

1. Parentheses and Expressions

a)

$$(3 + 5) \times 2 = 16$$

First, calculate inside parentheses: $3 + 5 = 8$

Then, multiply: $8 \times 2 = 16$

b)

$$[4 + 6] \div 2 = \text{-----}$$

c)

$$\{ 12 - 4 \} \times 3 = \text{-----}$$

1. Parentheses and Expressions

d)

$$(2 + 3) \times (4 + 1) = \underline{\hspace{2cm}}$$

e)

$$[(8 - 3) \times 2] + 5 = \underline{\hspace{2cm}}$$

f)

$$\{10 + [6 \div (3 - 1)]\} = \underline{\hspace{2cm}}$$

2. Writing and Interpreting Expressions

a)

"Add 8 and 7, then multiply by 2"

$$2 \times (8 + 7) = 30$$

b)

"Subtract 6 from 20, then divide by 2"

$$(20 - 6) \div 2 = \underline{\hspace{2cm}}$$

c)

"Multiply 3 and 4, then add 5"

$$3 \times 4 + 5 = \underline{\hspace{2cm}}$$

2. Writing and Interpreting Expressions

d)

"Multiply the difference of 9 and 5 by 4"

$$(9 - 5) \times 4 = \underline{\hspace{2cm}}$$

e)

"Add 6 and 2, divide by 2, then multiply by 3"

$$(6 + 2) \div 2 \times 3 = \underline{\hspace{2cm}}$$

f)

Without calculating, determine which is larger

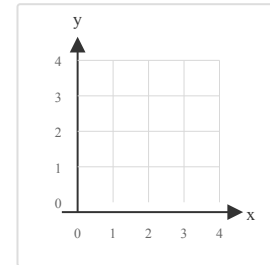
$$3 \times (18932 + 921) > 18932 + 921$$

*Because $3 \times (18932 + 921)$ is **3 times** $18932 + 921$*

3. Patterns and Coordinate Graphs

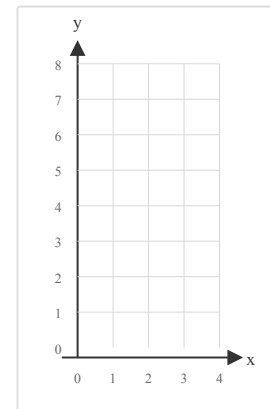
a) $y = x$

x	0	→	1	→	2	→	3	→	4
y	0	→	1	→	2	→	3	→	
	(0,0)		(1,1)		(2,)		(3,)		(4,)



b) $y = 2x$

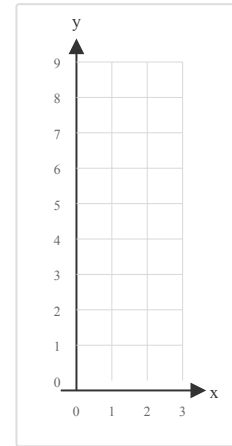
x	0	→	1	→	2	→	3	→	4
y	0	→	2	→	4	→	6	→	
	(0,0)		(1,2)		(2,)		(3,)		(4,)



3. Patterns and Coordinate Graphs

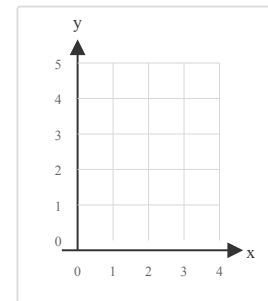
c) $y = 3x$

x	0	→	1	→	2	→	3
y	0	→	3	→	6	→	
	(0,0)		(1,3)		(2,)		(3,)



d) $y = x + 1$

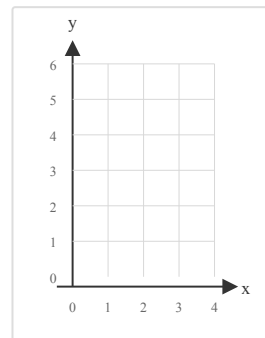
x	0	→	1	→	2	→	3	→	4
y	1	→	2	→	3	→	4	→	
	(0,1)		(1,2)		(2,)		(3,)		(4,)



3. Patterns and Coordinate Graphs

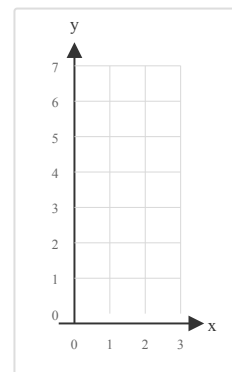
e) $y = x + 2$

x	0	→	1	→	2	→	3	→	4
y	2	→	3	→	4	→	5	→	
	(0,2)		(1,3)		(2,)		(3,)		(4,)



f) $y = 2x + 1$

x	0	→	1	→	2	→	3
y	1	→	3	→	5	→	
	(0,1)		(1,3)		(2,)		(3,)



4. Place Value: Same Digit, Different Positions

a)



b)

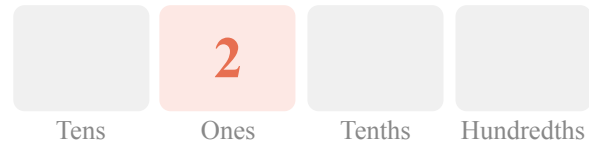


c)

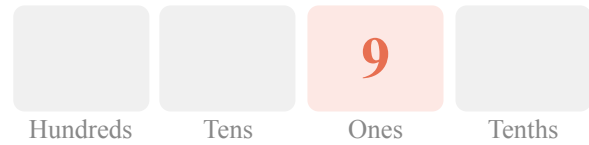


4. Place Value: Same Digit, Different Positions

d)



e)



f)



5. Powers of 10 and Exponents

a)

$$10^1 = 10 = \mathbf{10} \text{ (1 zero)}$$

$$10^2 = 10 \times 10 = \mathbf{100} \text{ (2 zeros)}$$

$$10^3 = 10 \times 10 \times 10 = \mathbf{1000} \text{ (3 zeros)}$$

$$10^4 = 10 \times 10 \times 10 \times 10 = \mathbf{10000} \text{ (4 zeros)}$$

5. Powers of 10 and Exponents

b)

$$10^5 = 10 \times 10 \times 10 \times 10 \times 10 = \boxed{} \quad (\boxed{} \uparrow 0)$$

c)

$$10^6 = 10 \times 10 \times 10 \times 10 \times 10 \times 10 = \boxed{} \quad (\boxed{} \uparrow 0)$$

d)

$$600 = 6 \times 100 = 6 \times \boxed{}$$

5. Powers of 10 and Exponents

e) $7000 = 7 \times \square = 7 \times \square$

f) $50000 = 5 \times \square = 5 \times \square$

6. Reading/Writing Decimals and Expanded Form

a)

$$\begin{array}{c} 345.67 \\ \text{Hundreds} \quad \text{Tens} \quad \text{Ones} \quad \text{Tenths} \quad \text{Hundredths} \\ 300 + 40 + 5 + 0.6 + 0.07 \\ 345.67 = 300 + 40 + 5 + 0.6 + 0.07 \end{array}$$

b)

$$52.8 = \boxed{} + \boxed{} + \boxed{}$$

c)

$$706.03 = \boxed{} + \boxed{} + \boxed{} + \boxed{}$$

6. Reading/Writing Decimals and Expanded Form

d)

$$9.4 = \boxed{} + \boxed{}$$

e)

$$1800.5 = \boxed{} + \boxed{} + \boxed{}$$

f)

$$0.89 = \boxed{} + \boxed{}$$

7. Comparing Decimals

a)

$$0.35 \text{ ? } 0.40$$

0	.	3	5
Ones		Tenths	Hundredths

0	.	4	0
Ones		Tenths	Hundredths

$$0.35 < 0.40$$

b)

$$0.7 \text{ } \square \text{ } 0.68$$

7. Comparing Decimals

c)

1.23 1.230

d)

0.509 0.51

7. Comparing Decimals

e)

3.07 3.1

f)

0.445 0.45

8. Rounding Decimals

a)

Rounding rule: Look at the next digit of the last place to keep; if ≥ 5 , round up; if < 5 , round down

3.47 $\rightarrow$ 3.5

Round to tenths place. Look at hundredths place. Hundredths is 7, $7 \geq 5$, round up

b)

