

Exponents

An **exponent** tells how many times a number, called the **base**, is used as a factor.



Skill

12

Understanding Exponents

Exponents show repeated factors.

$$2^3 = 2 \times 2 \times 2$$

The base, 2, is a factor 3 times.

Find the value of an expression in exponent form by multiplying.

$$2^3 = 2 \times 2 \times 2$$

$$= 4 \times 2$$

$$= 8$$

Any nonzero number to a power of zero is 1.

A number to the first power is the number.

$$2^0 = 1$$

$$2^1 = 2$$

Reading Exponents

The product of repeated factors is called a **power**.

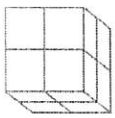
- Read 2^3 as "the third power of 2".
- You can also say that the value, 8, is a power of 2. Here are ways to read expressions in exponent form.

$$2^2 = 2 \times 2$$

the second power of 2 or 2 squared

$$2^3 = 2 \times 2 \times 2$$

the third power of 2 or 2 cubed



$$2^4 = 2 \times 2 \times 2 \times 2$$

the fourth power of 2

Try These

Find the value.

1 6^2

$6^2 = 6$ to the _____ power

$$6^2 = \underline{\quad} \times \underline{\quad}$$

$$= \underline{\quad}$$

2 4^3

$4^3 = 4$ to the _____ power

$$4^3 = \underline{\quad} \times \underline{\quad} \times \underline{\quad}$$

$$= \underline{\quad}$$

3 3^4

$3^4 = 3$ to the _____ power

$$3^4 = \underline{\quad} \times \underline{\quad} \times \underline{\quad} \times \underline{\quad}$$

$$= \underline{\quad}$$

Go to the next slide.

Practice on Your Own

Skill 12

10^4 ← exponent
↑
base

Powers of Ten

A power of ten is the product of repeated factors of 10.

$$10^1 = 10$$

$$10^2 = 10 \times 10 = 100$$

$$10^3 = 10 \times 10 \times 10 = 1,000$$

$$10^4 = 10 \times 10 \times 10 \times 10 = 10,000$$

$$10^5 = 10 \times 10 \times 10 \times 10 \times 10 = 100,000$$

$$10^6 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 = 1,000,000 \leftarrow$$

Count the zeros after the 1. There should be 6 zeros, for 10^6 .

Find the value.

1 8^2
 $8^2 =$ the _____ power
of 8
 $8^2 =$ _____ \times _____
 $=$ _____

2 3^3
 $3^3 =$ the _____ power
of 3
 $3^3 =$ _____ \times _____ \times _____
 $=$ _____

3 2^5
 $2^5 =$ the _____ power
of 2
 $2^5 =$ _____ \times _____ \times _____ \times _____ \times _____
 $=$ _____

4 7^2
 $7^2 =$ _____ \times _____
 $=$ _____

5 10^3
 $10^3 =$ _____ \times _____ \times _____
 $=$ _____

6 2^4
 $2^4 =$ _____ \times _____ \times _____ \times _____
 $=$ _____

7 5^2

8 7^3

9 2^3

10 10^5

Check

Find the value.

11 9^2

12 10^4

13 5^3

Round Decimals

Skill 16

Round 37.91, 2.387 and 41.5713 to the indicated place value.

Rounding Rules

- Find the place you want to round.
- Look at the first digit to its right.
- If this digit is less than 5, the digit in the rounding place stays the same.
- If this digit is 5 or more, the digit in the rounding place increases by 1.

Example A

Round 37.91 to the nearest whole number.

Round to first digit
this place to right

↓ ↓
37.91

Since $9 > 5$, the digit 7 increases by 1.

So, 37.91 rounded to the nearest whole number is 38.

Example B

Round 2.387 to the nearest tenth.

Round to first digit
this place to right

↓ ↓
2.387

Since $8 > 5$, the digit 3 increases by 1.

So, 2.387 rounded to the nearest tenth is 2.4.

Example C

Round 41.5713 to the nearest thousandth.

Round to first digit
this place to right

↓ ↓
41.5713

Since $3 < 5$, the digit 1 stays the same.

So, 41.5713 rounded to the nearest thousandth is 41.571.

Try These

Round the decimals to the indicated place value.

1 7.64 whole number

The digit to be rounded is ____.

The digit to the right is ____.

Is this digit 5 or more? ____.

The rounded number is ____.

2 13.118 tenth

The digit to be rounded is ____.

The digit to the right is ____.

Is this digit 5 or more? ____.

The rounded number is ____.

3 28.5347 thousandth

The digit to be rounded is ____.

The digit to the right is ____.

Is this digit 5 or more? ____.

The rounded number is ____.

Go to the next side.

Practice on Your Own

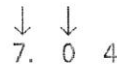
Skill 16

Round 7.04 to the nearest whole number.

Think:

- The digit to be rounded is 7.
- The digit to the right is 0.
- The digit is less than 5.

Round to this place. digit to the right



So, 7.04 rounded to the nearest whole number is 7.

Round the decimals to the underlined place.

1 37.49

- The digit to be rounded: _____
- The digit to the right: _____
- Is this digit 5 or more? _____
- The rounded number is _____.

2 83.125

- The digit to be rounded: _____
- The digit to the right: _____
- Is this digit 5 or more? _____
- The rounded number is _____.

3 62.5

- The digit to be rounded: _____
- The digit to the right: _____
- The rounded number is _____.

4 52.4876

- The digit to be rounded: _____
- The digit to the right: _____
- The rounded number is _____.

5 4.803

- The digit to be rounded: _____
- The rounded number is _____.

6 27.5948

- The digit to be rounded: _____
- The rounded number is _____.

7 1.519 _____

8 57.098 _____

9 0.8124 _____

Check

Round each decimal to the underlined place.

10 62.148 _____

11 47.50 _____

12 35.6125 _____

Find a Common Denominator

Skill 23

Find a common denominator for $\frac{1}{8} + \frac{1}{6}$.

Remember that the least common denominator (LCD) of two fractions is the least common multiple (LCM) of the denominators.

Step 1

List the multiples of each number.

8: 8, 16, 24, 32, 40, ...
6: 6, 12, 18, 24, 30, ...

Step 2

Circle the lowest multiple the numbers have in common.

8: 8, 16, 24, 32, 40, ...
6: 6, 12, 18, 24, 30, ...

Step 3

What is the lowest multiple the numbers have in common? This is the common denominator.

24

Try These

103

Find the common denominator.

1. $\frac{1}{10} + \frac{1}{8}$

List the multiples of each number.

10: _____

8: _____

What is the lowest multiple the numbers have in common?

2. $\frac{1}{4} + \frac{1}{16}$

List the multiples of each number.

4: _____

16: _____

What is the lowest multiple the numbers have in common?

3. $\frac{3}{4} + \frac{4}{5}$

List the multiples of each number.

4: _____

5: _____

What is the lowest multiple the numbers have in common?

Go to the next slide.

Practice on Your Own

Skill 23

Find the common denominator for $\frac{1}{15} + \frac{1}{12}$.

List the multiples of each number.

15: 15, 30, 45, 60, 75, 90, ...

12: 12, 24, 36, 48, 60, 72, ...

Circle the lowest multiple the two lists have in common.
The common denominator is 60.

Find the common denominator.

1 $\frac{1}{2} + \frac{2}{5}$

List the multiples of each number.

2: _____

5: _____

What is the lowest multiple the numbers have in common? _____

2 $\frac{2}{3} + \frac{5}{6}$

List the multiples of each number.

3: _____

6: _____

What is the lowest multiple the numbers have in common? _____

3 $\frac{3}{7} + \frac{5}{14}$

List the multiples of each number.

7: _____

14: _____

What is the lowest multiple the numbers have in common? _____

Find the common denominator.

4 $\frac{1}{5} + \frac{1}{10}$

5 $\frac{7}{8} + \frac{5}{12}$

6 $\frac{1}{3} + \frac{3}{5}$

7 $\frac{7}{12} + \frac{9}{16}$

8 $\frac{4}{15} + \frac{1}{30}$

9 $\frac{5}{24} + \frac{1}{18}$

Check

Find the common denominator.

10 $\frac{4}{5} + \frac{5}{6}$

11 $\frac{1}{8} + \frac{9}{32}$

12 $\frac{1}{8} + \frac{1}{14}$

Find the Percent of a Number

Skill

46

Forty model cars are on display in a hobby store and 25% of the cars are black. How many cars are black?

What is 25% of 40?

Step 1

Write the percent as a decimal.

$$25\% = 0.25$$

Step 2

Multiply. 40×0.25

$$\begin{array}{r} 40 \\ \times 0.25 \\ \hline 200 \\ 800 \\ \hline 10.00 \end{array}$$

← 2 decimal places in the factors
← 2 decimal places in the product.
So 10 is 25% of 40.

Try These

Solve.

1

What is 15% of 60?

Write the percent as a decimal.

Multiply 60×0.15 . _____

2

What is 65% of 40?

Write the percent as a decimal.

Multiply 40×0.65 . _____

3

What is 75% of 4?

Write the percent as a decimal.

Multiply 4×0.75 . _____

Go to the next side.



Practice on Your Own

Skill 46

To find the percent of a number use these steps.

Step 1 Change the percent to a decimal.

Step 2 Multiply. (Remember to place the decimal point correctly in the product.)

Solve.

1 What is 10% of 80?
Write the percent as a decimal. _____
Multiply 80×0.10 .

2 What is 45% of 60?
Write the percent as a decimal. _____
Multiply 60×0.45 .

3 What is 90% of 50?
Write the percent as a decimal. _____
Multiply 50×0.90 .

Solve.

4 What is 20% of 20?

5 What is 75% of 8?

6 What is 50% of 48?

7 What is 8% of 500?

8 What is 35% of 400?

9 What is 15% of 90?

Check

Solve each problem.

10 What is 16% of 25?

11 What is 7% of 60?

12 What is 18% of 250?

Order of Operations

Skill 51

Evaluate an expression by using the order of operations.

Order of Operations

1. Do the operation in parentheses.
2. Simplify exponents.
3. Multiply and divide from left to right.
4. Add and subtract from left to right.

Evaluate $7 + 2 \times 3$.

$2 \times 3 = 6$

$7 + 2 \times 3$ Multiply first.
 $7 + 6$ Then add.
 13

The value of the expression is 13.

Evaluate $3^2 + (4 \div 2)$.

$\frac{2}{2} \sqrt{4}$

$3^2 + (4 \div 2)$ Operate within parentheses.
 $3^2 + 2$ Simplify the exponent.
 $3 \times 3 = 9$
 $9 + 2$ Add.
 11

The value of the expression is 11.

Evaluate $\frac{(4+2)}{3} + 4^2$.

