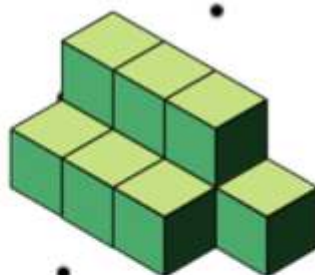
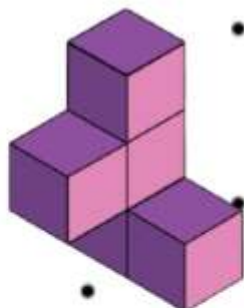
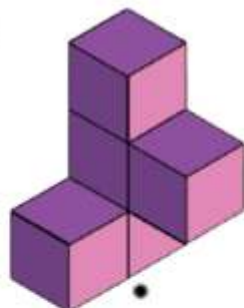
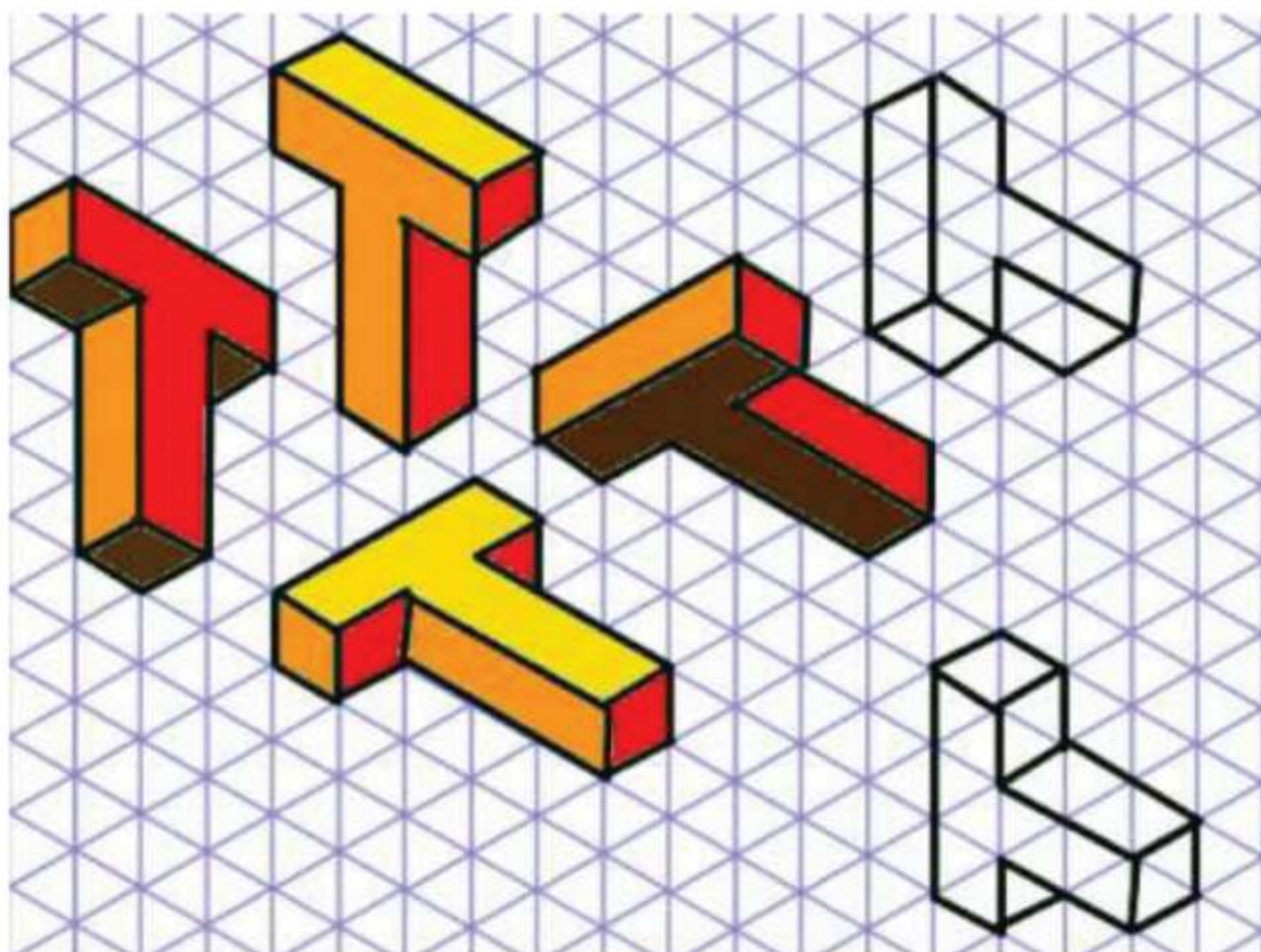


MATH DELIGHT 7



Universal Active Math

Math Delight - 7

Conceived and Written by

Dr. Vivek Monteiro, Geeta Mahashabde
Universal Active Math team



Universal Active Math - Math Delight VII (Of a series of Math Delight I to VIII)

ã Vivek Monteiro, Geeta Mahashabde, Navnirmiti Trust, Navnirmiti Learning Foundation

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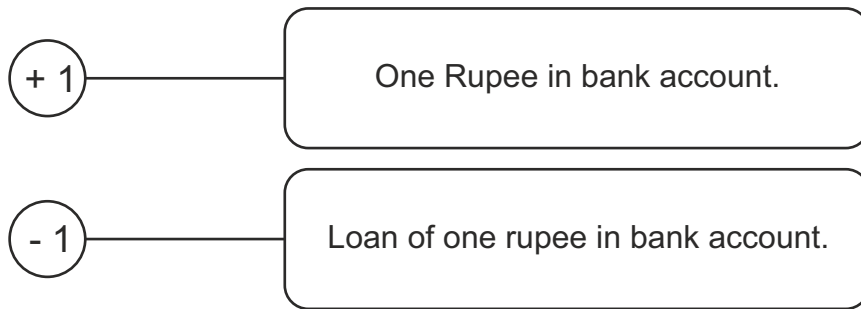
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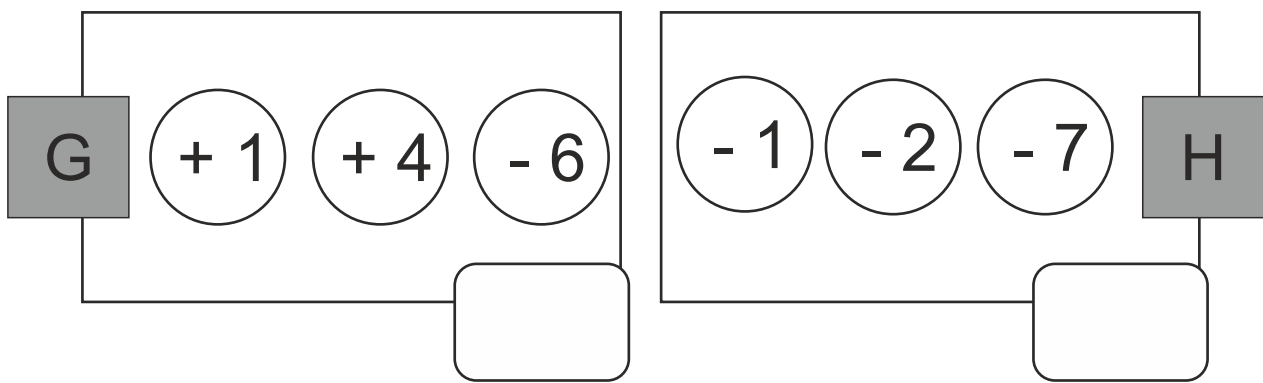
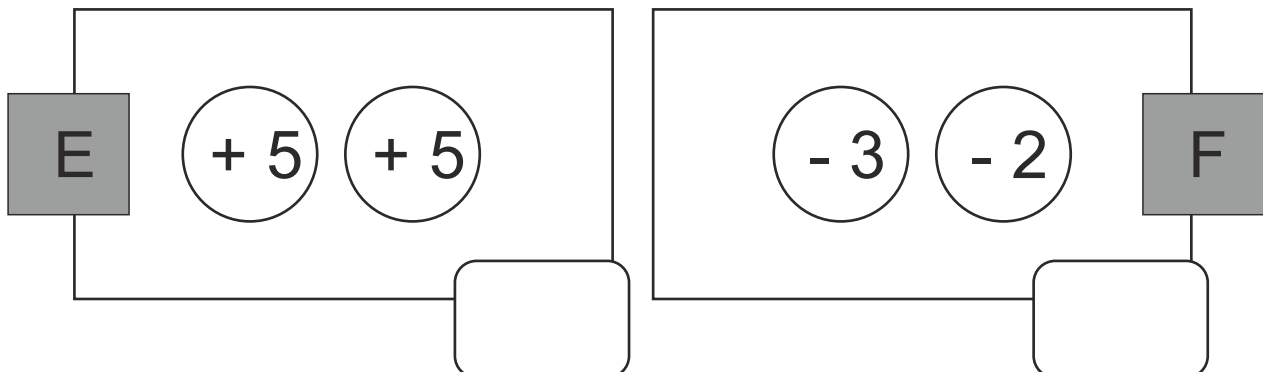
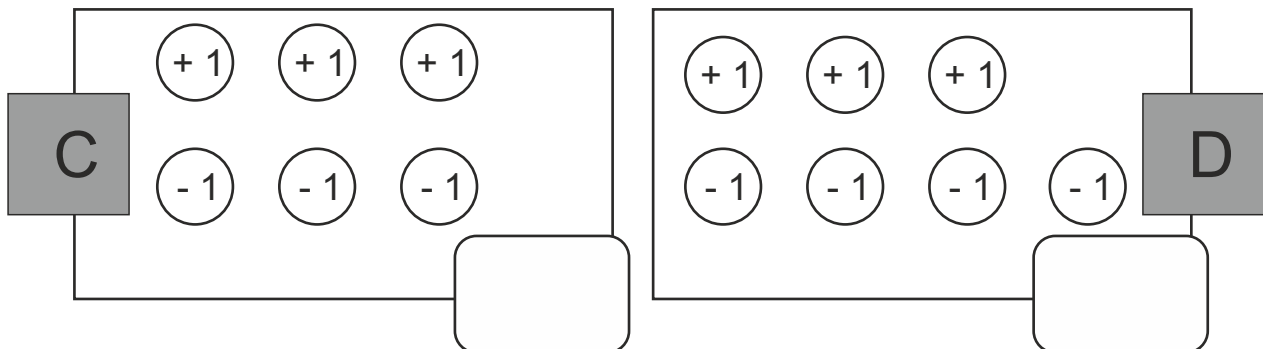
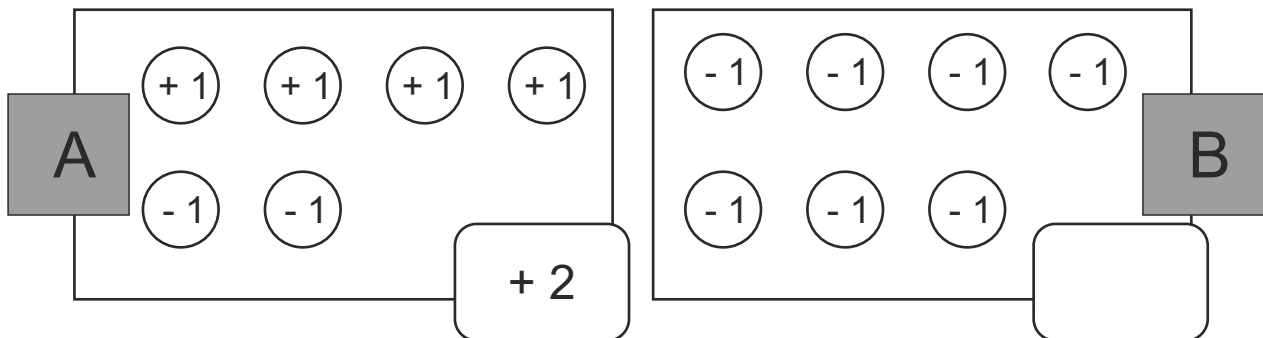
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A to F are six bank accounts. Write the values of these accounts.



Which account is the richest? _____

Which account is the Poorest? _____

Which account has zero value? _____

Who is richer, A or B? _____

Whose account has less value, D or B? _____

Compare using the signs $<$, $=$, $>$

$$\boxed{0} < \boxed{+2}$$

$$\boxed{-3} \quad \boxed{0} \quad \boxed{+5}$$

$$\boxed{-2} \quad \boxed{-6}$$

$$\boxed{+10} \quad \boxed{-8} \quad \boxed{-10}$$

Write appropriate numbers considering the signs $<$, $=$, $>$

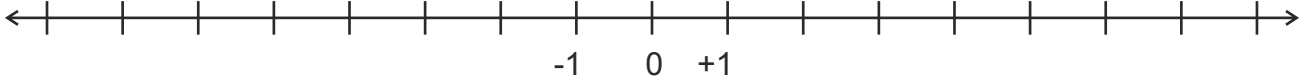
$$\boxed{-4} < \boxed{}$$

$$\boxed{+2} < \boxed{} < \boxed{}$$

$$\boxed{-4} > \boxed{}$$

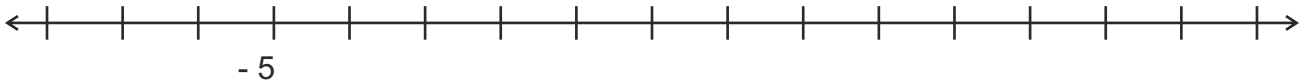
$$\boxed{+2} > \boxed{} > \boxed{}$$

Here is a number line. We place 0 at a point. +1 is on its right and -1 is on its left, both at the same distance from 0. Where will you place +2, -2, +3, -3, +4, -4?

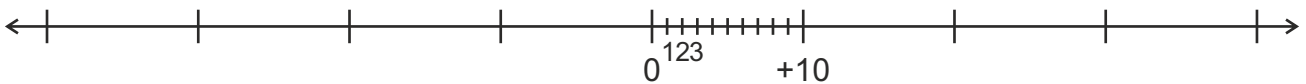


Represent the given numbers on the number line :

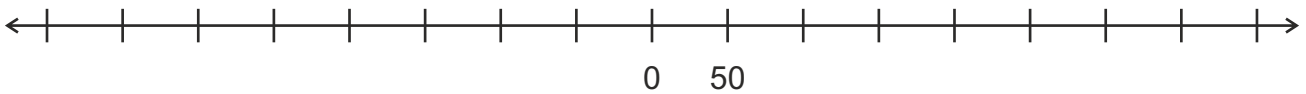
- 1) -7, -3, 0, +2, +7



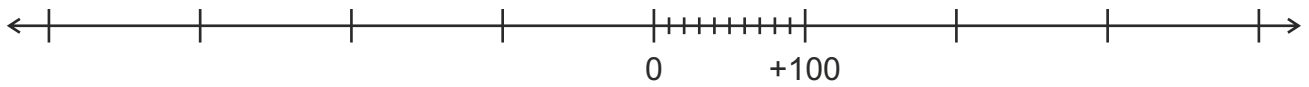
- 2) +20, +30, -10, -20, -30, -40



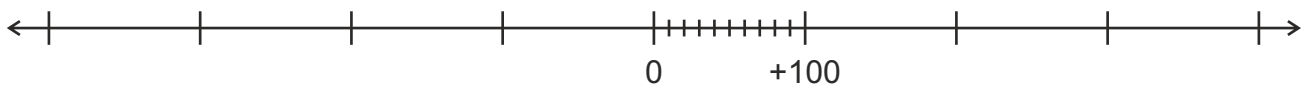
- 3) +100, +150, -50, -150, -300



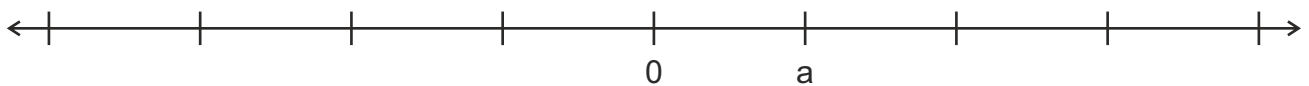
4) +200, +300, +400, -100, -200, -300



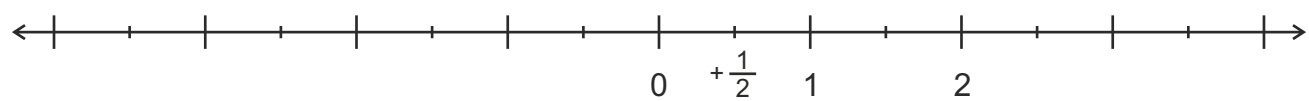
5) -100, +50, +150, -200, -250, +300



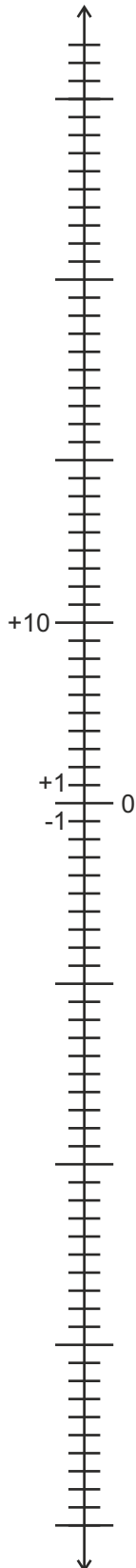
6) +2a, +3a, +4a, -2a, -3a, -4a



7) $+\frac{3}{4}$ $+\frac{4}{2}$ $-\frac{1}{2}$ $-\frac{2}{2}$ $-\frac{3}{2}$ $-\frac{4}{2}$



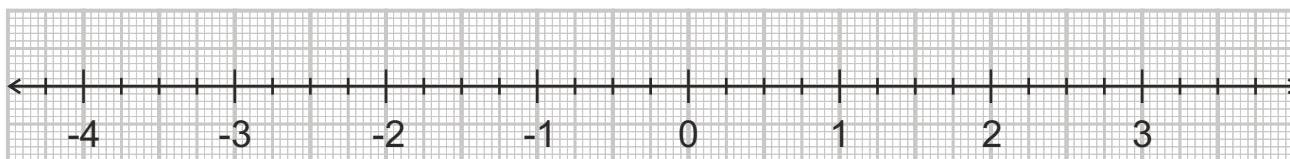
On a day in December 2020, at 1 pm, following were the temperatures of different locations in India. Place those numbers on the given number line. Write the name of each place next to its temperature.



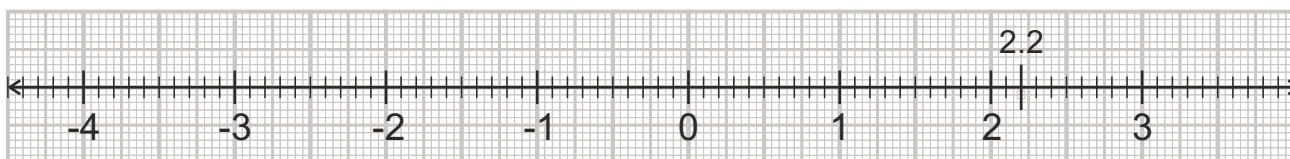
Place	Temperature(°C)
Aizawl (Mizoram)	+19
Trivandrum (Kerala)	+32
Pune (Maharashtra)	+29
Kolkata (W. Bengal)	+24
Kashmir	- 4
Shimla (Himachal)	+ 3
Leh	- 11
Khardungla (world's highest motorable road)	- 24

Represent the given numbers on the number line :

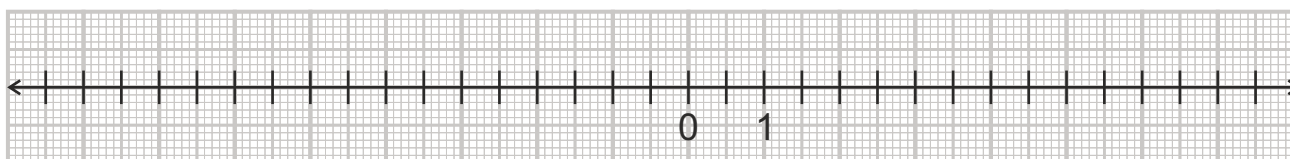
1) $+\frac{1}{2}$ $-\frac{1}{2}$ $+\frac{1}{4}$ $-\frac{1}{4}$ $1\frac{1}{2}$ $-1\frac{1}{2}$ $2\frac{1}{4}$ $-2\frac{1}{4}$



2) 2.2, 0.5, -0.5, 1.5, -1.5, -3.2, 2.4, -3.4



3) -5, -4.5, -3.2, -2.1, 0, 2.1, 3.2, 4.5, 5



Compare using the signs $<$, $=$, $>$

$(-15) > (-32)$

$(-\frac{4}{3}) \square (\frac{1}{3})$

$(3.4) \square (-3.4)$

$(-0.05) \square (-0.5)$

$(-3\frac{1}{2}) \square (-3\frac{1}{4})$

$(1.25) \square (1.5)$

Did you discover that

1. Any positive number is greater than any negative number.
2. The bigger number becomes the lesser number when we attach negative sign to both numbers.

In class 6, you had discovered rules of adding and subtracting positive and negative numbers. Revise it from Math Delight 6 (Page numbers 95 to 103).

1) $+$ and $+$ \longrightarrow $+$ Total

2) $-$ and $-$ \longrightarrow $-$ Total

3) $+$ and $-$ \longrightarrow (sign of the bigger number) and (difference)

$$\left. \begin{array}{l} -1 + 1 = 0 \\ -4 + 4 = 0 \end{array} \right\} \text{ We show this as cancellation in addition.}$$

$$-\cancel{1} + \cancel{1} = 0$$

$$-\cancel{4} + \cancel{4} = 0$$

Use appropriate rule and solve.

1) $+ 5 + 7$

2) $- 5 - 7$

3) $- 7 + 5$

4) $+ 5 - 10$

5) $- 200 + 10$

6) $- 300 - 10$

7) $+3a - 10a$

8) $- 5x - 3x$

9) $+ 5 + 3 - 2$

10) $- 6 - 2 + 4$

11) $- 3 - 2 - 1$

12) $- 5a + 5a - 2a$

13) $- 4 + 4 - 2 - 1$

14) $+ 3 - 2 - 3 + 2$

While adding, when you remove the brackets, signs of insiders remain unchanged.

1] $(+2) + (+3) = +2 + 3 = \boxed{+5}$

2] $(-5) + (-1) = -5 - 1 = \boxed{}$

3] $(-3) + (+2) = \dots\dots\dots = \boxed{}$

4] $(+6) + (-2) = \dots\dots\dots = \boxed{}$

5] $(+2 - 3) + (-2 - 3) = \dots\dots\dots = \boxed{}$

6] $(-3 + 5) + (-5 - 2) = \dots\dots\dots = \boxed{}$

Subtracting a positive number is like adding a negative number.
Subtracting a negative number is like adding a positive number.
Therefore while removing a bracket after a minus sign, signs of all insiders get reversed.

1] $(+3) - (+1) = +3 - 1 = \boxed{+2}$

2] $(-5) - (-2) = -5 + 2 = \boxed{}$

3] $(+6) - (+6) = \dots\dots\dots = \boxed{}$

4] $(+10) - (+2) = \dots\dots\dots = \boxed{}$

5] $(-8) - (-8) = \dots\dots\dots = \boxed{}$

6] $(+2 - 3) - (-2 - 3) = \dots\dots\dots = \boxed{}$

7] $(-3 + 5) - (-5 - 2) = \dots\dots\dots = \boxed{}$

Note that we are using two rules. Rule for removing the brackets, the rule for adding positive and negative numbers.

Fill in the blanks.

$$(+2) + (\quad) = +6$$

$$(+2) + (\quad) = -4$$

$$6 - (\quad) = 4$$

$$6 - (\quad) = 8$$

$$(-4) + (\quad) = -6$$

$$-4 + (\quad) = -2$$

$$(-4) - (\quad) = -6$$

$$(-4) - (\quad) = -2$$

$$(\quad) + (-2) = 0$$

$$(\quad) - (-2) = 0$$

$$(\quad) - (+2) = 0$$

$$(\quad) + (-3) = -6$$

$$(\quad) + (+3) = -3$$

$$(\quad) + (\quad) = 0$$

$$(\quad) + (\quad) = +5$$

$$(\quad) + (\quad) = -3$$

$$(\quad) + (\quad) = -10$$

$$(\quad) + (\quad) = -100$$

$$(5a) + (-2a) = \dots\dots\dots$$

$$(5a) - (-2a) = \dots\dots\dots$$

$$(10x) - (x) = \dots\dots\dots$$

$$(-3xy) - (-5xy) = \dots\dots\dots$$

$$(3a) + (-4a) - (-a) = \dots\dots\dots$$

$$(-7p) - (+3p) - (-p) = \dots\dots\dots$$

Use one positive and one negative number :

$$(\quad) + (\quad) = +6$$

Use two negative numbers :

$$(\quad) + (\quad) = -6$$

Use two negative numbers :

$$(\quad) - (\quad) = +4$$

Use one positive and one negative number :

$$(\quad) - (\quad) = -6$$

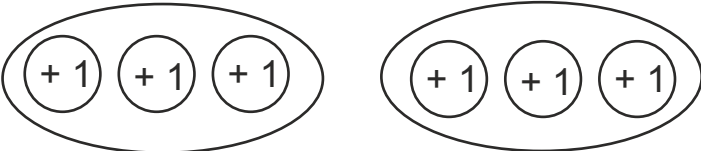
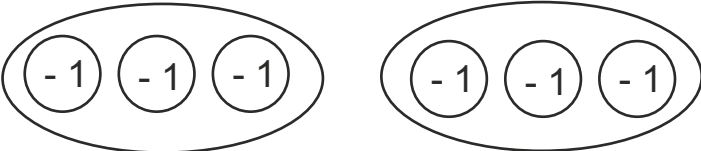
Use two numbers with the same sign :

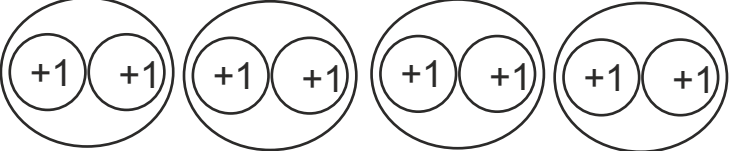
$$(\quad) + (\quad) = 2$$

$$(\quad) - (\quad) = 2$$

Multiplication of Integers

Multiplying by a positive number = Putting into your bank account those many times.

Multiplication	Picture	Answer
2×3 2 times 3		+ 6
$2 \times (-3)$ 2 times (-3)		- 6
3×2		
$3 \times (-2)$		
5×2		
$5 \times (-2)$		
2×5		
$2 \times (-5)$		

Multiplication	Picture	Answer
$4 \times (-2)$		
		
$3 \times \square$		12
$3 \times \square$		-12
$3 \times \square$		-15
$5 \times \square$		-15
$2 \times \square$		-8
$2 \times \square$		+8

Observe the pattern of multiplying by a positive integer on previous two pages.

Positive numbers x Positive number = + (product of two numbers)

Positive number x Negative number = - (product of two numbers)

Use the rule and solve.

$$(+2) \times (+6) = \boxed{}$$

$$(+2) \times (-6) = \boxed{}$$

$$(+3) \times (-6) = \boxed{}$$

$$(+2) \times (-10) = \boxed{}$$

$$(+4) \times () = \boxed{+16}$$

$$(+4) \times () = \boxed{-16}$$

$$() \times () = \boxed{+8}$$

$$() \times () = \boxed{-8}$$

$$(0) \times (+2) = \boxed{}$$

$$(0) \times (-2) = \boxed{}$$

$$(1) \times (1) = \boxed{}$$

$$(1) \times (-1) = \boxed{}$$

$$(0) \times (1) = \boxed{}$$

$$(0) \times (-1) = \boxed{}$$

$$(0) \times (0) = \boxed{}$$

Write three different multiplications which give the answer as -12.

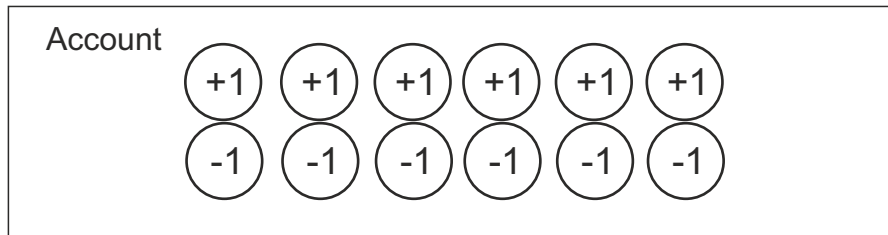
$$() \times () = \boxed{-12}$$

$$() \times () = \boxed{-12}$$

$$() \times () = \boxed{-12}$$

Multiplying by a negative number - Read carefully, try out and understand.

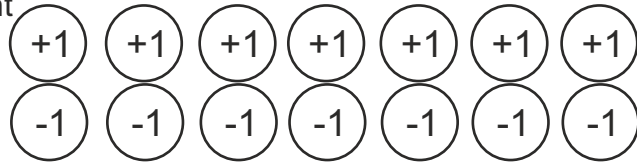
An empty account has zero value, but the account having zero value may not be empty. e.g. an account shown in this figure. It has +6 and -6



Multiplying by a positive number is putting into your account those many times. Multiplying by a negative number is taking away from your account those many times. For being able to take away, we start with an account having zeros made of (+1 and -1) pairs. This ensures that we start with an account of 0 value.

