Perth Academy **National 5 Relationships** **Homework 1**

1. (a) A straight line passes through the points $(1,4)$ and $(4,13)$. Find the gradient of the line.

   (b) A straight line passes through the points $(0,6)$ and $(3,0)$. Find the gradient of the line.

2. Draw accurate graphs of the following straight lines.

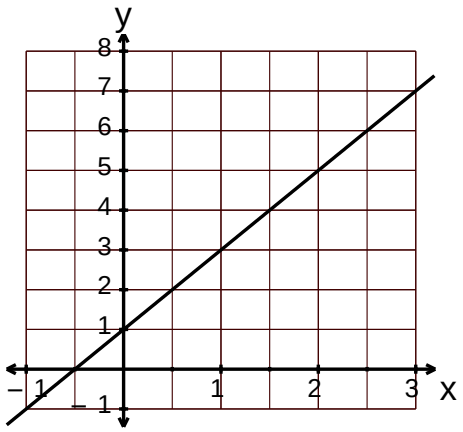
   (a) $y=2x+3$ (b) $y=3x-1$ (c) $y=-2$

3. Write down the gradient and the y-intercept of each of the following straight lines.

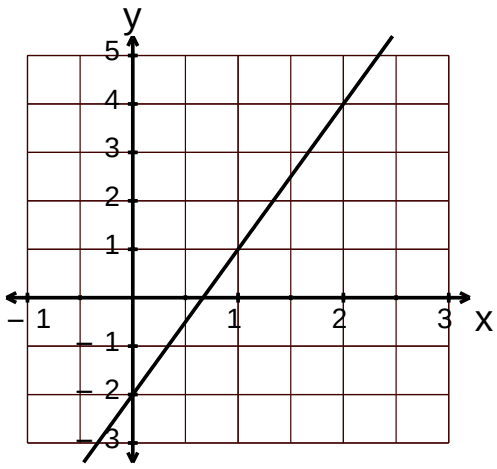
   (a) $y=5x+3$ (b) $y=-2x+1$ (c) $y=\frac{1}{2}x-4$

4. Find the equation of each of these straight lines.

   (a)



   (b)



5. Factorise

   (a) $x^2-2x-15$ (b) $10x-2x^2$ (c) $3x^2-4x+1$

6. Expand and simplify

   (a) $(3a+2b)(a-3b)$ (b) $(x-1)(x^2-2x-2)$ (c) $(x-3)^2-(x-1)^2$

7. Evaluate, without a calculator,

   (a) 2^6 (b) 3^{-2} (c) $25^{\frac{1}{2}}$

8. Simplify

   (a) $a^4\times a^7$ (b) $a^5\div a^{-3}$ (c) $\frac{a^3\times a^2}{a^{-1}}$

   (d) $(a^3)^4$ (e) $(\sqrt{x})^4$ (f) $(a^{-3})^2$

9. The following number patterns can be used to sum consecutive square numbers:

$$1^2+2^2=\frac{2\times3\times5}{6};\qquad 1^2+2^2+3^2=\frac{3\times4\times7}{6};\qquad 1^2+2^2+3^2+4^2=\frac{4\times5\times9}{6}.$$

(a) Express $1^2+2^2+3^2+4^2+\cdots\cdots+10^2$ in the same way.

(b) Express $1^2+2^2+3^2+4^2+\cdots\cdots+n^2$ in the same way.

10. Brackets can be multiplied out in the following way:

$$(y+1)(y+2)(y+3)=y^3+(1+2+3)y^2+(1\times2+1\times3+2\times3)y+1\times2\times3$$
$$(y+2)(y+3)(y+4)=y^3+(2+3+4)y^2+(2\times3+2\times4+3\times4)y+2\times3\times4$$
$$(y+3)(y+4)(y+5)=y^3+(3+4+5)y^2+(3\times4+3\times5+4\times5)y+3\times4\times5$$

(a) In the same way, multiply out $(y+4)(y+5)(y+6)$.

(b) In the same way, multiply out $(y+a)(y+b)(y+c)$.

11. Express each of the following as a single fraction in its simplest form.

(a) $\frac{3}{a}+\frac{1}{3a}$ (b) $\frac{6}{x}-\frac{5}{x^2}$ (c) $\frac{5}{2x}-\frac{3}{2x^2+4x}$

12. Given that $\frac{1}{2}+\frac{1}{3}+\frac{1}{12}+\frac{1}{18}+\frac{1}{x}=1$, find the value of x.

13. How many positive square numbers are factors of 1600?

14. Factorise $4y^2-9$ and hence simplify $\frac{8y-12}{4y^2-9}$, $y\neq\pm\frac{3}{2}$.