1 Using a calculator (powers, roots and memory)

Use your calculator to find the answers. Show your calculator keys. Give your answer correct to six significant figures where appropriate.

1 5.2^2 1.....

2 $\sqrt{38.2}$ 2.....

3 1.89^6 3.....

4 $\sqrt[3]{873}$ 4.....

5 $\sqrt[5]{723}$ 5.....

6 $27^{-\frac{1}{4}}$ 6.....

7 $1.6^{-\frac{2}{3}}$ 7.....

8 $\sqrt{2.7^3}$ 8.....

9 10^{-3} 9.....

10 $(-4)^3$ 10.....

11 $y = 3x^4 + 2x^3 - 6x^2$
Calculate the value of y when $x = 1.29$.
Use an efficient calculator method.

11.....

12 $y = 4x^5 - 3x^4 - 2x^3 + 8$
Calculate the value of y when $x = -1.71$.
Use an efficient calculator method.

12.....

Minimum mark	10	8	6	4	
Circle grade	A	B	C	D	E

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2 Standard form

Write the following numbers in standard form:

1 7420 1.....

2 538 2.....

3 0.0732 3.....

4 681.4 4.....

5 0.0006 5.....

6 0.0403 6.....

7 630 000 000 7.....

8 0.0000728 8.....

Write the following as ordinary numbers:

9 3.6×10^3 9.....

10 7.28×10^5 10.....

11 1.54×10^4 11.....

12 8.87×10^{-2} 12.....

13 3.72×10^{-1} 13.....

14 8.4×10^{-5} 14.....

15 6.1×10^{-3} 15.....

16 5.43×10^4 16.....

Give the answers to the following:

a In standard form (correct to three significant figures).

b As an ordinary number (correct to six significant figures where appropriate). Show your calculator keys for question 17.

17 $\frac{3.2 \times 10^7}{8.5 \times 10^3}$ 17a .....
17b.....

18 $(8.8 \times 10^{-2})^3$ 18a .....
18b.....

19 $4.852 \times 10^{-6} \times 3.68 \times 10^4$ 19a .....
19b.....

20 $5.328 \times 10^7 \times 2.63 \times 10^3$ 20a .....
20b.....

Minimum mark	19	16	12	8	
Circle grade	A	B	C	D	E

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3 Percentages and fractions – 1

1	Find $\frac{3}{8}$ of 28	1..... ☐
2	Find 17% of 80	2..... ☐
3	Increase 20 by $\frac{3}{16}$	3..... ☐
4	Increase 24 by 8%	4..... ☐
5	Increase 6 by 27%	5..... ☐
6	Decrease 30 by $\frac{2}{5}$	6..... ☐
7	Decrease 18 by 7%	7..... ☐
8	Decrease 35 by 76%	8..... ☐
9	Find $\frac{7}{20}$ of 18	9..... ☐
10	Increase 23 by 19%	10..... ☐
11	Decrease 86 by 72%	11..... ☐
12	Decrease 4.3 by 56%	12..... ☐
13	Find 18% of 7	13..... ☐
14	Increase 7.2 by 18%	14..... ☐
15	Decrease 6.8 by 24%	15..... ☐
16	Increase 0.27 by 72%	16..... ☐
17	Increase 28.3 by 16%	17..... ☐
18	Find 6% of 23	18..... ☐
19	Decrease 5.07 by 7%	19..... ☐
20	Increase 6.32 by 8%	20..... ☐

Minimum mark	16	13	10	7	
Circle grade	A	B	C	D	E

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4 Percentages and fractions – 2

1 The normal price of a car is £18 000. In a sale the price is reduced by 8%. What is the sale price of the car? 1 £..... ☐

2 An estate agent receives a $2\frac{1}{2}$% commission on the sale of a house. If the house sells for £64 000, how much commission will she receive? 2 £..... ☐

3 A box of Christmas cards is sold for £2.80. $\frac{3}{8}$ of the selling price is given to charity. How much is given to charity? 3 £..... ☐

4 The bill for a car repair is £28.40. The garage offers a 15% discount if the bill is paid immediately. Mr Evans pays immediately. How much does he pay? 4 £..... ☐

5 Mr Green earned £220 a week. Calculate his new wage if he receives a pay rise of:

a 3% 5a £..... ☐

b 2.5% 5b £..... ☐

c 11% 5c £..... ☐

6 In a sale the following items are reduced by 12%. Calculate the sale prices:

a Shirt, normal price £18 6a £..... ☐

b Trousers, normal price £22 6b £..... ☐

c Hat, normal price £7 6c £..... ☐

d Dress, normal price £16.50 6d £..... ☐

e Scarf, normal price £8.50 6e £..... ☐

Minimum mark	10	8	6	4	
Circle grade	A	B	C	D	E

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5 Percentages and fractions – 3