Multiplication	What is to be done and process	Answer
$(-3) \times 2$ (-3) times 2	Take away (+2) three times <p>The diagram shows the account from the previous figure with three diagonal lines striking through the top row of +1 tokens, leaving only three +1 tokens and six -1 tokens.</p>	-6
$(-2) \times 3$ (-2) times 3	Take away (+3) two times <p>The diagram shows the account with two diagonal lines striking through the top row of +1 tokens, leaving only one +1 token and six -1 tokens.</p>	-6
$(-3) \times (-2)$ (-3) times (-2) times	Take away (-2) three times <p>The diagram shows the account with three diagonal lines striking through the bottom row of -1 tokens, leaving six +1 tokens and no -1 tokens.</p>	+6
$(-1) \times (-6)$ (-1) times (-6) times	Take away (-6) one times <p>The diagram shows the account with one diagonal line striking through the bottom row of -1 tokens, leaving six +1 tokens and no -1 tokens.</p>	+6

Account



Multiplication	What is to be done and process	Answer
$(-2) \times (+2)$		
$(-2) \times (-4)$		
$(-4) \times (+2)$		
$(-4) \times (-2)$		
$(-8) \times (+1)$		
$(-8) \times (-1)$		

Observe the pattern of multiplying by a negative integer on previous two pages.

Positive numbers x Negative number = - (product of two numbers)

Negative numbers x Negative number = + (product of two numbers)

Use the rule and solve.

$$(-5) \times (+2) = \boxed{}$$

$$(-5) \times (-2) = \boxed{}$$

$$(-4) \times (-3) = \boxed{}$$

$$(-4) \times (3) = \boxed{}$$

$$(-2) \times (10) = \boxed{}$$

$$(-2) \times (-10) = \boxed{}$$

$$(-2) \times () = \boxed{-10}$$

$$() \times (+2) = \boxed{+10}$$

$$(-6) \times () = \boxed{+12}$$

$$(-2) \times () = \boxed{-12}$$

$$() \times () = \boxed{+15}$$

$$() \times () = \boxed{-15}$$

$$(-1) \times (1) = \boxed{}$$

$$(-1) \times (-1) = \boxed{}$$

Write six different multiplications which give the answer as + 15

$$() \times () = \boxed{+15}$$

$$() \times () = \boxed{+15}$$

$$() \times () = \boxed{+15}$$

$$() \times () = \boxed{+15}$$

$$() \times () = \boxed{+15}$$

$$() \times () = \boxed{+15}$$

Rules for multiplication of integers :

$$(+) \times (+) = + \text{ product}$$

$$(-) \times (+) = - \text{ product}$$

$$(+) \times (-) = - \text{ product}$$

$$(-) \times (-) = + \text{ product}$$

Use the rule and solve.

$$(+ 6) \times (+ 3) = \boxed{}$$

$$(+ 4) \times (- 4) = \boxed{}$$

$$(- 6) \times (+ 3) = \boxed{}$$

$$(- 4) \times (- 4) = \boxed{}$$

$$(+ 6) \times (- 3) = \boxed{}$$

$$(- 4) \times (+ 4) = \boxed{}$$

$$(- 6) \times (- 3) = \boxed{}$$

$$(+ 4) \times (+ 4) = \boxed{}$$

$$(+ 7) \times () = \boxed{+21}$$

$$() \times () = \boxed{-20}$$

$$(- 7) \times () = \boxed{+21}$$

$$() \times () = \boxed{+20}$$

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

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

$$(+ 2) \times (- 3) \times (0) = \boxed{}$$

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

$$(- 2) \times (- 3) \times (- 4) = \boxed{}$$

$$(-1) \times (-1) = \boxed{}$$

$$(-1) \times (-1) \times (-1) = \boxed{}$$

$$(-1) \times (-1) \times (-1) \times (-1) = \boxed{}$$

$$(-1) \times (-1) \times (-1) \times (-1) \times (-1) = \boxed{}$$

$$(-1) \times (-1) \times (-1) \times (-1) \times (-1) \times (-1) = \boxed{}$$

Write the missing numbers and signs.

$$(\boxed{-} \boxed{3}) \times (\boxed{+} \boxed{8}) = (\boxed{} \boxed{24})$$

$$(\boxed{-} \boxed{}) \times (\boxed{} \boxed{}) = (\boxed{+} \boxed{25})$$

$$(\boxed{-} \boxed{6}) \times (\boxed{} \boxed{}) = (\boxed{-} \boxed{6})$$

$$(\boxed{} \boxed{}) \times (\boxed{+} \boxed{}) = (\boxed{+} \boxed{14})$$

$$(\boxed{} \boxed{3}) \times (\boxed{} \boxed{}) = (\boxed{-} \boxed{27})$$

$$(\boxed{+} \boxed{9}) \times (\boxed{} \boxed{}) = (\boxed{} \boxed{54})$$

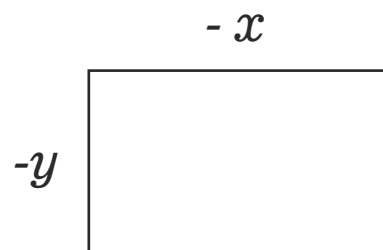
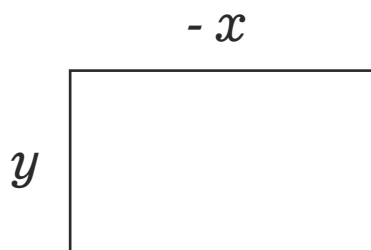
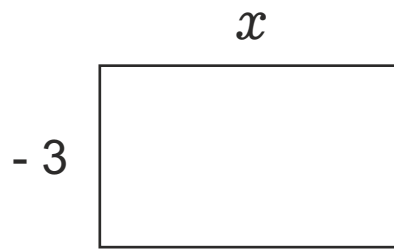
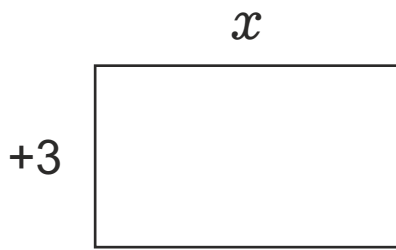
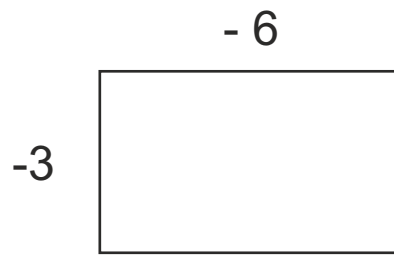
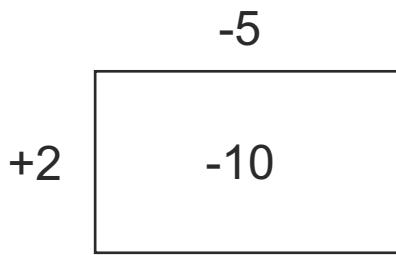
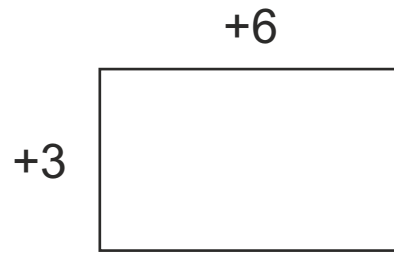
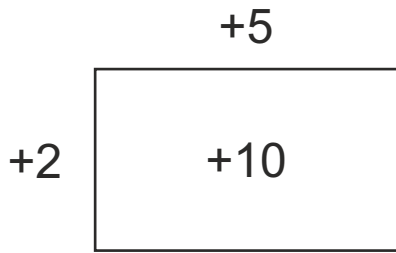
$$(\boxed{} \boxed{2}) \times (\boxed{} \boxed{2}) \times (\boxed{} \boxed{2}) = (\boxed{-} \boxed{8})$$

$$(\boxed{} \boxed{}) \times (\boxed{-} \boxed{2}) \times (\boxed{-} \boxed{3}) = (\boxed{-} \boxed{6})$$

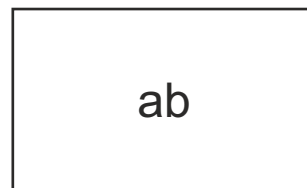
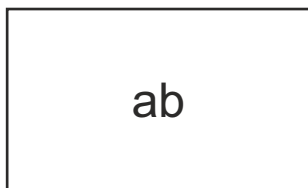
$$(\boxed{} \boxed{2}) \times (\boxed{+} \boxed{}) \times (\boxed{+} \boxed{5}) = (\boxed{+} \boxed{20})$$

$$(\boxed{} \boxed{1}) \times (\boxed{} \boxed{}) \times (\boxed{} \boxed{6}) = (\boxed{} \boxed{0})$$

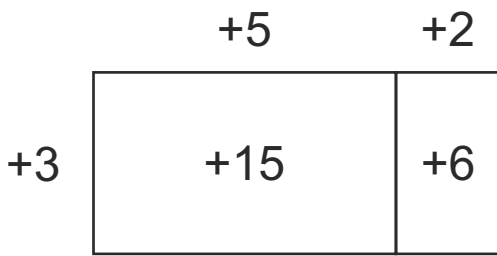
Let's write the numbers to be multiplied along the sides of a rectangle and product inside the rectangle. Write the missing numbers and products.



Write two different pairs which have ab as their product.



Distributive property



Area of big rectangle

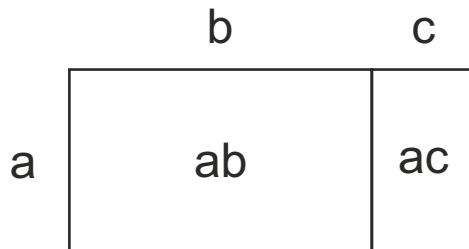
$$= (+3) \times (+5+2) = 3 \times 7 = 21$$

= Sum of areas of two small rectangles

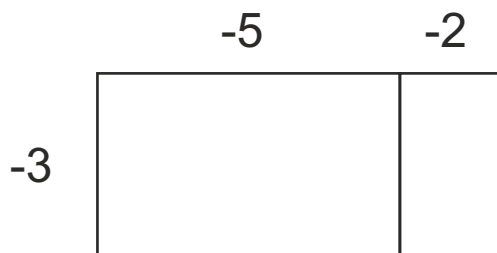
$$= [(+3) \times (+5)] + [(+3) \times (+2)]$$

$$= 15 + 6 = 21$$

$$(+3) \times [(+5) + (+2)] = [(+3) \times (+5)] + [(+3) \times (+2)]$$



$$a \times [b + c] = [b + c] \times a = [a \times b] + [a \times c]$$



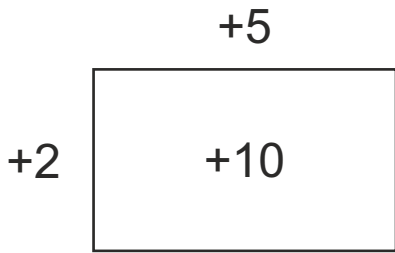
$$(-3) \times [(-5) + (-2)] = [(\quad) \times (\quad)] + [(\quad) \times (\quad)]$$

$$= [\quad] + [\quad]$$

=

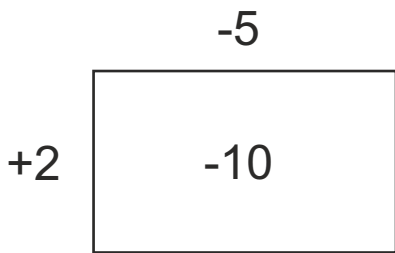
Factors	Expansion / Expression	Value
3×102	$3 \times (100 + 2)$ $= (3 \times 100) + (3 \times 2)$ $= 300 + 6$	306
$5 \times (100 + 1)$		
$2 \times (3a - 5a)$		
$(x + y) \times z$		
$a \times (x + y - z)$		
$3 \times (200 + 50 + 3)$		
3×198	$= 3 \times (200 - 2)$	

Write division statements and discover the rules for division.



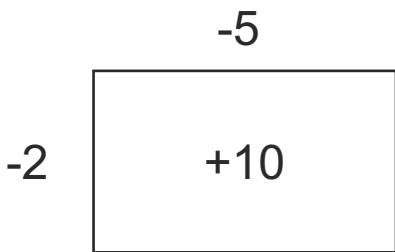
$$\frac{+10}{+2} = +5$$

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



$$\frac{-10}{+2} = \boxed{}$$

$$\frac{-10}{-5} = \boxed{}$$



$$\frac{+10}{-2} = \boxed{}$$

$$\frac{+10}{-5} = \boxed{}$$

Rules for division of integers

$$\frac{+}{+} = + \text{ division}$$

$$\frac{-}{+} = - \text{ division}$$

$$\frac{+}{-} = - \text{ division}$$

$$\frac{-}{-} = + \text{ division}$$

Use the rules and solve.

$$\frac{+14}{+7} = \boxed{}$$

$$\frac{-27}{+9} = \boxed{}$$

$$\frac{+36}{-6} = \boxed{}$$

$$\frac{-50}{-10} = \boxed{}$$

$$\frac{+13}{-1} = \boxed{}$$

$$\frac{0}{-4} = \boxed{}$$

$$\frac{-ab}{-a} = \boxed{}$$

$$\frac{+x^2}{-x} = \boxed{}$$

$$\frac{-5}{0} = \text{Not Defined}$$

$$\frac{abc}{-bc} = \boxed{}$$

$$\frac{a}{-1} = \boxed{}$$

$$\frac{-x}{-1} = \boxed{}$$

$$\frac{(ab - ac)}{a} = \frac{ax(b - c)}{ax} = b - c$$

$$\frac{(x^2 - xy)}{x} =$$

$$\frac{xy - xyz}{-xy} =$$

Draw your own rough sketch for solving each problem. Draw, think, count, use formula and get the answer.

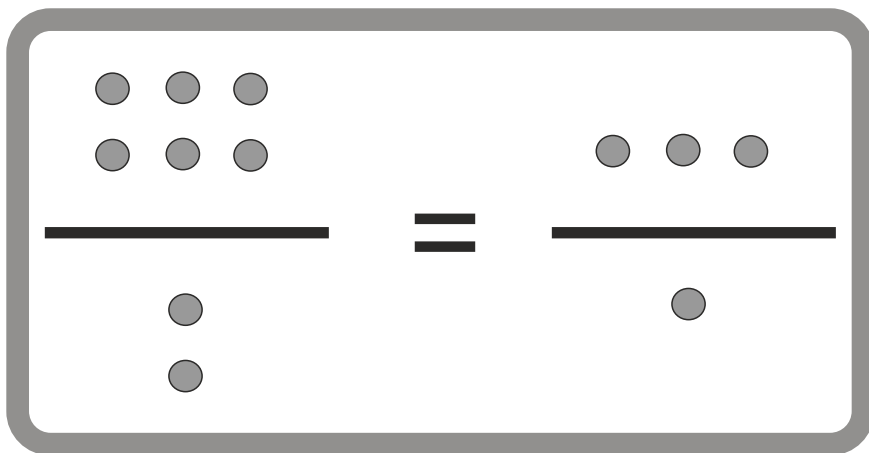
Minimum temperature in Shimla was (- 2) degree Celsius and maximum temperature was 11 degree Celsius. What is the difference between minimum to maximum?

Students get (+3) marks for each cooperative act and get (-2) marks for each competitive act. Find the marks obtained by each student.

Name	Number of acts and procedure	Total marks
A	2 cooperative and 4 competitive $[2 \times (+3) + 4 \times (-2)] = +6 - 8 = - 2$	-2
B	3 cooperative and 3 competitive	
C	5 cooperative and 2 competitive	
D	4 cooperative and 1 competitive	

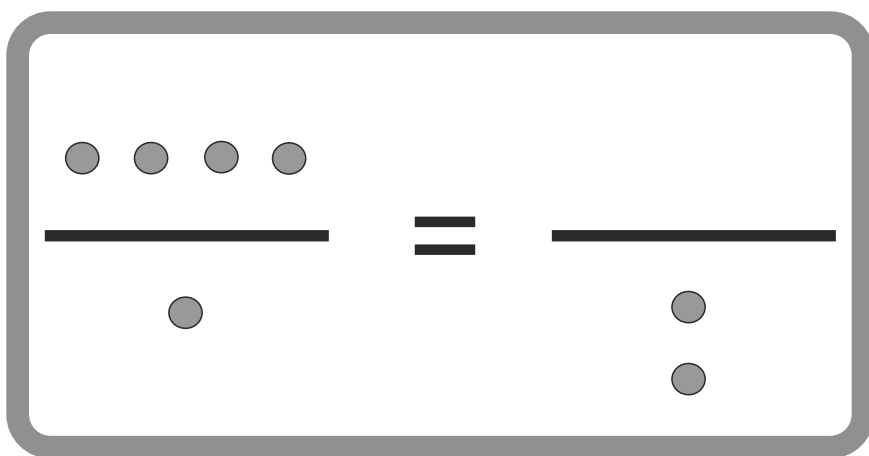
Equivalent Fractions

How many groups of 2 can be made from 6? 3

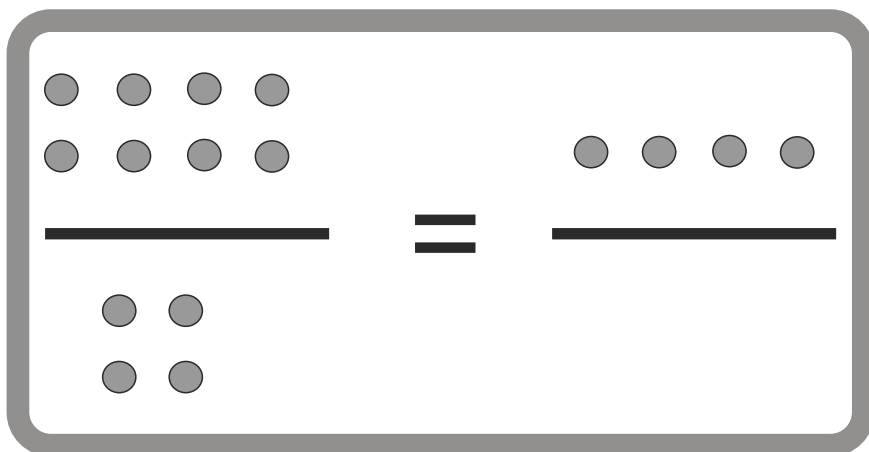


$$\frac{6}{2} = \frac{3}{1}$$

Draw the missing pebbles.
Write the missing number.



$$\frac{4}{1} = \frac{\square}{2}$$



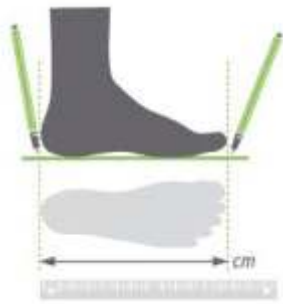
$$\frac{8}{4} = \frac{4}{\square}$$

Draw the missing pebbles.
Write the missing number.

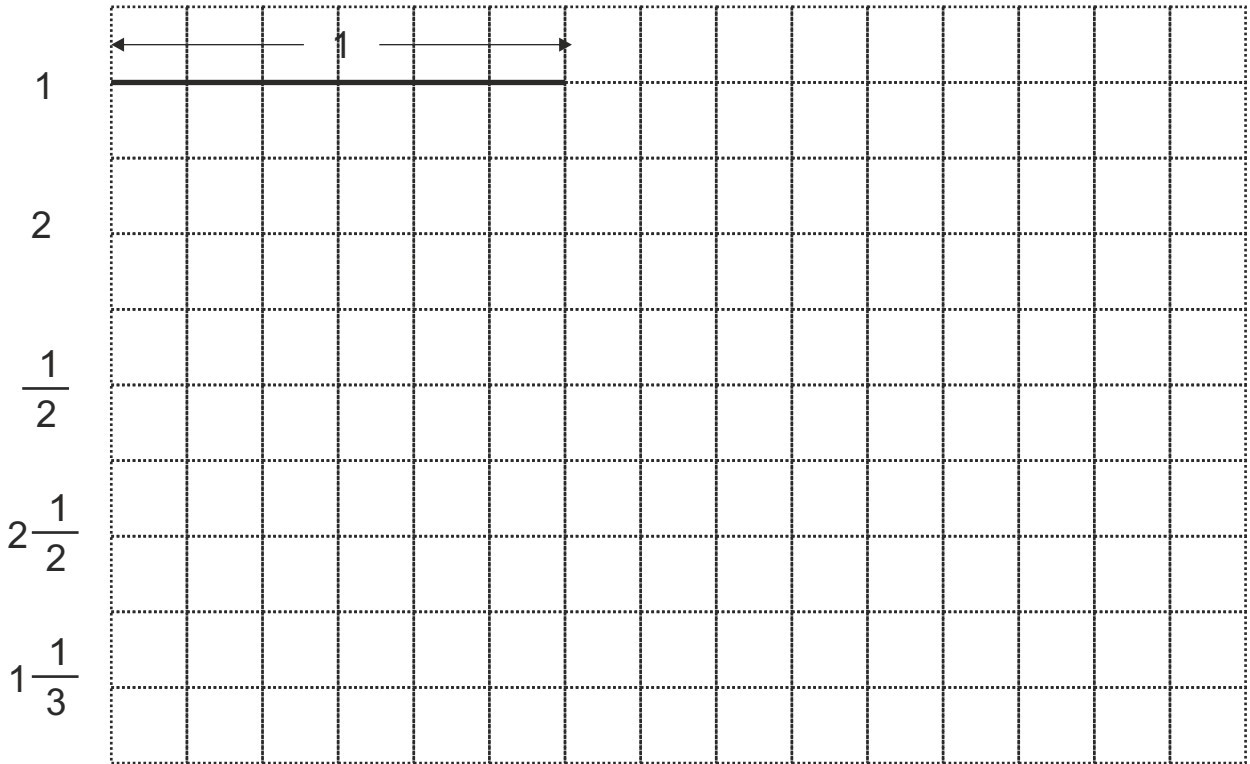
	$\frac{3}{1} = \frac{\quad}{\quad}$
	$\frac{\quad}{\quad} = \frac{\quad}{\quad}$
	$\frac{\quad}{\quad} = \frac{\quad}{\quad}$
	$\frac{\quad}{\quad} = \frac{\quad}{\quad}$
$\frac{\quad}{\quad} = \frac{\quad}{\quad}$	$\frac{3}{1} = \frac{\quad}{2}$
$\frac{\quad}{\quad} = \frac{\quad}{\quad}$	$\frac{6}{3} = \frac{4}{\quad}$
$\frac{\quad}{\quad} = \frac{\quad}{\quad}$	$\frac{1}{4} = \frac{\quad}{8}$
$\frac{\quad}{\quad} = \frac{\quad}{\quad}$	$\frac{2}{3} = \frac{\quad}{9}$

Write equivalent fractions in numbers.
 Use pebbles if required.
 But think for yourself.

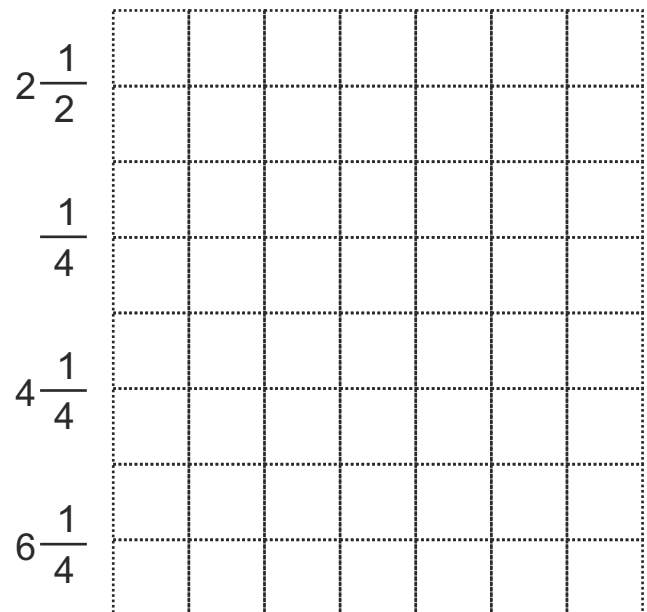
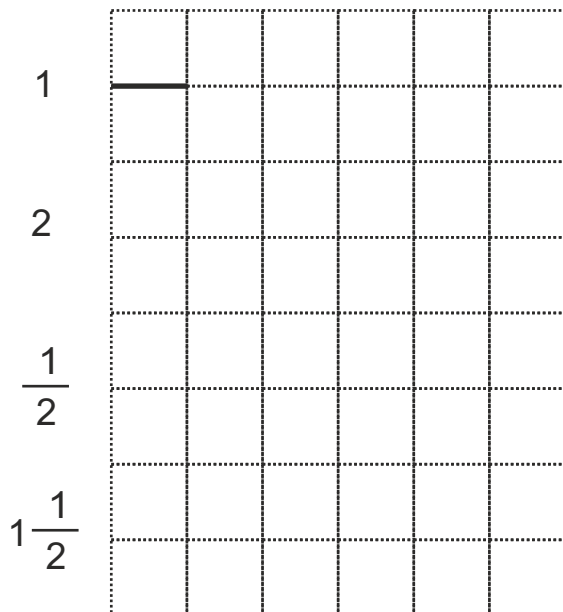
$\frac{6}{4} = \frac{3}{2}$	$\frac{6}{4} = \frac{12}{8}$	$\frac{6}{3} = \frac{10}{5}$
$\frac{4}{6} = \frac{2}{3}$	$\frac{4}{6} = \frac{8}{9}$	$\frac{4}{6} = \frac{2}{9}$
$\frac{1}{3} = \frac{2}{6}$	$\frac{1}{3} = \frac{4}{12}$	$\frac{1}{3} = \frac{3}{9}$
$\frac{1}{4} = \frac{2}{8}$	$\frac{1}{4} = \frac{4}{16}$	$\frac{1}{4} = \frac{3}{12}$
$\frac{5}{2} = \frac{10}{4}$	$\frac{5}{2} = \frac{15}{6}$	$\frac{5}{2} = \frac{20}{8}$
$\frac{2}{1} = \frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \frac{5}{5} = \frac{10}{10} = \frac{100}{100}$		
$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10} = \frac{10}{20} = \frac{100}{200}$		
$\frac{3}{2} = \frac{3}{4} = \frac{6}{8} = \frac{9}{12} = \frac{15}{20} = \frac{45}{60} = \frac{90}{120}$		
$\frac{3}{2} = \frac{15}{10} = \frac{60}{40} = \frac{18}{12} = \frac{21}{14} = \frac{100}{66.67} = \frac{90}{60}$		



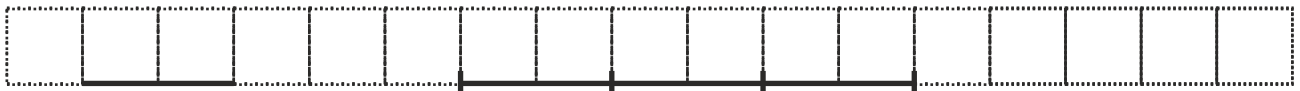
The length of one foot was measured.
It is shown on the grid below as 1 whole length.
Draw line segments showing all other lengths.



Draw line segments of the following lengths in cm.



Show the given multiplication in Length. $3 \times 2 = 3 \text{ times } 2 \text{ cm} = 6 \text{ cm}$



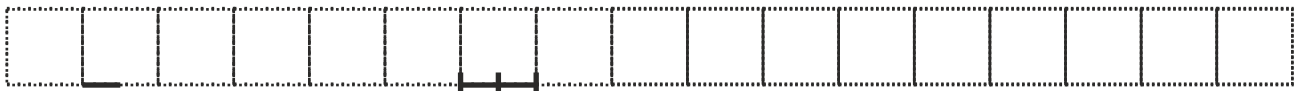
A segment of 2 cm (2 cm) taken 3 times → a segment of 6 cm

$$4 \times 1$$



1 cm 1 cm taken 4 times = cm

$$2 \times \frac{1}{2}$$



cm x 2 = cm

$$\frac{1}{2} \times 6$$



cm x 6 = cm

$$1 \frac{1}{2} \times 4$$



cm x 4 = cm



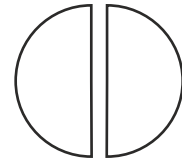
This circle is 1 whole Roti / Bhakari / Pizza / Dosa / Puri etc.

Multiplication	Meaning	Picture	Process	Answer
2×3	2 times 3		2×3	6
2×1				
1×2				
$2 \times \frac{1}{2}$	2 times. $\frac{1}{2}$		$\frac{1}{2} \times 2$	1
$4 \times \frac{1}{4}$				
$8 \times \frac{1}{8}$				

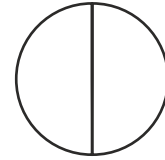
Meaning of cancellation in multiplication

$$2 \times \frac{1}{2}$$

half taken 2 times.

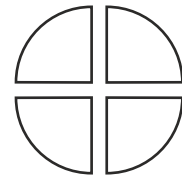


Two halves make a whole.

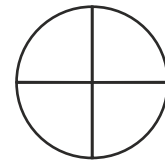


Thus $\frac{1}{\cancel{2}} \times \cancel{2} = 1$ One whole is made.

$$\frac{1}{4} \times 4 = \boxed{} \text{ taken 4 times.}$$



$$\frac{1}{4} \times 4 = \boxed{}$$

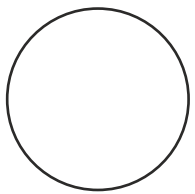


$$\frac{1}{2} \times 4 = \boxed{} \text{ taken 4 times.}$$

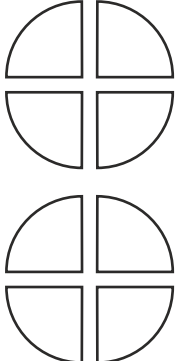
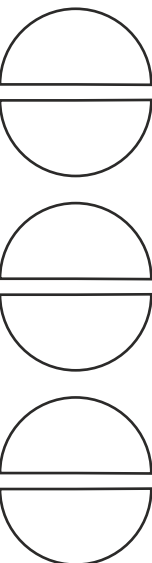

$$= \boxed{} \text{ halves}$$

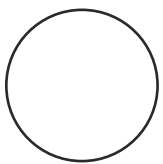
$$= \boxed{} \text{ wholes}$$

$$\frac{1}{2} \times 4 = \frac{1}{\cancel{2}} \times \cancel{2} \times 2 = 2$$

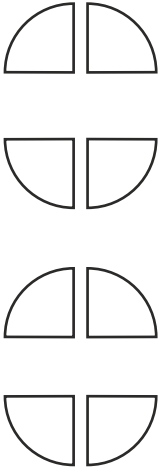



This circle is 1 whole Roti / Bhakari / Pizza / Dosa / Puri etc.

