Chapter 1 Equations and Inequalities

Ex 1.2

Answer 1e.

For any power x^y, the base is x and the exponent is y. The exponent represents the number of times the base is used as a factor.

Label the base and the exponent.

base $\rightarrow 12^{7\rightarrow \text{Exponent}}$

Thus, the base is 12 and 7 is the exponent.

Answer 1gp.

The given power has the exponent as 3 and the base as 6. This means that 6 is a factor 3 times.

$$6^3 = 6 \cdot 6 \cdot 6$$

Now, multiply from left to right.

$$6 \cdot 6 \cdot 6 = 216$$

Therefore, the given power evaluates to 216.

Answer 1q.

Add 2 to both sides of the given equation.

$$5b - 2 + 2 = 8 + 2$$
$$5b = 10$$

Divide both the sides by 5.

$$\frac{5b}{5} = \frac{10}{5}$$
$$b = 2$$

The solution appears to be 2.

CHECK

Substitute 2 for b in the original equation.

$$5b - 2 = 8$$

$$5(2) - 2 \stackrel{?}{=} 8$$

$$10 - 2 \stackrel{?}{=} 8$$

$$8 = 8 \checkmark$$

The solution checks.

Therefore, the solution to the given equation is 2.

Answer 2e.

Like terms means terms with same degree of same variables attached and only these terms can be added and subtracted.

That is, for a given two terms to be like, they must have same base variable attached to each other and its exponent/degree should also be same.

In short, the power expression should be similar.

For example:

i. $4x^2$ and $-3x^2$ are like terms. Here, the power expression is x^2 which is identical with x being the base similar variable and 2 being similar exponent.

ii. $2x^3$ and $5x^4$ are not like terms because they have common base variable x, but different exponents 3 and 4 respectively.

Answer 2gp.

Given power expression is -2^6

Clearly, in -2^6, 2 is acting as base and 6 as its exponent. As the exponent indicates the number of times the base is written in multiplication. So, in -2^6, 2 will be written 6 times in multiplication with negative sign in front of it.

Thus, $-2^6 = -(2.2.2.2.2.2)$

$= -64$

Hence, $\boxed{-2^6 = -64}$

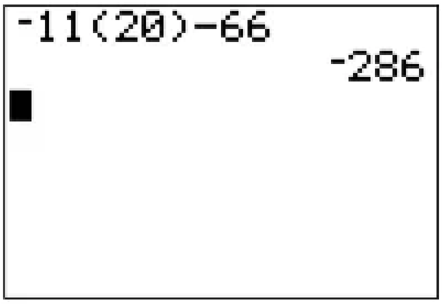
Answer 2q.

Given is: $-11(20)-66$

In order to evaluate above expression using graphical calculator, below steps needs to be performed as shown in snapshots.

1. Press $(-)$ key
2. Press key 1, two times to type 11
3. Press key (
4. Press key 2 and then press key 0, to type 20.
5. Press key)
6. Press key –
7. Press key 6, two times to type 66
8. Press key ENTER, to get the final result of above expression at your graphical calculator screen.

Complete snapshot is attached below:-



Answer 3e.

Observe the given statement.
In the power -3^4, the base is 3 and the exponent is 4. Evaluate the power.

$$\begin{aligned} -3^4 &= -(3\cdot 3\cdot 3\cdot 3) \\ &= -81 \end{aligned}$$

We find the answer to be -81. This is different from that given in the statement.

Evaluate considering that the exponent was applicable for the "–" sign.

$$\begin{aligned} (-3)^4 &= (-3)\cdot(-3)\cdot(-3)\cdot(-3) \\ &= 81 \end{aligned}$$

On comparing we find that the error in the statement was in the evaluation. The exponent was considered to be applicable for the "–" sign as well, which is incorrect. The correct statement is $-3^4 = -81$.

Answer 3gp.

In the given power, the exponent is 6 and the base is −2. The parentheses indicate that the exponent is applicable to the "−" sign also. This means −2 is a factor 6 times.

$$(-2)^6 = -2 \cdot -2 \cdot -2 \cdot -2 \cdot -2 \cdot -2$$

Multiply the terms. We know that the product of two numbers with the same sign is positive, and that the product of two numbers with different signs is negative

$$\begin{aligned} -2 \cdot -2 \cdot -2 \cdot -2 \cdot -2 \cdot -2 &= 4 \cdot -2 \cdot -2 \cdot -2 \cdot -2 \\ &= -8 \cdot -2 \cdot -2 \cdot -2 \end{aligned}$$

Perform all multiplication.

$$\begin{aligned} -8 \cdot -2 \cdot -2 \cdot -2 &= 16 \cdot -2 \cdot -2 \\ &= -32 \cdot -2 \\ &= 64 \end{aligned}$$

Therefore, the result is 64.

Answer 3q.

Open the parentheses using the distributive property.

$$\begin{aligned} 2(m) + 2(-4) &= m + 2 \\ 2m - 8 &= m + 2 \end{aligned}$$

Subtract m from both sides of the equation.

$$\begin{aligned} 2m - 8 - m &= m + 2 - m \\ m - 8 &= 2 \end{aligned}$$

Add 8 to each side.

$$\begin{aligned} m - 8 + 8 &= 2 + 8 \\ m &= 10 \end{aligned}$$

The solution appears to be 10.

CHECK

Substitute 10 for m in the original equation.

$$2(m - 4) = m + 2$$

$$2(10 - 4) \stackrel{?}{=} 10 + 2$$

$$\begin{aligned} 2(6) &\stackrel{?}{=} 12 \\ 12 &= 12 \quad \checkmark \end{aligned}$$

The solution checks.

Therefore, the solution to the given equation is 10.

Answer 4e.

Given power expression is 2^3.

Clearly, in 2^3, 2 is acting as base and 3 as its exponent. As the exponent indicates the number of times the base is being written in multiplication. So, in 2^3, 2 will be written 3 times in multiplication.

Thus, $2^3 = 2.2.2$

$= 8$

Hence, $\boxed{2^3 = 8}$

Answer 4gp.

Given expression is

$$5x(x-2) \text{ when } x = 6$$

Put $x = 6$ in given expression, it becomes

$$= 5(6)(6-2)$$

Simplify brackets, it becomes

$$= 5(6)(4)$$

Multiplying, it becomes

$$= 120$$

So, value of given expression $5x(x-2)$ when $x = 6$ is $\boxed{120}$

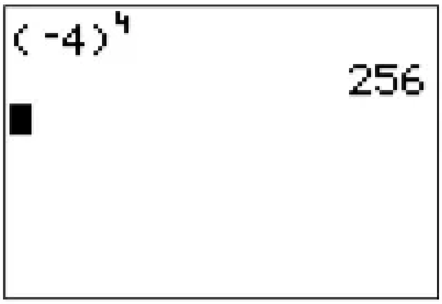
Answer 4q.

Given is: $(-4)^4$

In order to evaluate above expression using graphical calculator, below steps needs to be performed as shown in snapshots.

1. Press key (
2. Press $(-)$ key
3. Press key 4
4. Press key)
5. Press key ^
6. Press key 4
7. Press key ENTER, to get the final result of above expression at your graphical calculator screen.

Complete snapshot is attached below:-



Answer 5e.

The given power has base as 3 and exponent as 4. This means that 3 is used as a factor 4 times.

$3^4 = 3 \cdot 3 \cdot 3 \cdot 3$

Now, multiply from left to right.

$$3 \cdot 3 \cdot 3 \cdot 3 = 9 \cdot 9$$
$$= 81$$

Therefore, the given power evaluates to 81.

Answer 5gp.

Replace y with −2 in the given expression.

$3(-2)^2 - 4(-2)$

The given expression contains more than one operation and we can use the order of operations to evaluate the expression. According to the order of operations, the expression within the grouping symbols has to be evaluated first.

But the sets of parentheses in this expression are not used for grouping. Since there are no grouping symbols in the given expression, the power has to be evaluated first.

$$\begin{aligned}(-2)^2 &= -2 \cdot -2 \\ &= 4\end{aligned}$$

Thus, the expression simplifies to. $3(4) - 4(-2)$

Since multiplication has higher precedence than subtraction, perform multiplication next.

$3(4) - (-8) = 12 + 8$

Now, add the terms.

$12 + 8 = 20$

Therefore, the given expression evaluates to 20.

Answer 5q.

STEP 1 Subtract $4x$ from both sides of the given equation to solve for y.

$$\begin{aligned}4x + y - 4x &= 12 - 4x \\ y &= 12 - 4x\end{aligned}$$

STEP 2 Substitute 4 for x into the equation for y.

$y = 12 - 4(4)$

Simplify.

$$\begin{aligned}y &= 12 - 16 \\ &= -4\end{aligned}$$

The value of y is obtained as −4.

CHECK Substitute 4 for x, and −4 for y in the original equation, and check whether both sides of the equation are equal.

$$4x + y = 12$$

$$4(4) + (-4) \stackrel{?}{=} 12$$

$$16 - 4 \stackrel{?}{=} 12$$

$$12 = 12 \checkmark$$

Therefore, the value of y is −4, for the given value of x.

