# Unit 5 Advanced Review-Expressions and Equations

**Solve the following equations with models and algebraically.**
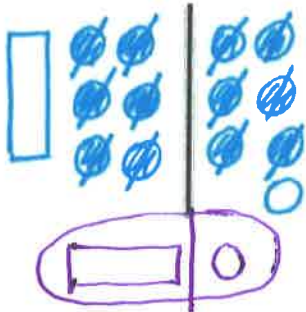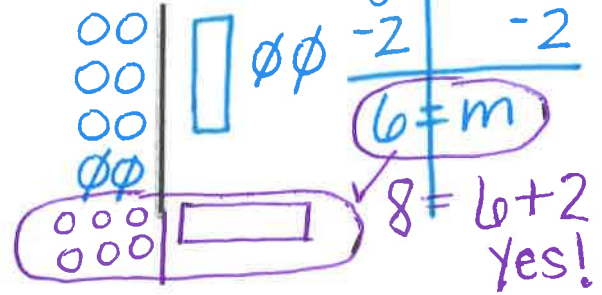
**..** $w + 6 = -5$

$$w - 6 = -5$$
$$+6 \quad +6$$
$$\boxed{w = 1}$$

$\checkmark 1 - 6 = -5$
Yes!

**2.** $8 = m + 2$

$$8 = m + 2$$
$$-2 \quad -2$$
$$\boxed{6 = m}$$

$8 = 6 + 2$
Yes!

**3.** $3x = -12$
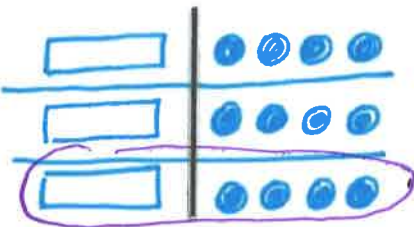
$$\frac{3x}{3} = \frac{-12}{3}$$
$$\boxed{x = -4}$$

$\checkmark 3(-4) = -12$
Yes!

**4.** $\frac{p}{5} = -11$
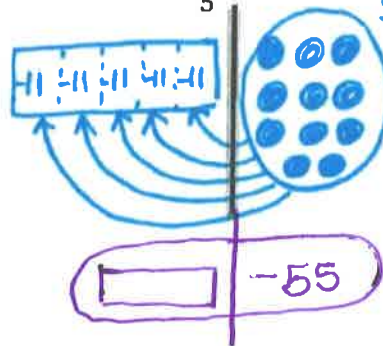
$$5 \cdot \frac{p}{5} = -11 \cdot 5$$
$$\boxed{p = -55}$$

$\checkmark \dfrac{-55}{5} = -11$
Yes!

**Write and solve an equation for each real-world problem. Be sure to define the variable.**

**5.** Julia spent $8.25 on breakfast. This is $1.75 more than her friend Bella spent on her breakfast. How much did Bella spend on her breakfast?

Let $b$ = __Bella's breakfast__

$$8.25 = b + 1.75$$
$$-1.75 \qquad -1.75$$
$$\boxed{\$6.50 = b}$$

Yes!
$\checkmark 8.25 = 6.50 + 1.75$

**6.** Josh saved $35 per month. He has saved a total of $280. For how many months has Josh been saving?

Let $m$ = __months Josh has been Saving__

$$\frac{280}{35} = \frac{35m}{35}$$
$$\boxed{8 = m}$$

$\begin{array}{r} 8 \\ 35\overline{)280} \\ -280 \\ \hline 0 \end{array}$

$\checkmark 280 = 35(8)$
Yes!

**7.** You had $25 to spend on seven pencils. After buying them you had $4. How much did each pencil cost?

Let $p$ = __cost of one pencil__

$$25 - 7p = 4$$
$$-25 \qquad -25$$
$$\frac{-7p}{-7} = \frac{-21}{-7}$$
$$\boxed{p = \$3}$$
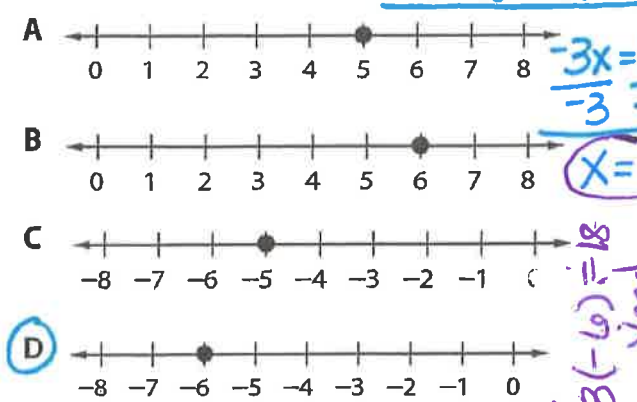
$\checkmark 25 - 7(3) = 4$
$25 - 21 = 4$
Yes!