1 The price of a meal including a 15% service charge was £9.66. How much was the price of the meal before the service charge was added? 1 £ ..... ☐

2 The price of a car including 17.5% VAT was £20 445. What was the price before the VAT was added? 2 £ ..... ☐

3 A dress was reduced in price by 30% in a sale. The sale price was £18.90. What was the original price? 3 £ ..... ☐

4 A man received a wage increase of 7%. His wage after the increase was £398.04. What was his wage before the increase? 4 £ ..... ☐

5 A TV cost £493.50 including 17.5% VAT. How much was the VAT? 5 £ ..... ☐

6 A picture was sold by a dealer for £728. He made a profit of 12%. How much profit did he make? 6 £ ..... ☐

7 Mrs Walker sold a table for £100. She made a loss of $\frac{1}{5}$ by selling at this price. How much money did she lose? 7 £ ..... ☐

8 The price of a car increased by 5%. The new price of the car was £21 000. What was the price of the car before the increase? 8 £ ..... ☐

Minimum mark	7	5	4	2	
Circle grade	A	B	C	D	E

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6 Percentages and fractions – 4

1 A woman earns £30 000 per annum. She receives a 4% increase each year. What is her annual salary in three years? 1 £ ..... ☐

2 A man earns £500 per week. He receives a 6% increase each year. What is his weekly wage in three years? Give your answer to the nearest penny. 2 £ ..... ☐

3 The population of a country is rising by 3% per annum. In 1996 the population was 8 400 000. What was the population in:

a 1998? 3a ..... ☐

b 1999? Give your answer to the nearest whole number. 3b ..... ☐

4 The value of a car decreased by 8% each year. The value in 1998 was £12 000.

a What was the value in 1999? 4a £ ..... ☐

b What will be the value in 2001? Give your answer to the nearest penny. 4b £ ..... ☐

5 A man's salary increased by 2.5% per annum. In 1992 he earned £15 000. How much did he earn in 1995? Give your answer to the nearest penny. 5 £ ..... ☐

6 A man invests £6000 at 7% per annum compound interest. What is the value of his investment after three years? Give your answer to the nearest penny. 6 £ ..... ☐

Minimum mark	7	5	4	2	
Circle grade	A	B	C	D	E

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7 Using algebraic formula – 1

In each question write the value of y correct to six significant figures where appropriate, given $a = \frac{3}{5}$, $b = -\frac{5}{6}$, $c = 3.872$, $d = -2.617$.

Evaluate the following:

1 $y = 3a + 4b$ 1.....

2 $y = a(b - 3c)$ 2.....

3 $y = \frac{6a - 4b}{a - b}$ 3.....

4 $y = a\sqrt{(bd)}$ 4.....

5 $y = \frac{a + b + c}{3d + c}$ 5.....

6 $y = \sqrt{\left(\frac{a - 3b}{c^2}\right)}$ 6.....

7 $y = \sqrt{a} + \sqrt{c}$ 7.....

8 $y = \frac{a^2 + b^2}{c^2}$ 8.....

9 $y = a^3b^2$ 9.....

10 $y = c - 2b(a - b)$ 10.....

11 $y = d - 2b(c + d)$ 11.....

12 $y = d^3 - a^3$ 12.....

Minimum mark	10	8	6	4	
Circle grade	A	B	C	D	E

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10 Re-writing formulae – 2

In each question make C the subject:

1 $\sqrt{C} = A$ 1 C=.....

2 $C^2 = A$ 2 C=.....

3 $B = \sqrt{(C + A)}$ 3 C=.....

4 $A = 8C^2$ 4 C=.....

5 $\sqrt{A} = \sqrt{C}$ 5 C=.....

6 $A = D + \sqrt{C}$ 6 C=.....

7 $B = \frac{\sqrt{C}}{AD}$ 7 C=.....

8 $D = AC^2$ 8 C=.....

9 $AB = (CD)^2$ 9 C=.....

10 $A = B + C^2$ 10 C=.....

11 $A = B - C^2$ 11 C=.....

12 $BD = A\sqrt{C}$ 12 C=.....

13 $B = A(C + D)$ 13 C=.....

14 $B = C(A + D)$ 14 C=.....

15 $B = \frac{D}{C + E}$ 15 C=.....

