Edexcel GCSE

Mathematics

Foundation/Higher Tier

Number: Roots and powers

Information for students

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 5 questions in this selection.

Advice for students

Show all stages in any calculations.
Work steadily through the paper. Do not spend too long on one question.
If you cannot answer a question, leave it and attempt the next one.
Return at the end to those you have left out.

Information for teachers

The questions in this document are taken from the 2009 GCSE Exam Wizard and include questions from examinations set between January 2003 and June 2009 from specifications 1387, 1388, 2540, 2544, 1380 and 2381.

Questions are those tagged as assessing "Roots and powers" though they might assess other areas of the specification as well. Questions are those tagged as "Foundation/Higher" so could have (though not necessarily) appeared on either a Foundation, Intermediate or Higher tier paper.

GCSE Mathematics

Formulae: Foundation Tier

You must not write on this formulae page.

Anything you write on this formulae page will gain NO credit.

Area of trapezium = $(a + b)h$
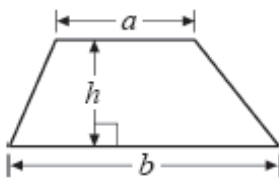
Volume of prism = area of cross section × length
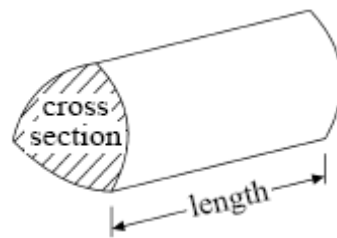
1. (a) Write as a power of 7

(i) $7^8 \div 7^3$

....

(ii) $\dfrac{7^2 \times 7^3}{7}$

....

(3)

(b) Write down the reciprocal of 2

....

(1)

(Total 4 marks)

2. (a) Work out the value of

(i) 4^2

....

(ii) $\sqrt{64}$

....

(iii) 3×2^3

....

(3)

(b)   Work out

(i) $-2+5$

....

(ii) $-2-3$

....
(2)
(Total 5 marks)

3.   Use a calculator to work out

$$\sqrt{\frac{21.6\times15.8}{3.8}}$$

(a)   Write down all the figures on your calculator display.

....
(2)

(b)   Give your answer to part (a) correct to 3 significant figures.

....
(1)
(Total 3 marks)

4.   Work out the value of $3^3 \times 10^2$

………………..
(Total 2 marks)

5.   Use your calculator to work out

$$\sqrt{12.63 + 18^2}$$

Write down all the figures on your calculator display.

....
(Total 2 marks)

01.   (a)   (i) 7^5
                        B1 cao

              (ii) 7^4 3
                        B2 cao
                        (B1 for sight of 5 or 7^{2+3} or 7×7^3 or $7^1 \times 7^3$ or $7^2 \times 7^2$ or 7^{2+3-1})

(b) $\dfrac{1}{2}$ 1

                 B1 for $\dfrac{1}{2}$ *or 0.5 or 2^{-1}*

                                                                       [4]

02.   (a)   (i)   16   1

                        B1 cao

              (ii)   8   1

                        B1 cao

              (iii)   24   1

                        B1 cao

(b)   (i)   3   1

                        B1 cao

              (ii)   −5   1

                        B1 cao

                                                        [5]

03.   (a) $\sqrt{\dfrac{21.6 \times 15.8}{3.8}} =$

         9.476841579   2

                 M1 for $89.81052\dots$ *or 341.28 or $4.86151\dots$ or* $\dfrac{8532}{95}$ *or* $\dfrac{8532}{25}$

                 A1 for $9.47684\dots$
                 SC : B1 for $9.476841579\dots$ truncated or rounded to at least 1 decimal place

      (b) $\sqrt{89.81052632}$

         9.48   1

                 B1 ft from (a) with at least 4 significant figures

                                                        [3]

04. 2700   2

27 × 100

> *M1 for 3 × 3 × 3 × 10 × 10 or 27 seen*
> *A1*

                                                                                                          [2]

05. $= \sqrt{336.63}$

18.347….   2

> *B2 for 18.347(47939) or* $\dfrac{7\sqrt{687}}{10}$
>
> *(B1 for 18.3… or 336.63 seen)*

                                                                                                          [2]

01. **Higher Tier**

A large number of candidates were able to score at least 1 mark in part (a), usually in (i). In part (a)(i) most candidates knew that they needed to subtract the powers, and virtually all of these were able to do this successfully. Many candidates were able to get part (a)(ii) correct, but a final incorrect answer of 7^5 was very common. This was usually achieved by either an error in simplifying the numerator, e.g. $\dfrac{7^2 \times 7^3}{7} = \dfrac{7^6}{7} = 7^5$, or by an error in dealing with the denominator, e.g. $\dfrac{7^2 \times 7^3}{7} = \dfrac{7^6}{7^0} = 7^5$.

In part (b), less than half the candidates were able to write down the reciprocal of 2. The most popular incorrect answers were $\dfrac{2}{1}$, 2^2, $\sqrt{2}$,.-2

Intermediate Tier

Few candidates gained full marks in part (a). Part (i) was frequently answered correctly but success in part (ii) was much more elusive. Common errors were $7^2 \times 7^3 = 7^6$, $7^5 \div 7 = 7^5$ and $7^5 \div 7 = 1^5$. Correct answers were extremely rare in part (b) as very few candidates knew the meaning of 'reciprocal'. A common incorrect answer was 4.

02. Candidates found this question quite difficult. Common wrong answers for part (a) were 8 for part (i), 32 for (ii) and 6 cubed for (iii). There was more success with part (b) with about half the candidates gaining both the correct answers.

03.   Only just under 40% of candidates were able to attain full marks for this very early question. Marks were generally lost due to an inability to use a calculator correctly. Taking the square root of just the numerator rather than the whole fraction was the most common error.

04.   It was good to see many candidates show $3 \times 3 \times 3 \times 10 \times 10$ in their working showing an understanding of the powers in both 3^3 and 10^2. What was less successful was the calculation of $3 \times 3 \times 3$ which often produced 9 rather than 27. Perhaps more surprisingly, 10^2 was often calculated as 20. For those attaining both the 27 and 100, combining them together sometimes gave $100 + 27 = 127$ or $100 \times 27 = 270$ rather than the anticipated 2700.

05.   **Foundation**

This question was very poorly answered even though it was testing the use of a calculator on a calculator paper. The modal answer was for finding the square root of 12.63 and then adding the square of 18. Another group of candidates calculated $12.63 + 18^2$ but then did not square root their answer. Unfortunately these answers were incorrect. Only 18% of candidates gave the fully correct answer whilst a further 11% gained 1 mark usually for calculating 336.63 or writing the answer as 18.3 rather than giving all the figures on their calculator display as required.

Higher

The great majority of candidates either scored full marks for a correct answer or no marks for evaluating $\sqrt{2.63} + 18^2$ rather than the expression given. Most of the candidates who failed to gain any marks wrote an answer down without any intermediate working. If they had written down some working they may have given thought to the order of operations required. Despite the instruction to write down all the figures from the calculator display, a significant proportion of candidates went on to round their answer. Further rounding was ignored if candidates had written the full version in the working space. Some calculators give the answer in the form $\dfrac{7\sqrt{687}}{10}$. This was accepted. In this question, the first on the paper, 59% of candidates were awarded 2 marks, but 33% of candidates could not be awarded any marks.