Chapter 12. Rational Expressions and Equations

Ex. 12.5

Answer 1CU.

The divisor of $2x^2 - 9x + 9$ that result in a remainder of 0 is option b and c because the factor of the trinomial is $2x^2 - 9x + 9 = (x-3)(2x-3)$.

For option b. consider the following division:

$$(2x^2 - 9x + 9) \div (x-3)$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r|l} & \quad 2x-3 \\ x-3 & \quad 2x^2-9x+9 \\ & (-)2x^2-6x \\ \hline & \quad -3x+9 \\ & (-)-3x+9 \\ \hline & \quad 0 \end{array}$$

For option c. consider the following division:

$$(2x^2 - 9x + 9) \div (2x-3)$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r|l} & \quad x-3 \\ 2x-3 & \quad 2x^2-9x+9 \\ & (-)2x^2-3x \\ \hline & \quad -6x+9 \\ & (-)-6x+9 \\ \hline & \quad 0 \end{array}$$

Answer 2CU.

A remainder of zero in a long division of a polynomial by a binomial means polynomial is exactly divisible by a binomial.

For example:

$$(2x+10)\div(x+5)$$

$$\begin{array}{r} 2 \\ x+5\overline{)\quad 2x+10} \\ \underline{(-)2x+10} \\ 0 \end{array}$$

The polynomial $(2x+10)$ is exactly divisible by the binomial $(x+5)$.

Answer 3CU.

A third-degree polynomial that includes a zero term $\boxed{x^3+2x^2+8}$.

Rewrite the polynomial so that it can be divided by $x+5$ using long division:

$$\boxed{x^3+2x^2+0x+8}$$

Answer 4CU.

To divide a polynomial by a monomial, divide each term of the polynomial by the monomial.

Consider the following division:

$$(4x^3+2x^2-5)\div 2x = \frac{4x^3+2x^2-5}{2x} \qquad \text{Write as a rational expression.}$$

$$= \frac{4x^3}{2x}+\frac{2x^2}{2x}-\frac{5}{2x} \qquad \text{Divide each term by } 2x.$$

$$= \frac{\cancel{4x^3}^{\,2x^2}}{\cancel{2x}_{\,1}}+\frac{\cancel{2x^2}^{\,x}}{\cancel{2x}_{\,1}}-\frac{5}{2x} \qquad \text{Simplify each term.}$$

$$= 2x^2+x-\frac{5}{2x} \qquad \text{Simplify.}$$

Thus, the quotient is $\boxed{2x^2+x-\frac{5}{2x}}$.

Answer 5CU.

To divide a polynomial by a monomial, divide each term of the polynomial by the monomial.

Consider the following division:

$$\frac{14a^2b^2+35ab^2+2a^2}{7a^2b^2}$$

$$=\frac{14a^2b^2}{7a^2b^2}+\frac{35ab^2}{7a^2b^2}+\frac{2a^2}{7a^2b^2} \quad \text{Divide each term by } 7a^2b^2.$$

$$=\frac{\overset{2}{\cancel{14a^2b^2}}}{\underset{1}{\cancel{7a^2b^2}}}+\frac{\overset{5}{\cancel{35ab^2}}}{\underset{a}{\cancel{7a^2b^2}}}+\frac{\overset{2}{\cancel{2a^2}}}{\underset{7b^2}{\cancel{7a^2b^2}}} \quad \text{Simplify each term.}$$

$$=2+\frac{5}{a}+\frac{2}{7b^2} \quad \text{Simplify.}$$

Thus, the quotient is $\boxed{2+\frac{5}{a}+\frac{2}{7b^2}}$.

Answer 6CU.

Consider the following division:

$$(n^2+7n+12)\div(n+3)=\frac{n^2+7n+12}{(n+3)} \quad \text{Write as a rational expression.}$$

$$=\frac{(n+4)(n+3)}{(n+3)} \quad \text{Factor the numerator.}$$

$$=\frac{(n+4)\overset{1}{\cancel{(n+3)}}}{\underset{1}{\cancel{(n+3)}}} \quad \text{Divide by the GCF.}$$

$$=n+4 \quad \text{Simplify.}$$

Thus, the quotient is $\boxed{n+4}$.

Answer 7CU.

Consider the following division:

$$\left(r^2+12r+36\right)\div\left(r+9\right)$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r}
r+3 \\
r+9\overline{\big)\quad r^2+12r+36} \\
\underline{(-)r^2+9r} \\
3r+36 \\
\underline{(-)3r+27} \\
9
\end{array}$$

The quotient of $\left(r^2+12r+36\right)\div\left(r+9\right)$ is $r+3$ with a remainder 9, which can be written as $\boxed{r+3+\frac{9}{r+9}}$.

Answer 8CU.

Consider the following division:

$$\frac{4m^3+5m-21}{2m-3}$$

Rename the m^2 term using a coefficient of 0.

$$\left(4m^3+0m^2+5m-21\right)\div\left(2m-3\right)$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r}
2m^2+3m+7 \\
2m-3\overline{\big)\quad 4m^3+0m^2+5m-21} \\
\underline{(-)4m^3-6m^2} \\
6m^2+5m \\
\underline{(-)6m^2-9m} \\
14m-21 \\
\underline{(-)14m-21} \\
0
\end{array}$$

Thus, the quotient is $\boxed{2m^2+3m+7}$.

Answer 9CU.

Consider the following division:

$$\left(2b^2+3b-5\right)\div(2b-1)$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r} b+2 \\ 2b-1\overline{\big)\quad 2b^2+3b-5} \\ \underline{(-)2b^2-b} \\ 4b-5 \\ \underline{(-)4b-2} \\ -3 \end{array}$$

The quotient of $\left(2b^2+3b-5\right)\div(2b-1)$ is $b+2$ with a remainder -3, which can be written as $\boxed{b+2-\frac{3}{2b-1}}$.

