5.4 Standard Form: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Write 5600 in standard form.

(Total for Question 1 is 1 mark)

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2 Here are four numbers written in standard form.

3.2×10^3 5.6×10^2 2.1×10^4 9.9×10^3

Put the numbers in order of size, starting with the smallest.

(Total for Question 2 is 2 marks)

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3 Four students each write the number 84000 in standard form.

Amir writes 8.4×10^4
Ben writes 84×10^3
Chloe writes 0.84×10^5
Dev writes 8.4×10^3

Exactly one student has written the number correctly in standard form. Write down the name of that student.

(Total for Question 3 is 1 mark)

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4 This question has two parts.

(a) Write 0.00000042 in standard form. **(3)**

(b) State how many zeros appear between the decimal point and the 4 in the original number. **(2)**

(Total for Question 4 is 5 marks)

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5 In 2024 the population of the United Kingdom was 6.8×10^7.
The area of the United Kingdom is 2.4×10^5 km².

(a) Work out the population density of the United Kingdom, in people per km^2, correct to 3 significant figures. **(3)**

.....

(b) State one limitation of using this calculation to describe how crowded the United Kingdom is. **(1)**

.....

(Total for Question 5 is 4 marks)

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6 Show that $(5 \times 10^{-3}) \times (4 \times 10^6) = 2 \times 10^4$

(Total for Question 6 is 3 marks)

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7 Work out the square root of (81×10^2). Give your answer in standard form.

(Total for Question 7 is 3 marks)

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8 Work out $(3.5 \times 10^4) \times (2.2 \times 10^{-3})$. Give your answer in standard form.

(Total for Question 8 is 2 marks)

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9 $\sqrt{5.8 \times 10^9}$

(a) Work out $\sqrt{5.8 \times 10^9}$. Give your answer as an ordinary number correct to the nearest whole number. **(2)**

.....

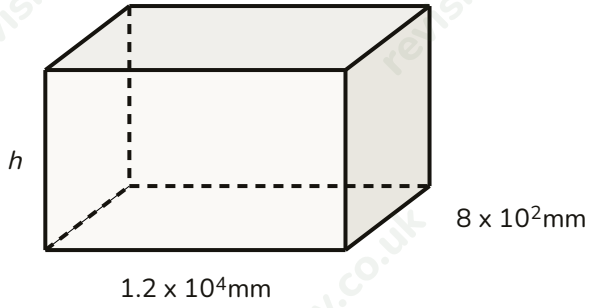
(b) Write your answer to part (a) in standard form, correct to 3 significant figures. **(2)**

(Total for Question 9 is 4 marks)

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10 A cuboid has a volume of 4.8×10^8 mm^3.
The length of the cuboid is 1.2×10^4 mm and the width of the cuboid is 8×10^2 mm.

Diagram NOT accurately drawn



(a) Work out the height of the cuboid, in mm. Give your answer in standard form. **(3)**

.....

(b) Given that 1 m = 1000 mm, work out the height of the cuboid in metres. Give your answer in standard form. **(3)**

.....

(Total for Question 10 is 6 marks)

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11 Three stars have these distances from Earth, in light-years.

Star P: 3.6×10^2 Star Q: 9×10^1 Star R: 1.4×10^3

Put the stars in order of distance from Earth, starting with the nearest. Show how you have compared the distances.

(Total for Question 11 is 2 marks)

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12 Estimate the product of 9.8×10^2 and 4.05×10^{-1} to 2 significant figures. Give your answer in standard form.

(Total for Question 12 is 2 marks)

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13 A pupil says that 0.00038 is equal to 38×10^{-5} written in standard form.
A second pupil says the first pupil is wrong, and that the correct standard form is 3.8×10^{-4}.
By writing both expressions as ordinary numbers, determine which pupil (if either) is correct, and explain any error in the incorrect statement.

(Total for Question 13 is 3 marks)

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14 The luminosity of a distant star is 3.2×10^{26} W. The luminosity of the Sun is 3.828×10^{26} W. Find the ratio star : Sun to 2 significant figures and give your answer in standard form.

(Total for Question 14 is 3 marks)

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15 Given $A = 5.12 \times 10^3$ and $B = 3.87 \times 10^2$, calculate $(A + B) / (A - B)$. Give your answer to 4 significant figures.

(Total for Question 15 is 4 marks)

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Mark scheme · 5.4 Standard Form: Test Pack

A correct answer earns full marks unless the question asks for working, a method, proof or explanation.