Multiplication	Meaning	Picture	Process	Answer
$\frac{1}{4} \times 8$	$\frac{1}{4}$ taken 8 times.		$\frac{1}{4} \times 8$	2
$\frac{1}{4} \times 12$				
				
				
$\frac{1}{3} \times 6$				



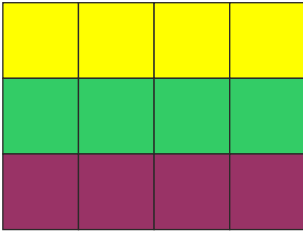
This circle is 1 whole Roti / Bhakari / Pizza / Dosa / Puri etc.

Multiplication	Picture	Process and Answer
$\frac{2}{4} \times 4$		$\frac{2}{4} \times \cancel{4} = 2$
$\frac{3}{4} \times 4$		
$\frac{3}{2} \times 4$		
		

Colour the given multiplications.

Write the length (l) breadth (b) and area of each rectangle (answer).

$$4 \times 3$$

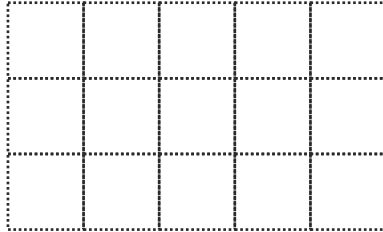


$$l = 4$$

$$b = 3$$

$$A = 4 \times 3 = 12$$

$$4 \times 2$$

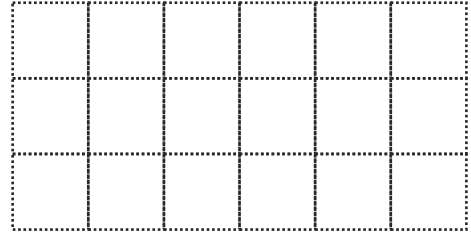


$$l =$$

$$b =$$

$$A =$$

$$4 \times 1$$

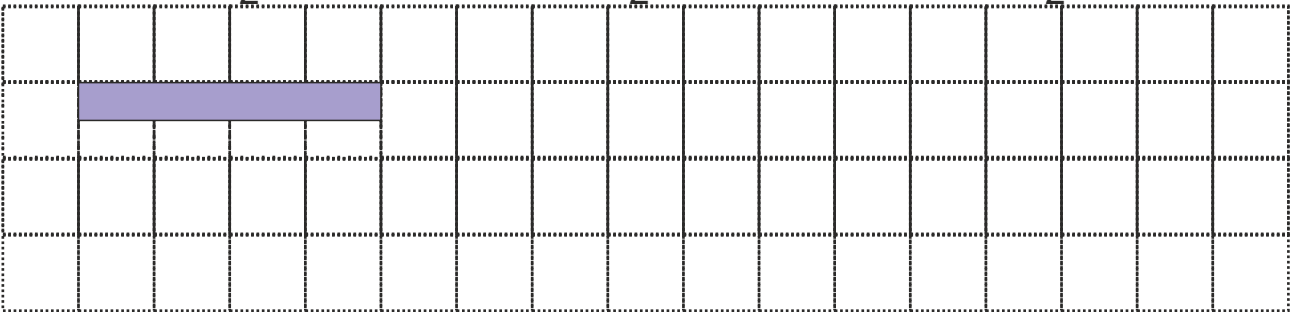


$$l =$$

$$b =$$

$$A =$$

$$4 \times \frac{1}{2}$$



$$l =$$

$$b =$$

$$A =$$

$$\frac{1}{2} \times 2$$

$$l =$$

$$b =$$

$$A =$$

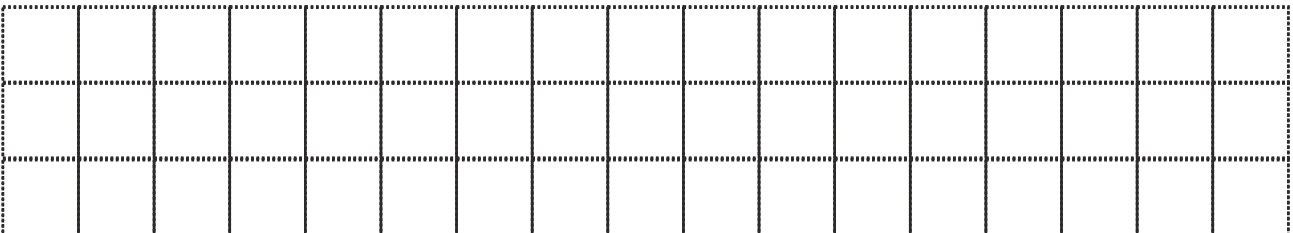
$$\frac{1}{2} \times 1$$

$$l =$$

$$b =$$

$$A =$$

$$\frac{1}{2} \times \frac{1}{2}$$



$$l =$$

$$b =$$

$$A =$$

$$\frac{3}{2} \times 2$$

$$l =$$

$$b =$$

$$A =$$

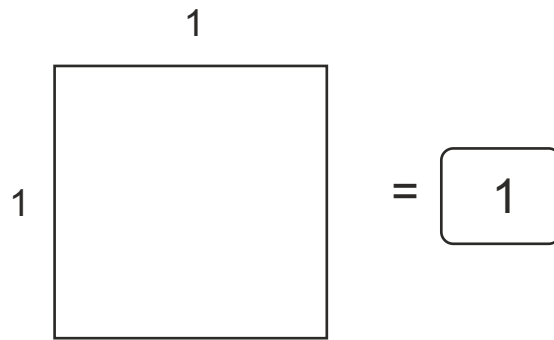
$$\frac{5}{2} \times \frac{1}{2}$$

$$l =$$

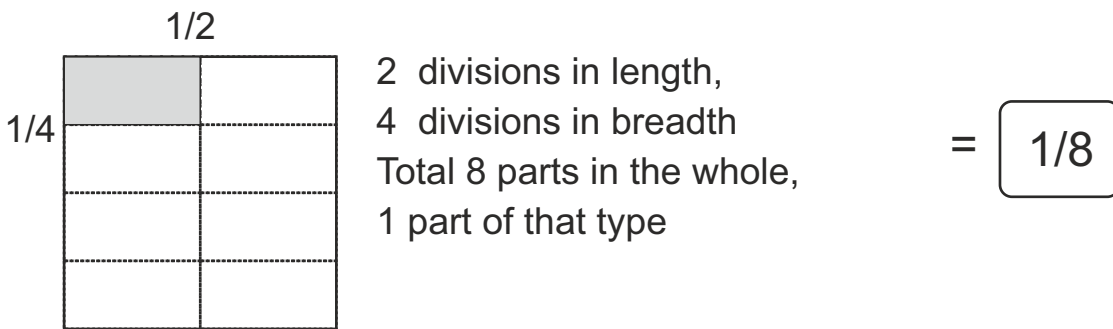
$$b =$$

$$A =$$

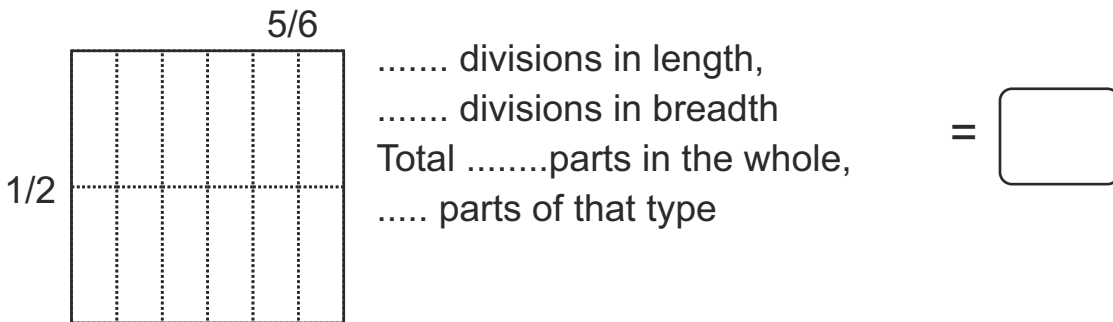
1×1



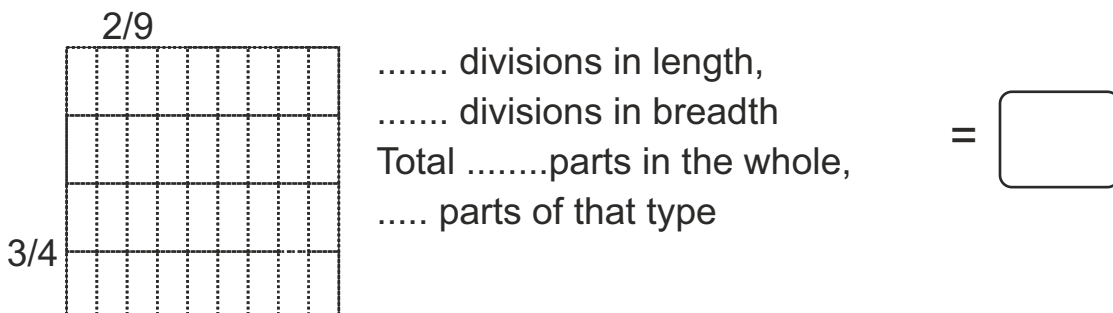
$1/2 \times 1/4$



$5/6 \times 1/2$

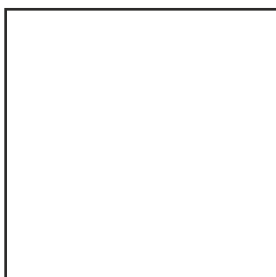


$2/9 \times 3/4$



Make the required number of divisions in length and breadth and find the answers–

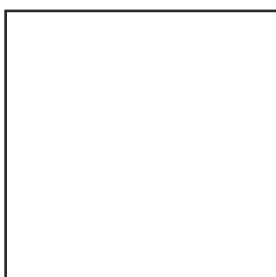
$$\frac{5}{6} \times \frac{5}{6}$$



..... divisions in length,
..... divisions in breadth
Totalparts in the whole, =
..... parts of that type

Can you guess the answer of $\frac{3}{6} \times \frac{2}{6}$? =

$$\frac{2}{4} \times \frac{3}{4}$$



..... divisions in length,
..... divisions in breadth
Totalparts in the whole, =
..... parts of that type

Can you guess the answer of $\frac{2}{4} \times \frac{2}{4}$? =

Have you discovered the rule,

$$\text{product of two fractions} = \frac{\text{product of numerators}}{\text{product of denominators}}$$

Have you discovered the rule,

$$\text{product of two fractions} = \frac{\text{product of numerators}}{\text{product of denominators}}$$

Now, apply the rule and find answers. Write the answer in its lowest form.

$$\frac{1}{4} \times \frac{1}{4} = \square$$

$$\frac{1}{2} \times \frac{1}{4} = \square$$

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

$$\frac{1}{4} \times \frac{3}{7} = \square$$

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

$$\frac{3}{4} \times \frac{8}{5} = \square$$

$$\frac{2}{3} \times \frac{3}{2} = \square$$

$$\frac{5}{4} \times \frac{4}{5} = \square$$

$$\frac{4}{3} \times \frac{6}{8} = \square$$

$$\frac{5}{2} \times \frac{6}{7} = \square$$

$$\frac{3}{8} \times \frac{4}{9} = \square$$

$$\frac{1}{1} \times \frac{1}{1} = \square$$

Commutativity

$$3 + 2 = 5$$

$$2 + 3 = 5$$

In addition, the answer remains the same even if you change the sequence. This is called commutativity.

Solve the problem. Do the same operation by changing the order of numbers. Do you get the same answer? If yes, that operation is commutative, else, not commutative.

Problem	in reverse order	Operation	Commutative / not commutative
$5 - 2 = 3$	$2 - 5 = -3$	Subtraction	Not Commutative
$10 + 2 =$			
$3 \times 2 =$			
$6 \div 2 =$			

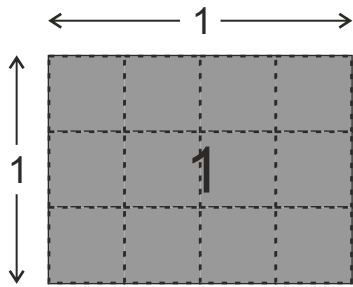
Try with other numbers.

Commutativity

3×2 3 times 2	$= 6 =$	2×3 2 times 3
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Fill in the blanks.

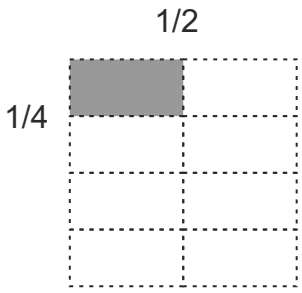
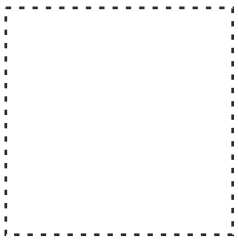
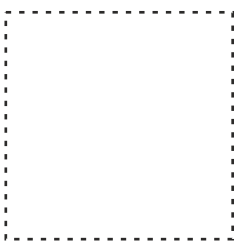
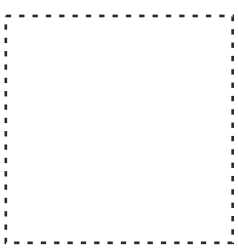
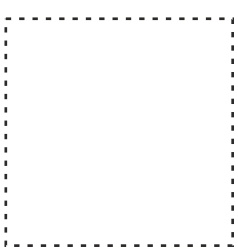
$4 \times 3 = 3 \times \square$	$4 \times \square = 2 \times 4$
$3 \times 10 = \square \times 3$	$5 \times 4 = 4 \times \square$
$\frac{1}{2} \times 2 = 2 \times \square$	$\frac{1}{4} \times 4 = 4 \times \square$
$\frac{1}{4} \times \frac{1}{2} = \square \times \frac{1}{4}$	$\frac{5}{6} \times \square = \frac{6}{5} \times \frac{5}{6}$
$4 \times b = b \times a$	$x \times y = \square \times x$
$a^2 \times b = b \times \square$	$3a \times 2b = 2b \times \square$

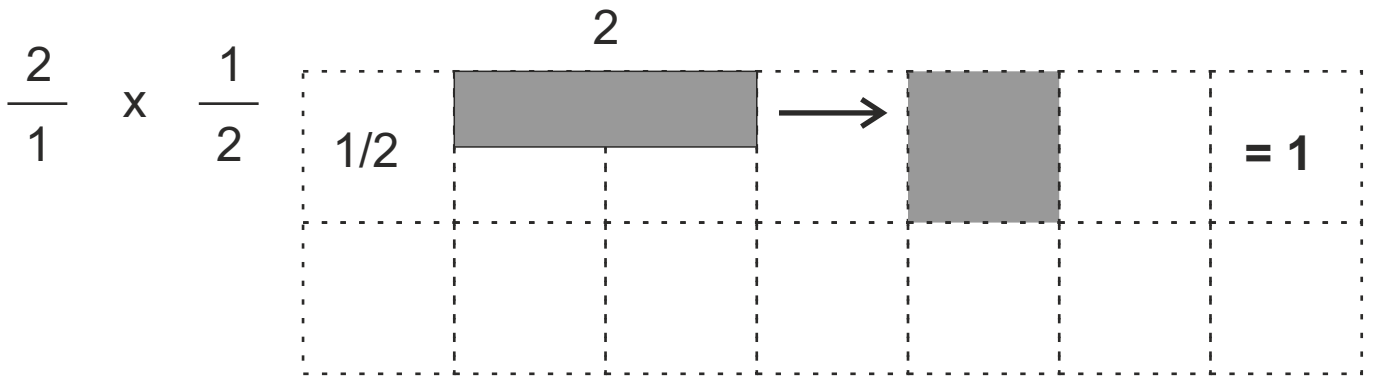


This is one whole chocolate.
 Its length = 1 and breadth = 1 .
 Area = length x breadth = 1 x 1 = 1 square

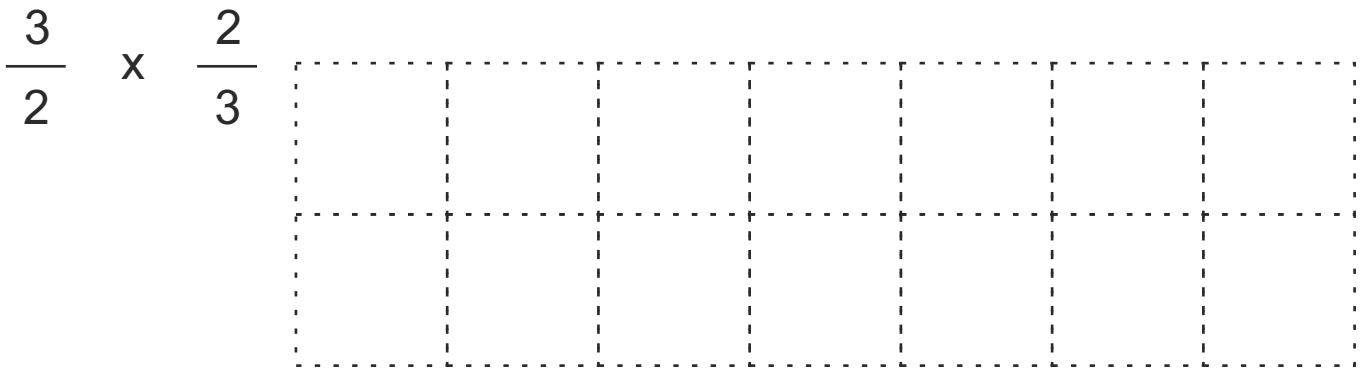
Some fractions of this chocolate are coloured here. Write the area and multiplication related to coloured portion in comparison with this 1 whole. One example is solved.

Picture of coloured portion	Coloured fraction(Area) = Length x Breadth
	$\frac{1}{12} = \frac{1}{4} \times \frac{1}{3}$
	$\square = \square \times \square$
	$\square = \square \times \square$
	$\square = \square \times \square$

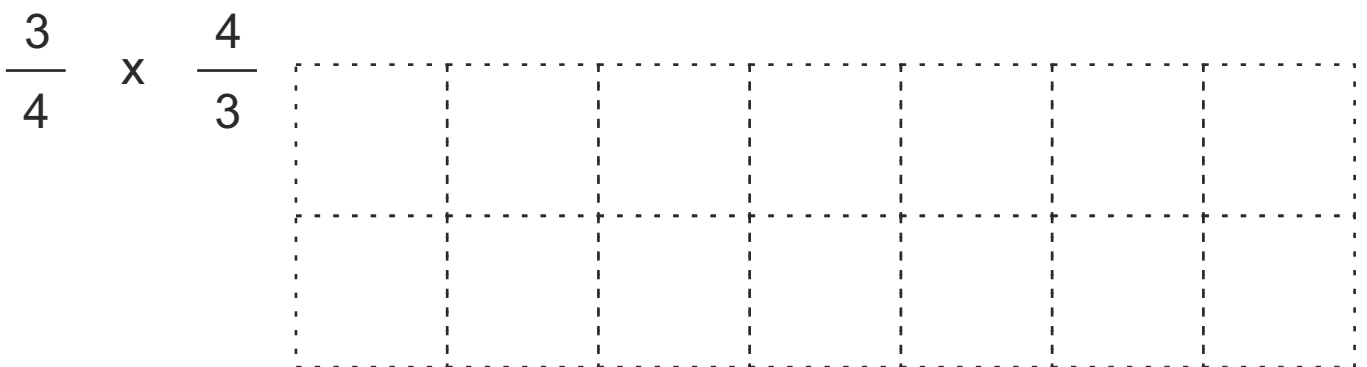
Multiplication	Picture	Procedure	Answer
$\frac{1}{2} \times \frac{1}{4}$		$\frac{1 \times 1}{2 \times 4}$	$\frac{1}{8}$
$\frac{1}{2} \times \frac{1}{3}$			
$\frac{1}{4} \times \frac{2}{3}$		$\frac{1}{\cancel{4}^2} \times \frac{\cancel{2}^1}{3}$	
$\frac{2}{5} \times \frac{3}{6}$			
$1 \times \frac{3}{4}$			



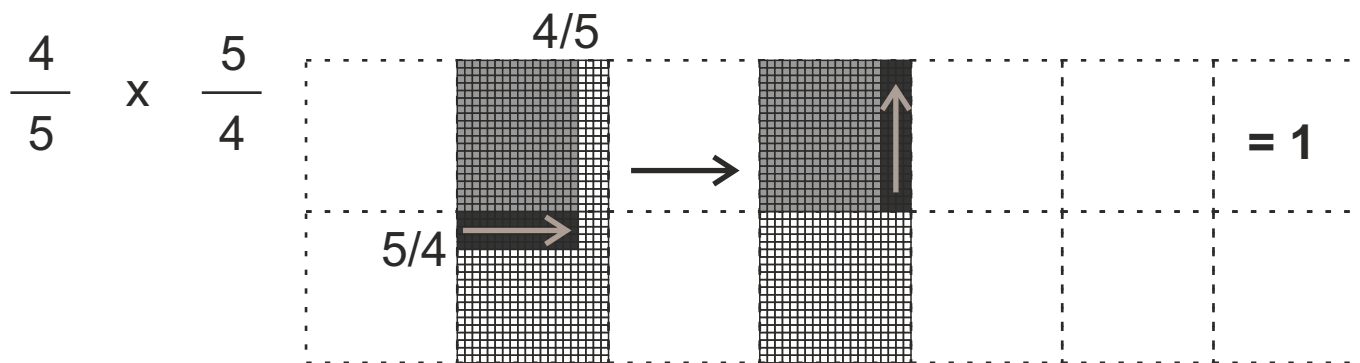
$$\frac{\cancel{2}}{1} \times \frac{1}{\cancel{2}} = \boxed{1}$$



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



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



$$\frac{\cancel{4}}{5} \times \frac{5}{\cancel{4}} = \boxed{1}$$

$$\frac{2}{3} \times \frac{3}{2} = \boxed{1}$$

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

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

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

$$5 \times \boxed{} = \boxed{1}$$

$$1 \times \boxed{} = \boxed{1}$$

Here, the product of two numbers is 1. Such numbers are called as multiplicative inverse or reciprocal of each other.

Number	6	$\frac{3}{5}$	$\frac{1}{10}$	$\frac{5}{3}$	100	1	0
Reciprocal	$\frac{1}{6}$						Not defined

$$(+2) + (-2) = 0$$

Therefore (+2) and (-2) are additive inverse of each other.

$$(5) \times \left(\frac{1}{5}\right) = 1$$

Therefore 5 and $\frac{1}{5}$ are multiplicative inverse of each other.

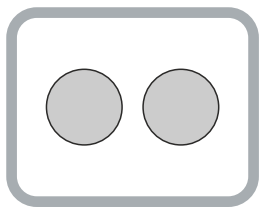
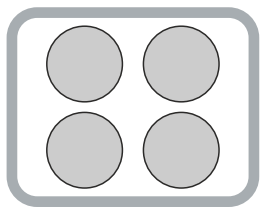
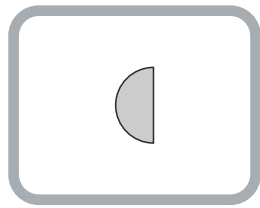
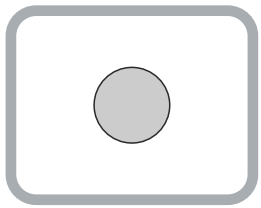
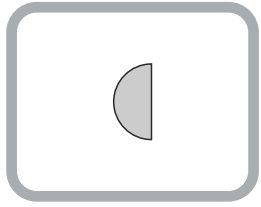
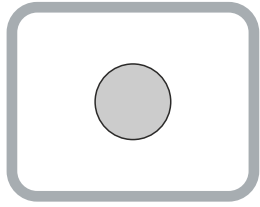
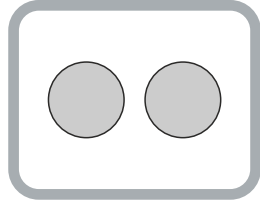
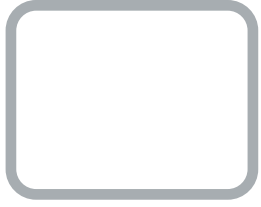
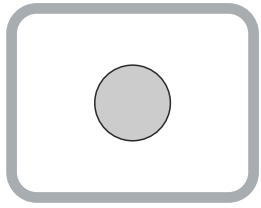
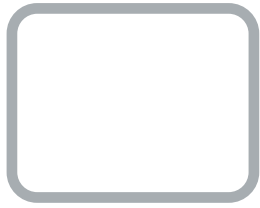
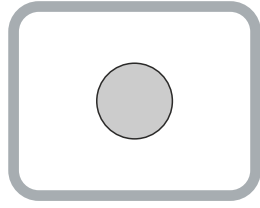

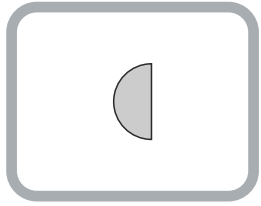
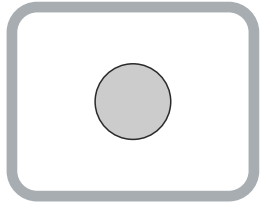
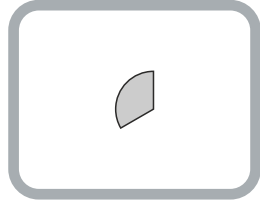
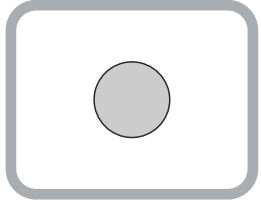
$$(-5) \times \left(-\frac{1}{5}\right) = 1$$

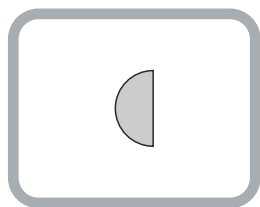

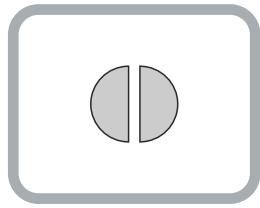
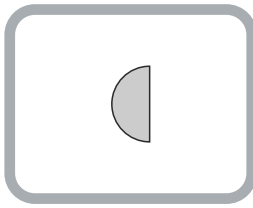


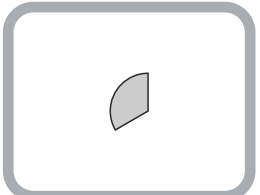
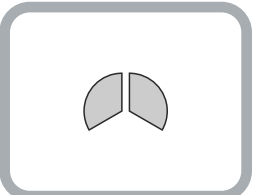
Therefore (-5) and $\left(-\frac{1}{5}\right)$ are multiplicative inverse of each other.

Write additive and multiplicative inverse :

Number	Additive Inverse	Multiplicative Inverse
+ 3		
$\frac{1}{4}$		
$-\frac{3}{4}$		
- 3.5		
x		
- 2a		
0		Does not exist.

Observe the equality on slates. Draw appropriate number of roties on empty slates.

	=			=	
	=			=	
	=			=	
	=			=	

	=	1	=	
	=	2	=	
	=	3	=	
	=	1	=	

Draw appropriate number of roties on empty slates. Write the missing numbers.

$\frac{4}{2} = \frac{\begin{array}{ c } \hline \text{4 circles} \\ \hline \end{array}}{\begin{array}{ c } \hline \text{2 circles} \\ \hline \end{array}} = \boxed{2} = \frac{\begin{array}{ c } \hline \text{2 circles} \\ \hline \end{array}}{\begin{array}{ c } \hline \text{1 circle} \\ \hline \end{array}}$	$\frac{4}{2} = \boxed{2} = \frac{2}{1}$
<p>How many groups of 2 can be made from 4?</p>	$\boxed{2}$

$\frac{1}{\frac{1}{2}} = \frac{\begin{array}{ c } \hline \text{1 circle} \\ \hline \end{array}}{\begin{array}{ c } \hline \text{1/2 circle} \\ \hline \end{array}} = \boxed{} = \frac{\begin{array}{ c } \hline \phantom{\text{circle}} \\ \hline \end{array}}{\begin{array}{ c } \hline \text{1 circle} \\ \hline \end{array}}$	$\frac{1}{\frac{1}{2}} = \boxed{} = \frac{}{1}$
<p>How many groups of 1/2 can be made from 1?</p>	$\boxed{}$

$\frac{1}{\frac{1}{4}} = \frac{\begin{array}{ c } \hline \phantom{\text{circle}} \\ \hline \end{array}}{\begin{array}{ c } \hline \text{1/4 circle} \\ \hline \end{array}} = \boxed{} = \frac{\begin{array}{ c } \hline \phantom{\text{circle}} \\ \hline \end{array}}{\begin{array}{ c } \hline \phantom{\text{circle}} \\ \hline \end{array}}$	$\frac{1}{\frac{1}{4}} = \boxed{} = \frac{}{1}$
<p>How many groups of 1/4 can be made from 1?</p>	$\boxed{}$

$$\frac{1}{\frac{1}{2}} = \frac{\begin{array}{|c|c|} \hline \text{shaded} & \text{shaded} \\ \hline \end{array}}{\begin{array}{|c|} \hline \text{shaded} \\ \hline \end{array}} = \frac{\boxed{2}}{\boxed{1}}$$

How many groups of $\frac{1}{2}$ can be made from 1?