Given power expression is 4^3

Clearly, in 4^3, 4 is acting as base and 3 as its exponent. As the exponent indicates the number of times the base is written in multiplication. So, in 4^3, 4 will be written 3 times in multiplication.

Thus, $4^3 = 4.4.4$

$= 64$

Hence, $\boxed{4^3 = 64}$

Answer 6gp.

Given expression is $(z+3)^3$ when $z = 1$

Put $z = 1$, it becomes

$=(1+3)^3$

Simplify brackets, it becomes

$=(4)^3$

Simplify power expression

$= 64$

So, value of given expression $(z+3)^3$ when $z = 1$ is $\boxed{64}$

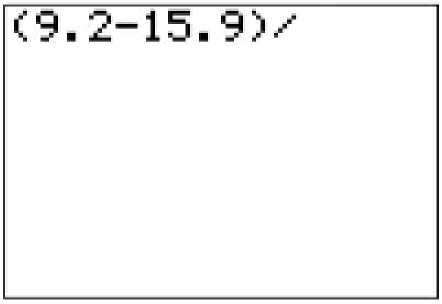
Answer 6q.

Given is: $\dfrac{9.2-15.9}{-19+14}$

In order to evaluate above expression using graphical calculator, below steps needs to be performed as shown in snapshots.

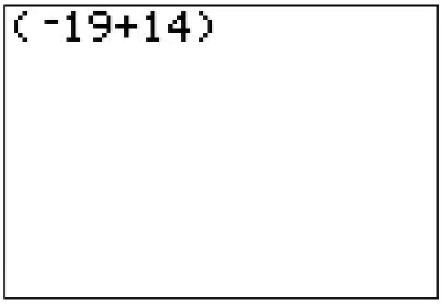
1. Press key (
2. Press key 9, then press key dot (.) and then press key 2 to type 9.2
3. Press key –
4. Press key 1, then press key 5, then press key dot (.) and then press key 9 to type 15.9
5. Press key)
6. Press $(\div)$key

Snapshot till step 6, is as shown below.



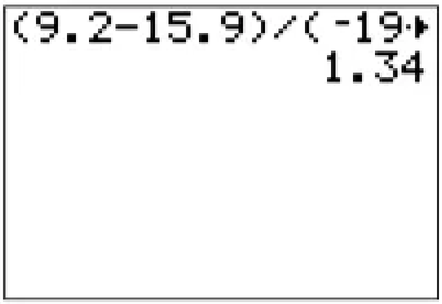
7. Press key (
8. Press $(-)$key
9. Press key 1, then press key 9 to type 19
10. Press key +
11. Press key 1 and then press key 4, to type 14.
12. Press key)

Snapshot from step 7 to 12, is as shown below.



13. Press key ENTER, to get the final result of above expression at your graphical calculator screen.

Complete snapshot showing result is attached below:-



Hence result, is $\frac{9.2-15.9}{-19+14}=1.34$

Answer 7e.

A term consisting of an exponent and a base is called a power term. The exponent represents the number of times the base is used as a factor. For any power x^y, the base is x and the exponent is y.

For the given power, 2 is the exponent and 7 is the base. This implies that 7 is used as a factor 2 times.

$7^2 = 7 \cdot 7$

Now, multiply.

$7 \cdot 7 = 49$

Therefore, the given expression evaluates to 49.

Answer 7gp.

STEP 1 Let c be the number of candles sold. We know that profit is the difference between income and expenses. The income can be found by taking the product of the number of candles and the price per candle.

Write a verbal model using the available information.

$$\begin{array}{ccccc} \text{Price per candle} & \cdot & \text{Number of candles sold} & - & \text{Expenses} \\ \text{(dollars/candle)} & & \text{(candles)} & & \text{(dollars)} \\ \Downarrow & & \Downarrow & & \Downarrow \\ 3 & \cdot & c & - & 120 \end{array}$$

Thus, an expression that shows the profit is $3c - 120$.

STEP 1 Evaluate the expression in **STEP 1** when $c = 135$.

Substitute 135 for c in $3c - 120$.
$3c - 120 = 3(135) - 120$

Follow the order of operations and perform multiplication first.
$3(135) - 120 = 405 - 120$

Now, subtract.
$405 - 120 = 285$

Therefore, the profit made on selling 135 candles is \$285.

Answer 7q.

Substitute -5 for m in the given expression.
$10m + 32 = 10(-5) + 32$

Since there is more than one operation to be carried out, we have to apply the order of operations. By the order, multiplication has higher priority than addition.

Perform the multiplication first.
$10(-5) + 32 = -50 + 32$

Now, do the addition.
$-50 + 32 = -18$

Therefore, the expression evaluates to -18 when $m = -5$.

Answer 8e.

Given power expression is -5^2

Clearly in -5^2, 5 is acting as base and 2 as the exponent.As the exponent indicates the number of times the base is being written in multiplication. So, in -5^2, 5 will be written 2 times in multiplicative with a negative sign in front of it.

Thus, $-5^2 = -(5.5)$

$= -25$

Hence, $\boxed{-5^2 = -25}$

Answer 8gp.

Given expression is

$$2+5x-6x^2+7x-3$$

The individual parts/values of the given expression which are being added or subtracted constitutes a term.

Here, the various terms of given expression are as follows.

Terms:- $2, 5x, 6x^2, 7x, 3$

These various terms are divided into two parts, variable and constant terms according to the fact that they contain and does not contain any unknown variable like x, y, z etc. respectively.

Using above rule, it is clear that 2 and 3 does not contain any variable x, y, z with them, so they are constant terms whereas $5x, 6x^2, 7x$ which contain x are variable terms.

Thus, constant terms: 2 and 3

Variable terms: $5x, 6x^2, 7x$

Next is coefficient. Coefficient is a number prefixed along with a variable power like $x, x^2, x^3, \ldots$ in a variable term.

In above given variable terms of given expression.

Coefficient of $5x$ is 5
Coefficient of $6x^2$ is 6
Coefficient of $7x$ is 7

Finally, is the like terms. Like terms are those in which variable power is same like $x, 2x, 3x$ etc. are like terms. $x^2, 3x^2, 5x^2$ etc. are like terms. Also, constants 1,2,3 etc are like terms.

Out of above given terms, like terms are 2 and 3, $5x$ and $7x$

Evaluating and simplifying the expression :

Writing the given expression again :

$$2+5x-6x^2+7x-3$$

Rearranging all the terms in decreasing power of x and combining all the like terms together.

$$=-6x^2+(7x+5x)+(2-3)$$

Simplifying the like terms

$$=-6x^2+12x-1$$

Hence, $\boxed{2+5x-6x^2+7x-3=-6x^2+12x-1}$

Answer 8q.

Given expression is: x^6 when $x=-3$

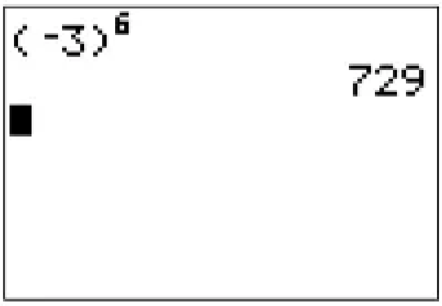
On putting the value of $x=-3$ in the given expression x^6, it becomes as below.

Given value is $(-3)^6$

In order to evaluate above expression using graphical calculator, below steps needs to be performed as shown in snapshots.

1. Press key (
2. Press $(-)$ key
3. Press key 3
4. Press key)
5. Press key ^
6. Press key 6
7. Press key ENTER, to get the final result of above expression at your graphical calculator screen.

Complete snapshot is attached below:-



Answer 9e.

A term consisting of an exponent and a base is called a power term. The exponent represents the number of times the base is used as a factor. For any x^y, the base is x and y is the exponent.

The given power has −2 as the base and 5 as the exponent. Thus, −2 is used as a factor 5 times.

$$(-2)^5 = -2 \cdot -2 \cdot -2 \cdot -2 \cdot -2$$

Now, perform multiplication from left to right. We know that the product of two negative numbers is a positive number.

$$\begin{aligned} -2 \cdot -2 \cdot -2 \cdot -2 \cdot -2 &= 4 \cdot 4 \cdot -2 \\ &= 16 \cdot -2 \\ &= -32 \end{aligned}$$

Therefore, the given expression evaluates to −32.

Answer 9gp.

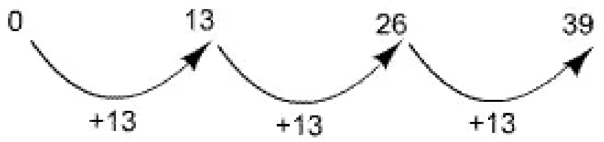
The given expression can be simplified by combining the like terms. The terms with same variable parts that are raised to the same exponent are called like terms. We can also consider constants as like terms.

In the given expression, $15m$ and $9m$ are like terms.
Combine the like terms.
$15m - 9m = 6m$

Thus, the simplified expression is $6m$.

Answer 9q.

We can see that each y-value increases by 13 units per x-value.



