Version : 1.0 0107

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Mathematics 6360

MPC1 Pure Core 1

Report on the Examination

2007 examination - January series

Set and published by the Assessment and Qualifications Alliance.

General

It was pleasing to see many candidates well prepared for this unit presenting their solutions clearly. Those who did not do quite so well might benefit from the following advice.

- When asked to use the Remainder Theorem no marks will be given for using long division.
- When rationalising $\frac{\sqrt{5}+3}{\sqrt{5}-2}$ it is necessary to multiply numerator and denominator by $\sqrt{5}+2$.
- The centre of a circle with equation $(x+1)^2+(y-6)^2=25$ is $(-1, 6)$.
- When asked to prove that a printed equation such as "$x^2+3x-10=0$" is true, it is important to include the "$= 0$".
- Practice is needed in rearranging formulae such as $x^2+3xh=27$ in order to make h the subject.
- A quadratic equation has real roots when the discriminant is greater than or equal to zero ($b^2-4ac \geqslant 0$).
- When solving a quadratic inequality, it is wise to use a sketch or sign diagram.

Question 1

Part (a)(i) Most candidates found $p(-2)$ but often failed to convince examiners that they had really shown that $k=10$. Many substituted $k=10$ from the outset and then drew no conclusion from the fact that $p(-2)=0$. Those using long division often made sign errors.

Part (a)(ii) Factorisation of a cubic seems well understood and, apart from those who could not factorise x^2-6x+5, candidates usually scored full marks. Some still confuse factors and roots.

Part (b) Many ignored the request to use the Remainder Theorem and scored no marks for long division. A few who correctly found that $p(3)=-20$ concluded that the remainder was $+20$.

Part (c) The sketch was generously marked with regard to the position of the stationary points but it was expected that candidates would indicate the values where the curve crossed the coordinate axes and often these values, particularly the 10 on the *y*-axis, were omitted.

Question 2

Part (a)(i) It was disappointing to see many candidates unable to rearrange $3x+5y=8$ to make y the subject in order to find the gradient. Some were successful in finding a second point on the line such as (1, 1) and then using the coordinates of *A* to find the gradient of *AB*.

Part (a)(ii) Most candidates knew how to find the gradient of a perpendicular line, but those using $y=mx+c$ made more arithmetic slips than those using the more appropriate form $y-y_1=m(x-x_1)$.

Part (b) Apart from those who used the wrong pair of equations, this part was usually answered correctly.

Part (c) Although this part was meant to be challenging, there were many successful attempts, particularly by those who used a sketch and reasoned on a 3, 4, 5 triangle. It had been intended that candidates would have formed an equation such as $16+(k+2)^2=25$, but more commonly something such as $16+y^2=25$ was seen, resulting in the incorrect values of ± 3.

Question 3

Part (a) It was not uncommon to see the denominator and numerator multiplied by different surds and the usual errors occurred as candidates tried to multiply out brackets. This part of the question did not seem to be answered as well as in previous years.

Part (b)(i) was usually correct but very few were successful in solving the equation in part (b)(ii), even though they reached forms of the correct equation such as $2\sqrt{5}x=4\sqrt{5}$ or $x=\dfrac{4\sqrt{5}}{2\sqrt{5}}$.

Question 4

Part (a) The $+\ 2x$ term was ignored by many who wrote the left hand side of the circle equation as $(x-1)^2+(y-6)^2$ but most candidates were able to complete the square correctly. The right hand side was often seen as 49 and since this was a perfect square it did not cause candidates to doubt their poor arithmetic.

Part (b) Many who had the correct circle equation in part (a) wrote the coordinates of the centre with incorrect signs. Generous follow through marks were awarded in this part provided the right hand side of the equation had a positive value.

Part (c) Almost all candidates reasoned correctly by considering the y-coordinate of the centre and the radius of the circle, although a number were successful in showing that the quadratic resulting from substituting $y = 0$ into the circle equation does not have real roots. Some simply drew a diagram and this alone was not regarded as sufficient to prove that the circle did not intersect the x-axis. Others using an algebraic approach found a quadratic that they said did not factorise and concluded incorrectly that the equation had no real roots.

Part (d) The algebra proved too difficult for the weaker candidates and many who had shown good algebraic skills rather casually forgot to include "$= 0$" on their final line of working. Sadly, many were unable to factorise the quadratic or wrote the coordinates of Q as $(-5, 2)$. It was good, however, to see more candidates being able to find the correct mid-point, where in previous years too many had found the difference of the coordinates before dividing by 2.

Question 5

Part (a) Candidates did not seem confident at working on this kind of problem and algebraic weaknesses were evident. Many worked backwards from the result in part (a)(i) and did not always convince the examiner that they were considering the surface area of four faces and the base. The inability of most candidates to rearrange the formula to make h the subject in part (a)(ii) was alarming. Consequently few, without considerable fudging, could establish the printed formula for the volume.

Part (b) Basic differentiation is well understood and most candidates found $\dfrac{\mathrm{d}V}{\mathrm{d}x}$ correctly. Some tried to substitute $x = 3$ into the expression for V in order to show there was a stationary point, but usually this part was answered well.

Part (c) It was not uncommon to see the second derivative as $4x$ even though the first derivative was correct. A generous follow through was given here provided candidates could interpret the value of their second derivative.

Question 6

Part (a)(i) Some candidates ignored the request to state the coordinates of B even though they were using the height of the triangle as 5. The negative x-coordinate of A caused quite a few to feel that the triangle had a negative area. Far too many when finding $\frac{1}{2} \times 1 \times 5$ wrote the answer as 3.

Part (a)(ii) Practically every candidate found the correct integral although some made errors when cancelling fractions.

Part (a)(iii) It was necessary here to have the lower limit as -1 and the upper limit as 0. Many reversed the order and by some trickery arrived at a positive value. This was penalised and so very few, even though many had an answer of 1 for the area, scored full marks for this part of the question.

Part (b) Most candidates differentiated correctly but, because of poor understanding of negative signs, many wrong values of -13 were seen for the gradient. There is obviously confusion for many between tangents and normals and several thought the gradient of the tangent was $\frac{-1}{17}$.

Question 7

Part (a) The condition for real roots was not widely known and the form of the printed answer caused many to write the condition as $b^2 - 4ac \leqslant 0$.

Part (b) It was disappointing to see many unable to factorise the quadratic correctly. Far too many guessed at answers and an approach using a sign diagram or sketch is recommended. Candidates also need to realise that the final form of the answer cannot be written as "$k \geqslant -5$ or $k \leqslant 8$".

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.