

Edexcel GCSE

Mathematics

Higher Tier

Number: Decimals

Information for students

The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2). There are 20 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.

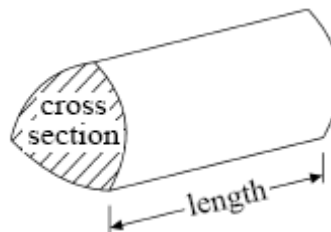
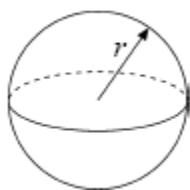
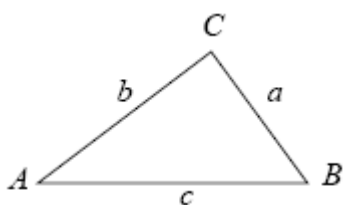
Information for teachers

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 “Decimals” though they might assess other areas of the specification as well. Questions are those tagged as “Higher” so could have (though not necessarily) appeared on either an Intermediate or Higher tier paper.

GCSE Mathematics

Formulae: Higher Tier

You must not write on this formulae page.**Anything you write on this formulae page will gain NO credit.****Volume of prism** = area of cross section \times length**Volume of sphere** $\frac{4}{3} \pi r^3$ **Volume of cone** $\frac{1}{3} \pi r^2 h$ **Surface area of sphere** = $4\pi r^2$ **Curved surface area of cone** = $\pi r l$ **In any triangle ABC****The Quadratic Equation**The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

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

Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ **Cosine Rule** $a^2 = b^2 + c^2 - 2bc \cos A$ **Area of triangle** = $\frac{1}{2} ab \sin C$

1. A company bought a van that had a value of £12 000
Each year the value of the van depreciates by 25%.

(a) Work out the value of the van at the end of three years.

£ (3)

The company bought a new truck.
Each year the value of the truck depreciates by 20%.
The value of the new truck can be multiplied by a single number to find its value at the end of four years.

(b) Find this single number as a decimal.

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

2. (a) Change $\frac{3}{11}$ to a decimal.

..... (1)

(b) Prove that the recurring decimal $0.\dot{3}9 = \frac{13}{33}$

(3)
(Total 4 marks)

3. Prove that the recurring decimal $0.\dot{4}\dot{5} = \frac{15}{33}$

(Total 3 marks)

4. Express the recurring decimal $0.2\dot{1}\dot{3}$ as a fraction.

.....
(Total 3 marks)

5. The value of a car depreciates by 35% each year.
At the end of 2007 the value of the car was £5460
Work out the value of the car at the end of 2006

£
(Total 3 marks)

6. Julie buys 19 identical calculators.
The total cost is £143.64

Work out the total cost of 31 of these calculators.

£

(Total 3 marks)

7. Work out $\frac{4.6 + 3.85}{3.2^2 - 6.51}$

Write down all the numbers on your calculator display.

.....

(Total 2 marks)

8. (a) Express $0.\dot{2}7$ as a fraction in its simplest form.

..... (3)

x is an integer such that $1 \leq x \leq 9$

- (b) Prove that $0.\dot{0}x = \frac{x}{99}$

(2)
(Total 5 marks)

9. (i) Convert the recurring decimal $0.\dot{3}\dot{6}$ to a fraction.

.....

(ii) Convert the recurring decimal $2.1\dot{3}\dot{6}$ to a mixed number.
Give your answer in its simplest form.

.....

(Total 5 marks)

10. Express the recurring decimal $2.0\dot{6}$ as a fraction.
Write your answer in its simplest form.

.....
(Total 3 marks)

11. The recurring decimal $0.\dot{7}\dot{2}$ can be written as the fraction $\frac{8}{11}$

Write the recurring decimal $0.5\dot{7}\dot{2}$ as a fraction.

.....
(Total 2 marks)

12. Express $0.3\dot{2}\dot{8}$ as a fraction in its simplest form.

.....
(Total 3 marks)

13. Use your calculator to work out the value of $\sqrt{7.08^2 - 6.57^2}$

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

..... (2)

(b) Write your answer to part (a) correct to 2 significant figures.