6.23 $\rightarrow$

Round to tenths

8. Rounding Decimals

c)

0.584 →
Round to hundredths

d)

12.96 →
Round to tenths

8. Rounding Decimals

e)

5.091 →
Round to hundredths

f)

9.999 →
Round to hundredths

9. Multi-Digit Multiplication

a)

$$\begin{aligned}24 \times 3 &= (20 + 4) \times 3 \\&= 20 \times 3 + 4 \times 3 \\&= 60 + 12 \\&= 72\end{aligned}$$

$$\begin{aligned}24 \times 13 &= (20 + 4) \times 13 \\&= 20 \times 13 + 4 \times 13 \\&= 20 \times (10 + 3) + 4 \times (10 + 3) \\&= 20 \times 10 + 20 \times 3 + 4 \times 10 + 4 \times 3 \\&= 200 + 60 + 40 + 12 \\&= 312\end{aligned}$$

9. Multi-Digit Multiplication

b)

$$35 \times 4 = \boxed{}$$

c)

$$123 \times 6 = \boxed{}$$

9. Multi-Digit Multiplication

d)

$$42 \times 15 = \boxed{}$$

e)

$$208 \times 7 = \boxed{}$$

f)

$$56 \times 23 = \boxed{}$$

10. Multi-Digit Division

a)

$$\begin{aligned} 48 \div 4 &= (40 + 8) \div 4 \\ &= 40 \div 4 + 8 \div 4 \\ &= 10 + 2 \\ &= 12 \end{aligned}$$

$$\begin{aligned} 84 \div 12 &= (60 + 24) \div 12 \\ &= 60 \div 12 + 24 \div 12 \\ &= 5 + 2 \\ &= 7 \end{aligned}$$

10. Multi-Digit Division

b)

$$72 \div 6 = \boxed{}$$

c)

$$96 \div 8 = \boxed{}$$

10. Multi-Digit Division

d)

$$105 \div 5 = \boxed{}$$

e)

$$168 \div 12 = \boxed{}$$

f)

$$225 \div 15 = \boxed{}$$

11. Decimal Addition and Subtraction

a)

$$\begin{aligned} 3.5 + 2.7 &= (3 + 2) + (0.5 + 0.7) \\ &= 5 + 1.2 \\ &= 6.2 \end{aligned}$$

$$\begin{aligned} 2.35 + 1.48 &= (2 + 1) + (0.3 + 0.05) + (0.4 + 0.08) \\ &= 3 + 0.3 + 0.4 + 0.05 + 0.08 \\ &= 3 + 0.7 + 0.13 \\ &= 3.83 \end{aligned}$$

$$\begin{aligned} 6.8 - 3.2 &= (6 - 3) + (0.8 - 0.2) \\ &= 3 + 0.6 \\ &= 3.6 \end{aligned}$$

$$\begin{aligned} 5.43 - 2.17 &= (5 - 2) + (0.43 - 0.17) \\ &= 3 + (0.2 + 0.23 - 0.17) \\ &= 3 + 0.2 + 0.06 \\ &= 3.26 \end{aligned}$$

11. Decimal Addition and Subtraction

b)

$$4.8 + 3.1 = \boxed{}$$

c)

$$7.25 + 1.33 = \boxed{}$$

d)

$$8.9 - 4.6 = \boxed{}$$

11. Decimal Addition and Subtraction

e)

$$6.78 - 3.45 = \boxed{}$$

f)

$$9.6 + 2.8 = \boxed{}$$

12. Decimal Multiplication

a)

$$\begin{aligned}0.4 \times 3 &= 4 \times \frac{1}{10} \times 3 \\&= 4 \times 3 \times \frac{1}{10} \\&= 12 \times \frac{1}{10} \\&= 1.2\end{aligned}$$

$$\begin{aligned}0.25 \times 4 &= 25 \times \frac{1}{100} \times 4 \\&= 25 \times 4 \times \frac{1}{100} \\&= 100 \times \frac{1}{100} \\&= 1\end{aligned}$$

$$\begin{aligned}0.6 \times 0.4 &= 6 \times \frac{1}{10} \times 4 \times \frac{1}{10} \\&= 6 \times 4 \times \frac{1}{10} \times \frac{1}{10} \\&= 24 \times \frac{1}{100} \\&= 0.24\end{aligned}$$

$$\begin{aligned}1.5 \times 1.2 &= 15 \times \frac{1}{10} \times 12 \times \frac{1}{10} \\&= 15 \times 12 \times \frac{1}{10} \times \frac{1}{10} \\&= 180 \times \frac{1}{100} \\&= 1.8\end{aligned}$$

12. Decimal Multiplication

b)

$$0.7 \times 5 = \boxed{}$$

c)

$$0.3 \times 0.7 = \boxed{}$$

d)

$$1.2 \times 4 = \boxed{}$$

12. Decimal Multiplication

e)

$$2.5 \times 0.8 = \boxed{}$$

f)

$$0.45 \times 6 = \boxed{}$$

13. Division and Decimal Principles

a) Definition of Division

Definition of Division

$a \div b = x$ means:

$$\mathbf{b \times x = a}$$

Theorem 1: Fundamental Property of Fractions

Theorem: $\mathbf{a \div b = (a \times c) \div (b \times c)}$

Proof: 设 $a \div b = x$, then $b \times x = a$ (Definition of Division)

Multiply both sides by c : $(b \times x) \times c = a \times c$

$(b \times c) \times x = a \times c$ (Associative Property of Multiplication)

therefore $x = (a \times c) \div (b \times c)$ (Definition of Division)

Thus $\mathbf{a \div b = (a \times c) \div (b \times c)}$ **Q.E.D.**

Corollary: $\mathbf{1/10 = 10/100}$

Proof: $1 \div 10 = (1 \times 10) \div (10 \times 10) = 10 \div 100$

13. Division and Decimal Principles

Theorem 2: Division and Multiplication Commutativity

$$\text{Theorem: } a \times b \div c = (a \div c) \times b$$

$$\begin{aligned} \text{Proof: } a \times b \div c &= a \times b \times (1/c) \\ &= a \times (1/c) \times b \quad (\text{Commutative Property of Multiplication}) \\ &= (a \div c) \times b \quad \text{Q.E.D.} \end{aligned}$$

Theorem 3: Distributive Property of Division

$$\text{Theorem: } (a + b) \div c = a \div c + b \div c$$

$$\begin{aligned} \text{Proof: } (a + b) \div c &= (a + b) \times (1/c) \\ &= a \times (1/c) + b \times (1/c) \quad (\text{Distributive Property of Multiplication}) \\ &= a \div c + b \div c \quad \text{Q.E.D.} \end{aligned}$$

Theorem 4: Fraction Multiplication

$$\text{Theorem: } (1/a) \times (1/b) = 1/(a \times b)$$

$$\text{Proof: 设 } x = (1/a) \times (1/b)$$

$$\text{则 } x \times (a \times b) = (1/a) \times (1/b) \times a \times b$$

$$= (1/a \times a) \times (1/b \times b) = 1 \times 1 = 1$$

$$\text{所以 } x = 1/(a \times b) \quad \text{Q.E.D.}$$

13. Division and Decimal Principles

Theorem 5: Commutativity of Multiplication and Division

$$\text{Theorem: } a \times b \div (c \times d) = (a \div c) \times (b \div d)$$

$$\text{Proof: } a \times b \div (c \times d) = a \times b \times 1/(c \times d)$$

$$= a \times b \times (1/c) \times (1/d) \quad (\text{定理4})$$

$$= a \times (1/c) \times b \times (1/d) \quad (\text{Commutative Property of Multiplication})$$

$$= (a \div c) \times (b \div d) \quad \text{Q.E.D.}$$

14. Decimal Division

a) Definition of Decimals

Definition of Decimals

Tenths place: $0.x = x \times \frac{1}{10}$ (x tenths)

