STANDARD FIVE

MATHEMATICS

REVIEW BOOKLET

Curriculum Planning and Development Division

(May 2017)

NOTES TO STUDENTS

- The booklet highlights some important facts that students are required to know in Mathematics through their preparation for the SEA, as prior knowledge for Form One.
- The booklet can be used as a resource for revision by students as they transition from Upper Primary to Form One.
- This booklet is not to replace the teaching of concepts, procedures and problem solving if reinforcement of these skills is needed by students.
- Examples/illustrations are provided.

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Contents

<table>
<tr><th colspan="2">A. NUMBER - Whole Numbers</th></tr>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>A factor is a number that divides another number, leaving no remainder.

The number 1 is a factor of every number.

Every number is a factor of itself.

The largest factor of ANY number is the number itself.</td><td>Factors of 14 are 1, 2, 7, 14.

14 ÷ 1 = 14
14 ÷ 2 = 7
14 ÷ 7 = 2
14 ÷ 14 = 1</td></tr>
<tr><td>A multiple is the product of a number and another number.

Every number is a multiple of itself.</td><td>The first four multiples of the number 8 are

8, 16, 24, 32</td></tr>
<tr><td>Even numbers are exactly divisible by 2.

They are multiples of 2.</td><td>2, 4, 6, 8, 10 …

2 ÷ 2 = 1
4 ÷ 2 = 2
6 ÷ 2 = 3
8 ÷ 2 = 4
10 ÷ 2 = 5</td></tr>
<tr><td>Odd numbers ALWAYS leave a remainder of 1 when divided by 2.</td><td>1, 3, 5, 7, 9 …

1 ÷ 2 = 0 Remainder 1
3 ÷ 2 = 1 Remainder 1
5 ÷ 2 = 2 Remainder 1
7 ÷ 2 = 3 Remainder 1
9 ÷ 2 = 4 Remainder 1</td></tr>
<tr><td>A prime number is any number that has only two factors: itself and 1.

2 is the only EVEN prime number.

Numbers that are not prime numbers are called composite numbers.

1 is a unique number. It is neither prime nor composite.</td><td>Prime numbers are highlighted on the chart below.

All other numbers beside the number 1 are composite.

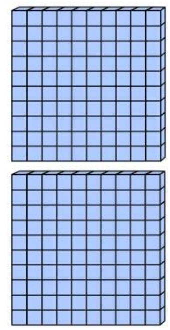
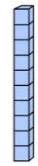
<table>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
<tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr>
<tr><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr>
<tr><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td></tr>
<tr><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td><td>50</td></tr>
<tr><td>51</td><td>52</td><td>53</td><td>54</td><td>55</td><td>56</td><td>57</td><td>58</td><td>59</td><td>60</td></tr>
<tr><td>61</td><td>62</td><td>63</td><td>64</td><td>65</td><td>66</td><td>67</td><td>68</td><td>69</td><td>70</td></tr>
<tr><td>71</td><td>72</td><td>73</td><td>74</td><td>75</td><td>76</td><td>77</td><td>78</td><td>79</td><td>80</td></tr>
<tr><td>81</td><td>82</td><td>83</td><td>84</td><td>85</td><td>86</td><td>87</td><td>88</td><td>89</td><td>90</td></tr>
<tr><td>91</td><td>92</td><td>93</td><td>94</td><td>95</td><td>96</td><td>97</td><td>98</td><td>99</td><td>100</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>A number can be represented in words and numerals.

e.g.

