

YEAR 11 TEST	Arithmetic and Algebra
Name	Result
DIRECTIONS <ul style="list-style-type: none"> • Use blue or black pen only. • Full working should be shown to ensure maximum marks. 	
1.	Express 0.46 as a simple fraction.
2.	Express $\frac{\sqrt{3}}{2\sqrt{7}-\sqrt{3}}$ in the form $a+\sqrt{b}$ where a and b are rational numbers.
3.	Evaluate $\sqrt[6]{\frac{4.3^{1.3}-2.9}{0.4-5.24 \times 10^{-3}}}$ and express your answer in scientific notation correct to 3 significant figures.
4.	Express $\frac{x\sqrt{x^{-3}}}{\sqrt[7]{x^4}}$ in simplest form, without negative or fractional indices.

5. Simplify :

(a). $\frac{y^3 - x^3}{x^2 - y^2}$

(b). $\frac{2}{3y-2} - \frac{5}{y+4}$

(b). $\frac{x^2 - 5x + 6}{x^2 - 9} \div \frac{3x^2 - 4x - 4}{x^2 + 3x}$

6. Solve : .

(a). $5x(x+2) = 3x-2$

(b). $|2x-5| = 3x-4$

7. Solve by completing the square : $6x^2 - 10x + 3 = 0$. Express your answer in simplest exact form.

8. Expand and simplify : $(3x - 2y^2)^3$.

9. Solve simultaneously :
$$\begin{cases} 2x - \frac{y}{4} = 5 \\ x + \frac{3y}{4} = -1 \end{cases}$$

10. Solve and sketch your solution on the number line :

(a). $|8y-9| < 7$

(b). $\frac{x}{x+1} \leq 5$

YEAR 11 TEST Arithmetic and Algebra

Name _____ Result $\frac{41\frac{1}{2}}{42} = 99\%$

DIRECTIONS • Use blue or black pen only.
• Full working should be shown to ensure maximum marks.

1. Express 0.46 as a simple fraction.

$$x = 0.4666 \dots$$

$$10x = 4.6666 \dots$$

$$9x = 4.2$$

$$x = \frac{42}{90}$$

$$= \frac{7}{15}$$

2. Express $\frac{\sqrt{3}}{2\sqrt{7}-\sqrt{3}}$ in the form $a+\sqrt{b}$ where a and b are rational numbers.

$$\frac{\sqrt{3}}{2\sqrt{7}-\sqrt{3}} \times \frac{2\sqrt{7}+\sqrt{3}}{2\sqrt{7}+\sqrt{3}} = \frac{2\sqrt{21}+3}{4(7)-43}$$

$$\therefore a = \frac{3}{25}$$

$$b = \frac{84}{625}$$

$$= \frac{3}{25} + \sqrt{\frac{84}{625}}$$

3. Evaluate $\sqrt{\frac{4.3^{13}-2.9}{0.4-5.24 \times 10^{-3}}}$ and express your answer in scientific notation correct to 3 significant figures.

$$1.46 \times 10^0$$

(3 sig figs)

4. Express $\frac{x\sqrt{x^{-3}}}{\sqrt{x^4}}$ in simplest form, without negative or fractional indices.

$$\frac{x \times (x)^{-\frac{3}{2}}}{(x)^{\frac{4}{2}}}$$

$$= \frac{x^{-\frac{1}{2}}}{x^2}$$

$$= x^{-\frac{5}{2}}$$

$$= \frac{1}{x^{\frac{5}{2}}}$$

Well done!

5. Simplify:

(a) $\frac{y^3-x^3}{x^2-y^2} = \frac{(y-x)(y^2+xy+x^2)}{(x+y)(x-y)}$

$$= \frac{(x+y)(x-y)}{(x+y)(x-y)} = \frac{y^2+xy+x^2}{x+y}$$

(b) $\frac{2}{3y-2} - \frac{5}{y+4} = \frac{2(y+4) - 5(3y-2)}{(3y-2)(y+4)}$

$$= \frac{2y+8-15y+10}{(3y-2)(y+4)} = \frac{18-13y}{(3y-2)(y+4)}$$

(b) $\frac{x^2-5x+6}{x^2-9} \div \frac{3x^2-4x-4}{x^2+3x} = \frac{(x-3)(x-2)}{(x+3)(x-3)} \times \frac{x(x+3)}{(3x+2)(x-2)}$