16 $B = \frac{C + D}{E}$ 16 C=.....

Minimum mark	13	11	8	5	
Circle grade	A	B	C	D	E

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11 Equations – 1

Find the value of y in each equation:

1 $y + 13 = 7$ 1 y=..... ☐

2 $y - 8 = 3$ 2 y=..... ☐

3 $3y = -12$ 3 y=..... ☐

4 $-2y = -6$ 4 y=..... ☐

5 $-4y = 2$ 5 y=..... ☐

6 $7y - 6 = 5y - 14$ 6 y=..... ☐

7 $5y - 8 = 9y + 6$ 7 y=..... ☐

8 $\frac{y}{6} = 3$ 8 y=..... ☐

9 $\frac{y}{4} = -6$ 9 y=..... ☐

10 $\frac{3y}{2} = 12$ 10 y=..... ☐

11 $\frac{2y + 3}{4} = 5$ 11 y=..... ☐

12 $\frac{4y - 2}{5} = 8$ 12 y=..... ☐

13 $\frac{3}{y} = 12$ 13 y=..... ☐

14 $\frac{4}{y} = -8$ 14 y=..... ☐

15 $\frac{3}{2y} = 12$ 15 y=..... ☐

16 $\frac{5}{4y} = -20$ 16 y=..... ☐

Minimum mark	13	11	8	5	
Circle grade	A	B	C	D	E

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12 Equations – 2

Find the value of a, correct to three significant figures where appropriate.

1 $a^2 = 8$ 1 a=..... ☐

2 $\sqrt{a} = 3.21$ 2 a=..... ☐

3 $a^2 = 4.2$ 3 a=..... ☐

4 $8a^2 = 48$ 4 a=..... ☐

5 $4 = \frac{3}{a^2}$ 5 a=..... ☐

6 $6 = \frac{a^2}{4}$ 6 a=..... ☐

7 $28 = \sqrt{a}$ 7 a=..... ☐

8 $42 = 3 + \sqrt{a}$ 8 a=..... ☐

9 $4(a + 3) = 18$ 9 a=..... ☐

10 $3(a + 2) = 5(a - 1)$ 10 a=..... ☐

11 $6(a - 2) - 2(a + 3) = 8$ 11 a=..... ☐

12 $5(2a - 3) = 6$ 12 a=..... ☐

13 $4(a + 3) - 5(a - 1) = 2$ 13 a=..... ☐

14 $6(a + 3) = 0$ 14 a=..... ☐

15 $\frac{a + 2}{4} = 8$ 15 a=..... ☐

16 $\frac{a - 3}{5} = 10$ 16 a=..... ☐

Minimum mark	13	11	8	5	
Circle grade	A	B	C	D	E

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13 Indices (powers) – 1

Simplify:

1 $a^5 \times a^7$ 1.....

2 $c^3 \times c^4$ 2.....

3 $y^5 \times y$ 3.....

4 $y^8 \div y^2$ 4.....

5 $y^6 \div y$ 5.....

6 $(y^4)^5$ 6.....

7 $(a^3)^2$ 7.....

8 $a^6 \times a^{-4}$ 8.....

9 $a^{-3} \times a^{-2}$ 9.....

10 $a^8 \times \frac{1}{a^5}$ 10.....

11 $a^{-3} \div a^{-5}$ 11.....

12 $\frac{a^4}{a^6}$ 12.....

13 $c^3 \times c^2 \times c$ 13.....

14 $3c^2 + 5c^2$ 14.....

15 $8y^2 - 3y^2$ 15.....

16 $10a^3 - 4a^3$ 16.....

Minimum mark	13	11	8	5	
Circle grade	A	B	C	D	E

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14 Indices (powers) – 2

Simplify:

1 $6y^3 \times 2y^4$ 1.....

2 $3a^4 \times 2a$ 2.....

3 $5a^4c^2 \times 3a^3c^2d$ 3.....

4 $10a^8 \div 5a^4$ 4.....

5 $12a^6 \div 4a^4$ 5.....

6 $15a^5c^3 \div 5a^3c^2$ 6.....

7 $(3a^2)^2$ 7.....

8 $(5y^4)^2$ 8.....

9 $\frac{6y^3}{2y}$ 9.....

10 $\frac{8y^6}{4y^3}$ 10.....

11 $\frac{15y^8}{10y^{12}}$ 11.....

12 $\frac{20a^3b^2}{10ab}$ 12.....

13 $\frac{15a^4bc^3}{10ab^3}$ 13.....