Numeral:
45 678

Words:
forty-five thousand, six hundred and seventy-eight

Expanded Form:
(4×10 000) + (5×1 000) + (6×100) + (7×10) + (8×1)</td>
<td>1.
<table>
<tr><th>Hundreds
2</th><th>Tens
1</th><th>Units or Ones
5</th></tr>
<tr><td></td><td></td><td></td></tr>
</table>
2. Numeral: 215

3. Word name: Two hundred and fifteen

4. Expanded form: (2 × 100) + (1 × 10) + (5 × 1)</td></tr>
</table>

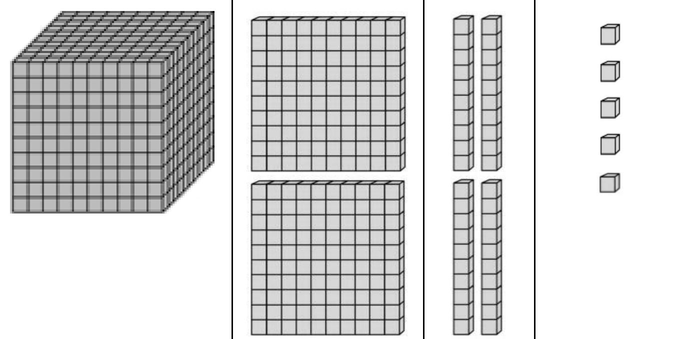
<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>
Place value is the position of the digit in the numeral. It is represented by columns on the place value chart.

The value is the worth of the digit.

e.g. The numeral 789

The place value of the digit 8 is tens.
The value of the digit 8 is eighty (80).
</td><td>
Example:

1 245

<table>
<tr><th>Thousands
1</th><th>Hundreds
2</th><th>Tens
4</th><th>Units or Ones
5</th></tr>
<tr><td colspan="4"></td></tr>
</table>

place value of 5 is ones : value of 5 is 5
place value of 4 is tens : value of 4 is 40
place value of 2 is hundreds : value of 2 is 200
place value of 1 is thousands : value of 1 is 1000
</td></tr>
<tr><td>
Ascending Order

To arrange numbers in ascending order, place them from smallest (first) to largest (last).
</td><td>
Example:

Place 17, 5, 9 and 8 in ascending order.
Answer: 5, 8, 9, 17

Example:

Place 3, 1, 19, 12, 9, 2 and 7 in ascending order.
Answer: 1, 2, 3, 7, 9, 12, 19
</td></tr>
<tr><td>
Descending Order

To arrange numbers in descending order, place them from largest (first) to smallest (last).
</td><td>
Example:

Place 17, 5, 9 and 8 in descending order.
Answer: 17, 9, 8, 5

Example:

Place 3, 1, 19, 12, 9, 2 and 7 in descending order.
Answer: 19, 12, 9, 7, 3, 2, 1
</td></tr>
</table>

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>A basic Addition Fact is defined as the sum of two one-digit numbers.

The sum of any number added to zero gives the same number.

e.g.
7 + 0 = 7</td><td>The 100 Addition facts of single digit numbers:
<table>
<tr><th>+</th><th>0</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th></tr>
<tr><td>0</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td>1</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
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<tr><td>6</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td></tr>
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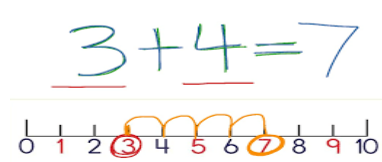
<tr><td>8</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td></tr>
<tr><td>9</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td></tr>
</table>
4 + 5 = 9
8 + 7 = 15</td></tr>
<tr><td>Addition on the number line

When adding on a number line, move to the right.</td><td>Example:

3 + 4

Begin at 3, then move 4 steps to the right.



Answer: 7</td></tr>
</table>

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>Addition with regrouping</td><td>Example:

Add 4529 + 733

Place all digits in the correct columns.

$$\begin{array}{ccccc} & \textbf{TH} & \textbf{H} & \textbf{T} & \textbf{O} \\ & \textbf{4} & \textbf{5} & \textbf{2} & \textbf{9} \\ + & & \textbf{7} & \textbf{3} & \textbf{3} \\ \hline & & & & \\ \hline \end{array}$$

Add the digits in the ones column: 9 + 3 = 12.
The number 12 represents 1 group of ten and 2 ones.
Place the digit 2 in the answer space for the ones column and the digit 1 above the tens column.

