CEGEP JOHN ABBOTT COLLEGE

INTRODUCTION TO ALGEBRA

(MATHEMATICS 201-007/∞)

1. Simplify $\dfrac{1-2^0}{1+2^0}$.
2. Solve $3(x+2)-10=4x-2(x-3)$.
3. If twelve is added to twice a number the result is three less than five times the number. Find the number.
4. Find the measure of an angle such that three times the complement of the angle is 30° more than the angle.
5. Approximate the radius of a circle with circumference 55.55 cm.
6. Which is the best buy? 20 pencils for \$2.00, 50 pencils for \$4.50 or 90 pencils for \$8.25.
7. Simplify
   (a) $\dfrac{(5x^{-3})^2(2y)^{-1}}{x^2y^{-3}}$ (b) $\left(\dfrac{4b^2}{a^2b^{-4}}\right)^{-3}$
   (c) $(3y^2-2y+7)(5y-4)$ (d) $(2a-7)^2$
   (e) $(5x^2-2x+4)-(5x+4)$ (f) $\left(x-\frac{1}{3}\right)\left(x+\frac{2}{3}\right)$
8. Perform the long division: $\dfrac{x^4+3x^3-2x^2-2x+12}{x+3}$
9. Factor (a) $3x^5y^2-6x^3y^4+12x^2y$
   (b) $a^2-2a-15$ (c) $6x^2+7x-5$
   (d) $4xy-6x+2ay-3a$ (e) m^4-16
10. Solve (a) $4x^3-8x^2+4x=0$
    (b) $6t^2-19t-7=0$ (c) $7m=3(2-m^2)$
11. Simplify
    (a) $\dfrac{x^2-4}{x^2+3x}\cdot\dfrac{x^2+4x}{x^2+3x-10}\div\dfrac{x^2+6x_8}{x^2-2x-15}$
    (b) $\dfrac{x+8}{x^2+x-2}-\dfrac{1}{1-x}+\dfrac{2}{x+2}$
12. Solve
    (a) $\dfrac{7}{3x-2}=\dfrac{11}{2x+5}$
    (b) $\dfrac{1}{x}+\dfrac{2}{x+1}=\dfrac{8}{3x}$
13. Find an equation of the line through the points $(1,2)$ and $(-0,-3)$.
14. (a) Find an equation of the line through $(-2,3)$ which is parallel to the x-axis.
    (b) Find an equation of the line through $(-2,3)$ which is perpendicular to the x-axis.
15. Determine whether the lines
    $$\ell_1: x-2y=8 \qquad \ell_2: 2x-y=3$$
    are parallel, perpendicular or neither parallel nor perpendicular.
16. Solve the linear system: $\begin{cases} 3x - 2y = 12 \\ 4x + 5y = -20 \end{cases}$ In which quadrant is the solution?
17. Solve the linear system: $\begin{cases} 7x - 2y = 17 \\ 5x + 6y = 27 \end{cases}$
18. Simplify
    (a) $\sqrt{192}-5\sqrt{12}$ (b) $\sqrt[3]{54}$
    (c) $\sqrt{75}\sqrt{6}$ (d) $(\sqrt{10}-2\sqrt{6})^2$
19. Rationalize each denominator and simplify.
    (a) $\dfrac{6}{\sqrt{18}}$ (b) $\dfrac{2}{3+\sqrt{7}}$
20. A 30 metre rope is attached to the top of a 10 metre pole and fixed to a point on the ground, forming a right triangle. How far is this point from the base of the pole?
21. Solve
    (a) $(3x-2)^2=49$ (b) $x^2=4x+10$ (c) $x^2+4=3x$
22. A right triangle has a 30° angle and an hypotenuse of length $8\sqrt{3}$. Find the length of its shortest side.
23. A right triangle has legs of lengths 5 and 8. Find its smallest angle.
24. $\triangle ABC$ has $\angle A=56.2^\circ$, $\angle C=78.3^\circ$ and side $b=12.5$. Find side a.
25. $\triangle ABC$ has side $a=117$, side $b=208$ and $\angle C=41.0^\circ$. Find side c.
26. A triangle is formed with three steel rods of lengths 1.2 metres, 1.5 metres and 2.1 metres. Find the angle contained by the shortest and longest rods.

ANSWERS

1. 0
2. 10
3. 5
4. 60°
5. 9.00 cm
6. 50 pencils for \$4.50.
7. (a) $\dfrac{25y^2}{2x^8}$, (b) $\dfrac{a^6}{64b^18}$,
   (c) $15y^3-22y^2+43y-28$,
   (d) $4a^2-28a+49$, (e) $5x^2-7x$,
   (f) $x^2+\frac{1}{15}x-\frac{2}{15}$.
8. x^3-2x+4
9. (a) $3x^2y(x^3y-2xy^3+4)$, (b) $(a-5)(a+3)$,
   (c) $(2x-1)(3x+5)$, (d) $(2x+a)(2y-3)$,
   (e) $(m-2)(m+2)(m^2+4)$.
10. (a) $0,\ 1$, (b) $-\frac{1}{3},\ \frac{7}{2}$, (c) $\frac{2}{3},\ -3$.
11. (a) $\dfrac{x-5}{x+5}$, (b) $\dfrac{4}{x-1}$.
12. (a) 3, (b) 5.
13. $y=5x-3$
14. (a) $y=3$, (b) $x=-2$.
15. The lines are neither parallel nor perpendicular.
16. $\left(\frac{20}{23},-\frac{108}{23}\right)$; the solution is in the fourth quadrant.
17. $(3,2)$
18. (a) $-2\sqrt{3}$, (b) $3\sqrt[3]{2}$,
    (c) $15\sqrt{2}$, (d) $34-8\sqrt{15}$.
19. (a) $\sqrt{2}$, (b) $3-\sqrt{7}$.
20. 28.3 m
21. (a) $3,\ -\frac{5}{3}$, (b) $2\pm\sqrt{14}$, (c) No (real) solution.
22. $4\sqrt{3}\approx 6.93$
23. 32.01°
24. 14.6
25. 143
26. 44.4°