$$= \frac{x}{3x+2}$$

6. Solve:

(a) $5x(x+2) = 3x-2$

$$5x^2 + 10x - 3x + 2 = 0$$

$$5x^2 + 7x + 2 = 0$$

$$5x^2 + 5x + 2x + 2 = 0$$

$$5x(x+1) + 2(x+1) = 0$$

$$(5x+2)(x+1) = 0$$

$$\therefore x = -\frac{2}{5} \text{ or } -1$$

(b) $|2x-5| = 3x-4$

$$2x-5 = 3x-4 \quad \text{or} \quad 2x-5 = -3x+4$$

$$-x = 1 \quad \text{or} \quad 5x = 9$$

$$x = -1 \quad \text{or} \quad x = \frac{9}{5}$$

Check:

$$|2(\frac{9}{5}) - 5| = 3(\frac{9}{5}) - 4$$

$$|1 - \frac{13}{5}| = 1\frac{2}{5}$$

$$1 - 2 - 5 = -3 - 4$$

$$-2 = -7x$$

$$x = \frac{9}{5} \text{ is only soln.}$$

$\therefore x = -1$ is not a soln.

7. Solve by completing the square: $6x^2 - 10x + 3 = 0$. Express your answer in simplest exact form.

$$6x^2 - 10x = -3$$
~~$$6x^2 - 10x + 25 = -3 + 25$$~~

$$x^2 - \frac{10}{6}x = -\frac{1}{2}$$

$$x^2 - \frac{10}{6}x + \frac{25}{36} = -\frac{1}{2} + \frac{25}{36}$$

$$\left(x - \frac{5}{6}\right)^2 = \frac{7}{36}$$

$$x - \frac{5}{6} = \pm \sqrt{\frac{7}{36}}$$

$$\therefore x = \frac{5 \pm \sqrt{7}}{6} \quad \checkmark \checkmark \checkmark$$

8. Expand and simplify: $(3x - 2y^2)^3$.

~~$$(3x - 2y^2)(9x^2 - 12xy^2 + 4y^4)$$~~

$$= 27x^3 - 3(3x)^2(2y^2) + 3(3x)(2y^2)^2 - 8y^6$$

$$= 27x^3 - 54x^2y^2 + 36xy^4 - 8y^6 \quad \checkmark \checkmark$$

9. Solve simultaneously:

$$\begin{cases} 2x - \frac{y}{4} = 5 & (1) \\ x + \frac{3y}{4} = -1 & (2) \end{cases}$$

$$8x - y = 20 \quad (1)$$

$$x = -1 - \frac{3y}{4} \quad (2)$$

sub (2) in (1)

$$8\left(-1 - \frac{3y}{4}\right) - y = 20$$

$$-8 - 6y - y = 20$$

$$-7y = 28$$

$$y = -4$$

sub y in (2)

$$x = -1 - \frac{3(-4)}{4}$$

$$x = -1 + 3 = 2$$

$\therefore x = 2$ $\checkmark \checkmark \checkmark$ (8) Great!

10. Solve and sketch your solution on the number line:

(a) $|8y - 9| < 7$

$$-7 < 8y - 9 < 7$$

$$2 < 8y < 16$$

$$\frac{1}{4} < y < 2 \quad \checkmark \checkmark$$

(b) $\frac{x}{x+1} \leq 5$ NB: $x \neq -1$

$$x(x+1) \leq 5(x+1)^2$$

$$(x+1)(x - 5(x+1)) \leq 0$$

$$(x+1)(x - 5x - 5) \leq 0$$

$$(x+1)(-5-4x) \leq 0 \quad \checkmark \checkmark$$

graph: $(x+1)(-5-4x) = y$
 $y = 0, x = -1, x = -\frac{5}{4}$

$\therefore x > -1$ or $x \leq -\frac{5}{4}$
 but $x \neq -1$
 $\therefore x > -1$ or $x \leq -\frac{5}{4}$ $\checkmark \checkmark$

Great! (8)