Answer 10CU.

Substitute $p=75\%=0.75$ in the formula $C=\frac{120{,}000p}{1-p}$ to find the cost for a manufacturer to reduce the pollutants.

$$\begin{aligned} C&=\frac{120{,}000p}{1-p} && \text{Formula.} \\ &=\frac{120{,}000(0.75)}{1-0.75} && \text{Substitute } 0.75 \text{ for } p. \\ &=360{,}000 && \text{Simplify.} \end{aligned}$$

Thus, the cost for a manufacturer is $\boxed{\$360{,}000}$.

Answer 11PA.

To divide a polynomial by a monomial, divide each term of the polynomial by the monomial.

Consider the following division:

$$\left(x^2+9x-7\right)\div 3x=\frac{x^2+9x-7}{3x} \quad \text{Write as a rational expression.}$$

$$=\frac{x^2}{3x}+\frac{9x}{3x}-\frac{7}{3x} \quad \text{Divide each term by } 3x.$$

$$=\frac{\overset{x}{\cancel{x^2}}}{\underset{3}{\cancel{3x}}}+\frac{\overset{3}{\cancel{9x}}}{\underset{1}{\cancel{3x}}}-\frac{7}{3x} \quad \text{Simplify each term.}$$

$$=\frac{x}{3}+3-\frac{7}{3x} \quad \text{Simplify.}$$

Thus, the quotient is $\boxed{\frac{x}{3}+3-\frac{7}{3x}}$.

Answer 12PA.

To divide a polynomial by a monomial, divide each term of the polynomial by the monomial.

Consider the following division:

$$\left(a^2+7a-28\right)\div 7a=\frac{a^2+7a-28}{7a} \quad \text{Write as a rational expression.}$$

$$=\frac{a^2}{7a}+\frac{7a}{7a}-\frac{28}{7a} \quad \text{Divide each term by } 7a.$$

$$=\frac{\overset{a}{\cancel{a^2}}}{\underset{7}{\cancel{7a}}}+\frac{\overset{1}{\cancel{7a}}}{\underset{1}{\cancel{7a}}}-\frac{\overset{4}{\cancel{28}}}{\underset{a}{\cancel{7a}}} \quad \text{Simplify each term.}$$

$$=\frac{a}{7}+1-\frac{4}{a} \quad \text{Simplify.}$$

Thus, the quotient is $\boxed{\frac{a}{7}+1-\frac{4}{a}}$.

Answer 13PA.

To divide a polynomial by a monomial, divide each term of the polynomial by the monomial.

Consider the following division:

$$\frac{9s^3t^2 - 15s^2t + 24t^3}{3s^2t^2}$$

$$= \frac{9s^3t^2}{3s^2t^2} - \frac{15s^2t}{3s^2t^2} + \frac{24t^3}{3s^2t^2} \quad \text{Divide each term by } 3s^2t^2.$$

$$= \frac{\overset{3s}{\cancel{9s^3t^2}}}{\underset{1}{\cancel{3s^2t^2}}} - \frac{\overset{5}{\cancel{15s^2t}}}{\underset{t}{\cancel{3s^2t^2}}} + \frac{\overset{8t}{\cancel{24t^3}}}{\underset{s^2}{\cancel{3s^2t^2}}} \quad \text{Simplify each term.}$$

$$= 3s - \frac{5}{t} + \frac{8t}{s^2} \quad \text{Simplify.}$$

Thus, the quotient is $\boxed{3s - \frac{5}{t} + \frac{8t}{s^2}}$.

Answer 14PA.

To divide a polynomial by a monomial, divide each term of the polynomial by the monomial.

Consider the following division:

$$\frac{12a^3b + 16ab^3 - 8ab}{4ab}$$

$$= \frac{12a^3b}{4ab} + \frac{16ab^3}{4ab} - \frac{8ab}{4ab} \quad \text{Divide each term by } 4ab.$$

$$= \frac{\overset{3a^2}{\cancel{12a^3b}}}{\underset{1}{\cancel{4ab}}} + \frac{\overset{4b^2}{\cancel{16ab^3}}}{\underset{1}{\cancel{4ab}}} - \frac{\overset{2}{\cancel{8ab}}}{\underset{1}{\cancel{4ab}}} \quad \text{Simplify each term.}$$

$$= 3a^2 + 4b^2 - 2 \quad \text{Simplify.}$$

Thus, the quotient is $\boxed{3a^2 + 4b^2 - 2}$.

Answer 15PA.

Consider the following division:

$$\left(x^2 + 9x + 20\right) \div (x+5) = \frac{x^2 + 9x + 20}{(x+5)} \quad \text{Write as a rational expression.}$$

$$= \frac{(x+4)(x+5)}{(x+5)} \quad \text{Factor the numerator.}$$

$$= \frac{(x+4)\overset{1}{\cancel{(x+5)}}}{\underset{1}{\cancel{(x+5)}}} \quad \text{Divide by the GCF.}$$

$$= x + 4 \quad \text{Simplify.}$$

Thus, the quotient is $\boxed{x+4}$.

Answer 16PA.

Consider the following division:

$$(x^2+6x-16)\div(x-2)=\frac{x^2+9x+20}{(x-2)} \qquad \text{Write as a rational expression.}$$

$$=\frac{(x+8)(x-2)}{(x-2)} \qquad \text{Factor the numerator.}$$

$$=\frac{(x+8)\overset{1}{\cancel{(x-2)}}}{\underset{1}{\cancel{(x-2)}}} \qquad \text{Divide by the GCF.}$$

$$=x+8 \qquad \text{Simplify.}$$

Thus, the quotient is $\boxed{x+8}$.