$$\begin{array}{ccccc} & & & {\scriptstyle 1} & \\ & \textbf{TH} & \textbf{H} & \textbf{T} & \textbf{O} \\ & \textbf{4} & \textbf{5} & \textbf{2} & \textbf{9} \\ + & & \textbf{7} & \textbf{3} & \textbf{3} \\ \hline & & & & \textbf{2} \\ \hline & & & 1 & \cancel{2} \end{array}$$

Add the digits in the tens column: 1 + 2 + 3 = 6.
Place the digit 6 in the answer space for the tens column.

$$\begin{array}{ccccc} & & & {\scriptstyle 1} & \\ & \textbf{TH} & \textbf{H} & \textbf{T} & \textbf{O} \\ & \textbf{4} & \textbf{5} & \textbf{2} & \textbf{9} \\ + & & \textbf{7} & \textbf{3} & \textbf{3} \\ \hline & & & \textbf{6} & \textbf{2} \\ \hline \end{array}$$

Add the digits in the hundreds column: 5 + 7 = 12.
The number 12 represents 1200, one thousand and two hundreds.
Place the digit 2 in the answer space for the hundreds column.
Place the 1 from the number 12 above the thousands column.

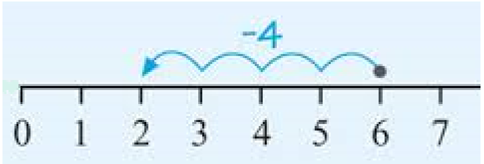
$$\begin{array}{ccccc} & {\scriptstyle 1} & & {\scriptstyle 1} & \\ & \textbf{TH} & \textbf{H} & \textbf{T} & \textbf{O} \\ & \textbf{4} & \textbf{5} & \textbf{2} & \textbf{9} \\ + & & \textbf{7} & \textbf{3} & \textbf{3} \\ \hline & & \textbf{2} & \textbf{6} & \textbf{2} \\ \hline & 1 & \cancel{2} & & \end{array}$$

Add the digits in the thousands column: 1 + 4 = 5.
Place the digit 5 in the answer space for the thousands column.

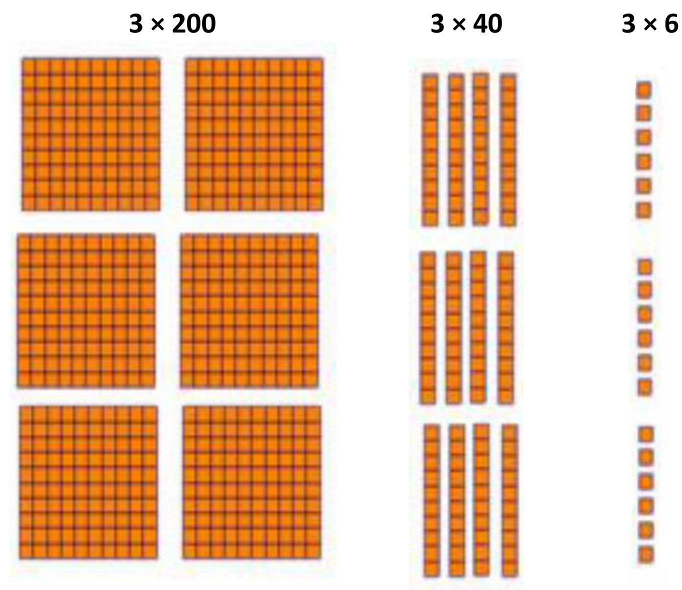
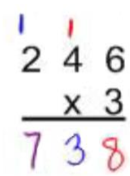
$$\begin{array}{ccccc} & {\scriptstyle 1} & & {\scriptstyle 1} & \\ & \textbf{TH} & \textbf{H} & \textbf{T} & \textbf{O} \\ & \textbf{4} & \textbf{5} & \textbf{2} & \textbf{9} \\ + & & \textbf{7} & \textbf{3} & \textbf{3} \\ \hline & \textbf{5} & \textbf{2} & \textbf{6} & \textbf{2} \\ \hline \end{array}$$</td></tr>
<tr><td>Commutative Law of Addition

