PMT

Paper Reference(s)

6663

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Monday 10 January 2005 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination
Mathematical Formulae (Green)

Items included with question papers
Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

In the boxes on the answer book, write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
This paper has ten questions.
The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner. Answers without working may gain no credit.

N23490A

1. (*a*) Write down the value of $16^{\frac{1}{2}}$.

(1)

(*b*) Find the value of $16^{-\frac{3}{2}}$.

(2)

---

2. (i) Given that $y = 5x^3 + 7x + 3$, find

(*a*) $\dfrac{dy}{dx}$,

(3)

(*b*) $\dfrac{d^2y}{dx^2}$.

(1)

(ii) Find $\displaystyle\int \left(1 + 3\sqrt{x} - \frac{1}{x^2}\right) dx$.

(4)

---

3. Given that the equation $kx^2 + 12x + k = 0$, where k is a positive constant, has equal roots, find the value of k.

(4)

---

4. Solve the simultaneous equations

$$x + y = 2$$

$$x^2 + 2y = 12.$$

(6)

---

5. The rth term of an arithmetic series is $(2r - 5)$.

(*a*) Write down the first three terms of this series.

(2)

(*b*) State the value of the common difference.

(1)

(*c*) Show that $\displaystyle\sum_{r=1}^{n} (2r - 5) = n(n - 4)$.

(3)

6.

Figure 1

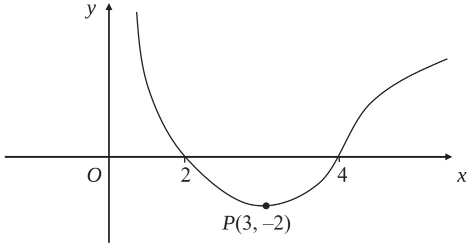


Figure 1 shows a sketch of the curve with equation $y = \mathrm{f}(x)$. The curve crosses the x-axis at the points (2, 0) and (4, 0). The minimum point on the curve is $P(3, -2)$.

In separate diagrams sketch the curve with equation

(*a*) $y = -\mathrm{f}(x)$,

(3)

(*b*) $y = \mathrm{f}(2x)$.

(3)

On each diagram, give the coordinates of the points at which the curve crosses the x-axis, and the coordinates of the image of P under the given transformation.

---

7. The curve C has equation $y = 4x^2 + \dfrac{5-x}{x}$, $x \neq 0$. The point P on C has x-coordinate 1.

(*a*) Show that the value of $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ at P is 3.

(5)

(*b*) Find an equation of the tangent to C at P.

(3)

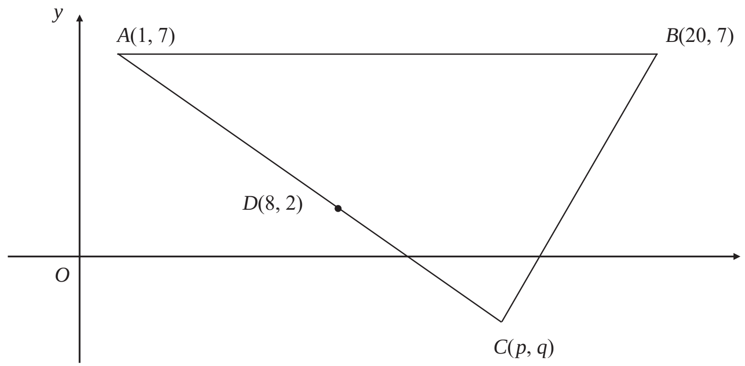
This tangent meets the x-axis at the point $(k, 0)$.

(*c*) Find the value of k.

(2)

8.

Figure 2



The points $A(1, 7)$, $B(20, 7)$ and $C(p, q)$ form the vertices of a triangle ABC, as shown in Figure 2. The point $D(8, 2)$ is the mid-point of AC.

(*a*) Find the value of p and the value of q.

(2)

The line l, which passes through D and is perpendicular to AC, intersects AB at E.

(*b*) Find an equation for l, in the form $ax + by + c = 0$, where a, b and c are integers.

(5)

(*c*) Find the exact x-coordinate of E.

(2)

---

9. The gradient of the curve C is given by

$$\frac{\mathrm{d}y}{\mathrm{d}x} = (3x-1)^2.$$

The point $P(1, 4)$ lies on C.

(*a*) Find an equation of the normal to C at P.

(4)

(*b*) Find an equation for the curve C in the form $y = \mathrm{f}(x)$.

(5)

(*c*) Using $\dfrac{\mathrm{d}y}{\mathrm{d}x} = (3x-1)^2$, show that there is no point on C at which the tangent is parallel to the line $y = 1 - 2x$.

(2)

PMT

10. Given that

$$f(x) = x^2 - 6x + 18, \quad x \geq 0,$$

(*a*) express f(*x*) in the form $(x - a)^2 + b$, where *a* and *b* are integers.
(3)

The curve *C* with equation $y = f(x)$, $x \geq 0$, meets the *y*-axis at *P* and has a minimum point at *Q*.

(*b*) Sketch the graph of *C*, showing the coordinates of *P* and *Q*.
(4)

The line $y = 41$ meets *C* at the point *R*.

(*c*) Find the *x*-coordinate of *R*, giving your answer in the form $p + q\sqrt{2}$, where *p* and *q* are integers.
(5)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)
6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Monday 23 May 2005 – Morning

Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Mathematical Formulae (Green)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

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N23491A

PMT

1. (*a*) Write down the value of $8^{\frac{1}{3}}$.

(1)

(*b*) Find the value of $8^{-\frac{2}{3}}$.

(2)

---

2. Given that $y = 6x - \dfrac{4}{x^2}$, $x \neq 0$,

(*a*) find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$,

(2)

(*b*) find $\int y \, \mathrm{d}x$.

(3)

3.

$$x^2 - 8x - 29 \equiv (x + a)^2 + b,$$

where a and b are constants.

(*a*) Find the value of a and the value of b.

(3)

(*b*) Hence, or otherwise, show that the roots of

$$x^2 - 8x - 29 = 0$$

are $c \pm d\sqrt{5}$, where c and d are integers to be found.

(3)

4.

Figure 1

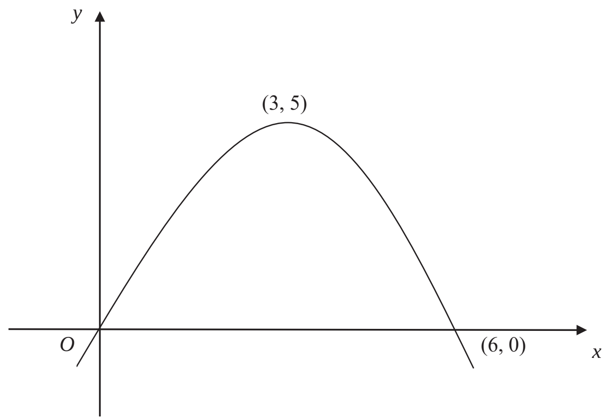

Figure 1 shows a sketch of the curve with equation $y = \mathrm{f}(x)$. The curve passes through the origin O and through the point (6, 0). The maximum point on the curve is (3, 5).

On separate diagrams, sketch the curve with equation

(*a*) $y = 3\mathrm{f}(x)$,

(2)

(*b*) $y = \mathrm{f}(x + 2)$.

(3)

On each diagram, show clearly the coordinates of the maximum point and of each point at which the curve crosses the x-axis.

---

5. Solve the simultaneous equations

$$x - 2y = 1,$$

$$x^2 + y^2 = 29.$$

(6)

PMT

6. Find the set of values of x for which

(*a*) $3(2x + 1) > 5 - 2x$,

(2)

(*b*) $2x^2 - 7x + 3 > 0$,

(4)

(*c*) **both** $3(2x + 1) > 5 - 2x$ **and** $2x^2 - 7x + 3 > 0$.

(2)

---

7. (*a*) Show that $\dfrac{(3-\sqrt{x})^2}{\sqrt{x}}$ can be written as $9x^{-\frac{1}{2}} - 6 + x^{\frac{1}{2}}$.

(2)

Given that $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{(3-\sqrt{x})^2}{\sqrt{x}}$, $x > 0$, and that $y = \frac{2}{3}$ at $x = 1$,

(*b*) find y in terms of x.

(6)

---

8. The line l_1 passes through the point $(9, -4)$ and has gradient $\frac{1}{3}$.

(*a*) Find an equation for l_1 in the form $ax + by + c = 0$, where a, b and c are integers.

(3)

The line l_2 passes through the origin O and has gradient -2. The lines l_1 and l_2 intersect at the point P.

(*b*) Calculate the coordinates of P.

(4)

Given that l_1 crosses the y-axis at the point C,

(*c*) calculate the exact area of $\triangle OCP$.

(3)

---

9. An arithmetic series has first term a and common difference d.

(*a*) Prove that the sum of the first n terms of the series is

$$\tfrac{1}{2}n[2a + (n-1)d].$$

(4)

Sean repays a loan over a period of n months. His monthly repayments form an arithmetic sequence.

He repays £149 in the first month, £147 in the second month, £145 in the third month, and so on. He makes his final repayment in the nth month, where $n > 21$.

(*b*) Find the amount Sean repays in the 21st month.

(2)

Over the n months, he repays a total of £5000.

(*c*) Form an equation in n, and show that your equation may be written as

$$n^2 - 150n + 5000 = 0.$$

(3)

(*d*) Solve the equation in part (*c*).

(3)

(*e*) State, with a reason, which of the solutions to the equation in part (*c*) is **not** a sensible solution to the repayment problem.

(1)

---

10. The curve C has equation $y = \frac{1}{3}x^3 - 4x^2 + 8x + 3$.

The point P has coordinates $(3, 0)$.

(*a*) Show that P lies on C.

(1)

(*b*) Find the equation of the tangent to C at P, giving your answer in the form $y = mx + c$, where m and c are constants.

(5)

Another point Q also lies on C. The tangent to C at Q is parallel to the tangent to C at P.

(*c*) Find the coordinates of Q.

(5)

TOTAL FOR PAPER: 75 MARKS

END

PMT

Paper Reference(s)

6663

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Tuesday 10 January 2006 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Mathematical Formulae (Green)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

In the boxes on the answer book, write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

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Full marks may be obtained for answers to ALL questions.
The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 10 questions on this paper. The total mark for this paper is 75.

Advice to Candidates

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N20233A

1. Factorise completely

$$x^3 - 4x^2 + 3x.$$

(3)

---

2. The sequence of positive numbers $u_1, u_2, u_3, \ldots$, is given by

$$u_{n+1} = (u_n - 3)^2, \qquad u_1 = 1.$$

(*a*) Find u_2, u_3 and u_4.

(3)

(*b*) Write down the value of u_{20}.

(1)

---

3. The line L has equation $y = 5 - 2x$.

(*a*) Show that the point P (3, –1) lies on L.

(1)

(*b*) Find an equation of the line perpendicular to L, which passes through P. Give your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(4)

---

4. Given that $y = 2x^2 - \frac{6}{x^3}$, $x \neq 0$,

(*a*) find $\frac{\mathrm{d}y}{\mathrm{d}x}$,

(2)

(*b*) find $\int y \,\mathrm{d}x$.

(3)

---

5. (*a*) Write $\sqrt{45}$ in the form $a\sqrt{5}$, where a is an integer.

(1)

(*b*) Express $\frac{2(3+\sqrt{5})}{(3-\sqrt{5})}$ in the form $b + c\sqrt{5}$, where b and c are integers.

(5)

PMT

6.

Figure 1

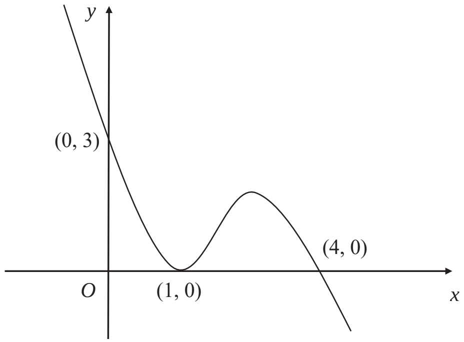

Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve passes through the points (0, 3) and (4, 0) and touches the x-axis at the point (1, 0).

On separate diagrams, sketch the curve with equation

(*a*) $y = f(x + 1)$,

(3)

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

(3)

(*c*) $y = f\left(\frac{1}{2}x\right)$.

(3)

On each diagram show clearly the coordinates of all the points at which the curve meets the axes.

7. On Alice's 11th birthday she started to receive an annual allowance. The first annual allowance was £500 and on each following birthday the allowance was increased by £200.

(*a*) Show that, immediately after her 12th birthday, the total of the allowances that Alice had received was £1200.

(1)

(*b*) Find the amount of Alice's annual allowance on her 18th birthday.

(2)

(*c*) Find the total of the allowances that Alice had received up to and including her 18th birthday.

(3)

When the total of the allowances that Alice had received reached £32 000 the allowance stopped.

(*d*) Find how old Alice was when she received her last allowance.

(7)

8. The curve with equation $y = f(x)$ passes through the point (1, 6). Given that

$$f'(x) = 3 + \frac{5x^2 + 2}{x^{\frac{1}{2}}}, \quad x > 0,$$

find $f(x)$ and simplify your answer.

(7)

PMT

9.