**8.** Kali spent half of her weekly allowance on clothes. To earn more money her parents let her clean the gutters for $9. What is her weekly allowance if she ended up with $13?
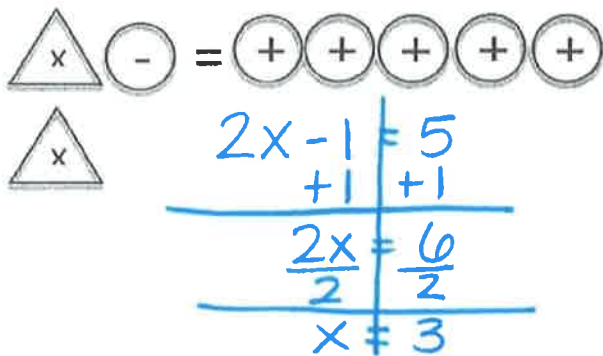
Let $a$ = __Weekly allowance__

$$\frac{a}{2} + 9 = 13$$
$$\quad -9 \quad -9$$
$$2 \cdot \frac{a}{2} = 4 \cdot 2$$
$$\boxed{a = \$8}$$

$\checkmark \dfrac{8}{2} + 9 = 13$
$4 + 9 = 13$
Yes!

**9.** Which number line shows the solution to the equation $-3x + 8 = 26$?

$$\frac{-8 \quad -8}{}$$

**A**

0 1 2 3 4 5 6 7 8

**B**

0 1 2 3 4 5 6 7 8

**C**

−8 −7 −6 −5 −4 −3 −2 −1 0

**(D)**

−8 −7 −6 −5 −4 −3 −2 −1 0

$-3x = 18$

$\frac{-3x}{-3} = \frac{18}{-3}$

$x = -6$

$\sqrt{\ } -3(-6) = 18$ Yes!

**10.** The model below represents an equation. Write the equation and solve it.

$\triangle_x \ \bigcirc - = +\ +\ +\ +\ +$

$\triangle_x$

$2x - 1 = 5$

$\frac{+1 \quad +1}{}$

$\frac{2x}{2} = \frac{6}{2}$

$x = 3$

**11.** What is the difference between an equation and an expression?

An equation has an equal sign, but an expression does not.

**12.** List three verbal expressions for each of the following operations:

Addition- total, sum, increased

Subtraction- less, difference, taken away

Multiplication- product, times, doubled

Division- quotient, half, split equally

**13.** Write the following in exponential and standard form.

$4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 = \ 4^5 \quad 1{,}024$

$6 \cdot 6 \cdot 6 \ = \ 6^3 \quad 216$

$2 \cdot 2 \cdot 2 \cdot 2 \ = \ 2^4 \quad 16$

**Solve the following equations. Please put a rectangle around your solution. Be sure to check your solution.**

**14.** $2y + (-3) = 15$

$2y - 3 = 15$

$\frac{+3 \quad +3}{}$

$\frac{2y}{2} = \frac{18}{2}$

$y = 9$

$\sqrt{\ }: 2 \cdot 9 + (-3) = +15$ Yes!

$18 - 3 = 15$

**15.** $3s + 12 = -27$

$\frac{-12 \quad -12}{}$

$\frac{3s}{3} = \frac{-39}{3}$

$s = -13$

$\sqrt{\ }: 3(-13) + 12 = -27$ Yes!

$-39 + 12 = -27$

$-27 = -27$

**16.** $-4 = \frac{d}{4} - 10$

$\frac{+10 \quad +10}{}$

$4 \cdot 6 = \frac{d}{4} \cdot 4$

$24 = d$

$\sqrt{\ }: \frac{24}{4} - 10 = -4$ Yes!

$6 - 10 = -4$

$-4 = -4$

**17.** $-9a + 1 = -80$

$\frac{-1 \quad -1}{}$

$\frac{-9a}{-9} = \frac{-81}{-9}$

$a = 9$

$\sqrt{\ }: -9(9) + 1 = -80$ Yes!

$-81 + 1 = -80$

$-80 = -80$

**18.** $\frac{x}{-7} + 5 = -4$

$\frac{-5 \quad -5}{}$

$-7 \cdot \frac{x}{-7} = -9 \cdot -7$

$x = 63$

$\sqrt{\ }: \frac{63}{-7} + 5 = -4$

$-9 + 5 = -4$

$-4 = -4$

Yes!

**19.** $5t - 10 = 95$

$\frac{+10 \quad +10}{}$

$\frac{5t}{5} = \frac{105}{5}$

$t = 21$

$\sqrt{\ }: 5(21) - 10 = 95$

$105 - 10 = 95$

$95 = 95$

Yes!