Answer 17PA.

Consider the following division:

$$(n^2-2n-35)\div(n+5)=\frac{n^2-2n-35}{(n+5)} \qquad \text{Write as a rational expression.}$$

$$=\frac{(n-7)(n+5)}{(n+5)} \qquad \text{Factor the numerator.}$$

$$=\frac{(n-7)\overset{1}{\cancel{(n+5)}}}{\underset{1}{\cancel{(n+5)}}} \qquad \text{Divide by the GCF.}$$

$$=n-7 \qquad \text{Simplify.}$$

Thus, the quotient is $\boxed{n-7}$.

Answer 18PA.

Consider the following division:

$$(s^2+11s+18)\div(s+9)=\frac{s^2+11s+18}{(s+9)} \qquad \text{Write as a rational expression.}$$

$$=\frac{(s+2)(s+9)}{(s+9)} \qquad \text{Factor the numerator.}$$

$$=\frac{(s+2)\overset{1}{\cancel{(s+9)}}}{\underset{1}{\cancel{(s+9)}}} \qquad \text{Divide by the GCF.}$$

$$=s+2 \qquad \text{Simplify.}$$

Thus, the quotient is $\boxed{s+2}$.

Answer 19PA.

Consider the following division:

$$\left(z^2-2z-30\right)\div\left(z+7\right)$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r} z-9 \\ z+7\overline{)\quad z^2-2z-30} \\ \underline{(-)z^2+7z\quad\;\;} \\ -9z-30 \\ \underline{(-)-9z-63} \\ 33 \end{array}$$

The quotient of $\left(z^2-2z-30\right)\div\left(z+7\right)$ is $z-9$ with a remainder 33, which can be written as $\boxed{z-9+\frac{33}{z+7}}$.

Answer 20PA.

Consider the following division:

$$\left(a^2+4a-22\right)\div\left(a-3\right)$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r} a+7 \\ a-3\overline{)\quad a^2+4a-22} \\ \underline{(-)a^2-3a\quad\;\;} \\ 7a-22 \\ \underline{(-)7a-21} \\ -1 \end{array}$$

The quotient of $\left(a^2+4a-22\right)\div\left(a-3\right)$ is $a+7$ with a remainder -1, which can be written as $\boxed{a+7-\frac{1}{a-3}}$.

Answer 21PA.

Consider the following division:

$$\left(2r^2-3r-35\right)\div(r-5)=\frac{2r^2-3r-35}{(r-5)}$$ Write as a rational expression.

$$=\frac{(2r+7)(r-5)}{(r-5)}$$ Factor the numerator.

$$=\frac{(2r+7)\overset{1}{\cancel{(r-5)}}}{\underset{1}{\cancel{(r-5)}}}$$ Divide by the GCF.

$$=2r+7$$ Simplify.

Thus, the quotient is $\boxed{2r+7}$.

Answer 22PA.

Consider the following division:

$$\left(3p^2+20p+11\right)\div(p+6)$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r} 3p+2 \\ p+6\overline{\big)\quad 3p^2+20p+11} \\ \underline{(-)3p^2+18p} \\ 2p+11 \\ \underline{(-)2p+12} \\ -1 \end{array}$$

The quotient of $\left(3p^2+20p+11\right)\div(p+6)$ is $3p+2$ with a remainder -1, which can be written as $\boxed{3p+2-\frac{1}{p+6}}$.

Answer 23PA.

Consider the following division:

$$\frac{3t^2+14t-24}{3t-4}$$

$$=\frac{(t+6)(3t-4)}{(3t-4)} \quad \text{Factor the numerator.}$$

$$=\frac{(t+6)\cancel{(3t-4)}^{1}}{\cancel{(3t-4)}_{1}} \quad \text{Divide by the GCF.}$$

$$=t+6 \quad \text{Simplify.}$$

Thus, the quotient is $\boxed{t+6}$.

Answer 24PA.

Consider the following division:

$$\frac{12n^2+36n+15}{2n+5}$$

$$=\frac{3(2n+1)(2n+5)}{(2n+5)} \quad \text{Factor the numerator.}$$

$$=\frac{3(2n+1)\cancel{(2n+5)}^{1}}{\cancel{(2n+5)}_{1}} \quad \text{Divide by the GCF.}$$

$$=3(2n+1) \quad \text{Simplify.}$$

Thus, the quotient is $\boxed{3(2n+1)}$.

Answer 26PA.

Consider the following division:

$$\frac{20b^3-27b^2+13b-3}{4b-3}$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r}
5b^2-3b+1 \\
4b-3\overline{)\;20b^3-27b^2+13b-3} \\
\underline{(-)20b^3-15b^2} \qquad\qquad \\
-12b^2+13b \qquad \\
\underline{(-)-12b^2+9b} \qquad \\
4b-3 \\
\underline{(-)4b-3} \\
0
\end{array}$$

Thus, the quotient is $\boxed{5b^2-3b+1}$.

Answer 27PA.

Consider the following division:

$$\frac{6x^3-9x^2+6}{2x-3}$$

Rename the x term using a coefficient of 0.

$$\left(6x^3-9x^2+0x+6\right)\div\left(2x-3\right)$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r|l} & \quad 3x^2 \\ \hline 2x-3 & 6x^3-9x^2+0x+6 \\ & (-)6x^3-9x^2 \\ \hline & \qquad\qquad\quad 6 \end{array}$$

The quotient of $\frac{6x^3-9x^2+6}{2x-3}$ is $3x^2$ with a remainder 6, which can be written as

$$\boxed{3x^2+\frac{6}{2x-3}}.$$

Answer 28PA.