$\frac{(4+2)}{3} + 4^2$ Operate within parentheses.
 $\frac{6}{3} + 4^2$ Simplify the exponent.
 $\frac{6}{3} + 16$ Divide.
 $2 + 16$ Add.
 18

The value of the expression is 18.

Try These

Evaluate each expression. Write what you do.

1 $3 + 8 \div 2$

First do: _____

Then do: _____

The value is _____.

2 $(5 + 3) \times 7$

First do: _____

Then do: _____

The value is _____.

3 $\frac{(12-3)}{3} \times 8$

First do: _____

Next do: _____

Then do: _____

The value is _____.

4 $5^2 - (10 - 6)$

First do: _____

Next do: _____

Then do: _____

The value is _____.

Go to the next side.

Practice on Your Own

Skill

51

Think:

Order of operations:

1. Operate within parentheses.
2. Simplify exponents.
3. Multiply and divide from left to right.
4. Add and subtract from left to right.

Evaluate $\frac{(29-5)}{4} + 2^3$.

$\frac{(29-5)}{4} + 2^3$	Operate within parentheses. $29 - 5 = 24$
$\frac{24}{4} + 2^3$	Simplify the exponent. $2 \times 2 \times 2 = 8$
$\frac{24}{4} + 8$	Divide. $24 \div 4 = 6$
$6 + 8$	Add.
14	

The value of the expression is 14.

Evaluate each expression.

1 $7 + 10 \div 5$

First do: _____

Then do: _____

The value is _____.

2 $\frac{(18-6)}{4} \times 2$

First do: _____

Next do: _____

Then do: _____

The value is _____.

3 $\frac{(15-6)}{3} + 4^2$

First do: _____

Next do: _____

Then do: _____

Then do: _____

The value is _____.

Evaluate each expression. Write the steps you use to evaluate.

4 $5^2 \div (8-3)$

5 $(18+18) \div 3^2$

6 $\frac{(12-3)}{3} \times 8$

Check

Evaluate each expression. Write the steps you use to evaluate.

7 $(5 \times 2) + (8 - 3)$

8 $4^2 - (13 - 5)$

9 $\frac{(16-7)}{9} + 6^2$

Simplifying Numeric Expressions

Skill



Simplify each numeric expression. Remember order of operations.

Example 1 Simplify $\frac{1}{2}(8)(3 + 2)$.

$\frac{1}{2}(8)(3 + 2)$	First, add $3 + 2$.
\downarrow	
$\frac{1}{2}(8)(5)$	Then, multiply $\frac{1}{2}$ by 8.
\downarrow	
$4(5)$	Then multiply by 5.
	so, $\frac{1}{2}(8)(3 + 2) = 20$.

Example 2 Simplify $\frac{1}{2}(4)^2(8)$.

$\frac{1}{2}(4)^2(8)$	Simplify the exponent.
\downarrow	
$\frac{1}{2}(16)(8)$	Multiply $\frac{1}{2}$ by 16.
\downarrow	
$(8)(8)$	Multiply 8 by 8.
	so, $\frac{1}{2}(4)^2(8) = 64$.

Try These

Simplify each expression by following the steps.

1 $\frac{1}{2}(6)(3)$
 First do: _____
 Then do: _____
 The value is _____.

2 $2(3 \cdot 14)(14)$
 First do: _____
 Then do: _____
 The value is _____.

3 $\frac{1}{2}(8)(4 + 7)$
 First do: _____
 Then do: _____
 The value is _____.



Practice on Your Own

Skill 52

Simplify $2(3.14)(6)$.

Think: Multiply from left to right.

$$\begin{array}{r} 2(3.14)(6) \\ \downarrow \\ 6.28(6) \\ \downarrow \\ 37.68 \end{array}$$

Simplify $\frac{1}{2}(6.5)^2(4)$.

Think: Simplify the exponent first.

$$\begin{array}{r} \frac{1}{2}(6.5)^2(4) \\ \downarrow \\ \frac{1}{2}(42.25)(4) \quad \text{Multiply from left to right.} \\ \downarrow \\ 84.5 \end{array}$$

Tell what you would do first, and then simplify the expression.

1 $\frac{1}{2}(6)^2(3)$

First do: _____

The value is _____.

2 $\frac{1}{2}(10)(2 + 6)$

First do: _____

The value is _____.

3 $\frac{1}{3}(3.14)(4)^2(9)$

First do: _____

The value is _____.

4 $3.14(5)^2(3)$

First do: _____

The value is _____.

5 $\frac{1}{2}(6)(5.75)$

First do: _____

The value is _____.

6 $\frac{1}{2}(16)(3 + 7)$

First do: _____

The value is _____.

Check

Simplify each expression.

7 $\frac{1}{3}(3.14)(3)^2(5)$

8 $\frac{1}{2}(18)(12 + 16)$

9 $\frac{1}{3}\left(\frac{22}{7}\right)(3)^2(7)$

Evaluate Expressions

Skill 54

You can evaluate, or find the value of, an expression by using the order of operations.

- Order of Operations
1. Operate inside parentheses.
 2. Evaluate terms with exponents.
 3. Multiply and divide from left to right.
 4. Add and subtract from left to right.

Evaluate $2b + 3$ for $b = -4$.

$$2b + 3 \text{ Replace } b \text{ with } -4.$$

$$\downarrow$$

$$2 \cdot -4 + 3 \text{ Multiply first.}$$

Think: $2 \cdot -4 = -8$

$$-8 + 3 \text{ Then add.}$$

Think: $-8 + 3 = -5$

-5

So, when $b = -4$, the value of $2b + 3$ is -5 .

Evaluate $\frac{2a}{3} - 4$ for $a = 9$.

$$\frac{2a}{3} - 4 \text{ Replace } a \text{ with } 9.$$

$$\downarrow$$

$$\frac{2 \cdot 9}{3} - 4$$

Think: $2 \cdot 9 = 18$

$$\frac{18}{3} - 4$$

Think: $18 \div 3 = 6$

$$6 - 4$$

Finally, subtract.

Think: $6 - 4 = 2$

2

So, when $a = 9$, the value of $\frac{2a}{3} - 4$ is 2 .

Evaluate $5(s + 3)^2$ for $s = 2$.

$$5(s + 3)^2 \text{ Replace } s \text{ with } 2.$$

$$\downarrow$$

$$5(2 + 3)^2 \text{ Operate inside parentheses.}$$

Think: $2 + 3 = 5$

$$5 \cdot 5^2 \text{ Evaluate } 5^2.$$

Think: $5^2 = 5 \times 5$, or 25

$$5 \cdot 25 \text{ Multiply.}$$

Think: $5 \cdot 25 = 125$

125

So, when $s = 2$, the value of $5(s + 3)^2$ is 125 .

Try These

Evaluate the expression for the given value of the variable. Write each step.

1 $a = 5$ Replace a with 5 .

$$4a - 6$$

$$\downarrow$$

$$4 \cdot \square - 6 \text{ Multiply.}$$

_____ Subtract.

_____ Subtract.

The value of $4a - 6$ is _____.

2 $b = 4$ Replace b with 4 .

$$\frac{1 \cdot b}{2} + 1$$

$$\downarrow$$

$$\frac{1 \cdot \square}{2} + 1 \text{ Multiply first.}$$

_____ Divide.

_____ Add.

The value of $\frac{1 \cdot b}{2} + 1$ is _____.

3 $c = 3$ Replace c with 3 .

$$2(10 - c)^2$$

$$2(10 - \square)^2 \text{ Operate inside parentheses.}$$

_____ Evaluate term with exponent.

_____ Multiply.

The value of $2(10 - c)^2$ is _____.



Practice on Your Own

Skill 54

Remember:

When you multiply a negative number by a positive number, the product is a negative number.

Evaluate $(x + 3)^2 + 4xy$, for $x = 7$ and $y = -2$.

$$\begin{aligned} &(x + 3)^2 + 4xy \\ &\downarrow \qquad \qquad \downarrow \\ &(7 + 3)^2 + 4 \cdot 7 \cdot -2 \\ &10^2 + 4 \cdot 7 \cdot -2 \\ &100 + 4 \cdot 7 \cdot -2 \\ &100 + 28 \cdot -2 \\ &100 + -56 \\ &44 \end{aligned}$$

Replace x with 7 and y with -2 .

Operate inside parentheses.

Evaluate 10^2 .

Multiply.

Multiply.

Add.

The value of $(x + 3)^2 + 4xy$ is 44.

Evaluate the expression for the given value of the variable. Write each step.

1 $m = 5$
 $n = 2$

$7mn - 3$ Replace m with 5
 $7 \cdot \square \cdot \square - 3$ and n with 2.
_____ Multiply.
_____ Subtract.

The value of $7mn - 3$ is _____.

2 $p = -8$

$5(p + 10)^2$
 $5(\square + 10)^2$ Replace p with -8 .
_____ Parentheses
_____ Exponents
_____ Multiply.

The value $5(p + 10)^2$ is _____.

3 $t = 24$
 $\frac{3t}{4} + 8$

_____ **Think:**
_____ Multiply.
_____ Divide.
_____ Add.

Value: _____

4 $z = -4$
 $3(z + 8)^2$

_____ **Think:**
_____ Parentheses
_____ then
_____ exponents

Value: _____

5 $p = 7, g = -3$
 $pg + 12$

Value: _____

Evaluate the expression for the given value of the variable.

6 $5c^2$ for $c = 3$

Value: _____

7 $-2ab + 3$ for
 $a = -1$ and $b = -6$

Value: _____

8 $3(n + 5)^2$ for $n = 4$

Value: _____

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Check

Evaluate the expression for the given value of the variable.

9 $20 + 5d$ for $d = -2$

Value: _____

10 $\frac{1}{2}xy + 7$ for
 $x = 2$ and $y = 8$

Value: _____

11 $4(t - 1)^2$ for $t = 7$

Value: _____

Evaluate Expressions

SKILL



You can evaluate, or find the value of, an expression by using the order of operations.

- Order of Operations
- Operate inside parentheses.
 - Evaluate terms with exponents.

- Multiply and divide from left to right.
- Add and subtract from left to right.

Evaluate $2b + 3$ for $b = -4$.

$2b + 3$ Replace b with -4 .

$2 \cdot -4 + 3$ Multiply first.

$-8 + 3$ Then add.

-5 Think: $-8 + 3 = -5$

So, when $b = -4$, the value of $2b + 3$ is -5 .

Evaluate $\frac{2a}{3} - 4$ for $a = 9$.

$\frac{2a}{3} - 4$ Replace a with 9 .

$\frac{2 \cdot 9}{3} - 4$ Multiply first.

$\frac{18}{3} - 4$ Think: $2 \cdot 9 = 18$

$6 - 4$ Then divide.

