4.4 Solutions

GCSE Mathematics
The Classification of Numbers

Answer 1

$10\pi + 20 = 51.42$ cm to two decimal places

[3 marks]

Answer 2

$\frac{25}{8}$

[2 marks]

Answer 3

$\frac{7}{5}$

[2 marks]

Answer 4

(i) $\mathbb{P}$ irrational **(ii)** $\mathbb{Q}$ rational **(iii)** $\mathbb{P}$ irrational
(iv) $\mathbb{Q}$ rational **(v)** $\mathbb{P}$ irrational **(vi)** $\mathbb{Q}$ rational

[6 marks]

Answer 5

(i) 11 cm **(ii)** $\mathbb{Q}$ rational

[2, 1 marks]

Answer 6

$\frac{7\sqrt{12}}{2\sqrt{3}} = \frac{7\sqrt{4 \times 3}}{2\sqrt{3}} = \frac{7 \times 2\sqrt{3}}{2\sqrt{3}} = \frac{7}{1}$ which is rational

[3 marks]

Answer 7

(i) 314 cm^2 **(ii)** 714 cm^2 **(iii)** 871 cm^2

[2, 2, 2 marks]

Answer 8

(a) 13 $\mathbb{Q}$ rational
(b) $\sqrt{61}$ $\mathbb{P}$ irrational
(c) 3 $\mathbb{Q}$ rational
(d) $\frac{5}{7}$ $\mathbb{Q}$ rational

[8 marks]

Answer 9

(a) One of $\sqrt{3} \times \sqrt{12} = \frac{6}{1}$ or $\sqrt{8} \times \sqrt{50} = \frac{20}{1}$

[2 marks]

(b) One of $\frac{\sqrt{12}}{\sqrt{3}} = \frac{2}{1}$ or $\frac{\sqrt{50}}{\sqrt{8}} = \frac{5}{2}$

[2 marks]

Answer 10

$\sqrt{4\frac{1}{4}} = \frac{\sqrt{17}}{\sqrt{4}} = \frac{\sqrt{17}}{2}$ $\mathbb{P}$ irrational

$\sqrt{6\frac{1}{4}} = \sqrt{\frac{25}{4}} = \frac{5}{2}$ $\mathbb{Q}$ rational

$\frac{1}{3} + \sqrt{3}$ $\mathbb{P}$ irrational

$\left(\frac{1}{3}\sqrt{3}\right)^2 = \frac{1}{3}\sqrt{3} \times \frac{1}{3}\sqrt{3} = \frac{1}{3}$ $\mathbb{Q}$ rational

[5 marks]

Answer 11

Specific examples are expected, but here are the generalised requirements.

(i) Any number, n, where $-1 < n < 1$, is made less by being squared.

(ii) For any two numbers, m and n, where $m < 0$ and $n > |m|$

have the property that $n > m$ and $n^2 > m^2$

(iii) Any two irrational numbers, m and n of the form $\sqrt{a\,b^{2d}}$ and $\sqrt{a\,c^{2e}}$ have the property that

$$\sqrt{a\,b^{2d}} \times \sqrt{a\,c^{2e}} = a \times b^d \times c^e$$

which is rational, where a, b, c, d and e are positive integers.

[6 marks]

Answer 12

(i)	$\mathbb{P}$ irrational	**(ii)**	$\mathbb{Q}$ rational	**(iii)**	$\mathbb{P}$ irrational
(iv)	$\mathbb{P}$ irrational	**(v)**	$\mathbb{Q}$ rational	**(vi)**	$\mathbb{P}$ irrational

[6 marks]

Answer 13

(i)	2	$\mathbb{Q}$ rational
(ii)	$2\sqrt{2}$	$\mathbb{P}$ irrational
(iii)	$3 + \sqrt{2}$	$\mathbb{P}$ irrational
(iv)	$2 + \sqrt{2}$	$\mathbb{P}$ irrational
(v)	$3 + 2\sqrt{2}$	$\mathbb{P}$ irrational
(vi)	-1	$\mathbb{Q}$ rational

[6 marks]