6}{x^2 - 7x + 10}$

.....
Q28

(Total 3 marks)

TOTAL FOR PAPER: 100 MARKS

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2008-05-H-NC

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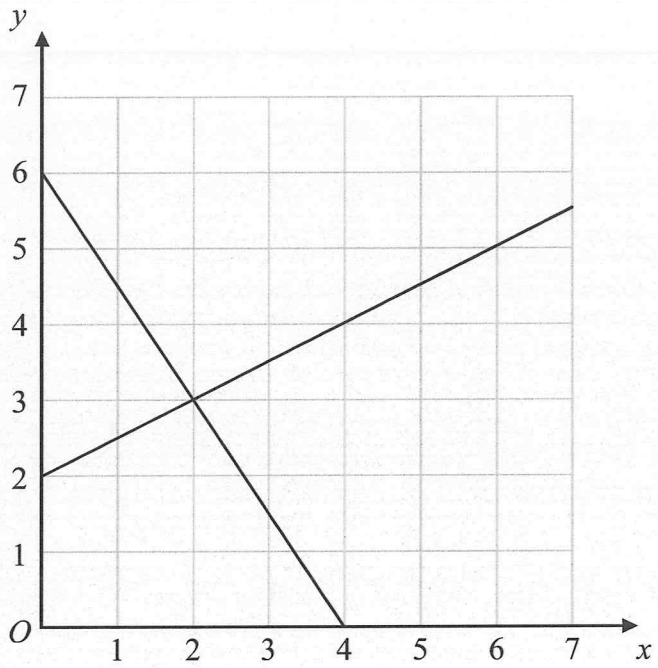
19.



The diagram shows graphs of $y = \frac{1}{2}x + 2$

and $2y + 3x = 12$

(a) Use the diagram to solve the simultaneous equations

$$y = \frac{1}{2}x + 2$$

$$2y + 3x = 12$$

$x =$ ..... $y =$ .....

(1)

(b) Find an equation of the straight line which is parallel to the line $y = \frac{1}{2}x + 2$ and passes through the point (0, 4).

.....

(2)

Q19

(Total 3 marks)

Leave blank

20. (a) Solve the inequality

$$3t + 1 < t + 12$$

.....

(2)

(b) t is a whole number.
Write down the largest value of t that satisfies

$$3t + 1 < t + 12$$

.....

(1) **Q20**

(Total 3 marks)

21. M is directly proportional to L^3.

When $L = 2$, $M = 160$

Find the value of M when $L = 3$

.....

Q21

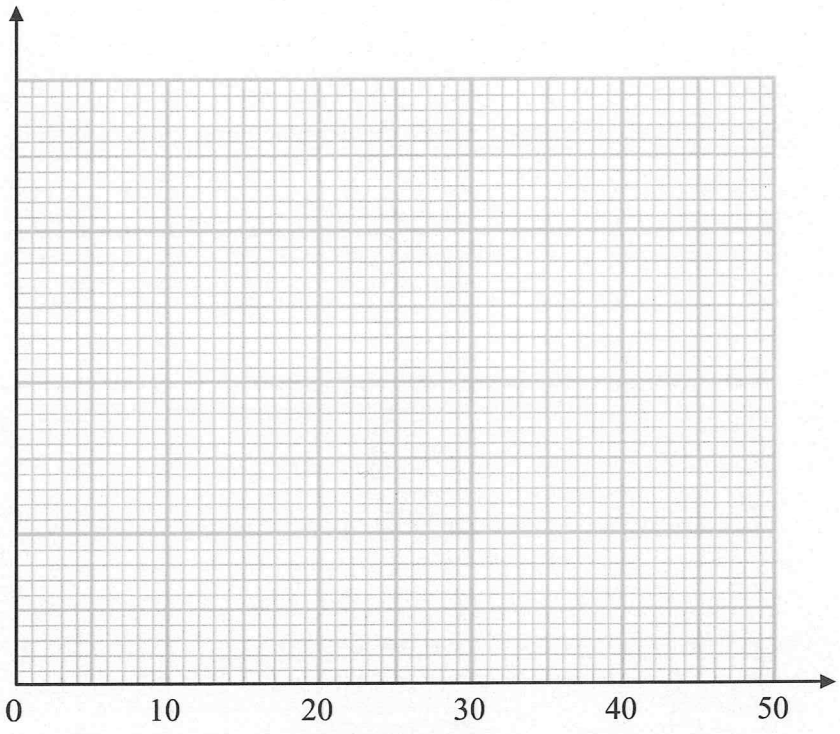
(Total 4 marks)

Leave blank

22. A call centre receives 64 telephone calls one morning.
The table gives information about the lengths, in minutes, of these telephone calls.