2 Think: $18 \div 3 = 6$

Finally, subtract.

Think: $6 - 4 = 2$

So, when $a = 9$, the value of $\frac{2a}{3} - 4$ is 2 .

Evaluate $5(s + 3)^2$ for $s = 2$.

$5(s + 3)^2$ Replace s with 2 .

$5(2 + 3)^2$ Operate inside parentheses.

$5 \cdot 5^2$ Think: $2 + 3 = 5$

Evaluate 5^2 .

Think: $5^2 = 5 \times 5$, or 25

$5 \cdot 25$ Multiply.

125 Think: $5 \cdot 25 = 125$

So, when $s = 2$, the value of $5(s + 3)^2$ is 125 .

Try These

Evaluate the expression for the given value of the variable. Write each step.

1 $a = 5$ Replace a with 5 .

$4a - 6$

$4 \cdot 5 - 6$ Multiply.

$20 - 6$ Subtract.

The value of $4a - 6$ is 14 .

2 $b = 4$ Replace b with 4 .

$\frac{1}{2} \cdot b + 1$

$\frac{1}{2} \cdot 4 + 1$ Multiply first.

$2 + 1$ Divide.

3 Add.

The value of $\frac{1}{2} \cdot b + 1$ is 3 .

3 $c = 3$ Replace c with 3 .

$2(10 - c)^2$

$2(10 - 3)^2$ Operate inside parentheses.

$2(7)^2$ Evaluate term with exponent.

$2 \cdot 49$ Multiply.

98

The value of $2(10 - c)^2$ is 98 .



Practice on Your Own

Skill 54

Remember:

When you multiply a negative number by a positive number, the product is a negative number.

Evaluate $(x + 3)^2 + 4xy$, for $x = 7$ and $y = -2$.

$$\begin{aligned} &(x + 3)^2 + 4xy \\ &\downarrow \qquad \qquad \downarrow \\ &(7 + 3)^2 + 4 \cdot 7 \cdot -2 \\ &10^2 + 4 \cdot 7 \cdot -2 \\ &100 + 4 \cdot 7 \cdot -2 \\ &100 + 28 \cdot -2 \\ &100 + -56 \\ &44 \end{aligned}$$

Replace x with 7 and y with -2 .

Operate inside parentheses.

Evaluate 10^2 .

Multiply.

Multiply.

Add.

The value of $(x + 3)^2 + 4xy$ is 44.

Evaluate the expression for the given value of the variable. Write each step.

1 $m = 5$
 $n = 2$

$7mn - 3$ Replace m with 5
 $7 \cdot \square \cdot \square - 3$ and n with 2.
_____ Multiply.
_____ Subtract.

The value of $7mn - 3$ is _____.

2 $p = -8$
 $5(p + 10)^2$

$5(\square + 10)^2$ Replace p with -8 .
_____ Parentheses
_____ Exponents
_____ Multiply.

The value $5(p + 10)^2$ is _____.

3 $t = 24$
 $\frac{3t}{4} + 8$

_____ **Think:**
_____ Multiply.
_____ Divide.
_____ Add.

Value: _____

4 $z = -4$
 $3(z + 8)^2$

_____ **Think:**
_____ Parentheses
_____ then
_____ exponents

Value: _____

5 $p = 7, g = -3$
 $pg + 12$

Value: _____

Evaluate the expression for the given value of the variable.

6 $5c^2$ for $c = 3$

Value: _____

7 $-2ab + 3$ for
 $a = -1$ and $b = -6$

Value: _____

8 $3(n + 5)^2$ for $n = 4$

Value: _____

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Check

Evaluate the expression for the given value of the variable.

9 $20 \div 5d$ for $d = -2$

Value: _____

10 $\frac{1}{2}xy + 7$ for
 $x = 2$ and $y = 8$

Value: _____

11 $4(t - 1)^2$ for $t = 7$

Value: _____

Simplifying Algebraic Expressions



To simplify algebraic expressions, combine like terms.

Example 1

$$5 + 3x - 1$$

Put a square around the terms with the variable x and a circle around the constant terms.

$$\boxed{5} \quad \boxed{+ 3x} \quad \textcircled{-1}$$

Combine the terms in each shape.

$$\boxed{+ 3x}$$

$$\textcircled{5 - 1}$$

$$3x + 4$$

Example 2

$$b + 7 + 6b + 5$$

Put a square around the terms with a variable b and a circle around the constant terms.

$$\boxed{b} \quad \textcircled{+ 7} \quad \boxed{+ 6b} \quad \textcircled{+ 5}$$

Combine the terms in each shape.

Think: The coefficient of the first b is 1.

$$\boxed{b + 6b}$$

$$7b + 12$$

$$\textcircled{7 + 5}$$

Example 3

$$3a + 7b - 4 + 9a - 2b$$

Put a square around the terms with a variable a , a circle around terms with a variable b , and a triangle around the constant terms.

$$\boxed{3a} \quad \textcircled{+ 7b} \quad \triangle -4 \quad \boxed{+ 9a} \quad \textcircled{- 2b}$$

Combine the terms in each shape.

$$\boxed{3a + 9a}$$

$$\textcircled{7b - 2b}$$

$$\triangle -4$$

$$12a + 5b - 4$$

Try These

Simplify each algebraic expression.

1 $7 + 3x - x - 4$

Terms with x _____

Constant terms _____

2 $5 + 2a - 7$

Terms with a _____

Constant terms _____

3 $8y - 7x + 4 - 2x + 9$

Terms with x _____

Terms with y _____

Constant terms _____

Go to the next slide.



Practice on Your Own

Skill 55

Simplify. $9x - 4y + 5x - 8 + y$

Think: Group like terms by drawing circles, squares and triangles around the like terms.

$9x$
 $-4y$
 $+5x$
 -8
 $+y$
 Combine the terms in the same shape.

$9x + 5x$
 $-4y + y$
 -8
Think: The coefficient of y is 1.

$14x - 3y - 8$ Simplify.

Simplify each algebraic expression by combining like terms.

1 $6n - 3n + 2$

terms with n _____
 constant terms _____

2 $4 + 5y + y - 6$

terms with y _____
 constant terms _____

3 $2a - 5b - b - a$

terms with a _____
 terms with b _____

4 $26 - y + 4y + 4$

terms with y _____
 constant terms _____

5 $-x + 7y - 4x + 6$

terms with x _____
 terms with y _____
 constant terms _____

6 $3a + 6 - 4b + 7 - b$

terms with a _____
 terms with b _____
 constant terms _____

Check

Simplify each algebraic expression.

7 $9y + 5 + 2y - 4y$

8 $6b + 4a + 9 - 2a - 7$

9 $2n + 6m - 9n + 8 - 6m - 3$

Connect Words and Equations

Skill

56

Remember: An equation is an algebraic or numerical sentence that shows two quantities are equal.

You can write an algebraic equation for a word sentence. An algebraic equation is an equation that contains a variable.

Follow these steps to write an algebraic equation for a word sentence.

Step 1 Read the sentence.

Step 2 Identify operations, the unknown quantity, and the placement of the equal sign.

Step 3 Choose a variable.

Step 4 Write the equation.

Example 1

A number increased by 4 is 12.

unknown addition equals

$$n + 4 = 12$$

Example 2

The difference of a number and 15 is 7.

subtraction unknown equals

$$a - 15 = 7$$

Example 3

The product of 2 and a number is 10.

multiplication unknown equals

$$2b = 12$$

Example 4

A number divided by 6 is 3.

unknown division equals

$$\frac{c}{6} = 3$$

Try These

Write the operation. Then write an algebraic equation for the word sentence.

1 Twelve plus a number is 17.

Operation: _____
Equation: _____

2 The difference of a number and 1 is 2.

Operation: _____
Equation: _____

3 A number times 3 is 15.

Operation: _____
Equation: _____

4 The quotient of 24 and a number is 6.

Operation: _____
Equation: _____

Go to the next side.

Practice on Your Own

Skill 56

Think:

Use the word sentence to determine the operation, the unknown value, or variable, and the placement of the equal sign. Then write the equation.

Word Sentence	Algebraic Equation
10 is 3 more than a number. equals addition unknown	$10 = x + 3$
4.5 less than a number is 3.2. subtraction unknown equals	$x - 4.5 = 3.2$
Twice a number is -56 . multiplication unknown equals	$2x = -56$
A number divided by 6 is $\frac{1}{2}$. unknown division equals	$\frac{x}{6} = \frac{1}{2}$

Write the operation. Then write an algebraic equation for the word sentence.

- | | | |
|--|--|---|
| <p>1 A number plus 8 is 19.
Operation: _____
Equation: _____</p> | <p>2 The difference of a number and 6.8 is 1.1.
Operation: _____
Equation: _____</p> | <p>3 The quotient of a number and 3 is 9.
Operation: _____
Equation: _____</p> |
| <p>4 Twice a number is 30.
Operation: _____
Equation: _____</p> | <p>5 31 is 8 more than a number.
Operation: _____
Equation: _____</p> | <p>6 A number divided by 16 is $\frac{3}{8}$.
Operation: _____
Equation: _____</p> |

Write an algebraic equation for the word sentence.

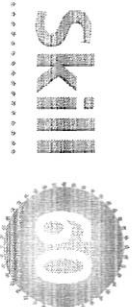
- | | | |
|---|--|--|
| <p>7 A number increased by 12 is 45.
_____</p> | <p>8 16 less than a number is 5.
_____</p> | <p>9 7 times a number is -35.
_____</p> |
| <p>10 28.9 is 7.2 more than a number.
_____</p> | <p>11 The product of a number and 3 is 33.
_____</p> | <p>12 The quotient of 8 and a number is -2.
_____</p> |

Check

Write an algebraic equation for the word sentence.

- | | | |
|---|--|--|
| <p>13 7 times a number is 84.
_____</p> | <p>14 19.2 decreased by a number is 6.7.
_____</p> | <p>15 A number divided by 6 is $\frac{2}{3}$.
_____</p> |
| <p>16 A number increased by 12 is 67.
_____</p> | <p>17 15 less than a number is 82.
_____</p> | <p>18 3 times a number is -36.
_____</p> |

Solve Two-Step Equations



Solve each equation by isolating the variable on one side of the equals sign. Add or subtract before you multiply or divide.

Example 1 $2y + 3 = -11$ Think: What number times 2 added to 3 equals -11 ?

$$2y + 3 - 3 = -11 - 3 \quad \text{Subtract 3 from each side.}$$

$$2y = -14$$

$$\frac{2y}{2} = \frac{-14}{2}$$

$$y = -7$$

Divide each side by 2.