Figure 2

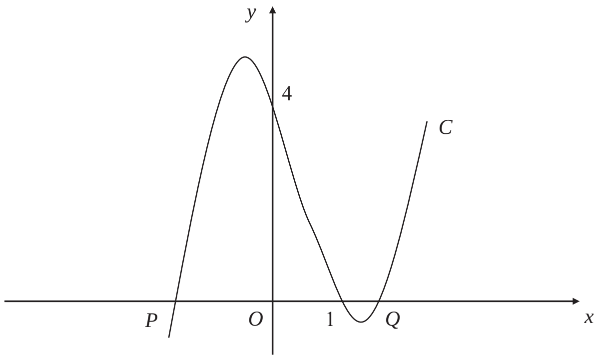

Figure 2 shows part of the curve C with equation

$$y = (x - 1)(x^2 - 4).$$

The curve cuts the x-axis at the points P, (1, 0) and Q, as shown in Figure 2.

(a) Write down the x-coordinate of P and the x-coordinate of Q.

(2)

(b) Show that $\dfrac{\mathrm{d}y}{\mathrm{d}x} = 3x^2 - 2x - 4$.

(3)

(c) Show that $y = x + 7$ is an equation of the tangent to C at the point (–1, 6).

(2)

The tangent to C at the point R is parallel to the tangent at the point (–1, 6).

(d) Find the exact coordinates of R.

(5)

10.

$$x^2 + 2x + 3 \equiv (x + a)^2 + b.$$

(a) Find the values of the constants a and b.

(2)

(b) Sketch the graph of $y = x^2 + 2x + 3$, indicating clearly the coordinates of any intersections with the coordinate axes.

(3)

(c) Find the value of the discriminant of $x^2 + 2x + 3$. Explain how the sign of the discriminant relates to your sketch in part (b).

(2)

The equation $x^2 + kx + 3 = 0$, where k is a constant, has no real roots.

(d) Find the set of possible values of k, giving your answer in surd form.

(4)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Monday 22 May 2006 – Morning

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Green)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
There are 11 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
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N23557A

1. Find $\int (6x^2 + 2 + x^{-\frac{1}{2}})\, dx$, giving each term in its simplest form.

(4)

---

2. Find the set of values of x for which

$$x^2 - 7x - 18 > 0.$$

(4)

---

3. On separate diagrams, sketch the graphs of

(*a*) $y = (x + 3)^2$,

(3)

(*b*) $y = (x + 3)^2 + k$, where k is a positive constant.

(2)

Show on each sketch the coordinates of each point at which the graph meets the axes.

---

4. A sequence $a_1, a_2, a_3, \ldots$ is defined by

$$a_1 = 3,$$

$$a_{n+1} = 3a_n - 5, \quad n \geq 1.$$

(*a*) Find the value a_2 and the value of a_3.

(2)

(*b*) Calculate the value of $\sum_{r=1}^{5} a_r$.

(3)

---

5. Differentiate with respect to x

(*a*) $x^4 + 6\sqrt{x}$,

(3)

(*b*) $\dfrac{(x+4)^2}{x}$.

(4)

---

6. (*a*) Expand and simplify $(4 + \sqrt{3})(4 - \sqrt{3})$.

(2)

(*b*) Express $\dfrac{26}{4+\sqrt{3}}$ in the form $a + b\sqrt{3}$, where a and b are integers.

(2)

---

7. An athlete prepares for a race by completing a practice run on each of 11 consecutive days. On each day after the first day he runs further than he ran on the previous day. The lengths of his 11 practice runs form an arithmetic sequence with first term a km and common difference d km.

He runs 9 km on the 11th day, and he runs a total of 77 km over the 11 day period.

Find the value of a and the value of d.

(7)

---

8. The equation $x^2 + 2px + (3p + 4) = 0$, where p is a positive constant, has equal roots.

(*a*) Find the value of p.

(4)

(*b*) For this value of p, solve the equation $x^2 + 2px + (3p + 4) = 0$.

(2)

---

9. Given that $f(x) = (x^2 - 6x)(x - 2) + 3x$,

(*a*) express $f(x)$ in the form $x(ax^2 + bx + c)$, where a, b and c are constants.

(3)

(*b*) Hence factorise $f(x)$ completely.

(2)

(*c*) Sketch the graph of $y = f(x)$, showing the coordinates of each point at which the graph meets the axes.

(3)

---

10. The curve C with equation $y = f(x)$, $x \neq 0$, passes through the point $(3, 7\tfrac{1}{2})$.

Given that $f'(x) = 2x + \dfrac{3}{x^2}$,

(*a*) find $f(x)$.

(5)

(*b*) Verify that $f(-2) = 5$.

(1)

(*c*) Find an equation for the tangent to C at the point $(-2, 5)$, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(4)

---

11. The line l_1 passes through the points $P(-1, 2)$ and $Q(11, 8)$.

(*a*) Find an equation for l_1 in the form $y = mx + c$, where m and c are constants.

(4)

The line l_2 passes through the point $R(10, 0)$ and is perpendicular to l_1. The lines l_1 and l_2 intersect at the point S.

(*b*) Calculate the coordinates of S.

(5)

(*c*) Show that the length of RS is $3\sqrt{5}$.

(2)

(*d*) Hence, or otherwise, find the exact area of triangle PQR.

(4)

TOTAL FOR PAPER: 75 MARKS

END

PMT

Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1
Advanced Subsidiary

Wednesday 10 January 2007 – Afternoon
Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Green)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

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N23561A

1. Given that

$$y = 4x^3 - 1 + 2x^{\frac{1}{2}}, \quad x > 0,$$

find $\dfrac{dy}{dx}$.

(4)

---

2. (*a*) Express $\sqrt{108}$ in the form $a\sqrt{3}$, where a is an integer.

(1)

(*b*) Express $(2 - \sqrt{3})^2$ in the form $b + c\sqrt{3}$, where b and c are integers to be found.

(3)

---

3. Given that $$f(x) = \frac{1}{x}, \quad x \neq 0,$$

(*a*) sketch the graph of $y = f(x) + 3$ and state the equations of the asymptotes.

(4)

(*b*) Find the coordinates of the point where $y = f(x) + 3$ crosses a coordinate axis.

(2)

---

4. Solve the simultaneous equations

$$y = x - 2,$$

$$y^2 + x^2 = 10.$$

(7)

---

5. The equation $2x^2 - 3x - (k + 1) = 0$, where k is a constant, has no real roots.

Find the set of possible values of k.

(4)

---

6. (*a*) Show that $(4 + 3\sqrt{x})^2$ can be written as $16 + k\sqrt{x} + 9x$, where k is a constant to be found.

(2)

(*b*) Find $\displaystyle\int (4 + 3\sqrt{x})^2 \, dx$.

(3)

PMT

7. The curve C has equation $y = \mathrm{f}(x)$, $x \neq 0$, and the point $P(2, 1)$ lies on C. Given that

$$\mathrm{f}'(x) = 3x^2 - 6 - \frac{8}{x^2},$$

(*a*) find $\mathrm{f}(x)$.

(5)

(*b*) Find an equation for the tangent to C at the point P, giving your answer in the form $y = mx + c$, where m and c are integers.

(4)

---

8. The curve C has equation $y = 4x + 3x^{\frac{3}{2}} - 2x^2$, $\quad x > 0$.

(*a*) Find an expression for $\dfrac{\mathrm{d}y}{\mathrm{d}x}$.

(3)

(*b*) Show that the point $P(4, 8)$ lies on C.

(1)

(*c*) Show that an equation of the normal to C at the point P is

$$3y = x + 20.$$

(4)

The normal to C at P cuts the x-axis at the point Q.

(*d*) Find the length PQ, giving your answer in a simplified surd form.

(3)

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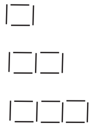
9. Ann has some sticks that are all of the same length. She arranges them in squares and has made the following 3 rows of patterns:

Row 1

Row 2

Row 3



She notices that 4 sticks are required to make the single square in the first row, 7 sticks to make 2 squares in the second row and in the third row she needs 10 sticks to make 3 squares.

(*a*) Find an expression, in terms of n, for the number of sticks required to make a similar arrangement of n squares in the nth row.

(3)

Ann continues to make squares following the same pattern. She makes 4 squares in the 4th row and so on until she has completed 10 rows.

(*b*) Find the total number of sticks Ann uses in making these 10 rows.

(3)

Ann started with 1750 sticks. Given that Ann continues the pattern to complete k rows but does not have sufficient sticks to complete the $(k + 1)$th row,

(*c*) show that k satisfies $(3k - 100)(k + 35) < 0$.

(4)

(*d*) Find the value of k.

(2)

---

10. (*a*) On the same axes sketch the graphs of the curves with equations

(i) $y = x^2(x - 2)$,

(3)

(ii) $y = x(6 - x)$,

(3)

and indicate on your sketches the coordinates of all the points where the curves cross the x-axis.

(*b*) Use algebra to find the coordinates of the points where the graphs intersect.

(7)

TOTAL FOR PAPER: 75 MARKS

END

PMT

Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1
Advanced Subsidiary

Monday 21 May 2007 - Morning
Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Mathematical Formulae (Green)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

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H26107A

1. Simplify $(3 + \sqrt{5})(3 - \sqrt{5})$.

(2)

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2. (*a*) Find the value of $8^{\frac{4}{3}}$.

(2)

(*b*) Simplify $\dfrac{15x^{\frac{4}{3}}}{3x}$.

(2)

---

3. Given that $y = 3x^2 + 4\sqrt{x}$, $x > 0$, find

(*a*) $\dfrac{dy}{dx}$,

(2)

(*b*) $\dfrac{d^2y}{dx^2}$,

(2)

(*c*) $\int y \; dx$.

(3)

---

4. A girl saves money over a period of 200 weeks. She saves 5p in Week 1, 7p in Week 2, 9p in Week 3, and so on until Week 200. Her weekly savings form an arithmetic sequence.

(*a*) Find the amount she saves in Week 200.

(3)

(*b*) Calculate her total savings over the complete 200 week period.

(3)

5.

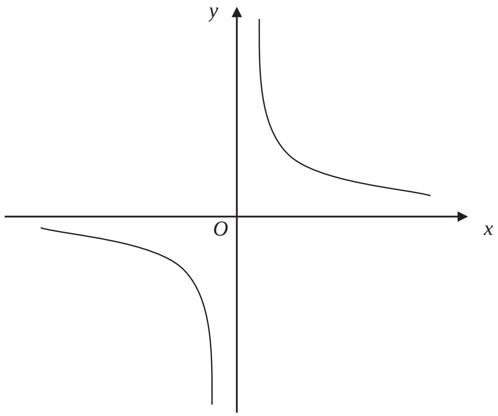

Figure 1

Figure 1 shows a sketch of the curve with equation $y = \dfrac{3}{x}$, $x \neq 0$.

(*a*) On a separate diagram, sketch the curve with equation $y = \dfrac{3}{x+2}$, $x \neq -2$, showing the coordinates of any point at which the curve crosses a coordinate axis.
(3)

(*b*) Write down the equations of the asymptotes of the curve in part (*a*).
(2)

---

6. (*a*) By eliminating *y* from the equations

$$y = x - 4,$$

$$2x^2 - xy = 8,$$

show that

$$x^2 + 4x - 8 = 0.$$

(2)

(*b*) Hence, or otherwise, solve the simultaneous equations

$$y = x - 4,$$

$$2x^2 - xy = 8,$$

giving your answers in the form $a \pm b\sqrt{3}$, where *a* and *b* are integers.
(5)

---

7. The equation $x^2 + kx + (k + 3) = 0$, where *k* is a constant, has different real roots.

(*a*) Show that $k^2 - 4k - 12 > 0$.
(2)

(*b*) Find the set of possible values of *k*.
(4)

---

8. A sequence a_1, a_2, a_3,... is defined by

$$a_1 = k,$$

$$a_{n+1} = 3a_n + 5, \quad n \geq 1,$$

where *k* is a positive integer.

(*a*) Write down an expression for a_2 in terms of *k*.
(1)

(*b*) Show that $a_3 = 9k + 20$.
(2)

(*c*) (i) Find $\sum_{r=1}^{4} a_r$ in terms of *k*.

(ii) Show that $\sum_{r=1}^{4} a_r$ is divisible by 10.
(4)

---

9. The curve *C* with equation $y = f(x)$ passes through the point (5, 65).

Given that $f'(x) = 6x^2 - 10x - 12$,

(*a*) use integration to find f(*x*).
(4)

(*b*) Hence show that $f(x) = x(2x + 3)(x - 4)$.
(2)

(*c*) Sketch *C*, showing the coordinates of the points where *C* crosses the *x*-axis.
(3)

PMT

10. The curve C has equation $y = x^2(x - 6) + \frac{4}{x}$, $x > 0$.

The points P and Q lie on C and have x-coordinates 1 and 2 respectively.

(a) Show that the length of PQ is $\sqrt{170}$.
(4)

(b) Show that the tangents to C at P and Q are parallel.
(5)

(c) Find an equation for the normal to C at P, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.
(4)

---

11. The line l_1 has equation $y = 3x + 2$ and the line l_2 has equation $3x + 2y - 8 = 0$.

(a) Find the gradient of the line l_2.
(2)

The point of intersection of l_1 and l_2 is P.

(b) Find the coordinates of P.
(3)

The lines l_1 and l_2 cross the line $y = 1$ at the points A and B respectively.

(c) Find the area of triangle ABP.
(4)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Wednesday 9 January 2008 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Mathematical Formulae (Green)	Nil

Calcalculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
There are 11 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner. Answers without working may gain no credit.

N25561A

PMT

1. Find $\int (3x^2 + 4x^5 - 7) \, dx$.

(4)

---

2. (*a*) Write down the value of $16^{\frac{1}{4}}$.

(1)

(*b*) Simplify $(16x^{12})^{\frac{3}{4}}$.

