

1. Simplify. Give answers only with positive exponents.

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

2. Solve the following equations.

(a) $3x + 4 = 5 + 2(x - 7)$ (b) $4(p - 3) = 16 - 4(p + 3)$
(c) $\frac{1}{3}x + 1 = \frac{1}{4}(2 - x)$ (d) $\frac{m}{5} = \frac{m - 3}{6}$

3. If 5 is added to three times a number, and this sum is doubled, the result is the same as if the number is multiplied by 7 and 14 is added to the product. What is the number?

4. Find the measure of an angle such that the difference between it supplement and 2 times its complement is 48° .

5. The area of a triangle is 162 cm^2 . Given the height is 27 cm, find the length of the base of the triangle.

6. Perform the indicated operations and simplify.

(a) $(8x^5 + 3x^4 - 2x) - (6x^5 - 3x^4 + 4x^2 - 11)$
(b) $(3 - y)(4y^2 - 6y + 2)$ (c) $(2m - 3)^2$

7. Perform the long division $(2m^5 + m^4 + 6m^3 - 3m^2 - 18) \div (m^2 + 3)$.

8. Factor completely.

(a) $3x - 12 - ax + 4a$ (b) $9x^2 + 24x + 16$
(c) $2x^2 + 5x - 3$ (d) $4m^3 + 4m^2 - 48m$ (e) $16a^2 - 81b^2$

9. Solve the following equations.

(a) $p^3 - 100p = 0$ (b) $(2q - 15)^2 = 49$
(c) $3x^2 - 6x - 4 = 0$ (d) $\frac{3m}{(2m + 1)(3m - 2)} = \frac{4}{2m + 1} + \frac{1}{3m - 2}$

10. Perform the indicated operations and simplify.

(a) $\frac{x^2 - x - 6}{x^2 + 2x - 15} \cdot \frac{x^2 + 10x + 25}{x^2 - 4}$ (b) $\frac{p^2 - 3p}{p^2 + 6p + 8} \div \frac{3 - p}{p + 2}$
(c) $\frac{4}{a - 1} - \frac{4a}{a - 1}$ (d) $\frac{5}{p^2 - 4p + 3} - \frac{4}{3p^2 - 3}$

11. Given the equations for the lines $\begin{cases} \ell_1: 5x - 2y = 13 \\ \ell_2: y = \frac{5}{2}x + 38 \\ \ell_3: 2x + 5y = 27 \end{cases}$

- (a) Which lines are parallel? Justify.
(b) Which lines are perpendicular? Justify.

12. Find an equation for the line which passes through the points $(-3, 6)$ and $(2, 1)$.

13. Solve the system of linear equations. $\begin{cases} y = 2x + 10 \\ y = -x - 2 \end{cases}$

14. Solve the system of linear equations.

(a) $\begin{cases} 3x + y = 5 \\ x + y = 3 \end{cases}$ (b) $\begin{cases} \frac{4}{5}x - y = 4 \\ 4x - 5y = 20 \end{cases}$

15. Simplify:

(a) $\sqrt{\frac{2x}{5}} \cdot \sqrt{\frac{10}{4}}$ (b) $4\sqrt{28} - 6\sqrt{7} + 5\sqrt{63}$
(c) $\sqrt{75x^3y^4}$ (d) $\sqrt[3]{54a^6b}$

16. Rationalize the denominator.

(a) $\frac{5}{3\sqrt{8}}$ (b) $\frac{2}{6 - \sqrt{5}}$

17. A 13 m long wire stretches from the top of a 12 m pole to the ground. How far away from the base of the pole will the wire be attached?

18. In a right triangle, ABC , where c is the hypotenuse, side b is 72 cm and angle A is 48° , find the length of side a .

19. A triangular lot of land has sides 114 m, 310 m and 402 m. What is the angle contained by the shortest two sides?

20. In triangle ABC , side b measures 43 cm, side c measures 57 cm and angle A measures 73° . Find the length of side a .

21. In a triangle ABC , side c measures 3 m, side a measures 4 m and angle C measures 25° .

- (a) Find the measure of angle A .
(b) Find the measure of angle B .

ANSWERS

1. (a) $4y^4$ (b) $-9a^8b^{10}$
2. (a) $x = -13$ (b) $p = 2$ (c) $x = -6/7$
(d) $m = -15$
3. The number is -4 .
4. The measure of the angle is 48° .
5. The base of the triangle is 12 cm long.
6. (a) $2x^5 + 6x^4 - 4x^2 - 2x + 11$
(b) $-4y^3 + 18y^2 - 20y + 6$
(c) $4m^2 - 12m + 9$
7. $2m^3 + m^2 - 6$
8. (a) $(3 - a)(x - 4)$ (b) $(3x + 4)^2$
(c) $(2x - 1)(x + 3)$ (d) $4m(m + 4)(m - 3)$
(e) $(4a - 9b)(4a + 9b)$

9. (a) $p = 0, \pm 10$ (b) $q = 4, 11$
(c) $x = 1 \pm \sqrt{7/3}$ (d) $m = 7/11$
10. (a) $\frac{x+5}{x-2}$ (b) $-\frac{p}{p+4}$ (c) -4
(d) $\frac{11p+27}{3(p-3)(p-1)(p+1)}$
11. (a) $\ell_1 \parallel \ell_2$ (b) $\ell_1 \perp \ell_3$ and $\ell_2 \perp \ell_3$
12. $x + y = 3$
13. $(x, y) = (-4, 2)$
14. (a) $(x, y) = (1, 2)$ (b) Infinitely many solutions (i.e., dependent); $4x - 5y = 20$.
15. (a) \sqrt{x} (b) $17\sqrt{7}$ (c) $5xy^2\sqrt{3x}$
(d) $3a^2\sqrt[3]{2b}$
16. (a) $\frac{5\sqrt{2}}{12}$ (b) $\frac{2(6+\sqrt{5})}{31}$

17. The wire is attached to the ground 5 m from the base of the pole.
18. $a = 72 \tan 48^\circ \approx 79.97 \text{ cm}$
19. $\cos \vartheta = -13127/17670 \approx -0.7429$,
 $\therefore \vartheta \approx 137.98^\circ$.
20. $a^2 = 5098 - 4092 \cos 73^\circ \approx 3664.7939$,
 $\therefore a \approx 60.54 \text{ cm}$.
21. This is the ambiguous case (SSA).
(a) $\sin A = \frac{4}{3} \sin 25^\circ \approx 0.5635$, so either
(i) $\angle A \approx 34.3^\circ$, or (ii) $\angle A \approx 145.7^\circ$.
(b) The corresponding measures of $\angle B$ are:
(i) $\angle B \approx 120.7^\circ$, and (ii) $\angle B \approx 9.3^\circ$.