Check: Replace y with -7 .

$$\begin{aligned} 2(-7) + 3 &\stackrel{?}{=} -11 \\ -14 + 3 &\stackrel{?}{=} -11 \\ -11 &= -11 \checkmark \end{aligned}$$

Example 2 $\frac{x}{3} - 5 = 2$

$$\frac{x}{3} - 5 + 5 = 2 + 5 \quad \text{Add 5 to both sides.}$$

$$\frac{x}{3} = 7$$

$$\frac{x}{3} \cdot 3 = 7 \cdot 3$$

$$x = 21$$

Multiply each side by 3.

Check: Replace the x with 21.

$$\begin{aligned} \frac{21}{3} - 5 &\stackrel{?}{=} 2 \\ 7 - 5 &= 2 \checkmark \end{aligned}$$

Try These

Solve each equation by following the steps.

1 $4a + 3 = -5$

$$4a + 3 - 3 = -5 - 3$$

$$4a = \underline{\hspace{2cm}}$$

$$\frac{4a}{4} = \frac{\underline{\hspace{2cm}}}{4}$$

$$a = \underline{\hspace{2cm}}$$

Check: $4(\underline{\hspace{2cm}}) + 3 = -5$

$$4(\underline{\hspace{2cm}}) + 3 \stackrel{?}{=} -5$$

2 $\frac{y}{3} + 4 = 7$

$$\frac{y}{3} + 4 - 4 = 7 - 4$$

$$\frac{y}{3} = \underline{\hspace{2cm}}$$

$$y = \underline{\hspace{2cm}} (3)$$

$$y = \underline{\hspace{2cm}}$$

3 Solve $3x - y = 7$ for x .

$$3x - y + y = 7 + y$$

$$3x = \underline{\hspace{2cm}}$$

$$\frac{3x}{3} = \frac{\underline{\hspace{2cm}}}{3}$$

$$x = \underline{\hspace{2cm}}$$

Go to the next slide.

Practice on Your Own

Skill 60

Solve each equation for the variable.

Solve $2a + 3.5 = 7.5$.

$$2a + 3.5 - 3.5 = 7.5 - 3.5$$

$$2a = 4$$

$$a = 2$$

Check: $2(2) + 3.5 \stackrel{?}{=} 7.5$

$$4 + 3.5 \stackrel{?}{=} 7.5$$

$$7.5 = 7.5 \checkmark$$

Think: What number times 2 plus 3.5 equals 7.5?

Solve $4y + w = 9$ for y .

$$4y + w - w = 9 - w$$

$$4y = 9 - w$$

$$\frac{4y}{4} = \frac{9 - w}{4}$$

$$y = \frac{9 - w}{4}$$

Solve and check each equation.

1

$$6b + 11 = 29$$

$$6b + 11 - 11 = 29 - 11$$

$$6b = \underline{\hspace{2cm}}$$

$$b = \underline{\hspace{2cm}}$$

Check: $6(?) + 11 = 29$

$$\underline{\hspace{2cm}} = 29$$

2

$$4a + 8 = 20$$

$$4a + 8 - 8 = 20 - 8$$

$$4a = \underline{\hspace{2cm}}$$

$$a = \underline{\hspace{2cm}}$$

Check: $4(?) + 8 = 20$

$$\underline{\hspace{2cm}} = 20$$

3

$$3m + 2 = 5x \text{ for } m$$

$$3m + 2 - 2 = 5x - 2$$

$$3m = \underline{\hspace{2cm}}$$

$$m = \underline{\hspace{2cm}}$$

4

$$\frac{x}{6} + 7 = 9$$

$$\frac{x}{6} + 7 - 7 = 9 - 7$$

$$\frac{x}{6} = \underline{\hspace{2cm}}$$

$$x = \underline{\hspace{2cm}}$$

Check: $\frac{?}{6} + 7 = 9$

$$\underline{\hspace{2cm}} = 9$$

5

$$\frac{n}{0.4} - 3.5 = 11.5$$

$$\frac{n}{0.4} - 3.5 + 3.5 = 11.5 + 3.5$$

$$\frac{n}{0.4} = \underline{\hspace{2cm}}$$

$$n = \underline{\hspace{2cm}}$$

Check: $\frac{?}{0.4} - 3.5 = 11.5$

$$\underline{\hspace{2cm}} = 11.5$$

6

$$6y + 4 = 12x \text{ for } y$$

$$6y + 4 - 4 = 12x - 4$$

$$6y = \underline{\hspace{2cm}}$$

$$y = \underline{\hspace{2cm}}$$

Check

Solve each equation.

7

$$4x + 7 = -1$$

$$x = \underline{\hspace{2cm}}$$

8

$$\frac{a}{7} - 4 = 0$$

$$a = \underline{\hspace{2cm}}$$

9

$$5c + a = 8 \text{ for } c$$

$$c = \underline{\hspace{2cm}}$$

Graph Linear Equations

SKILL

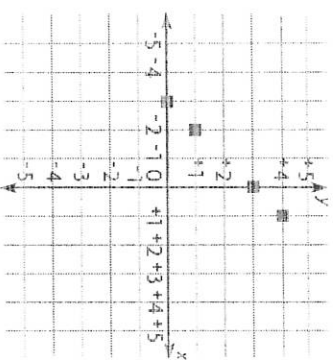
674

The graph of an equation is the graph of all the points whose coordinates are solutions of the equation.
Graph the equation $y = x + 3$.

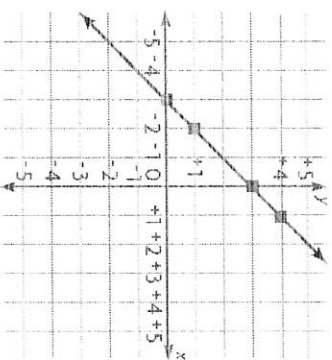
Step 1: Choose values for x and create a table of values.

x	$x + 3$	y	(x, y)
0	0 + 3	3	(0, 3)
1	1 + 3	4	(1, 4)
-3	-3 + 3	0	(-3, 0)
-2	-2 + 3	1	(-2, 1)

Step 2: Graph the ordered pairs.



Step 3: Draw a line through the points.



Try These

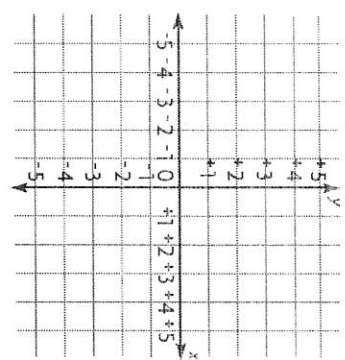
Graph the equation on a coordinate plane.

1 $y = x + 2$

Create a table of values:

x	$x + 2$	y	(x, y)
-2			(<u> </u> , <u> </u>)
-1			(<u> </u> , <u> </u>)
0			(<u> </u> , <u> </u>)
1			(<u> </u> , <u> </u>)

Plot the points and draw the line.



Go to the next slide.

Practice on Your Own

Skill 64

To graph a linear equation follow these steps.

- Step 1: Make a table of values.
- Step 2: Plot the ordered pairs.
- Step 3: Draw a line through the points.

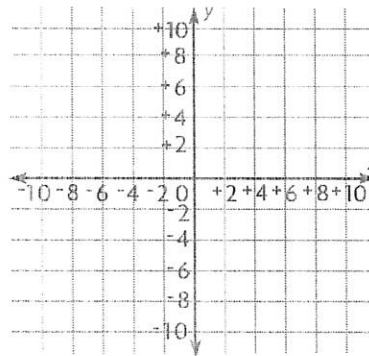
Graph each equation on a coordinate plane.

1 $y = x - 1$

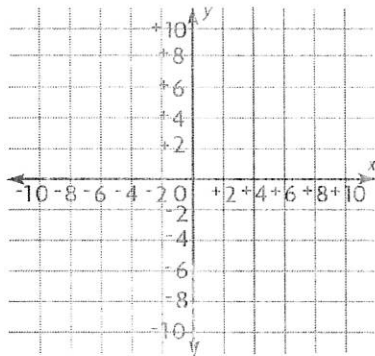
Create a table of values:

x	$x - 1$	y	(x, y)
-2			(__, __)
-1			(__, __)
0			(__, __)
1			(__, __)

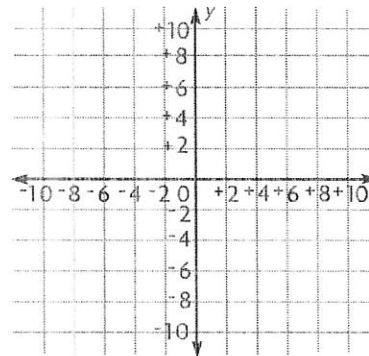
Plot the points and draw the line.



2 $y = x + 5$



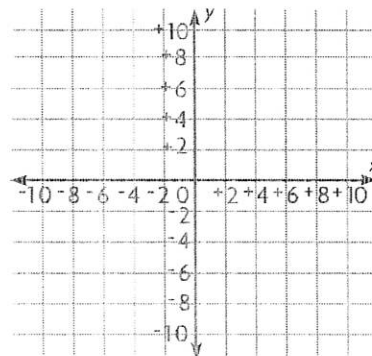
3 $y = 2x + 1$



Check

Graph the equation on a coordinate plane.

4 $y = 2x - 1$



Solve Proportions

Skill 65

A proportion is an equation that shows two equivalent ratios.
Solve for n . $\frac{3}{8} = \frac{n}{24}$.

Step 1
Equal ratios have equal cross products. Find the cross products.

$$\frac{3}{8} = \frac{n}{24}$$

$$8 \times n$$

$$3 \times 24$$

Remember $8 \times n$ can be written as $8n$.

$$8 \times n = 3 \times 24$$

$$8n = 3 \times 24$$

Step 2
Solve the equation for n .

$$\frac{3}{8} = \frac{n}{24}$$

$$8n = 3 \times 24$$

$$8n = 72$$

$$\frac{8n}{8} = \frac{72}{8}$$

$$n = 9$$

Multiply 3×24 to simplify.
Divide both sides by 8.

Step 3
Check the solution. Replace n with 9 to tell if the cross products are equal.

$$\frac{3}{8} = \frac{9}{24}$$

$$8 \times 9 = 3 \times 24$$

$$72 = 72$$

So, $\frac{3}{8} = \frac{9}{24}$.

271

Try These

Solve for n .