(2)

---

3. Simplify

$$\frac{5-\sqrt{3}}{2+\sqrt{3}},$$

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

(4)

---

4. The point $A(-6, 4)$ and the point $B(8, -3)$ lie on the line L.

(*a*) Find an equation for L in the form $ax + by + c = 0$, where a, b and c are integers.

(4)

(*b*) Find the distance AB, giving your answer in the form $k\sqrt{5}$, where k is an integer.

(3)

---

5. (a) Write $\dfrac{2\sqrt{x}+3}{x}$ in the form $2x^p + 3x^q$, where p and q are constants.

(2)

Given that $y = 5x - 7 + \dfrac{2\sqrt{x}+3}{x}$, $x > 0$,

(*b*) find $\dfrac{dy}{dx}$, simplifying the coefficient of each term.

(4)

6.

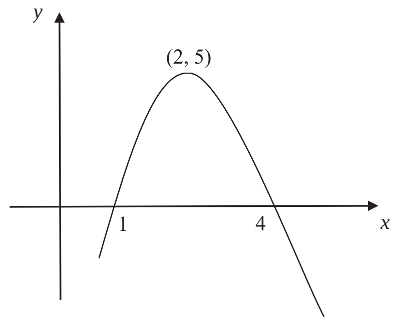

Figure 1

Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve crosses the x-axis at the points (1, 0) and (4, 0). The maximum point on the curve is (2, 5).

In separate diagrams, sketch the curves with the following equations. On each diagram show clearly the coordinates of the maximum point and of each point at which the curve crosses the x-axis.

(*a*) $y = 2f(x)$,

(3)

(*b*) $y = f(-x)$.

(3)

The maximum point on the curve with equation $y = f(x + a)$ is on the y-axis.

(*c*) Write down the value of the constant a.

(1)

PMT

7. A sequence is given by

$$x_1 = 1,$$

$$x_{n+1} = x_n(p + x_n),$$

where p is a constant ($p \neq 0$).

(a) Find x_2 in terms of p.
(1)

(b) Show that $x_3 = 1 + 3p + 2p^2$.
(2)

Given that $x_3 = 1$,

(c) find the value of p,
(3)

(d) write down the value of x_{2008}.
(2)

---

8. The equation

$$x^2 + kx + 8 = k$$

has no real solutions for x.

(a) Show that k satisfies $k^2 + 4k - 32 < 0$.
(3)

(b) Hence find the set of possible values of k.
(4)

---

9. The curve C has equation $y = \mathrm{f}(x)$, $x > 0$, and $\mathrm{f}'(x) = 4x - 6\sqrt{x} + \dfrac{8}{x^2}$.

Given that the point $P(4, 1)$ lies on C,

(a) find $\mathrm{f}(x)$ and simplify your answer.
(6)

(b) Find an equation of the normal to C at the point $P(4, 1)$.
(4)

---

10. The curve C has equation

$$y = (x + 3)(x - 1)^2.$$

(a) Sketch C, showing clearly the coordinates of the points where the curve meets the coordinate axes.
(4)

(b) Show that the equation of C can be written in the form

$$y = x^3 + x^2 - 5x + k,$$

where k is a positive integer, and state the value of k.
(2)

There are two points on C where the gradient of the tangent to C is equal to 3.

(c) Find the x-coordinates of these two points.
(6)

---

11. The first term of an arithmetic sequence is 30 and the common difference is -1.5.

(a) Find the value of the 25th term.
(2)

The rth term of the sequence is 0.

(b) Find the value of r.
(2)

The sum of the first n terms of the sequence is S_n.

(c) Find the largest positive value of S_n.
(3)

TOTAL FOR PAPER: 75 MARKS

END

PMT

Paper Reference(s)
6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Monday 2 June 2008 – Morning
Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Mathematical Formulae (Green)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
There are 11 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

1. Find $\int (2 + 5x^2)\ \mathrm{d}x$.

(3)

---

2. Factorise completely $x^3 - 9x$.

(3)

3.

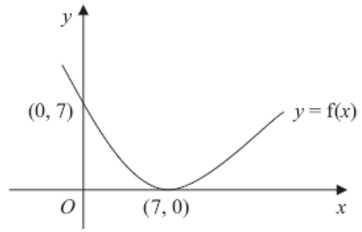

Figure 1

Figure 1 shows a sketch of the curve with equation $y = \mathrm{f}(x)$. The curve passes through the point (0, 7) and has a minimum point at (7, 0).

On separate diagrams, sketch the curve with equation

(*a*) $y = \mathrm{f}(x) + 3$,

(3)

(*b*) $y = \mathrm{f}(2x)$.

(2)

On each diagram, show clearly the coordinates of the minimum point and the coordinates of the point at which the curve crosses the y-axis.

4.
$$\mathrm{f}(x) = 3x + x^3, \qquad x > 0.$$

(*a*) Differentiate to find $\mathrm{f}'(x)$.

(2)

Given that $\mathrm{f}'(x) = 15$,

(*b*) find the value of x.

(3)

PMT

5. A sequence $x_1, x_2, x_3, \ldots$ is defined by

$$x_1 = 1,$$

$$x_{n+1} = ax_n - 3, \quad n \geq 1,$$

where a is a constant.

(*a*) Find an expression for x_2 in terms of a.

(1)

(*b*) Show that $x_3 = a^2 - 3a - 3$.

(2)

Given that $x_3 = 7$,

(*c*) find the possible values of a.

(3)

---

6. The curve C has equation $y = \dfrac{3}{x}$ and the line l has equation $y = 2x + 5$.

(*a*) Sketch the graphs of C and l, indicating clearly the coordinates of any intersections with the axes.

(3)

(*b*) Find the coordinates of the points of intersection of C and l.

(6)

---

7. Sue is training for a marathon. Her training includes a run every Saturday starting with a run of 5 km on the first Saturday. Each Saturday she increases the length of her run from the previous Saturday by 2 km.

(*a*) Show that on the 4th Saturday of training she runs 11 km.

(1)

(*b*) Find an expression, in terms of n, for the length of her training run on the nth Saturday.

(2)

(*c*) Show that the total distance she runs on Saturdays in n weeks of training is $n(n + 4)$ km.

(3)

On the nth Saturday Sue runs 43 km.

(*d*) Find the value of n.

(2)

(*e*) Find the total distance, in km, Sue runs on Saturdays in n weeks of training.

(2)

---

8. Given that the equation $2qx^2 + qx - 1 = 0$, where q is a constant, has no real roots,

(*a*) show that $q^2 + 8q < 0$.

(2)

(*b*) Hence find the set of possible values of q.

(3)

---

9. The curve C has equation $y = kx^3 - x^2 + x - 5$, where k is a constant.

(*a*) Find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$.

(2)

The point A with x-coordinate $-\frac{1}{2}$ lies on C. The tangent to C at A is parallel to the line with equation $2y - 7x + 1 = 0$.

Find

(*b*) the value of k,

(4)

(*c*) the value of the y-coordinate of A.

(2)

PMT

10.

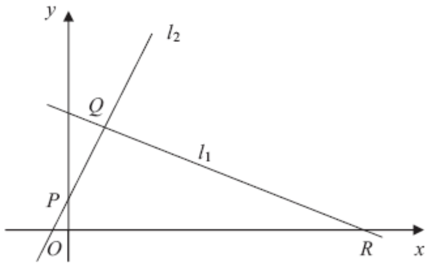

Figure 2

The points Q (1, 3) and R (7, 0) lie on the line l_1, as shown in Figure 2.

The length of QR is $a\sqrt{5}$.

(*a*) Find the value of a.
(3)

The line l_2 is perpendicular to l_1, passes through Q and crosses the y-axis at the point P, as shown in Figure 2. Find

(*b*) an equation for l_2,
(5)

(*c*) the coordinates of P,
(1)

(*d*) the area of ΔPQR.
(4)

---

11. The gradient of a curve C is given by $\dfrac{dy}{dx} = \dfrac{(x^2+3)^2}{x^2}$, $x \neq 0$.

(*a*) Show that $\dfrac{dy}{dx} = x^2 + 6 + 9x^{-2}$.
(2)

The point (3, 20) lies on C.

(*b*) Find an equation for the curve C in the form $y = f(x)$.
(6)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Friday 9 January 2009 – Morning

Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Mathematical Formulae (Green)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
The marks for the parts of questions are shown in round brackets, e.g. **(2)**.
There are 11 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

N30081A

PMT

1. (*a*) Write down the value of $125^{\frac{1}{3}}$.

(1)

(*b*) Find the value of $125^{-\frac{2}{3}}$.

(2)

2. Find $\int (12x^5 - 8x^3 + 3) \ dx$, giving each term in its simplest form.

(4)

3. Expand and simplify $(\sqrt{7} + 2)(\sqrt{7} - 2)$.

(2)

4. A curve has equation $y = f(x)$ and passes through the point (4, 22).

Given that

$$f'(x) = 3x^2 - 3x^{\frac{1}{2}} - 7,$$

use integration to find f(x), giving each term in its simplest form.

(5)

5.

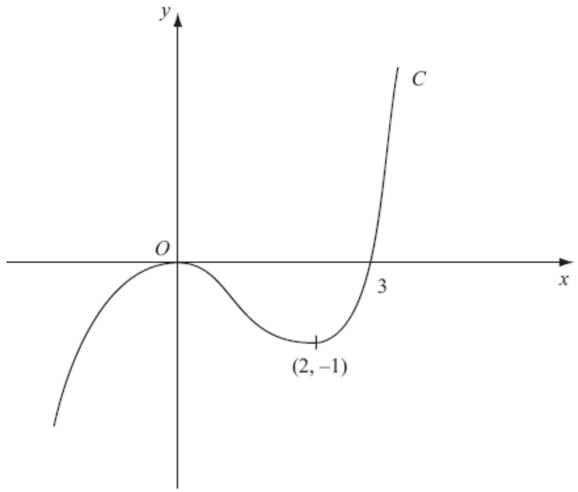

Figure 1

Figure 1 shows a sketch of the curve C with equation $y = f(x)$. There is a maximum at (0, 0), a minimum at (2, –1) and C passes through (3, 0).

On separate diagrams, sketch the curve with equation

(*a*) $y = f(x + 3)$,

(3)

(*b*) $y = f(-x)$.

(3)

On each diagram show clearly the coordinates of the maximum point, the minimum point and any points of intersection with the x-axis.

PMT

6. Given that $\dfrac{2x^2 - x^{\frac{3}{2}}}{\sqrt{x}}$ can be written in the form $2x^p - x^q$,

(*a*) write down the value of p and the value of q.
(2)

Given that $y = 5x^4 - 3 + \dfrac{2x^2 - x^{\frac{3}{2}}}{\sqrt{x}}$,

(*b*) find $\dfrac{dy}{dx}$, simplifying the coefficient of each term.
(4)

---

7. The equation $kx^2 + 4x + (5 - k) = 0$, where k is a constant, has 2 different real solutions for x.

(*a*) Show that k satisfies

$$k^2 - 5k + 4 > 0.$$
(3)

(*b*) Hence find the set of possible values of k.
(4)

---

8. The point $P(1, a)$ lies on the curve with equation $y = (x + 1)^2(2 - x)$.

(*a*) Find the value of a.
(1)

(*b*) Sketch the curves with the following equations:

(i) $y = (x + 1)^2(2 - x)$,

(ii) $y = \dfrac{2}{x}$.

On your diagram show clearly the coordinates of any points at which the curves meet the axes.
(5)

(*c*) With reference to your diagram in part (*b*), state the number of real solutions to the equation

$$(x + 1)^2(2 - x) = \frac{2}{x}.$$
(1)

---

9. The first term of an arithmetic series is a and the common difference is d.

The 18th term of the series is 25 and the 21st term of the series is $32\frac{1}{2}$.

(*a*) Use this information to write down two equations for a and d.
(2)

(*b*) Show that $a = -17.5$ and find the value of d.
(2)

The sum of the first n terms of the series is 2750.

(*c*) Show that n is given by

$$n^2 - 15n = 55 \times 40.$$
(4)

(*d*) Hence find the value of n.
(3)

---

10. The line l_1 passes through the point $A(2, 5)$ and has gradient $-\frac{1}{2}$.

(*a*) Find an equation of l_1, giving your answer in the form $y = mx + c$.
(3)

The point B has coordinates $(-2, 7)$.

(*b*) Show that B lies on l_1.
(1)

(*c*) Find the length of AB, giving your answer in the form $k\sqrt{5}$, where k is an integer.
(3)

The point C lies on l_1 and has x-coordinate equal to p.

The length of AC is 5 units.

(*d*) Show that p satisfies

$$p^2 - 4p - 16 = 0.$$
(4)

PMT

11. The curve C has equation

$$y = 9 - 4x - \frac{8}{x}, \quad x > 0.$$

The point P on C has x-coordinate equal to 2.

(a) Show that the equation of the tangent to C at the point P is $y = 1 - 2x$.
(6)

(b) Find an equation of the normal to C at the point P.
(3)

The tangent at P meets the x-axis at A and the normal at P meets the x-axis at B.

(c) Find the area of the triangle APB.
(4)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Friday 5 June 2009 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Orange or Green)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
There are 11 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

H34262A

PMT

1. Simplify

(a) $(3\sqrt{7})^2$

(1)

(b) $(8 + \sqrt{5})(2 - \sqrt{5})$

(3)

---

2. Given that $32\sqrt{2} = 2^a$, find the value of a.

(3)

---

3. Given that $y = 2x^3 + \dfrac{3}{x^2}$, $x \neq 0$, find

(a) $\dfrac{dy}{dx}$,

(3)

(b) $\int y \, dx$, simplifying each term.

