**Important Note:** Calculators are not permitted when writing the Math Placement Test. In order to fully benefit from these practice problems, you should solve them without the aid of a calculator.

**Introduction to Algebra**

**Topics** Real number system; order of operations; equations; inequalities; applications.

1. Translate the words into symbols: The number \( y \) is 6 less than twice \( x \).

2. True or false: \((a - b) - c = a - (b - c)\)

3. You pay $29.95 for a sweater at a 20% off sale. What was the regular price?

**Polynomials**

**Topics** Adding, subtracting, multiplying and dividing polynomials; factoring.

4. Simplify: \(5(2x - y + 3) - (4 - (x - y))\)

5. Simplify: \((-2u^3v)^3(-v^2w^4)^5\)

6. Expand and simplify: \((5x + 4)(3x^2 + 2x + 1)\)

7. Perform the polynomial division: \((7 + x - 3x^3) ÷ (2x + 1)\) and give the quotient and the remainder.

8. Factor each of the following completely:
   (a) \(3y - 48y^3\)
   (b) \(3x^2 + 4x + 1\)
   (c) \(5y^4 - 18y^2 - 8\)

**Rational Expressions**

**Topics** Multiplying, dividing, adding, subtracting and simplifying rational expressions.

9. Express in reduced form:
   (a) \(\frac{3x^2 + 2x - 1}{x^2 - 4x - 5}\)
   (b) \(\frac{x^2 + 2x + 1}{x^2 - 2x + 1} \cdot \frac{x^2 - 1}{x^2 + 1}\)
   (c) \(\frac{x^2 - x - 20}{x^2 + 7x + 12} ÷ \frac{x^2 - 10x + 25}{x^2 + 6x + 9}\)
10. Perform the operations and simplify:

(a) \( \frac{x}{x-1} + \frac{1}{1-x} \)  
(b) \( 3\left(\frac{x+1}{x+2}\right) + \frac{1}{3}\left(\frac{x}{xy+2y}\right) \)

(c) \( \frac{x}{x^2+5x+6} - \frac{2}{x^2+3x+2} \)

11. Express in reduced form:

(a) \( \frac{1}{x+2} \)  
(b) \( \frac{2 + \frac{1}{x}}{\left(x+1\right)^2 - \frac{1}{x^2}} \)

**Radicals and Rational Exponents**

**Topics**

Expressing and simplifying roots in radical and rational exponent notation; rationalizing numerators and denominators; simplifying negative exponent forms.

12. Evaluate:  
(a) \( \sqrt{(-7)^2} \)  
(b) \( \frac{1}{3}\sqrt{-0.125} \)

13. Simplify: \( \frac{1}{\sqrt[3]{8x^3y^4}} \)

14. Expand and simplify: \( \left(\sqrt{x} + \sqrt{y}\right)^2 \)

15. Rationalize the denominator:  
(a) \( \frac{5}{2\sqrt{7}} \)  
(b) \( \frac{\sqrt{a} + \sqrt{3}}{\sqrt{a} - \sqrt{3}} \)

16. Rewrite each expression so that it contains only positive exponents and simplify.

(a) \( \left(2 + a - 4\right)^0 \)  
(b) \( \left(a^2 + b^3\right)\left(a^{-2} + b^{-2}\right) \)

(c) \( \left(-\frac{x^{-1}}{x^{-5}}\right)^{-2} \)  
(d) \( \frac{2x^{-3} - y^{-2}}{x + y^{-1}} \)

(e) \( \left(3a^{-2} + b^{-2}\right)^{-1} \)
Equations and Inequalities

**Topics**  Solving linear and quadratic equations; linear inequalities; absolute value; applications.

17. Solve each of the following for $x$:
   
   (a) $5(2 - 3x) + 3 = 7 - 6x$  
   (b) $5 - [4 - 3(x + 2)] = 5x$  
   (c) $\frac{1}{12} (3x + 1)^2 = \frac{3}{4} \left( x - \frac{2}{3} \right)$  
   (d) $\frac{x}{x-1} + \frac{2}{x+1} = \frac{2}{x^2 - 1}$  
   (e) $\frac{1}{x} - \frac{2}{x+2} + \frac{1}{x+3} = 0$  
   (f) $\frac{ax+b}{c} - 2x = \frac{x}{a+c}$

18. The perimeter of a rectangular lot is 420 feet. The lot is two-and-one half times as long as it is wide. What are the dimensions of the lot?

19. How many millilitres of 5% butterfat milk and 1% butterfat milk should be mixed to create one litre (1000 ml) of 4% butterfat milk?

20. A ferry leaves Nanaimo to make the 22 km trip to Vancouver at the same time as a ferry leaves Vancouver for Nanaimo. The ferry leaving Nanaimo travels 2 km/h faster than the other ferry. How far are they from Vancouver when they meet 45 minutes later?

21. Solve each of the following equations for $x$:
   
   (a) $(2x+1)(3x+2) = 3x + 2$  
   (b) $(x-5)(x-2) = 4$  
   (c) $3x^2 - x = 10$  
   (d) $3x^2 - 7x - 2 = 0$  
   (e) $\frac{x}{x-5} + \frac{3}{x+1} = \frac{30}{x^2 - 4x - 5}$

22. A rectangle has a perimeter of 100 cm and an area of 200 cm$^2$. Find its dimensions.

23. Solve each of the following equations for $x$:
   
   (a) $x^{-1} + x^{-2} = 2$  
   (b) $x^{3/2} = -8$  
   (c) $x - \sqrt{9-x} = 7$  
   (d) $3x^4 - 5x^2 + 2 = 0$

24. Solve each of the following for $x$:
   
   (a) $\frac{2x+5}{3} < 5 - \frac{1-x}{2}$  
   (b) $|2x+3| = 15$  
   (c) $|8 - 5x| > 12$
**Geometry**

**Topics**
Cartesian co-ordinate system; distance between points in the plane; equations of lines and circles; applications.

25. Find the distance between the points $(1, 2)$ and $(4, 1)$.

26. Find an equation for the circle with radius 3 and centre at $(-1, 4)$.

27. Determine the radius and center of the circle defined by the equation $x^2 + y^2 - 5x + 2y = 0$.

28. Determine an equation for each of the lines shown.

29. Determine an equation for the line passing through the points $(7, 2)$ and $(-2, -1)$.

30. Determine which of the following lines are parallel, and which are perpendicular to the line $2y - 1 = 3(x + 2)$:

   A : $2x + 3y = 7$
   B : $x = 2$
   C : $y = \frac{3}{2}$
   D : $y = 1.5x + 2$
   E : $x = 1.5y - 1$

31. Determine which of the following lines are parallel, and which are perpendicular to the line $y = 5$:

   A : $2x + 2y = 7$
   B : $x = 2$
   C : $y = \pi$
   D : $x - y = 2$
   E : $3(x - y) = 3x - 1$

32. Express the area of an equilateral triangle in terms of its side length, $x$.

33. Express the area of the trapezoid in terms of the length $x$. 