Make the required parts of the number in numerator and find the answer.

$$\frac{2}{\frac{1}{2}} = \frac{\begin{array}{|c|c|} \hline \text{shaded} & \text{shaded} \\ \hline \end{array}}{\begin{array}{|c|} \hline \text{shaded} \\ \hline \end{array}} = \frac{\boxed{}}{\boxed{1}}$$

$$\frac{1}{\frac{1}{4}} = \frac{\begin{array}{|c|} \hline \text{shaded} \\ \hline \end{array}}{\begin{array}{|c|} \hline \text{shaded} \\ \hline \end{array}} = \frac{\boxed{}}{\boxed{1}}$$

$$\frac{3}{\frac{1}{2}} = \frac{\begin{array}{|c|c|c|} \hline \text{shaded} & \text{shaded} & \text{shaded} \\ \hline \end{array}}{\begin{array}{|c|} \hline \text{shaded} \\ \hline \end{array}} = \frac{\boxed{}}{\boxed{1}}$$

Study carefully the answers on previous page and fill in the blanks in the following questions.

$$\frac{1}{\frac{1}{2}} = 2$$

$$\frac{1}{\frac{1}{3}} = \square$$

$$\frac{1}{\square} = 4$$

$$\frac{\square}{\frac{1}{5}} = 5$$

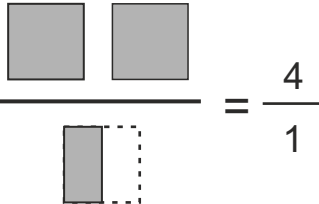
$$\frac{2}{\frac{1}{3}} = \square$$

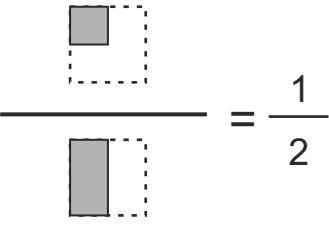
$$\frac{3}{\frac{1}{5}} = \square$$

$$\frac{\square}{\frac{1}{3}} = 9$$

$$\frac{4}{\square} = 12$$

Dividing by a fraction = Multiplying by its reciprocal

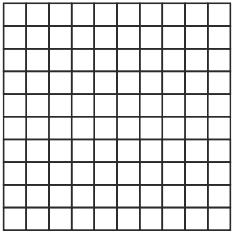
Division	By making portions	Procedure	Answer
$\frac{2}{1 \frac{1}{2}}$		$\frac{2}{1} \times \frac{2}{1} = \frac{4}{1}$	4
$\frac{1}{1 \frac{1}{4}}$			
$\frac{3}{1 \frac{1}{4}}$			
$\frac{1}{2 \frac{1}{4}}$			
$\frac{1}{4 \frac{1}{8}}$			
$\frac{3}{2 \frac{1}{4}}$			

Division	By making portions	Procedure	Answer
$\frac{1}{4} \div \frac{1}{2}$		$\frac{1}{\cancel{4}^1} \times \frac{\cancel{2}^1}{1} = \frac{1}{2}$	$\frac{1}{2}$
$\frac{1}{4} \div \frac{1}{8}$			
$\frac{3}{4} \div \frac{1}{2}$			
$\frac{3}{2} \div \frac{3}{4}$			
$\frac{2}{4} \div \frac{1}{8}$			
$\frac{1}{3} \div \frac{1}{3}$			

This is one whole chocolate bar. Colour both fractions in each division problem and write the answer by observation. Also solve by procedure.



Division	By making portions	Procedure	Answer
$\frac{1}{2}$ <hr/> $\frac{1}{3}$	 <hr/> $= \frac{3}{2}$ 	$\frac{1}{2} \times \frac{3}{1} = \frac{3}{2}$	$\frac{3}{2}$
$\frac{2}{3}$ <hr/> $\frac{1}{2}$	 <hr/> $= \frac{\square}{\square}$ 		
$\frac{2}{3}$ <hr/> $\frac{2}{3}$	 <hr/> $= \frac{\square}{\square}$ 		
$\frac{1}{3}$ <hr/> $\frac{5}{6}$	 <hr/> $= \frac{\square}{\square}$ 		
$\frac{4}{6}$ <hr/> $\frac{2}{3}$	 <hr/> $= \frac{\square}{\square}$ 		



= 1

Colour the squares to show fraction and write it in houses and using decimal point. Fill all blank columns.

Fraction	Picture	Number written in houses	Decimal form								
$\frac{1}{10}$		<table border="1"> <tr> <td>U</td> <td>•</td> <td>$\frac{1}{10}$</td> <td>$\frac{1}{100}$</td> </tr> <tr> <td>0</td> <td>•</td> <td>1</td> <td>0</td> </tr> </table>	U	•	$\frac{1}{10}$	$\frac{1}{100}$	0	•	1	0	0.1
U	•	$\frac{1}{10}$	$\frac{1}{100}$								
0	•	1	0								
$\frac{12}{10}$		<table border="1"> <tr> <td>U</td> <td>•</td> <td>$\frac{1}{10}$</td> <td>$\frac{1}{100}$</td> </tr> <tr> <td>1</td> <td>•</td> <td>2</td> <td>0</td> </tr> </table>	U	•	$\frac{1}{10}$	$\frac{1}{100}$	1	•	2	0	1.2
U	•	$\frac{1}{10}$	$\frac{1}{100}$								
1	•	2	0								
$\frac{4}{100}$		<table border="1"> <tr> <td>U</td> <td>•</td> <td>$\frac{1}{10}$</td> <td>$\frac{1}{100}$</td> </tr> <tr> <td></td> <td>•</td> <td></td> <td></td> </tr> </table>	U	•	$\frac{1}{10}$	$\frac{1}{100}$		•			
U	•	$\frac{1}{10}$	$\frac{1}{100}$								
	•										
$\frac{35}{100}$		<table border="1"> <tr> <td>U</td> <td>•</td> <td>$\frac{1}{10}$</td> <td>$\frac{1}{100}$</td> </tr> <tr> <td></td> <td>•</td> <td></td> <td></td> </tr> </table>	U	•	$\frac{1}{10}$	$\frac{1}{100}$		•			
U	•	$\frac{1}{10}$	$\frac{1}{100}$								
	•										
$\frac{170}{100}$		<table border="1"> <tr> <td>U</td> <td>•</td> <td>$\frac{1}{10}$</td> <td>$\frac{1}{100}$</td> </tr> <tr> <td></td> <td>•</td> <td></td> <td></td> </tr> </table>	U	•	$\frac{1}{10}$	$\frac{1}{100}$		•			
U	•	$\frac{1}{10}$	$\frac{1}{100}$								
	•										

Writing expanded form into short form

$300 + 20 + 4$



324

$300 + 20 + 4 + \frac{6}{10}$



324.6

$2 \times 10 + 5 \times 1 + 5 \times \frac{1}{10}$



$300 + \frac{5}{10}$



$3 \times 100 + 5 \times 1 + 6 \times \frac{1}{10} + 4 \times \frac{1}{100}$



$5 \times 100 + 2 \times 10 + 0 \times 1 + 3 \times \frac{1}{10} + 1 \times \frac{1}{100}$



Writing short form as expanded form

324



$3 \times 100 + 2 \times 10 + 4 \times 1$

324.6



$3 \times 100 + 2 \times 10 + 4 \times 1 + 6 \times \frac{1}{10}$

400.5



21.65



1.52



0.5



11.58



205.67



250.09



Dividing a number by 10, 100, 1000

number	number / 10	number / 100	number / 1000
125	12.5	1.25	0.125
42			
0.234			
1000			
500.05			

Multiplying a number by 10, 100, 1000

number	number x 10	number x 100	number x 1000
25			
17.231			
0.5463			
0.0001			
999.009			

Different ways of converting Fractions to Decimals :

1. Making denominator as 10, 100, 1000 etc. (when denominator is a factor of 10,100,1000)

$\frac{7}{2} = \frac{7 \times 5}{2 \times 5} = \frac{35}{10} = 3.5$	$\frac{15}{50} =$
$\frac{8}{125} =$	$\frac{20}{125} =$

2. Converting into improper fraction and then converting the remaining part into decimal.

$\frac{7}{2} = 3 + \frac{1}{2} = 3 + \frac{5}{10} = 3.5$	$\frac{115}{50} =$
$\frac{105}{20} =$	$\frac{28}{25} =$

3. Direct division including decimal point (Easier when denominator is a single digit number)

$\frac{1}{5} \rightarrow$ $ \begin{array}{r} 0.2 \\ 5 \overline{) 1.0} \\ \underline{- 0} \downarrow \\ 10 \\ \underline{- 10} \\ 0 \end{array} $ $\frac{1}{5} = 0.2$	$\frac{12}{8} \rightarrow$
--	----------------------------

Observe the numbers carefully and decide which method to use. Don't jump to procedure.

A number hi ngun tak a thlir chung in eng dan hmang a chawh tur nge i ngaihtuah ang. A chawh dan kal hmang en lo in.

Units of distance measurement and their conversions

$10 \text{ mm} = 1 \text{ cm}$

$100 \text{ cm} = 1 \text{ m}$

$1000 \text{ m} = 1 \text{ km}$

millimeter (mm)	centimeter (cm)	meter (m)	kilometer (km)
1000000	100000	1000	1
1000	100	1	0.001
	1		
1			
			Diameter of earth 12742 km
		Height of Mount Everest 8848.86 m	
	Diameter of 10-rupee coin 2.7 cm		
Thickness of paper 0.1 mm			

Units of mass (weight) measurement and their conversions

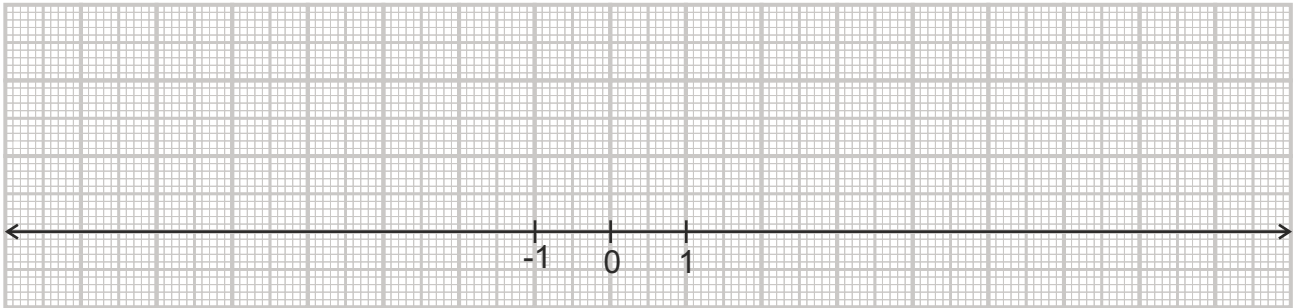
$$1000 \text{ mg} = 1 \text{ g}$$

$$1000 \text{ g} = 1 \text{ kg}$$

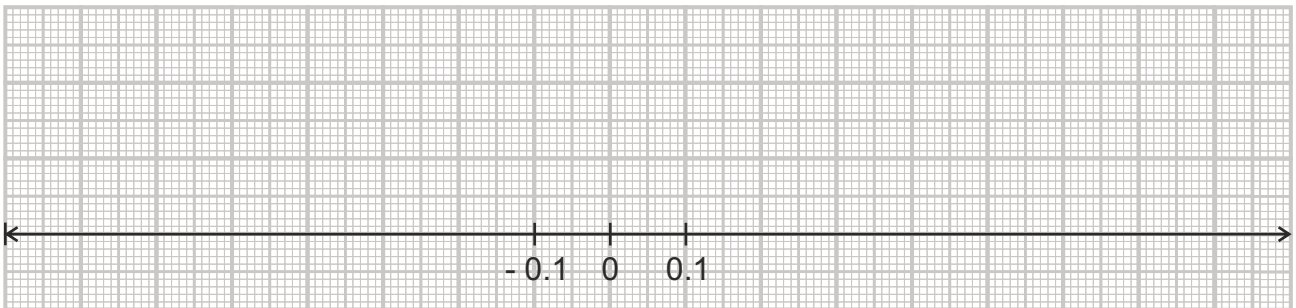
milligram (mg)	gram (g)	kilogram (kg)
1000000	1000	1
1000	1	0.001
1	0.001	0.000001
		One liter of water weighs 1 kg
	A house-mouse weighs 19 g	
An ant weighs 3 mg		
		Indian elephant weighs 8818 kg

Plot the numbers on number lines.

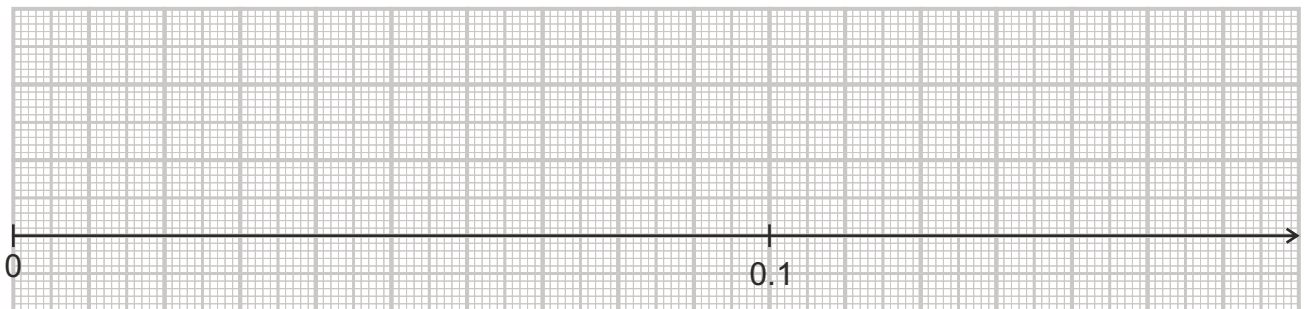
2, -2, 0.5, -0.5, 2.5, -2.5, 8.1, -7.1



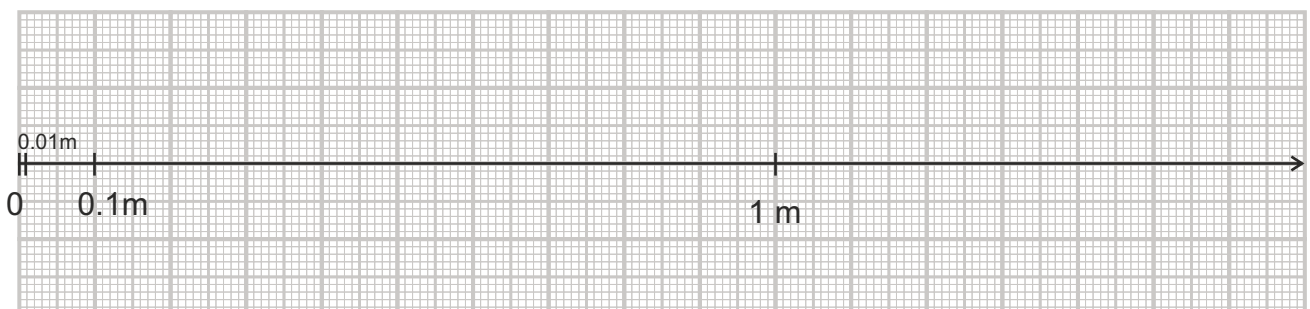
0.2, -0.2, 0.35, -0.35, 0.83, -0.54, 0.54



0.01, 0.001, 0.15, 0.05, 0.083, 0.061, 0.005



0.1 m, 0.01m, 0.35m, 50 cm, 1.5 m, 0.7 m, 0.06 m, 161 cm



Write the numbers in houses and do the addition or subtraction.

$5.2 + 4$

U	$\frac{1}{10}$

Answer

$60 + 0.5$

T	U	$\frac{1}{10}$

Answer

$63.5 + 9.75$

T	U	$\frac{1}{10}$	$\frac{1}{100}$

Answer

$6.5 - 0.5$

U	$\frac{1}{10}$

Answer

$25 - 4.5$

T	U	$\frac{1}{10}$

Answer

$40 - 25.4$

T	U	$\frac{1}{10}$	$\frac{1}{100}$

Answer

$6 + 2.5 =$

$7 - 1.5 =$

$12.5 + 3 =$

$50 - 10.5 =$

Write the numbers in houses and do the addition or subtraction.

$$324.25 + 28.05$$

H	T	U	$\frac{1}{10}$	$\frac{1}{100}$

Answer

$$63.5 + 9.75$$

H	T	U	$\frac{1}{10}$	$\frac{1}{100}$

Answer

$$629.75 - 58.9$$

H	T	U	$\frac{1}{10}$	$\frac{1}{100}$

Answer

$$40 - 25.4$$

H	T	U	$\frac{1}{10}$	$\frac{1}{100}$

Answer

$$5.5 + 4.5 = \text{ }$$

$$7.5 - 1.5 = \text{ }$$

$$10.48 + 3.05 = \text{ }$$

$$50.0 - 8.05 = \text{ }$$

Fraction multiplication	Equivalent of answer having 10, 100 etc in denominator	Decimal form of answer
$\frac{5}{10} \times \frac{3}{10} = \frac{15}{100}$	$\frac{15}{100}$	0.15
$\frac{3}{2} \times \frac{1}{2} = \frac{3}{4}$	$\frac{75}{100}$	0.75
$\frac{1}{2} \times \frac{5}{2} =$		
$\frac{3}{2} \times \frac{3}{5} =$		
$\frac{5}{4} \times \frac{2}{5} =$		
$\frac{7}{10} \times \frac{3}{5} =$		
$\frac{13}{100} \times \frac{1}{10} =$		
$\frac{9}{50} \times \frac{9}{10} =$		
$\frac{12}{5} \times \frac{9}{25} =$		

Multiplication of decimal fractions

$$0.5 \times 0.3 = \frac{5}{10} \times \frac{3}{10} = \frac{15}{100} = 0.15$$

$$0.5 \times 0.03 =$$

$$0.5 \times 0.03 =$$

$$0.05 \times 0.03 =$$

Observe the above answers. Did you discover the rule?

Multiply the two numbers as if there is no decimal point.

Count the total number of digits on the right of decimal point in two numbers.

Put the decimal point in answer such that it will have these many digits on the right of decimal point.

Solve using the rule.

$$\begin{array}{r} 15.03 \\ \times 5.7 \\ \hline \end{array}$$

$$\begin{array}{r} 36.24 \\ \times 10.02 \\ \hline \end{array}$$

$$\begin{array}{r} 0.009 \\ \times 0.9 \\ \hline \end{array}$$

Division of decimal fractions

Method 1 - Convert into fractions

$$\frac{2.5}{0.5} = \frac{\frac{25}{10}}{\frac{5}{10}}$$
$$= \frac{25}{10} \times \frac{10}{5} = 5$$

Method 2 - Multiply numerator and denominator by an appropriate number between 10, 100, etc to convert them into integers.

$$\frac{2.5}{0.5} = \frac{2.5 \times 10}{0.5 \times 10}$$
$$= \frac{25}{5} = 5$$

$$\frac{10.8}{0.03} =$$
$$=$$

$$\frac{10.8}{0.03} = \frac{10.8 \times 100}{0.03 \times 100}$$
$$=$$

$$\frac{0.5}{0.005} =$$

$$\frac{0.5}{0.005} =$$

Find :

$$3.6 \div 0.2$$

$$7.75 \div 0.25$$

$$3.25 \div 0.5$$

$$30.94 \div 0.7$$

$$0.35 \div 5$$

$$7 \div 3.5$$

$$0.25 \div 0.5$$

$$0.7 \div 35$$

Data Handling

Let's understand basic concepts of data handling through one simple and real example.

The first step is to collect data. This chart has the data of number of persons in the families of some of the teachers of Mizoram.

Name	Number of members in the family
Baby Lalthakimi Chinzah	7
Zoramthanga	4
T.Vanlalhruaia	5
R.Lalzuimawia	2
Andrew	3
C.Lalrotluangi	9
C. Zirthangzela	2
C.Lianzela	8
Zorengpuii	3
Vanlalsiami	7
C.Lalthawmmawia	6
Lalchhanhima hnamte	9
Lalsangliana	5
Ramtharnglaki	3
Zonunhrangi	2
R. Vanlalhluna	3
Lalhrinsaka Pachuau	5
V Lalremruata	6
Michael Lalkrosvuana	6

Observe the chart on previous page and answer the following questions :

- How many members are there in Baby's family?.....
- Whose family has 7 members?.....
- How many families' information do we have? (N).....
- What is the total number of persons in all families together? (M).....
- What is the average of number of family members? (M/N).....

This is called as MEAN.

- What is the number of members in the smallest family?.....
- What is the number of members in the largest family?.....
- Can the minimum number of family members be zero?.....
- Can the maximum number of family members be 100?.....
- How many families that have 2 members?.....
- How many families have 3 members?.....
- The number of members that has come more often is

This is called as MODE.

Arrange the data of number of family members in ascending order (from smallest to biggest).

Also include the repeated numbers.

2, 2, 2,

Check whether you have got 19 numbers in the above list.

The middle value of this list is

This is called as MEDIAN.

For our data of families :

Mean =

Mode =

Median =

Mean = Average

Mode = The number that comes more often

Median (The middle number when you arrange the data in ascending order)

Daily income of 11 families is given here :

500, 940, 650, 500, 470, 2330, 570, 540, 600, 500, 3400

Mean =

From the average income we may feel that the income of families is ok.

Mode =

Mode gives us an idea of what more families are earning.

Median =

Median tells us the middle number.

Observe mean, mode and median carefully. What can you say about the incomes of these families?

Measure the following angles using protractor and fill in the chart.

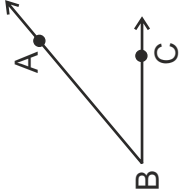
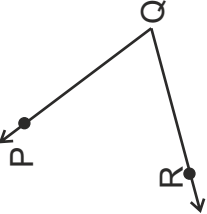
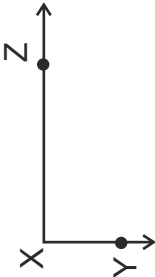
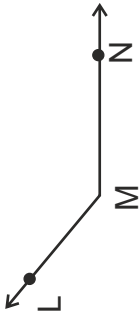
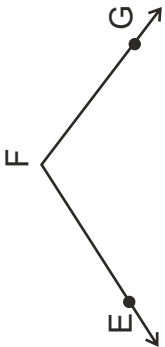
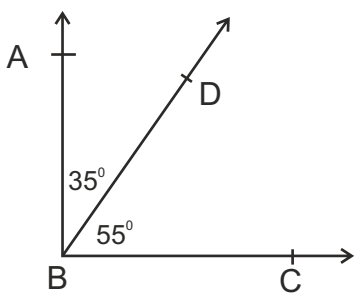
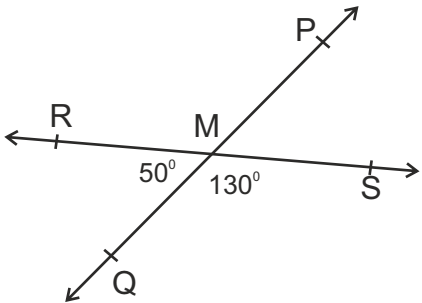
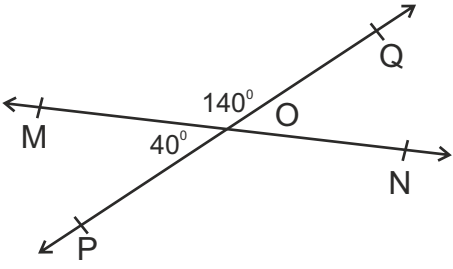
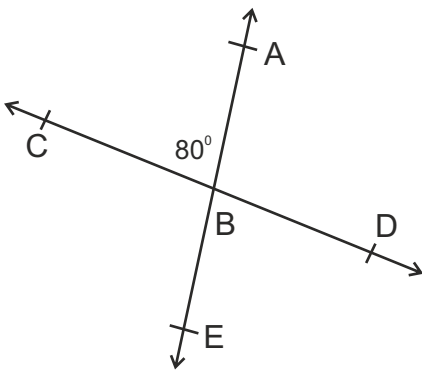
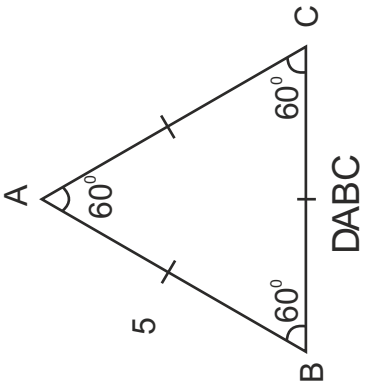
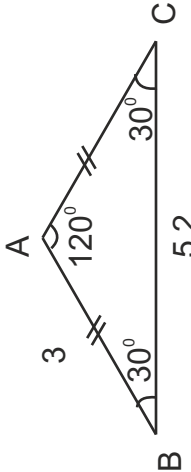
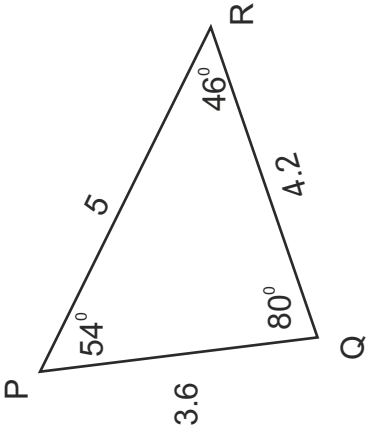
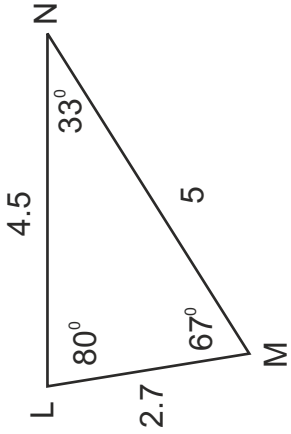
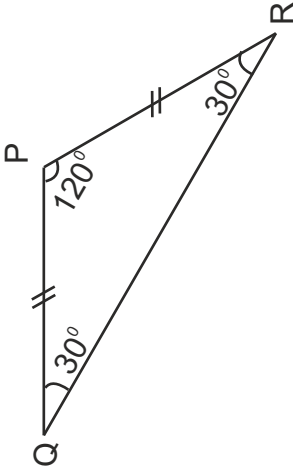
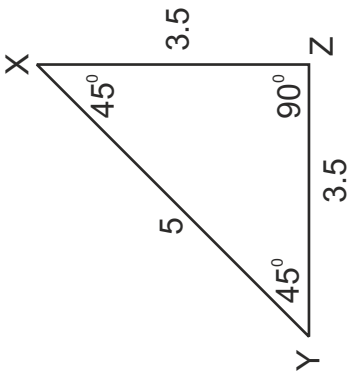
Angle	Short Name	Long name 2 ways	Measure	Type of angle
	$\angle B$	$\angle ABC$ $\angle CBA$	40°	Acute angle





Figure	Information
	$\angle ABD = \dots\dots\dots$ $\angle DBC = \dots\dots\dots$ $\angle ABD + \angle DBC = \dots\dots\dots$ $\angle ABC = \dots\dots\dots$
	$\angle RMQ = \dots\dots\dots$ $\angle PMS = \dots\dots\dots$ $\angle RMP = \dots\dots\dots$ $\angle QMS = \dots\dots\dots$ $\angle RMQ = \angle \dots\dots\dots$ $\angle RMP = \angle \dots\dots\dots$
	$\angle MOQ = \dots\dots\dots$ $\angle NOQ = \dots\dots\dots$ $\angle MOQ + \angle NOQ = \dots\dots\dots$ $\angle MOP = \dots\dots\dots$ $\angle PON = \dots\dots\dots$ $\angle MOP + \angle PON = \dots\dots\dots$
	<p>Fill in the blanks without actually measuring the angles.</p> $\angle EBD = \dots\dots\dots$ $\angle ABD = \dots\dots\dots$ $\angle CBE = \dots\dots\dots$ $\angle ABC + \angle CBE + \angle EBD + \angle ABD = \dots\dots\dots$

Triangle	Sides	Angles	Type based on sides	Type based on angles
 <p style="text-align: center;">DABC</p>	<p>AB = 4 cm AC = 4 cm BC = 4 cm</p>	<p>$\angle A = 60^\circ$ $\angle B = 60^\circ$ $\angle C = 60^\circ$</p>	Equilateral triangle	Acute angled triangle
				
				

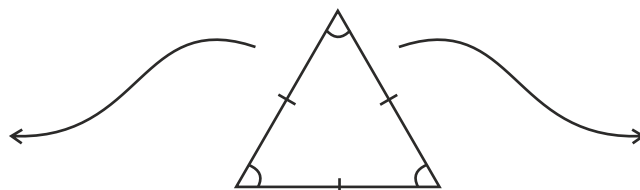
Triangle	Sides	Angles	Type based on sides	Type based on angles
 <p>Triangle LMN with side LN = 4.5, side LM = 2.7, side MN = 5, angle L = 80°, angle M = 67°, angle N = 33°.</p>				
<p>Measure the sides</p>  <p>Triangle PQR with angle Q = 30°, angle P = 120°, angle R = 30°, side PQ = 2, side PR = 2, side QR = $2\sqrt{2}$.</p>				
 <p>Triangle XYZ with side XY = 5, side XZ = 3.5, side YZ = 3.5, angle X = 45°, angle Y = 45°, angle Z = 90°.</p>				

Match the given triangles with their types.

