An understanding of certain mathematical concepts is necessary for you to succeed in MATH1050. The following 23 problems cover some of the mathematical concepts that we believe are required background knowledge for MATH1050. The purpose of giving you this diagnostic quiz is for you to be able to identify any areas in which your mathematical knowledge is weak, so that you can revise those areas and hence be better prepared for MATH1050.

This diagnostic quiz is for your own information. It does not count towards your final grade in this course and you do not have to tell anyone else how you do.

You should attempt each of the 23 questions, without the help of a calculator, and check your answers against the solutions provided. There are several questions on each of the key concepts. If, after attempting these questions, you feel that a particular topic needs revision, then we suggest that you read through the revision material for that topic. The revision material is provided on the MATH1050 course web page.

**Fractions**

1. Write the following as a single fraction. $\dfrac{3a}{4} + \dfrac{b}{3}$

2. Expand and simplify the following expression. $\dfrac{8ab}{c} \div \left(\dfrac{18ab}{c}\right)$

**Manipulating equations**

3. Solve the following equation. $24 - 2x = \dfrac{x}{2} + 4$

4. Given that $b = \dfrac{1}{x-3}$, write $x$ in terms of $b$.

**Powers**

5. Simplify the following (assuming that $x > 0$). $\sqrt{\dfrac{x^4 \times x^5}{x^3}}$

6. Evaluate each of the following.

   (a) $5^0$

   (b) $2^{-2}$

   (c) $8^{2/3}$

   (d) $\dfrac{\sqrt{12}}{\sqrt{3}}$

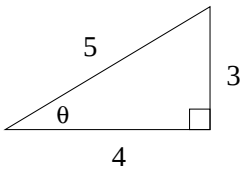
   (e) $\sqrt{-9}$

7. Simplify the following expression. $\dfrac{(x^{1/2} \times y)^3}{y^{-3} \times \sqrt{x}}$

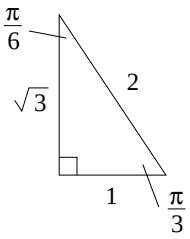
**Trigonometry**

8. Write $60°$ in radians.

9. Given the right-angled triangle below, determine the values of $\sin\theta$, $\cos\theta$ and $\tan\theta$.



10. Use the triangle below to determine $\cos\frac{5\pi}{6}$.




**Factorisation and Solving Quadratic Equations**

11. Factorise $x^2 - x$ and hence solve $x^2 - x = 0$.

12. Factorise $x^2 + 11x + 28$ and hence solve $x^2 + 11x + 28 = 0$

13. Factorise $9x^2 - 64$ and hence solve $9x^2 - 64 = 0$.

14. The quadratic formula says that the equation

$$ax^2 + bx + c = 0 \quad \text{has solutions} \quad x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

Use the quadratic formula to solve the following equation. $2x^2 - 2x - 5 = 0$

**Solving Inequalities**

15. Solve the following inequality. $3x + 2 \leq 6 - x$

16. Solve the following inequality. $|3 - 2x| \geq 5$

**Sigma Notation**

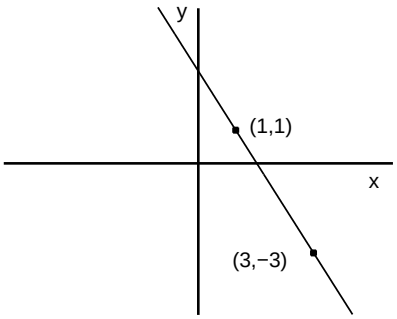
17. Write the following sum in sigma notation. $7 + 9 + 11 + 13 + 15$

18. Write the following sum in expanded form. $\displaystyle\sum_{i=1}^{4}(i^2 + 1)$

**Graphing Lines and Parabolas**

19. Sketch the line $y = 4x - 7$.

20. Determine the equation of the line shown below.




21. Sketch the parabola $y = 2x^2 - 4x + 7$.

**Differentiation**

22. Let $y = 3x^3 - 4x^2 + 2$. Determine $\dfrac{dy}{dx}$.

23. Let $y = x^{-3} + 3x^2 + \sqrt{x}$. Determine $\dfrac{dy}{dx}$.