Now, we can write the verbal model for the table.

$$\begin{array}{ccccc} y\text{-value} & = & \text{Rate of change} & \cdot & x\text{-value} \\ \Downarrow & & \Downarrow & & \Downarrow \\ y & = & 13 & \cdot & x \end{array}$$

Therefore the equation representing the table is $y = 13x$.

Answer 10e.

Given power expression is -8^3

Clearly, in -8^3, 8 is acting as base and 3 as its exponent. As the exponent indicates the number of times, the base is written in multiplication. So, in -8^3, 8 will be written 3 times in multiplication with negative sign in front of it.

Thus, $-8^3 = -(8.8.8)$

$$= -512$$

Hence, $\boxed{-8^3 = -512}$

Answer 10gp.

Given expression is

$$2n - 1 + 6n + 5$$

Combining like terms, it becomes

$$= (2n + 6n) + (5 - 1)$$

Simplifying like terms, it becomes

$$= 8n + 4$$

Hence, $\boxed{2n - 1 + 6n + 5 = 8n + 4}$.

Answer 10q.

Given expression is: $\frac{10x}{2z-3}$ when $x = -3$ and $z = -6$

On putting the value of $x = -3$ and $z = -6$ in the given expression $\frac{10x}{2z-3}$, it becomes as below.

Given value is $\frac{10(-3)}{2(-6)-3}$

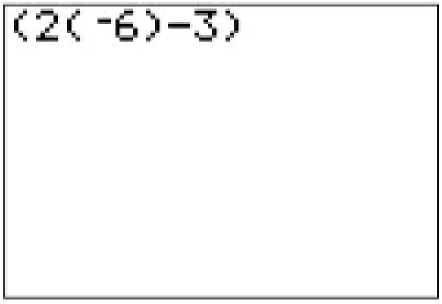
In order to evaluate above expression using graphical calculator, below steps needs to be performed as shown in snapshots.

1. Press key (
2. Press key 1, then press key 0 to type 10.
3. Press key (
4. Press key $(-)$
5. Press key 3
6. Press key)
7. Press key)
8. Press $(\div)$key

Snapshot till step 8, is as shown below.

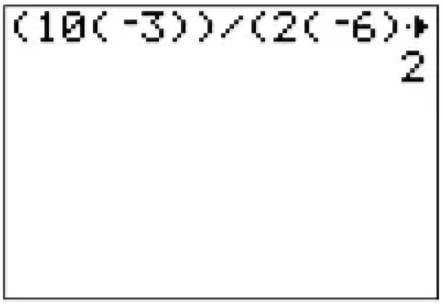
9. Press key (
10. Press key 2
11. Press key (
12. Press key $(-)$
13. Press key 6
14. Press key)
15. Press key –
16. Press key 3
17. Press key)

Snapshot from step 9 to 17, is as shown below.



18. Press key ENTER, to get the final result of above expression at your graphical calculator screen.

Complete snapshot showing result is attached below:-



Hence result of $\frac{10x}{2z-3}$ when $x=-3$ and $z=-6$ is 2

Answer 11e.

In the given power, the exponent is 4 and the base is 10. This means that 10 is a factor 4 times. The exponent is not applicable to the "–" sign.

$-10^4 = -(10 \cdot 10 \cdot 10 \cdot 10)$

Multiply the terms within the parentheses.

$-(10 \cdot 10 \cdot 10 \cdot 10) = -1000$

Therefore, the result is –1000.

Answer 11gp.

The given expression can be simplified by combining the like terms. The terms with same variable parts that are raised to the same exponent are called like terms. We can also consider constants as like terms.

In the given expression, $3p^3$ and p^3 are like terms.
Group together the like terms.
$3p^3 + 5p^2 - p^3 = (3p^3 - p^3) + 5p^2$

Combine the like terms.
$(3p^3 - p^3) + 5p^2 = 2p^3 + 5p^2$

Thus, the simplified expression is $2p^3 + 5p^2$.

Answer 11q.

It is given that the fee for the first lesson is 1.5 times the fee for the later lessons. The total fee is the sum of the fee for the first lesson and the fee of the later 9 lessons.

We can represent this as a verbal model.

$$\begin{array}{ccccccccc} \text{Total fee (dollars)} & = & 1.5 & \cdot & \text{Fee for a lesson (dollars)} & + & 9 & \cdot & \text{Fee for a lesson (dollars)} \\ \Downarrow & & \Downarrow & & \Downarrow & & \Downarrow & & \Downarrow \\ 315 & = & 1.5 & \cdot & x & + & 9 & \cdot & x \end{array}$$

The equation obtained from this is $315 = 1.5x + 9x$.

Simplify the equation.
$315 = 10.5x$

Divide both the sides by 10.5 and simplify.

$$\frac{315}{10.5} = \frac{10.5x}{10.5}$$
$$30 = x$$

Thus, the fee for a lesson is \$30.

$$\text{The fee for the first lesson} = 30 \cdot (1.5) = 45$$

Therefore, the fee for the first lesson is \$45 and the fee for a later lesson is \$30.

Answer 12e.

Given power expression is $(-3)^2$

Clearly, in $(-3)^2$, -3 is acting as base and 2 as its exponent. As the exponent indicates the number of times the base is written in multiplication. So, in $(-3)^2$, -3 will be written 2 times in multiplication.

Thus, $(-3)^2 = (-3).(-3)$

$$= 9$$

Hence, $\boxed{(-3)^2 = 9}$

Answer 12gp.

Given expression is

$$2q^2 + q - 7q - 5q^2$$

Combining like terms, it becomes

$$= (2q^2 - 5q^2) + (q - 7q)$$

Simplifying like terms, it becomes

$$= -3q^2 - 6q$$

Hence, $\boxed{2q^2 + q - 7q - 5q^2 = -3q^2 - 6q}$

Answer 12q.

Given expression is: $(-4x+9)\div(y+2)$ when $x=-3$ and $y=5$

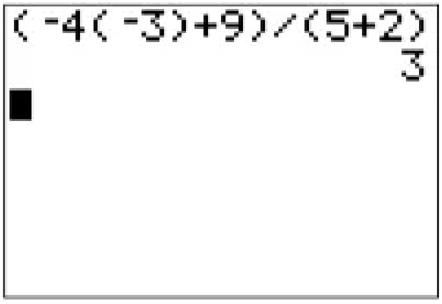
On putting the value of $x=-3$ and $y=5$ in the given expression $(-4x+9)\div(y+2)$, it becomes as below.

Given value is $(-4(-3)+9)\div(5+2)$

In order to evaluate above expression using graphical calculator, below steps needs to be performed as shown in snapshots.

1. Press key (
2. Press key $(-)$
3. Press key 4
4. Press key (
5. Press key $(-)$
6. Press key 3
7. Press key)
8. Press key +
9. Press key 9
10. Press key)
11. Press $(\div)$ key
12. Press key (
13. Press key 5
14. Press key +
15. Press key 2
16. Press key)
17. Press key ENTER, to get the final result of above expression at your graphical calculator screen.

Complete snapshot showing result is attached below:-



Hence result of $(-4x+9)\div(y+2)$ when $x=-3$ and $y=5$ is 3

Answer 13e.

In the given power, the exponent is 3 and the base is -4. The parentheses indicates that the exponent is applicable to "–" sign also. This means -4 is a factor 3 times.

$(-4)^3 = -4 \cdot -4 \cdot -4$

Multiply the terms within the parentheses.

$-4 \cdot -4 \cdot -4 = -64$

Therefore, the result is -64.

Answer 13gp.

Apply the distributive property to remove the parentheses.

$8(x - 3) - 2(x + 6) = 8x - 24 - 2x - 12$

Group the like terms.

$8x - 24 - 2x - 12 = (8x - 2x) - (24 + 12)$

Combine the like terms.

$(8x - 2x) - (24 + 12) = 6x - 36$

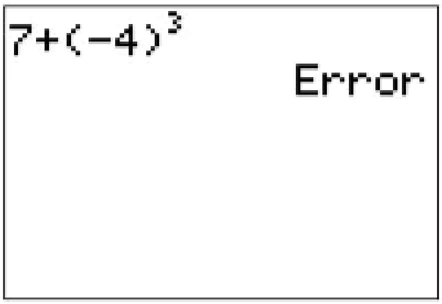
Thus, the simplified expression is $6x - 36$.

Answer 13q.

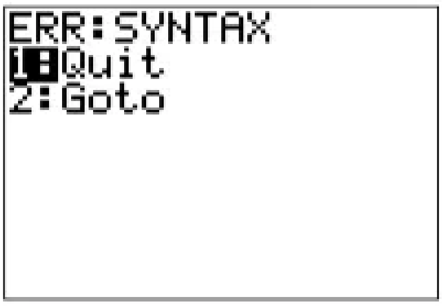
Given expression is: $7+(-4)^3$

Error message received by pressing the keys as done by student, resulted in generating an error message as shown below.

Snapshot (1) after typing and before pressing enter key is as below.