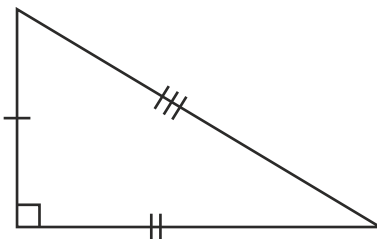
Type based on angles

Type based on sides

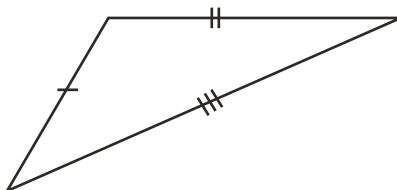
Acute triangle



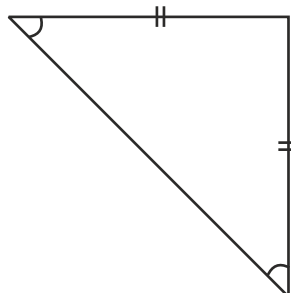
Equilateral triangle



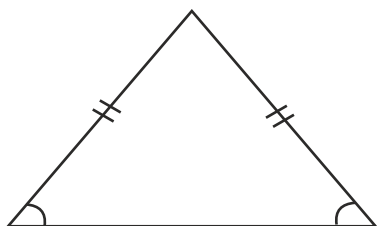
Right triangle



Isosceles triangle



Obtuse triangle

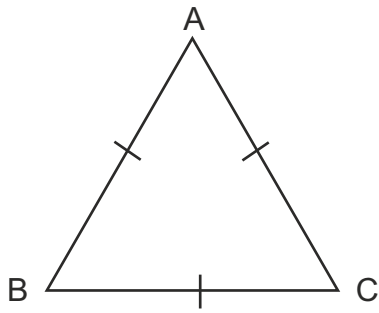


Scalene triangle

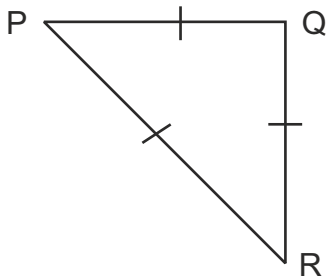
Can a right angled triangle be equilateral ? _____

Can equilateral triangle be obtuse angled triangle ? _____

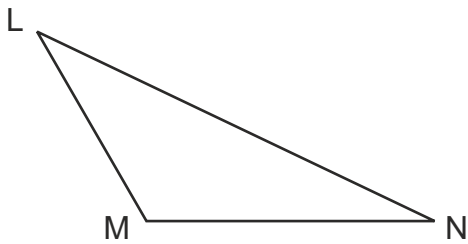
For each triangle, measure the angles and find the sum.



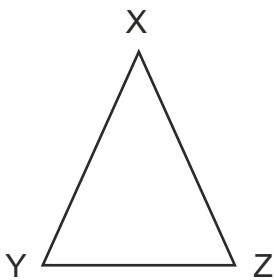
$\angle A =$
 $\angle B =$
 $\angle C =$
 $\angle A + \angle B + \angle C =$



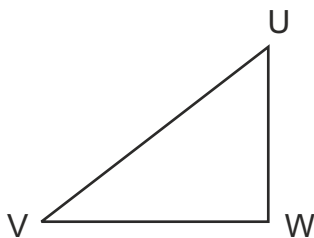
$\angle P =$
 $\angle Q =$
 $\angle R =$
 $\angle P + \angle Q + \angle R =$



$\angle L =$
 $\angle M =$
 $\angle N =$
 $\angle L + \angle M + \angle N =$



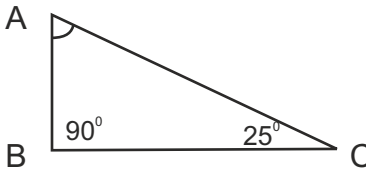
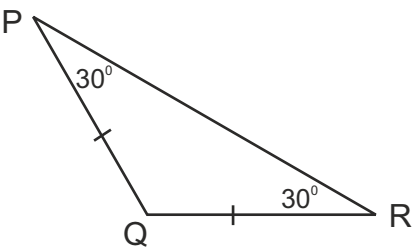
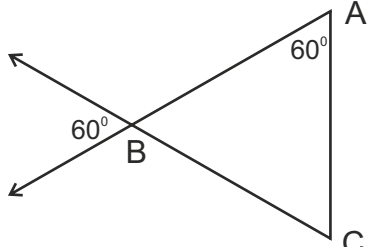
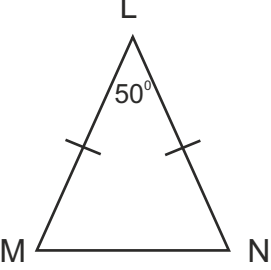
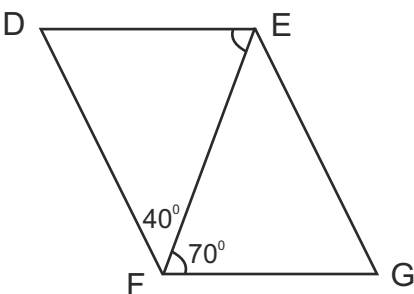
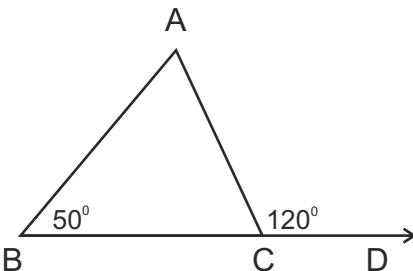
$\angle X =$
 $\angle Y =$
 $\angle Z =$
 $\angle X + \angle Y + \angle Z =$



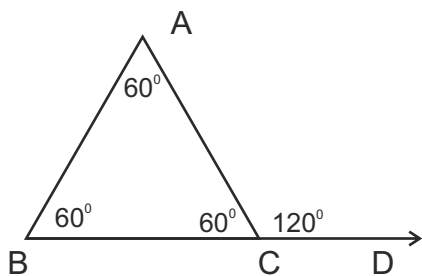
$\angle U =$
 $\angle V =$
 $\angle W =$
 $\angle U + \angle V + \angle W =$

Angles of a triangle add up to

Sum of the angles of a triangle is 180. Use this to find the missing angles.

Figure	Observe and Find
	$\angle A = \dots\dots\dots$
	$\angle Q = \dots\dots\dots$
	$\angle C = \dots\dots\dots$
	$\angle M = \dots\dots\dots$
	$\angle DEF + \angle EFG = \dots\dots\dots$ $\angle D = \dots\dots\dots$
	$\angle ACB + \angle ACD = 180$ $\angle ACB + \dots\dots\dots = 180$ $\angle ACB = \dots\dots\dots$ $\angle A = \dots\dots\dots$

Measure all three angles of the given triangles and the given exterior angle using a protractor. What do you observe?



$$\angle A = \dots\dots\dots^\circ$$

$$\angle B = \dots\dots\dots^\circ$$

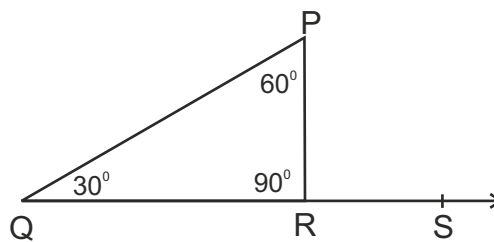
$$\angle ACB = \dots\dots\dots^\circ$$

$$\angle ACD = \dots\dots\dots^\circ$$

$$\angle ACD = \text{Exterior angle} = \dots\dots\dots^\circ$$

Sum of its interior

$$\begin{aligned} \text{opposite angles} &= \angle A + \angle B \\ &= \dots\dots\dots^\circ \end{aligned}$$



$$\angle P = \dots\dots\dots^\circ$$

$$\angle Q = \dots\dots\dots^\circ$$

$$\angle PRQ = \dots\dots\dots^\circ$$

$$\angle PRS = \dots\dots\dots^\circ$$

$$\angle PRS = \text{Exterior angle} = \dots\dots\dots^\circ$$

Sum of its interior

$$\begin{aligned} \text{opposite angles} &= \angle P + \angle Q \\ &= \dots\dots\dots^\circ \end{aligned}$$

An exterior angle of a triangle is equal to sum of its interior opposite angles.

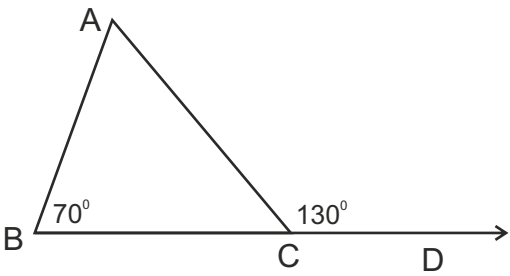
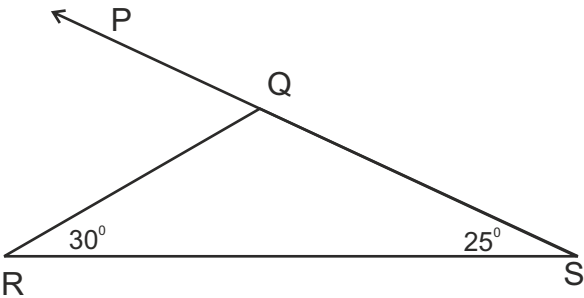
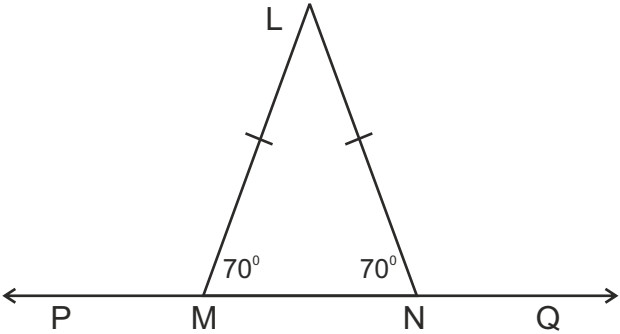
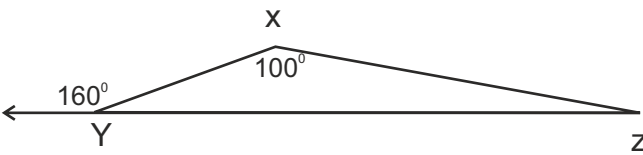
Draw any triangle. Draw all exterior angles. Could you draw 6 angles?
Check the above property for your triangle.

Find the missing angles in the figure by using properties of triangles.

Use two properties.

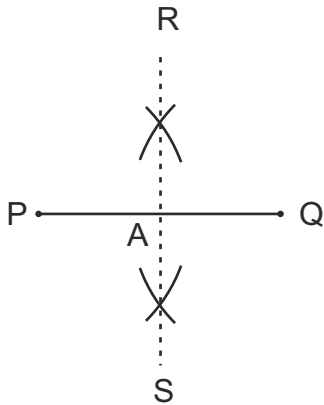
1) Angles of a triangle add up to 180° .

2) Exterior angle is equal to the sum of interior opposite angles.

Figure	Find
	$\angle ACD = \dots\dots\dots$ $\angle ACB = \dots\dots\dots$ $\angle A + \angle B = \angle ACD$ $\angle A + 70 = \dots\dots\dots$ $\angle A = \dots\dots\dots$
	$\angle PQR = \dots\dots\dots$ $\angle RQS = \dots\dots\dots$
	$\angle L = \dots\dots\dots$ $\angle LMP = \dots\dots\dots$ $\angle LNQ = \dots\dots\dots$
	$\angle Z = \dots\dots\dots$ $\angle XYZ = \dots\dots\dots$

Revision of basic constructions

Example : Draw a perpendicular bisector RS of line segment PQ using compass :



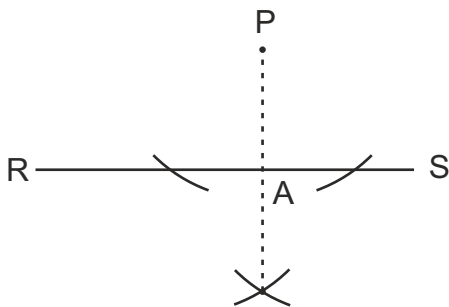
$RS \perp PQ$
 $PA = AQ$

Draw a perpendicular bisector CD of line segment AB using compass :



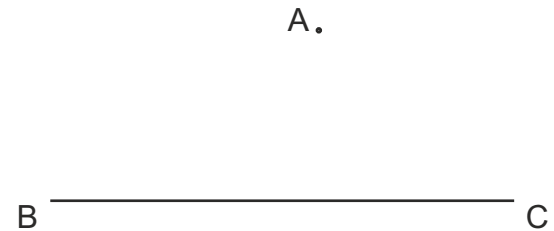
..... \perp
 =

Example : Draw a perpendicular from an external point P to segment RS.



$PA \perp RS$
 $\angle PAR = \angle PAS = 90^\circ$

Draw a perpendicular from an external point A to segment BC.



..... \perp
 $\angle \dots = \angle \dots = \dots^\circ$

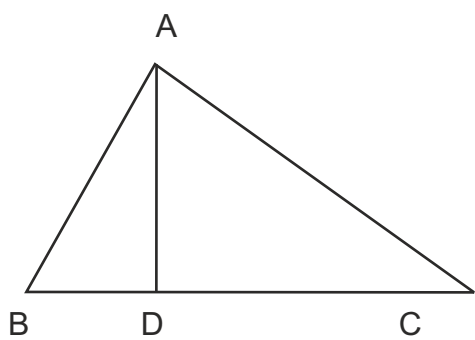
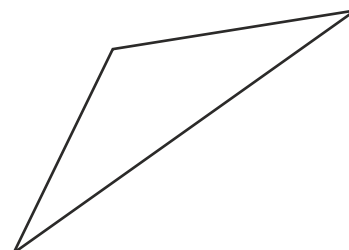
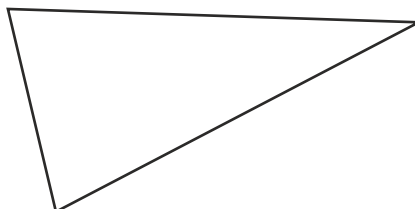
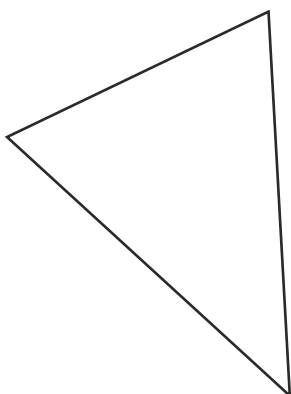
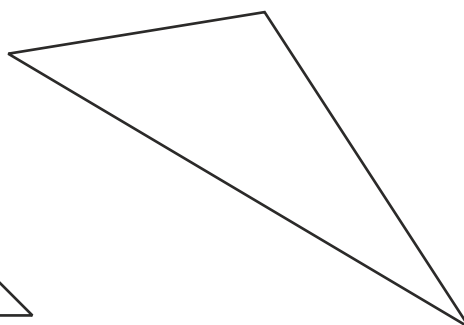
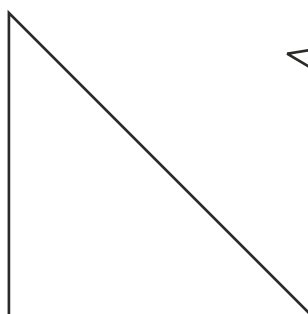
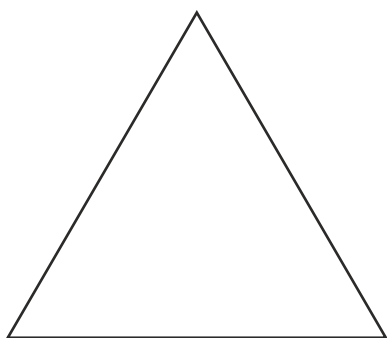
Draw 3 different line segments, Draw perpendicular bisectors of each of them.

Draw 3 different line segments.

Take point A such that it is outside of each of these segments.

Draw a perpendicular to each of the line segments from point A.

Median : A line segment joining a vertex to the midpoint of opposite side.
 Draw all three medians of each triangle.

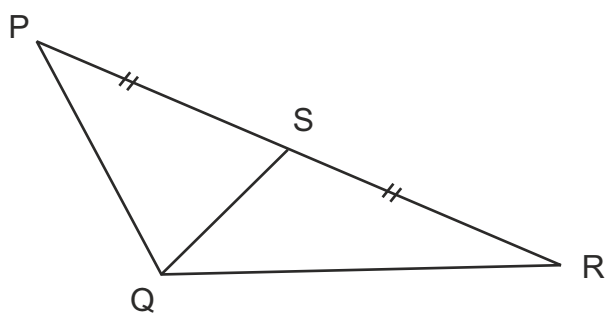


Is AD a median ? Why?

.....

.....

.....



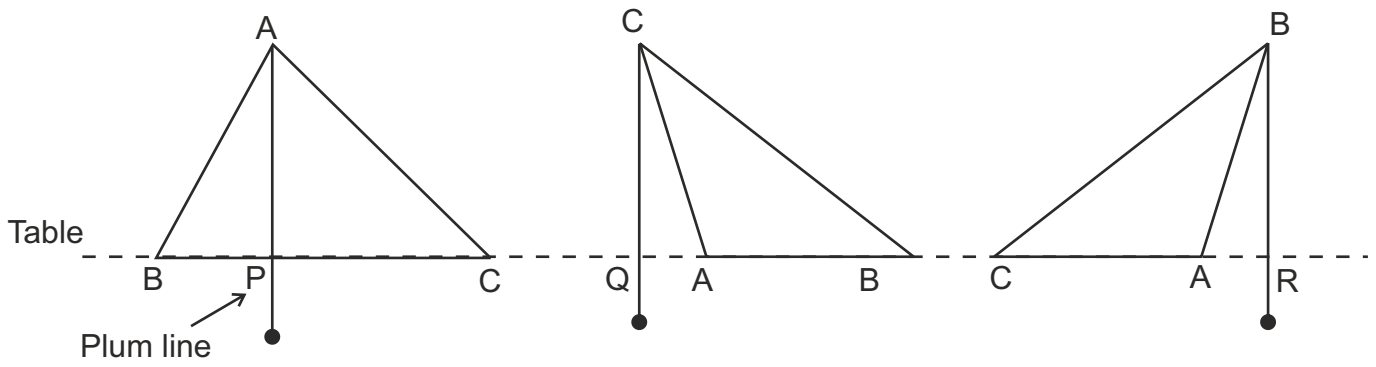
Is QS a median ? Why?

.....

.....

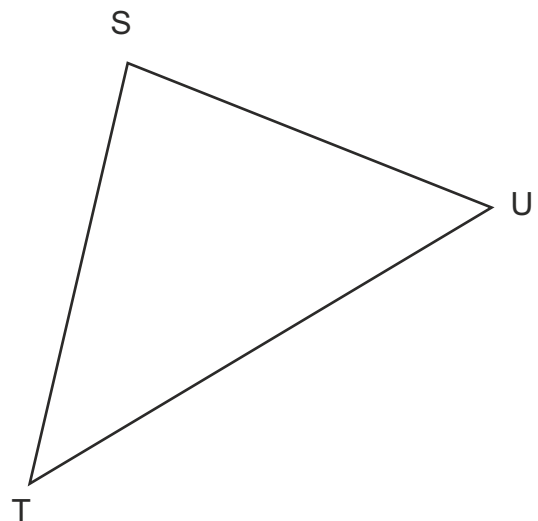
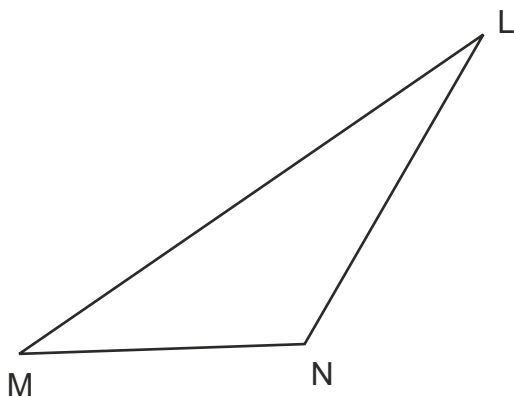
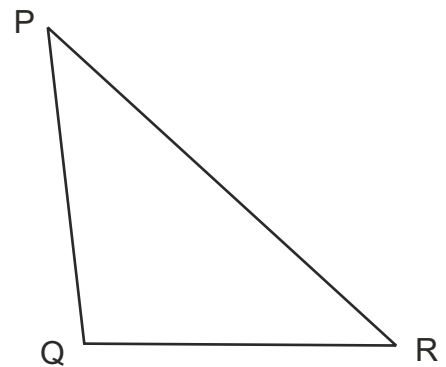
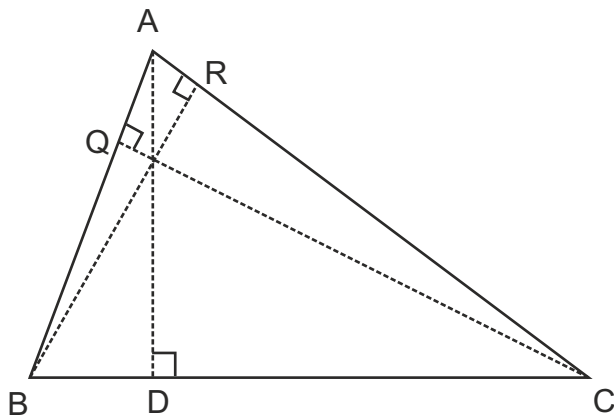
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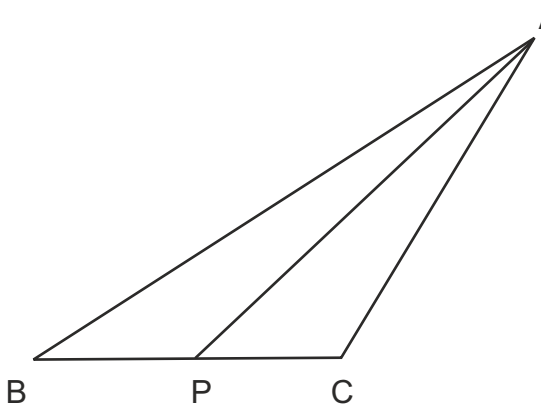
Altitude : Perpendicular from vertex of a triangle to the opposite side.



AP, CQ and BR are altitudes of $\triangle ABC$.

Draw all three altitudes of each triangle using set square.



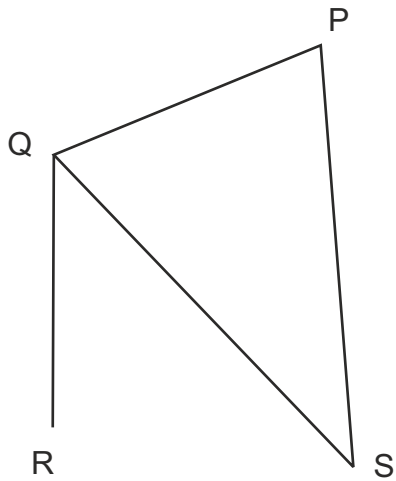


Is AP an altitude of $\triangle ABC$? Why?

.....

.....

.....

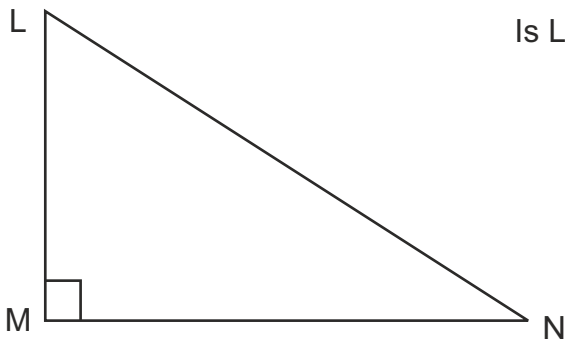


Is QR an altitude of $\triangle PQS$? Why?

.....

.....

.....



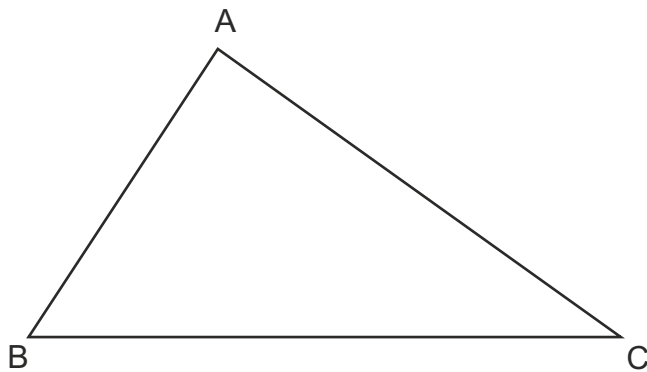
Is LM an altitude of $\triangle LMN$? Why?

.....

.....

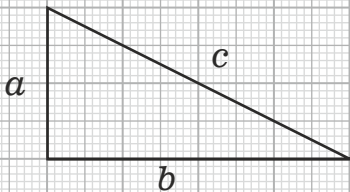
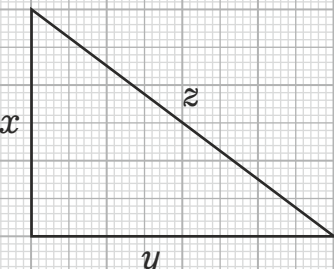
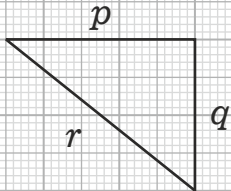
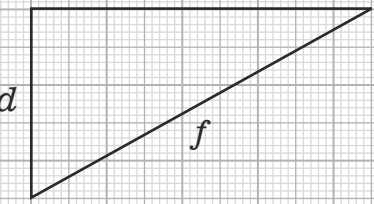
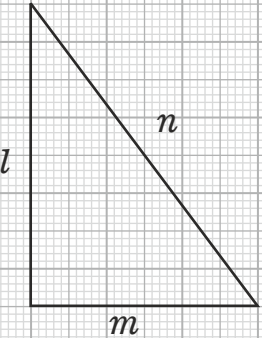
.....

Draw all three medians and all three altitudes of $\triangle ABC$.



Pythagoras Theorem.

Measure all three sides and verify. Use calculator.

Triangle	Side 1	Side 2	Hypotenuse	Verification (Use calculator)
	$a = \dots\dots\dots$	$b = \dots\dots\dots$	$c = \dots\dots\dots$	$a^2 = \dots\dots\dots$ $b^2 = \dots\dots\dots$ $a^2 + b^2 = \dots\dots\dots$ $c^2 = \dots\dots\dots$
	$x = \dots\dots\dots$	$y = \dots\dots\dots$	$z = \dots\dots\dots$	$x^2 = \dots\dots\dots$ $y^2 = \dots\dots\dots$ $x^2 + y^2 = \dots\dots\dots$ $z^2 = \dots\dots\dots$
	$p = \dots\dots\dots$	$q = \dots\dots\dots$	$r = \dots\dots\dots$	$p^2 = \dots\dots\dots$ $q^2 = \dots\dots\dots$ $p^2 + q^2 = \dots\dots\dots$ $r^2 = \dots\dots\dots$
	$d = \dots\dots\dots$	$e = \dots\dots\dots$	$f = \dots\dots\dots$	$d^2 = \dots\dots\dots$ $e^2 = \dots\dots\dots$ $d^2 + e^2 = \dots\dots\dots$ $f^2 = \dots\dots\dots$
	$l = \dots\dots\dots$	$m = \dots\dots\dots$	$n = \dots\dots\dots$	$l^2 = \dots\dots\dots$ $m^2 = \dots\dots\dots$ $l^2 + m^2 = \dots\dots\dots$ $n^2 = \dots\dots\dots$

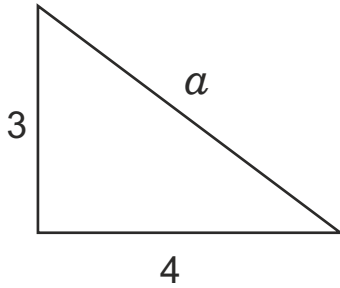
From the above examples is the sum of squares of right-angle making sides of a triangle equal to the square of hypotenuse?

Pythagoras Theorem

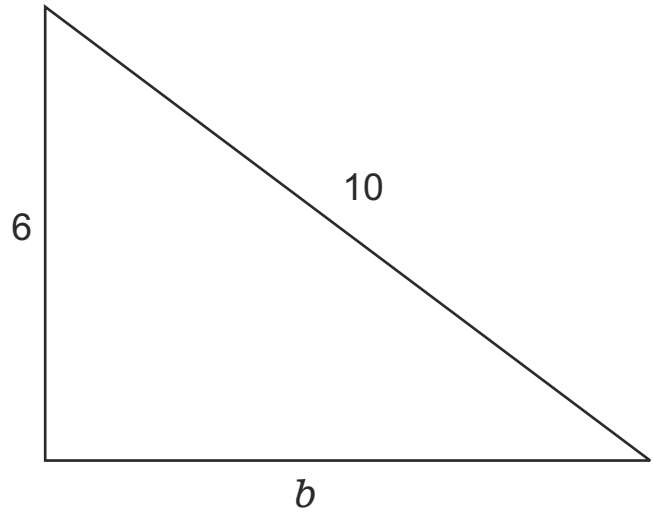
In any right triangle, the sum of squares of right-angle making sides is equal to the square of hypotenuse.

Find the missing side using Pythagoras theorem.