Consider the following division:

$$\frac{9g^3+5g-8}{3g-2}$$

Rename the g^2 term using a coefficient of 0.

$$\left(9g^3+0g^2+5g-8\right)\div\left(3g-2\right)$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r|l} & \quad 3g^2+2g+3 \\ \hline 3g-2 & 9g^3+0g^2+5g-8 \\ & (-)9g^3-6g^2 \\ \hline & \qquad 6g^2+5g \\ & \quad (-)6g^2-4g \\ \hline & \qquad\qquad 9g-8 \\ & \qquad (-)9g-6 \\ \hline & \qquad\qquad\quad -2 \end{array}$$

The quotient of $\frac{9g^3+5g-8}{3g-2}$ is $3g^2+2g+3$ with a remainder -2, which can be written as

$$\boxed{3g^2+2g+3-\frac{2}{3g-2}}.$$

Answer 29PA.

Consider the following division:

$$\left(6n^3+5n^2+12\right)\div\left(2n+3\right)$$

Rename the n term using a coefficient of 0.

$$\left(6n^3+5n^2+0n+12\right)\div\left(2n+3\right)$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r}
3n^2-2n+3 \\
2n+3\overline{\big)\ 6n^3+5n^2+0n+12} \\
\underline{(-)6n^3+9n^2\qquad\qquad} \\
-4n^2+0n\qquad \\
\underline{(-)-4n^2-6n\qquad} \\
6n+12 \\
\underline{(-)6n+9} \\
3
\end{array}$$

The quotient of $\left(6n^3+5n^2+12\right)\div\left(2n+3\right)$ is $3n^2-2n+3$ with a remainder 3, which can be written as $\boxed{3n^2-2n+3+\dfrac{3}{2n+3}}$.

Answer 30PA.

Consider the following division:

$$\left(4t^3+17t^2-1\right)\div\left(4t+1\right)$$

Rename the t term using a coefficient of 0.

$$\left(4t^3+17t^2+0t-1\right)\div\left(4t+1\right)$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r}
t^2+4t-1 \\
4t+1\overline{\big)\ 4t^3+17t^2+0t-1} \\
\underline{(-)4t^3+\ \ t^2\qquad\qquad} \\
16t^2+0t\qquad \\
\underline{(-)16t^2+4t\qquad} \\
-4t-1 \\
\underline{(-)-4t-1} \\
0
\end{array}$$

Thus, the quotient is $\boxed{t^2+4t-1}$.

Answer 31PA.

The expression $\frac{W(L-x)}{x}$ represents the weight of an object that can be lifted if *W* pounds of force are applied to a lever *L* inches long with the fulcrum placed *x* inches from the object.

Substitute 150 for *W*, and 60 for *L* in the expression to determine the heaviest rock he could lift if the fulcrum is *x* inches from the rock:

$$=\boxed{\frac{150(60-x)}{x}}.$$

Answer 32PA.

The expression $\frac{W(L-x)}{x}$ represents the weight of an object that can be lifted if *W* pounds of force are applied to a lever *L* inches long with the fulcrum placed *x* inches from the object.

Use the above expression to find the weight of a rock.

Substitute 210 for *W*, $6\cdot 12=72$ for *L* and 20 for *x* in the expression.

$$\begin{aligned}&\frac{W(L-x)}{x}\\&=\frac{210(72-20)}{20} && \text{Substitute.}\\&=546 && \text{Simplify}\end{aligned}$$

Thus, the weight of a rock is $\boxed{546\text{ pounds}}$.

Answer 33PA.

First find the perimeter of the bedroom:

$$\begin{aligned}P&=2l+2b && \text{Formula.}\\&=2(14)+2(12) && \text{Substitute.}\\&=28+24 && \text{Simplify.}\\&=52\text{ ft or }624\text{ in.}\end{aligned}$$

Now find the length of walls to put decorative border.

$$\begin{aligned}&624-42-42-34.5-34.5\\&=471\text{ in.}\end{aligned}$$

The border comes in 5-yard rolls. Now find the number of rolls of border.

$$\begin{aligned}&471\text{ in}\cdot\frac{1\text{ ft}}{12\text{ in}}\cdot\frac{1\text{ yard}}{3\text{ ft}}\cdot\frac{1\text{ roll}}{1\text{ yard}}\\&=471\ \cancel{\text{in}}\cdot\frac{1\ \cancel{\text{ft}}}{12\ \cancel{\text{in}}}\cdot\frac{1\ \cancel{\text{yard}}}{3\ \cancel{\text{ft}}}\cdot\frac{1\text{ roll}}{5\ \cancel{\text{yard}}}\\&=\frac{471\text{ rolls}}{12\cdot 3\cdot 5}\\&\approx 3\text{ rolls}\end{aligned}$$

Thus, the number of rolls of border is $\boxed{3}$.

Answer 34PA.

The expression $\frac{\pi d^2}{64}$ can be used to determine the number of slices of a round pizza with diameter *d*.

Divide total cost *C* by number of slices $\frac{\pi d^2}{64}$ to find a formula to calculate the cost per slice.

$$s = C \div \frac{\pi d^2}{64}$$

$$= C \cdot \frac{64}{\pi d^2} \qquad \text{Multiply by the reciprocal of } \frac{\pi d^2}{64}.$$

$$= \frac{64C}{\pi d^2} \qquad \text{Simplify.}$$

Thus, the formula to calculate the cost per slice is $\boxed{\frac{64C}{\pi d^2}}$.

Answer 35PA.

The expression $\frac{\pi d^2}{64}$ can be used to determine the number of slices of a round pizza with diameter *d*.