(3)

---

4. Find the set of values of x for which

(a) $4x - 3 > 7 - x$

(2)

(b) $2x^2 - 5x - 12 < 0$

(4)

(c) **both** $4x - 3 > 7 - x$ **and** $2x^2 - 5x - 12 < 0$

(1)

---

5. A 40-year building programme for new houses began in Oldtown in the year 1951 (Year 1) and finished in 1990 (Year 40).

The numbers of houses built each year form an arithmetic sequence with first term a and common difference d.

Given that 2400 new houses were built in 1960 and 600 new houses were built in 1990, find

(a) the value of d,

(3)

(b) the value of a,

(2)

(c) the total number of houses built in Oldtown over the 40-year period.

(3)

---

6. The equation $x^2 + 3px + p = 0$, where p is a non-zero constant, has equal roots.

Find the value of p.

(4)

---

7. A sequence $a_1, a_2, a_3, \ldots$ is defined by

$$a_1 = k,$$

$$a_{n+1} = 2a_n - 7, \quad n \geq 1,$$

where k is a constant.

(a) Write down an expression for a_2 in terms of k.

(1)

(b) Show that $a_3 = 4k - 21$.

(2)

Given that $\sum_{r=1}^{4} a_r = 43$,

(c) find the value of k.

(4)

PMT

8.

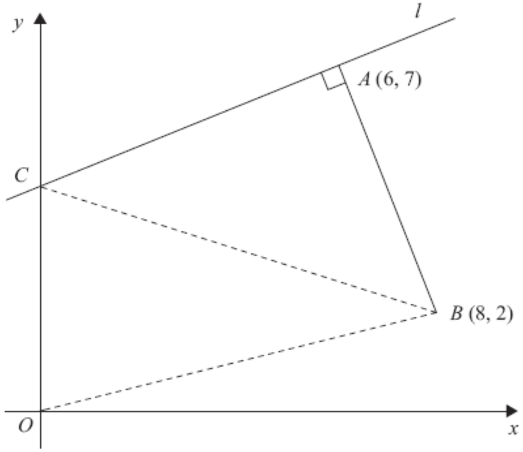

Figure 1

The points A and B have coordinates (6, 7) and (8, 2) respectively.

The line l passes through the point A and is perpendicular to the line AB, as shown in Figure 1.

(a) Find an equation for l in the form $ax + by + c = 0$, where a, b and c are integers.

(4)

Given that l intersects the y-axis at the point C, find

(b) the coordinates of C,

(2)

(c) the area of ΔOCB, where O is the origin.

(2)

9.

$$f(x) = \frac{(3 - 4\sqrt{x})^2}{\sqrt{x}}, \quad x > 0.$$

(a) Show that $f(x) = 9x^{-\frac{1}{2}} + Ax^{\frac{1}{2}} + B$, where A and B are constants to be found.

(3)

(b) Find $f'(x)$.

(3)

(c) Evaluate $f'(9)$.

(2)

10. (a) Factorise completely $x^3 - 6x^2 + 9x$

(3)

(b) Sketch the curve with equation

$$y = x^3 - 6x^2 + 9x$$

showing the coordinates of the points at which the curve meets the x-axis.

(4)

Using your answer to part (b), or otherwise,

(c) sketch, on a separate diagram, the curve with equation

$$y = (x - 2)^3 - 6(x - 2)^2 + 9(x - 2)$$

showing the coordinates of the points at which the curve meets the x-axis.

(2)

PMT

11. The curve C has equation

$$y = x^3 - 2x^2 - x + 9, \quad x > 0.$$

The point P has coordinates (2, 7).

(*a*) Show that P lies on C.

(1)

(*b*) Find the equation of the tangent to C at P, giving your answer in the form $y = mx + c$, where m and c are constants.

(5)

The point Q also lies on C.

Given that the tangent to C at Q is perpendicular to the tangent to C at P,

(*c*) show that the x-coordinate of Q is $\frac{1}{3}(2 + \sqrt{6})$.

(5)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Monday 11 January 2010 – Morning

Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Mathematical Formulae (Pink or Green)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
The marks for the parts of questions are shown in round brackets, e.g. **(2)**.
There are 10 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

N34854A

PMT

1. Given that $y = x^4 + x^{\frac{1}{3}} + 3$, find $\frac{dy}{dx}$.

(3)

---

2. (*a*) Expand and simplify $(7 + \sqrt{5})(3 - \sqrt{5})$.

(3)

(*b*) Express $\frac{7+\sqrt{5}}{3+\sqrt{5}}$ in the form $a + b\sqrt{5}$, where a and b are integers.

(3)

---

3. The line l_1 has equation $3x + 5y - 2 = 0$.

(*a*) Find the gradient of l_1.

(2)

The line l_2 is perpendicular to l_1 and passes through the point (3, 1).

(*b*) Find the equation of l_2 in the form $y = mx + c$, where m and c are constants.

(3)

4.
$$\frac{dy}{dx} = 5x^{-\frac{1}{2}} + x\sqrt{x}, \qquad x > 0.$$

Given that $y = 35$ at $x = 4$, find y in terms of x, giving each term in its simplest form.

(7)

---

5. Solve the simultaneous equations

$$y - 3x + 2 = 0$$

$$y^2 - x - 6x^2 = 0$$

(7)

---

6. The curve C has equation

$$y = \frac{(x+3)(x-8)}{x}, \quad x > 0.$$

(*a*) Find $\frac{dy}{dx}$ in its simplest form.

(4)

(*b*) Find an equation of the tangent to C at the point where $x = 2$.

(4)

---

7. Jill gave money to a charity over a 20-year period, from Year 1 to Year 20 inclusive. She gave £150 in Year 1, £160 in Year 2, £170 in Year 3, and son on, so that the amounts of money she gave each year formed an arithmetic sequence.

(*a*) Find the amount of money she gave in Year 10.

(2)

(*b*) Calculate the total amount of money she gave over the 20-year period.

(3)

Kevin also gave money to charity over the same 20-year period.

He gave £A in Year 1 and the amounts of money he gave each year increased, forming an arithmetic sequence with common difference £30.

The total amount of money that Kevin gave over the 20-year period was **twice** the total amount of money that Jill gave.

(*c*) Calculate the value of A.

(4)

PMT

8.

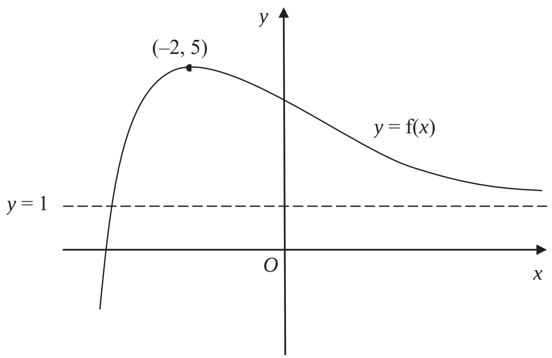

Figure 1

Figure 1 shows a sketch of part of the curve with equation $y = \mathrm{f}(x)$.

The curve has a maximum point $(-2, 5)$ and an asymptote $y = 1$, as shown in Figure 1.

On separate diagrams, sketch the curve with equation

(*a*) $y = \mathrm{f}(x) + 2$,
(2)

(*b*) $y = 4\mathrm{f}(x)$,
(2)

(c) $y = \mathrm{f}(x + 1)$.
(3)

On each diagram, show clearly the coordinates of the maximum point and the equation of the asymptote.

9. (*a*) Factorise completely $x^3 - 4x$.
(3)

(*b*) Sketch the curve C with equation

$$y = x^3 - 4x,$$

showing the coordinates of the points at which the curve meets the axis.
(3)

The point A with x-coordinate -1 and the point B with x-coordinate 3 lie on the curve C.

(*c*) Find an equation of the line which passes through A and B, giving your answer in the form $y = mx + c$, where m and c are constants.
(5)

(*d*) Show that the length of AB is $k\sqrt{10}$, where k is a constant to be found.
(2)

10. $$\mathrm{f}(x) = x^2 + 4kx + (3 + 11k), \quad \text{where } k \text{ is a constant.}$$

(*a*) Express $\mathrm{f}(x)$ in the form $(x + p)^2 + q$, where p and q are constants to be found in terms of k.
(3)

Given that the equation $\mathrm{f}(x) = 0$ has no real roots,

(*b*) find the set of possible values of k.
(4)

Given that $k = 1$,

(*c*) sketch the graph of $y = \mathrm{f}(x)$, showing the coordinates of any point at which the graph crosses a coordinate axis.
(3)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Monday 24 May 2010 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination papers	**Items included with question**
Mathematical Formulae (Pink)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
There are 11 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

H35383A

1. Write

$$\sqrt{(75)} - \sqrt{(27)}$$

in the form $k\sqrt{x}$, where k and x are integers.
(2)

---

2. Find

$$\int (8x^3 + 6x^{\frac{1}{2}} - 5)\ \mathrm{d}x,$$

giving each term in its simplest form.
(4)

---

3. Find the set of values of x for which

(*a*) $3(x - 2) < 8 - 2x$,
(2)

(*b*) $(2x - 7)(1 + x) < 0$,
(3)

(*c*) both $3(x - 2) < 8 - 2x$ **and** $(2x - 7)(1 + x) < 0$.
(1)

---

4. (*a*) Show that $x^2 + 6x + 11$ can be written as

$$(x + p)^2 + q,$$

where p and q are integers to be found.
(2)

(*b*) Sketch the curve with equation $y = x^2 + 6x + 11$, showing clearly any intersections with the coordinate axes.
(2)

(*c*) Find the value of the discriminant of $x^2 + 6x + 11$.
(2)

---

5. A sequence of positive numbers is defined by

$$a_{n+1} = \sqrt{(a_n^2 + 3)}, \quad n \geq 1,$$
$$a_1 = 2.$$

(*a*) Find a_2 and a_3, leaving your answers in surd form.

(2)

(*b*) Show that $a_5 = 4$.

(2)

6.

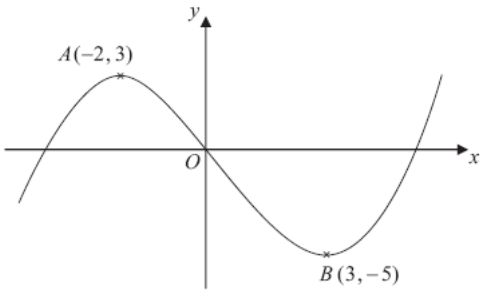

Figure 1

Figure 1 shows a sketch of the curve with equation $y = \mathrm{f}(x)$. The curve has a maximum point A at $(-2, 3)$ and a minimum point B at $(3, -5)$.

On separate diagrams sketch the curve with equation

(*a*) $y = \mathrm{f}(x + 3)$,

(3)

(*b*) $y = 2\mathrm{f}(x)$.

(3)

On each diagram show clearly the coordinates of the maximum and minimum points.

The graph of $y = \mathrm{f}(x) + a$ has a minimum at $(3, 0)$, where a is a constant.

(*c*) Write down the value of a.

(1)

---

7. Given that

$$y = 8x^3 - 4\sqrt{x} + \frac{3x^2 + 2}{x}, \qquad x > 0,$$

find $\frac{\mathrm{d}y}{\mathrm{d}x}$.

(6)

---

8. (*a*) Find an equation of the line joining $A(7, 4)$ and $B(2, 0)$, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(3)

(*b*) Find the length of AB, leaving your answer in surd form.

(2)

The point C has coordinates $(2, t)$, where $t > 0$, and $AC = AB$.

(*c*) Find the value of t.

(1)

(*d*) Find the area of triangle ABC.

(2)

---

9. A farmer has a pay scheme to keep fruit pickers working throughout the 30 day season. He pays £a for their first day, £$(a + d)$ for their second day, £$(a + 2d)$ for their third day, and so on, thus increasing the daily payment by £d for each extra day they work.

A picker who works for all 30 days will earn £40.75 on the final day.

(a) Use this information to form an equation in a and d.

(2)

A picker who works for all 30 days will earn a total of £1005.

(b) Show that $15(a + 40.75) = 1005$.

(2)

(c) Hence find the value of a and the value of d.

(4)

---

10. (*a*) On the axes below sketch the graphs of

(i) $y = x(4 - x)$,

(ii) $y = x^2(7 - x)$,

showing clearly the coordinates of the points where the curves cross the coordinate axes.
(5)

(*b*) Show that the x-coordinates of the points of intersection of

$$y = x(4 - x) \quad \text{and} \quad y = x^2(7 - x)$$

are given by the solutions to the equation $x(x^2 - 8x + 4) = 0$.
(3)

The point A lies on both of the curves and the x and y coordinates of A are both positive.

(*c*) Find the exact coordinates of A, leaving your answer in the form $(p + q\sqrt{3}, r + s\sqrt{3})$, where p, q, r and s are integers.
(7)

---

11. The curve C has equation $y = f(x)$, $x > 0$, where

$$\frac{dy}{dx} = 3x - \frac{5}{\sqrt{x}} - 2.$$

Given that the point $P(4, 5)$ lies on C, find

(*a*) $f(x)$,
(5)

(*b*) an equation of the tangent to C at the point P, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.
(4)

TOTAL FOR PAPER: 75 MARKS

END

PMT

Paper Reference(s)
6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Monday 10 January 2011 – Morning

Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Mathematical Formulae (Pink)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
The marks for the parts of questions are shown in round brackets, e.g. **(2)**.
There are 11 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

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Answers without working may not gain full credit.

H35402A

1. (*a*) Find the value of $16^{-\frac{1}{4}}$.