Length (x) minutes	Frequency
$0 < x \leqslant 5$	4
$5 < x \leqslant 15$	10
$15 < x \leqslant 30$	24
$30 < x \leqslant 40$	20
$40 < x \leqslant 45$	6

Draw a histogram for this information.



Q22

(Total 4 marks)

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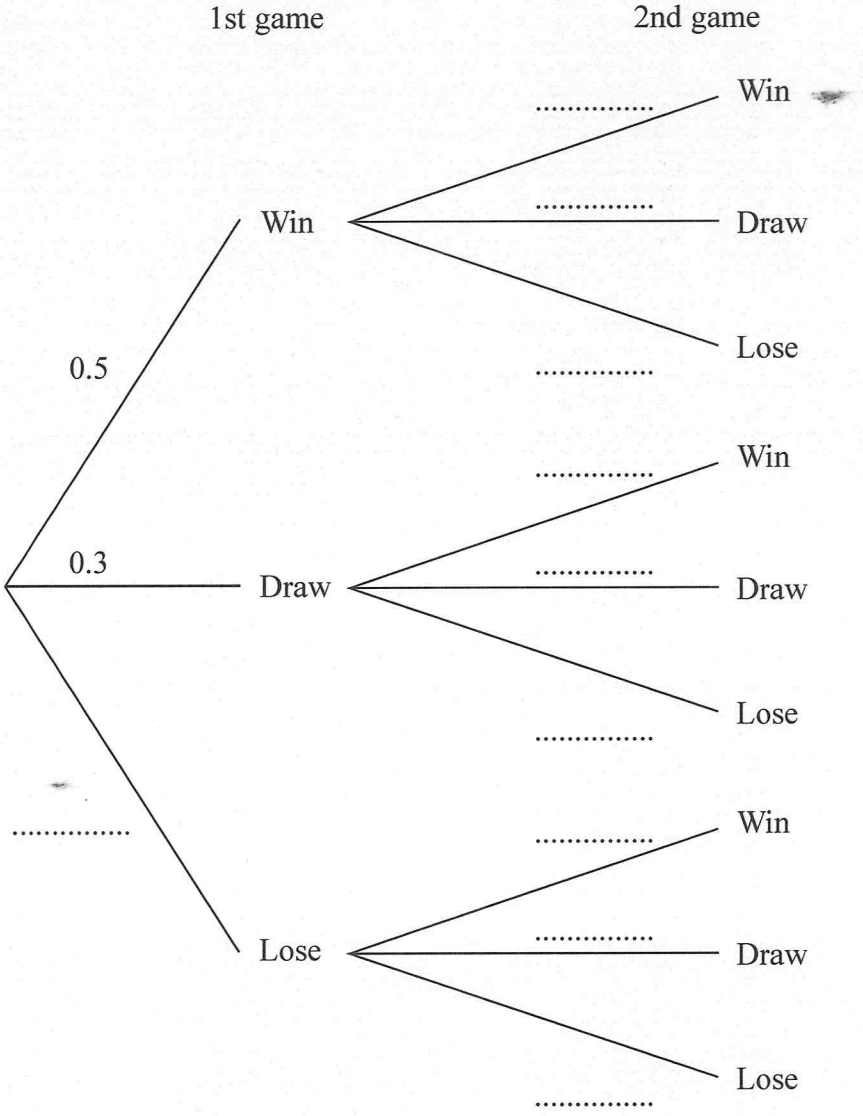
23. In a game of chess, a player can either win, draw or lose.