Snapshot (2) after pressing enter, generating error message, is as below

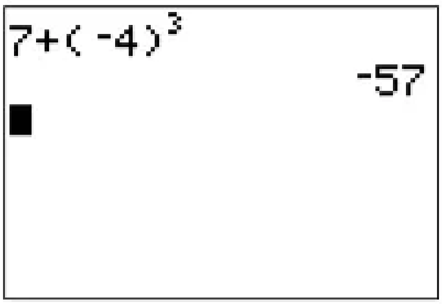


Error committed by the student, is while typing -4 using graphical calculator. He typed following keys

1. Press – key
2. Press key 4

Student should have typed it like as shown in following steps along with final snapshot giving correct result.

1. Press key 7
2. Press key +
3. Press key (
4. Press $(-)$ key
5. Press key 4
6. Press key)
7. Press key ^
8. Press key 3
9. Press key ENTER, to get the final result of above expression at your graphical calculator screen.



Answer 14e.

Given power expression is $(-2)^8$

Clearly, in $(-2)^8$, -2 is acting as base and 8 as its exponent. As the exponent indicates the number of times the base is written in multiplication. So, in $(-2)^8$, -2 will be written 8 times in multiplication.

Thus, $(-2)^8 = (-2).(-2).(-2).(-2).(-2).(-2).(-2).(-2)$

$= 256$

Hence, $\boxed{(-2)^8 = 256}$

Answer 14gp.

Given expression is

$$-4y - x + 10x + y$$

Combining like terms, it becomes

$$= (-4y + y) + (-x + 10x)$$

Simplifying like terms, it becomes

$$= 9x - 3y$$

Hence, $\boxed{-4y - x + 10x + y = 9x - 3y}$

Answer 15e.

In the given power, exponent is 2 and base is −8. This means that −8 is a factor 2 times.

$(-8)^2 = -8 \cdot -8$

Multiply the terms within the parentheses.

$-8 \cdot -8 = 64$

Therefore, the result is 64.

Answer 15gp.

Let n be the number of large prints. Then, the number of small prints is $15 - n$.

Write a verbal model using the available information.

$$\underset{0.75}{\underset{\downarrow}{\begin{matrix}\text{Price of}\\ \text{large print}\\ (\text{dollars/print})\end{matrix}}} \cdot \underset{n}{\underset{\downarrow}{\begin{matrix}\text{Number of}\\ \text{large prints}\\ (\text{prints})\end{matrix}}} + \underset{0.25}{\underset{\downarrow}{\begin{matrix}\text{Price of}\\ \text{small print}\\ (\text{dollars/print})\end{matrix}}} \cdot \underset{15-n}{\underset{\downarrow}{\begin{matrix}\text{Number of}\\ \text{small prints}\\ (\text{prints})\end{matrix}}}$$

An expression for the total cost is $0.75n + 0.25(15 - n)$

Use the distributive property to clear the parentheses.
$0.75n + 0.25(15 - n) = 0.75n + 3.75 - 0.25n$.

Group together the like terms.
$0.75n + 3.75 - 0.25n = 0.75n - 0.25n + 3.75$

Combine the like terms.
$0.75n - 0.25n + 3.7 = 0.50n + 3.75$

Thus, the simplified expression for the total cost $0.50n + 3.75$.

Replace n with 5 in the simplified expression.

$$0.50n + 3.75 = 0.50(5) + 3.75$$
$$2.50 + 3.75 = 6.25$$

Therefore, the total cost is \$6.25.

Answer 16e.

Given expression is

$$5d - 6 \text{ when } d = 7$$

Put $d = 7$, it becomes

$$= 5 \times 7 - 6$$

Simplify multiplication first, it becomes

$$= 35 - 6$$

Now, subtract them, it becomes

$$= 29$$

So, value of expression $5d - 6$ when $d = 7$ is $\boxed{29}$

Answer 17e.

Substitute 2 for f in the given expression.
$-10(2) + 15$

This expression contains multiplication and addition operations. By the order of operations, multiplication has higher priority than addition.

Perform the multiplication first.
$-20 + 15$

Now, perform the addition.
$-20 + 15 = -5$

Thus, the expression evaluates to -5 when $f = 2$.

Answer 18e.

Given expression is

$$6h \div 2 + h \text{ when } h = 4$$

Put $h = 4$, it becomes

$$= 6(4) \div 2 + 4$$

Simplify the brackets, it becomes

$$= 24 \div 2 + 4$$

Simplify the division, it becomes

$$= 12 + 4$$

Adding, it becomes

$$= 16$$

So, value of given expression $6h \div 2 + h$ when $h = 4$ is $\boxed{16}$

Answer 19e.

Substitute 10 for j in the given expression.

$5 \cdot 10 - 3 \cdot 10 \cdot 5$

This expression contains multiplication and subtraction operations. By the order of operations, multiplication has higher priority than subtraction.

Perform all multiplications moving from left to right.

$$\begin{aligned} 5 \cdot 10 - 3 \cdot 10 \cdot 5 &= 50 - 30 \cdot 5 \\ &= 50 - 150 \end{aligned}$$

Now, do the subtraction.

$50 - 150 = -100$

Therefore, the expression evaluates to -100 when $j = 10$.

Answer 20e.

Given expression is

$$(k+2)^2 - 6k \text{ when } k = 5$$

Put $k = 5$, it becomes

$$= (5+2)^2 - 6(5)$$

Simplify the brackets, it becomes

$$= (7)^2 - 30$$

Simplify power, it becomes

$$= 49 - 30$$

Subtracting, it becomes

$$= 19$$

So, value of given expression $(k+2)^2 - 6k$ when $k = 5$ is $\boxed{19}$

Answer 21e.

Substitute 6 for m in the given expression.

$8 \cdot 6+(2 \cdot 6-9)^3$

The given expression contains more than one operation and we can use the order of operations to evaluate the expression. According to the order of operations, the expression within the grouping symbols has to be evaluated first.

Take the expression within the grouping symbols. Since multiplication has higher precedence than subtraction, perform multiplication first.

$(2 \cdot 6-9)^3=(12-9)^3$

Now, perform subtraction.

$(12-9)^3=3^3$

Thus, the value inside the parentheses evaluates to 3, and the given expression reduces to

$8 \cdot 6+3^3$

The power has to be evaluated next.

$3^3=3 \cdot 3 \cdot 3$

Perform multiplication from left to right.

$$\begin{aligned} 3 \cdot 3 \cdot 3 &= 9 \cdot 3 \\ &= 27 \end{aligned}$$

The expression now becomes $8 \cdot 6+27$

Again, follow the order and carry out multiplication.

$8 \cdot 6+27=48+27$

Add the terms.

$48+27=75$

Therefore, the given expression evaluates to 75.

Answer 22e.

Given expression is as below

$$n^3-4n+10$$

Put $n=-3$, it becomes

$$=(-3)^3-4(-3)+10$$

Solving power expression, $(-3)^3=-27$, it becomes

$$=-27-4(-3)+10$$

Multiplying the term, it becomes

$$=-27+12+10$$

Adding all terms, it becomes

$$=-5$$

Hence, value of given expression $n^3-4n+10$ when $n=-3$ is $\boxed{-5}$

Answer 23e.

Substitute -1 for x in the given equation.
$2(-1)^4-4(-1)^3$

According to the order of operations, grouping symbols have to be evaluated first. But the sets of parentheses in this expression are not used for grouping. Since there are no grouping symbols in the given expression, the powers have to be evaluated first.

We know that the product of 2 negative numbers is a positive number and the product of a negative number and a positive number is a negative number.
Evaluate the powers.

$$\begin{aligned}(-1)^4 &= (-1)\cdot(-1)\cdot(-1)\cdot(-1)\\ &= 1\cdot 1\\ &= 1\end{aligned}$$

$$\begin{aligned}(-1)^3 &= (-1)\cdot(-1)\cdot(-1)\\ &= 1\cdot(-1)\\ &= -1\end{aligned}$$

Substitute the values of the powers in the expression.

$2 \cdot 1 - 4 \cdot (-1)$

Perform multiplication from left to right.

$$\begin{aligned} 2 \cdot 1 - 4 \cdot (-1) &= 2 - 4 \cdot (-1) \\ &= 2 - (-4) \end{aligned}$$

Now, simplify.

$$\begin{aligned} 2 - (-4) &= 2 + 4 \\ &= 6 \end{aligned}$$

Therefore, the given expression evaluates to 6.

Answer 24e.

Given expression is

$$2x^2 - 6x + 15 \text{ when } x = -2$$

Put $x = -2$, it becomes

$$= 2(-2)^2 - 6(-2) + 15$$

Solving power expression, $(-2)^2 = 4$, it becomes

$$= 2(4) - 6(-2) + 15$$

Multiplying the terms, it becomes

$$= 8 + 12 + 15$$

Adding all terms, it becomes

$$= 35$$

So, value of given expression $2x^2 - 6x + 15$ when $x = -2$ is $\boxed{35}$

Hence, option $\boxed{C}$ is correct

Answer 25e.

The given expression can be simplified by combining the like terms. Variable terms with the same variable raised to the same exponent are called like terms. Constants are also called like terms.

In the given expression, $9x$ and $4x$ are like terms. Apply the distributive law to combine the like terms.

$9x - 4x + 5 = (9 - 4)x + 5$

Simplify the expression within the parentheses.
$(9-4)x+5=5x+5$

Therefore, the simplified expression is $5x+5$.

Answer 26e.