This law states that the result for addition will be the same when the order of the numbers changes.</td><td>Example:

$$\left.\begin{array}{l} 2 + 3 + 5 = 10 \\ \\ 3 + 5 + 2 = 10 \\ \\ 5 + 3 + 2 = 10 \end{array}\right] \text{same result}$$</td></tr>
</table>

Facts to Remember	Illustration/ Example
Subtraction on the number line When subtracting on a number line, move to the left or move backward.	**Example:** 6 – 4 = 2 Begin at 6, then move 4 steps backward.  Answer: 2

Facts to Remember	Illustration/ Example
Subtraction with regrouping	**Example:** Subtract 4792 from 6538 Place all digits in the correct columns $\begin{array}{ccccc} & \textbf{TH} & \textbf{H} & \textbf{T} & \textbf{O} \\ & 6 & 5 & 3 & 8 \\ - & 4 & 7 & 9 & 2 \\ \hline & & & & \\ \hline \end{array}$ In the ones column, subtract 2 from 8: 8 – 2 = 6. Place the digit 6 in the answer space for the ones column. $\begin{array}{ccccc} & \textbf{TH} & \textbf{H} & \textbf{T} & \textbf{O} \\ & 6 & 5 & 3 & 8 \\ - & 4 & 7 & 9 & 2 \\ \hline & & & & 6 \\ \hline \end{array}$ In the tens column, 3 is less than 9. To subtract, you need to take 1 hundred and regroup to 10 tens. 1 hundred is the same as 10 tens. 10 tens added to 3 tens equal 13 tens. 13 tens subtract 9 tens equal 4 tens. Place the digit 4 in the answer space for the tens column. $\begin{array}{ccccc} & \textbf{TH} & \textbf{H} & \textbf{T} & \textbf{O} \\ & 6 & \cancel{5}^{4} & {}^{1}3 & 8 \\ - & 4 & 7 & 9 & 2 \\ \hline & & & 4 & 6 \\ \hline \end{array}$ In the hundreds column, 4 is less than 7. To subtract, you need to take 1 thousand and regroup to 10 hundreds. 10 hundreds added to 4 hundreds equal 14 hundreds. 14 hundreds subtract 7 hundreds equal 7 hundreds. Place the digit 7 in the answer space for the hundreds column. $\begin{array}{ccccc} & \textbf{TH} & \textbf{H} & \textbf{T} & \textbf{O} \\ & \cancel{6}^{5} & \cancel{5}^{14} & {}^{1}3 & 8 \\ - & 4 & 7 & 9 & 2 \\ \hline & 1 & 7 & 4 & 6 \\ \hline \end{array}$ In the thousands column, subtract 4 from 5: 5 – 4 = 1. Place the digit 1 in the answer space for the thousands column. $\begin{array}{ccccc} & \textbf{TH} & \textbf{H} & \textbf{T} & \textbf{O} \\ & \cancel{6}^{5} & \cancel{5}^{14} & {}^{1}3 & 8 \\ - & 4 & 7 & 9 & 2 \\ \hline & 1 & 7 & 4 & 6 \\ \hline \end{array}$

Facts to Remember	Illustration/ Example
The **product** of 3 and 4 is 12. $3 \times 4 = 12$	**Example:** Three ways of calculating 246×3 **1. Area Model:** **$(3\times200) + (3\times40) + (3\times6) = 600 + 120 + 18 = 738$**  **2. Regrouping**  6 × 3 = 18 (*1 ten and 8 ones*). Regroup and add 1 to the tens column. 4 tens × 3 = 12 tens (*1 hundred and 2 tens*) Regroup and add 1 to the hundreds column. **3. Repeated Addition** $\begin{array}{r} 2\ 4\ 6 \\ 2\ 4\ 6 \\ +\ 2\ 4\ 6 \\ \hline 7\ 3\ 8 \\ \hline \end{array}$