Divide total cost *C* by number of slices $\frac{\pi d^2}{64}$ to find a formula to calculate the cost per slice.

$$s = C \div \frac{\pi d^2}{64}$$

$$= C \cdot \frac{64}{\pi d^2} \qquad \text{Multiply by the reciprocal of } \frac{\pi d^2}{64}.$$

$$= \frac{64C}{\pi d^2} \qquad \text{Simplify.}$$

Thus, the formula to calculate the cost per slice is $\frac{64C}{\pi d^2}$.

Complete the table below:

Size (d)	10-inch	14-inch	18-inch
Price (C)	\$4.99	\$8.99	\$12.99
Number of slices $\frac{\pi d^2}{64}$	5	10	16
Cost per slice $\frac{64C}{\pi d^2}$	\$1.02	\$0.93	\$0.82

Thus, 18-inch pizza offers the best price per slice.

Answer 36PA.

Use the following information:

The density of a material is its mass per unit volume.

To find the densities for the materials divide Mass by Volume.

Material	Mass (g)	Volume $\left(\text{cm}^3\right)$	Density $= \frac{\text{Mass}}{\text{Volume}}$
Aluminum	4.15	1.54	$\frac{4.15}{1.54} = 2.69$
Gold	2.32	0.12	$\frac{2.32}{0.12} = 19.33$
Silver	6.30	0.60	$\frac{6.30}{0.60} = 10.50$
Steel	7.80	1.00	$\frac{7.80}{1.00} = 7.80$
Iron	15.20	1.95	$\frac{15.20}{1.95} = 7.79$

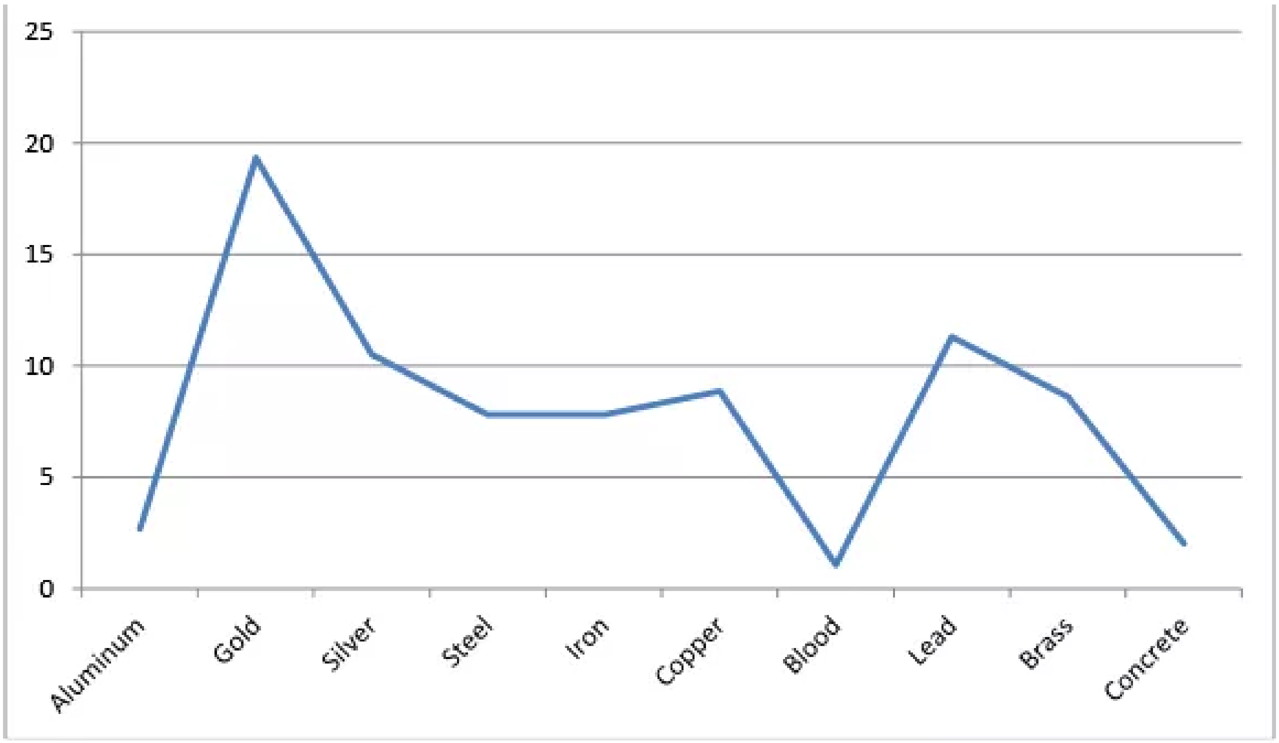
Copper	2.48	0.28	$\frac{2.48}{0.28} = 8.86$
Blood	4.35	4.10	$\frac{4.35}{4.10} = 1.06$
Lead	11.30	1.00	$\frac{11.30}{1.00} = 11.30$
Brass	17.90	2.08	$\frac{17.90}{2.08} = 8.61$
concrete	40.00	20.00	$\frac{40.00}{20.00} = 2$

Answer 37PA.

Use the following information:
The density of a material is its mass per unit volume.
To find the densities for the materials divide Mass by Volume.

