1. *ABC* is an isosceles triangle.

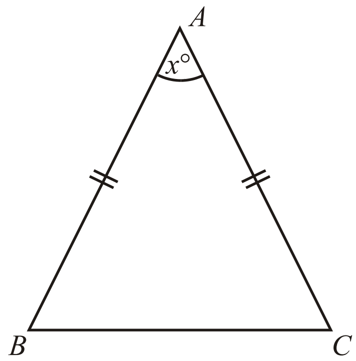

Diagram **NOT** accurately drawn

$AB = AC$
$AB = 3p + q$
$BC = p + q$

(a) Find an expression, in terms of p and q, for the perimeter of the triangle.
Give your answer in its simplest form.

....
(2)

Angle $A = x°$

(b) Find an expression, in terms of x, for the size of angle B.

....
(2)

(c) Solve the simultaneous equations

$$3p + q = 11$$

$$p + q = 3$$

$p =$ ....

$q =$ ....

(3)
(Total 7 marks)

2. *ABC* is an isosceles triangle.

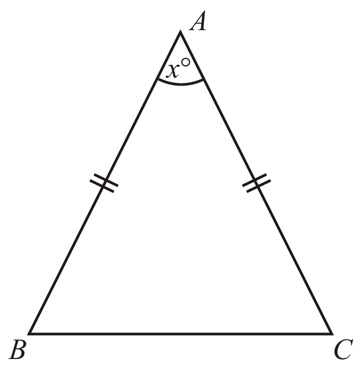

Diagram **NOT** accurately drawn

$AB = AC$
Angle $A = x°$

(a) Find an expression, in terms of x, for the size of angle B.

....

(2)

(b) Solve the simultaneous equations.

$$3p + q = 11$$

$$p + q = 3$$

p = ...

q = ...

(3)
(Total 5 marks)

3. (a) Write down an expression, in terms of n, for the nth multiple of 5.

....

(1)

(b) Hence or otherwise

(i) prove that the sum of two consecutive multiples of 5 is always an odd number,

(ii) prove that the product of two consecutive multiples of 5 is always an even number.

(5)
(Total 6 marks)

4. The diagram shows a cylinder and a sphere.

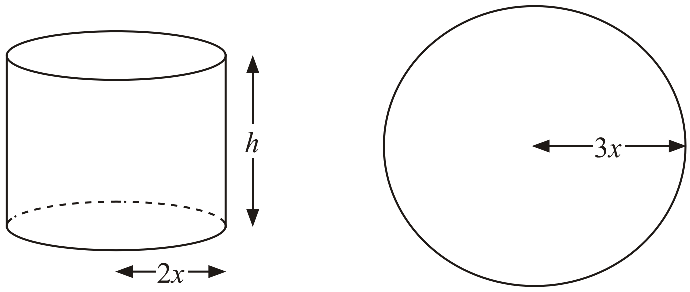

Diagram **NOT** accurately drawn

The radius of the base of the cylinder is $2x$ cm and the height of the cylinder is h cm.
The radius of the sphere is $3x$ cm.
The volume of the cylinder is equal to the volume of the sphere.

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

h = ...
(Total 3 marks)

5.

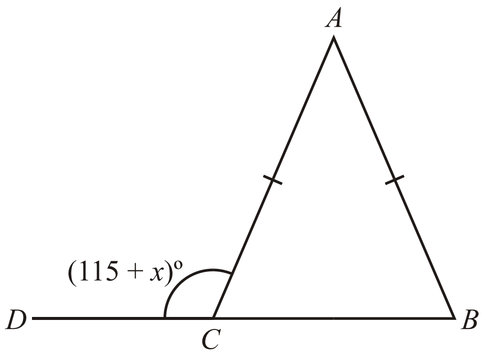

Diagram **NOT** accurately drawn

$AB = AC$.
BCD is a straight line.
Angle $ACD = (115 + x)°$.

Find, in terms of x, the size of angle BAC.
Give your answer in its simplest form.