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

14. Work out $147.6 \div 0.24$
You **must** show all your working.

.....
(Total 3 marks)

15. Express the recurring decimal $0.1\dot{2}\dot{6}$ as a fraction.

.....
(Total 3 marks)

16. Use your calculator to work out $\frac{\sqrt{13.2 - 6.8}}{3.25 + 4.9}$
Write down all the figures on your calculator display.

.....
(Total 2 marks)

17. Convert the recurring decimal $2.1\dot{4}5$ to a fraction.

.....
(Total 3 marks)

18. Change the recurring decimal $0.2\dot{3}$ to a fraction.

.....
(Total 2 marks)

19. Prove that $0.4\dot{7}\dot{3}$ can be written as the fraction $\frac{469}{990}$

(Total 2 marks)

20. Prove that the recurring decimal $0.\dot{1}\dot{7} = \frac{17}{99}$

(Total 2 marks)

01. (a) £5062.50 3

$$£12000 \times 0.25 = £3000; £12000 - £3000 = £9000$$

$$£9000 \times 0.25 = £2250; £9000 - £2250 = £6750$$

$$£6750 \times 0.25 = £1687.50; £6750 - £1687.50 =$$

M1 for $12000 \times 0.75 (= 9000)$ oe or £3000 or £23437.50 seen

M1 (dep) for at least two further depreciation calculations

(complete steps)

A1 cao

OR *M2 for $12000 \times (0.75)^3$ or 5062.50 seen*

(M1 for $12000 \times (0.75)^n$, $n = 2$ or 4)

(b) 0.4096 2

$$0.8 \times 0.8 \times 0.8 \times 0.8 \text{ (oe)}$$

M1 0.8^4 (oe)

A1 cao

[5]

02. (a) 0.2727... 1

B1 for 2.27 recurring or 0.2727.... oe or 0.273

(b) eg $x = 0.3939...$ so $100x = 39.3939...$

$$99x = 39$$

$$\text{so } x = \frac{39}{99} = \frac{13}{33}$$

3

M1 for $100x = 39.39...$

M1 dep for subtraction of both sides

A1 for $\frac{13}{33}$ from correct proof

Alternative method

M1 for $13.000 \div 33$

M1 for remainders 31 and 13

A1 for 0.39 recurring

SC:B1 for $\frac{39}{99}$

[4]

03. $x = 0.4545\dots$
 so $100x = 45.4545\dots$
 $99x = 45$
 $x = \frac{45}{99} = \frac{15}{33}$

proof

3

M1 for $100x = 45.45 \dots$ or $10000x = 4545.45 \dots$

M1 (dep) for subtraction of both sides

A1 for $\frac{15}{33}$ from correct proof

[3]

04. $x = 0.213131313\dots$
 $10x = 2.13131313\dots$
 $1000x = 213.131313\dots$
 $990x = 211$

$$\frac{211}{990}$$

3

M1 for $0.2131313\dots$ or $0.2 + 0.0131313\dots$ (dots MUST be included)

M1 for two correct recurring decimals that, when subtracted, leave a terminating decimal

A1 for $\frac{211}{990}$

[3]

05. 65% of orig value = £5460
 1% of orig value = $\frac{£5460}{65}$
 Orig value = $\frac{£5460}{65} \times 100$

£8400

3

M1 65% (of orig value) = £5460 or $(100\% - 35\%) \times$ orig price = 5460 or 0.65 or 65% seen

M1 $\frac{£5460}{65} \times 100$ or $\frac{5460}{0.65}$

A1 £8400

[3]

06. $143.64 \div 19 = 7.56$
 $7.56 \times 31 = 234.36$ 3

M1 for $143.64 \div 19$ (or 7.56 seen) or 143.64×31 (or 4452.84 seen)

*M1(dep) for ' 7.56 ' $\times 31$ or ' 4452.84 ' $\div 19$
 or $143.64 + 12 \times '7.56'$*

A1 for 234.36 cao accept 234.36p

Alternative method:

M1 for $\frac{31}{19}$ (or $1.63(1\dots)$ seen)