1 $\frac{2}{12} = \frac{9}{n}$

$\frac{2}{12} = \frac{9}{n}$

Write the cross products.
 $2 \times n = 12 \times \square$
 $2n = \square$
Simplify.
 $\frac{2n}{2} = \frac{\square}{2}$
Solve for n .
 $n = \underline{\hspace{2cm}}$

2 $\frac{8}{12} = \frac{6}{n}$

$\frac{8}{12} = \frac{6}{n}$

Write the cross products.
 $8 \times n = 12 \times \square$
 $8n = \square$
Simplify.
 $\frac{8n}{8} = \frac{\square}{8}$
Solve for n .
 $n = \underline{\hspace{2cm}}$

3 $\frac{5}{9} = \frac{n}{27}$

$\frac{5}{9} = \frac{n}{27}$

Write the cross products.
 $9 \times n = 5 \times \square$
 $9n = \square$
Simplify.
 $\frac{9n}{9} = \frac{\square}{9}$
Solve for n .
 $n = \underline{\hspace{2cm}}$

Go to the next side.

Practice on Your Own

Skill 65

Think:

To solve for n in a proportion:

1. Write the cross products.
2. Simplify, if necessary.
3. Solve for n .
4. Check the answer.

$$\begin{aligned} \frac{2}{n} &= \frac{16}{48} \\ n \times 16 &= 2 \times 48 \\ 16n &= 96 \\ \frac{16n}{16} &= \frac{96}{16} \\ n &= 6 \\ 6 \times 16 &= 2 \times 48 \\ 96 &= 96 \end{aligned}$$

$$\begin{aligned} \frac{3}{5} &= \frac{21}{n} \\ 3n &= 5 \times 21 \\ 3n &= 105 \\ \frac{3n}{3} &= \frac{105}{3} \\ n &= 35 \\ 3 \times 35 &= 5 \times 21 \\ 105 &= 105 \end{aligned}$$

Solve for n . Check that the cross products are equal.

1 $\frac{4}{5} = \frac{n}{20}$ $5 \times n = \square \times 20$

Write the cross products. $5n = \square$

Simplify. $\frac{5n}{\square} = \frac{\square}{\square}$

Solve. $n = \underline{\quad}$

Check. $\underline{\quad} = \underline{\quad}$

2 $\frac{6}{8} = \frac{9}{n}$ $6 \times n = \square \times 9$

Write the cross products. $6n = \square$

Simplify. $\frac{6n}{\square} = \frac{\square}{\square}$

Solve. $n = \underline{\quad}$

Check. $\underline{\quad} = \underline{\quad}$

3 $\frac{3}{7} = \frac{n}{21}$

$7n = \square \times 21$

$7n = \square$

$\frac{7n}{\square} = \frac{\square}{\square}$

$n = \underline{\quad}$

4 $\frac{9}{15} = \frac{3}{n}$

$15 \times \square = 9 \times n$

$\square = 9n$

$\frac{\square}{\square} = \frac{9n}{\square}$

$n = \underline{\quad}$

5 $\frac{7}{10} = \frac{n}{90}$

$n = \underline{\quad}$

6 $\frac{14}{n} = \frac{42}{12}$

$n = \underline{\quad}$

Check

7 $\frac{3}{n} = \frac{9}{24}$

$n = \underline{\quad}$

8 $\frac{8}{12} = \frac{4}{n}$

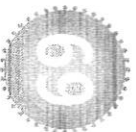
$n = \underline{\quad}$

9 $\frac{n}{4} = \frac{18}{24}$

$n = \underline{\quad}$

Graph Ordered Pairs (First Quadrant)

SKILL



An ordered pair is a pair of numbers used to locate a point on a coordinate plane.

Example

The first number in the pair represents the x-coordinate. It tells you how many units to move **right** on the x-axis.

The second number represents the y-coordinate. It tells you how many units to move **up** on the y-axis.

Always start at 0.

Find the Post Office on the coordinate plane shown.

Always start at 0.

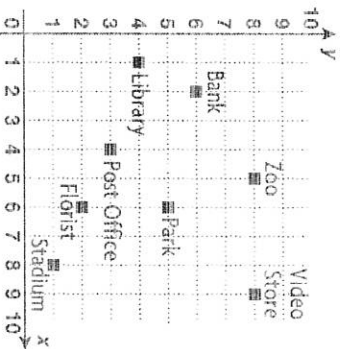
First, move 4 spaces to the right.

Then, move 3 spaces up.

Ordered pair (4, 3)

x-coordinate y-coordinate

✓ ✓
(4, 1)



Try These

Use the coordinate plane shown above to complete each statement.

1 What are the coordinates for the Library?
First move ___ spaces right.
Next, move ___ spaces up.
Ordered pair (__, __)

2 What are the coordinates for the Park?
First move ___ spaces right.
Next, move ___ spaces up.
Ordered pair (__, __)

3 What store is located at (9, 8).
First move 9 spaces right.
Next, move 8 spaces up.

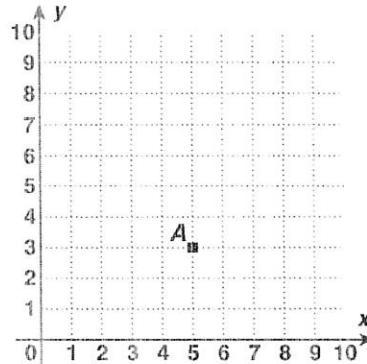


Practice on Your Own

Skill 69

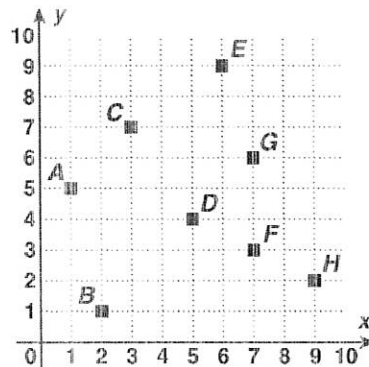
Think:

To find the ordered pair for point A, start at 0. Move 5 units to the right, then move 3 units up. The ordered pair for point A is (5, 3).



Use the coordinate plane at the right. Complete. Write the ordered pair for each point.

- 1 point A Move _____ units to the right.
Move _____ units up.
ordered pair: (____, ____)
- 2 point B Move _____ units to the right.
Move _____ units up.
ordered pair: (____, ____)
- 3 point C Move _____ units to the right.
Move _____ units up.
ordered pair: (____, ____)



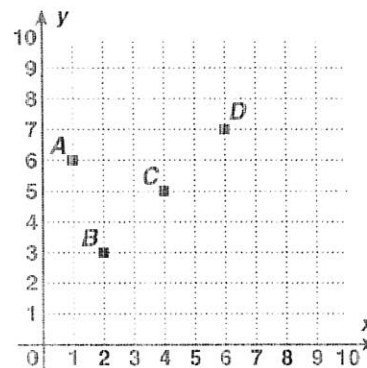
Use the coordinate plane above. Write the ordered pair for each point.

- 4 point D ordered pair: (____, ____)
- 5 point E ordered pair: (____, ____)
- 6 point F ordered pair: (____, ____)

Check

Use the coordinate plane below. Write the ordered pair for each point.

- 7 point A ordered pair: (____, ____)
- 8 point B ordered pair: (____, ____)
- 9 point C ordered pair: (____, ____)
- 10 point D ordered pair: (____, ____)



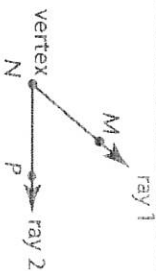
Name Angles

SKILL

75

Angles are named by three letters:

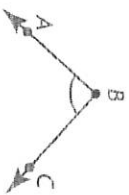
- In the angle at the right, the vertex is N.
- On one side is a point labeled M.
- On the other side, a point is labeled P.



So, the angle can be named $\angle MNP$ or $\angle PNM$. The vertex is always the middle letter. The symbol for angle is \angle . The angle can also be named using only the vertex. So, the angle can be named $\angle N$.

Example A

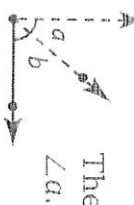
Name the angle three ways.



$\angle ABC$, $\angle CBA$, or $\angle B$

Example B

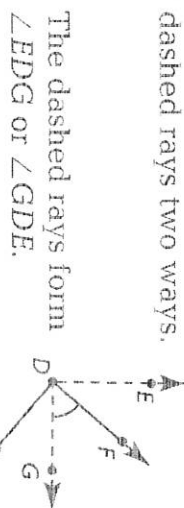
Name the angle formed by the dashed rays.



The dashed rays form $\angle a$.

Example C

Name the angle formed by the dashed rays two ways.

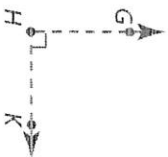


The dashed rays form $\angle EDG$ or $\angle GDE$.

Try These

Name the angle formed by dashed rays.

1



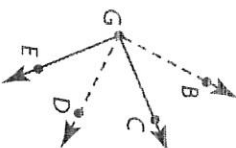
\angle _____
 \angle _____
 \angle _____

2



\angle _____

3



\angle _____
 \angle _____

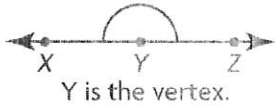
Go to the next side

Practice on Your Own

Skill 75

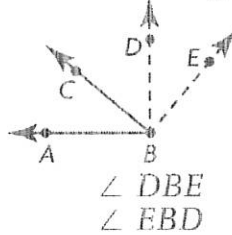
Think:

Use the vertex to name the angle.



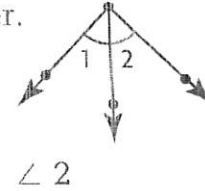
Name the angle formed by dashed rays.

\sphericalangle means angle

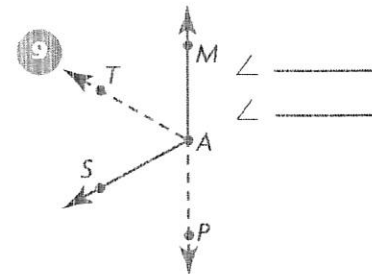
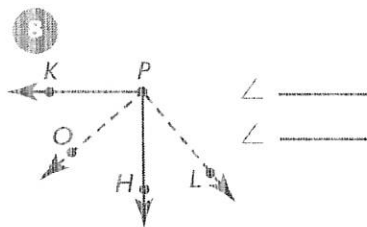
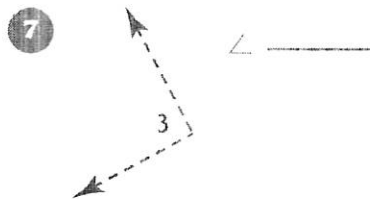
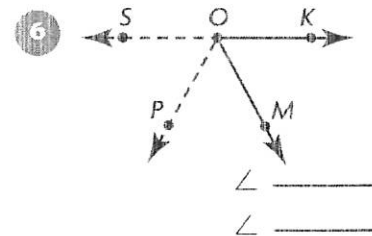
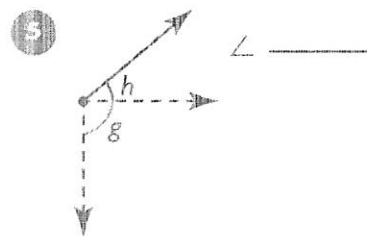
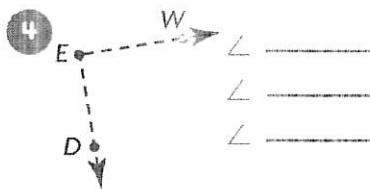
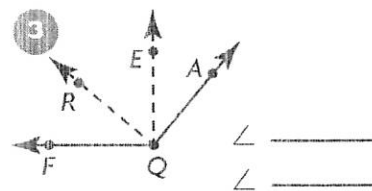
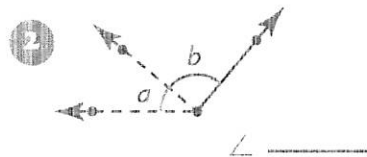


There are no points on the rays.