Hundredths place: $0.0x = x \times \frac{1}{100}$ (x hundredths)

$$0.5 = 5 \times \frac{1}{10}$$

$$0.05 = 5 \times \frac{1}{100}$$

$$0.57 = 0.5 + 0.07$$

$$= 5 \times \frac{1}{10} + 7 \times \frac{1}{100}$$

$$= 5 \times \frac{10}{100} + 7 \times \frac{1}{100} \quad (\text{Theorem 1})$$

$$= 50 \times \frac{1}{100} + 7 \times \frac{1}{100}$$

$$= (50 + 7) \times \frac{1}{100}$$

$$= 57 \times \frac{1}{100}$$

$$2.57 = 2 + 0.57$$

$$= 2 \times 1 + 57 \times \frac{1}{100}$$

$$= 2 \times \frac{100}{100} + 57 \times \frac{1}{100}$$

$$= 200 \times \frac{1}{100} + 57 \times \frac{1}{100}$$

$$= (200 + 57) \times \frac{1}{100}$$

$$= 257 \times \frac{1}{100}$$

14. Decimal Division

$$\begin{aligned}4.8 \div 2 &= 48 \times \frac{1}{10} \div 2 \\&= 48 \div 2 \times \frac{1}{10} \\&= 24 \times \frac{1}{10} \\&= 2.4\end{aligned}$$

$$\begin{aligned}0.56 \div 7 &= 56 \times \frac{1}{100} \div 7 \\&= 56 \div 7 \times \frac{1}{100} \\&= 8 \times \frac{1}{100} \\&= 0.08\end{aligned}$$

$$\begin{aligned}3.6 \div 0.4 &= 36 \times \frac{1}{10} \div (4 \times \frac{1}{10}) \\&= 36 \div 4 \times \frac{1}{10} \div \frac{1}{10} \\&= 36 \div 4 \\&= 9\end{aligned}$$

$$\begin{aligned}1.44 \div 1.2 &= 144 \times \frac{1}{100} \div (120 \times \frac{1}{100}) \\&= 144 \div 120 \times \frac{1}{100} \div \frac{1}{100} \\&= 144 \div 120 \\&= 1.2\end{aligned}$$

14. Decimal Division

b)

$$6.3 \div 3 = \text{[]}$$

c)

$$7.5 \div 0.5 = \text{[]}$$

d)

$$0.72 \div 8 = \text{[]}$$

14. Decimal Division

e)

$$4.2 \div 0.6 = \boxed{}$$

f)

$$2.25 \div 0.5 = \boxed{}$$

15. Addition and Subtraction of Fractions with Unlike Denominators

a)

$$\begin{aligned} 1/2 + 1/4 &= 1 \times 2 / 2 \times 2 + 1/4 \\ &= 2/4 + 1/4 \\ &= 3/4 \end{aligned}$$

$$\begin{aligned} 1/3 + 1/6 &= 1 \times 2 / 3 \times 2 + 1/6 \\ &= 2/6 + 1/6 \\ &= 1/2 \end{aligned}$$

$$\begin{aligned} 2/3 - 1/2 &= 2 \times 2 / 3 \times 2 - 1 \times 3 / 2 \times 3 \\ &= 4/6 - 3/6 \\ &= 1/6 \end{aligned}$$

$$\begin{aligned} 3/4 + 1/8 &= 3 \times 2 / 4 \times 2 + 1/8 \\ &= 6/8 + 1/8 \\ &= 7/8 \end{aligned}$$

15. Addition and Subtraction of Fractions with Unlike Denominators

b)

$$\frac{1}{4} + \frac{1}{8} = \boxed{}$$

c)

$$\frac{5}{6} - \frac{1}{2} = \boxed{}$$

d)

$$\frac{2}{5} + \frac{1}{10} = \boxed{}$$

15. Addition and Subtraction of Fractions with Unlike Denominators

e)

$$\frac{7}{8} - \frac{1}{4} = \boxed{}$$

f)

$$\frac{1}{3} + \frac{3}{10} = \boxed{}$$

16. Fraction Word Problems

a)

Xiao Ming ate $\frac{1}{2}$ of a cake, and Xiao Hong ate $\frac{1}{4}$.

How much cake did they eat altogether?

$$\frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4} = \frac{3}{4}$$

Answer: They ate $\frac{3}{4}$ of the cake altogether.

A rope is $\frac{7}{8}$ meters long. $\frac{1}{4}$ meter was used.

How many meters are left?

$$\frac{7}{8} - \frac{1}{4} = \frac{7}{8} - \frac{2}{8} = \frac{5}{8}$$

Answer: $\frac{5}{8}$ meters are left.

A bottle has $\frac{2}{3}$ liter of water. $\frac{1}{6}$ liter was drunk.

How many liters are left in the bottle?

$$\frac{2}{3} - \frac{1}{6} = \frac{4}{6} - \frac{1}{6} = \frac{1}{2}$$

Answer: $\frac{1}{2}$ liter is left.

Xiao Hua walked $\frac{3}{5}$ km, and Xiao Li walked $\frac{1}{2}$ km.

How many kilometers did they walk altogether?

$$\frac{3}{5} + \frac{1}{2} = \frac{6}{10} + \frac{5}{10} = \frac{11}{10}$$

Answer: They walked $\frac{11}{10}$ km altogether.

16. Fraction Word Problems

b)

A field is $\frac{5}{6}$ hectares. $\frac{1}{3}$ hectares were planted with corn.

How many hectares of field are left?

$$\frac{5}{6} - \frac{1}{3} = \boxed{}$$

c)

A cake used $\frac{1}{2}$ cup of sugar. Cookies used $\frac{3}{10}$ cup of sugar.

How many cups of sugar were used in total?

$$\frac{1}{2} + \frac{3}{10} = \boxed{}$$

d)

Xiao Gang ran $\frac{3}{4}$ km, and Xiao Qiang ran $\frac{1}{8}$ km.

How much farther did Xiao Gang run than Xiao Qiang?

$$\frac{3}{4} - \frac{1}{8} = \boxed{}$$

16. Fraction Word Problems

e)

Xiao Ming drank $\frac{2}{5}$ liter of milk, and Xiao Hong drank $\frac{1}{10}$ liter.
How many liters of milk did they drink in total?

$$\frac{2}{5} + \frac{1}{10} = \boxed{}$$

f)

A road is $\frac{5}{6}$ km long. $\frac{1}{2}$ km has been repaired.
How many km are left to repair?

$$\frac{5}{6} - \frac{1}{2} = \boxed{}$$

17. Relationship between Fractions and Division

$$a / b = a \div b$$

a)

$$1/2 = 1 \div 2$$

$$3/4 = 3 \div 4$$

$$5/8 = 5 \div 8$$

$$7/3 = 7 \div 3$$

17. Relationship between Fractions and Division

b)

$$2/5 = \boxed{}$$

c)

$$9/4 = \boxed{}$$

d)

$$11/6 = \boxed{}$$

17. Relationship between Fractions and Division

e)

$$7 \div 8 = \boxed{}$$

f)

$$5 \div 3 = \boxed{}$$

18. Fraction Multiplication

$$a/b \times c/d = (a \times c) / (b \times d)$$

a)

$$\begin{aligned} 1/2 \times 3/4 &= (1 \times 3) / (2 \times 4) \\ &= \mathbf{3/8} \end{aligned}$$

$$\begin{aligned} 2/3 \times 5/7 &= (2 \times 5) / (3 \times 7) \\ &= \mathbf{10/21} \end{aligned}$$

$$\begin{aligned} 3 \times 2/5 &= (3 \times 2) / 5 \\ &= \mathbf{6/5} \end{aligned}$$

$$\begin{aligned} 4/9 \times 3 &= (4 \times 3) / 9 \\ &= 12/9 = \mathbf{4/3} \end{aligned}$$

18. Fraction Multiplication

b)

$$\frac{2}{5} \times \frac{3}{4} = \boxed{}$$

c)

$$\frac{5}{6} \times \frac{1}{3} = \boxed{}$$

d)

$$4 \times \frac{3}{7} = \boxed{}$$

18. Fraction Multiplication

e)

$$\frac{7}{8} \times \frac{2}{5} = \boxed{}$$

f)

$$\frac{5}{9} \times 6 = \boxed{}$$

19. Multiplication and Scaling

Multiplying by a number **greater than 1** makes the result **larger**

Multiplying by a number **equal to 1** keeps the result **unchanged**

Multiplying by a number **less than 1** makes the result **smaller**

a)

$$6 \times \frac{2}{3} = 6 \times (1 - \frac{1}{3}) = 6 - 6 \times \frac{1}{3} < 6$$

$$4 \times \frac{5}{4} = 4 \times (1 + \frac{1}{4}) = 4 + 4 \times \frac{1}{4} > 4$$

$$8 \times \frac{3}{3} = 8 \times 1 = 8$$

$$10 \times \frac{1}{4} = 10 \times (1 - \frac{3}{4}) = 10 - 10 \times \frac{3}{4} < 10$$