M1 (dep) ' $1.63\dots$ ' $\times 143.64$

A1 for 234.36 cao accept 234.36p

[3]

07. $4.6 + 3.85 = 8.45$
 $3.2^2 - 6.51 = 3.73$
 $8.45 \div 3.73 =$
 2.26541555 2

M1 for $\frac{169}{20}$ or $\frac{256}{25}$ or $\frac{373}{100}$ or 3.73 or 10.24 or 8.45 seen

A1 for 2.265(41555); accept $\frac{845}{373}$

[2]

08. (a) $\frac{3}{11}$ 3

Let $x = 0.2727\dots$

$100x = 27.2727\dots$

$99x = 27$

M1 for $100x - x = 27.27\dots - 0.27\dots$

A1 for $27/99$ oe

A1 for $3/11$ cao

- (b) $y = \frac{x}{99}$ 2

Let $y = 0.0x0x\dots$

$100y = x.0x0x\dots$

$99y = x$

M1 for $100y - y = x.0x\dots - 0.0x\dots$ oe

A1 for completion of proof

[5]

09. (a) $\frac{36}{99}$ oe 2

$$x = 0.3636.. \quad 100x = 36.3636..$$

$$MI \text{ for } 36.3636... - 0.3636... \text{ or } 99x = 36$$

$$A1 \text{ for } \frac{36}{99} \text{ oe}$$

(b) $2 \frac{3}{22}$ oe 3

For example $y = 0.13636...$

$$10y = 1.3636...$$

$$1000y = 136.3636...$$

$$990y = 135 \quad y = \frac{135}{990}$$

MI for a clear fully correct method using either $2.1\dot{3}\dot{6}$ or $0.1\dot{3}\dot{6}$ including subtraction to $ay = b$ where at least one of a or b is correct

$$A2 \text{ for } \frac{47}{22} \text{ or } 2 \frac{3}{22}$$

$$[A1 \text{ for any fraction equivalent to } \frac{47}{22} \text{ eg. } \frac{2115}{990}]$$

Alt method:

$$MI \text{ for } 2 \frac{1}{10} + (\text{ans}(i)/10)$$

$$A2 \text{ for } \frac{47}{22} \text{ or } 2 \frac{3}{22}$$

$$[A1 \text{ for any fraction equivalent to } \frac{47}{22} \text{ eg. } \frac{2115}{990}]$$

[5]

10. $\frac{31}{15}$ or $2\frac{1}{15}$ 3

$$10x = 20.66\dots$$

$$x = 2.06\dots$$

$$9x = 18.6$$

$$x = \frac{18.6}{9}$$

BI for 2.0666...

MI for a clear fully correct method for dealing with a recurring decimal including subtraction to $ax = b$ where at least one of a

or b is correct OR $0.\dot{6} = \frac{2}{3}$

AI for $\frac{31}{15}$ oe (e.g. $\frac{2046}{990}$, $\frac{186}{90}$)

[3]

11. $\frac{1}{2} + \frac{8}{110}$ 2
 $\frac{63}{110}$ oe

MI for $\frac{1}{2} + \left(\frac{8}{11} \div 10\right)$ OR $\left(5 + \frac{8}{11}\right) \div 10$

AI cao

Alternative method

MI for $0.5\dot{7}\dot{2} = 0.57272\dots$

AI cao

[2]

12. $x = 0.32828\dots$ 3
 $100x = 32.828\dots$
 $99x = 32.5$
 $\frac{65}{198}$

MI for 0.32828...

