

YEAR 11 TEST

Arithmetic and Algebra

Name _____

Result _____

DIRECTIONS

- 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 $\frac{x\sqrt{x^{-3}}}{\sqrt[2]{x^4}}$ in simplest form, without negative or fractional indices.

5.	<p>Simplify :</p> <p>(a). $\frac{y^3 - x^3}{x^2 - y^2}$</p>
	<p>(b). $\frac{2}{3y-2} - \frac{5}{y+4}$</p>
	<p>(b). $\frac{x^2 - 5x + 6}{x^2 - 9} \div \frac{3x^2 - 4x - 4}{x^2 + 3x}$</p>
6.	<p>Solve :</p> <p>(a). $5x(x+2) = 3x - 2$</p> <p>(b). $2x - 5 = 3x - 4$</p>

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

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Arithmetic and Algebra

Name _____

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

DIRECTIONS

- Use blue or black pen only.
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1. Express 0.46 as a simple fraction.

$$x = 0.4666 \dots$$

$$10x = 4.6666 \dots$$

$$9x = 4.2$$

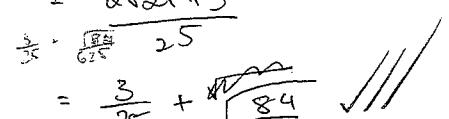
$$x = \frac{42}{90} = \frac{7}{15}$$



- 2.

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

$$\begin{aligned} \frac{\sqrt{3}}{2\sqrt{7}-\sqrt{3}} \times \frac{2\sqrt{7}+\sqrt{3}}{2\sqrt{7}+\sqrt{3}} &= \frac{2\sqrt{21}+3}{4(7)-3} \quad \therefore a = \frac{3}{25} \\ &= \frac{2\sqrt{21}+3}{25} \quad b = \frac{84}{625} \\ &= \frac{3}{25} + \frac{\sqrt{84}}{625} \end{aligned}$$



- 3.

- Evaluate $\sqrt{\frac{4.3^{1.3}-2.9}{0.4-5.24 \times 10^{-3}}}$ and express your answer in scientific notation correct to 3 significant figures.

$$1.46 \times 10^9$$

(3 sig figs)



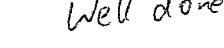
- 4.

- Express $\frac{x\sqrt{x^{-3}}}{\sqrt[7]{x^4}}$ in simplest form, without negative or fractional indices.

$$\begin{aligned} \frac{x(x^{-\frac{3}{2}})}{(x)^{\frac{4}{7}}} &= \frac{x^{-\frac{1}{2}}}{x^{\frac{4}{7}}} \\ &= x^{-\frac{15}{14}} \\ &= 1 \end{aligned}$$



Well done!



- 5.

Simplify:

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

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

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

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

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

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

6. Solve:

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

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

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

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

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

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

$$2x-5 = 3x-4$$

$$-x = 1$$

$$x = -1$$

Check:

$$|2x-5| = 3x-4$$

$$|-2-5| = -3-4$$

$$7 = -7$$

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

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

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

$$\text{or } -1$$

$$2x-5 = -3x+4$$

$$5x = 9$$

$$x = \frac{9}{5}$$

$$14\frac{1}{2}$$

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

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

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

7.	Solve by completing the square : $6x^2 - 10x + 3 = 0$. Express your answer in simplest exact form.
	$6x^2 - 10x = -3$ $\frac{1}{6}x^2 - \frac{5}{3}x = -\frac{1}{2}$ $x^2 - \frac{10}{6}x + \frac{25}{36} = -\frac{1}{2} + \frac{25}{36}$ $(x - \frac{5}{6})^2 = \frac{7}{36}$ $x - \frac{5}{6} = \pm \sqrt{\frac{7}{36}}$ $\therefore x = \frac{5 \pm \sqrt{7}}{6}$
8.	Expand and simplify : $(3x - 2y^2)^3$.
	$(3x - 2y^2)(9x^2 + 6xy^2 + 4y^4)$ $= 27x^3 - (3)(3x)^2(2y^2) + (3)(3x)(2y^2)^2 - 8y^6$ $= 27x^3 - 54x^2y^2 + 36xy^4 - 8y^6$ $\therefore y^2(27x^3 - 54x^2y^2 + 36xy^4 - 8y^6)$
9.	<p>Solve simultaneously :</p> $\begin{cases} 2x - \frac{y}{4} = 5 & (1) \\ x + \frac{3y}{4} = -1 & (2) \end{cases}$ <p>sub (2) in (1)</p> $2(-1 - \frac{3y}{4}) - y = 20$ $-8 - 6y - y = 20$ $-7y = 28$ $y = -4$ <p>sub y in (2)</p> $x = -1 - \frac{3(-4)}{4}$ $x = -1 + 3$ $\therefore x = 2$ <p>Good!</p>

10.	Solve and sketch your solution on the number line :
	(a). $ 8y - 9 < 7$
	$8y - 9 < 7$ $-7 < 8y - 9 < 7$ $2 < 8y < 16$ $\frac{1}{4} < y < 2$
	(b). $\frac{x}{x+1} \leq 5$ NB: $x \neq -1$ $x(x+1) \leq 5(x+1)^2$ $(x+1)(x-5(x+1)) \leq 0$ $(x+1)(x-5x-5) \leq 0$ $(x+1)(-5-4x) \leq 0$
	graph : $(x+1)(-5-4x) = 0$ $y=0, x = -1, -\frac{5}{4}$
	$\therefore x > -1 \text{ or } x \leq -\frac{5}{4}$ <p>but $x \neq -1$</p> $\therefore x > -1 \text{ or } x \leq -\frac{5}{4}$