Loughborough University

Week 2: Algebra Basics 2, Formulae and Functions

Try these exercises now, do not use a calculator, and try to solve the exercises without help

1. Simplify, if possible, (a) $\frac{abc}{3ac}$ (b) $\frac{3ab}{a+b}$
2. Simplify, if possible, $\frac{x^2+2x-15}{2x^2-5x-3}$
3. Transpose $v = \sqrt{x+2y}$, (a) for x, (b) for y.
4. The surface area of a sphere is given by the formula $SA = 4\pi r^2$. If the sphere has a surface area of 20 cm^2, what is the radius of the sphere?
5. The volume of a cone is given by $V = \frac{1}{3}\pi r^2 h$.
   (a) Calculate the volume of a cone with radius 4cm and height 5cm.
   (b) Rearrange the formula to make h the subject.
   (c) Rearrange to make r the subject.
   (d) What height is a cone whose radius is 2.4 cm and whose volume is 37 cm^3.
6. Given two functions $g(t) = 3t + 2$ and $h(t) = t + 3$ obtain an expression for (a) the composition $g(h(t))$, and (b) the composition $h(g(t))$, and (c) $g(g(t))$.
7. State the vertical intercept and the gradient of each of the following lines:
   (a) $y = 3x + 3$
   (b) $y = 2x - 3$
   (c) $y = 4$
   (d) $y = 1 - x$
   (e) $y = -5x$
8. Sketch the lines from question 7. Which has the steepest gradient? Where do lines a. and c. intersect?
9. Which of these are straight lines?
   (a) $2x + 3y = 4$
   (b) $y = 3x^2 + 5$
   (c) $4xy + 2 = 5$
   (d) $x = 3$
   (e) $x + y = 1.2$
   (f) $x^2 - y^2 = 2$
10. What is the gradient of the straight line through (1,2) and (3,5)?
11. What is the equation of the straight line in question 10?
12. What is the distance between the points in question 10?