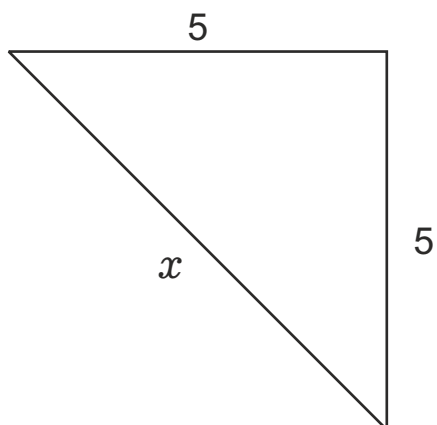
Find a



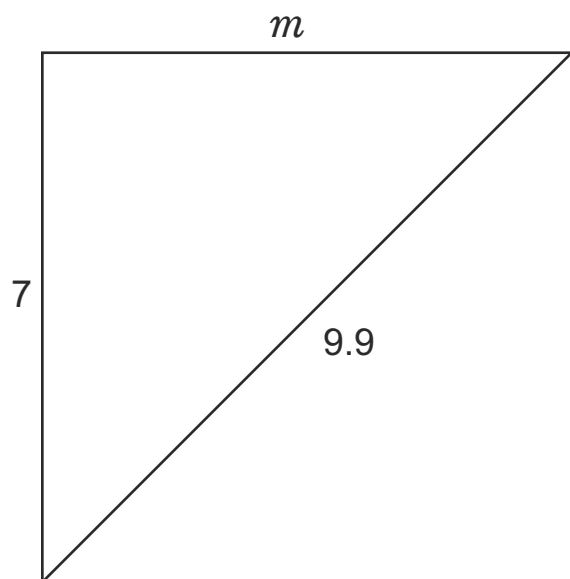
Find b



Find x



Find m



Use scale, protractor, compass and pencil to draw the following triangles on loose papers. Write the names of vertices inside the triangle. Cut out the triangle.

For each triangle check whether everyone's triangle is congruent (exactly identical)

Draw and cut this triangle	Everyone got the same triangle?	Test of congruency
Side 1 = 6 cm Side 2 = 8 cm Side 3 = 5 cm	Yes	SSS is the test of congruency
Angle 1 = 80° Angle 2 = 70° Angle 3 = 30°	No	AAA is NOT the test of congruency
Side 1 = 8 cm Side 2 = 8 cm Side 3 = 11 cm		
Side 1 = 7 cm Side 2 = 9 cm Angle between these two sides = 50°		
In triangle ABC, Side BC = 7 cm $\angle B = 60^\circ$ $\angle C = 40^\circ$		
In triangle PQR, Side QR = 11 cm Side PQ = 6 cm $\angle R = 30^\circ$	You will get two different triangles	
In triangle LMN, $\angle L = 80^\circ$ $\angle M = 60^\circ$ $\angle N = 40^\circ$		
Side 1 = 6 cm Side 2 = 8 cm Angle between these two sides = 90°		
One angle = 90° Side 1 = 8 cm Hypotenuse = 13 cm		

Have you discovered that

- if SSS, SAS, ASA, AAS and Hypotenuse-Side (HS) are the same in two triangles, you get congruent triangles.
- You may not get congruent triangles if SSA and AAA are the same in two triangles.

See the markings on two triangles.

By which test are they congruent?

Write the congruency of sides and angles

By SSS test $\triangle ABC \cong \triangle PQR$

AB \cong PQ PA \cong PB

AC \cong PR PB \cong BQ

BC \cong QR BC \cong BQ

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Ratio

Sanika has 10 pencils. Sarang has 5 pencils. Compare in two ways :

1) _____

2) _____

Sanika has 2 times that of Sarang. This kind of comparison by division (or by mutiple) is called as ratio.

$$\frac{\text{Sanika's pencils}}{\text{Sarang's pencils}} = \frac{10}{5} = \frac{2}{1}$$

The ratio is also written as 2 : 1
We read it as 'Two is to One'

$$\frac{\text{Sarang's pencils}}{\text{Sanika's pencils}} = \frac{\square}{\square} = \frac{\square}{\square}$$
$$\text{ratio} = \frac{\square}{\square} = \square : \square$$

$$\frac{\text{Sanika's pencils}}{\text{Total pencils}} = \frac{\square}{\square} = \frac{\square}{\square}$$
$$\text{ratio} = \frac{\square}{\square} = \square : \square$$

$$\frac{\text{Sarang's pencils}}{\text{Total pencils}} = \frac{\square}{\square} = \frac{\square}{\square}$$
$$\text{ratio} = \frac{\square}{\square} = \square : \square$$

Of the 24 hours day, Mangesh sleeps for 8 hours.

He is awake for _____ hours.

$$\frac{\text{Hours of sleep}}{\text{Hours of being awake}} = \frac{\square}{\square} = \frac{\square}{\square}$$

A teacher has to check total 60 notebooks. She has finished checking 36 notebooks.
Find the ratio of work done to the total work.

There are 30 girls and 24 boys in a class. Find the ratio of girls to boys.

Mother took 4 katories of rice and 2 katories of dal to make Khichadi.
Write the following numbers and ratios.

$$\text{Rice} = \square \text{ katories} \quad \text{Dal} = \square \text{ katories}$$

$$\text{Total grains} = \square \text{ katories}$$

$$\text{Rice} : \text{Dal} = \square : \square$$

$$\text{Dal} : \text{Rice} = \square : \square$$

$$\text{Rice} : \text{Total grains} = \square : \square$$

$$\text{Dal} : \text{Total grains} = \square : \square$$

The number of people is doubled because of guests. Now she needs total 12 katories of grains. The ratio of rice : dal has to remain the same. Find the quantity of rice and dal in it.

$$\text{Total grains} = \boxed{12} \text{ katories}$$

$$\text{Rice} : \text{Dal} = \boxed{2} : \boxed{1}$$

$$\frac{2}{1} = \frac{\square}{\square} \quad \text{We find the equivalent number such that numerator and denominator add to 12.}$$

$$\text{Rice} : \text{Dal} = \square : \square$$

$$\text{Dale} : \text{Rice} = \square : \square$$

$$\text{Rice} : \text{Total grains} = \square : \square$$

$$\text{Dal} : \text{Total grains} = \square : \square$$

Find the ratio of given quantities.

(Note : To compare two quantities the units must be the same.)

Quantities	Process	Ratio
16, 20	$\frac{\cancel{16}^4}{\cancel{20}_5}$	4 : 5
100, 60		
1 hour, 30 min		
1 km, 1 m		
150 cm, 100 cm		
12, 6, 60	$\frac{2 \quad 1 \quad 10}{\cancel{12}, \cancel{6}, \cancel{60}}$	2 : 1 : 10
100, 75, 50		

Distributing a quantity in a given ratio.



Nora



GOZO

Nora and Gozo love carrots.

Let's divide the carrots among them as per a different rule each time.

Total Carrots	Logic of the rule	Ratio (Nora : Gozo)	Equivalent Ratios	Nora gets	Gozo gets
12	Equal to both	1 : 1	$\frac{1}{1} = \frac{6}{6}$	6	6
12	Nora's weight is double that of Gozo. She should get double carrots.	2 : 1			
12	Gozo is 3 times more active. So he should get 3 times.	1 : 3			

Total Carrots	Nora gets	Gozo gets	Equivalent Ratios	Ratio (Nora : Gozo)
20	15	5	$\frac{15}{5} = \frac{3}{1}$	3 : 1
20				3 : 2
20	16	4		
24				1 : 1
24	15	9		
24				7 : 5
24	16	8		

Ketaki and Pranav started a stall of lemon juice.

Ketaki spent Rs. 100 and Pranav spent Rs. 80 to buy materials.

They decided to share the profit in the ratio of their investment (money spent)as both were putting in equal efforts to run the stall.

$$\frac{\text{Ketaki's investment}}{\text{Pranav's investment}} = \frac{100}{80} = \frac{\quad}{\quad}$$

$$\text{Ratio} = 5 : 4$$

Day	Total Profit	Equivalent Ratios	Ketaki gets	Pranav gets
1	18	$\frac{5}{4} = \frac{10}{8}$	10	8
2	36			
3	45			
4	90			

Two friends A and B, earned a profit of Rs. 800/- by selling vegetables. They decided to share the profit in the ratio of number of members in their families as 3 : 5. How will the share Rs. 800?

Three friends A, B and C earned 2500 rupees by selling vegetables. How will you distribute it as per the ratio of number of members in the family which is 2 : 3 : 5?

Divide the given number in the given ratio.

Number	Ratio	Process	Distribution
10	3 : 2	3 and 2 given once, 5 are over. We can give two times. So 6 and 4	6, 4
100	3 : 2		
1000	3 : 2		
5000	1 : 4		
2500	1 : 4		
2400	7 : 5		

Indian flag has the ratio of length : breadth as 3 : 2.

The flag of Bangladesh has the ratio 5 : 3.

Which flag looks longer, which flag has more ratio?

To compare $\frac{3}{2}$ and $\frac{5}{3}$ let's find their equivalent fractions having the same denominator, 6.

$$\frac{3}{2} = \frac{\boxed{}}{6}$$

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

$$\frac{3}{2} \boxed{<} \frac{5}{6}$$

_____ flag looks longer.

One glass of lemonade has lemon : water in the ratio 1 : 4. The other glass has ratio 2 : 7
Which lemonade will taste more sour?

A division has 20 girls and 18 boys. B division has 20 girls and 20 boys. C division has 18 girls and 20 boys. Which class has the highest ratio of girls to boys?

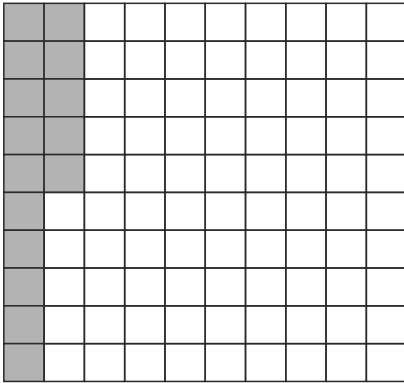
Percentage

Find equivalent fraction having 100 in denominator. Write using % sign.

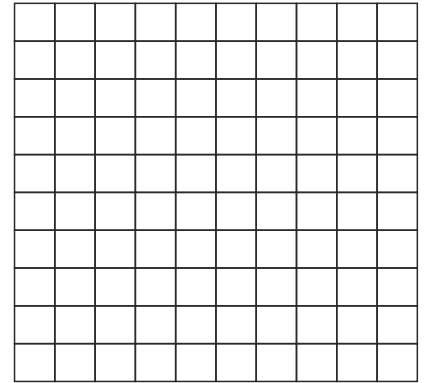
Fraction	Equivalent having 100 in denominator	Percentage
$\frac{1}{2}$	$\frac{1 \times 50}{2 \times 50} = \frac{50}{100}$	50%
$\frac{1}{4}$		
$\frac{1}{10}$		
$\frac{3}{4}$		
$\frac{2}{5}$		
$\frac{3}{2}$		
		20%
		90%

Colour the given portion.

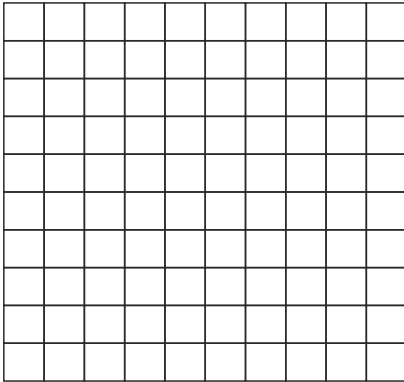
15%



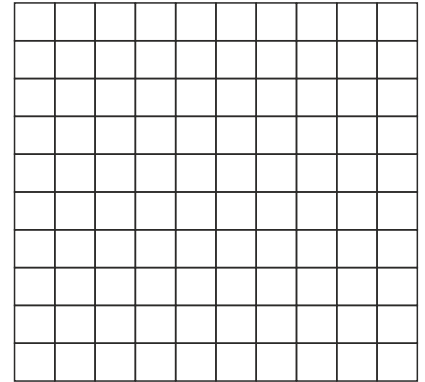
$$\frac{1}{5}$$



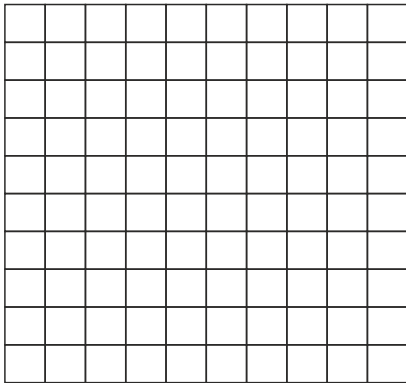
40%



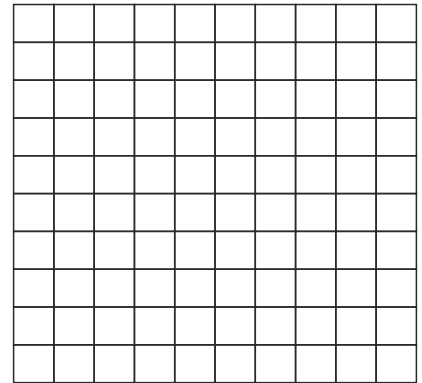
$$\frac{3}{10}$$



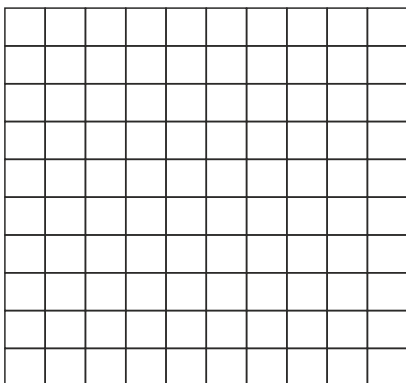
30%



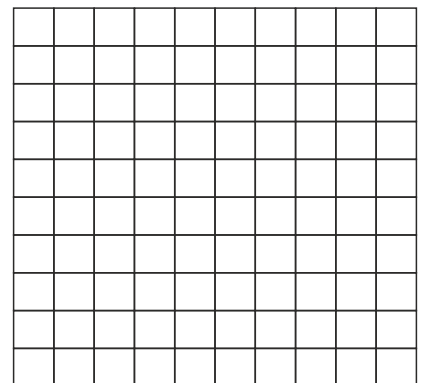
$$\frac{4}{25}$$



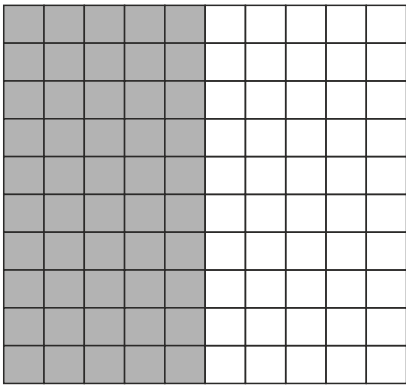
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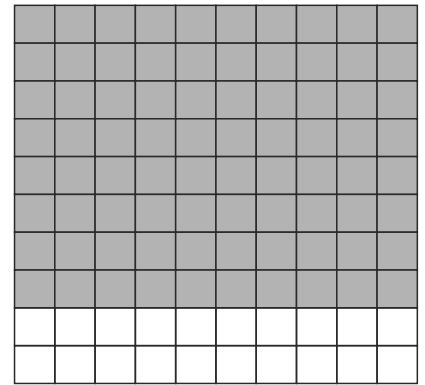
$$\frac{9}{20}$$



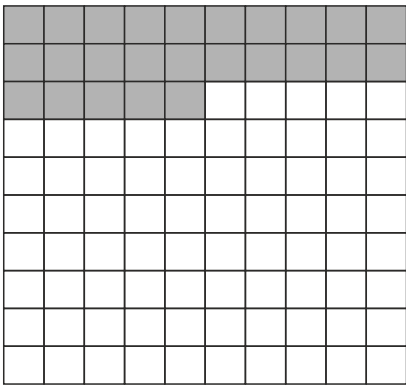
Join each figure with fraction or percentage of coloured portion.



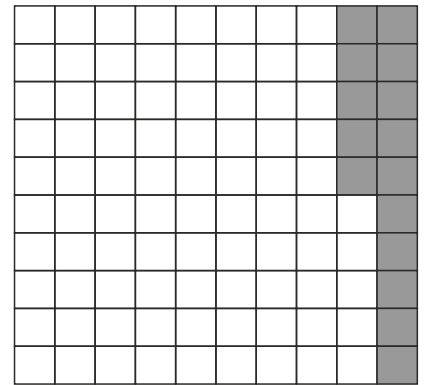
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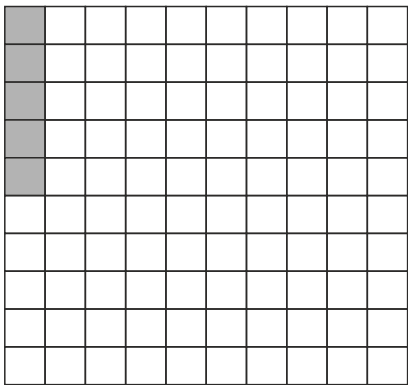
$\frac{1}{100}$



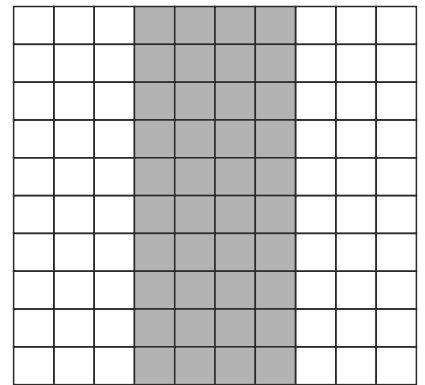
$\frac{1}{4}$



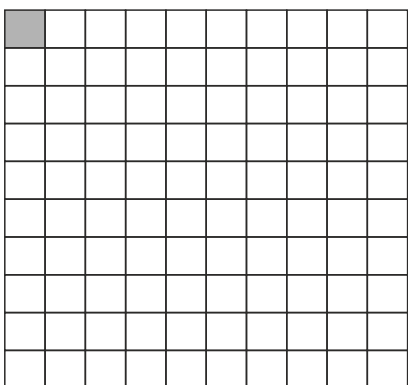
40%



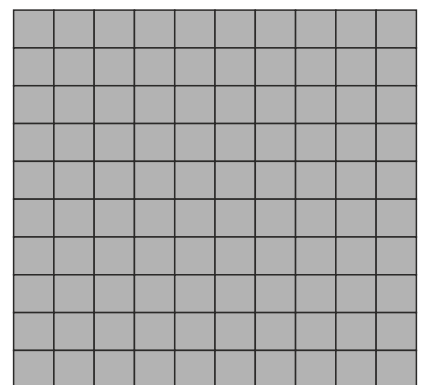
$\frac{1}{2}$



100%



$\frac{4}{5}$



5%

Equivalent ratios and four numbers in proportion

One mango costs 10 rupees. What is the cost of 5 mangoes?

Mangoes	Cost (Rs.)
1	10
5	?

$$\frac{1}{5} = \frac{10}{50}$$

We say, 1, 5, 10 and 50 are in proportion.

One mango costs 8 rupees. What is the cost of 4 mangoes?

Mangoes	Cost (Rs.)
	?

$$\frac{\square}{\square} = \frac{\square}{\square}$$

_____, _____, _____, _____ are in proportion.

We write mangoes below mangoes, rupees below rupees.

To find the cost of many from 1, we multiply the number by the cost of 1.

5 mangoes cost 60 rupees. What is the cost of 1 mango?

Mangoes	Cost (Rs.)
5	60
1	?

$$\frac{5}{1} = \frac{60}{12}$$

We say, 5, 1, 60 and 12 are in proportion.

10 mangoes cost 70 rupees. What is the cost of 1 mango?

Mangoes	Cost (Rs.)
	?

$$\frac{\square}{\square} = \frac{\square}{\square}$$

_____, _____, _____, _____ are in proportion.

We write mangoes below mangoes, rupees below rupees.

To find the cost of 1 from many, we divide the cost of many by the number.

Unitary Method

5 mangoes cost 45 rupees. What is the cost of 1 mango?

From that find the cost of 7 mangoes.

Mangoes	Cost (Rs.)
5	45
1	$\frac{45}{5}$
7	$7 \times \frac{45}{5}$



Mangoes	Cost (Rs.)
5	45
Skipping this step	
7	$7 \times \frac{45}{5}$

$$\frac{\square}{\square} = \frac{\square}{\square}$$

240 km in 4 hours. How many km in 5 hours?

Hours	km

$$\frac{\square}{\square} = \frac{\square}{\square}$$

____, _____, _____, _____ are in proportion.

10 rupees off on purchase of 100 rupees.
 How many rupees off on purchase of 60 rupees?

$$\frac{\square}{\square} = \frac{\square}{\square}$$

_____, _____, _____, _____ are in proportion.

Read the table below. Write the question in words. Find the answer.

Petrol in lit	km
3	60
5	?

$$\frac{\square}{\square} = \frac{\square}{\square}$$

_____, _____, _____, _____ are in proportion.

A car goes 20 km in 1 liter petrol. How many liters of petrol will be needed to go 100 km?

liter	km

$$\frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}}$$

4 notebooks cost Rs. 80/-. How many notebooks can you get in 200 rupees?

Manas walked 10 km in 2 hours. How much distance will he walk in 3 hours?

Percentage

Meena has got 40 marks out of 50. How many marks has she got out of 100?

$$\frac{\boxed{40}}{\boxed{50}} = \frac{\boxed{80}}{\boxed{100}}$$

When we make the denominator of fraction as 100, we call the number in numerator as 'per cent'. (per hundred). Meena has got 80 per cent marks. We write it as 80%.

Mangesh got 180 out of 200 in mathematics. How many percent marks has he got?

$$\frac{\boxed{}}{\boxed{200}} = \frac{\boxed{}}{\boxed{100}} \quad \underline{\hspace{2cm}} \%$$

30 marks out of 50 means how many per cent?

$$\frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{100}} \quad \underline{\hspace{2cm}} \%$$

90% means how many out of 50?

$$\frac{\boxed{}}{\boxed{}} = \frac{\boxed{}}{\boxed{}} \quad \underline{\hspace{2cm}}$$

20 percent discount means a discount of how many rupees on 90 rupees of purchase?

Purchase	Discount
100	20
90	$\frac{90 \times 20}{100}$

_____ %

A discount of 100 rupees on purchase of 400 rupees. What is the percentage discount?

Purchase Thil lei	Discount Tlawm

_____ %

20% students are absent in a school having 500 students. How many students are absent?

Four quantities in each of the following situations are in proportion to each other. We can write them as a pair of equivalent fractions. Find the answers considering this equivalence:

1. One mango costs 10 rupees. What is the cost of 3 mangoes?

1 Mango	10 rupees
3 Mangoes	30 rupees

$$\frac{1}{3} = \frac{10}{30}$$

2. Five mangoes cost 60 rupees, what is the cost of 1 mango?

3. A car goes 240 km in 4 hours. How many km will it go in 5 hours?

4. 15 rupees of discount on purchase of 100 rupees. How much discount on purchase of 60 rupees?

5. A car goes 20 km in 1 lit of petrol. How much petrol would be needed to go 100 km?

6. 40 marks out of 50 is equivalent to how many marks out of 100?

7. $\frac{1}{2}$ means what per cent? (How many out of 100?)

8. 90 per cent is how many out of 10 and how many out of 50?

9. 4 mangoes out of 400 were rotten. What was the percentage of rotten mangoes?

10. There are 15 girls and 10 boys in a class.
What is the percentage of girls in the class?
What is the percentage of boys in the class?

Rational numbers

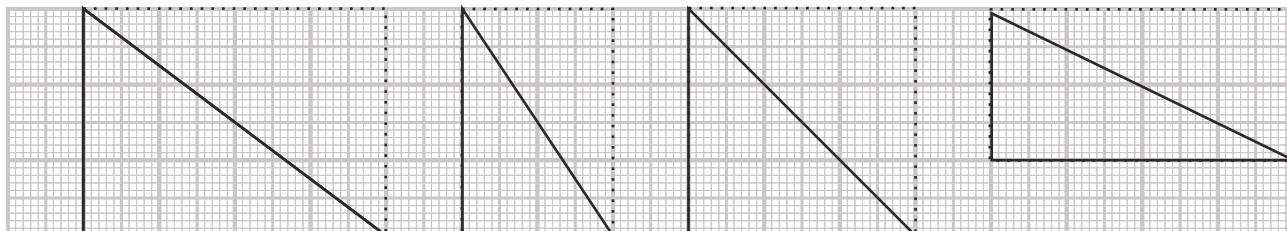
A number that can be expressed in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$ is called a Rational number.

Number	in $\frac{p}{q}$ form	Some equivalent rational numbers	In standard form
3	$\frac{3}{1}$	$\frac{6}{2}$ $\frac{9}{3}$ $\frac{30}{10}$	$\frac{3}{1}$
1			
1.2			
1.25			
0			
$\frac{3}{2}$			
$\frac{-36}{-24}$			
$\frac{3}{-15}$			

Perimeter and Area

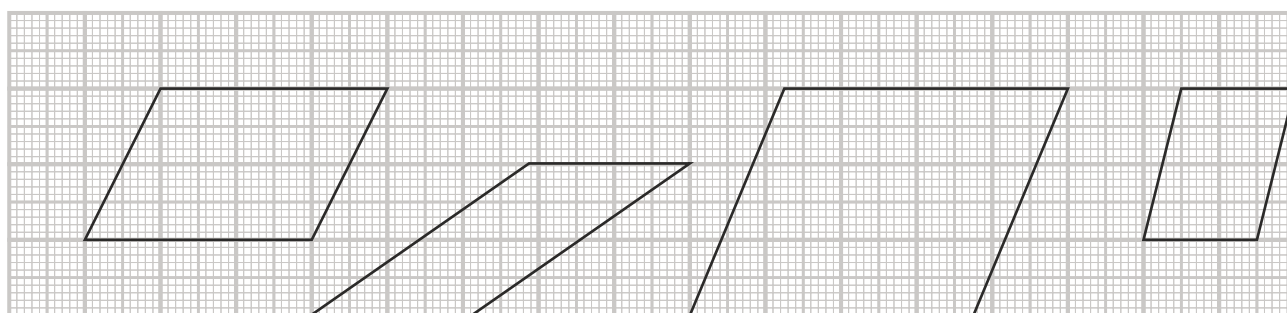
Revise perimeter and area from class 6 - Pages 154 to 161.

Find the area of right angled triangle by observation. Note that it is half of dotted rectangle.



Verify the area of each triangle using formula ($1/2 \times \text{base} \times \text{height}$)

Area of parallelogram = base \times height. Find area of each parallelogram.



Circumference of circle

Measure the circumference and diameter of three flat circular objects like plate, bangle, table top, etc. using a thread or using tailor's tape.

For each circle find (circumference / Diameter). Use calculator to find this value.

Object	Circumference (C)	Diameter (d)	C/d
Plate			
.....			
.....			
.....			

Did you get C/d almost same for all circles?

Is it somewhere near 3.14? Or 22/7?

The ratio of circumference of a circle to its diameter is called as **pi**. It is written as **π**

From the definition of pi, $C = \pi \times d$

$$\text{Diameter} = 2 \times \text{radius.}$$

$$C = \pi \times 2 \times r = 2 \times \pi \times r$$

Use calculator and find area of these circles using the formula $2 \pi r$. Use $\pi = 22/7$ or 3.14

Object	Diameter (d)	Radius($r = d/2$)	Circumference $C = 2 \pi r$
Cycle rim	63 cm		
Plate	28 cm		
Earth	12742 km		

Revision of basics

$5 \times 1 = \dots\dots\dots$

$5 \times 0 = \dots\dots\dots$

$a \times 1 = \dots\dots\dots$

$a \times 0 = \dots\dots\dots$

$\frac{3}{2} \times 1 = \dots\dots\dots$

$\frac{3}{2} \times 0 = \dots\dots\dots$

$1 \times \frac{7}{4} = \dots\dots\dots$

$0 \times \frac{7}{4} = \dots\dots\dots$

$\frac{a}{b} \times 1 = \dots\dots\dots$

$\frac{a}{b} \times 0 = \dots\dots\dots$

$1 \times \frac{a}{b} = \dots\dots\dots$

$0 \times \frac{a}{b} = \dots\dots\dots$

$(-a) \times 1 = \dots\dots\dots$

$(-a) \times 0 = \dots\dots\dots$

Find equivalent fractions of $\frac{2}{3}$

$\frac{2}{3} = \text{---} = \text{---} = \text{---} = \text{---} = \text{---}$

Find equivalent fractions of $\frac{a}{b}$

$\frac{a}{b} = \text{---} = \text{---} = \text{---} = \text{---} = \text{---}$

Find equivalent fractions of $\frac{2a}{3b}$

$\frac{2a}{3b} = \text{---} = \text{---} = \text{---} = \text{---} = \text{---}$

Write the fraction in its reduced form.

$$\frac{10}{15} = \frac{\cancel{5} \times 2}{\cancel{5} \times 3} = \frac{2}{3}$$

$$\frac{12}{30} =$$

$$\frac{14}{42} =$$

$$\frac{45}{30} =$$

One student has done this.

Discuss what is wrong, why it is wrong :

$$\frac{45}{30} = \frac{\cancel{30} + 15}{\cancel{30}} = 15$$

Cancellation can be done only when the number is written as multiplication of its factors.