Facts to Remember	Illustration/ Example
Multiplication using Partial Products	**Example:** 21×12

$$
\begin{array}{rrrl}
 & 2 & 1 & \\
\times & 1 & 2 & \\
\hline
 & & 2 & \text{Ones by Ones} \\
 & 4 & 0 & \text{Tens by Ones} \\
 & 1 & 0 & \text{Ones by Tens} \\
2 & 0 & 0 & \text{Tens by Tens} \\
\hline
2 & 5 & 2 &
\end{array}
$$

The product of any number and 1 is the same number.

e.g.

7 × 1 **=** 1 × 7 = **7**

The product of any number and 0 is 0.

e.g.

7 × 0 = 0 × 7 = 0

Pattern for multiplication by 10:
1 × 10 = 10
2 × 10 = 20
3 × 10 = 30
4 × 10 = 40
5 × 10 = 50

Multiplication Facts to 144

X	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

Commutative Law for Multiplication

This law states that if two or more numbers are multiplied the result will be the same no matter their order.

Example:

$$\left.\begin{array}{l} 5 \times 3 = 15 \\ 3 \times 5 = 15 \end{array}\right\} \text{same result}$$

Example:

$$\left.\begin{array}{l} 4 \times 2 \times 6 = 48 \\ 6 \times 4 \times 2 = 48 \\ 2 \times 4 \times 6 = 48 \end{array}\right\} \text{same result}$$

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>Division can be represented by grouping or partitioning.</td><td>

Example:

Divide 4707 by 32

We are dividing by 32. Here are some multiplication facts for 32:

1 × 32 = 32   4 × 32 = 128   7 × 32 = 224

<table>
<tr><td>0 1
32) 4 7 0 7
-3 2
1 5</td><td>0 1 4
32) 4 7 0 7
-3 2
1 5 0
-1 2 8
2 2</td><td>0 1 4 7
32) 4 7 0 7
-3 2
1 5 0
-1 2 8
2 2 7
- 2 2 4
3</td></tr>
<tr><td>47 hundreds ÷ 32 = 100 sets of 32 with a remainder of 15 hundreds.</td><td>150 tens ÷ 32 = 40 sets of 32 with a remainder of 22 tens</td><td>227 ÷ 32 = 7 sets of 32 with a remainder of 3</td></tr>
</table>

4707 is the **dividend**
32 is the **divisor**
147 is the **quotient**
3 is the **remainder**

</td></tr>
<tr><td>Zero divided by any number equals zero.</td><td>

Example:

$\frac{0}{5} = 0$

</td></tr>
<tr><td>Any number divided by itself equals 1, except the number 0.</td><td>

Example:

1 ÷ 1 = 1

2 ÷ 2 = 1

3 ÷ 3 = 1

10 ÷ 10 = 1

</td></tr>
</table>

Facts to Remember	Illustration/ Example
In multi-step word problems, one or more steps must be solved in order to get the information needed to solve the final question.	**Example:** Jason played three games at the mall. He won 33 tickets from Basketball Hoops and 18 tickets from Air Hockey. He won three times the number of tickets from Car Racing as he did from Air Hockey. How many tickets did Jason win altogether? Solution 1: No. of tickets won from Basketball Hoops = 33 No. of tickets won from Air Hockey = 18 Step 1: No. of tickets won from Car Racing = 18 × 3 = 54 Step 2: Total number of tickets won = Tickets from Basketball Hoops and Air Hockey and Car Racing = 33 + 18 + 54 = 105 Solution 2: Step 1: No. of tickets won in Air Hockey & Car Racing = 18 × 4 = 72 Step 2: Total number of tickets won = Air Hockey and Car Racing Tickets + Basketball Hoops Tickets = 72 + 33 = 105 Answer: Jason won 105 tickets altogether.
	Example: Marcus had 600 marbles. He gave away 175 marbles and put the remaining marbles equally into 5 bags.  How many marbles were there in each bag? Solution: Step 1: 600 – 175 = 425 He had 425 marbles left. Step 2: 425 ÷ 5 = 85 There were 85 marbles in each bag. Answer: Each bag had 85 marbles.