The probability that Vishi wins any game of chess is 0.5
The probability that Vishi draws any game of chess is 0.3

Vishi plays 2 games of chess.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Vishi will win both games.

.....

(2)

(Total 4 marks)

Q23

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24.

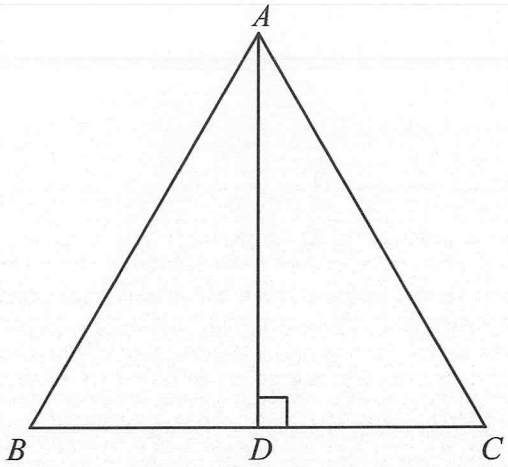

Diagram **NOT** accurately drawn

ABC is an equilateral triangle.
D lies on *BC*.
AD is perpendicular to *BC*.

(a) Prove that triangle *ADC* is congruent to triangle *ADB*.

(3)

(b) Hence, prove that $BD = \frac{1}{2}AB$.

(2) **Q24**

(Total 5 marks)

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25.

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$u = 2\frac{1}{2}$, $v = 3\frac{1}{3}$

(a) Find the value of f.

.....

(3)

(b) Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

.....

(2) **Q25**

(Total 5 marks)

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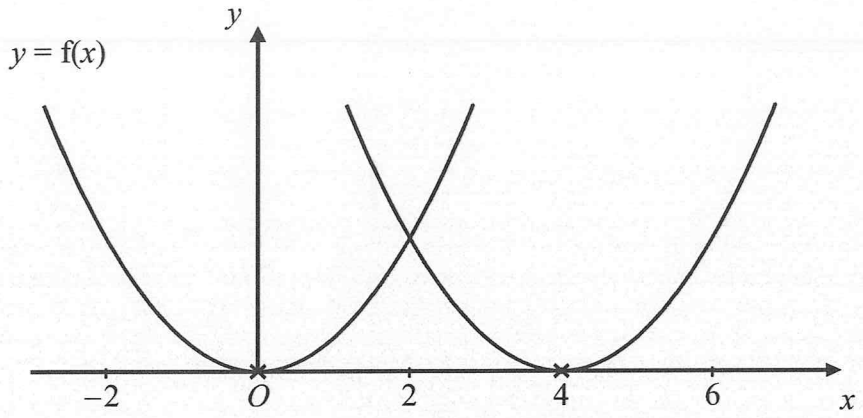
26.