The angles are named by number.

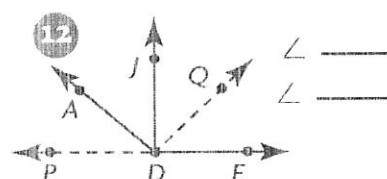
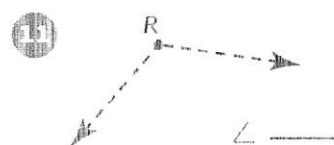
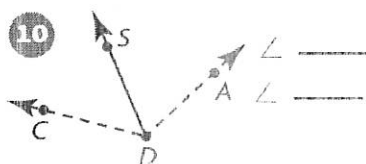


Name the angle formed by the dashed rays.



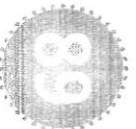
Check

Name the angle formed by the dashed rays.



Measure Angles

SKILL

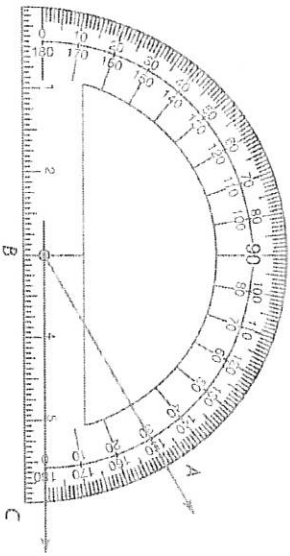


Recall that an *angle* is formed by two rays with a common endpoint called a vertex. Measure angles with a protractor that has a scale in 1 degree intervals.

Measure the angle.

Step 1 Place the center point of the protractor on the vertex of the angle.

Step 2 Place the base of the protractor along ray BC .

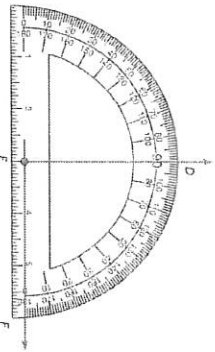


Step 3 Read the same scale which has a ray passing through zero.

So, the measure of angle ABC is 30° .
Write: $m\angle ABC = 30^\circ$

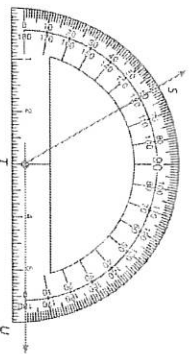
Try These

1

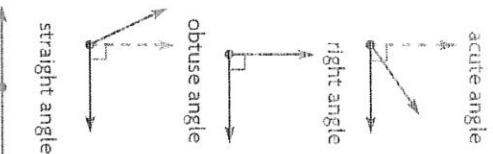


The measure of \angle _____ is _____.

2



The measure of \angle _____ is _____.



Remember:

is smaller than a right angle or less than 90° .

measures 90° .

is larger than a right angle or more than 90° .

measures 180° .

Go to the next side.



Practice on Your Own

Skill 89

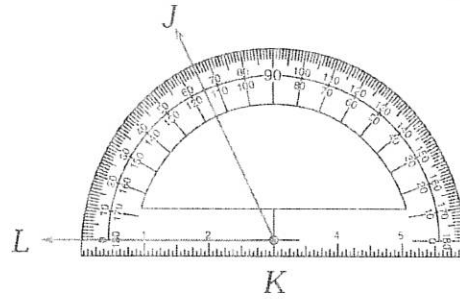
Think:

First place the center point of the protractor on the vertex of the angle.

Then align one ray with the base of the protractor.

Remember:

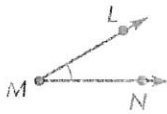
You can turn the page around to help you measure the angle.



So, the measure of angle JKL is 65° .
 $m\angle JKL = 65^\circ$

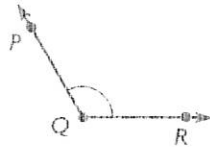
Use a protractor. Measure the angle. Align the center point of the protractor with the vertex of the angle shown in blue.

1



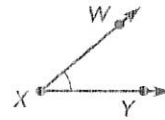
$m\angle LMN = \underline{\hspace{2cm}}^\circ$

2



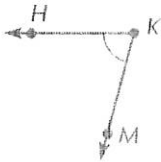
$m\angle PQR = \underline{\hspace{2cm}}^\circ$

3



$m\angle WXY = \underline{\hspace{2cm}}^\circ$

4



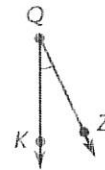
$m\angle \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$

5



$m\angle \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$

6



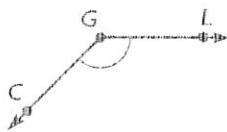
$m\angle \underline{\hspace{1cm}} = \underline{\hspace{2cm}}$

Use a protractor to measure each angle.

7



8



9



Check

Use a protractor to measure each angle.

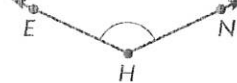
10



11



12



11
TRY THESE

- 225; 3,375
- 400; 8,000
- $\frac{4}{9}$

PRACTICE

- 324
- 196
- $\frac{1}{16}$
- 15, 625
- 1,728
- 4,096
- 2,304
- $\frac{25}{64}$
- 1,600
- 4,913
- 27,000
- 9,261

CHECK

- 144
- 484
- 1
- 9
- 1,331
- 125,000
- 64,000

12
TRY THESE

- second, 6×6 , 36
- third, $4 \times 4 \times 4$, 64
- fourth, $3 \times 3 \times 3 \times 3$, 81

PRACTICE

- second, 8×8 , 64
- third, $3 \times 3 \times 3$, 27
- fifth, $2 \times 2 \times 2 \times 2 \times 2$, 32
- 7×7 , 49
- $10 \times 10 \times 10$, 1,000
- $2 \times 2 \times 2 \times 2$, 16
- 25
- 343
- 8
- 100,000
- 81
- 10,000
- 125

CHECK

- 81
- 10,000
- 125

13
TRY THESE

- add 4 or + 4, 23, 27, 31
- multiply by 3 or $\times 3$, 81, 243, 729
- subtract 2 or - 2, 17, 15, 13

PRACTICE

- subtract 4 or - 4, 34, 30, 26
- add 8 or + 8, 40, 48, 56
- divide by 4 or $\div 4$, 16, 4, 1
- 21, 14, 7
- 256, 1,024, 4,096
- 80, 75, 70
- 67, 77, 87
- 48, 60, 72
- 10,000, 100,000, 1,000,000
- 22, 11, 0
- 100, 125, 150
- 25, 5, 1

CHECK

- 22, 11, 0
- 100, 125, 150
- 25, 5, 1

14
TRY THESE

- 10^0 , 0.4
- $\frac{75}{100}$, 0.75
- 10^1 , 1.1
- $\frac{35}{100}$, 1.35

PRACTICE

- 10^0 , 0.3
- $\frac{7}{10}$, 0.7
- $\frac{1}{10}$, 0.1
- $\frac{5}{10}$, 1.5
- $\frac{17}{100}$, 0.17
- $\frac{70}{70}$, 0.70
- 100^0 , 0.04
- $\frac{65}{100}$, 1.65
- 10^0 , 0.9
- 10^1 , 1.6
- $\frac{82}{100}$, 0.82
- 10^1 , 1.37

CHECK

- 10^0 , 0.9
- 10^1 , 1.6
- $\frac{82}{100}$, 0.82
- 10^1 , 1.37

ANSWERS

15**TRY THESE**

- 826.3; 826 and 3 tenths
- 4,351.22; 4 thousand, 351 and 22 hundredths

PRACTICE

- 23.57; 23 and 57 hundredths
- 177.68; 177 and 68 hundredths
- 890.3; 890 and 3 tenths
- 106,434.19; 106 thousand, 434 and 19 hundredths
- 169.45
- 2,165.5

CHECK

- 6 thousand, 489 and 9 tenths
- 123 thousand, 690 and 56 hundredths

16**TRY THESE**

- 7.6, yes, 8
- 1, 1, no, 13.1
- 4, 7, yes, 28,535

PRACTICE

- 7.4, no, 37
- 1, 2, no, 83.1
- 2, 5, 63
- 7, 6, 52,488
- 8, 4, 8
- 4, 27,595
- 7, 2
- 8, 57.1
- 9, 0.812

CHECK

- 62
- 47.5
- 35,613

17**PRACTICE**

- >
- <
- >
- <
- >
- =
- 0.89, 0.91, 3.42
- 0.03, 0.5, 2.4, 2.65
- 13, 127, 1.18, 1.11

CHECK

- >
- <
- 2.83, 2.48, 2.38, 1.7
- 0.5, 1.18, 1.38, 1.83

18**TRY THESE**

- 2, 3, 3
- 1, 4, 1
- 2, 5, 2

PRACTICE

- 1, 4, 4
- 3, 4, 3
- 1, 2, 2
- 5
- 8
- 5
- 7
- 2
- 3
- 6
- 3
- 2
- 9
- 9
- 5
- 6
- 7
- 8
- 6
- 10

CHECK

- 5
- 6
- 8
- 10

ANSWERS

ANSWERS

23

TRY THESE

- 10: 10, 20, 30, 40, 50, 60, 70, 80, 90, ...
8: 8, 16, 24, 32, 40, 48, 56, 64, 72, 80, ...
The LCM is 40.
 - 4: 8, 12, 16, 20, ...
16: 16, 32, 48, ...
The LCM is 16.
 - 4: 4, 8, 12, 16, 20, 24, 28, ...
5: 5, 10, 15, 20, 25, ...
The LCM is 20.
- PRACTICE**
- 2, 4, 6, 8, 10, 12, ...;
5, 10, 15, 20, ...; 10
 - 3, 6, 9, 12, ...; 6,
12, 18, ... 6
 - 7, 14, 21, ...; 14,
21, 28, ... 14
 - 10
 - 24
 - 15
 - 48
 - 30

