

Number of Students: 19

Time: 1 ½ hours

## ANSWER ALL QUESTIONS

## Question One

Express the following as a single fraction in its simplest form:

$$\frac{6y}{x(x+4y)} - \frac{3}{2x}$$

(03-I-1a)

## Question Two

Solve, without using a calculator, the following simultaneous equations:

$$x + 2y + 4z = 7$$

$$x + 3y + 2z = 1$$

$$-y + 3z = 8.$$

(02-I-2a)

## Question Three

Solve the simultaneous equations

$$x - y = 0$$

$$(x + 2)^2 + y^2 = 10.$$

(01-I-2a)

## Question Four

Solve for  $x$ 

$$|3x + 5| < 4.$$

(01-I-2bi)

## Question Five

Solve for  $x$ :

$$x = \sqrt{7x - 6} + 2.$$

(03-I-5a)

## Question Six

Find the range of values of  $x \in \mathbf{R}$  for which

$$x^2 + x - 20 \leq 0.$$

(02-I-2bi)

## Question Seven

$$f(x) = ax^2 + bx + c \quad \text{where } a, b, c \in \mathbf{R}.$$

Given that  $k$  is a real number such that  $f(k) = 0$ , prove that  $x - k$  is a factor of  $f(x)$ .

(03-I-1bi)

## Question Eight

$\alpha$  and  $\beta$  are real numbers such that  $\alpha + \beta = -7$  and  $\alpha\beta = 11$ .

- (i) Show that  $\alpha^2 + \beta^2 = 27$ .
- (ii) Find a quadratic equation with roots  $\frac{\alpha}{\beta}$  and  $\frac{\beta}{\alpha}$  and write your answer in the form  $px^2 + qx + r = 0$  where  $p, q, r \in \mathbf{Z}$ .

(02-I-2c)

## Question Nine

The cubic equation  $4x^3 + 10x^2 - 7x - 3 = 0$  has one integer root and two irrational roots. Express the irrational roots in simplest surd form.

(05-I-2b)

## Question Ten

Find the value of  $x$  in each case:

- (i)  $\frac{8}{2^x} = 32$
- (ii)  $\log_9 x = \frac{3}{2}$ .

(02-I-5a)

Happy Christmas!