19. Multiplication and Scaling

b)

$5 \times 3/2$, Is the result greater or less than 5?

$$5 \times 3/2 = \text{[]}$$

c)

$7 \times 4/7$, Is the result greater or less than 7?

$$7 \times 4/7 = \text{[]}$$

d)

$9 \times 5/5$, Is the result greater or less than 9?

$$9 \times 5/5 = \text{[]}$$

19. Multiplication and Scaling

e)

$6 \times 1/3$, Is the result greater or less than 6?

$$6 \times 1/3 = \boxed{}$$

f)

$3 \times 7/6$, Is the result greater or less than 3?

$$3 \times 7/6 = \boxed{}$$

20. Fraction Multiplication Word Problems

a)

Xiao Ming has 12 candies and ate $\frac{2}{3}$ of them. How many did he eat?

$$\begin{aligned} 12 \times \frac{2}{3} &= 12 \times 2 \times \frac{1}{3} = 12 \times \frac{1}{3} \times 2 \\ &= \frac{12}{3} \times 2 = 4 \times 2 = 8 \end{aligned}$$

Answer: He ate 8 candies.

A book has 80 pages. Xiao Li read $\frac{3}{5}$ of them. How many pages did she read?

$$\begin{aligned} 80 \times \frac{3}{5} &= 80 \times 3 \times \frac{1}{5} = 80 \times \frac{1}{5} \times 3 \\ &= \frac{80}{5} \times 3 = 16 \times 3 = 48 \end{aligned}$$

Answer: She read 48 pages.

A field is 60 m². $\frac{2}{5}$ was planted with vegetables. How many m² is the vegetable field?

$$\begin{aligned} 60 \times \frac{2}{5} &= 60 \times 2 \times \frac{1}{5} = 60 \times \frac{1}{5} \times 2 \\ &= \frac{60}{5} \times 2 = 12 \times 2 = 24 \end{aligned}$$

Answer: The vegetable field is 24 m².

(Case where division is not exact)

$$\begin{aligned} 7 \times \frac{5}{3} &= 7 \times 5 \times \frac{1}{3} = 35 \times \frac{1}{3} \\ &= \frac{35}{3} = 35/3 \end{aligned}$$

20. Fraction Multiplication Word Problems

b)

A box has **24** apples. Xiao Hong took **1/4** of them.

How many apples did she take?

$$24 \times 1/4 = \boxed{}$$

c)

A road is **36** km long. **5/6** of it has been repaired.

How many km were repaired?

$$36 \times 5/6 = \boxed{}$$

d)

Xiao Ming has **30** yuan and spent **2/3** of it on stationery.

How much did he spend?

$$30 \times 2/3 = \boxed{}$$

20. Fraction Multiplication Word Problems

e)

A bag of rice weighs **18** kg. **5/9** of it was eaten.

How many kg were eaten?

$$18 \times 5/9 = \boxed{}$$

f)

The school has **45** trees, and **4/5** of them are fruit trees.

How many fruit trees are there?

$$45 \times 4/5 = \boxed{}$$

21. Fraction Division

$$a \div (b/c) = a \times (c/b)$$

a)

$$\text{Proof: } \frac{1}{b/c} = c/b$$

Let $x = \frac{1}{b/c}$. Then $(b/c) \times x = 1$ (Definition of Division)

Multiply both sides by c : $b \times x = c$

Therefore $x = c / b$

Thus $\frac{1}{b/c} = c/b$ **Q.E.D.**

$$6 \div 1/2 = 6 \times \frac{1}{1/2} = 6 \times 2/1 = 12$$

$$4 \div 2/3 = 4 \times \frac{1}{2/3} = 4 \times 3/2 = 6$$

$$1/3 \div 2 = 1/3 \times \frac{1}{2} = 1/3 \times 1/2 = 1/6$$

$$1/4 \div 3 = 1/4 \times \frac{1}{3} = 1/4 \times 1/3 = 1/12$$

21. Fraction Division

b)

$$8 \div \frac{1}{4} = \boxed{}$$

c)

$$9 \div \frac{3}{4} = \boxed{}$$

d)

$$\frac{1}{5} \div 2 = \boxed{}$$

21. Fraction Division

e)

$$\frac{1}{6} \div 4 = \boxed{}$$

f)

$$10 \div \frac{5}{6} = \boxed{}$$

22. Unit Conversion

Weight	$1 \text{ kg} = 1000 \text{ g}$	$\leftrightarrow$	$1 \text{ g} = 1/1000 \text{ kg}$
Length	$1 \text{ km} = 1000 \text{ m}$	$\leftrightarrow$	$1 \text{ m} = 1/1000 \text{ km}$
	$1 \text{ m} = 100 \text{ cm}$	$\leftrightarrow$	$1 \text{ cm} = 1/100 \text{ m}$
	$1 \text{ cm} = 10 \text{ mm}$	$\leftrightarrow$	$1 \text{ mm} = 1/10 \text{ cm}$
Volume	$1 \text{ L} = 1000 \text{ mL}$	$\leftrightarrow$	$1 \text{ mL} = 1/1000 \text{ L}$

a)

$$3 \text{ kg} = 3 \times 1 \text{ kg} = 3 \times 1000 \text{ g} = 3000 \text{ g}$$

$$2500 \text{ g} = 2500 \times 1 \text{ g} = 2500 \times 1/1000 \text{ kg} = 2500 \div 1000 \text{ kg} = 2.5 \text{ kg}$$

$$4.5 \text{ L} = 4.5 \times 1 \text{ L} = 4.5 \times 1000 \text{ mL} = 4500 \text{ mL}$$

$$2.7 \text{ m} = 2.7 \times 1 \text{ m} = 2.7 \times 100 \text{ cm} = 270 \text{ cm}$$

22. Unit Conversion

b)

$$5 \text{ km} = \boxed{} \text{ m}$$

c)

$$3600 \text{ g} = \boxed{} \text{ kg}$$

d)

$$2.3 \text{ L} = \boxed{} \text{ mL}$$

22. Unit Conversion

e)

$$150 \text{ cm} = \boxed{} \text{ m}$$

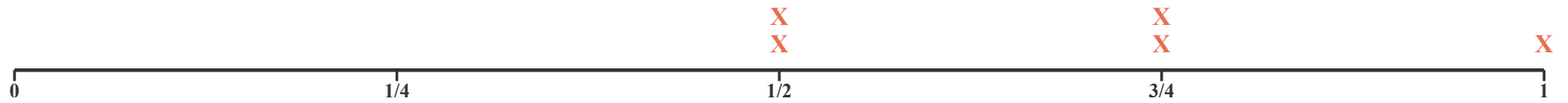
f)

$$8 \text{ cm} = \boxed{} \text{ mm}$$

23. Fraction Line Plots

a)

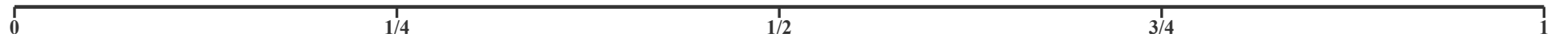
5 kids jumped rope, distances (m): $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{2}$, 1, $\frac{3}{4}$



$\frac{1}{2}$ appears 2 times, $\frac{3}{4}$ appears 2 times, 1 appears 1 time

b)

6 kids' pencil lengths (m): $\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$

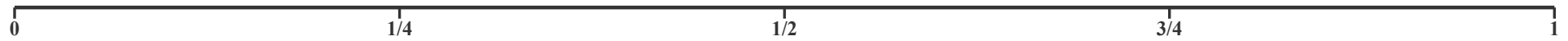


Which length is most common?