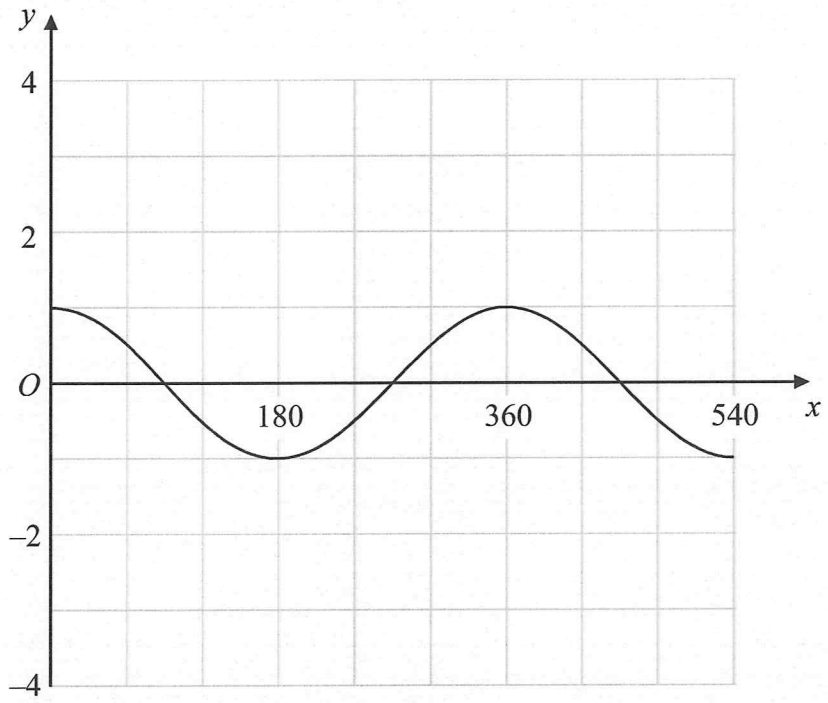


The curve with equation $y = f(x)$ is translated so that the point at (0, 0) is mapped onto the point (4, 0).

(a) Find an equation of the translated curve.

.....

(2)



The grid shows the graph of $y = \cos x°$ for values of x from 0 to 540

(b) On the grid, sketch the graph of $y = 3\cos(2x°)$ for values of x from 0 to 540

(2) **Q26**

(Total 4 marks)

TOTAL FOR PAPER: 100 MARKS

END

***21**

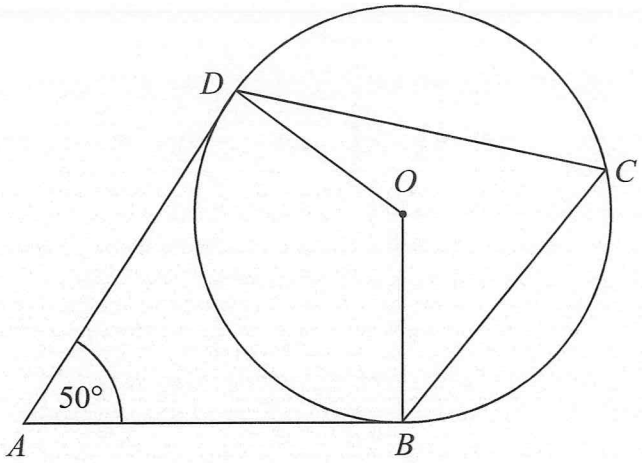


Diagram **NOT** accurately drawn

B, *C* and *D* are points on the circumference of a circle, centre *O*.
AB and *AD* are tangents to the circle.

Angle *DAB* = 50°

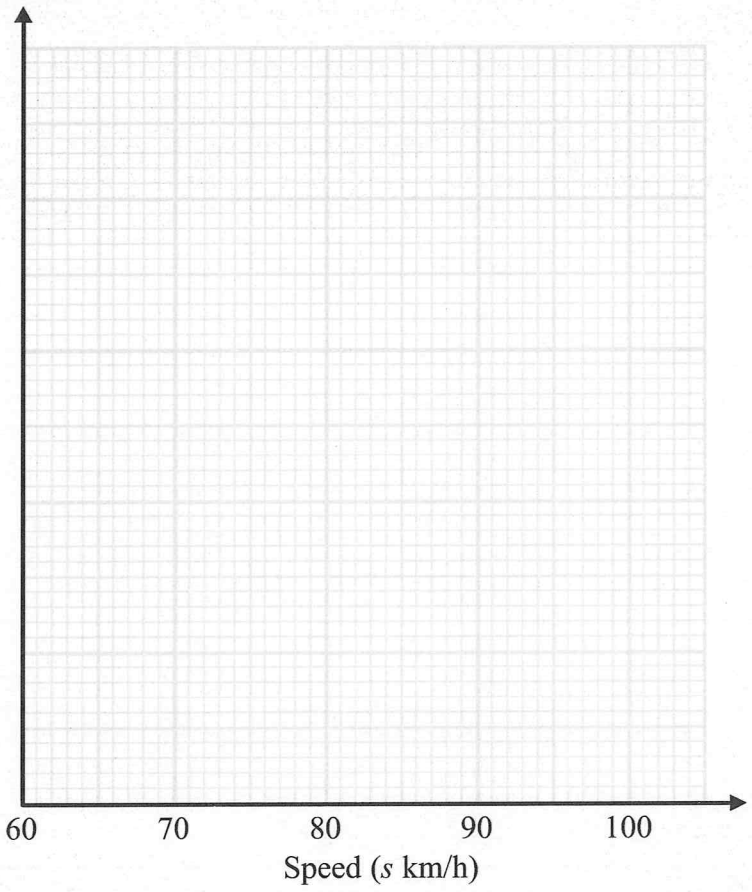
Work out the size of angle *BCD*.
Give a reason for each stage in your working.