23

CHECK

- 72
- 30
- 32
- 56

24

TRY THESE

- 4
 - 6
 - 6
 - 1
- PRACTICE**
- 2
 - 2
 - 10
 - 6
 - $\frac{1}{2}, \frac{1}{3}, \frac{1}{3}$
 $\frac{2}{2}, \frac{2}{3}, \frac{2}{3}$
 - $\frac{3}{4}, \frac{3}{9}, \frac{3}{9}$
 - $\frac{2}{2}, \frac{2}{2}, \frac{2}{2}$
 - $\frac{3}{3}, \frac{6}{6}, \frac{6}{6}$
 - 3, 3
 - 4, 4
 - $\frac{2}{2}, \frac{1}{1}, \frac{1}{1}$
 - $\frac{4}{4}, \frac{1}{1}, \frac{1}{1}$
 - 8
 - 1
 - 3
 - 7
 - 14
 - 1
 - 14
- CHECK**
- 5
 - 4
 - 1
 - 14

25

TRY THESE

- no, $<$, $<$
 - yes, no, 4, $>$,
3, $>$
 - $<$
 - 2, =, 2
- PRACTICE**
- no, 10, $>$, $>$
 - yes, no, 6, $<$, $<$
 - $<$
 - no, 6, $>$, $>$
 - $<$
 - $>$, 2
 - yes, no, 12, $<$,
15, $<$
 - $<$
 - $>$, 3
 - $<$
 - $>$
 - $<$
- CHECK**
- $>$
 - $>$
 - $<$

44

TRY THESE

- $\frac{1}{12}$
- $\frac{3}{8}$
- $\frac{6}{20} \cdot \frac{3}{10}$

PRACTICE

- $\frac{1}{4}$
- $\frac{3}{16}$
- $\frac{6}{15} \cdot \frac{2}{5}$
- $1 \times \frac{1}{4} \cdot \frac{1}{5} \cdot \frac{1}{20}$
- $\frac{2}{3} \times \frac{1}{6} \cdot \frac{2}{18} \cdot \frac{1}{9}$
- $4 \times 5 \cdot 20 \cdot 2$
- $5 \times 6 \cdot 30 \cdot 3$
- $\frac{1}{35}$
- $\frac{1}{16}$
- $\frac{1}{3}$

CHECK

- $\frac{1}{27}$
- $\frac{1}{8}$
- $\frac{1}{4}$

45

TRY THESE

- 15, 2
- 5, 5, 1, 5, 15

PRACTICE

- 42, 1
- 30, 2
- 100, 2
- $\frac{21}{5}$
- 30
- 20
- 124, 8
- 1, 287
- 30, 16

CHECK

- 57
- 323, 7
- 72

46

TRY THESE

- 0.15, 9
- 0.65, 26
- 0.75, 3

PRACTICE

- 0.10, 8
- 0.45, 27
- 0.90, 45
- 4
- 6
- 24
- 40
- 140
- 13.5

CHECK

- 4
- 4.2
- 4.5

47

TRY THESE

- 107, different
- 226, same
- 98, same
- 26, different

PRACTICE

- 5, different
- 27, different
- 25, same
- 18, different
- 80, different
- 12, same
- 84, same
- 15, different

CHECK

- 24
- 68
- 23
- 17

ANSWERS

50

TRY THESE

- 8, 17
- 6, 24
- $a = 2$

PRACTICE

- 10, 13
- 6, 12
- 6, 42
- 3, 9
- 17
- 1
- 150
- 40
- $c = 4$
- $a = 2$
- $p = 6$
- $b = 7$
- $y = 1$
- $c = 11$

CHECK

- 50
- 0
- 7

51

TRY THESE

- $8 \div 2 = 4$; $3 + 4 = 7$; 7
- $5 + 3 = 8$; $8 \times 7 = 56$; 56
- $12 - 3 = 9$; $\frac{9}{3} = 3$; $3 \times 8 = 24$; 24
- $10 - 6 = 4$; $5 \times 5 = 25$; $25 - 4 = 21$; 21

PRACTICE

- $10 \div 5 = 2$; $7 + 2 = 9$; 9
- $18 - 6 = 12$; $\frac{12}{4} = 3$; $3 \times 2 = 6$; 6
- $15 - 6 = 9$; $4 \times 4 = 16$; $\frac{9}{3} = 3$; $3 + 16 = 19$; 19
- $5^2 \div 5 = 25 \div 5 = 5$
- $36 \div 3^2 = 36 \div 9 = 4$
- $\frac{9}{3} \times 8 = 3 \times 8 = 24$

51

CHECK

- $10 + 5 = 15$
- $4^2 - 8 = 16 - 8 = 8$
- $\frac{9}{9} + 6^2 = 1 + 36 = 37$

52

TRY THESE

- multiply $\frac{1}{2}$ by 6, multiply 3 by 3, 9
- multiply 2 by 3.14, multiply 6.28 by 14, 87.92
- add 4 and 7, multiply $\frac{1}{2}$ by 8 then multiply 4 by 11, 44

PRACTICE

- square 6, 54
- add 2 and 6, 40
- square 4, 150.72
- square 5, 235.5
- multiply $\frac{1}{2}$ by 6, 17.25
- add 3 and 7, 80

CHECK

- 47.1
- 252
- 66

ANSWERS

53

TRY THESE

1. addition: $5 + t$
or $t + 5$

2. subtraction:

$12 - p$

PRACTICE

1. multiplication:

$2m$

2. subtraction:

$x - 8$

3. division; $\frac{24}{c}$ or $\frac{24}{c} + c$

$24 + c$

4. addition: $4 + s$
or $s + 4$

5. multiplication:

$5b$

6. subtraction:

$r - 11$

7. d

8. a

9. b

10. c

11. addition, multiplication, $3 + 8p$
or $8p + 3$

12. subtraction, multiplication, $7n - 4$

53

13. division,

subtraction
 $\frac{2}{4} - 6$

CHECK

14. addition, $17 + x$
or $x + 17$

15. multiplication,

subtraction,

$29y - 8$

16. b

17. a

54

TRY THESE

1. 5; 20 - 6; 14, 14

2. 4; 4; 2 + 1; 3, 3

3. 3; $2 \cdot 7^2$;

$2 \cdot 49$; 98; 98

PRACTICE

1. 5, 2; $70 - 3$;

67 ; 67

2. -8 , $5 \cdot 2^2$;

$5 \cdot 4$; 20; 20

3. $\frac{3 \times 24}{4} + 8$;

$\frac{72}{4} + 8$;

$18 + 8$; 26

4. $3(-4 + 8)^2$;

$3 \cdot 4^2$; $3 \cdot 16$; 48

5. $7 \cdot -3 + 12$;

$-21 + 12$; -9

6. 45

7. -9

8. 243

CHECK

9. 10

10. 15

11. 144

55

TRY THESE

1. $3x - x$, 7, -4,

$2x + 3$

2. $2a$, 5, -7 , $2a - 2$

3. $-7x$, $-2x$, $8y$, 4,

9, $-9x + 8y + 13$

PRACTICE

1. $6n$, $-3n$, 2,

$3n + 2$

2. $5y$, y , 4, -6,

$6y - 2$

3. $2a$, $-a$, $-5b$, $-b$,

$a - 6b$

4. $-y$, $4y$, 26, 4,

$3y + 30$

5. $-x$, $-4x$, $7y$, 6,

$-5x + 7y + 6$

6. $3a$, $-4b$, $-b$,

6 , 7 , $3a - 5b$
 $+ 13$

CHECK

7. $7y + 5$

8. $2a + 6b + 2$

9. $-7n + 5$

ANSWERS

56

Variables may vary.

TRY THESE

- addition;
 $12 + x = 17$
- subtraction;
 $x - 1 = 2$
- multiplication;
 $3x = 15$
- division;
 $\frac{24}{x} = 6$

PRACTICE

- addition;
 $x + 8 = 19$
- subtraction;
 $x - 6.8 = 1.1$
- division; $\frac{x}{3} = 9$
- multiplication;
 $2x = 30$
- addition;
 $31 = x + 8$
- division; $\frac{x}{16} = \frac{3}{8}$
- $x + 12 = 45$
- $x - 16 = 5$
- $7x = -35$
- $28.9 = x + 7.2$
- $3x = 33$
- $8 = -2$ or $8 \div x = -2$

56

CHECK

- $7x = 84$
- $19.2 - x = 6.7$
- $\frac{x}{6} = \frac{2}{3}$
- $x + 12 = 67$
- $x - 15 = 82$
- $3x = -36$

57

TRY THESE

- addition; $2 + 7 = n$; 9
- subtraction;
 $7 - 3 = n$; 4
- multiplication;
 $4 \times n = 24$; 6
- division;
 $12 \div 6 = n$; 2

PRACTICE

- $n = 2 + 7$; 9
- $25 - 12 = n$; 13
- $8 \times n = 32$; 4
- $30 \div 5 = n$; 6
- $11 + n = 18$; 7
- $27 - 12 = n$; 15
- $9 \times n = 63$; 7
- $81 \div 9 = n$; 9
- 39
- 43
- 45
- 6
- $11 \times 20 = 220$
- $388 - 253 = 135$
or
 $388 - 135 = 253$
- $480 \div 32 = 15$
or $480 \div 15 = 32$
- $176 + 172 = 348$

57

CHECK

- 15
- 13
- 9
- 26
- $151 + 78 = 229$
- $126 \div 9 = 14$ or
 $126 \div 14 = 9$
- $287 - 109 = 178$
or
 $287 - 178 = 109$
- $18 \times 12 = 216$

ANSWERS

58

TRY THESE

- 7, 7, 7, 16, 16
- 10, 10, 10, 15, 15
- 4, 4, 4, 4, 28, 28
- 80, 80, 80, 10, 10

PRACTICE

- 4, 4, 4, 16, 16
- 36, 36, 36, 12, 12
- 18, 18, 18, 10, 10
- 2, 2, 2, 14, 14
- 0.4, 0.4, 0.4, 1.2, 1.2
- 7.5, 7.5, 7.5, 1.5, 1.5
- 1.8
- 0.6
- 12.6

CHECK

- 14.5
- 8
- 63

59

TRY THESE

- $1n = 7$
 $n = 7$
Check 7; 14
- $1t = 70$
 $t = 70$
Check 70; 3.5

PRACTICE

- $6 \div \frac{2}{3} = 1c$
 $6 \div \frac{2}{3} = c$
 $9 = c$
Check 9; 6
- $15 \div \frac{3}{4} = 1y$
 $15 \div \frac{4}{3} = y$
 $20 = y$
Check 20; 15

