

Chapter 6

GCSE Mathematics The Classification of Numbers

6.1 Test

Do NOT use a calculator

Marks Available : 50

Question 1

$$\sqrt{8} = 2.828427125 \dots$$

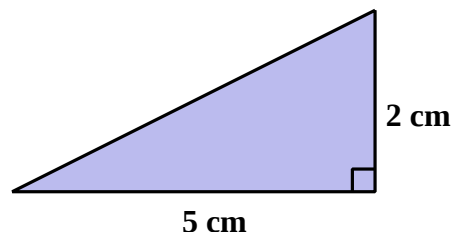
List all of the integers, n , which satisfy

$$-\sqrt{8} < n < \sqrt{8}$$

[2 marks]

Question 2

Calculate the **exact** length of this triangle's hypotenuse.



[3 marks]

Question 3

- (i) Leaving your answer written in terms of π , calculate the **exact** area of a circle which has a radius of 3 cm.

[3 marks]

- (ii) Give your part (i) answer as a decimal accurate to one decimal place.
Use $\pi = 3.14$ in your calculation.

[1 mark]

Question 4

A helpful table of squares:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	4	9	16	25	36	49	64	81	100	121	144	169	196	225	256	289	324	361	400

By using the helpful table of squares, or otherwise, determine whether each of the following numbers is **Rational**, $\mathbb{Q}$, **Irrational**, $\mathbb{P}$.

(i) $\sqrt{225}$

(ii) $\sqrt{281}$

(iii) $\sqrt{12^2 + 1^2 + 12^2}$

[3 marks]

Question 5

Show that each of the following is rational by writing them in the form

$$\frac{p}{q}$$

where p and q are integers, $q \neq 0$.

(i) $\left(\frac{7}{8}\right)^2$

[1 mark]

(ii) $\sqrt{\frac{324}{361}}$

[1 mark]

(iii) $\left(6 + \frac{1}{4}\right)^{0.5}$

[2 marks]

Question 6

$$\sqrt{6} = 2.449489743 \dots$$

$$\sqrt{7} = 2.645751311 \dots$$

Write down a rational number that lies between $\sqrt{6}$ and $\sqrt{7}$

[2 marks]

Question 7

For each expression state if it is **Rational**, $\mathbb{Q}$, or **Irrational**, $\mathbb{P}$.

Show working where necessary.

(i) $(\sqrt{\pi})^2$

(ii) $\frac{7\pi}{3\pi}$

(iii) $1^{\sqrt{2}}$

(iv) $(\sqrt{\pi})^0$

(v) $3^{0.5}$

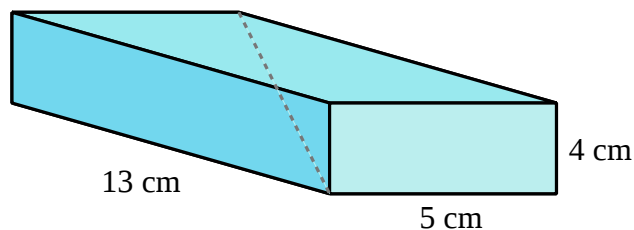
(vi) $(\sqrt{3} + 1)^2$

[6 marks]

Question 8

In a cuboid with sides of lengths a , b and c , the longest diagonal in the box, d , is given by a three dimensional version of Pythagoras' Theorem.

$$d^2 = a^2 + b^2 + c^2$$



- (i) Work out the length of the longest diagonal of a cuboid that measures 13 cm by 5 cm by 4 cm

[2 marks]

- (ii) Is your part (i) answer a rational number, $\mathbb{Q}$, or an irrational number, $\mathbb{P}$?

[1 mark]

Question 9

Show that 0.875 can be written in the form $\frac{p}{q}$ for $p, q \in \mathbb{Z}$ and $q \neq 0$.

Simplify your answer if it is possible to do so.

[3 marks]

Question 10

Viola says that as $\pi = 3.14$, which terminates, π must be a rational number.

Explain her error.

[2 marks]

Question 11

List the integers, if any, which satisfy

$$32 \leq 5n + 17 < 52$$

[3 marks]

Question 12

Consider the number, $0.\dot{1}\ddot{8}$

That is, 0.181 818 181 818 181 818

Show how this number can be rewritten in the form $\frac{p}{q}$ for integer p and q with $q \neq 0$.

Simplify your answer if it is possible to do so.

[3 marks]

Question 13

Show that each of the following is rational by writing them in the form

$\frac{p}{q}$ where p and q are integers and $q \neq 0$.

(i) $\left(\frac{1}{2} + \frac{1}{4}\right)^2$

(ii) $\sqrt{\frac{2}{5} + \frac{6}{25}}$

[4 marks]

Question 14

Use the theorem of Pythagoras to show that a right angled triangle with shorter sides of lengths $\frac{12}{5}$ cm and $\frac{16}{5}$ cm has a hypotenuse of integer length.

[3 marks]

Question 15

Consider the number

$$0.208\dot{3}$$

Let $x = 0.2083333333333333.....$

(i) Work out the value of $10\,000\,x$

[1 mark]

(ii) Work out the value of $1\,000\,x$

[1 mark]

(iii) By subtracting answer (b) from answer (a) work out $9\,000\,x$

[1 mark]

(iv) Hence write $0.208\dot{3}$ in the form of a rational number.

That is, in the form $\frac{p}{q}$ for integer p and q with $q \neq 0$

Simplify your answer if it is possible to do so.

[2 marks]