Angle BAC = ……………………°
(Total 3 marks)

6.

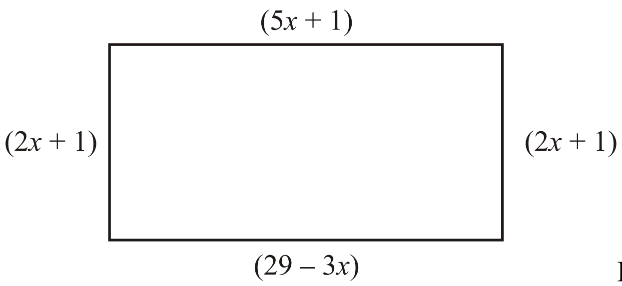

Diagram **NOT** accurately drawn

The diagram shows the length, in centimetres, of each side of the rectangle.
The perimeter of the rectangle is P cm.

Work out the value of P.

P = ...

(Total 4 marks)

1. (a) $7p + 3q$ 2

$3p + q + 3p + q + p + q$

M1 for $3p + q + 3p + q + p + q$
A1 for $7p + 3q$
(SC B1 for answer of $4p+2q$)

(b) $\frac{180 - x}{2}$ 2

$\frac{180 - x}{2}$ or $(180 - x) - 2$

M1 for $(180 - x)$ seen
A1 for fully correct expression (accept $\frac{(180 - A)}{2}$)

(c) $p = 4$
$q = -1$ 3

$3p + q = 11$
$p + q = 3$
Subtract
$2p = 8$

M1 for intention to subtract
M1 (dep) for substituting found value into either equation
A1 for $p=4$, $q = -1$

[7]

2. (a) $\frac{180 - x}{2}$ 2

$\frac{180 - x}{2}$ or $(180 - x) - 2$

M1 for $(180 - x)$ seen
A1 for fully correct expression (accept $\frac{(180 - A)}{2}$)

(b) $p = 4$
$q = -1$ 3

$3p + q = 11$
$p + q = 3$
Subtract
$2p = 8$

M1 for intention to subtract
M1 (dep) for substituting found value into either equation
A1 for $p = 4$, $q = -1$

[5]

3. (a) $5n$ 1

B1 cao

(b) (i) $5n + 5(n \pm 1)$

$10n \pm 5$

$5(2n \pm 1)$

Both 5 and 2n ± 1 are odd 2

M1 for 5n + 5(n ± 1) or 10n ± 5 or for 5(2n ± 1)

A1 for stating both 5 and 2n ± 1 are odd and odd × odd = odd oe

(ii) $5n \times 5(n \pm 1)$

$25n(n \pm 1)$

25 is odd, one of n or $n \pm 1$ is odd so odd × even × odd = even 3

M1 for 5n × 5(n ± 1)

A1 for realises that one of n and n ± 1 will be even or considers 5n or 5(n ± 1) for both odd and even

A1 for establishing correct result oe

(SC if M0, MO awarded in part (b) B1 for using in b(i) or (ii) a numerical argument with more than 2 examples)

(SC for 5n and 5n±1 used B1 in (i) and B1 in (ii) for fully reasoned argument)

[6]

4. $\pi(2x)^2 h = \frac{4}{3}\pi(3x)^3$

$h = \dfrac{\frac{4}{3}\pi(3x)^3}{\pi(2x)^2} = 9x$ 3

M1 for $\pi(2x)^2 h = \frac{4}{3}\pi(3x)^3$ *(condone absence of brackets)*

M1 (dep) for valid algebra that gets to h = ax (condone one error in powers of numerical constants)

A1 cao

[3]

5. $50 + 2x$ 3

Angle *BCA* =
$180 - (115 + x)$ $(= 65 - x)$
$180 - 2\text{"}(65 - x)\text{"}$

M1 for angle BCA = 180 − (115 + x)
M1 for 180 − 2"(180 − (115 + x))"
A1 for 2x + 50 or 2(x + 25)
OR
M1 for 360 − 2(115 + x)
M1 for 180 − (360 − 2(115 + x))
A1 for 2x + 50 or 2(x + 25)