23. Fraction Line Plots

c)

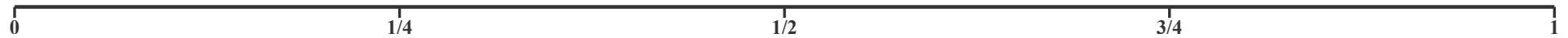
8 kids' jump rope distances (m): $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$, 1, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$



How many kids got $\frac{1}{2}$?

d)

5 cups' volumes (L): $\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{4}$

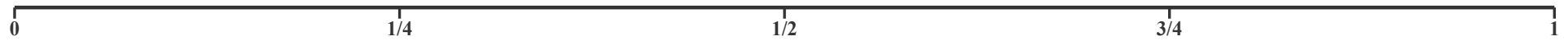


How many are less than $\frac{1}{2}$?

23. Fraction Line Plots

e)

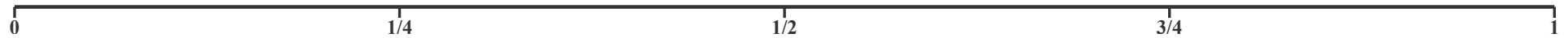
7 small trees' heights (m): $\frac{3}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, 1, $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{4}$



How many are $\frac{3}{4}$ m?

f)

6 erasers' lengths (m): $\frac{1}{4}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{4}$



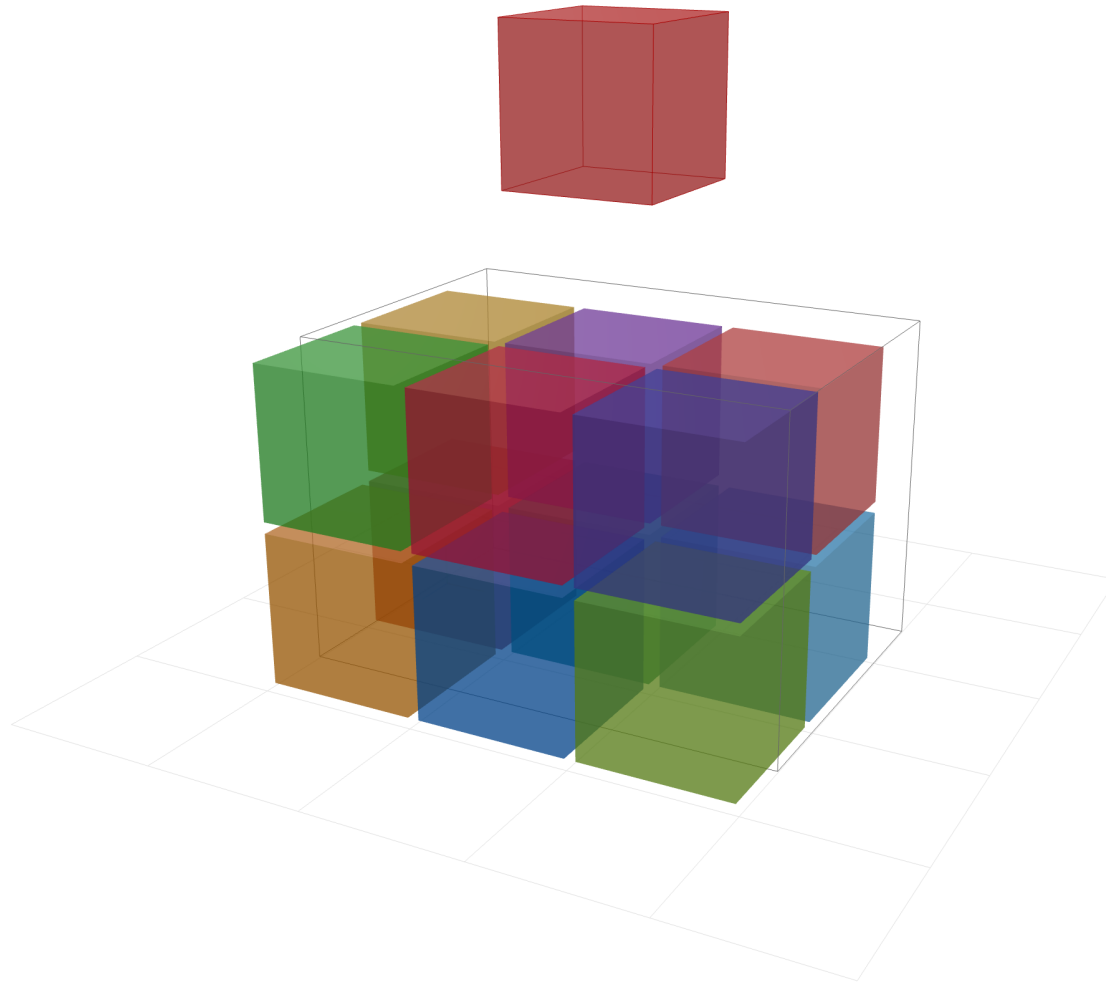
How many are greater than $\frac{1}{4}$?

24. Volume Concepts

Definition (by convention)
A cube with edge length 1 has volume = 1

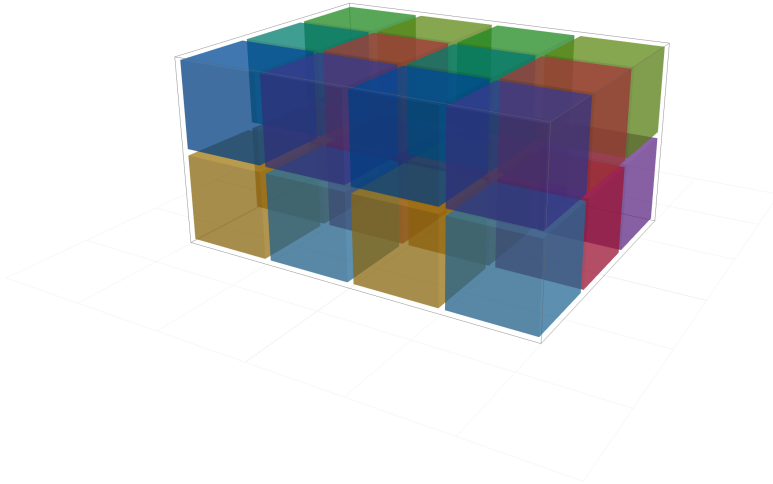
Axiom 1 $V \geq 0$ **Axiom 2** Congruent shapes have equal volume **Axiom 3** Non-overlapping: total volume = sum of parts

a)



$$3 \times 2 \times 2 = \text{ } \uparrow$$

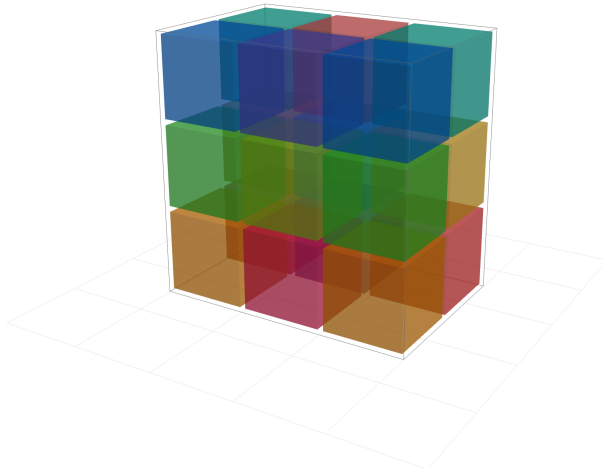
24. Volume Concepts



b)