MI (dep) for attempt to subtract two recurring decimals that would result in a correct terminating decimal

(e.g. $328.28\dots - 3.28\dots$ or $32.828\dots - 0.328\dots$)

AI for $\frac{65}{198}$ oe with numerator and denominator both integer

[3]

13. (a) $50.1264 - 43.1649 = 6.9615$ 2
 $\sqrt{6.9615} =$
 $2.638465\dots$
B2 for 2.638465... accept 2.6384....
(B1 for 6.9615)
- (b) 2.6 1
B1 ft
- [3]**
14. $\frac{147.6}{0.24} = \frac{14760}{24}$ 3
 $\begin{array}{r} 615 \\ 24 \overline{)14736^{12}0} \\ \underline{144} \\ 36 \\ \underline{36} \\ 0 \end{array}$
 615
M1 for 14760 ÷ 24
M1 for attempt at complete method, either division or
cancelling of fraction or chunking method (needs to get to 6 x x)
A1 cao
SC B2 for 6.15 or digits 615 seen in working
- [3]**
15. $100x = 12.62626\dots$ 3
 $x = 0.12626\dots$
 $99x = 12.5$
 $= \frac{125}{990}$ oe
- M1 for 0.1262626...*
M1 for two decimals seen that, when subtracted, result in a
terminating decimal
A1 for $\frac{125}{990}$ oe (eg. $\frac{25}{198}$)
- [3]**

16. 0.3104(07623)

2

B2 for 0.3104(07623)
(B1 for 2.52(98.....) or 2.53 or 0.31 seen)
SC: B1 for 0.886...

[2]

17. $x = 2.1454545\dots$

3

$$10x = 21.454545\dots$$

$$1000x = 2145.4545\dots$$

$$990x = 2124$$

$$2\frac{8}{55} \text{ oe}$$

M1 for 2.14545(45...) or 0.14545(45...)
[1000x = 2145.45 for example would imply this]
M1 for two recurring decimals that, when subtracted, leave a terminating decimal

A1 for $2\frac{8}{55}$ oe (eg $\frac{2124}{990}$)

[Note: $\frac{212.4}{99}$ gets M2 A0]

Common errors that are being made:

$x = 2.1454545\dots$ (or $x = 0.1454545\dots$ or $x = 0.0454545\dots$)
[2.14545 (or 0.14545 or 0.04545) is sufficient for the award of the first M1] $100x = 214.54545\dots$

Working out $99x$ does leave a terminating decimal, 212.4 so the second M1 can be awarded but an answer of $\frac{212.4}{99}$ does not

gain the A1 until the decimal is correctly removed.

$$x = 2.1454545\dots$$

$$1000x = 2145.4545\dots$$

Working out $999x$ does not leave a terminating decimal, so M1M0A0

$x = 2.145145145$ loses the first M1
 $1000x = 2145.145145$
 Finding $999x = 2143$ then demonstrates a correct method for finding "two recurring decimals that when subtracted leave a terminating decimal" The second M1 can then be awarded. So M0M1A0 is scored

An answer of $\frac{2124}{990}$ followed by incorrect cancelling gets

M2A1 (isw)

$\frac{144}{990}$ oe gets M2A0 (for those who lose the 2 units)

[3]

18. $100 \times 0.\dot{2}\dot{3} = 23.\dot{2}\dot{3}$

$99 \times 0.\dot{2}\dot{3} = 23$

$\frac{23}{99}$

2

M1 for $100 \times 0.\dot{2}\dot{3}$ or $10000 \times 0.\dot{2}\dot{3}$

A1 for $\frac{23}{99}$ oe

[2]

19. $100x = 47.3737\dots$

$x = 0.4737\dots$

$99x = 46.9$

$x = 46.9/99$

proof

2

M1 for valid method

eg $100x = 47.37373$, $1x = 0.4737\dots$ and subtract

OR $1000x = 473.7373$, $10x = 4.737\dots$ and subtract

A1 for valid argument leading to $\frac{469}{990}$

[2]

20. $x = 0.1717\dots$
 $1000x = 171.7171\dots$
 $99x = 17$
 $x = \frac{17}{99}$

or

$1000x = 171.7171\dots$
 $10x = 1.7171\dots$

$990x = 170$
 $x = 17/99$

Proof

2

M1 for valid method

eg $100x = 17.17\dots$, $1x = 0.1717\dots$ and subtract

OR

$1000x = 171.7171\dots$, $10x = 1.7171\dots$ and subtract

A1 for valid argument leading to $x = \frac{17}{99}$

Alternative method for long division

M1 for identifying 71 and 17 as remainders

A1 for correct statement

[2]