Material	Mass (g)	Volume (cm^3)	Density $= \frac{\text{Mass}}{\text{Volume}}$
Aluminium	4.15	1.54	$\frac{4.15}{1.54} = 2.69$
Gold	2.32	0.12	$\frac{2.32}{0.12} = 19.33$
Silver	6.30	0.60	$\frac{6.30}{0.60} = 10.50$
Steel	7.80	1.00	$\frac{7.80}{1.00} = 7.80$
Iron	15.20	1.95	$\frac{15.20}{1.95} = 7.79$
Copper	2.48	0.28	$\frac{2.48}{0.28} = 8.86$
Blood	4.35	4.10	$\frac{4.35}{4.10} = 1.06$
Lead	11.30	1.00	$\frac{11.30}{1.00} = 11.30$
Brass	17.90	2.08	$\frac{17.90}{2.08} = 8.61$
concrete	40.00	20.00	$\frac{40.00}{20.00} = 2$

Now plot the graph of the densities for the materials:

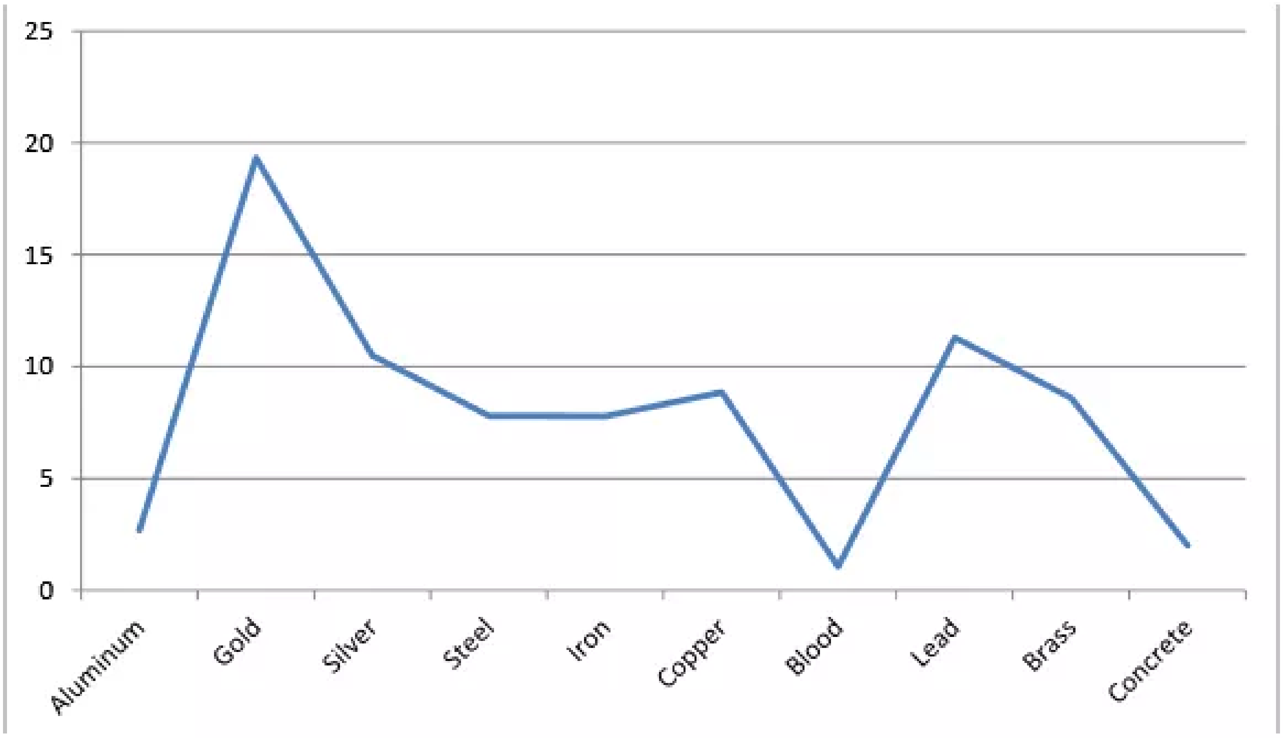


Answer 38PA.

Use the following information:
The density of a material is its mass per unit volume.
To find the densities for the materials divide Mass by Volume.

Material	Mass (g)	Volume (cm^3)	Density $= \frac{\text{Mass}}{\text{Volume}}$
Aluminium	4.15	1.54	$\frac{4.15}{1.54} = 2.69$
Gold	2.32	0.12	$\frac{2.32}{0.12} = 19.33$
Silver	6.30	0.60	$\frac{6.30}{0.60} = 10.50$
Steel	7.80	1.00	$\frac{7.80}{1.00} = 7.80$
Iron	15.20	1.95	$\frac{15.20}{1.95} = 7.79$
Copper	2.48	0.28	$\frac{2.48}{0.28} = 8.86$
Blood	4.35	4.10	$\frac{4.35}{4.10} = 1.06$
Lead	11.30	1.00	$\frac{11.30}{1.00} = 11.30$
Brass	17.90	2.08	$\frac{17.90}{2.08} = 8.61$
concrete	40.00	20.00	$\frac{40.00}{20.00} = 2$

Now plot the graph of the densities for the materials:



Answer 40PA.

Let $f(x) = x^2 + 7x + 12$

Since, $x + k$ is a factor of the function $f(x)$ then

$$x + k = 0$$
$$x = -k$$

Substitute $-k$ for *x* in the function

$$f(x) = x^2 + 7x + 12$$
$$f(-k) = (-k)^2 + 7(-k) + 12$$
$$0 = k^2 - 7k + 12$$
$$0 = (k-3)(k-4) \qquad \text{Factor.}$$

Use zero factor property. Solve for *k*.

$$k - 3 = 0 \quad \text{or} \quad k - 4 = 0$$
$$k = 3 \qquad\qquad k = 4$$

Thus, the value of *k* is $\boxed{3 \text{ and } 4}$.

Answer 41PA.