Given expression is

$$y^2+2y+3y^2$$

Combining like terms, it becomes

$$=(y^2+3y^2)+2y$$

Adding like terms, it becomes

$$=4y^2+2y$$

Hence, $\boxed{y^2+2y+3y^2=4y^2+2y}$

Answer 27e.

The given expression can be simplified by combining the like terms. Variable terms with the same variable raised to the same exponent are called like terms. Constants are also called like terms.

In the given expression, $5z^2$ and $8z^2$ are like terms. Combine the like terms using the distributive law.
$5z^2-2z+8z^2+10=(5+8)z^2-2z+10$

Simplify the expression within the parentheses.
$(5+8)z^2-2z+10=13z^2-2z+10$

Therefore, the simplified expression is $13z^2-2z+10$.

Answer 28e.

Given expression is

$$10w^2-4w+3w^2+18w$$

Combining like terms, it becomes

$$=(10w^2+3w^2)+(-4w+18w)$$

Adding like terms, it becomes

$$=13w^2+14w$$

Hence, $\boxed{10w^2-4w+3w^2+18w=13w^2+14w}$

Answer 29e.

Use the distributive property to open the parentheses.
$7(m-3)+4(m+5)=7m-7(3)+4m+4(5)$

Simplify the expression.
$7m-7(3)+4m+4(5)=7m-21+4m+20$

Group the like terms.
$7m - 21 + 4m + 20 = (7m + 4m) + (-21 + 20)$

Combine the like terms.
$(7m + 4m) + (-21 + 20) = 11m - 1$

Thus, the simplified expression is $11m - 1$

Answer 30e.

Given expression is

$$10(n^2+n)-6(n^2-2)$$

Apply distributive property, it becomes

$$=10n^2+10n-6n^2+12$$

Grouping like terms, it becomes

$$=(10n^2-6n^2)+10n+12$$

Subtracting like terms, it becomes

$$=4n^2+10n+12$$

Hence, $\boxed{10(n^2+n)-6(n^2-2)=4n^2+10n+12}$

Answer 31e.

Use the distributive property to remove the parentheses.
$4p^2 - 12p - 9p^2 + 3(4p + 7) = 4p^2 - 12p - 9p^2 + 12p + 21$

Group the like terms.
$4p^2 - 12p - 9p^2 + 12p + 21 = (4p^2 - 9p^2) + (-12p + 12p) + 21$

Combine the like terms.
$(4p^2 - 9p^2) + (-12p + 12p) + 21 = -5p^2 + 0 + 21$

Simplify the expression.
$-5p^2 + 0 + 21 = -5p^2 + 21$

Thus, the simplified expression is $-5p^2 + 21$

Answer 32e.

Given expression is

$$6(q-2)-2(q^2+6q)$$

Apply distributive property, it becomes

$$=6q-12-2q^2-12q$$

Combining like terms, it becomes

$$=-2q^2+(6q-12q)-12$$

Subtracting like terms, it becomes

$$=-2q^2-6q-12$$

Hence, solution of $\boxed{6(q-2)-2(q^2+6q)=-2q^2-6q-12}$

Answer 33e.

The terms with same variable parts that are raised to the same exponent are called like terms. We can also consider constants as like terms.

The variables in the first choice are different. So, they are not like terms.

The exponents of the variables in the second choice are different. Thus, the second choice also does not represent like terms.

We can see that in the third choice also the variables are different.

The variables and the exponents are the same in the fourth choice.

Therefore, the terms in **choice D** are like terms.

Answer 34e.

Perimeter of given triangle $=$ Sum of length of all its sides

$$= 5a + 2b + (5a + b)$$

Combining like terms, perimeter becomes

$$\text{Perimeter of given triangle} = (5a + 5a) + (2b + b)$$

$$= 10a + 3b$$

Thus, given expression of perimeter of the triangle is

$$\boxed{\text{Perimeter} = 10a + 3b} \quad \ldots\ldots(1)$$

Next, given that $a = 3, b = 10$

Put $a = 3, b = 10$ in (1), it becomes

$$\text{Perimeter} = 10(3) + 3(10)$$

Solving multiplication, it becomes

$$= 30 + 30$$

On adding, it becomes

Hence, $\boxed{\text{Perimeter} = 60}$

Answer 35e.

The given figure represents a rectangle. For a rectangle of length l and breadth b the perimeter is given by $l + l + b + b$, that is, by the sum of all of its sides. We can rewrite the expression as $2(l + b)$.

The length of the given rectangle is $n + 12$, and the breadth is $4n$.

Substitute $n + 12$ for l, $4n$ for b, and simplify.
$2[(n + 12) + 4n] = 2[n + 12 + 4n]$

Use the distributive law to remove the grouping symbol.
$2[n + 12 + 4n] = 2n + 24 + 8n$

Group the like terms and simplify.
$2n + 24 + 8n = 10n + 24$

Thus, the simplified expression for the perimeter is $10n + 24$.

Replace n with 2 and simplify.

$$\begin{aligned} 10 \cdot 2 + 24 &= 20 + 24 \\ &= 44 \end{aligned}$$

Therefore, the perimeter of the rectangle is 44.

Answer 36e.

Perimeter of given square = Sum of length of all its sides

But, as square has all its sides of equal length.

So, its perimeter $= 4(\text{lenght of each side})$

$$= 4(g + 2h)$$

Apply distributive property, it becomes

$$= 4(g) + 4(2h)$$
$$= 4g + 8h$$

Thus, Perimeter of given square $= 4g + 8h$ ......(1)

Now, given that $g = 5, h = 4$

Put these value in (1), it becomes

Perimeter of given square $= 4(5) + 8(4)$

$$= 20 + 32$$

$$= 52$$

Hence, $\boxed{\text{Perimeter of given square} = 52}$

Answer 37e.

Substitute 16 for x, and −9 for y in the given expression.
$5x + 6y = 5(16) + 6(-9)$

Since there is more than one operation to be performed, let us use the order of operations. Multiplication has higher precedence than addition.

Perform all multiplications first.
$5(16) + 6(-9) = 80 - 54$

Now, subtract.
$80 - 54 = 26$

Therefore. the result is 26.

Answer 38e.

Given expression is as below

$$16x+11y \text{ when } x=-2 \text{ and } y=-3$$

Put $x=-2$ and $y=-3$, it becomes

$$=16(-2)+11(-3)$$

Simplify the brackets, it becomes

$$=-32-33$$

Adding, it becomes

$$=-65$$

So, value of given expression $16x+11y$ when $x=-2$ and $y=-3$ is $\boxed{-65}$

Answer 39e.

Substitute 4 for x, and -3 for y in the expression.
$x^3 + 5y = 4^3 + 5(-3)$

Since there is more than one operation to be performed, let us use the order of operations.

Evaluate the power first.
$4^3 + 5(-3) = 64 + 5(-3)$

Perform multiplication before addition.
$64 - 5(-3) = 64 - 15$

Now, subtract.
$64 - 15 = 49$

Therefore. the result is 49.

Answer 40e.

Given expression is as below

$$(3x)^2 - y^3 \text{ when } x = 4 \text{ and } y = 5$$

Put $x = 4$ and $y = 5$, it becomes

$$= [3(4)]^2 - (5)^3$$

Simplify the brackets, it becomes

$$= (12)^2 - (5)^3$$

Simplify power, it becomes

$$= 144 - 125$$

$$= 19$$

So, the value of given expression $(3x)^2 - y^3$ when $x = 4$ and $y = 5$ is $\boxed{19}$

Answer 41e.

Substitute 10 for x, and 8 for y.

$$\frac{x - y}{x + y} = \frac{10 - 8}{10 + 8}$$

The expression can be simplified using the order of operations. The fraction bar in the expression acts as a grouping symbol. The numerator and the denominator are to be evaluated separately

Take the expression from the numerator first. Subtract 8 from 10.
$10 - 8 = 2$

Now, perform addition in the expression in the denominator.
$10 + 8 = 18$

Replace the numerator and the denominator with the simplified values.

$$\frac{10-8}{10+8} = \frac{2}{18}$$
$$= \frac{1}{9}$$

Thus, the expression evaluates to $\frac{1}{9}$ when $x = 10$ and $y = 8$.

Answer 42e.

Given expression is as below

$$\frac{x+2y}{4x-y} \text{ when } x=-3 \text{ and } y=4$$

Put $x=-3$ and $y=4$, it becomes

$$=\frac{-3+2(4)}{4(-3)-4}$$

Simplify the brackets, it becomes

$$=\frac{-3+8}{-12-4}$$

Adding terms on numerator and denominator both, it becomes

$$=\frac{5}{-16}$$

$$=\frac{-5}{16}$$

So, the value of given expression $\frac{x+2y}{4x-y}$ when $x=-3$ and $y=4$ is $\boxed{\frac{-5}{16}}$

Answer 43e.

The given expression can be simplified by combining the like terms. The terms with same variable parts that are raised to the same exponent are called like terms. We can also consider constants as like terms.

In the given expression, $16c$ and $5c$ are like terms, and $10d$ and $3d$ are like terms.
Group the like terms.
$16c - 10d + 3d - 5c = (16c - 5c) + (-10d + 3d)$

Answer 44e.