Find :

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

$$\frac{a \times b}{a \times c} =$$

$$\frac{a \times b}{c \times d} =$$

$$\frac{10 \times 3}{15 \times 2} =$$

$$\frac{a^2}{a} =$$

$$\frac{x^2 y}{xy} =$$

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

$$\frac{xyz}{3xy} =$$

$$\frac{3a^2}{9} =$$





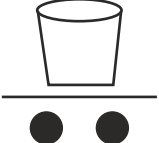
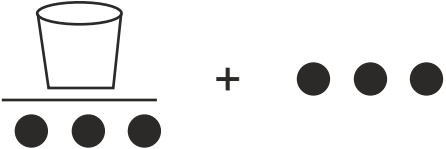
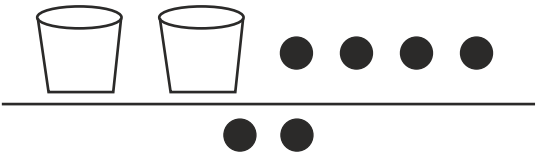
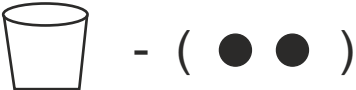
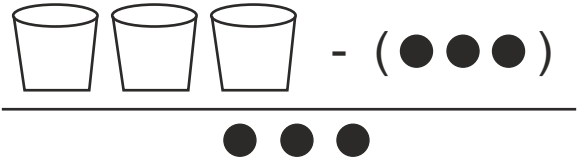
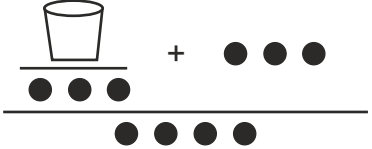
$$\frac{120}{40} =$$

$$\frac{120a^2}{150a} =$$

$$\frac{x + y}{xy} =$$

Last problem : watch carefully. We can't cancel when there is + sign.

Equations - Preparations.

Picture	 is an unknown	Expression
		x
		$2x$
		$3x + 4$
		$4x + 1$
		
		
		
		
		
		

Write the algebraic expressions :

Description	Algebraic Expression
Sum of x and y	$x + y$
	xy
a and b both squared and added	
5 added to three times the product of m and n	
	$10 - yz$
	$\frac{1}{4} pq$
	$x^2 + 3x + 2$
	$2(3a + 6b)$
<p>Your age is x. Your brother is 5 years elder than you. Sum of your and your brother's age.</p> <p>I kum chu x a ni a. I unaupa chu nangai in kum 5 in a upa a. I kum leh i unaupa kum belhkhawm.</p>	

Addition

$$+1 + 1 =$$

$$-1 - 1 =$$

$$+1 - 1 =$$

$$-1 + 1 =$$

$$+4 + 4 =$$

$$-4 - 4 =$$

$$+4 - 4 =$$

$$-4 + 4 =$$

+1 and -1 cancel by making a zero.

+4 and -4 cancel by making a zero.

$$+ 2 + 1 = + 1 + 1 + 1 = + 3$$

$$- 2 - 1 = - 1 - 1 - 1 = - 3$$

$$+ 2 - 1 = + 1 + \cancel{1} - \cancel{1} = + 1$$

$$- 2 + 1 = - 1 - \cancel{1} + \cancel{1} = - 1$$

[+ and total]

[- and total]

[Difference with sign
of bigger number]

Use these rules and solve :

$$+ 5 + 3 =$$

$$- 5 - 3 =$$

$$+ 20 - 5 =$$

$$- 20 + 5 =$$

$$- 100 + 50 =$$

$$- 25 - 25 =$$

$$+ 200 - 100 =$$

$$- 100 + 150 =$$

$$2a + 3a =$$

$$- 2a - 3a =$$

$$+ 2a - 3a =$$

$$- 2a + 3a =$$

$$100x + 50x =$$

$$- 100x - 50x =$$

$$+ 100x - 50x =$$

$$- 100x + 50x =$$

$$+ 5 - 2 - 3 + 4 + 3 = + 7$$

$$- 3 - 4 + 6 - 2 + 1 =$$

$$- 2 - 3 - 1 - 5 - 4 =$$

$$+ 7 - 3 - 4 + 5 - 1 =$$

$$3a - 5a + 2a =$$

$$-4x - 2x + 7x =$$

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

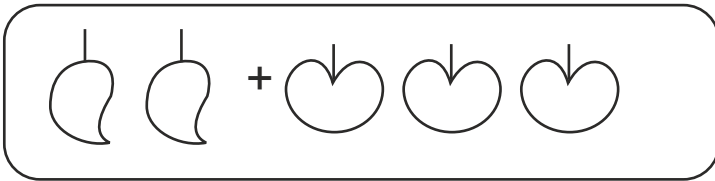
$$10xy - 5xy - 5xy + 2xy =$$

$$+ 1 + 1 + 1 - 1 + 1 - 1 - 1 =$$

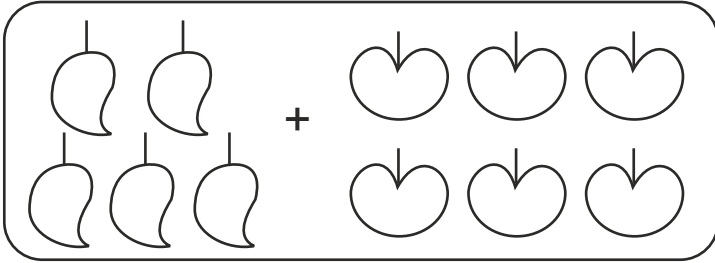
$$+ 5 - 5 + 5 - 5 - 5 + 5 =$$

$$a - a - a - a + a + a =$$

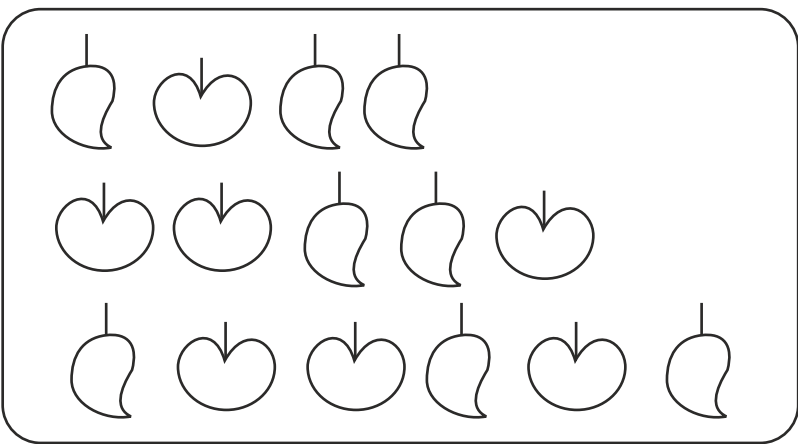
$$2x^2 - x^2 + x^2 - 2x^2 + x^2 =$$



= 2 Mangoes + 3 Apples

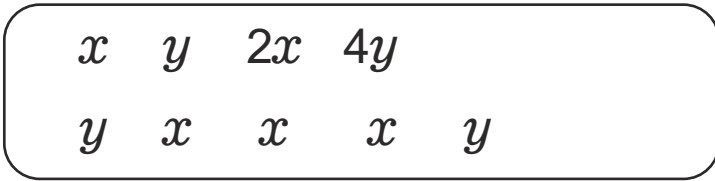


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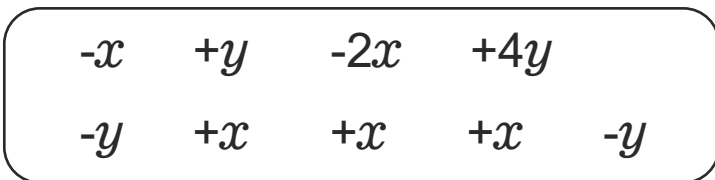


=

You collected like terms together



=



=

$\begin{array}{r} -3x + 5y \\ + \quad +3x - 2y \\ \hline + 3y \end{array}$	OR	$\begin{array}{r} -3x + 5y + 3x - 2y \\ = 3y \end{array}$
--	----	---

Write the addition problem by collecting like terms together. Solve it.

$$\begin{array}{r}
 \boxed{-2x \quad + 3y \quad - y \quad + 5x} \\
 + \boxed{-5x \quad + y \quad + 2y \quad + x} \\
 \hline
 \Rightarrow \boxed{\begin{array}{r} 3x \quad + \quad 2y \\ -4x \quad + \quad 3y \\ \hline -x \quad + \quad 5y \end{array}}
 \end{array}$$

Vertical Addition

OR

$$\begin{array}{r}
 3x \quad + 2y \quad - 4x \quad + 3y \\
 = 3x \quad - 4x \quad + 2y \quad + 3y \\
 = -x \quad + 5y
 \end{array}
 \left. \vphantom{\begin{array}{r} 3x \quad + 2y \quad - 4x \quad + 3y \\ = 3x \quad - 4x \quad + 2y \quad + 3y \\ = -x \quad + 5y \end{array}} \right\} \text{Horizontal Addition}$$

$ \begin{array}{r} 5x \quad + \quad 2y \\ + 12x \quad + \quad 7y \\ \hline \end{array} $	$ \begin{array}{r} 4a \quad + \quad 3b \\ + a \quad + \quad 3b \\ \hline \end{array} $
$ \begin{array}{r} 19x \quad - \quad 3y \\ + 2x \quad + \quad 5y \\ \hline \end{array} $	$ \begin{array}{r} 6a \quad - \quad 9b \\ + -a \quad - \quad 4b \\ \hline \end{array} $

$$\begin{array}{r}
 -3xy \quad + \quad 6x^2y^2 \\
 + -5xy \quad - \quad 2x^2y^2 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 -3xy + 3x^2y^2 \\
 + -5xy - 2x^2y^2 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 x^2 - 3xy + 2y^2 \\
 + -x^2 - 10xy + y^2 \\
 \hline
 \end{array}$$

Simplify

$$m^2n^2 + m^2 - n^2 - m^2n^2 - m^2 + n^2$$

$$-4m^2n^2 + 3mn + m^2n^2 - 2mn$$

$$20a - 5b - 15a + 20b$$

$$x^2 - 3x + 2x^2 - 2x$$

$$21b - 32 + 7b - 20$$

$$-z^2 + 13z^2 - 5z + 7z^2$$

$$2x^2 - 5y^2 + 3 + 3y^2 - 5x^2 - 4$$

$$a^2 - 2ab - b^2 + 2ab - a^2 + b^2$$

Add the given terms.

$$3mn, \quad -5mn, \quad +8mn, \quad -4mn$$

$$-7xy + 5, \quad 12xy + 2, \quad 9xy - 8$$

$$a + b - 3, \quad b - a + 3$$

$$5m - 7n, \quad 3n - 4m$$

Subtraction

Subtracting a positive number is like adding a negative number.

Subtracting a negative number is like adding a positive number.

$$-(+1) = -1$$

$$-2a - 3a =$$

$$-(+a) =$$

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

$$-(-x - 2) = +x + 2$$

$$-(-1) = +1$$

$$-2a - 3a =$$

$$-(-a) =$$

$$-(-y + 2) = +y - 2$$

$$-(y - 2) = -y + 2$$

While removing the bracket of expression to be subtracted, invert the signs of all terms.

$$(+1) - (+1) = \cancel{1} - \cancel{1} = 0$$

$$(+1) - (-1) = 1 + 1 = 2$$

$$(-1) - (+1) = -1 - 1 = -2$$

$$(-1) - (-1) = -\cancel{1} + \cancel{1} = 0$$

$$+ 5 - (+ 3) =$$

$$- 5 - (- 3) =$$

$$+ 20 - (- 5) =$$

$$+ 20 - (+ 5) =$$

$$- 100 - (+ 50) =$$

$$- 25 - (- 25) =$$

$$+ 200 - (- 100) =$$

$$+ 200 - (+ 100) =$$

$$+ 2a - (3a) =$$

$$- 2a - (- 3a) =$$

$$+ 2a - (- 3a) =$$

$$- 2a - (+ 3a) =$$

$$100x - (+ 50x) =$$

$$- 100x - (- 50x) =$$

$$+ 100x - (- 50x) =$$

$$- 100x - (+ 50x) =$$

$$\begin{aligned} & + 5 - (+ 2) + (- 2) - (- 4) \\ = & + 5 - 2 - 2 + 4 \\ = & + 5 + 4 - 2 - 2 \\ = & + 9 - 4 \\ = & + 5 \end{aligned}$$

No change in sign while adding.
Invert the sign while subtracting.

$$\begin{aligned} & 3a + (- 5a) - (- 2a) \\ = & \end{aligned}$$

$$\begin{aligned} & - 4x - (- 2x) + (- 7x) \\ = & \end{aligned}$$

$$\begin{aligned} & 5x^2 - x^2 - (- 3x^2) + (- 2x^2) \\ = & \end{aligned}$$

$$\begin{aligned} & - (- 10xy) - (- 5xy) + (- 5xy) - 10xy \\ = & \end{aligned}$$

$$\begin{array}{r}
 7x - 3y \\
 - \quad \oplus 12x \quad \oplus 7y \\
 \hline
 - 5x - 10y
 \end{array}$$

$$\begin{array}{r}
 4a + 3b \\
 - \quad a + 8b \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 19x - 3y \\
 - \quad 2x + 5y \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 6a - 9b \\
 - \quad - a - 4b \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 - 3xy + 6x^2y^2 \\
 - \quad - 5xy - 2x^2y^2 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 - 3xy + 6x^2y^2 \\
 - \quad - 5xy - 2x^2y^2 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 x + y + z \\
 - \quad x - y + z \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 - x - y - z \\
 - \quad - x - y - z \\
 \hline
 \end{array}$$

Solve

$$\begin{aligned} & 4x + 3y - (x + 2y) \\ = & 4x + 3y - x - 2y \\ = & 4x - x + 3y + 2y \\ = & 3x + y \end{aligned}$$

$$- 3a - 2b - (-2a + 3b)$$

$$9x - 3z - (2x - 6y)$$

$$(3y^2 + 5y - 4) - (8y - y^2 - 4)$$

$$p - (p - q) - q - (q - p)$$

$$3ab - 2a^2 - 2b^2 - (5a^2 - 7ab + 5b^2)$$

$$4m^2 - 3mn + 8 - (-m^2 + 5mn)$$

$$a - b - (a - b)$$

Your age is 12
Next year your age will be _____

Your age is a
Next year your age will be _____

You have m rupees.
Your sister has 5 rupees more.
Your sister has _____ rupees

Your height is h cm.
Your friend is shorter by 10 cm.
Your friend's height is _____ cm.

One notebook costs 10 rupees.
What is the cost of n notebooks?

Mother has p chocolates.
She wants to share them equally
among 4 children.
Child will get _____ chocolates.

A child is x years old.
His mother's age is twice his age.
Mother's age is _____
Father's age is 5 more than
mother's age. Father's age is _____.
Uncle's age is 3 less than father.
Uncle's age is _____

Evaluating the expressions :

x	$x + 2$	$2x$	$2x + 2$	x^2	$x^2 + 2$
3	$3 + 2 = 5$	$2 \times 3 = 6$	$(2 \times 3) + 2$ $= 6 + 2$ $= 8$	$3 \times 3 = 9$	$9 + 2 = 11$
5					
1					
0					

Find the value of given expressions if $x = -2$

$$\begin{aligned}
 & 3x - 4 \\
 & = 3 \times (-2) - 4 \\
 & = -6 - 4 \\
 & = -10
 \end{aligned}$$

$$-4x + 6$$

$$5x^2$$

$$x^2 + 3x - 3$$

Cost of one notebook is 12 rupees. We purchase 6 such notebooks. What is the total cost?

Cost of one notebook is x rupees. We purchase y such notebooks. What is the total cost?

For different values of x and y , find the value of xy .

$$\begin{array}{r} x = 7, \quad y = 8 \\ \\ \\ \end{array} \quad \begin{array}{r} xy \\ = \\ = \end{array}$$

$$x = 5 + 2, \quad y = 8$$

One child did $5 + 2 \times 8$ and got 56.

Another child did $5 + 2 \times 8$ and got 21.

Can you figure out what happened?

Try using different calculators.

We have to tell the calculator which operation to do first (where to put brackets)

$$\begin{array}{r} xy \\ = (5 + 2) \times 8 \\ = 7 \times 8 \\ = 56 \end{array}$$

$$\begin{array}{r} x = 5 + 2, \quad y = 5 - 4 \\ \\ \\ \end{array} \quad \begin{array}{r} xy \\ = (5 + 2) \times (5 - 4) \\ = \\ = \end{array}$$

$$\begin{array}{r} x = 3 + 4, \quad y = 3 - 2 \\ \\ \end{array} \quad \begin{array}{r} xy \\ = \end{array}$$

Find the value of given expressions using given values of variables. Also use calculator.

$$x = 8, y = 4 \qquad \frac{x}{y} =$$

$$x = 5+3, y = 3+1 \qquad \frac{x}{y} =$$

One child did $5 + 3 \div 3 + 1$ and got 7.

Another child did $(5+3) \div (3+1)$ and got 2.

Can you figure out what happened?

Try using different calculators.

We have to tell the calculator which operation to do first (where to put brackets)

Find using formula. Also solve using calculator.

$\frac{1}{\frac{1}{4}}$	$\frac{6}{\frac{1}{2}}$	$1 \times \frac{1}{\frac{1}{4}}$
$1 \times \frac{3}{\frac{1}{2}}$	$\frac{3}{\frac{2}{1}}$	$\frac{a}{\frac{b}{1}}$

Find :

$$\frac{2}{3} \times \frac{5}{3}$$

$$\frac{a}{b} \times \frac{c}{d}$$

$$\frac{a}{b} \times c$$

$$\frac{a}{b} \times \frac{b}{a}$$

$$\frac{2a}{b} \times \frac{b^2}{a}$$

$$\frac{a}{1} \times \frac{1}{a}$$

$a = 10, b = 2$, Find :

$$\frac{a}{b}$$

$$\frac{a}{1} \div \frac{b}{1}$$

$$\frac{1}{\frac{b}{a}}$$

Find :

$$\begin{aligned} & \frac{2}{3} \div \frac{5}{3} \\ &= \frac{2}{\cancel{3}} \times \frac{\cancel{3}}{5} \\ &= \frac{2}{5} \end{aligned}$$

$$\frac{a}{b} \div \frac{c}{d}$$

$$\frac{\frac{x}{y}}{\frac{u}{v}}$$

$$\frac{\frac{10}{2}}{\frac{15}{3}}$$

$$\frac{2a}{3b} \div \frac{a}{9b}$$

$$\frac{\frac{5x}{4y}}{\frac{4y}{5x}}$$

$a = 10$, $b = 2$, Find :

$$\frac{\frac{a}{b}}{1}$$

$$\frac{4a}{5b} \div \frac{a}{b}$$

$$\frac{1}{\frac{a}{b}} \div \frac{1}{\frac{b}{a}}$$

Equations

We have kept an unknown number in cup.

Let's call it as x . Write the following equations in the language of x .

$$\text{Cup} = \bullet \bullet \bullet$$

$$x = 3$$

$$\text{Cup} + \bullet \bullet = \bullet \bullet \bullet \bullet \bullet$$

$$\text{Cup} \text{ Cup} = \bullet \bullet \bullet \bullet \bullet$$

$$\text{Cup} \text{ Cup} + \bullet \bullet \bullet = \bullet \bullet \bullet \bullet \bullet$$

$$\text{Cup} + \bullet \bullet = \bullet \bullet$$

$$\text{Cup} \text{ Cup} \text{ Cup} + \bullet = \bullet$$

$$\frac{\text{Cup}}{\bullet \bullet} = \frac{\bullet \bullet \bullet}{\bullet}$$

$$\frac{\text{Cup} + \bullet \bullet \bullet \bullet \bullet}{\bullet \bullet \bullet \bullet \bullet} = \bullet \bullet \bullet$$

Description	Equation
A number is equal to 5	$x = 5$
4 added to a number is 7	
3 times a number is 15	
2 subtracted from a number given 3.	
A number divided by 3 is 4.	
Two times a number plus 5 is 8.	
Three times a number minus 2 given 10.	
Half of a number plus 1 is 5.	

Equation	Description
$x = 4$	
$2x = 6$	
$x + 2 = 6$	
$3x + 1 = 10$	
$4x - 2 = 2$	
$\frac{x}{2} = 5$	
$\frac{x}{3} - 4 = 1$	

A number is called n .

What is the number after n ?

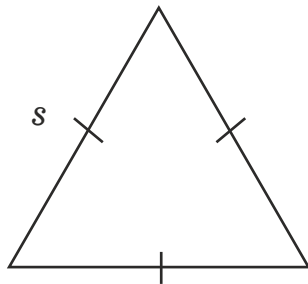
What is the number before n ?



Breadth of a rectangle is b .

Length is double of breadth.

Write length _____



Side of an equilateral triangle is s .

Its perimeter (sum of all three sides)

is _____

Riya was born when her mother was 25 years old.

Today Riya's age is r . Her mother's age is _____.

Grandmother's age is 10 times that of her grandson's age.

If grandson's age is m , grandmother's age is _____.

If grandmother's age is 50 years, grandson's age is _____ years.

Solving equations

Solve worksheets 174 to 179 of Math Delight 6.

Equation	To have only variable on left hand side	Solution
$x + 3 = 5$	Subtract 3 from both sides.	$x + 3 - 3 = 5 - 3$ $x = 2$
$x - 2 = 4$		
$3x = 12$		
$\frac{x}{2} = 5$		

Solve.

$x + 5 = 8$	$m + 4 = 3$	$2p = 20$
$\frac{x}{4} = 3$	$7 = y + 2$	$10 = 5t$

$$2x - 4 = 2$$

Added 4 on both sides.

$$2x - 4 + 4 = 2 + 4$$

$$2x = 8$$

Divided by 2 on both sides.

$$\frac{\cancel{2}x}{\cancel{2}} = \frac{\cancel{8}}{\cancel{2}} 4$$

$$x = 4$$

$$3x + 5 = 8$$

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

$$4y - 3 = 13$$

$$\frac{m}{4} + 1 = 6$$

$$\frac{2}{3}n - 1 = 1$$

Did you multiply by $\frac{3}{2}$ in second step?

$$5t + 28 = 10$$

$$\frac{a}{5} + 3 = 2$$

$$2y + \frac{5}{2} = \frac{17}{2}$$

$$\frac{5}{2}x = -10$$

$$\frac{3l}{2} = \frac{2}{3}$$

$$\frac{2b}{3} - 5 = 3$$

$$7m + \frac{19}{2} = 13$$

$$6z + 10 = -2$$

$$2(x + 4) = 12$$

$$3(n - 5) = 21$$

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

$$4(2 - x) = 8$$

$$4 = 5(p - 2)$$

$$-4 = 5(p - 2)$$

$$3(x + 1) = 0$$

$$4(5 - x) = 0$$

Factors

Factors : Making parts by multiplication till we get all prime numbers.

$$90 = 10 \times 9$$

10 and 9 can be further factorised.

$$90 = 2 \times 5 \times 3 \times 3$$

Vertical method of factorization

We want prime factors of a number. We divide the number by the first prime number 2, as many times possible. Then we divide by 3 as many times as possible. We divide by 2, 3, 5, 7, 11, 13, 17, 19, 23.... sequentially as many times as we can. We repeat this till we get 1. The product of all prime numbers you divided by is the prime factorization.

$$\begin{array}{r|l} 2 & 84 \\ 2 & 42 \\ 3 & 21 \\ 7 & 7 \\ & 1 \end{array}$$

$$84 = 2 \times 2 \times 2 \times 3$$

Observe the number to be factorised.

If you can easily think of breaking it by multiplication, horizontal method will be easy.

Otherwise vertical method will certainly guide you to the answer.

Find the prime factors (Use any method) :

30	45
49	39
60	66
70	65
132	114

Find the prime factors.

$$6ab^2$$

$$x^2y^2$$

$$aby^2$$

$$p^2q^3$$

$$3x^2y^2$$

$$6x^2y^2$$

$$21p^2q$$

$$40x^3y^3z^3$$

The above terms are called as Monomials.

Factorise :

You know that $a \times (b+c) = ab + ac$

This equation has left hand side in the form of a product of two terms. They are factors. Right hand side of the equation is in the form of addition of two terms. It is expansion. If we want to find factors from expansion, we may take the common term as a multiplier.

$$\begin{aligned} & 6xy + 4y^2 \\ = & \underline{2} \times 3 \times x \times \underline{y} + \underline{2} \times 2 \times y \times \underline{y} \\ = & 2y (3x + 2y) \end{aligned}$$

$10xy + 15x^2y$	$14p^2 - 42pq^2$
$9x^2 + 3x$	$30a^2b - 25ab^2$

Each of the above expressions has two terms. They are called as Binomials.

Words used in algebra

$$x^2 + 6x + 9$$

This is an expression. It is a trinomial.

It has 3 terms : x^2 , $6x$ and 9.

x is a variable.

9 is a constant.

1 is a coefficient of x^2 and 6 is a coefficient of x .

$$3a + 4b + 5$$

This expression has terms.

It is called

Term 1 :

Term 2 :

Term 3 :

Variables in this are

Constant is

Coefficient of a is

Coefficient of b is

Factorise : $x^2 + 6x =$

This expression has terms.

Therefore it is called

Term 1 :

Term 2 :

x is called as

Coefficient of x^2 is

Coefficient of x is

The factors of this expression are :

Expand :

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

$$= (4 \times 2) - (4 \times 3) + (4 \times 5)$$

$$= 8 - 12 + 20$$

$$= 16$$

$$-3 (3 - 2 - 1)$$

$$4 (2a - 3b)$$

$$6x (2xy + 3y - 5)$$

$$-4 (-5a - b)$$

$$\frac{1}{3} \left(\frac{1}{2} a + \frac{1}{5} k \right)$$

$$\frac{1}{4} \left(\frac{4}{3} a + 8b \right)$$

$$-\frac{1}{5} \left(\frac{5}{2} x - \frac{2}{5} y \right)$$

Indices

As Product	Using Powers	Number
$2 \times 2 \times 2$	2^3	8
$3 \times 3 \times 3 \times 3$		
$5 \times 5 \times 5$		
$4 \times 4 \times 4 \times 4$		
$2 \times 2 \times 2 \times 2 \times 2$		
	2	64
	5^4	
	7^2	
	9^{\square}	81
	3^{\square}	81
	8^{\square}	64
	4^{\square}	16
	2^{\square}	16

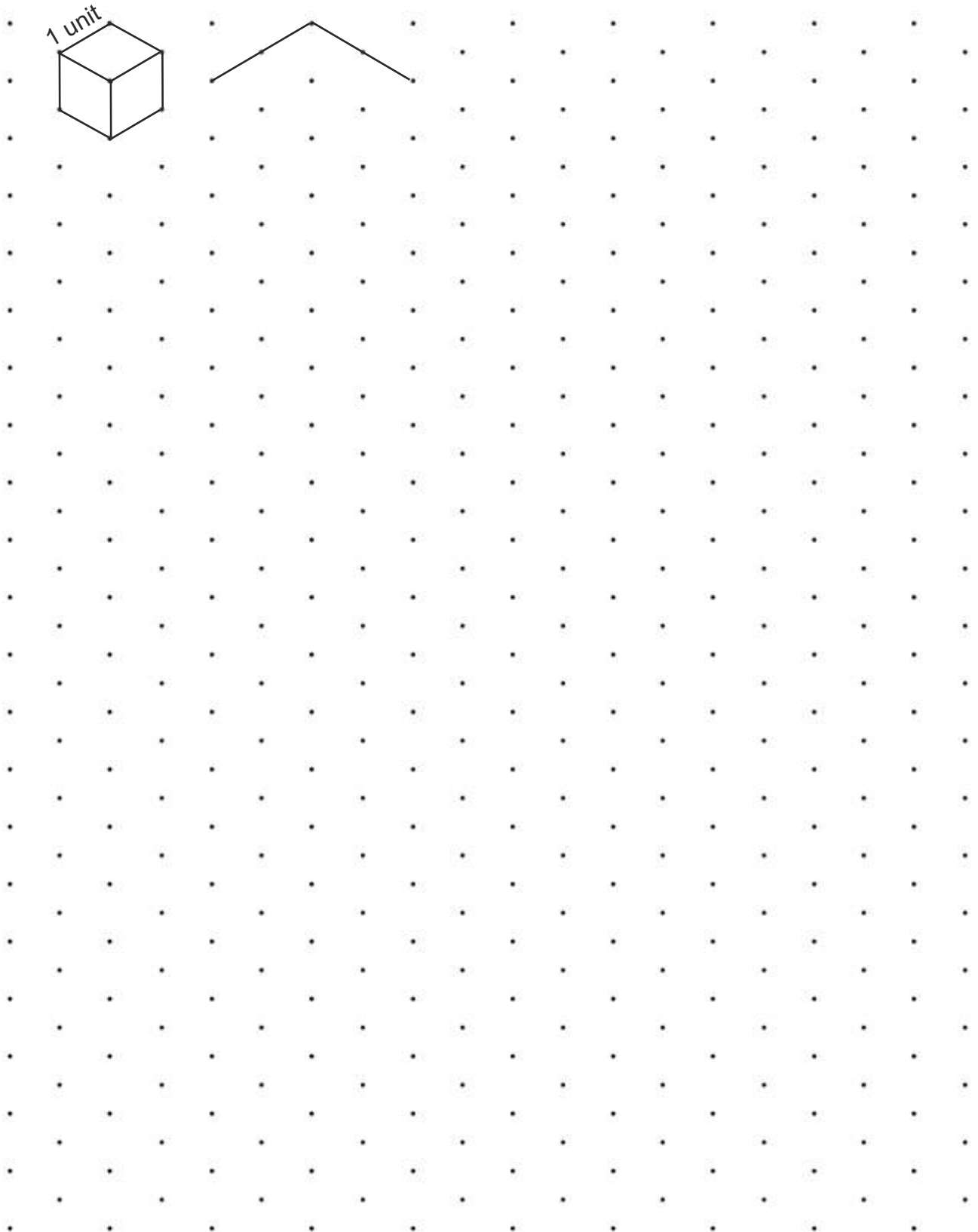
As Product	Using Powers
$x \times x \times x$	
	y^4
	x^3
	a^2
$a \times a \times b$	
	ab^2
	a^3
	a^3b^3
$a \times x \times x$	
$(x \times x \times x) + (y \times y)$	$x^3 + y^2$
$(x \times x \times x) - (y \times y)$	
$(x \times x \times x) - (x \times x)$	

Fill in the blanks.