长4、宽2、高3的长方体，数一数有多少个单位正方体？

$$4 \times 2 \times 3 = \boxed{} \text{ 个}$$

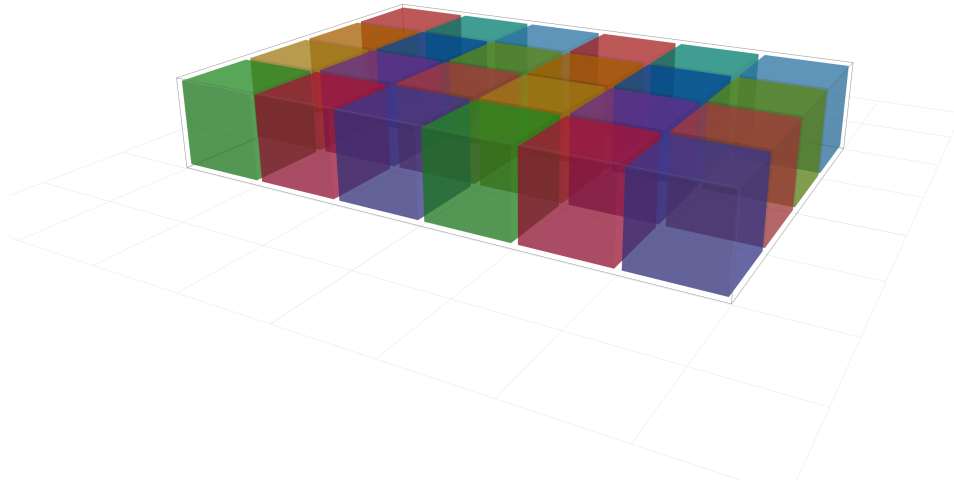


c)

长3、宽3、高2的长方体，数一数有多少个单位正方体？

$$3 \times 3 \times 2 = \boxed{} \text{ 个}$$

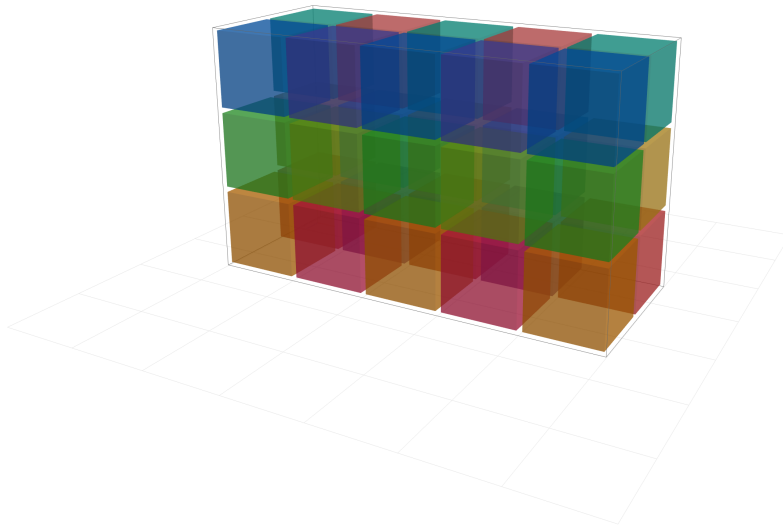
24. Volume Concepts



d)

长6、宽1、高4的长方体，数一数有多少个单位正方体？

$$6 \times 1 \times 4 = \boxed{} \text{ 个}$$



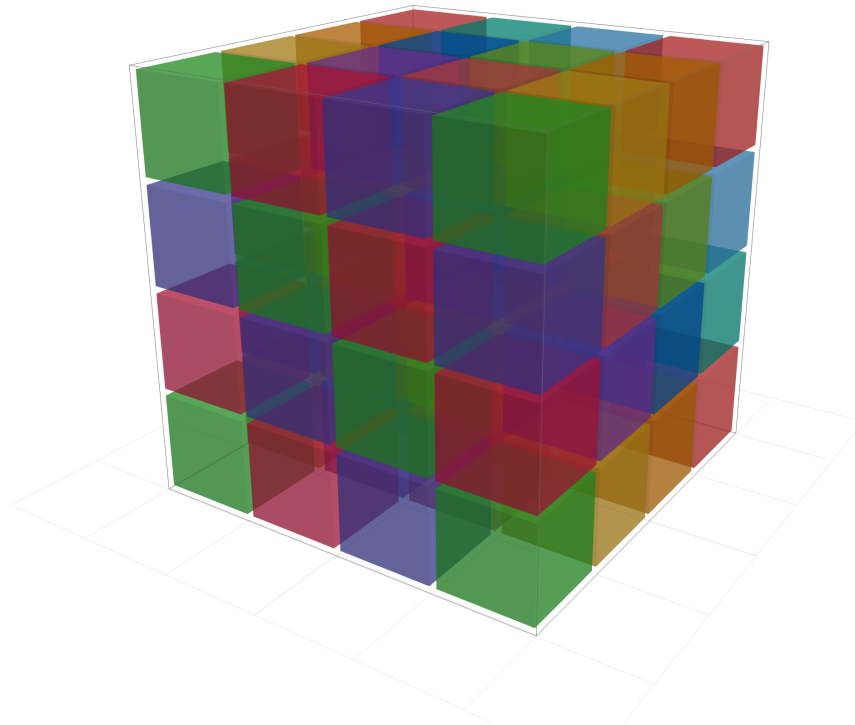
e)

长5、宽3、高2的长方体，数一数有多少个单位正方体？

$$5 \times 3 \times 2 = \boxed{} \text{ 个}$$

24. Volume Concepts

f)



$$4 \times 4 \times 4 = \boxed{} \text{ 个}$$

25. Volume Calculation

Derivation: Volume Formula for a Rectangular Prism

A rectangular prism with **length a**, **width b**, **height c**

Can be divided into $a \times b \times c$ unit cubes

By additivity of volume: $V = a \times b \times c$

a)

Length 5 cm, width 3 cm, height 4 cm

$$V = 5 \times 3 \times 4 = 60 \text{ cm}^3$$

Length 6 cm, width 2 cm, height 5 cm

$$V = 6 \times 2 \times 5 = 60 \text{ cm}^3$$

Base area $B = 12 \text{ cm}^2$, height $h = 3 \text{ cm}$

$$V = B \times h = 12 \times 3 = 36 \text{ cm}^3$$

Base area $B = 8 \text{ cm}^2$, height $h = 6 \text{ cm}$

$$V = B \times h = 8 \times 6 = 48 \text{ cm}^3$$

25. Volume Calculation

b)

Length 4 cm, width 4 cm, height 3 cm. What is the volume?

$$4 \times 4 \times 3 = \boxed{} \text{ cm}^3$$

c)

Length 7 cm, width 2 cm, height 5 cm. What is the volume?

$$7 \times 2 \times 5 = \boxed{} \text{ cm}^3$$

d)

Base B = 15 cm², height h = 4 cm. What is the volume?

$$15 \times 4 = \boxed{} \text{ cm}^3$$

25. Volume Calculation

e)

Length 9 cm, width 3 cm, height 2 cm. What is the volume?

$$9 \times 3 \times 2 = \boxed{} \text{ cm}^3$$

f)

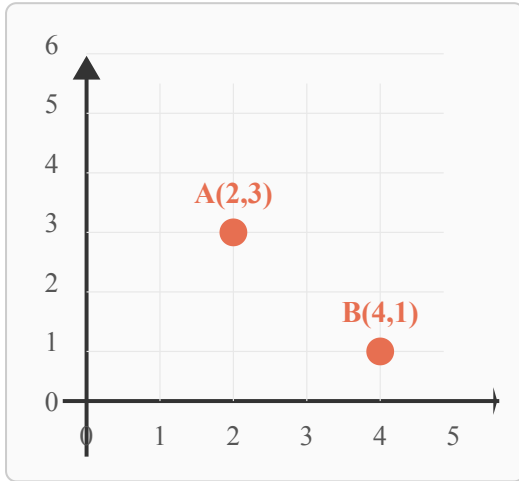
Base B = 20 cm², height h = 5 cm. What is the volume?

$$20 \times 5 = \boxed{} \text{ cm}^3$$

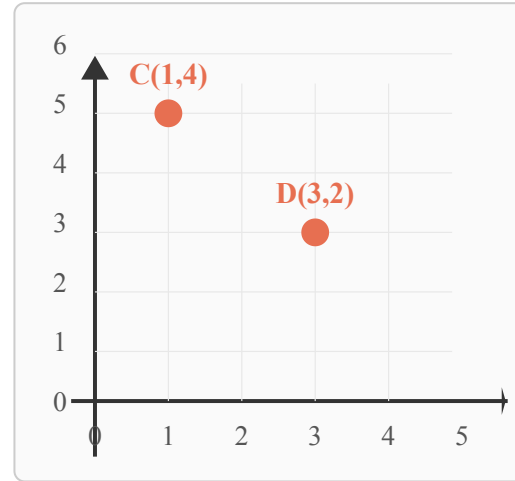
26. Coordinate Plane

(x, y) : x is the horizontal position, y is the vertical position

a) A (2, 3) B (4, 1)