(Total for Question 21 is 4 marks)

22 The table gives some information about the speeds, in km/h, of 100 cars.

Speed (s km/h)	Frequency
$60 < s \leqslant 65$	15
$65 < s \leqslant 70$	25
$70 < s \leqslant 80$	36
$80 < s \leqslant 100$	24

(a) On the grid, draw a histogram for the information in the table.



(3)

(b) Work out an estimate for the number of cars with a speed of more than 85 km/h.

.....

(2)

(Total for Question 22 is 5 marks)

23 (a) Simplify fully $\dfrac{x^2 + 3x - 4}{2x^2 - 5x + 3}$

.....

(3)

(b) Write $\dfrac{4}{x+2} + \dfrac{3}{x-2}$ as a single fraction in its simplest form.

.....

(3)

(Total for Question 23 is 6 marks)

24 Express the recurring decimal $0.28\dot{1}$ as a fraction in its simplest form.

.....

(Total for Question 24 is 3 marks)

25 The diagram shows a solid metal cylinder.

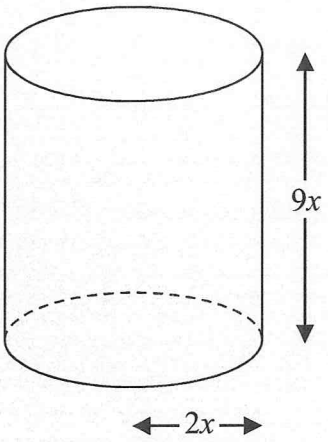


Diagram **NOT** accurately drawn

The cylinder has base radius $2x$ and height $9x$.

The cylinder is melted down and made into a sphere of radius r.

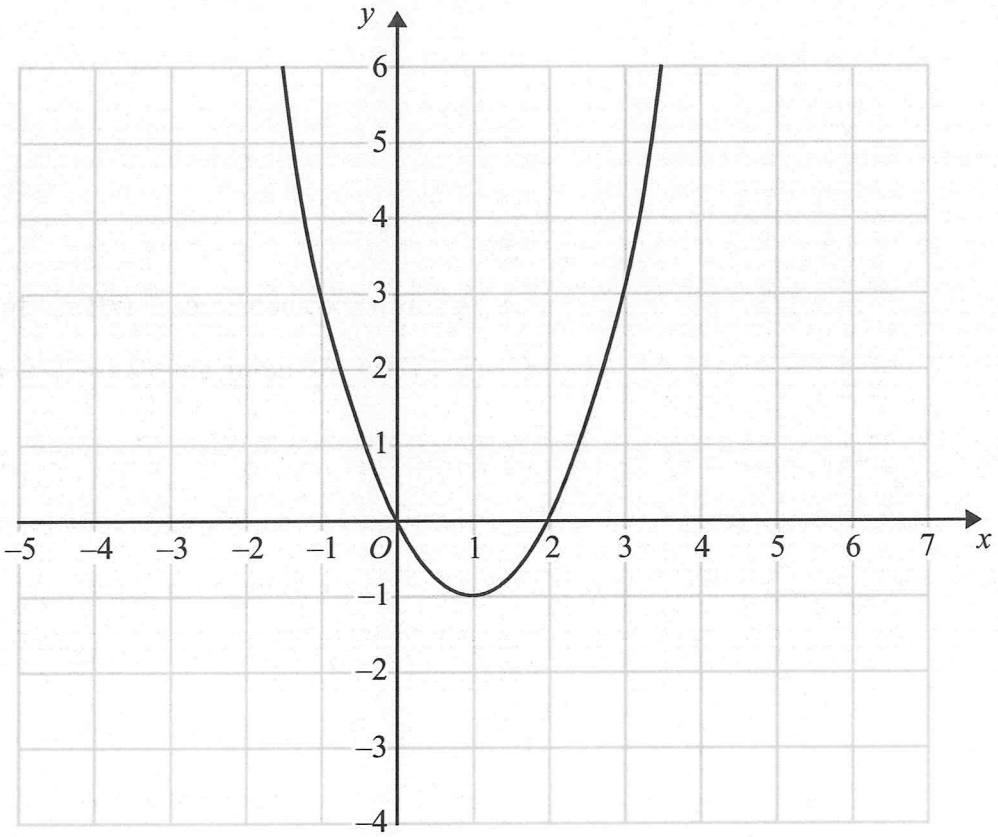
Find an expression for r in terms of x.