Let $f(x)=x^2+7x+k$

Function is divided by $x+2$, there is a remainder of 2.

$$x+2=0$$
$$x=-2$$

Substitute -2 for *x* in the function

$$f(x)=x^2+7x+k-(R)$$
$$f(-2)=(-2)^2+7(-2)+k-2 \qquad R=2\ (\text{Remainder})$$
$$0=4-14+k-2$$
$$12=k$$

Thus, the value of *k* is $\boxed{12}$.

Answer 42PA.

Let $f(x)=x^2-2x-k$

Since, $x+7$ is a factor of the function $f(x)$ then

$$x+7=0$$
$$x=-7$$

Substitute -7 for *x* in the function

$$f(x)=x^2-2x-k$$
$$f(-7)=(-7)^2-2(-7)-k$$
$$0=49+14-k$$
$$k=63$$

Thus, the value of *k* is $\boxed{63}$.

Answer 43PA.

Divide can be used to find the number of pieces of fabric available when you divide a large piece of fabric into smaller pieces.

Answer should include the following.

- The two expressions are equivalent. If you use the Distributive Property, you can separate the numerator into two expressions with the same denominator.
- When you simplify the right side of the equation, the numerator is $a-b$ and the denominator is *c*. This is the same as the expression on the left.

Answer 44PA.

To find the length of the rectangle divide the area of rectangle by width.

$$\frac{m^2+4m-32}{m-4} \quad \text{Write as a rational expression.}$$

$$=\frac{(m+8)(m-4)}{(m-4)} \quad \text{Factor the numerator.}$$

$$=\frac{(m+8)\cancel{(m-4)}^{1}}{\cancel{(m-4)}_{1}} \quad \text{Divide by the GCF.}$$

$$=m+8 \quad \text{Simplify.}$$

Thus, the length of the rectangle is $\boxed{m+8}$.

Answer 45PA.

Consider the following division:

$$\left(x^3+5x-20\right)\div(x-3)$$

Rename the x^2 term using a coefficient of 0.

$$\left(x^3+0x^2+5x-20\right)\div(x-3)$$

Use long division process to divide a polynomial by a binomial.

$$\begin{array}{r l}
 & x^2+3x+14 \\
x-3\,\big) & x^3+0x^2+5x-20 \\
 & \underline{(-)x^3-3x^2} \\
 & 3x^2+5x \\
 & \underline{(-)3x^2-9x} \\
 & 14x-20 \\
 & \underline{(-)14x-42} \\
 & 22
\end{array}$$

The quotient of $\left(x^3+5x-20\right)\div(x-3)$ is $x^2+3x+14$ with a remainder 22, which can be written as option $\boxed{B.\ x^2+3x+14+\frac{22}{x-3}}$.

Answer 46MYS.

Consider the following rational expression.

$$\frac{x^2+5x+6}{x^2-x-12} \div \frac{x+2}{x^2+x-20}$$

$$= \frac{x^2+5x+6}{x^2-x-12} \cdot \frac{x^2+x-20}{x+2}$$ Multiply by the reciprocal of $\frac{x+2}{x^2+x-20}$.

$$= \frac{(x+3)(x+2)}{(x-4)(x+3)} \cdot \frac{(x+5)(x-4)}{(x+2)}$$ Factor the numerator and denominator.

$$= \frac{\cancel{(x+3)}\,\cancel{(x+2)}}{\cancel{(x-4)}\,\cancel{(x+3)}} \cdot \frac{(x+5)\,\cancel{(x-4)}}{\cancel{(x+2)}}$$ The GCF is $(x+3)(x+2)(x-4)$.

$$= x+5$$ Simplify.

Thus, the quotient is $\boxed{x+5}$.

Answer 47MYS.

Consider the following rational expression.

$$\frac{m^2+m-6}{m^2+8m+15} \div \frac{m^2-m-2}{m^2+9m+20}$$

$$= \frac{m^2+m-6}{m^2+8m+15} \cdot \frac{m^2+9m+20}{m^2-m-2}$$ Multiply by the reciprocal of $\frac{m^2-m-2}{m^2+9m+20}$.

$$= \frac{(m+3)(m-2)}{(m+5)(m+3)} \cdot \frac{(m+5)(m+4)}{(m-2)(m+1)}$$ Factor the numerator and denominator.

$$= \frac{\cancel{(m+3)}\,\cancel{(m-2)}}{\cancel{(m+5)}\,\cancel{(m+3)}} \cdot \frac{\cancel{(m+5)}\,(m+4)}{\cancel{(m-2)}\,(m+1)}$$ The GCF is $(m+3)(m-2)(m+5)$.

$$= \frac{m+4}{m+1}$$ Simplify.

Thus, the quotient is $\boxed{\frac{m+4}{m+1}}$.

Answer 48MYS.

Consider the following rational expression.

$$\frac{b^2+19b+84}{b-3}\cdot\frac{b^2-9}{b^2+15b+36}$$

$$=\frac{(b+12)(b+7)}{(b-3)}\cdot\frac{(b-3)(b+3)}{(b+12)(b+3)} \quad \text{Factor the numerator and denominator.}$$

$$=\frac{\cancel{(b+12)}(b+7)}{\cancel{(b-3)}}\cdot\frac{\cancel{(b-3)}\cancel{(b+3)}}{\cancel{(b+12)}\cancel{(b+3)}} \quad \text{The GCF is } (b+12)(b-3)(b+3).$$

$$=b+7 \quad \text{Simplify.}$$

Thus, the quotient is $\boxed{b+7}$.

Answer 49MYS.