(2)

(*b*) Simplify $x\left(2x^{-\frac{1}{4}}\right)^4$.

(2)

---

2. Find

$$\int (12x^5 - 3x^2 + 4x^{\frac{1}{3}})\ \mathrm{d}x,$$

giving each term in its simplest form.

(5)

---

3. Simplify

$$\frac{5-2\sqrt{3}}{\sqrt{3}-1},$$

giving your answer in the form $p + q\sqrt{3}$, where p and q are rational numbers.

(4)

---

4. A sequence $a_1, a_2, a_3, \ldots$ is defined by

$$a_1 = 2,$$

$$a_{n+1} = 3a_n - c$$

where c is a constant.

(*a*) Find an expression for a_2 in terms of c.

(1)

Given that $\sum_{i=1}^{3} a_i = 0$,

(*b*) find the value of c.

(4)

5.

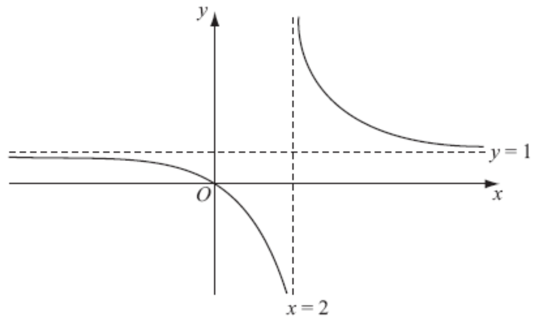

Figure 1

Figure 1 shows a sketch of the curve with equation $y = \mathrm{f}(x)$ where

$$\mathrm{f}(x) = \frac{x}{x-2}, \quad x \neq 2.$$

The curve passes through the origin and has two asymptotes, with equations $y = 1$ and $x = 2$, as shown in Figure 1.

(*a*) In the space below, sketch the curve with equation $y = \mathrm{f}(x-1)$ and state the equations of the asymptotes of this curve.

(3)

(*b*) Find the coordinates of the points where the curve with equation $y = \mathrm{f}(x-1)$ crosses the coordinate axes.

(4)

---

6. An arithmetic sequence has first term a and common difference d. The sum of the first 10 terms of the sequence is 162.

(*a*) Show that $10a + 45d = 162$.

(2)

Given also that the sixth term of the sequence is 17,

(*b*) write down a second equation in a and d,

(1)

(*c*) find the value of a and the value of d.

(4)

PMT

7. The curve with equation $y = f(x)$ passes through the point $(-1, 0)$.

Given that

$$f'(x) = 12x^2 - 8x + 1,$$

find $f(x)$.

(5)

---

8. The equation $x^2 + (k - 3)x + (3 - 2k) = 0$, where k is a constant, has two distinct real roots.

(*a*) Show that k satisfies

$$k^2 + 2k - 3 > 0.$$

(3)

(*b*) Find the set of possible values of k.

(4)

---

9. The line L_1 has equation $2y - 3x - k = 0$, where k is a constant.

Given that the point $A(1, 4)$ lies on L_1, find

(*a*) the value of k,

(1)

(*b*) the gradient of L_1.

(2)

The line L_2 passes through A and is perpendicular to L_1.

(*c*) Find an equation of L_2 giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(4)

The line L_2 crosses the x-axis at the point B.

(*d*) Find the coordinates of B.

(2)

(*e*) Find the exact length of AB.

(2)

---

10. (*a*) Sketch the graphs of

(i) $y = x(x + 2)(3 - x)$,

(ii) $y = -\dfrac{2}{x}$.

showing clearly the coordinates of all the points where the curves cross the coordinate axes.

(6)

(*b*) Using your sketch state, giving a reason, the number of real solutions to the equation

$$x(x + 2)(3 - x) + \frac{2}{x} = 0.$$

(2)

---

11. The curve C has equation

$$y = \frac{1}{2}x^3 - 9x^{\frac{3}{2}} + \frac{8}{x} + 30, \qquad x > 0.$$

(*a*) Find $\dfrac{dy}{dx}$.

(4)

(*b*) Show that the point $P(4, -8)$ lies on C.

(2)

(*c*) Find an equation of the normal to C at the point P, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(6)

TOTAL FOR PAPER: 75 MARKS

END

PMT

Paper Reference(s)
6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Wednesday 18 May 2011 – Morning

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Pink)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
There are 10 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

1. Find the value of

(*a*) $25^{\frac{1}{2}}$,

(1)

(*b*) $25^{-\frac{3}{2}}$.

(2)

---

2. Given that $y = 2x^5 + 7 + \dfrac{1}{x^3}$, $x \neq 0$, find, in their simplest form,

(*a*) $\dfrac{\mathrm{d}y}{\mathrm{d}x}$,

(3)

(*b*) $\displaystyle\int y \ \mathrm{d}x$.

(4)

---

3. The points P and Q have coordinates $(-1, 6)$ and $(9, 0)$ respectively.

The line l is perpendicular to PQ and passes through the mid-point of PQ.

Find an equation for l, giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.

(5)

---

4. Solve the simultaneous equations

$$x + y = 2$$
$$4y^2 - x^2 = 11$$

(7)

---

5. A sequence a_1, a_2, a_3, …, is defined by

$$a_1 = k,$$
$$a_{n+1} = 5a_n + 3, \quad n \geq 1,$$

where k is a positive integer.

(a) Write down an expression for a_2 in terms of k.
(1)

(b) Show that $a_3 = 25k + 18$.
(2)

(c) (i) Find $\sum_{r=1}^{4} a_r$ in terms of k, in its simplest form.

(ii) Show that $\sum_{r=1}^{4} a_r$ is divisible by 6.
(4)

---

6. Given that $\dfrac{6x + 3x^{\frac{5}{2}}}{\sqrt{x}}$ can be written in the form $6x^p + 3x^q$,

(a) write down the value of p and the value of q.
(2)

Given that $\dfrac{dy}{dx} = \dfrac{6x + 3x^{\frac{5}{2}}}{\sqrt{x}}$ and that $y = 90$ when $x = 4$,

(b) find y in terms of x, simplifying the coefficient of each term.
(5)

---

7. $$f(x) = x^2 + (k + 3)x + k,$$

where k is a real constant.

(a) Find the discriminant of f(x) in terms of k.
(2)

(b) Show that the discriminant of f(x) can be expressed in the form $(k + a)^2 + b$, where a and b are integers to be found.
(2)

(c) Show that, for all values of k, the equation f(x) = 0 has real roots.
(2)

8.

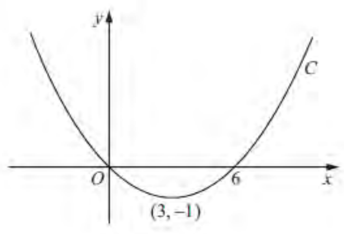

Figure 1

Figure 1 shows a sketch of the curve C with equation $y = f(x)$.
The curve C passes through the origin and through (6, 0).
The curve C has a minimum at the point (3, –1).

On separate diagrams, sketch the curve with equation

(a) $y = f(2x)$,
(3)

(b) $y = -f(x)$,
(3)

(c) $y = f(x + p)$, where p is a constant and $0 < p < 3$.
(4)

On each diagram show the coordinates of any points where the curve intersects the x-axis and of any minimum or maximum points.

PMT

9. (*a*) Calculate the sum of all the even numbers from 2 to 100 inclusive,

$$2 + 4 + 6 + \ldots\ldots + 100.$$

(3)

(*b*) In the arithmetic series

$$k + 2k + 3k + \ldots\ldots + 100,$$

k is a positive integer and k is a factor of 100.

(i) Find, in terms of k, an expression for the number of terms in this series.

(ii) Show that the sum of this series is

$$50 + \frac{5000}{k}.$$

(4)

(*c*) Find, in terms of k, the 50th term of the arithmetic sequence

$$(2k + 1), \quad (4k + 4), \quad (6k + 7), \ldots,$$

giving your answer in its simplest form.

(4)

---

10. The curve C has equation

$$y = (x + 1)(x + 3)^2.$$

(*a*) Sketch C, showing the coordinates of the points at which C meets the axes.

(4)

(*b*) Show that $\frac{\mathrm{d}y}{\mathrm{d}x} = 3x^2 + 14x + 15$.

(3)

The point A, with x-coordinate -5, lies on C.

(*c*) Find the equation of the tangent to C at A, giving your answer in the form $y = mx + c$, where m and c are constants.

(4)

Another point B also lies on C. The tangents to C at A and B are parallel.

(*d*) Find the x-coordinate of B.

(3)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Friday 13 January 2012 – Morning

Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Mathematical Formulae (Pink)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
The marks for the parts of questions are shown in round brackets, e.g. **(2)**.
There are 10 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

P40082A

PMT

1. Given that $y = x^4 + 6x^{\frac{1}{2}}$, find in their simplest form

(*a*) $\dfrac{\mathrm{d}y}{\mathrm{d}x}$,

(3)

(*b*) $\int y \ \mathrm{d}x$.

(3)

---

2. (*a*) Simplify

$$\sqrt{32} + \sqrt{18},$$

giving your answer in the form $a\sqrt{2}$, where a is an integer.

(2)

(*b*) Simplify

$$\frac{\sqrt{32} + \sqrt{18}}{3 + \sqrt{2}},$$

giving your answer in the form $b\sqrt{2} + c$, where b and c are integers.

(4)

---

3. Find the set of values of x for which

(*a*) $4x - 5 > 15 - x$,

(2)

(*b*) $x(x - 4) > 12$.

(4)

---

4. A sequence $x_1, x_2, x_3, \ldots$ is defined by

$$x_1 = 1,$$

$$x_{n+1} = a x_n + 5, \qquad n \geq 1,$$

where a is a constant.

(*a*) Write down an expression for x_2 in terms of a.

(1)

(*b*) Show that $x_3 = a^2 + 5a + 5$.

(2)

Given that $x_3 = 41$

(*c*) find the possible values of a.

(3)

---

5. The curve C has equation $y = x(5 - x)$ and the line L has equation $2y = 5x + 4$.

(*a*) Use algebra to show that C and L do not intersect.

(4)

(*b*) Sketch C and L on the same diagram, showing the coordinates of the points at which C and L meet the axes.

(4)

6.

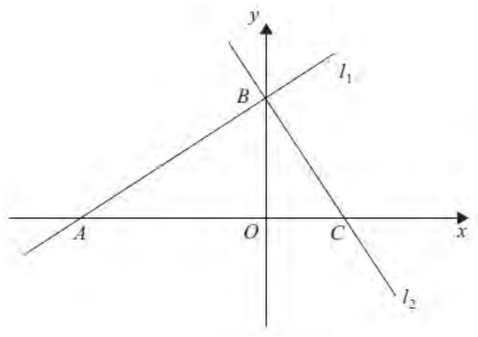

Figure 1

The line l_1 has equation $2x - 3y + 12 = 0$.

(*a*) Find the gradient of l_1.

(1)

The line l_1 crosses the x-axis at the point A and the y-axis at the point B, as shown in Figure 1.

The line l_2 is perpendicular to l_1 and passes through B.

(*b*) Find an equation of l_2.

(3)

The line l_2 crosses the x-axis at the point C.

(*c*) Find the area of triangle ABC.

(4)

---

7. A curve with equation $y = \mathrm{f}(x)$ passes through the point (2, 10). Given that

$$\mathrm{f}'(x) = 3x^2 - 3x + 5,$$

find the value of f(1).

(5)

---

8. The curve C_1 has equation

$$y = x^2(x + 2).$$

(*a*) Find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$.

(2)

(*b*) Sketch C_1, showing the coordinates of the points where C_1 meets the x-axis.

(3)

(*c*) Find the gradient of C_1 at each point where C_1 meets the x-axis.

(2)

The curve C_2 has equation

$$y = (x - k)^2(x - k + 2),$$

where k is a constant and $k > 2$.

(*d*) Sketch C_2, showing the coordinates of the points where C_2 meets the x and y axes.

(3)

---

9. A company offers two salary schemes for a 10-year period, Year 1 to Year 10 inclusive.

Scheme 1: Salary in Year 1 is £P.
Salary increases by £($2T$) each year, forming an arithmetic sequence.

Scheme 2: Salary in Year 1 is £(P + 1800).
Salary increases by £T each year, forming an arithmetic sequence.

(*a*) Show that the total earned under Salary Scheme 1 for the 10-year period is

$$£(10P + 90T).$$

(2)

For the 10-year period, the total earned is the same for both salary schemes.

(*b*) Find the value of T.

(4)

For this value of T, the salary in Year 10 under Salary Scheme 2 is £29 850.

(*c*) Find the value of P.

(3)

PMT

10.

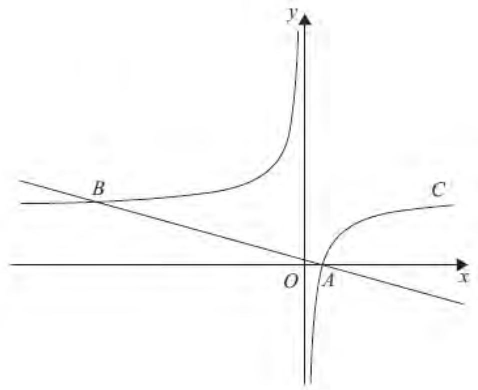

Figure 2

Figure 2 shows a sketch of the curve C with equation

$$y = 2 - \frac{1}{x}, \qquad x \neq 0.$$

The curve crosses the x-axis at the point A.

(a) Find the coordinates of A.