[3]

6. 53 4

$5x + 1 = 29 - 3x$
$8x = 28$
$x = 3.5$
$2 \times (2 \times 3.5 + 1) + 2 \times (5 \times 3.5 + 1)$

M1 for 5x + 1=29 – 3x or
(2x + 1)(5x + 1) = (2x + 1)(29 – 3x)
A1 for 3.5
M1 for any correct expression for perimeter
A1 for 53

[4]

1. A good proportion of candidates made a reasonable attempt at part (a). Many added the three sides but a significant number only added two sides. Some of those who wrote $3p + q + 3p + q + p + q$ were unable to give this expression in its simplest form and final answers often contained terms in p^2, q^2 *and pq.* Some candidates gave wrong answers such as $7p + 2q$ with no working. Such candidates gained no marks. Part (b) was poorly answered. Only the better candidates knew how to attempt the question and some of these gave the answer as $180 - x \div 2$. Less than a quarter of candidates were successful in part (c). Some of the correct answers resulted from trial and error but many candidates using this approach did not check that their solution satisfied both equations and $p = 3$, $q = 2$ was a common incorrect answer. Many of those who used an algebraic approach did not realise that they could just subtract the equations. Instead, they multiplied the second equation by 3 and subtracted in an attempt to eliminate p. Quite often this led to $2q = 2$ rather than $2q = -2$.

2. In part (a) nearly 70% of candidates were able to write a correct algebraic expression for the size of one of the base angles of an isosceles triangle as $\frac{180-x}{2}$.

It was pleasing to see 80% of candidates scoring full marks on solving the straightforward simultaneous, equations. Many candidates chose to multiply the second equation by 3 and then subtracted to eliminate *p* rather than the more direct approach of subtracting the two equations.

3. This question was all about a proof involving sums and products of multiples of 5. Only 5% of the candidature was able to give the rigorous proof that was needed in part (b) though partial credit was awarded to about half of the candidates. Part (a) was answered correctly by 85% of candidates but candidates often then tried unsuccessfully to explain their proof without using the guidance in part (a) and in the stem of part (b).

4. Few candidates were able to achieve full marks in this question. A surprising number of candidates used incorrect formulae, particularly for the sphere, indicating that many candidates were perhaps unfamiliar with the contents of the formula page.

By far the most common error was the omission of the implied brackets for the powers of $2x$ and $3x$, so that only the x's were squared and cubed. Of those who tried to deal with the numbers a very common error was $3^3 = 9$. The use of algebra to make h the subject of the formula was a problem for some candidates- subtraction often taking the place of division. It was encouraging to see that candidates are now much happier dealing with π by not replacing it with a decimal approximation.

5. This was poorly answered, mainly because the standard of written algebra seen was so low. A typical start was for the candidate to omit to use brackets and just write $180 - 115 + x$, or just $65 + x$. This approach frequently lead to the incorrect answer of $50 - 2x$ or, after a double error, to the correct answer of $50 + 2x$. Surprisingly, of those who got the correct unsimplified expression, many were unable to simplify to $50 + 2x$.

6. **Higher Tier**

Approximately one fifth of candidates were able to give a fully correct solution to this question. The majority of candidates were able to gain some credit for writing down a correct expression for the perimeter. Those candidates who appreciated that $5x + 1$ must be equal to $29 - 3x$ were able to score full marks. Candidates who used trial and improvement were rarely successful.

Intermediate Tier

Only a small number (5%) gained full marks, and this was usually a result of a trial and improvement as opposed to any algebraic method. The majority of candidates attempted to derive an algebraic expression for the perimeter of the rectangle and this gained one mark if a correct expression was given. Quite often $5x + 1$ was put equal to $6x$, etc. which lead to expressions of $38x$ or, in some cases, just 38.