**20.** Generate an equivalent expression using the order of operations. *(You should get the same answer for both problems.)*

$$15 + [20 - (24 \div 8)^2 + 4]$$
$$15 + [20 - 3^2 + 4]$$
$$15 + [20 - 9 + 4]$$
$$15 + [11 + 4]$$
$$15 + 15$$
$$\boxed{30}$$

$$[7(2+4) \div 2] + 3^2$$
$$[7 \cdot 6 \div 2] + 3^2$$
$$[42 \div 2] + 3^2$$
$$21 + 3^2$$
$$21 + 9$$
$$\boxed{30}$$

**1.** Solve the following:

$$3^3 + 2^4 + 4^2$$
$$27 + 16 + 16$$
$$43 + 16$$
$$59$$

**22.** Write each phrase as an expression or equation.

s tripled less than 4 is 15 $\quad 4 - 3s = 15$

the quotient of t and 5 $\quad \dfrac{t}{5}$

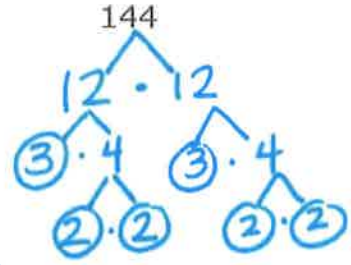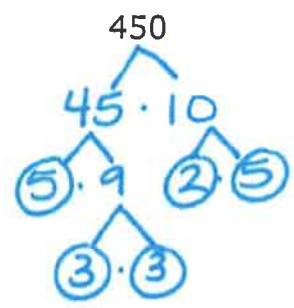The sum of 12 and m is 28 $\quad 12 + m = 28$

20 subtracted from n $\quad n - 20$

five squared added to 7 $\quad 7 + 5^2$

than, from, to → turn around words

**23.** Write the prime factorization using exponents for the following numbers.



$$144 = 2^4 \cdot 3^2$$



$$450 = 2 \cdot 3^2 \cdot 5^2$$

**24.** Simplify each expression by combining like terms.

$$6x + 2(x - 4) + 10 = 8x + 2$$
$$6x + 2x - 8 + 10$$

$$4x - 2y + 3(x - y) = 7x - 5y$$
$$4x - 2y + 3x - 3y$$

$$12 + 5(3x + 2y) - 7x + 4y - 5 =$$
$$12 + 15x + 10y - 7x + 4y - 5$$

$$8x + 14y + 7$$

**25.** Generate an equivalent expression using the stated property.

*Commutative property of addition*

$5 + (2 + 9) =$ $\dfrac{5+(9+2) \text{ or}}{(2+9)+5}$

*Associative property of addition*

$a + (b + c) =$ $(a+b)+c$

*Commutative property of multiplication*

$9 \cdot 6 =$ $6 \cdot 9$

*Identity property of multiplication*

$5 \cdot 1 =$ $5$

**26.** Determine whether the two expressions are equivalent. If so, tell what property is applied.

**Associative, Distributive, Commutative, Identity, or Inverse**

$3 \cdot 1 = 3$

$\underline{\text{identity}}$

$(2 \cdot 5) \cdot 7 = 2 \cdot (5 \cdot 7)$

$\underline{\text{associative}}$

$5(x + 3) = 5x + 15$

$\underline{\text{distributive}}$

$14 \ominus (7 \ominus 2) = (14 \ominus 7) \ominus 2$

$\underline{\text{associative}}$ ~~associative~~ *not equivalent*

$12 + 15 = 15 + 12$

$\underline{\text{commutative}}$

**27.** Evaluate each of the following expressions given:

$$a = -7 \qquad b = 2 \quad \text{and} \quad c = \tfrac{1}{4}$$

$b + a =$ $-5$
$2 + (-7)$

$8c - a =$ $9$
$8\left(\tfrac{1}{4}\right) - (-7) = 2 + 7$

$6b^2 =$ $24$
$6 \cdot 2^2 = 6 \cdot 4$

$32c \div 2b =$ $8$
$32 \cdot \left(\tfrac{1}{4}\right) \div 2(2) = 8 \div 2 \cdot 2 = 4 \cdot 2 = 8$

$b^3 \div c =$ $32$
$2^3 \div \tfrac{1}{4} = 8 \div \tfrac{1}{4} = 8 \cdot 4$

**28.** Using the distributive property or factoring, write an equivalent expression.

$6(n + 9) =$ $6n + 54$

$3(2m - 1) =$ $6m - 3$

$15p + 10 =$ $5(3p + 2)$

$12g - 18 =$ $6(2g - 3)$

$4(7x + 2y) =$ $28x + 8y$

$-2(4r + 3h) =$ $-8r - 6h$

$14w + 21 =$ $7(2w + 3)$