(1)

(b) Show that the equation of the normal to C at A can be written as

$$2x + 8y - 1 = 0.$$

(6)

The normal to C at A meets C again at the point B, as shown in Figure 2.

(c) Find the coordinates of B.

(4)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Wednesday 16 May 2012 – Morning

Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Mathematical Formulae (Pink)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet ‘Mathematical Formulae and Statistical Tables’ is provided.
Full marks may be obtained for answers to ALL questions.
The marks for the parts of questions are shown in round brackets, e.g. **(2)**.
There are 10 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

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Answers without working may not gain full credit.

P40684A

PMT

1. Find

$$\int\left(6x^2 + \frac{2}{x^2} + 5\right)\mathrm{d}x,$$

giving each term in its simplest form.

(4)

---

2. (*a*) Evaluate $(32)^{\frac{3}{5}}$, giving your answer as an integer.

(2)

(*b*) Simplify fully $\left(\frac{25x^4}{4}\right)^{-\frac{1}{2}}$.

(2)

---

3. Show that $\frac{2}{\sqrt{12}-\sqrt{8}}$ can be written in the form $\sqrt{a}+\sqrt{b}$, where a and b are integers.

(5)

4.

$$y = 5x^3 - 6x^{\frac{4}{3}} + 2x - 3.$$

(*a*) Find $\frac{\mathrm{d}y}{\mathrm{d}x}$, giving each term in its simplest form.

(4)

(*b*) Find $\frac{\mathrm{d}^2y}{\mathrm{d}x^2}$.

(2)

---

5. A sequence of numbers $a_1, a_2, a_3, \ldots$ is defined by

$$a_1 = 3,$$

$$a_{n+1} = 2a_n - c, \qquad (n \geq 1),$$

where c is a constant.

(*a*) Write down an expression, in terms of c, for a_2.

(1)

(*b*) Show that $a_3 = 12 - 3c$.

(2)

Given that $\sum_{i=1}^{4} a_i \geq 23$,

(*c*) find the range of values of c.

(4)

---

6. A boy saves some money over a period of 60 weeks. He saves 10p in week 1, 15p in week 2, 20p in week 3 and so on until week 60. His weekly savings form an arithmetic sequence.

(*a*) Find how much he saves in week 15.

(2)

(*b*) Calculate the total amount he saves over the 60 week period.

(3)

The boy's sister also saves some money each week over a period of m weeks. She saves 10p in week 1, 20p in week 2, 30p in week 3 and so on so that her weekly savings form an arithmetic sequence. She saves a total of £63 in the m weeks.

(*c*) Show that

$$m(m + 1) = 35 \times 36.$$

(4)

(*d*) Hence write down the value of m.

(1)

PMT

7. The point P (4, –1) lies on the curve C with equation $y = \mathrm{f}(x)$, $x > 0$, and

$$\mathrm{f}'(x) = \frac{1}{2}x - \frac{6}{\sqrt{x}} + 3.$$

(*a*) Find the equation of the tangent to C at the point P, giving your answer in the form $y = mx + c$, where m and c are integers.
(4)

(*b*) Find $\mathrm{f}(x)$.
(4)

8.

$$4x - 5 - x^2 = q - (x + p)^2,$$

where p and q are integers.

(*a*) Find the value of p and the value of q.
(3)

(*b*) Calculate the discriminant of $4x - 5 - x^2$.
(2)

(*c*) Sketch the curve with equation $y = 4x - 5 - x^2$, showing clearly the coordinates of any points where the curve crosses the coordinate axes.
(3)

---

9. The line L_1 has equation $4y + 3 = 2x$.

The point A (p, 4) lies on L_1.

(*a*) Find the value of the constant p.
(1)

The line L_2 passes through the point C (2, 4) and is perpendicular to L_1.

(*b*) Find an equation for L_2 giving your answer in the form $ax + by + c = 0$, where a, b and c are integers.
(5)

The line L_1 and the line L_2 intersect at the point D.

(*c*) Find the coordinates of the point D.
(3)

(*d*) Show that the length of CD is $\frac{3}{2}\sqrt{5}$.
(3)

A point B lies on L_1 and the length of $AB = \sqrt{80}$.

The point E lies on L_2 such that the length of the line CDE = 3 times the length of CD.

(*e*) Find the area of the quadrilateral $ACBE$.
(3)

PMT

10.

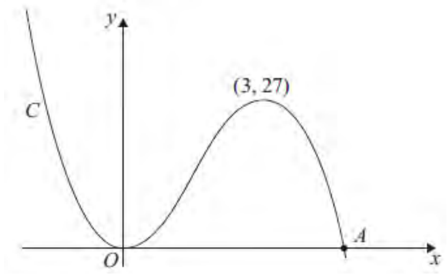

Figure 1

Figure 1 shows a sketch of the curve C with equation $y = f(x)$, where

$$f(x) = x^2(9 - 2x).$$

There is a minimum at the origin, a maximum at the point (3, 27) and C cuts the x-axis at the point A.

(*a*) Write down the coordinates of the point A.

(1)

(*b*) On separate diagrams sketch the curve with equation

(i) $y = f(x + 3)$,

(ii) $y = f(3x)$.

On each sketch you should indicate clearly the coordinates of the maximum point and any points where the curves cross or meet the coordinate axes.

(6)

The curve with equation $y = f(x) + k$, where k is a constant, has a maximum point at (3, 10).

(*c*) Write down the value of k.

(1)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Monday 14 January 2013 – Morning

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Pink)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
The marks for the parts of questions are shown in round brackets, e.g. **(2)**.
There are 11 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

P414882A

PMT

1. Factorise completely $x - 4x^3$.

(3)

---

2. Express 8^{2x+3} in the form 2^y, stating y in terms of x.

(2)

---

3. (i) Express

$$(5 - \sqrt{8})(1 + \sqrt{2})$$

in the form $a + b\sqrt{2}$, where a and b are integers.

(3)

(ii) Express

$$\sqrt{80} + \frac{30}{\sqrt{5}}$$

in the form $c\sqrt{5}$, where c is an integer.

(3)

---

4. A sequence u_1, u_2, u_3, ..., satisfies

$$u_{n+1} = 2u_n - 1, \quad n \geq 1.$$

Given that $u_2 = 9$,

(*a*) find the value of u_3 and the value of u_4 ,

(2)

(*b*) evaluate $\sum_{r=1}^{4} u_r$.

(3)

---

5. The line l_1 has equation $y = -2x + 3$.

The line l_2 is perpendicular to l_1 and passes through the point (5, 6).

(*a*) Find an equation for l_2 in the form $ax + by + c = 0$, where a, b and c are integers.

(3)

The line l_2 crosses the x-axis at the point A and the y-axis at the point B.

(*b*) Find the x-coordinate of A and the y-coordinate of B.

(2)

Given that O is the origin,

(*c*) find the area of the triangle OAB.

(2)

6.

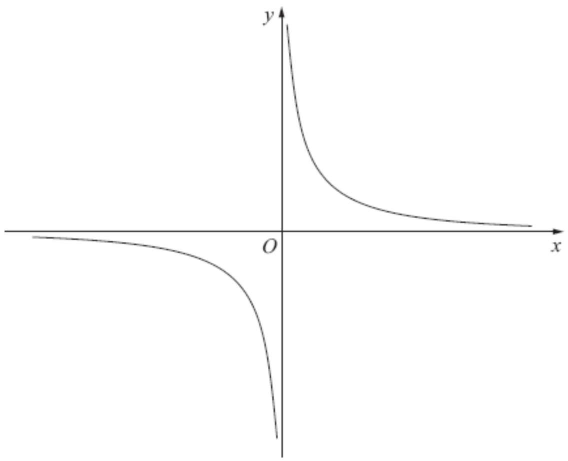

Figure 1

Figure 1 shows a sketch of the curve with equation $y = \dfrac{2}{x}$, $x \neq 0$.

The curve C has equation $y = \dfrac{2}{x} - 5$, $x \neq 0$, and the line l has equation $y = 4x + 2$.

(*a*) Sketch and clearly label the graphs of C and l on a single diagram.

On your diagram, show clearly the coordinates of the points where C and l cross the coordinate axes.

(5)

(*b*) Write down the equations of the asymptotes of the curve C.

(2)

(*c*) Find the coordinates of the points of intersection of $y = \dfrac{2}{x} - 5$ and $y = 4x + 2$.

(5)

7. Lewis played a game of space invaders. He scored points for each spaceship that he captured.

Lewis scored 140 points for capturing his first spaceship.

He scored 160 points for capturing his second spaceship, 180 points for capturing his third spaceship, and so on.

The number of points scored for capturing each successive spaceship formed an arithmetic sequence.

(*a*) Find the number of points that Lewis scored for capturing his 20th spaceship.

(2)

(*b*) Find the total number of points Lewis scored for capturing his first 20 spaceships.

(3)

Sian played an adventure game. She scored points for each dragon that she captured. The number of points that Sian scored for capturing each successive dragon formed an arithmetic sequence.

Sian captured n dragons and the total number of points that she scored for capturing all n dragons was 8500.

Given that Sian scored 300 points for capturing her first dragon and then 700 points for capturing her nth dragon,

(*c*) find the value of n.

(3)

8.
$$\frac{dy}{dx} = -x^3 + \frac{4x - 5}{2x^3}, \quad x \neq 0.$$

Given that $y = 7$ at $x = 1$, find y in terms of x, giving each term in its simplest form.

(6)

9. The equation

$$(k + 3)x^2 + 6x + k = 5, \text{ where } k \text{ is a constant,}$$

has two distinct real solutions for x.

(*a*) Show that k satisfies

$$k^2 - 2k - 24 < 0.$$

(4)

(*b*) Hence find the set of possible values of k.

(3)

PMT

10. $$4x^2 + 8x + 3 \equiv a(x + b)^2 + c.$$

(*a*) Find the values of the constants a, b and c.

(3)

(*b*) Sketch the curve with equation $y = 4x^2 + 8x + 3$, showing clearly the coordinates of any points where the curve crosses the coordinate axes.

(4)

---

11. The curve C has equation

$$y = 2x - 8\sqrt{x} + 5, \quad x \geq 0.$$

(*a*) Find $\frac{dy}{dx}$, giving each term in its simplest form.

(3)

The point P on C has x-coordinate equal to $\frac{1}{4}$.

(*b*) Find the equation of the tangent to C at the point P, giving your answer in the form $y = ax + b$, where a and b are constants.

(4)

The tangent to C at the point Q is parallel to the line with equation $2x - 3y + 18 = 0$.

(*c*) Find the coordinates of Q.

(5)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)
6663/01R

Edexcel GCE

Core Mathematics C1 (R)

Advanced Subsidiary

Monday 13 May 2013 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Mathematical Formulae (Pink)	Nil

Calculators may NOT be used in this examination.

This paper is strictly for students outside the UK.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663R), your surname, initials and signature.

Information for Candidates

A booklet ‘Mathematical Formulae and Statistical Tables’ is provided.
Full marks may be obtained for answers to ALL questions.
The marks for the parts of questions are shown in round brackets, e.g. **(2)**.
There are 11 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

P42823A

PMT

1. Given $y = x^3 + 4x + 1$, find the value of $\frac{\mathrm{d}y}{\mathrm{d}x}$ when $x = 3$.

(4)

---

2. Find $\frac{15}{\sqrt{3}} - \sqrt{27}$ in the form $k\sqrt{3}$, where k is an integer.

(4)

---

3. Find

$$\int \left(3x^2 - \frac{4}{x^2}\right) \mathrm{d}x,$$

giving each term in its simplest form.

(4)

---

4. The line L_1 has equation $4x + 2y - 3 = 0$.

(*a*) Find the gradient of L_1.

(2)

The line L_2 is perpendicular to L_1 and passes through the point (2, 5).

(*b*) Find the equation of L_2 in the form $y = mx + c$, where m and c are constants.

(3)

---

5. Solve

(*a*) $2^y = 8$,

(1)

(*b*) $2^x \times 4^{x+1} = 8$.

(4)

---

6. A sequence $x_1, x_2, x_3, \ldots$ is defined by

$$x_1 = 1,$$
$$x_{n+1} = (x_n)^2 - kx_n, \qquad n \geq 1,$$

where k is a constant.

(*a*) Find an expression for x_2 in terms of k.

(1)

(*b*) Show that $x_3 = 1 - 3k + 2k^2$.

(2)

Given also that $x_3 = 1$,

(*c*) calculate the value of k.

(3)

(*d*) Hence find the value of $\sum_{n=1}^{100} x_n$.

(3)

---

7. Each year, Abbie pays into a savings scheme. In the first year she pays in £500. Her payments then increase by £200 each year so that she pays £700 in the second year, £900 in the third year and so on.

(*a*) Find out how much Abbie pays into the savings scheme in the tenth year.

(2)

Abbie pays into the scheme for n years until she has paid a total of £67 200.

(*b*) Show that $n^2 + 4n - 24 \times 28 = 0$.

(5)

(*b*) Hence find the number of years that Abbie pays into the savings scheme.

(2)

---

8. A rectangular room has a width of x m.

The length of the room is 4 m longer than its width.

Given that the perimeter of the room is greater than 19.2 m,

(a) show that $x > 2.8$.

(3)

Given also that the area of the room is less than 21 m^2,

(b) (i) write down an inequality, in terms of x, for the area of the room.

(ii) Solve this inequality.

(4)

(c) Hence find the range of possible values for x.

(1)

9.