CHECK

- 4; $n = 4$
 - 12; $6 = h$
 - 0.2; $x = 25$
 - 0.3; $b = 70$
 - 7.5
 - 30
 - 8
 - 13
- CHECK
- 20
 - 54
 - 12
 - 13

60

TRY THESE

- 8, -2, -2, -5, -5
- 3, 9
- $7 + y$; $x = \frac{7+y}{3}$

PRACTICE

- 18, 3
- 12, 3
- $5x - 2$;
 $m = \frac{5x-2}{3}$
- 2, 12
- 15, 6
- $12x - 4$;
 $y = \frac{12x-4}{6}$

CHECK

- 2
- 28
- $c = \frac{8-a}{5}$

61

PRACTICE




For 1. to 7. Check number lines

- left
- positive, 0, right
- negative, 0, left
- right
- negative, left
- positive, right
- negative, left
- check number lines
- check number lines
- check number lines
- check number lines




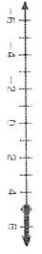
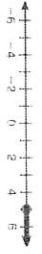
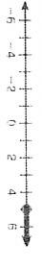
Answers

62


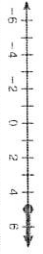




TRY THESE

- open; right

- closed; left

- open; left


PRACTICE

- closed; left

- open; right

- 

- 


CHECK

- 

- 

- 


63

TRY THESE

- 4, open, left
 $a < -4$
- 2, closed, right
 $a \geq -2$
- 3, closed, left
 $a \leq 3$

PRACTICE

- 3, closed, left
 $a \leq -3$
- 1, closed, right
 $a \geq 1$
- $a < 0$
- $a < -5$

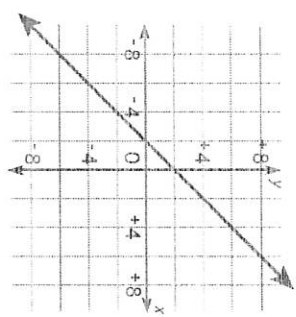
CHECK

- $a < 6$
- $a \geq -6$
- $a \leq 2$
- $a < 1$

64

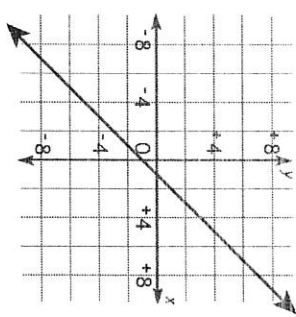
TRY THESE

- | x | x + 2 | y | (x, y) |
|----|--------|---|---------|
| -2 | -2 + 2 | 0 | (-2, 0) |
| -1 | -1 + 2 | 1 | (-1, 1) |
| 0 | 0 + 2 | 2 | (0, 2) |
| 1 | 1 + 2 | 3 | (1, 3) |



PRACTICE

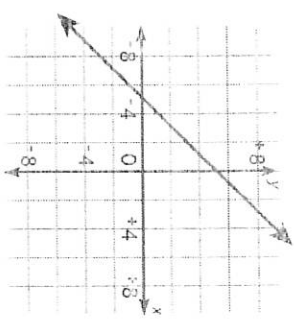
- | x | x - 1 | y | (x, y) |
|----|--------|----|----------|
| -2 | -2 - 1 | -3 | (-2, -3) |
| -1 | -1 - 1 | -2 | (-1, -2) |
| 0 | 0 - 1 | -1 | (0, -1) |
| 1 | 1 - 1 | 0 | (1, 0) |



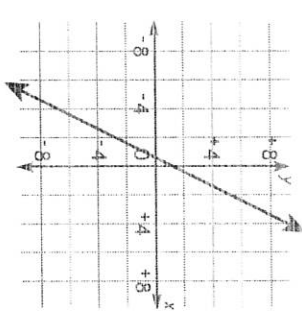
ANSWERS

64

2.

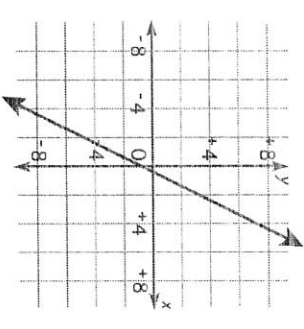


3.



CHECK

4.



65

TRY THESE

1. 9; 108; 108; 54
2. 6; 72; 72; 9
3. 27; 135; 135; 15

PRACTICE

1. 4; 80; 5; $\frac{80}{5}$; 16;
Check: $80 = 80$
2. 8; 72; 6; $\frac{72}{6}$; 12;
Check: $72 = 72$
3. 3; 63; 7; $\frac{63}{7}$; 9
4. 3; 45; $\frac{45}{9}$; 5
5. 63
6. 4

CHECK

7. 8
8. 6
9. 3

66

TRY THESE

1. yards, 3, 18
2. inches, 12, 6
3. meters, 100, 400
4. centimeters, 100, 7

PRACTICE

1. Multiply; 7,040
2. Multiply; 80
3. Multiply; 21
4. Divide; 4
5. Divide; 0.007
6. Divide; 3
7. 24
8. 6,000
9. 4,000
10. 5
11. 3
12. 9
13. 45
14. 300
15. 5
16. 9

CHECK

17. 8,800
18. 830
19. 4
20. 0.004

TRY THESE

- 10, 11
- 1, 3

PRACTICE

- 21, 42
- 4, 6
- 10, 1 + 11, 8, 21, 9;
12, 3 + 11, 8, 24, 1;
14, 1 + 11, 8, 25, 9

- 5, 9 — 3, 5, 2, 4;
13, 1 — 3, 5, 9, 6;
15, 6 — 3, 5, 12, 1
- 15 • 5, 75;
24 • 5, 120;
37 • 5, 185
- 84 ÷ 12, 7;
108 ÷ 12, 9;
132 ÷ 12, 11

CHECK

- 29, 8 — 6, 7, 23, 1;
42, 9 — 6, 7, 36, 2;
58, 3 — 6, 7, 51, 6
- 3 • 14, 42, 7 • 14,
98;
11 • 14, 154

TRY THESE

- 4, 1; F
- 5, 2; E
- 6, 5; (6, 5)

PRACTICE

- 1; right, 3; up;
(1, 3)
- 5; right, 0; up;
(5, 0)
- 3; left, 4; down;
(-3, -4)

- (-5, 4)
- (-2, -3)
- (0, 1)
- (5, 4)
- (-6, 0)
- (5, -4)

CHECK

- (2, -2)
- (0, -6)
- (-3, 5)
- (4, 0)

TRY THESE

- 1, 4, (1, 4)
- 6, 5, (6, 5)
- Video Store

PRACTICE

- 1, 5, (1, 5)
- 2, 1, (2, 1)
- 3, 7, (3, 7)
- (5, 4)
- (6, 9)
- (7, 3)

CHECK

- (1, 6)
- (2, 3)
- (4, 5)
- (6, 7)

TRY THESE

- 80, 90, up, 80,
88
- 90, 100, up, 90,
94
- 0, -10, down,
0, -6
- 20, 30, up, 20,
22

PRACTICE

- 10
- 0, 10, down, 10,
8
- 10, -20, up,
-20, -18
- 20, 30, up, 20,
22
- 0, 4
- 20, -18
- 10, 12
- 20, 22
- 8
- 62
- 12
- 44
- 30
- 10
- 0
- 20

Answers



TRY THESE

1. $\frac{3}{8}$ in.
2. $4\frac{1}{2}$ cm
3. $2\frac{1}{8}$ in.

PRACTICE

1. $7\frac{1}{2}$ in.
 2. $2\frac{1}{2}$ cm.
 3. 11 in
 4. will vary
 5. will vary
 6. will vary
- CHECK**
7. will vary
 8. will vary
 9. will vary



TRY THESE

1. right
2. acute
3. obtuse
4. straight

PRACTICE

1. acute
 2. right
 3. obtuse
 4. straight
 5. right
 6. acute
 7. obtuse
 8. straight
 9. right
- CHECK**
10. acute
 11. obtuse
 12. right



TRY THESE

1. GHK; KHG; H
2. d
3. BGD; DGB

PRACTICE

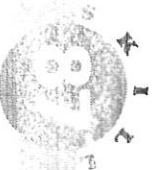
1. GCM; MCG; C
 2. a
 3. ROE; EOR
 4. DEW; WED; E
 5. g
 6. SOP; POS
 7. 3
 8. OPL; LPO
 9. TAP; PAT
- CHECK**
10. CDA; ADC
 11. R
 12. PDQ; QDP



PRACTICE

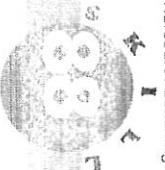
1. isosceles triangle
 2. equilateral triangle
 3. right triangle
 4. obtuse triangle
 5. rectangle
 6. parallelogram
 7. rhombus
 8. trapezoid
 9. pentagon
 10. hexagon
 11. octagon
 12. scalene triangle
- CHECK**
13. rhombus or square
 14. isosceles triangle
 15. rectangle
 16. parallelogram

ANSWERS



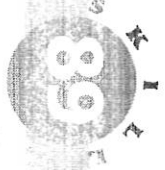
TRY THESE

1. translation
 2. reflection
 3. rotation
- PRACTICE**
1. reflection
 2. translation
 3. rotation
 4. rotation
 5. translation
 6. reflection
 7. translation
 8. reflection
 9. translation
- CHECK**
10. reflection
 11. rotation
 12. translation



TRY THESE

1. Yes, no
 2. no, yes
 3. yes, no
 4. no, no
- PRACTICE**
1. 4
 2. 2
 3. 2
 4. 0
 5. 1
 6. 2
 7. 0
 8. 2
- CHECK**
9. 1
 10. 1
 11. 0
 12. 1



TRY THESE

1. $DEF, 90^\circ$
 2. $UTS, 120^\circ$
- PRACTICE**
1. 30
 2. 120
 3. 40
 4. $HKM, 75^\circ$
 5. $RLO, 145^\circ$
 6. $KOZ, 25^\circ$
 7. $m\angle JEM = 90^\circ$
 8. $m\angle CGL = 135^\circ$
 9. $m\angle DGB = 20^\circ$
- CHECK**
10. $m\angle GDR = 180^\circ$
 11. $m\angle LRS = 15^\circ$
 12. $m\angle EHN = 130^\circ$



TRY THESE

1. Boys, 13, climbing
 2. Bicycling, 10, 9, 1
 3. Girls, 11, 12, 23
- PRACTICE**
1. Marina, 140, 140
 2. Game 1, 205, Jorge
 3. Lucia, 192, Game 1
 4. Game 2, 212, 218, 6
 5. 621
 6. Theon
- CHECK**
7. Game 1
 8. Jorge

ANSWERS