Consider the following rational expression.

$$\frac{z^2+16z+39}{z^2+9z+18}\cdot\frac{z+5}{z^2+18z+65}$$

$$=\frac{(z+13)(z+3)}{(z+6)(z+3)}\cdot\frac{(z+5)}{(z+5)(z+13)} \quad \text{Factor the numerator and denominator.}$$

$$=\frac{\cancel{(z+13)}\cancel{(z+3)}}{(z+6)\cancel{(z+3)}}\cdot\frac{\cancel{(z+5)}}{\cancel{(z+5)}\cancel{(z+13)}} \quad \text{The GCF is } (z+13)(z+3)(z+5).$$

$$=\frac{1}{z+6} \quad \text{Simplify.}$$

Thus, the quotient is $\boxed{\frac{1}{z+6}}$.

Answer 50MYS.

Consider the following expression:

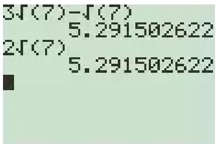
$$3\sqrt{7}-\sqrt{7}$$

$$=(3-1)\sqrt{7} \quad \text{Distributive property.}$$

$$=2\sqrt{7} \quad \text{Simplify.}$$

Thus, the answer is $\boxed{2\sqrt{7}}$.

Use a TI-83 calculator to verify answer:



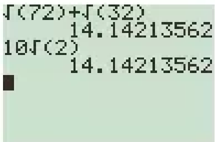
Answer 51MYS.

Consider the following expression:

$$
\begin{aligned}
&\sqrt{72}+\sqrt{32} \\
&=\sqrt{36\cdot 2}+\sqrt{16\cdot 2} && \text{Factor} \\
&=6\sqrt{2}+4\sqrt{2} && \text{Simplify} \\
&=(6+4)\sqrt{2} && \text{Distributive property.} \\
&=10\sqrt{2} && \text{Simplify.}
\end{aligned}
$$

Thus, the answer is $\boxed{10\sqrt{2}}$.

Use a TI-83 calculator to verify answer:



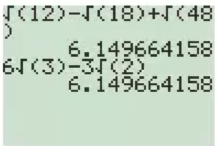
Answer 52MYS.

Consider the following expression:

$$
\begin{aligned}
&\sqrt{12}-\sqrt{18}+\sqrt{48} \\
&=\sqrt{4\cdot 3}-\sqrt{9\cdot 2}+\sqrt{16\cdot 3} && \text{Factor} \\
&=2\sqrt{3}-3\sqrt{2}+4\sqrt{3} && \text{Simplify} \\
&=2\sqrt{3}+4\sqrt{3}-3\sqrt{2} && \text{Group like terms.} \\
&=(2+4)\sqrt{3}-3\sqrt{2} && \text{Distributive property.} \\
&=6\sqrt{3}-3\sqrt{2} && \text{Simplify.}
\end{aligned}
$$

Thus, the answer is $\boxed{6\sqrt{3}-3\sqrt{2}}$.

Use a TI-83 calculator to verify answer:



Answer 53MYS.

Consider the following expression:

$d^2 - 3d - 40$

$= d^2 - 8d + 5d - 40$ Write $-3d$ as $-8d + 5d$.

$= d(d-8) + 5(d-8)$ Distributive property.

$= (d-8)(d+5)$ Factor out $(d-8)$.

Thus, the factor is $\boxed{(d-8)(d+5)}$.

Answer 54MYS.

Consider the following expression:

$x^2 + 8x + 16$

$= x^2 + 4x + 4x + 16$ Write $8x$ as $4x + 4x$.

$= x(x+4) + 4(x+4)$ Distributive property.

$= (x+4)(x+4)$ Factor out $(x+4)$.

Thus, the factor is $\boxed{(x+4)(x+4) \text{ or } (x+4)^2}$.

Answer 55MYS.

Consider the following expression:

$t^2 + t + 1$

For the trinomial $t^2 + t + 1$, $b = 1$, and $c = 1$. There are no such pair of numbers, whose sum is 1 and whose product is 1.

Thus, the expression is $\boxed{\text{prime}}$.

Answer 57MYS.

Consider the following expression:

$\left(6n^2 - 6n + 10m^3\right) + \left(5n - 6m^3\right)$

$= 6n^2 - 6n + 10m^3 + 5n - 6m^3$ Distributive property.

$= 10m^3 - 6m^3 + 6n^2 - 6n + 5n$ Group like terms.

$= 4m^3 + 6n^2 - n$ Combine like terms.

Thus, the sum is $\boxed{4m^3 + 6n^2 - n}$.

Answer 58MYS.

Consider the following expression:

$$\left(3x^2+4xy-2y^2\right)+\left(x^2+9xy+4y^2\right)$$

$= 3x^2+4xy-2y^2+x^2+9xy+4y^2$ Distributive property.

$= 3x^2+x^2+4xy+9xy-2y^2+4y^2$ Group like terms.

$= 4x^2+13xy+2y^2$ Combine like terms.

Thus, the sum is $\boxed{4x^2+13xy+2y^2}$.

Answer 59MYS.

Consider the following expression:

$$\left(a^3-b^3\right)+\left(-3a^3-2a^2b+b^2-2b^3\right)$$

$= a^3-b^3-3a^3-2a^2b+b^2-2b^3$ Distributive property.

$= a^3-3a^3-2a^2b+b^2-b^3-2b^3$ Group like terms.

$= -2a^3-2a^2b+b^2-3b^3$ Combine like terms.

Thus, the sum is $\boxed{-2a^3-2a^2b+b^2-3b^3}$.

Answer 60MYS.

Consider the following expression:

$$\left(2g^2+6h\right)+\left(-4g^2-8h\right)$$

$= 2g^2+6h-4g^2-8h$ Distributive property.

$= 2g^2-4g^2+6h-8h$ Group like terms.

$= -2g^2-2h$ Combine like terms.

Thus, the sum is $\boxed{-2g^2-2h}$.