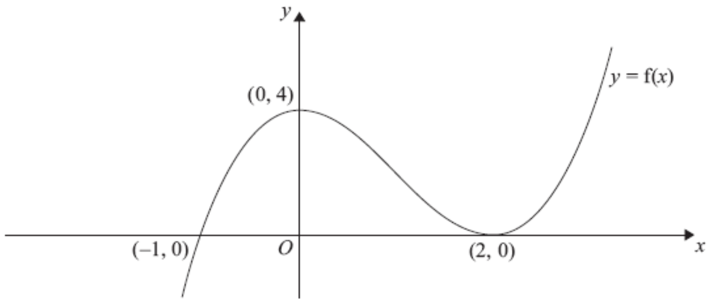

Figure 1

Figure 1 shows a sketch of the curve C with equation $y = f(x)$.

The curve C passes through the point (–1, 0) and touches the x-axis at the point (2, 0).

The curve C has a maximum at the point (0, 4).

The equation of the curve C can be written in the form.

$$y = x^3 + ax^2 + bx + c,$$

where a, b and c are integers.

(a) Calculate the values of a, b and c.

(5)

(b) Sketch the curve with equation $y = f(\frac{1}{2}x)$.

Show clearly the coordinates of all points where the curve crosses or meets the coordinate axes.

(3)

PMT

10. A curve has equation $y = \mathrm{f}(x)$. The point P with coordinates (9, 0) lies on the curve.

Given that

$$\mathrm{f}'(x) = \frac{x+9}{\sqrt{x}}, \qquad x > 0,$$

(*a*) find $\mathrm{f}(x)$.

(6)

(*b*) Find the x-coordinates of the two points on $y = \mathrm{f}(x)$ where the gradient of the curve is equal to 10.

(4)

11.

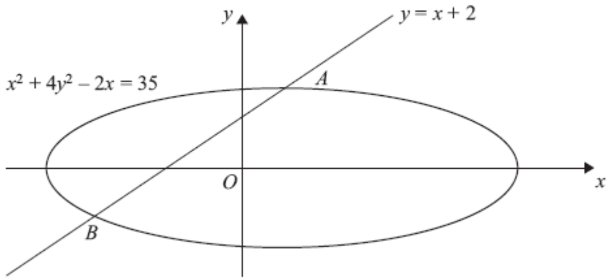

Figure 2

The line $y = x + 2$ meets the curve $x^2 + 4y^2 - 2x = 35$ at the points A and B as shown in Figure 2.

(*a*) Find the coordinates of A and the coordinates of B.

(6)

(*b*) Find the distance AB in the form $r\sqrt{2}$, where r is a rational number.

(3)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)

6663/01

Edexcel GCE

Core Mathematics C1

Advanced Subsidiary

Monday 13 May 2013 – Afternoon

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Pink)	Nil

Calculators may NOT be used in this examination.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663), your surname, initials and signature.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
The marks for the parts of questions are shown in round brackets, e.g. **(2)**.
There are 11 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

P41802A

PMT

1. Simplify

$$\frac{7+\sqrt{5}}{\sqrt{5}-1},$$

giving your answer in the form $a + b\sqrt{5}$, where a and b are integers.

(4)

---

2. Find

$$\int\left(10x^4 - 4x - \frac{3}{\sqrt{x}}\right)\mathrm{d}x,$$

giving each term in its simplest form.

(4)

---

3. (*a*) Find the value of $8^{\frac{5}{3}}$.

(2)

(*b*) Simplify fully $\dfrac{(2x^{\frac{1}{2}})^3}{4x^2}$.

(3)

---

4. A sequence $a_1, a_2, a_3, \ldots$ is defined by

$$a_1 = 4,$$
$$a_{n+1} = k(a_n + 2), \qquad \text{for } n \geq 1$$

where k is a constant.

(*a*) Find an expression for a_2 in terms of k.

(1)

Given that $\sum_{i=1}^{3} a_i = 2$,

(*b*) find the two possible values of k.

(6)

---

5. Find the set of values of x for which

(*a*) $2(3x + 4) > 1 - x$,

(2)

(*b*) $3x^2 + 8x - 3 < 0$.

(4)

---

6. The straight line L_1 passes through the points $(-1, 3)$ and $(11, 12)$.

(*a*) Find an equation for L_1 in the form $ax + by + c = 0$, where a, b and c are integers.

(4)

The line L_2 has equation $3y + 4x - 30 = 0$.

(*b*) Find the coordinates of the point of intersection of L_1 and L_2 .

(3)

---

7. A company, which is making 200 mobile phones each week, plans to increase its production.

The number of mobile phones produced is to be increased by 20 each week from 200 in week 1 to 220 in week 2, to 240 in week 3 and so on, until it is producing 600 in week N.

(*a*) Find the value of N.

(2)

The company then plans to continue to make 600 mobile phones each week.

(*b*) Find the total number of mobile phones that will be made in the first 52 weeks starting from and including week 1.

(5)

8.

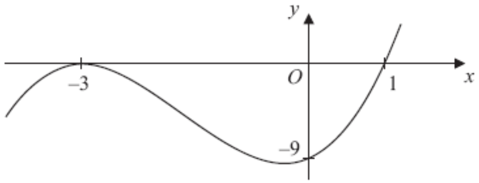

Figure 1

Figure 1 shows a sketch of the curve with equation $y = \mathrm{f}(x)$ where

$$\mathrm{f}(x) = (x+3)^2(x-1), \qquad x \in \mathbb{R}.$$

The curve crosses the x-axis at (1, 0), touches it at (–3, 0) and crosses the y-axis at (0, –9).

(*a*) Sketch the curve C with equation $y = \mathrm{f}(x+2)$ and state the coordinates of the points where the curve C meets the x-axis.
(3)

(*b*) Write down an equation of the curve C.
(1)

(*c*) Use your answer to part (*b*) to find the coordinates of the point where the curve C meets the y-axis.
(2)

9.

$$\mathrm{f}'(x) = \frac{(3-x^2)^2}{x^2}, \qquad x \neq 0.$$

(*a*) Show that $\mathrm{f}'(x) = 9x^{-2} + A + Bx^2$, where A and B are constants to be found.
(3)

(*b*) Find $\mathrm{f}''(x)$.
(2)

Given that the point (–3, 10) lies on the curve with equation $y = \mathrm{f}(x)$,

(*c*) find $\mathrm{f}(x)$.
(5)

---

10. Given the simultaneous equations

$$2x + y = 1$$
$$x^2 - 4ky + 5k = 0$$

where k is a non zero constant,

(*a*) show that $x^2 + 8kx + k = 0$.
(2)

Given that $x^2 + 8kx + k = 0$ has equal roots,

(*b*) find the value of k.
(3)

(*c*) For this value of k, find the solution of the simultaneous equations.
(3)

11.

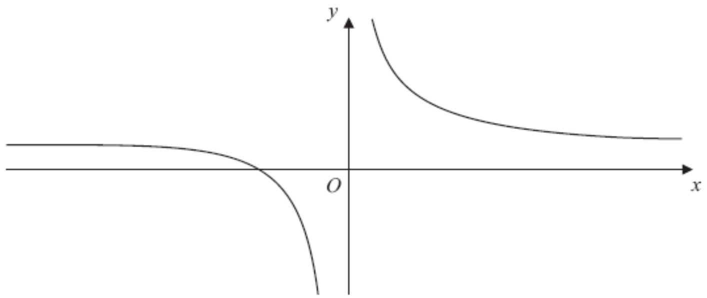

Figure 2

Figure 2 shows a sketch of the curve H with equation $y = \frac{3}{x} + 4$, $x \neq 0$.

(a) Give the coordinates of the point where H crosses the x-axis.
(1)

(b) Give the equations of the asymptotes to H.
(2)

(c) Find an equation for the normal to H at the point $P(-3, 3)$.
(5)

This normal crosses the x-axis at A and the y-axis at B.

(d) Find the length of the line segment AB. Give your answer as a surd.
(3)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)

6663A/01

Pearson Edexcel International Advanced Level

Core Mathematics C1

Advanced Subsidiary

Monday 13 January 2014 – Morning

Time: 1 hour 30 minutes

Materials required for examination	**Items included with question papers**
Mathematical Formulae (Pink)	Nil

Calculators may NOT be used in this examination.

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B). Coloured pencils and highlighter pens must not be used.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided – *there may be more space than you need*.
- You should show sufficient working to make your methods clear. Answers without working may not gain full credit.

Information

- The total mark for this paper is 75.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

P43134A

1. Simplify fully

(*a*) $\left(2\sqrt{x}\right)^2$

(1)

(*b*) $\dfrac{5+\sqrt{7}}{2+\sqrt{7}}$

(3)

---

2. $$y = 2x^2 - \frac{4}{\sqrt{x}} + 1, \qquad x > 0$$

(*a*) Find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$, giving each term in its simplest form.

(3)

(*b*) Find $\dfrac{\mathrm{d}^2y}{\mathrm{d}x^2}$, giving each term in its simplest form.

(2)

---

3. Solve the simultaneous equations

$$x - 2y - 1 = 0$$

$$x^2 + 4y^2 - 10x + 9 = 0$$

(7)

4.

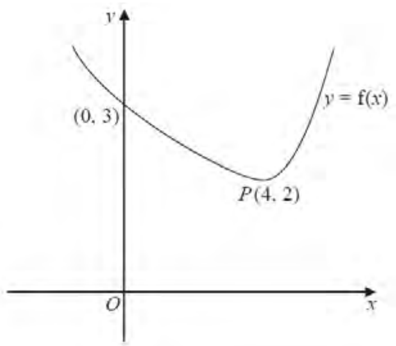

Figure 1

Figure 1 shows a sketch of a curve with equation $y = \mathrm{f}(x)$.

The curve crosses the y-axis at (0, 3) and has a minimum at P (4, 2).

On separate diagrams, sketch the curve with equation

(*a*) $y = \mathrm{f}(x + 4)$,

(2)

(*b*) $y = 2\mathrm{f}(x)$.

(2)

On each diagram, show clearly the coordinates of the minimum point and any point of intersection with the y-axis.

---

5. Given that for all positive integers n,

$$\sum_{r=1}^{n} a_r = 12 + 4n^2$$

(*a*) find the value of $\sum_{r=1}^{5} a_r$

(2)

(*b*) find the value of a_6

(3)

6.

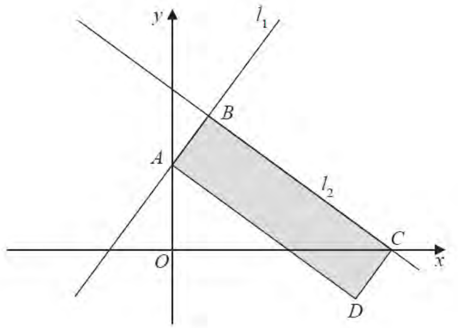

Figure 2

The straight line l_1 has equation $2y = 3x + 7$.

The line l_1 crosses the y-axis at the point A as shown in Figure 2.

(*a*) (i) State the gradient of l_1.

(ii) Write down the coordinates of the point A.

(2)

Another straight line l_2 intersects l_1 at the point B (1, 5) and crosses the x-axis at the point C, as shown in Figure 2.

Given that $\angle ABC = 90°$,

(*b*) find an equation of l_2 in the form $ax + by + c = 0$, where a, b and c are integers.

(4)

The rectangle $ABCD$, shown shaded in Figure 2, has vertices at the points A, B, C and D.

(*c*) Find the exact area of rectangle $ABCD$.

(5)

7. Shelim starts his new job on a salary of £14 000. He will receive a rise of £1500 a year for each full year that he works, so that he will have a salary of £15 500 in year 2, a salary of £17 000 in year 3 and so on. When Shelim's salary reaches £26 000, he will receive no more rises. His salary will remain at £26 000.

(*a*) Show that Shelim will have a salary of £26 000 in year 9.

(2)

(*b*) Find the total amount that Shelim will earn in his job in the first 9 years.

(2)

Anna starts her new job at the same time as Shelim on a salary of £A. She receives a rise of £1000 a year for each full year that she works, so that she has a salary of £(A + 1000) in year 2, £(A + 2000) in year 3 and so on. The maximum salary for her job, which is reached in year 10, is also £26 000.

(*c*) Find the difference in the total amount earned by Shelim and Anna in the first 10 years.

(6)

8. The equation $2x^2 + 2kx + (k + 2) = 0$, where k is a constant, has two distinct real roots.

(*a*) Show that k satisfies

$$k^2 - 2k - 4 > 0$$

(3)

(*b*) Find the set of possible values of k.

(4)

9. A curve with equation $y = \mathrm{f}(x)$ passes through the point (3, 6). Given that

$$\mathrm{f}'(x) = (x - 2)(3x + 4)$$

(*a*) use integration to find $\mathrm{f}(x)$. Give your answer as a polynomial in its simplest form.

(5)

(*b*) Show that $\mathrm{f}(x) \equiv (x - 2)^2(x + p)$, where p is a positive constant. State the value of p.

(3)

(*c*) Sketch the graph of $y = \mathrm{f}(x)$, showing the coordinates of any points where the curve touches or crosses the coordinate axes.

(4)

PMT

10. The curve C has equation $y = x^3 - 2x^2 - x + 3$.

The point P, which lies on C, has coordinates (2, 1).

(*a*) Show that an equation of the tangent to C at the point P is $y = 3x - 5$.

(5)

The point Q also lies on C.

Given that the tangent to C at Q is parallel to the tangent to C at P,

(*b*) find the coordinates of the point Q.

(5)

TOTAL FOR PAPER: 75 MARKS

END

Paper Reference(s)

6663/01R

Edexcel GCE

Core Mathematics C1 (R)

Advanced Subsidiary

Monday 19 May 2014 – Morning

Time: 1 hour 30 minutes

Materials required for examination	Items included with question papers
Mathematical Formulae (Pink)	Nil

Calculators may NOT be used in this examination.