.....

(Total for Question 25 is 3 marks)

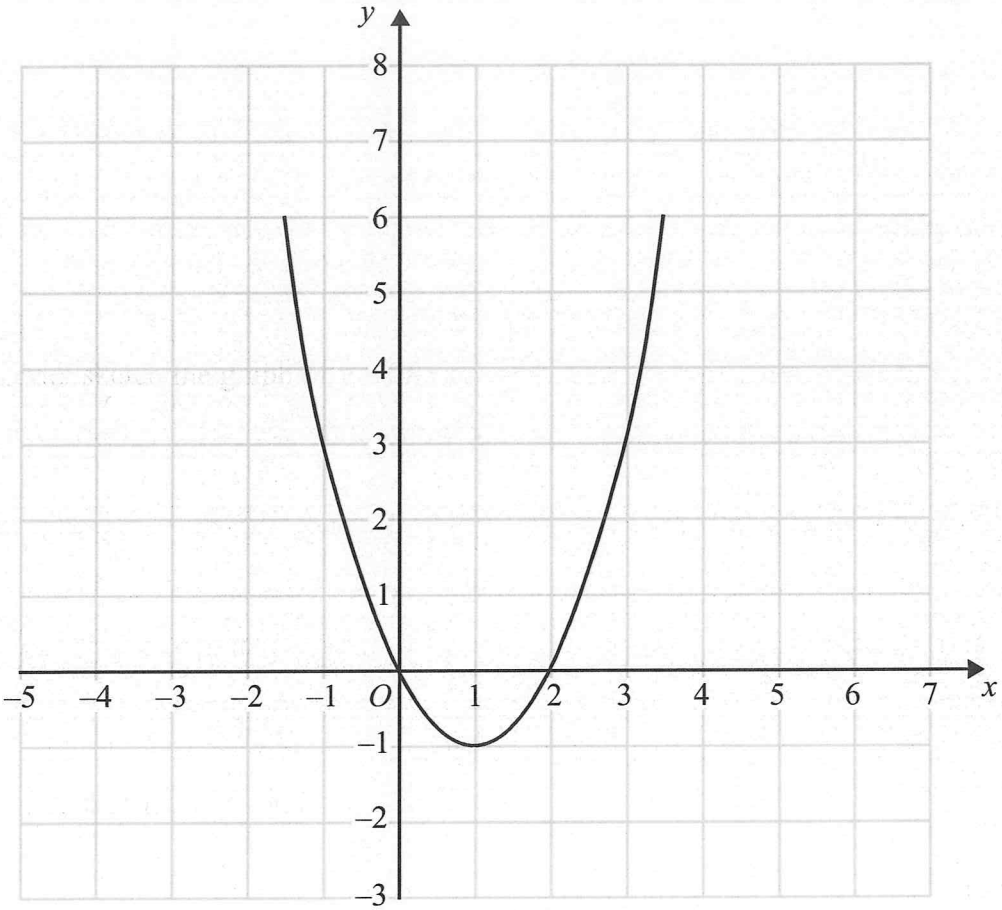
26 The graph of $y = f(x)$ is shown on each of the grids.

(a) On this grid, sketch the graph of $y = f(x - 3)$



(2)

(b) On this grid, sketch the graph of $y = 2f(x)$



(2)

(Total for Question 26 is 4 marks)

TOTAL FOR PAPER IS 100 MARKS