The World of Numbers

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. Which of these is irrational?
(a) √20 **(b)** √49 **(c)** 2/4 **(d)** 0.87

2. The decimal expansion of 4/15 is:
(a) terminating **(b)** cannot be found
(c) non-terminating non-repeating **(d)** non-terminating repeating

3. (√11 + √23)(√11 − √23) equals:
(a) 12 **(b)** √253 **(c)** 34 **(d)** −12

4. $(8 + \sqrt{10})^2$ equals:
(a) 74 + 16√10 **(b)** 74 + 8√10 **(c)** 164 + 16√10 **(d)** 74

5. Which of these is irrational?
(a) π **(b)** 0.5 **(c)** 22/7 **(d)** 3.14

6. 1/√14 with a rational denominator is:
(a) 1/14 **(b)** 14/√14 **(c)** √14 **(d)** √14/14

7. The value of 8 raised to the power 1/3 is:
(a) 3 **(b)** 2 **(c)** 4 **(d)** 8

8. Assertion (A): √48 is an irrational number.
Reason (R): The square root of a positive integer that is not a perfect square is irrational.
(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Section B — Short answer — 8 × 2 = 16 marks

9. Rationalise the denominator: 1/(6 + √10)

10. Simplify: 4√5 + 4√20

11. Write 0.616161… (61 repeating) in the form p/q.

12. Simplify: $\sqrt{20} \times \sqrt{19}$

13. Simplify: 9 to the power 2/3 × 9 to the power 1/3

14. Find the value of 125 raised to the power −1/3.

15. Write 73/80 in decimal form.

16. Rationalise the denominator: $\sqrt{13}/\sqrt{14}$

Section C — Word problems — 4 × 4 = 16 marks

17. A square plot has an area of 200 m^2. Find the length of its side in simplest surd form.

18. A rectangle is $(5 + \sqrt{5})$ cm long and $(5 - \sqrt{5})$ cm wide. Find its area.

19. The two shorter sides of a right-angled triangle are $\sqrt{3}$ cm and $\sqrt{28}$ cm. Find the longest side.

20. A wire $21\sqrt{13}$ m long is cut into 3 equal pieces. How long is each piece?

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Answer key

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Q	Answer	Working
1	**(a) $\sqrt{20}$**	20 is not a perfect square
2	**(d) non-terminating repeating**	the denominator 15 has a prime factor other than 2 and 5
3	**(d) −12**	$(\sqrt{11})^2 - (\sqrt{23})^2 = 11 - 23$
4	**(a) $74 + 16\sqrt{10}$**	$8^2 + 2 \times 8 \times \sqrt{10} + 10 = 74 + 16\sqrt{10}$
5	**(a) π**	22/7 and 3.14 are only approximations of π
6	**(d) $\sqrt{14}/14$**	multiply top and bottom by $\sqrt{14}$
7	**(b) 2**	$8 = 2^3$, so (2^3) to the $1/3 = 2^1 = 2$
8	**(a) Both A and R are true, and R is the correct explanation of A.**	A is true: 48 is not a perfect square. R is true and explains A.
9	**$(6 - \sqrt{10})/26$**	multiply by $(6 - \sqrt{10})$; denominator $6^2 - 10 = 26$
10	**$12\sqrt{5}$**	$\sqrt{20} = 2\sqrt{5}$, so $4\sqrt{5} + 8\sqrt{5} = 12\sqrt{5}$
11	**61/99**	x = 0.6161…, 100x − x = 61, x = 61/99 = 61/99
12	**$2\sqrt{95}$**	$\sqrt{380} = 2\sqrt{95}$
13	**9**	add the powers: 2/3 + 1/3 = 1; $9^1 = 9$
14	**1/5**	$125 = 5^3$; power −1/3 gives $5^{-1} = 1/5$
15	**0.9125**	80 has only 2 and 5 as prime factors, so it terminates: 73 ÷ 80 = 0.9125
16	**$\sqrt{182}/14$**	multiply by $\sqrt{14}$: $\sqrt{182}/14 = \sqrt{182}/14$
17	**$10\sqrt{2}$ m**	side = $\sqrt{200} = \sqrt{(100 \times 2)} = 10\sqrt{2}$
18	**20 cm^2**	$(5 + \sqrt{5})(5 - \sqrt{5}) = 5^2 - 5 = 20$
19	**$\sqrt{31}$ cm**	$\sqrt{(3 + 28)} = \sqrt{31} = \sqrt{31}$
20	**$7\sqrt{13}$ m**	$21\sqrt{13} \div 3 = 7\sqrt{13}$

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