Mixed Form	Expanded Form	Number
$2^2 \times 2^3$	$(2 \times 2) \times (2 \times 2 \times 2)$	2^5
$3^2 \times 3^3$		
$4^2 \times 4^5$		
$x^2 \times x$		
$x^2 \times x^3$		
	$(x \times x \times x) \times (x \times x \times x \times x)$	
		x^4
		y^{10}
		a^3
$a^2 \times a \times b + b^2$		
		b^6
$2^2 \times 2^3 \times 3^5 \times 3^1$		
$2^2 \times 2^3 \times 3^5 \times 3^1$		

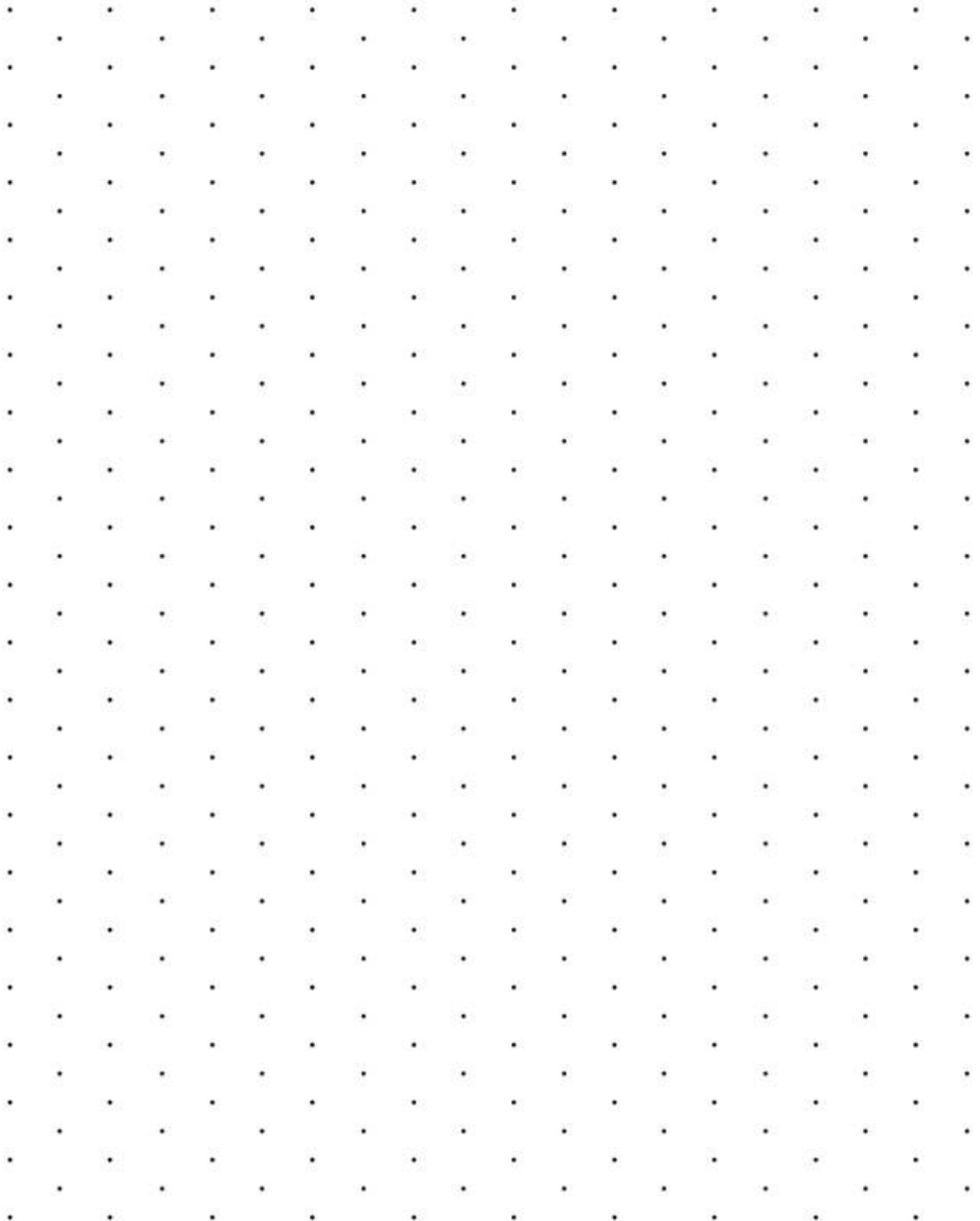
1. Draw a cube of 1x1x1
2. Draw a cube of 2x2x2
3. Draw a cube of 3x3x3
4. Draw a cube of 4x4x4
5. Draw a cube of 5x5x5

Isometric Dot Paper (1 cm)

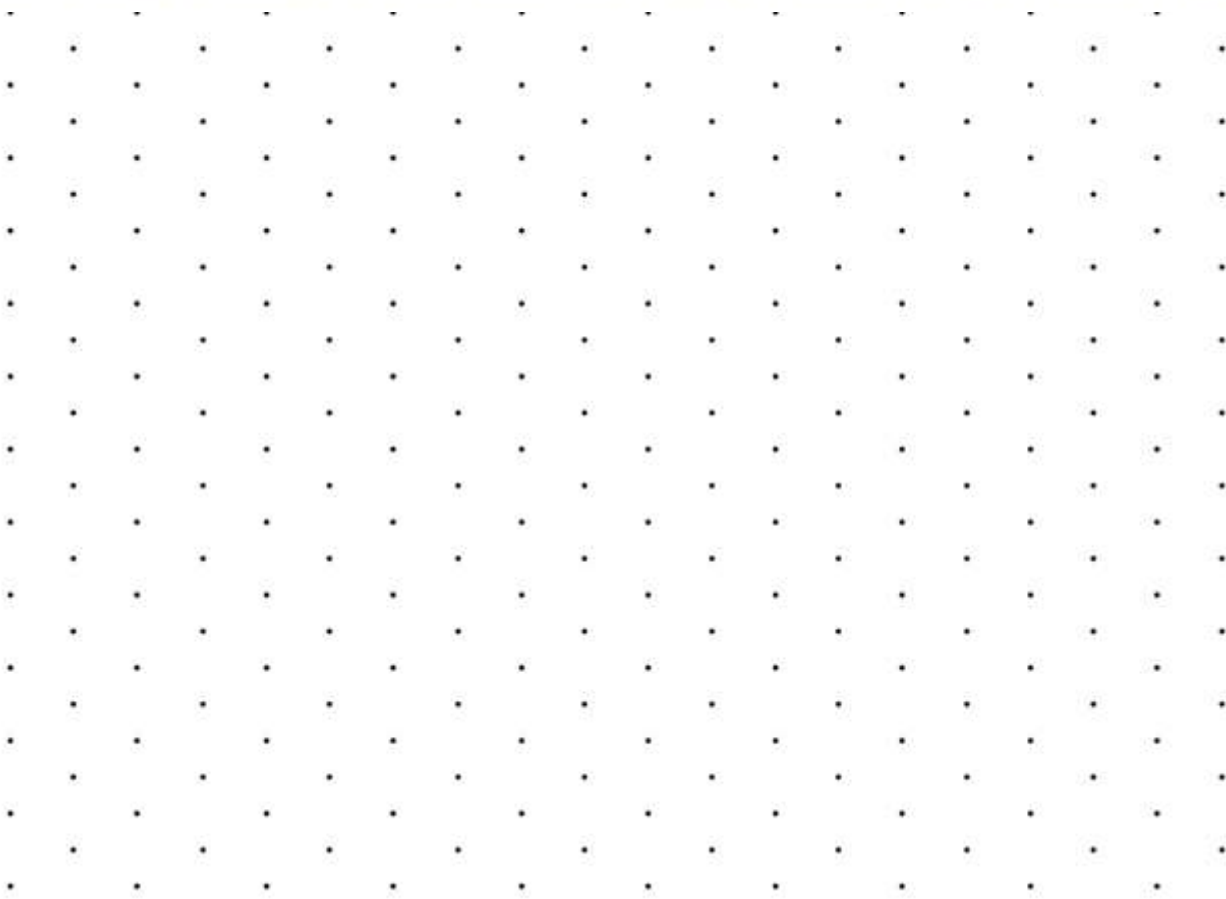
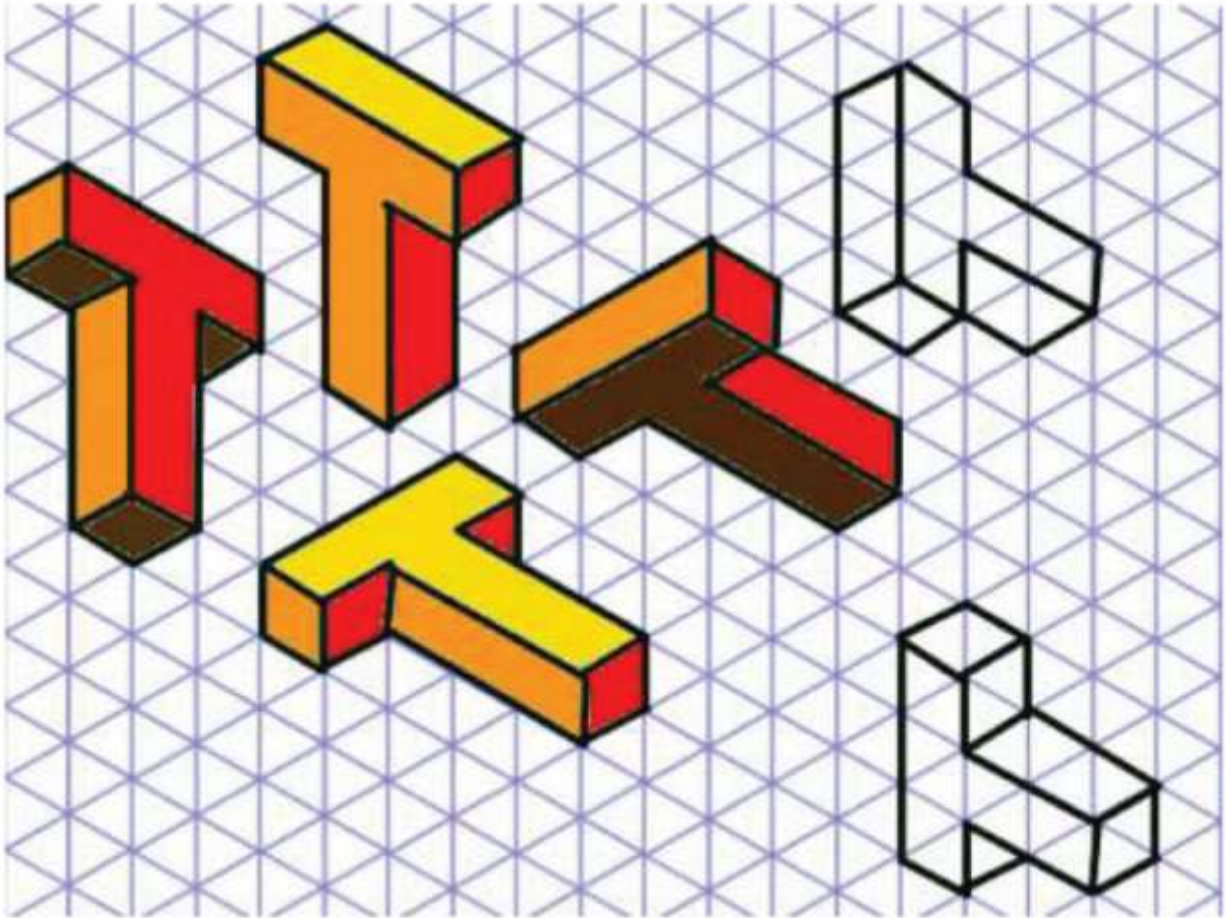


1. Draw a cuboid of $1 \times 1 \times 2$
2. Draw a cuboid of $2 \times 2 \times 1$
3. Draw a cuboid of $1 \times 1 \times 3$
4. Draw a cuboid of $2 \times 2 \times 3$
5. Draw a cuboid of $2 \times 3 \times 4$

Isometric Dot Paper (1 cm)

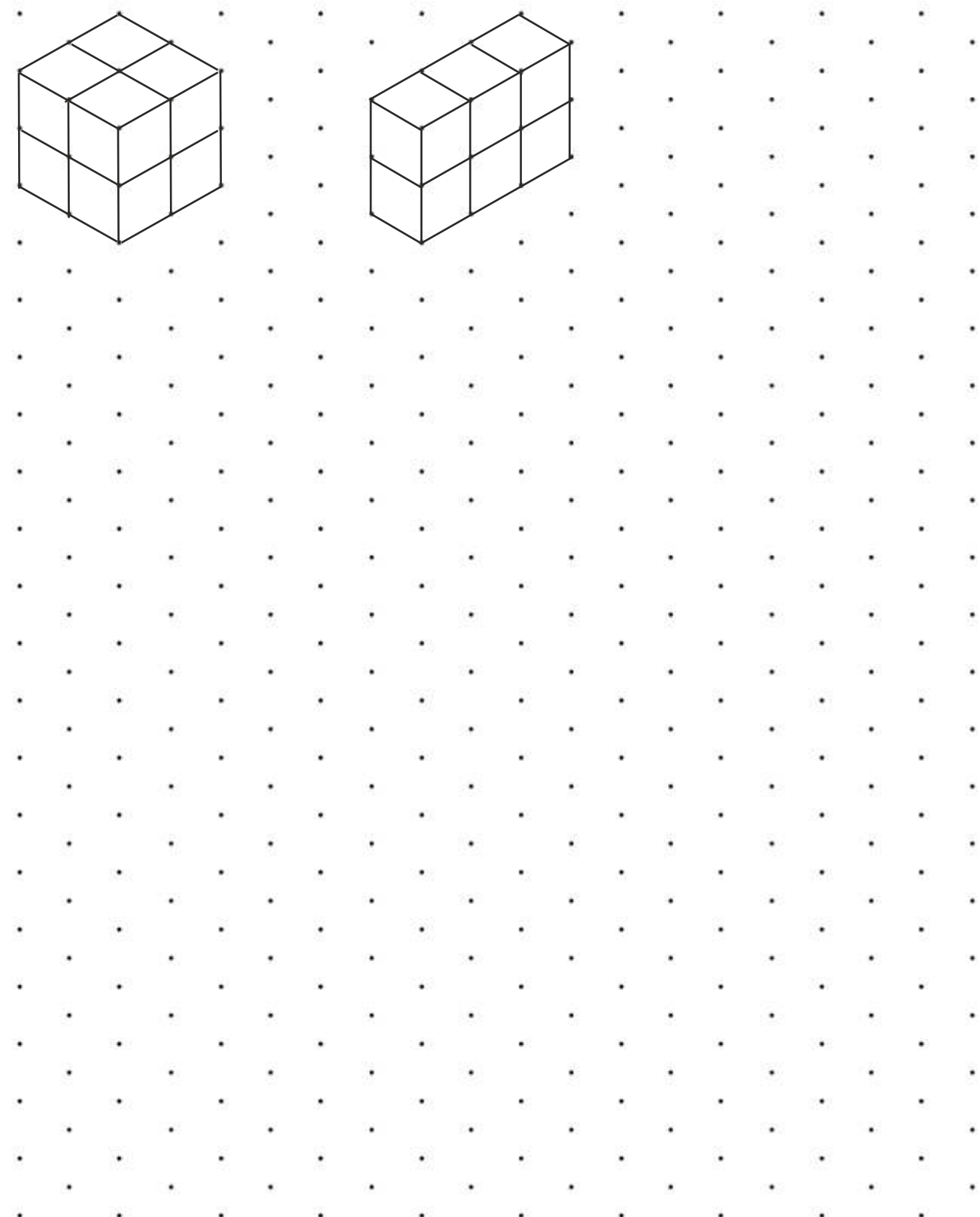
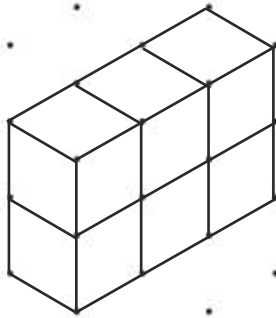
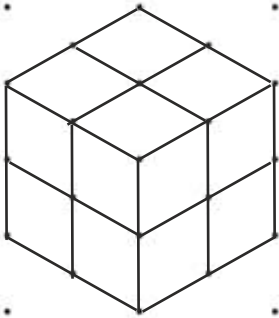


Draw first letter of your name in different ways. (One example is shown here).

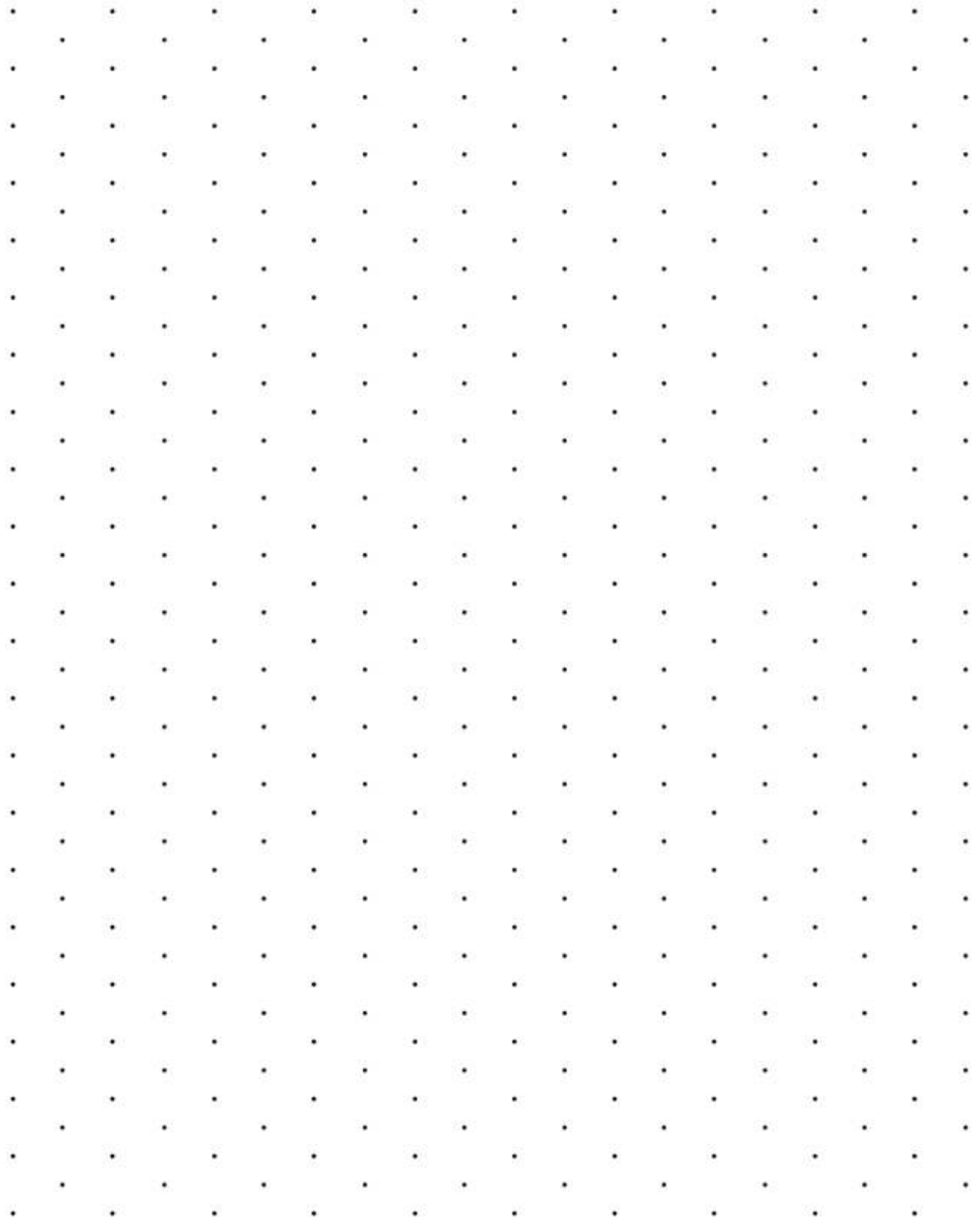


Draw the following 3D shapes on isometric dot paper.

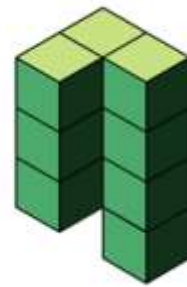
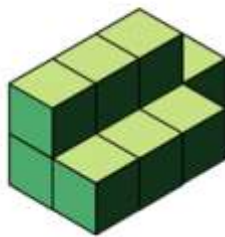
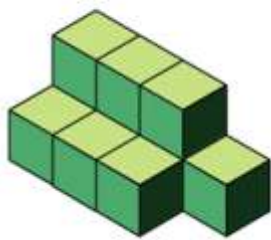
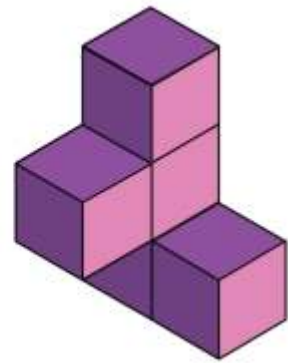
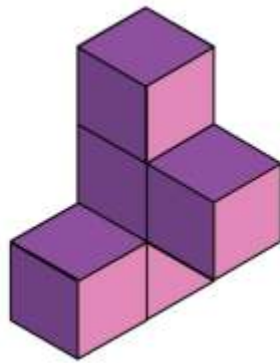
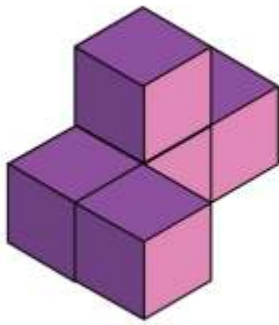
Make more shapes using Jodo blocks, observe each shape carefully and draw it.



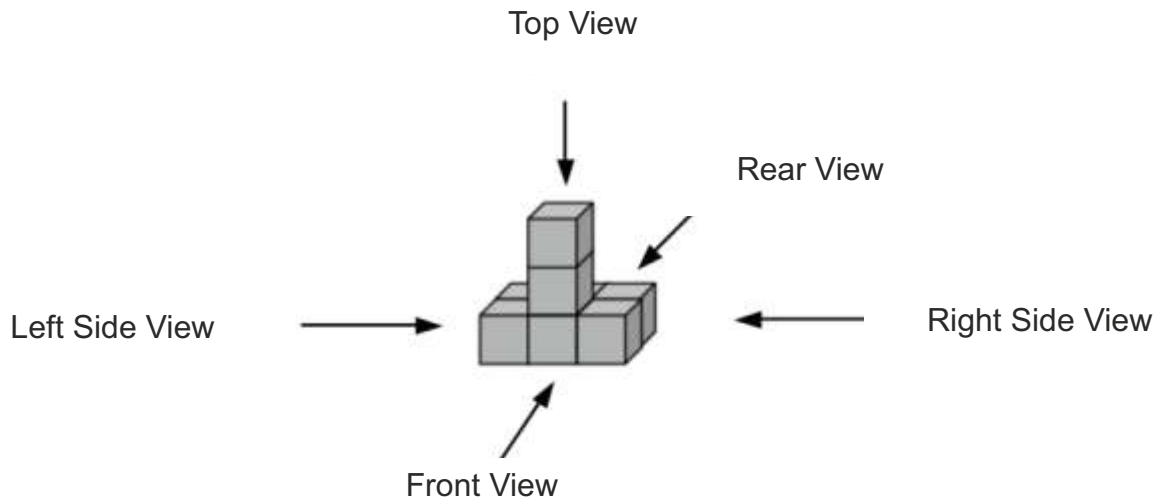
Make 12 different flat shapes using 5 Jodo Blocks (snap cubes).
Watch each of the shapes carefully and draw it on isometric dot paper.



Draw these shapes on isometric dot paper.



Build the structure shown in this picture using Jodo blocks.



Observe the shape from all sides and compare with the views given here.

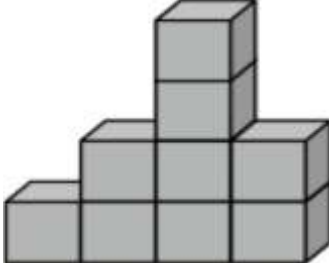
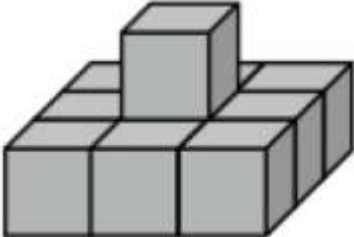
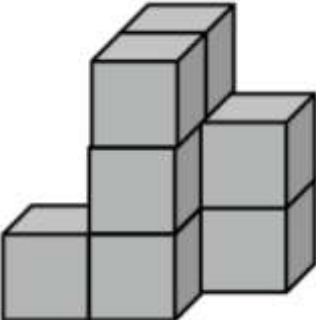
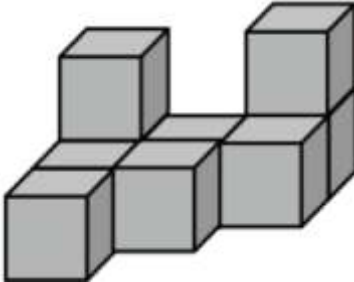
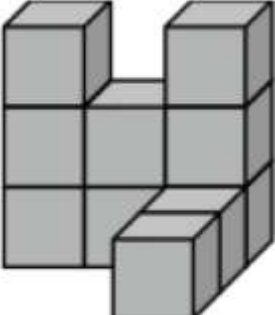
Front view	Top view	Right side view	Left side view	Rear view

Make this shape using Jodo blocks, observe from all sides and draw the views in this table.

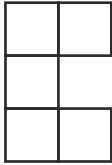


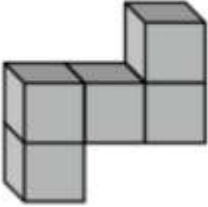
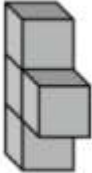
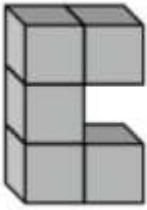
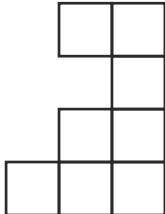
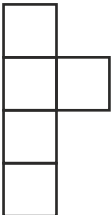
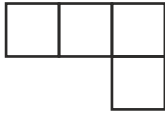
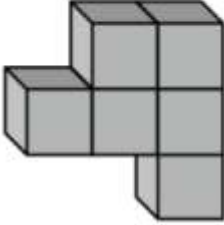
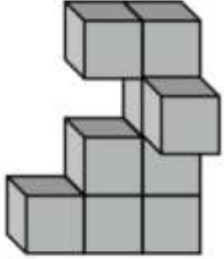
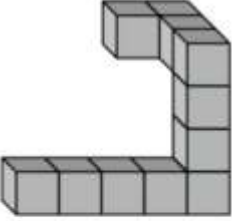
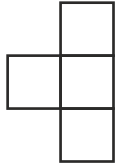
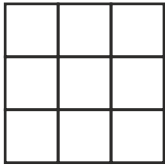
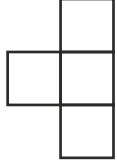
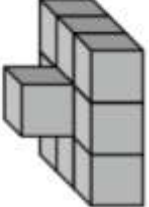
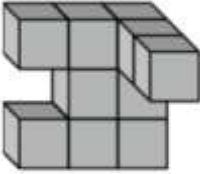
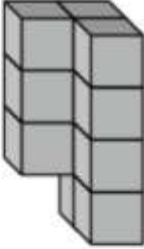


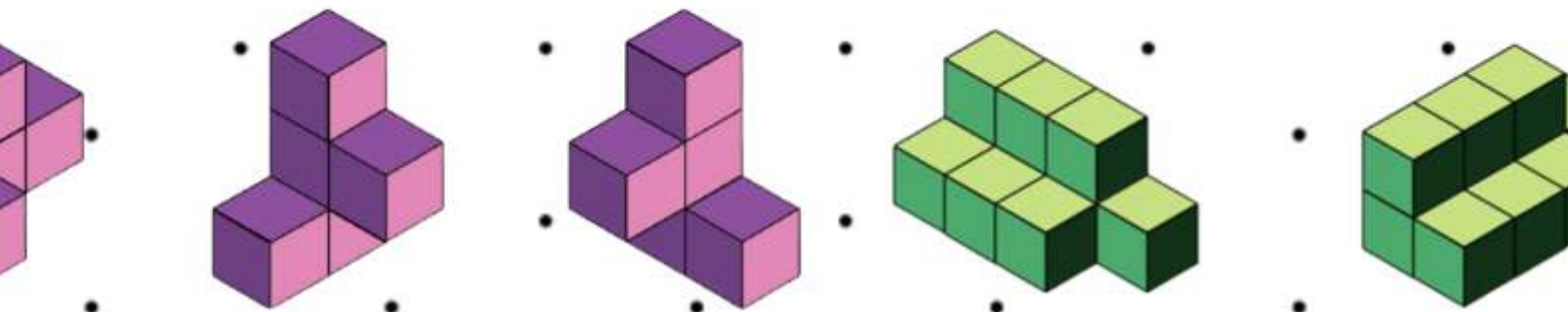
Front view	Top view	Right side view	Left side view	Rear view

Make the given structure using Jodo blocks and draw the views in this table.

Structure	Front view	Top view	Right side view
			
			
			
			
			

Look at the front view, top view and the right side view. Build the structure having these front, top and right side views using Jodo blocks. Circle the shape from A, B and C which matches the shape you made.

Front view	Top view	Right side view	
			 A  B  C
			 A  B  C
			 A  B  C



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