Question 1

5.6 x 10^3 cao **B1**

Answer: 5.6 x 10^3

Question 2

converts numbers to a comparable form, e.g. as ordinary numbers 3200, 560, 21000, 9900 oe **M1**

5.6 x 10^2, 3.2 x 10^3, 9.9 x 10^3, 2.1 x 10^4 cao, all four in correct order **A1**

Answer: 5.6 x 10^2, 3.2 x 10^3, 9.9 x 10^3, 2.1 x 10^4

Question 3

Amir **B1**

Answer: Amir (8.4 x 10^4 is correctly in standard form, since $1 \leq 8.4 < 10$, and 8.4 x 10^4 = 84000)

Question 4

(a) move decimal to give 4.2 x 10^{-7} or equivalent method **M1**

(a) 4.2 x 10^{-7} cao **A1**

(a) correct power and coefficient stated **A1**

(a) Answer: 4.2 x 10^{-7}

(b) 6 zeros cao **B1**

(b) explicit count or statement **B1**

(b) Answer: 6

Question 5

(a) sets up (6.8 x 10^7) / (2.4 x 10^5) **M1**

(a) 283.3... or 2.833... x 10^2 seen (unrounded value) **M1**

(a) awrt 283 (people per km^2) **A1**

(a) Answer: 283 people per km^2 (awrt)

(b) any valid limitation, e.g. the calculation assumes the population is spread evenly across the whole area, but in reality people are concentrated much more heavily in cities than in rural areas oe **B1**

(b) Answer: The average density does not show that people are actually spread very unevenly, with far higher density in cities than in the countryside.

Question 6

multiplies coefficients, 5 x 4 = 20 **M1**

multiplies powers of 10, 10^{-3} x 10^6 = 10^3, giving 20 x 10^3 **M1**

cso, converts 20 x 10^3 to 2 x 10^4, matching the given answer, with no incorrect working seen **A1**

Answer: 2 x 10^4 (shown)

Question 7

$\sqrt{81}$ = 9 or $\sqrt{10^2}$ = 10^1 **M1**

combines both parts **M1**

standard form cao **A1**

Answer: 9 x 10^1

Question 8

multiply coefficients and add powers: 3.5 x 2.2 and $10^{4 + -3}$ method **M1**

7.7 x 10^1 cao **A1**

Answer: 7.7 x 10^1

Question 9

(a) correct calculator method, sight of 76157.7... or awrt 76157.7 **M1**

(a) 76158 cao (nearest whole number) **A1**

(a) Answer: 76158

(b) ft, converts their part (a) answer to standard form, e.g. 7.6158 x 10^4 **M1**

(b) ft, awrt 7.62 x 10^4 **A1**

(b) Answer: 7.62 x 10^4 (awrt)

Question 10

(a) finds length x width, (1.2 x 10^4) x (8 x 10^2) = 9.6 x 10^6 **M1**

(a) dependent, divides volume by their length x width, (4.8 x 10^8) / (9.6 x 10^6) **M1**

(a) 5 x 10^1 cao (50 mm) **A1**

(a) Answer: 5 x 10^1 mm (50 mm)

(b) ft, divides their part (a) answer by 10^3, e.g. (5 x 10^1) / (1 x 10^3) **M1**

(b) dependent, subtracts powers correctly, 10^1 / 10^3 = 10^{-2} **M1**

(b) ft, 5 x 10^{-2} cao (0.05 m) **A1**

(b) Answer: 5 x 10^{-2} m (0.05 m)

Question 11

converts distances to a comparable form, e.g. as ordinary numbers 360, 90, 1400 oe **M1**

Q, P, R cao, all three in correct order (nearest first) **A1**

Answer: Star Q, Star P, Star R

Question 12

multiply the numbers: 9.8 x 4.05 x $10^{2 + -1}$ or equivalent method **M1**

4.0 x 10^2 cao (396.9 rounded to 2 s.f.) **A1**

Answer: 4.0 x 10^2

Question 13

converts 38 x 10^{-5} and/or 3.8 x 10^{-4} to an ordinary number, showing both equal 0.00038 **M1**

states the second pupil is correct **B1**

dependent on M1, explains that although 38 x 10^{-5} is numerically equal to 0.00038, it is not in standard form because 38 is not between 1 and 10, whereas 3.8 x 10^{-4} is correctly in standard form because 3.8 is between 1 and 10 **B1**

Answer: The second pupil is correct; 3.8 x 10^{-4} is the correctly written standard form of 0.00038.

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Question 14

divide 3.2×10^{26} by 3.828×10^{26} or show equivalent calculation	**M1**
evaluate ratio 3.2/3.828 = 0.8360... shown	**M1**
8.4×10^{-1} cao (0.84 to 2 s.f.)	**A1**

Answer: 8.4×10^{-1}

Question 15

convert to ordinary numbers or show sum and difference in standard form: A + B = 5120 + 387 and A - B = 5120 - 387	**M1**
evaluate sum 5507 and difference 4733 or show correct intermediate values	**M1**
5507 / 4733 = 1.163532... correct to at least 4 s.f.	**A1**
1.164 cao (answer rounded to 4 significant figures)	**A1**

Answer: 1.164

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