Given expression is

$$9j+4k-2j-7k$$

Combining like terms, it becomes

$$=(9j-2j)+(4k-7k)$$

Subtracting like terms, it becomes

$$=7j-3k$$

Hence, $\boxed{9j+4k-2j-7k=7j-3k}$

Answer 45e.

The terms with same variable parts that are raised to the same exponent are called like terms. We can also consider constants as like terms.

Rearrange the terms such that the like terms come together.
$2m^2 + 6n^2 - 5n^2 - 8m$

Group the like terms and rewrite the expression.
$2m^2 + (6n^2 - 5n^2) - 8m$

Now, combine the like terms.
$2m^2 + (6n^2 - 5n^2) - 8m = 2m^2 + n^2 - 8m$

Therefore, the given expression evaluates to $2m^2 + n^2 - 8m$.

Answer 46e.

Given expression is

$$p^3+3q^2-q+3p^3$$

Combining like terms, it becomes

$$= \left(p^3+3p^3\right)+3q^2-q$$

Adding like terms, it becomes

$$= 4p^3+3q^2-q$$

Hence, $\boxed{p^3+3q^2-q+3p^3=4p^3+3q^2-q}$

Answer 47e.

The terms with same variable parts that are raised to the same exponent are called like terms. We can also consider constants as like terms.

Rewrite the expression such that the like terms appear together.
$10m^2 + 3m^2 + 3n - 3n - 8 + 3$

Combine the like terms.
$13m^2 + 0 - 5 = 13m^2 - 5$

Therefore, the given expression evaluates to $13m^2 - 5$.

Answer 48e.

Given expression is

$$3y^2+5x-12x+9y^2-5$$

Combining like terms, it becomes

$$=\left(3y^2+9y^2\right)+(5x-12x)-5$$

Adding and subtracting the like terms, it becomes

$$=12y^2-7x-5$$

Hence, $\boxed{3y^2+5x-12x+9y^2-5=12y^2-7x-5}$

Answer 49e.

Use the distributive property to clear the parentheses.

$8(s-t)+16(t-s)=8s-8t+16t-16s$

Group the like terms. The terms having the same variable part raised to the same exponent are called like terms.

$8s-8t+16t-16s=s\,(8-16)+t\,(16-8)$

Simplify the expression within the two sets of parentheses.

$$\begin{aligned} s(8-16)+t(16-8) &= s\,(-8)+t\,(8) \\ &= -8\,s+8\,t \end{aligned}$$

Therefore, the simplified expression is $-8s+8t$.

Answer 50e.

Given expression is as below

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

Apply distributive property, it becomes

$$=3x^2-3y+9x^2+18y$$

Combining like terms, it becomes

$$=\left(3x^2+9x^2\right)+(18y-3y)$$

Adding and subtracting like terms, it becomes

$$=12x^2+15y$$

Hence, $\boxed{3\left(x^2-y\right)+9\left(x^2+2y\right)=12x^2+15y}$

Answer 51e.

The algebraic expression has to contain three coefficients. In a term, that is a product of a number and a power of a variable, the number part is the coefficient. Let us take the coefficients as 1, 3, and 4.

Now, we need two like terms. The terms having the same variable parts raised to the same power are called like terms. Use any two of the coefficients, say, 3 and 4, along with any variable, say, y to write two like terms. Thus, two like terms are $3y$ and $4y$.

The final requirement is that there should be a constant term. Let us take the constant term as 12.

Use the coefficient, like terms, and the constant to write an algebraic expression. A variable term with coefficient 1 is y^2.

An algebraic expression answering the required conditions is $y^2 + 3y - 12 + 4y$.

Simplify the expression.
Group the like terms using the distributive property.
$y^2 + 3y - 12 + 4y = y^2 + (3 + 4)\,y - 12$

Now, add the terms within the parentheses.
$x^2 + (4 + 3)\,y + 12 = x^2 + 7y + 12$

Therefore, the simplified expression is $y^2 + 7y - 12$.

Answer 52e.

Given expression :

$$9+12\div3-1=15 \qquad \ldots\ldots(1)$$

To make given statement true, parentheses will be added/inserted to $3-1$ and new statement will look like:

$$9+12\div(3-1)=15 \qquad \ldots\ldots(2)$$

Checking of the truthfulness of new statement:

Left hand side of (2) $=9+12\div(3-1)$

Simplifying the brackets, it becomes

$=9+12\div(2)$

Simplifying the division, it becomes

$=9+6$

$=15$

$=$ right hand side of (2)

Hence, new statement (2) obtained by adding parentheses in statement (1) has now become a true statement.

Answer 53e.

Let us use two sets of parentheses to group the first two terms and the last two terms on the left hand side.

$(4+3)\cdot(5-2)$

Evaluate the expression and check whether the right hand side is obtained.

By the order of operation, simplify within the two sets of parentheses first.

$$(4+3)\cdot(5-2) = 7\cdot(5-2)$$
$$= 7\cdot 3$$

Now, multiply.

$7\cdot 3 = 21$

The right hand side is obtained.

Therefore, the correct statement is $(4+3)\cdot(5-2) = 21$.

Answer 54e.

Given expression:

$$8+5^2-6\div 3=9 \qquad \text{......(1)}$$

To make given statement true, parentheses will be added/inserted to $8+5^2-6$ and new statement will look like:

$$\left(8+5^2-6\right)\div 3=9 \qquad \text{......(2)}$$

Checking of the truthfulness of new statement:

Left hand side of (2) $=\left(8+5^2-6\right)\div 3$

Simplifying the power expression in brackets, it becomes

$$=(8+25-6)\div 3$$

Simplifying the addition and subtractions in brackets, it becomes

$$=(27)\div 3$$
$$=9$$
$$=\text{ right hand side of (2)}$$

Hence, new statement (2) obtained by adding parentheses in statement (1) has now become a true statement

Answer 55e.

We can use two sets of parentheses to group the first two terms and the last two terms on the left hand side

$$\left(3 \cdot 4^2\right) - \left(2^3 + 3^2\right) = \left(3 \cdot 16\right) - \left(8 + 9\right)$$

Now, evaluate the expression by using the order of operation.
Evaluate the expressions inside the two sets of parentheses first.

$$\begin{aligned}\left(3 \cdot 16\right) - \left(8 + 9\right) &= 48 - \left(8 + 9\right) \\ &= 48 - 17\end{aligned}$$

Now, perform subtraction.
$48 - 17 = 31$

The grouping is incorrect, because the left hand side did not evaluate to 23.

Now, let us try another grouping, say, $\left(3 \cdot 4\right)^2 - \left(2^3 + 3\right)^2$

Evaluate the expression within the two sets of parentheses.

$$\left(3 . 4\right)^2 = 12^2$$

$$\begin{aligned}\left(2^3 + 3\right)^2 &= \left(\left(2 . 2 \cdot 2\right) + 3\right)^2 \\ &= \left(\left(8\right) + 3\right)^2 \\ &= 11^2\end{aligned}$$

Thus, the expression reduces to $12^2 - 11^2$

Evaluate the powers.

$$\left(12 \cdot 12\right) - \left(11 \cdot 11\right) = 144 - 121$$

Perform subtraction.
$144 - 121 = 23$

The right-hand side is obtained.
Therefore, the correct statement is $(3 \cdot 4)^2 - (2^3 + 3)^2 = 23$.

Answer 56e.

Consider the expression:

$$(x+y)^2$$

Consider it as power expression with base as $x+y$ and exponent 2, it can be simplified by writing $(x+y)$ twice in multiplication.

$$(x+y)^2=(x+y)(x+y)$$

Apply distributive property, it becomes

$$=(x+y)x+(x+y)y$$

Again apply distributive property, it becomes

$$=x.x+y.x+x.y+y.y$$

Writing $x.x=x^2$, $y.y=y^2$ and $y.x=x.y$

$$=xy$$

Thus, $(x+y)^2=x^2+xy+xy+y^2$

Adding like terms, it becomes

$$=x^2+2xy+y^2$$

Thus, $(x+y)^2=x^2+2xy+y^2$ ......(1)

Now, given is $(x+y)^2=x^2+y^2$ ......(2)

Equating (1) and (2), it becomes

$$x^2+2xy+y^2=x^2+y^2$$

Subtracting x^2 from both sides, it becomes

$$x^2+2xy+y^2-x^2=y^2$$

$$2xy+y^2=y^2$$

Subtracting y^2 from both sides, it becomes

$$2xy+y^2-y^2=0$$

$$2xy=0$$

Thus, either $x=0$ or $y=0$

So, we conclude that

$$(x+y)^2 = x^2 + y^2 \text{ only if either } x = 0 \text{ or } y = 0$$

Also from (1)

$$(x+y)^2 = x^2 + 2xy + y^2$$

Clearly for all non-zero real values of x and y that is $x \neq 0$, $y \neq 0$

$(x+y)^2 \neq x^2 + y^2$ as $2xy$ is an extra term in $(x+y)^2$ which is missing in $x^2 + y^2$

Hence, the two expressions are not equivalent.

Answer 57e.