14 $\frac{16xy^3z^4}{12x^4yz^2}$ 14.....

15 $(2a^2)^3$ 15.....

16 $2(a^2)^3$ 16.....

Minimum mark	13	11	8	5	
Circle grade	A	B	C	D	E

16

15 Expansion of brackets – 1

Expand the following expressions:

1 $3(2a + 5)$ 1.....

2 $5(4a - 7)$ 2.....

3 $6(a + 4)$ 3.....

4 $a(3a + 5)$ 4.....

5 $4a(5a - 3)$ 5.....

6 $2y^2(3y^3+4y)$ 6.....

7 $6c^3(3c^2 + 2c + 1)$ 7.....

8 $ab(cd + e)$ 8.....

9 $(3a + 5)4$ 9.....

10 $(2a^2 - 3a)2$ 10.....

11 $a^2b^3c^4(a^3b - abc^2)$ 11.....

12 $a^6c^3(ac^2d + ac)$ 12.....

13 $3a^2c(2a + 3c)$ 13.....

14 $5ay\ (4y^2 - 3a)$ 14.....

15 $3a^2cy^3(2ac - 3y)$ 15.....

16 $6y^3z^2(2ay - 3z^3)$ 16.....

Minimum mark	13	11	8	5	
Circle grade	A	B	C	D	E

16

16 Expansion of brackets – 2

Expand and simplify the following expressions:

1 $(a + 3)(a + 5)$ 1.....

2 $(y + 4)(y - 3)$ 2.....

3 $(c - 2)(c - 5)$ 3.....

4 $(a - 8)(a + 5)$ 4.....

5 $(2x + 5y)(3x + 6y)$ 5.....

6 $(5a - 3c)(2a - 2c)$ 6.....

7 $(3a + 4c)(2a - 3c)$ 7.....

8 $(3a - 2c) + (4a - 8c)$ 8.....

9 $(4a + 3c) - (2a + 4c)$ 9.....

10 $8c - 3(5a - 3c)$ 10.....

11 $8c - 2(4a + 2c)$ 11.....

12 $6a - 3(a - 4)$ 12.....

13 $a^2 - a(3a + y)$ 13.....

14 $(a - c)^2$ 14.....

15 $(2a - 3y)^2$ 15.....

16 $(3a + 4c)^2$ 16.....

Minimum mark	13	11	8	5	
Circle grade	A	B	C	D	E

16

17 Factorisation – 1

Factorise:

1	$6a + 3$	1.....	☐
2	$5y + 15$	2.....	☐
3	$7c - 14$	3.....	☐
4	$12x - 6$	4.....	☐
5	$8x^2 - 14x$	5.....	☐
6	$3a^2 - 6a$	6.....	☐
7	$10c^2 - 5c$	7.....	☐
8	$12c - 14d + 18e$	8.....	☐
9	$8a^4 + 7a^3 - 6a^2$	9.....	☐
10	$15c^3 - 10c^2$	10.....	☐
11	$16d^5 - 12d^3$	11.....	☐
12	$20y^8 - 16y^6 + 12y^5$	12.....	☐
13	$a^2c^3 - a^2c + a^2d$	13.....	☐
14	$6a^3bc - 12a^2b^2 + 18a^3b$	14.....	☐
15	$12abc^3 + 8a^2bd$	15.....	☐
16	$18a^3cd - 12abc^2$	16.....	☐

Minimum mark	13	11	8	5	
Circle grade	A	B	C	D	E

16

18 Factorisation – 2

Factorise:

1	$a^2 + 6a + 8$	1.....(.....)(.....)	☐
2	$a^2 + 7a + 6$	2.....(.....)(.....)	☐
3	$a^2 - 2a - 15$	3.....(.....)(.....)	☐
4	$a^2 + 9a + 14$	4.....(.....)(.....)	☐
5	$x^2 - 7x + 10$	5.....(.....)(.....)	☐
6	$x^2 + 2x - 15$	6.....(.....)(.....)	☐
7	$x^2 - 9x + 8$	7.....(.....)(.....)	☐
8	$x^2 - 3x - 40$	8.....(.....)(.....)	☐
9	$y^2 - 9y + 20$	9.....(.....)(.....)	☐
10	$y^2 + 13y + 42$	10.....(.....)(.....)	☐
11	$y^2 - y - 90$	11.....(.....)(.....)	☐
12	$a^2 - b^2$	12.....(.....)(.....)	☐

Minimum mark	10	8	6	4	
Circle grade	A	B	C	D	E

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