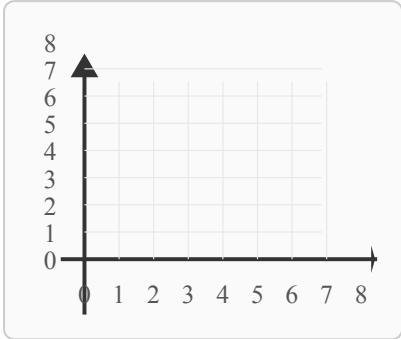


b) C (1, 4) D (3, 2)

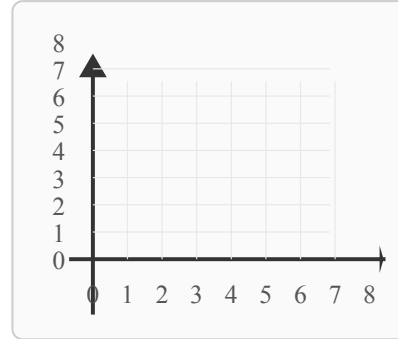


26. Coordinate Plane

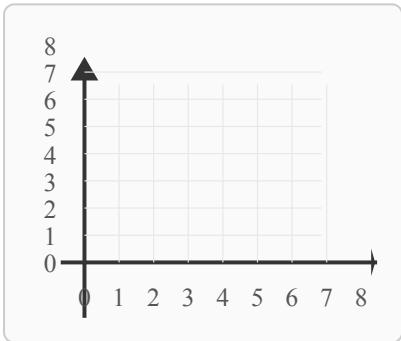
b) Plot (3, 5)



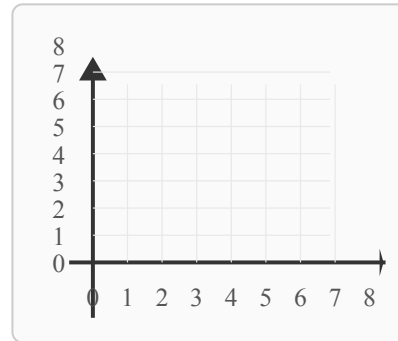
c) Plot (6, 2)



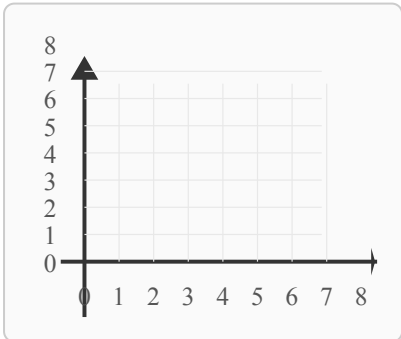
d) Plot (5, 3)



e) Plot (7, 4)



f) Plot (4, 6)



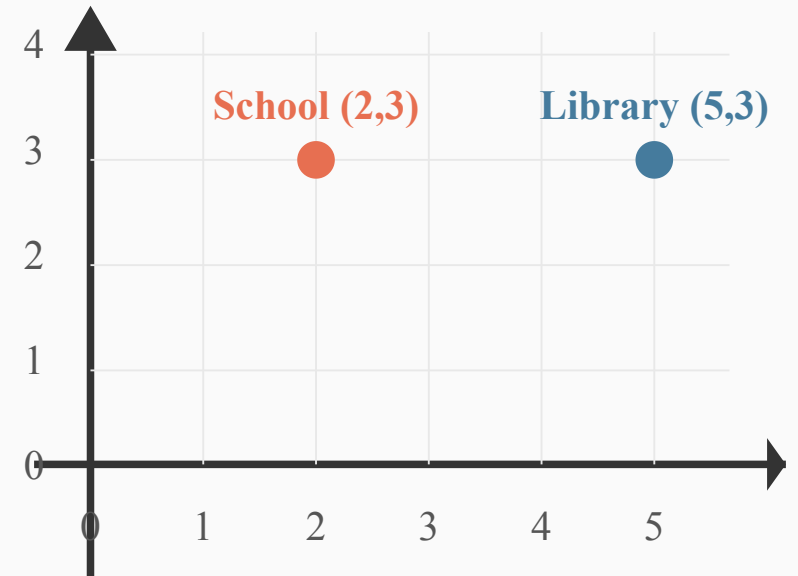
27. Coordinate Plane Word Problems

Example 1

School at (2, 3), Library at (5, 3)

How many squares apart?

x direction: $5 - 2 = 3$ squares

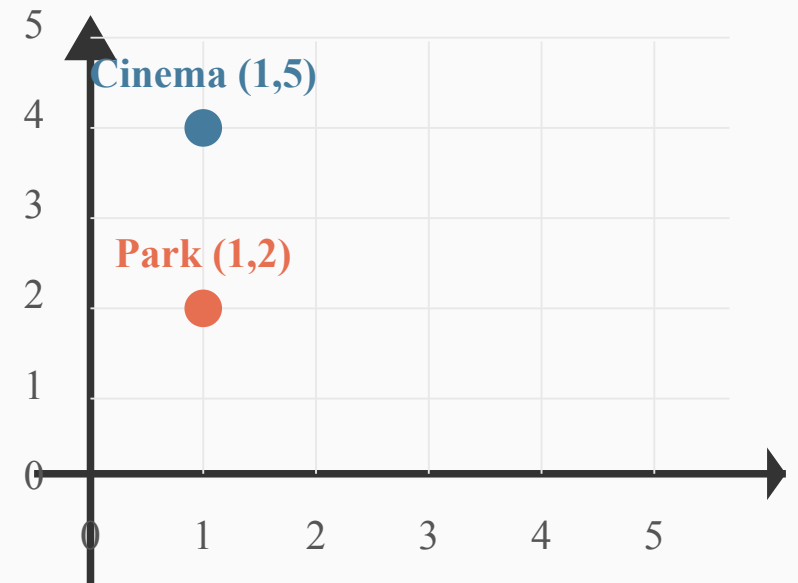


Example 2

Park at (1, 2), Cinema at (1, 5)

How many squares apart?

y direction: $5 - 2 = 3$ squares

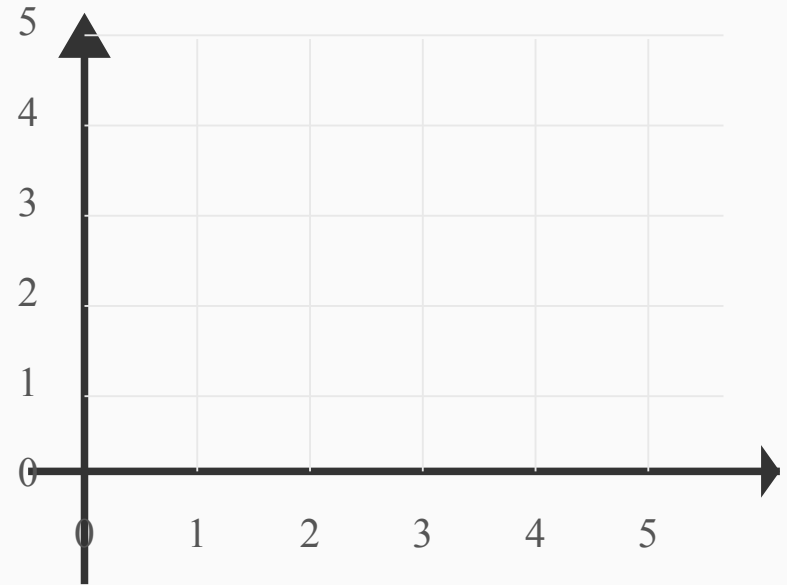


27. Coordinate Plane Word Problems

b)

Home at (1, 1), School at (1, 5)

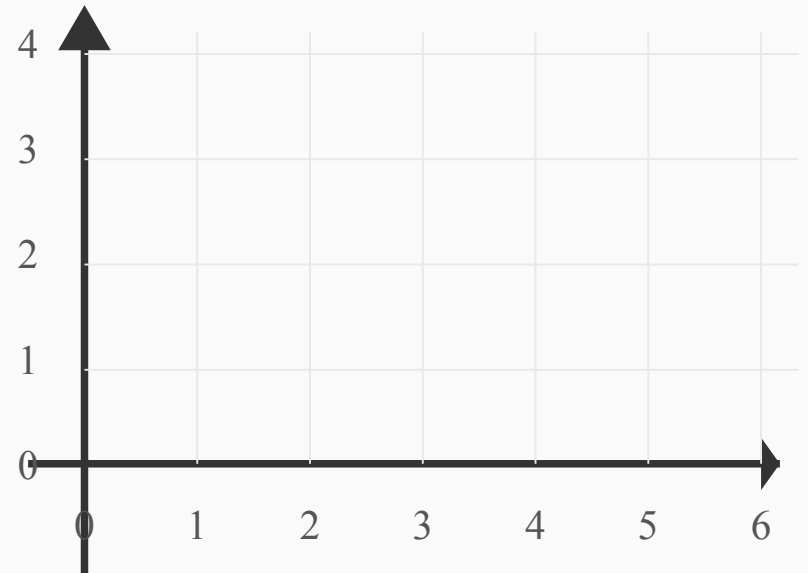
How many squares apart?



c)

Supermarket at (2, 4), Bookstore at (6, 4)

How many squares apart?