STEP 1 The average movie ticket price (in dollars) since 1974 can be calculated using the expression $0.131x + 1.89$.

STEP 2 Since x is the number of years after 1974, the value of x corresponding to 1974 can be taken as 0.

The year 1984 is 10 years after 1974, which means that the value of x corresponding to 1984 is 10. Similarly, for 1994 the value of x is 20, and that for 2004 is 30.

Calculate the ticket price in 1974 by substituting 0 for x in the expression.

$$(0.131)0 + 1.89 = 1.89$$

Thus, in 1974 the movie ticket price was \$1.89.

Similarly, find the ticket prices in the remaining years.

$$\begin{aligned}\text{Ticket price in 1984} &= (0.131)10 + 1.89 \\ &= 3.20\end{aligned}$$

$$\begin{aligned}\text{Ticket price in 1994} &= (0.131)20 + 1.89 \\ &= 4.51\end{aligned}$$

$$\begin{aligned}\text{Ticket price in 2004} &= (0.131)30 + 1.89 \\ &= 5.82\end{aligned}$$

Thus, the ticket price in the year 1984 is \$3.20, in the year 1994 is \$4.51, and that in the year 2004 is \$5.82.

Answer 58e.

Given is:

Initial reading of odometer of a car in a given month $= 96882$
Final reading of odometer of a car in a given month $= 97057$
So, the distance traveled by car in 1 month

$$= \text{final reading of odometer - Initial reading of odometer}$$
$$= 97057 - 96882$$
$$= 115$$

As, distance traveled by car in each month is assumed to be same.

So, distance traveled by car in m months $= m \times (\text{distance travelled by car in 1 month})$

$$= m \times 115$$
$$= 115m$$

Hence, odometer reading of car after m months $= (\text{initial reading of car}) + (\text{distance travelled by car in m months})$

$$= 96882 + 115m \qquad \ldots\ldots(1)$$

For predicting reading after 12 months:

Put $m = 12$ in (1), it becomes

Odometer reading of car after 12 months $= 96882 + 115 \times 12$

$$= 96882 + 1380$$

$$= 98262$$

Hence, Odometer reading of car after 12 months is $\boxed{98262}$

Answer 59e.

The balance on the credit card can be computed by finding the difference between the total amount and the cost of x lunches.

Represent the balance as a verbal model.

Total amount (dollars)	$-$	Cost of one lunch (dollars)	$\cdot$	Number of lunches
$\Downarrow$		$\Downarrow$		$\Downarrow$
270	$-$	4.50	$\cdot$	x

The expression for the balance is $270 - 4.5x$

The balance on the credit card should not be a negative number. This means that, the expression makes sense only for those positive integer values of x that do not result in a negative balance.

Let us consider that the student bought 100 lunches. Substitute 100 for x.

$$270 - 4.5x = 270 - (4.5) \cdot 100$$
$$= -180$$

The balance is now negative and the expression doesn't make sense. In other words, we can say that the money in the card is not sufficient to buy 100 lunches.

Therefore, we can replace x with any positive integer, provided the cost of x lunches do not exceed 270 dollars.

Answer 60e.

Given is:

Total time spent on exercise $= 60$ min

Time spent on walking $= w$ min

So, time spent on running $= (60 - w)$ min

Next, amount of calories burnt by walking for 1 min $= 4$ cal

So, amount of calories burnt by walking for w min $= 4 \times w$
$= 4w$ cal

Also, amount of calories burnt by running for 1 min $= 10$ cal

So, amount of calories burnt by running for $(60 - w)$ min $= 10 \times (60 - w)$
$= 10(60 - w)$ *cal*

Hence, total calories burnt during exercise for 60min

$= $ (total calories burnt during walking) $+$ (total calories burnt during running)

$= 4w + 10(60 - w)$

Apply distributive law, it becomes

$$= 4w + 10 \times 60 - 10(w)$$
$$= 4w + 600 - 10w$$

Grouping like terms, it becomes

$$= (4w - 10w) + 600$$
$$= -6w + 600$$

Hence, total calories burnt during whole exercise $= -6w + 600$ ......(1)

For finding calories burnt during whole exercise if 20 minutes are spent on walking,

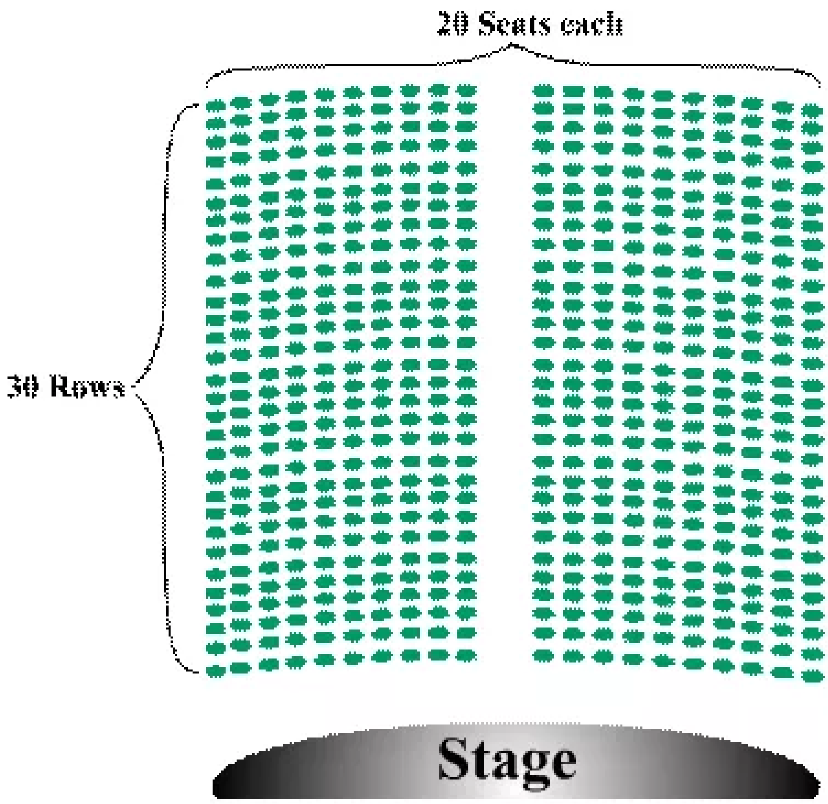
Put $w = 20$ in (1), it becomes

$$\begin{aligned}\text{Total calories burnt during whole exercise} &= -6\times 20+600\\ &= -120+600\\ &= 480\end{aligned}$$

Thus, total calories burnt during whole exercise if 20 minutes are spent on walking is $\boxed{480}$

Answer 61e.

(a) First, let us make a sketch of the theatre seating. The seating is arranged in 30 rows such that each row has 20 seats.



(b) Write a verbal model for the income when all seats are sold.

$$\underbrace{\text{Total cost}}_{t} = \underbrace{\text{Ticket rate of closed seats}}_{45} \cdot \underbrace{\text{Number of closed seats}}_{n} + \underbrace{\text{Ticket rate of remaining seats}}_{35} \cdot \underbrace{\text{Number of remaining seats}}_{30-n}$$

(c) Form an algebraic expression using the verbal model.
$t = 45n + 35(30 - n)$

Use the distributive law to clear the parentheses.

$$\begin{aligned} t &= 45n + 1050 + 35n \\ &= 10n + 1050 \end{aligned}$$

Thus, the simplified expression is $t = 45n + 1050$.

(d) In order to calculate the income when n is 5, substitute 5 for n in the simplified expression obtained in part **(c)**.

$$t = 10(5) + 1050$$

Simplify.

$$t = 50 + 1050$$
$$= 1100$$

Similarly, compute the income when n is 10 and 15.

$$t = 10(10) + 1050$$
$$= 100 + 1050$$
$$= 1150$$

$$t = 10(15) + 1050$$
$$= 150 + 1050$$
$$= 1200$$

Make a table for the income using these values.

n	5	10	15
t	1100	1150	1200

Answer 62e.

Given is:

Total number of workers in a company $= 80$
Number of workers who chose desktop computers $= n$
So, number of workers who chose laptops $= (80 - n)$

Next, cost of 1 desktop computer $= \$900$
So, cost of n desktop computers $= \$(900 \times n)$

$$= \$900n$$

Also, cost of 1 laptop $= \$1550$

So, cost of $(80 - n)$ laptops $= \$1550(80 - n)$
Hence, total cost of 80 computers $= \$[900n + 1550(80 - n)]$

Apply distributive property, it becomes

$$= \$[900n + 1550(80) - 1550n]$$

Grouping like terms, it becomes

$$= \$[900n - 1550n + 1550(80)]$$

$$= \$[-650n + 124000]$$

Thus, $\boxed{\text{total cost of 80 computers} = \$[124000 - 650n]}$ ……(1)

Next, to find total cost of 80 computers if 65 workers choose desktop, for this:

Put $n = 65$ in (1), it becomes

$$\text{Total cost of 80 computers if 65 workers choose desktop} = \$[124000 - 650 \times 65]$$
$$= \$[124000 - 42250]$$
$$= \$81750$$

Hence, Total cost of 80 computers if 65 workers choose desktop is $\boxed{\$81750}$

Answer 63e.