This paper is strictly for students outside the UK.

Instructions to Candidates

Write the name of the examining body (Edexcel), your centre number, candidate number, the unit title (Core Mathematics C1), the paper reference (6663R), your surname, initials and signature.
Answer ALL the questions.

Information for Candidates

A booklet 'Mathematical Formulae and Statistical Tables' is provided.
Full marks may be obtained for answers to ALL questions.
The marks for the parts of questions are shown in round brackets, e.g. **(2)**.
There are 11 questions in this question paper. The total mark for this paper is 75.

Advice to Candidates

You must ensure that your answers to parts of questions are clearly labelled.
You must show sufficient working to make your methods clear to the Examiner.
Answers without working may not gain full credit.

P43146A

PMT

1. Factorise fully $25x - 9x^3$.

(3)

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2. (*a*) Evaluate $81^{\frac{3}{2}}$

(2)

(*b*) Simplify fully $x^2\left(4x^{-\frac{1}{2}}\right)^2$

(2)

---

3. A sequence $a_1, a_2, a_3, \ldots$ is defined by

$$a_{n+1} = 4a_n - 3, \qquad n \geq 1$$

$$a_1 = k, \qquad \text{where } k \text{ is a positive integer.}$$

(*a*) Write down an expression for a_2 in terms of k.

(1)

Given that $\sum_{r=1}^{3} a_r = 66$

(*b*) find the value of k.

(4)

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4. Given that $y = 2x^5 + \frac{6}{\sqrt{x}}$, $x > 0$, find in their simplest form

(*a*) $\frac{\mathrm{d}y}{\mathrm{d}x}$

(3)

(*b*) $\int y \, \mathrm{d}x$

(3)

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5. Solve the equation

$$10 + x\sqrt{8} = \frac{6x}{\sqrt{2}}$$

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

(4)

6.

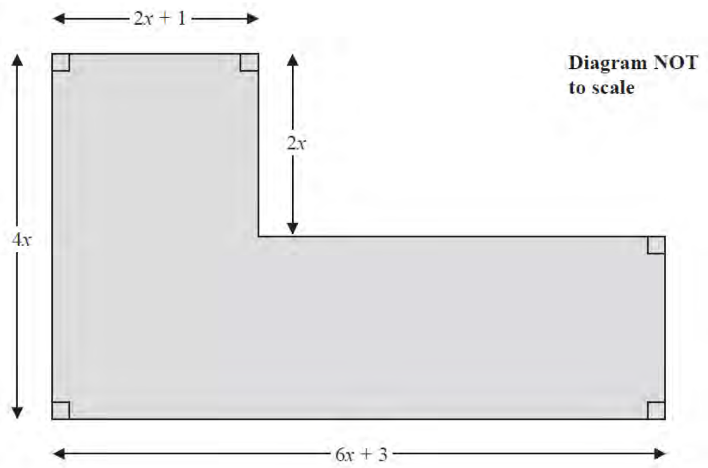

Figure 1

Figure 1 shows the plan of a garden. The marked angles are right angles.

The six edges are straight lines.

The lengths shown in the diagram are given in metres.

Given that the perimeter of the garden is greater than 40 m,

(*a*) show that $x > 1.7$.

(3)

Given that the area of the garden is less than 120 m^2,

(*b*) form and solve a quadratic inequality in x.

(5)

(*c*) Hence state the range of the possible values of x.

(1)

7.

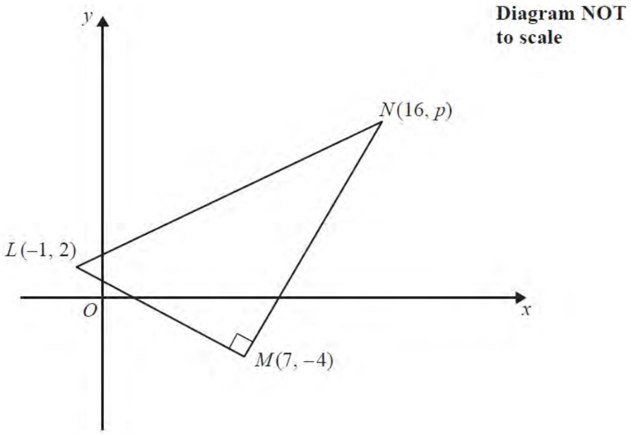

Figure 2

Figure 2 shows a right angled triangle LMN.

The points L and M have coordinates (–1, 2) and (7, –4) respectively.

(a) Find an equation for the straight line passing through the points L and M.

Give your answer in the form $ax + by + c = 0$, where a, b and c are integers.
(4)

Given that the coordinates of point N are $(16, p)$, where p is a constant, and angle $LMN = 90°$,

(b) find the value of p.
(3)

Given that there is a point K such that the points L, M, N, and K form a rectangle,

(c) find the y coordinate of K.
(2)

8.

$$\frac{\mathrm{d}y}{\mathrm{d}x} = 6x^{-\frac{1}{2}} + x\sqrt{x}, \qquad x > 0$$

Given that $y = 37$ at $x = 4$, find y in terms of x, giving each term in its simplest form.
(7)

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9. The curve C has equation $y = \frac{1}{3}x^2 + 8$.

The line L has equation $y = 3x + k$, where k is a positive constant.

(a) Sketch C and L on separate diagrams, showing the coordinates of the points at which C and L cut the axes.
(4)

Given that line L is a tangent to C,

(b) find the value of k.
(5)

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10. Xin has been given a 14 day training schedule by her coach.

Xin will run for A minutes on day 1, where A is a constant.

She will then increase her running time by $(d + 1)$ minutes each day, where d is a constant.

(a) Show that on day 14, Xin will run for

$$(A + 13d + 13) \text{ minutes.}$$
(2)

Yi has also been given a 14 day training schedule by her coach.

Yi will run for $(A - 13)$ minutes on day 1.

She will then increase her running time by $(2d - 1)$ minutes each day.

Given that Yi and Xin will run for the same length of time on day 14,

(b) find the value of d.
(3)

Given that Xin runs for a total time of 784 minutes over the 14 days,

(c) find the value of A.
(3)

PMT

11.

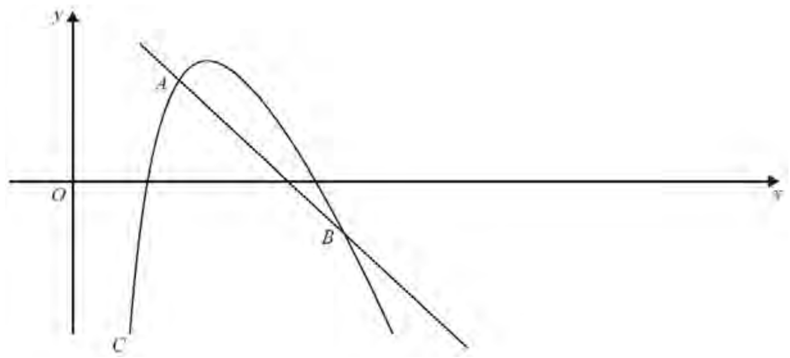

Figure 3

A sketch of part of the curve C with equation

$$y = 20 - 4x - \frac{18}{x}, \qquad x > 0$$

is shown in Figure 3.

Point A lies on C and has an x coordinate equal to 2.

(a) Show that the equation of the normal to C at A is $y = -2x + 7$.
(6)

The normal to C at A meets C again at the point B, as shown in Figure 3.

(b) Use algebra to find the coordinates of B.
(5)

TOTAL FOR PAPER: 75 MARKS

END

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P43014A

PMT

1. Find $\int (8x^3 + 4)\ \mathrm{d}x$, giving each term in its simplest form.

(3)

2. (*a*) Write down the value of $32^{\frac{1}{5}}$.

(1)

(*b*) Simplify fully $(32x^5)^{-\frac{2}{5}}$.

(3)

3. Find the set of values of x for which

(*a*) $3x - 7 > 3 - x$,

(2)

(*b*) $x^2 - 9x \leq 36$,

(4)

(*c*) **both** $3x - 7 > 3 - x$ **and** $x^2 - 9x \leq 36$.

(1)

4.

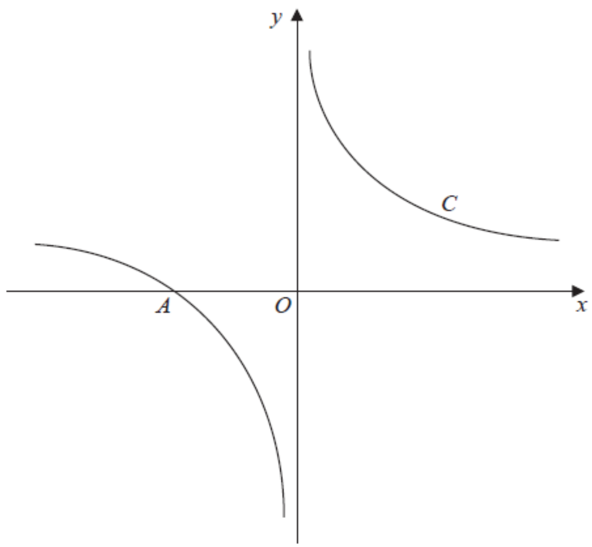

Figure 1

Figure 1 shows a sketch of the curve C with equation

$$y = \frac{1}{x} + 1, \quad x \neq 0.$$

The curve C crosses the x-axis at the point A.

(*a*) State the x-coordinate of the point A.

(1)

The curve D has equation $y = x^2(x - 2)$, for all real values of x.

(*b*) On a copy of Figure 1, sketch a graph of curve D. Show the coordinates of each point where the curve D crosses the coordinate axes.

(3)

(*c*) Using your sketch, state, giving a reason, the number of real solutions to the equation

$$x^2(x - 2) = \frac{1}{x} + 1.$$

(1)

PMT

5. A sequence of numbers $a_1, a_2, a_3 \ldots$ is defined by

$$a_{n+1} = 5a_n - 3, \qquad n \geq 1.$$

Given that $a_2 = 7$,

(*a*) find the value of a_1.

(2)

(*b*) Find the value of $\sum_{r=1}^{4} a_r$.

(3)

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6. (*a*) Write $\sqrt{80}$ in the form $c\sqrt{5}$, where c is a positive constant.

(1)

A rectangle R has a length of $(1 + \sqrt{5})$ cm and an area of $\sqrt{80}$ cm^2.

(*b*) Calculate the width of R in cm. Express your answer in the form $p + q\sqrt{5}$, where p and q are integers to be found.

(4)

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7. Differentiate with respect to x, giving each answer in its simplest form,

(*a*) $(1 - 2x)^2$,

(3)

(*b*) $\dfrac{x^5 + 6\sqrt{x}}{2x^2}$.

(4)

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8. In the year 2000 a shop sold 150 computers. Each year the shop sold 10 more computers than the year before, so that the shop sold 160 computers in 2001, 170 computers in 2002, and so on forming an arithmetic sequence.

(*a*) Show that the shop sold 220 computers in 2007.

(2)

(*b*) Calculate the total number of computers the shop sold from 2000 to 2013 inclusive.

(3)

In the year 2000, the selling price of each computer was £900. The selling price fell by £20 each year, so that in 2001 the selling price was £880, in 2002 the selling price was £860, and so on forming an arithmetic sequence.

(*c*) In a particular year, the selling price of each computer in £s was equal to three times the number of computers the shop sold in that year. By forming and solving an equation, find the year in which this occurred.

(4)

PMT

9.

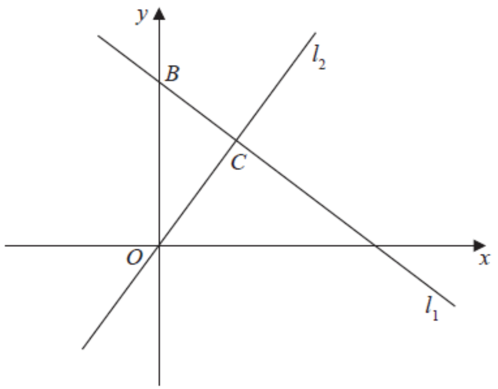

Figure 2

The line l_1, shown in Figure 2 has equation $2x + 3y = 26$.

The line l_2 passes through the origin O and is perpendicular to l_1.

(*a*) Find an equation for the line l_2.

(4)

The line l_2 intersects the line l_1 at the point C. Line l_1 crosses the y-axis at the point B as shown in Figure 2.

(*b*) Find the area of triangle *OBC*. Give your answer in the form $\frac{a}{b}$, where a and b are integers to be determined.

(6)

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10. A curve with equation $y = \text{f}(x)$ passes through the point $(4, 25)$.

Given that $\text{f}'(x) = \frac{3}{8}x^2 - 10x^{-\frac{1}{2}} + 1, \quad x > 0,$

(*a*) find $\text{f}(x)$, simplifying each term.

(5)

(*b*) Find an equation of the normal to the curve at the point $(4, 25)$. Give your answer in the form $ax + by + c = 0$, where a, b and c are integers to be found.

(5)

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11. Given that $\text{f}(x) = 2x^2 + 8x + 3$,

(*a*) find the value of the discriminant of $\text{f}(x)$.

(2)

(*b*) Express $\text{f}(x)$ in the form $p(x + q)^2 + r$ where p, q and r are integers to be found.

(3)

The line $y = 4x + c$, where c is a constant, is a tangent to the curve with equation $y = \text{f}(x)$.

(*c*) Calculate the value of c.

(5)

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