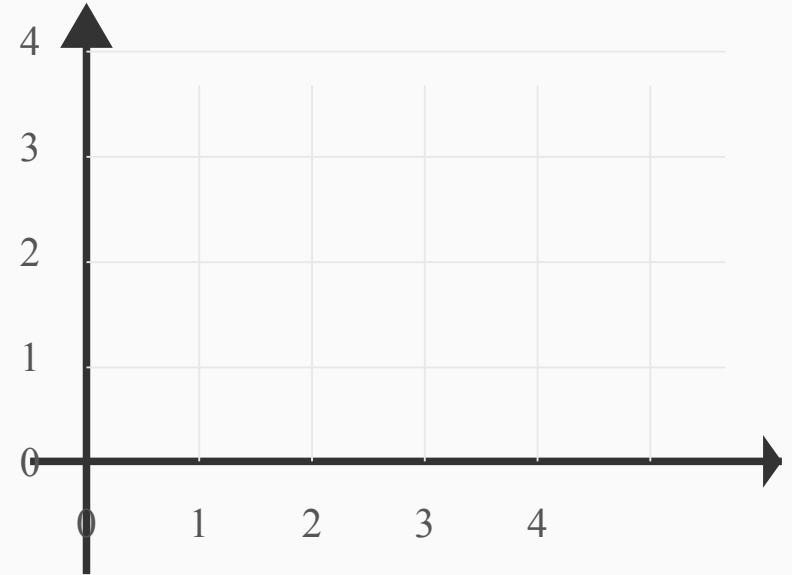


27. Coordinate Plane Word Problems

d)

Bank at (3, 2), Post Office at (3, 4)

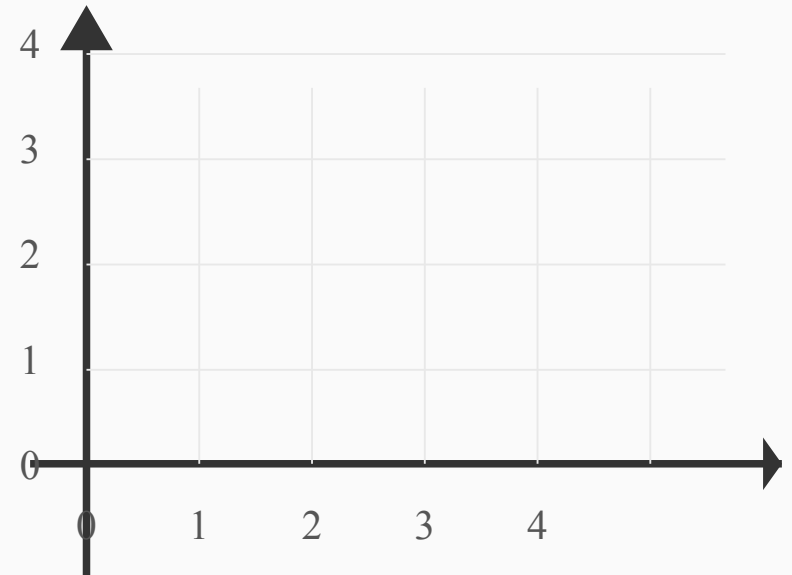
How many squares apart?



e)

Zoo at (0, 0), Aquarium at (0, 3)

How many squares apart?



28. Hierarchical Classification of Quadrilaterals

a)

Quadrilateral

Closed shape with 4 sides

Parallelogram

+ **Both pairs of opposite sides parallel**

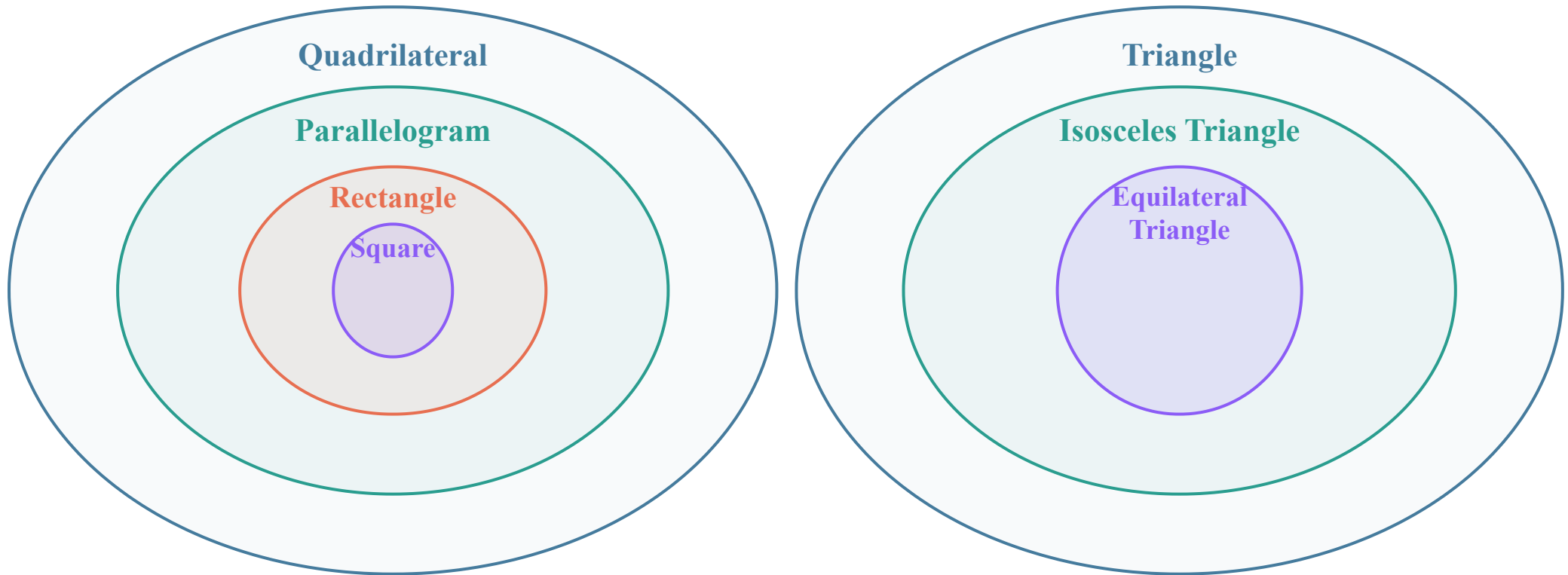
Rectangle

+ **All 4 angles are right angles**

Square

+ **All 4 sides equal**

Venn diagram (small circle inside big circle):



Triangle

Closed shape with 3 sides

Isosceles Triangle

+ **2 sides equal**

Equilateral Triangle

+ **3条边都相等** (三个角都是 60°)

28. Hierarchical Classification of Quadrilaterals

b) Is a square a parallelogram? **Yes / No**

c) Is a trapezoid a parallelogram? **Yes / No**

d) Is a rectangle a square? **Yes / No**

e) Is an isosceles triangle always equilateral? **Yes / No**

f) Is a parallelogram always a rectangle? **Yes / No**