You have decided to buy 25 fish out of which x are of the first kind, y are of the second kind, and the remaining are of the third kind.

From the given information, we find that $25 - (x + y)$ are of the third kind.

The cost of each kind of fish is also given. The cost of buying x fish of the first kind is $1.50x$. Similarly, the cost of buying y fish of the second kind is $2y$, and that of buying the third kind is $8(25 - (x + y))$. The sum of these products will give the total cost.

First, write a verbal model for the algebraic expression.

$$\underbrace{\begin{matrix}\text{Price of}\\ \text{first kind}\\ \text{of fish}\end{matrix}}_{1.5} \cdot \underbrace{\begin{matrix}\text{number of}\\ \text{first kind}\\ \text{of fish}\end{matrix}}_{x} + \underbrace{\begin{matrix}\text{Price of}\\ \text{second kind}\\ \text{of fish}\end{matrix}}_{1.5} \cdot \underbrace{\begin{matrix}\text{number of}\\ \text{second kind}\\ \text{of fish}\end{matrix}}_{y} + \underbrace{\begin{matrix}\text{Price of}\\ \text{third kind}\\ \text{of fish}\end{matrix}}_{1.5} \cdot \underbrace{\begin{matrix}\text{number of}\\ \text{third kind}\\ \text{of fish}\end{matrix}}_{25-(x+y)}$$

Use the distributive law to clear the parentheses.
$1.5x + 2y + 8(25 - (x + y)) = 1.5x + 2y + 200 - 8x - 8y$

Group together the like terms.
$1.5x + 2y + 200 - 8x - 8y = (1.5 - 8)x + (2 - 8)y + 200$

Combine the terms within the two sets of parentheses.
$(1.5 - 8)x + (2 - 8)y + 200 = -6.5x - 6y + 200$

Thus, the algebraic expression for the cost is $-6.5x - 6y + 200$.

Now, substitute 8 for x, and 10 for y in the expression.

$$\begin{aligned} 6.5x - 6y + 200 &= -6.5(8) - 6(10) + 200 \\ &= -52 - 60 + 200 \\ &= 88 \end{aligned}$$

Therefore, the total cost for the fishes is \$88.

Answer 64e.

Least common denominator (LCD) is that smallest integer which is divisible by the denominator of all given fractions whose LCD is to be found.

For this, we first list all the denominators. Then we make prime factors of each denominator.

After this, the value of LCD of the entire denominators consists of all the prime factors but the common among all three will be written once. On multiplying these prime factors the value we thus obtain, will give us the value of LCD.

Now, given fractions are:

$$\frac{1}{2}, \frac{4}{5}, \frac{3}{10}$$

For finding their LCD, list all the denominators: $2, 5, 10$

Prime factors of $2 = 2$
Prime factors of $5 = 5$
Prime factors of $10 = 2 \times 5$

Writing all prime factors without repeating the common ones and multiplying them, we have:

LCD of $\frac{1}{2}, \frac{4}{5}, \frac{3}{10} = 2 \times 5$

So, $\boxed{\text{LCD of } \frac{1}{2}, \frac{4}{5}, \frac{3}{10} = 10}$

Answer 65e.

For any two fractions with different denominators the least common denominator is equal to the least common multiple (LCM) of the denominators.

In order to obtain the LCM of the denominators, first find their prime factors.

$2 = 1 \cdot 2$
$3 = 1 \cdot 3$
$4 = 1 \cdot 2 \cdot 2$

Select the factorization of one number and compare it with the factorization of the other numbers.

If all the factors of the other numbers are completely included in the factorization of the first number, then the factorization of the first number is taken as the LCM.

If there are numbers in the factorization of the other numbers that are missing in that of the first, multiply the missing number to the factorization of the first number.

Select the factorization of 4 and compare it with the other factorizations.
The factorization of 4 contains the factorization of 2, but it does not contain the factorization of 3. The missing number is 3.

In order to calculate the LCM, multiply 3 to the factorization of 4.

$$1 \cdot 2 \cdot 2 \cdot 3 = 4 \cdot 3$$
$$= 12$$

Therefore, the least common denominator is 12.

Answer 66e.

Least common denominator (LCD) is that smallest integer which is divisible by the denominator of all given fractions whose LCD is to be found.

For this, we first list all the denominators. Then we make prime factors of each denominator.

After this, the value of LCD of the entire denominators consists of all the prime factors but the common among all three will be written once. On multiplying these prime factors the value we thus obtain, will give us the value of LCD.

Now, given fractions are:

$$\frac{3}{4}, \frac{1}{6}, \frac{7}{8}$$

For finding the LCD, list all the denominators: $4, 6, 8$

Prime factors of $4 = 2 \times 2$
Prime factors of $6 = 2 \times 3$
Prime factors of $8 = 2 \times 2 \times 2$

LCD of $\frac{3}{4}, \frac{1}{6}, \frac{7}{8} = 2 \times 2 \times 2 \times 3$

$$= 24$$

So, $\boxed{\text{LCD of } \frac{3}{4}, \frac{1}{6}, \frac{7}{8} = 24}$

Answer 67e.

For any two fractions with different denominators the least common denominator is equal to the least common multiple (LCM) of the denominators.

In order to obtain the LCM of the denominators first find out their prime factors.

$$9 = 1 \cdot 3 \cdot 3$$
$$4 = 1 \cdot 2 \cdot 2$$
$$6 = 1 \cdot 2 \cdot 3$$

Select the factorization of one number and compare it with the factorization of the other numbers.

If all the factors of the other numbers are completely included in the factorization of the first number, then the factorization of the first number is taken as the LCM.

If there are numbers in the factorization of the other numbers that are missing in that of the first, multiply the missing number to the factorization of the first number.

Let us select the factorization of 6 and compare it with the other factorizations.

Compare the factorizations of 9 and 6.
The factorization of 6 lacks a factor of 3. So, we multiply 3 to the factorization of 6.

Now, compare the factorizations of 4 and 6.
The factorization of 6 lacks a factor of 2. Thus, we multiply 2 to the factorization of 6.

Find the LCM.

$$\begin{aligned}(1 \cdot 2 \cdot 3) \cdot (3) \cdot (2) &= 6 \cdot (3) \cdot (2) \\ &= 6 \cdot 6 \\ &= 36\end{aligned}$$

Therefore, the least common denominator is 36.

Answer 68e.

Given expression is:

$$(7.8).25 = 7.(8.25)$$

The associative property of multiplication for real numbers $7, 8, 25$ is given by:

$$(7.8).25 = 7.(8.25) \qquad \ldots\ldots(1)$$

This statement represents the associative property of real numbers and as it is known that multiplication of real numbers is always associative, that is we can multiply any two numbers first and then multiply the result with third number.

In words, associative property of multiplication means that the value of multiplication of real numbers remains same and does not change upon how the multiplication is done by combining any two numbers first and then multiplication the third number to their result.

It allows us to collect any two real numbers first, multiply them and to their results multiply the third number.

In equation (1), on one side it can be seen that firstly 1^{st} and 2^{nd} number are being multiply and then to their result 3^{rd} number is multiply.

Whereas, on the other hand, firstly 2^{nd} and 3^{rd} number are being multiply and then to their result 1^{st} number is multiply. Then, by equation (1), it can be seen that result of multiplication of these 3 real numbers remain same as done by the two above ways.

The property given by (1) represents $\boxed{\text{associative property of multiplication.}}$

Answer 69e.

In the given statement, the first number is multiplied by its reciprocal and the result obtained is equal to 1.

We know that according to the inverse law of multiplication, any number multiplied to its reciprocal is equal to 1.

Therefore, the given statement illustrates the inverse law of multiplication.

Answer 70e.

Given conversion is:

15 meters to centimeters

As, 1 meter = 100 centimeters

$$So,\ 15 \text{ meters} = 15 \times 100 \text{ centimeters}$$
$$= 1500 \text{ centimeters}$$

Thus, $\boxed{15 \text{ meters} = 1500 \text{ centimeters}}$

Answer 71e.

First, let us convert the value given in pounds to kg, and then convert it from kg to tons. We know that one pound is equal to 0.454 kg. Use this information to convert 5000 pounds to kilograms

$$5000(0.454 \text{ kg}) = 2270 \text{ kg}$$

Thus, 5000 pounds is equivalent to 2270 kilograms.

One kilogram is equal to 0.0011 ton. In order to convert 2270 kilogram to tons, multiply the number of kilogram by 0.0011 ton.

$$2270(0.0011 \text{ ton}) = 2.497 \text{ tons}$$

Therefore, 5000 pounds is approximately equal to 2.49 tons.

Answer 72e.

Given conversion is:

100 yards to inches

As 1 yard contain 3 feet and each feet contains 12 inches

$$\text{So,}\quad 1 \text{ yard} = 3 \text{ feet}$$
$$= 3 \times 12 \text{ inches}$$

Thus, 1 yard = 36 inches

$$\text{Now, } 100 \text{ yards} = 100 \times 36 \text{ inches}$$
$$= 3600 \text{ inches}$$

Hence, $\boxed{100 \text{ yards} = 3600 \text{ inches}}$