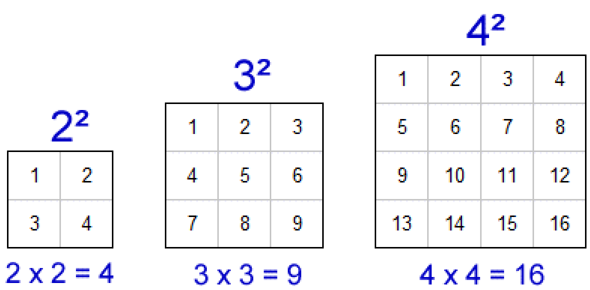
Facts to Remember

The **square** of a number is the **product** of the number and itself.

Square numbers can be represented by objects arranged as a square as shown below:

e.g.

2^2 is read as "the square of 2".
3^2 is read as "the square of 3".
4^2 is read as "the square of 4".



4 9 16

The sequence of square numbers is shown below:
1, 4, 9, 16, 25, 36, …

The square number pattern is shown below:

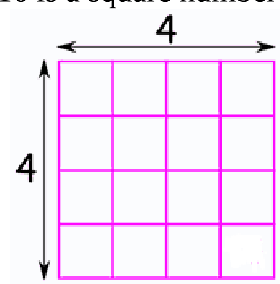
1	=	1^2	=	1
4	=	2^2	=	1 + 3
9	=	3^2	=	1 + 3 + 5
16	=	4^2	=	1 + 3 + 5 + 7
25	=	5^2	=	1 + 3 + 5 + 7 + 9
36	=	6^2	=	1 + 3 + 5 + 7 + 9 + 11

The rule for the pattern or sequence is the sum of the odd numbers.

Illustration/ Example

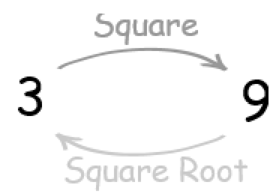
Example:

$4 \times 4 = 16$, so 16 is a square number

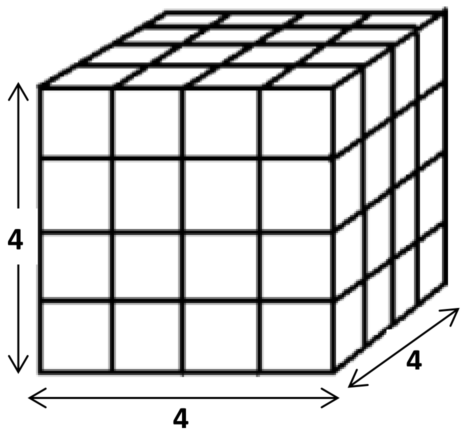


Square Numbers

1^2	=	1	×	1	……	1^2	=	1
2^2	=	2	×	2	……	2^2	=	4
3^2	=	3	×	3	……	3^2	=	9
4^2	=	4	×	4	……	4^2	=	16
5^2	=	5	×	5	……	5^2	=	25
6^2	=	6	×	6	……	6^2	=	36
7^2	=	7	×	7	……	7^2	=	49
8^2	=	8	×	8	……	8^2	=	64
9^2	=	9	×	9	……	9^2	=	81
10^2	=	10	×	10	……	10^2	=	100
						11^2	=	121
						12^2	=	144
						13^2	=	169
						14^2	=	196
						15^2	=	225
						16^2	=	256
						17^2	=	289
						18^2	=	324
						19^2	=	361
						20^2	=	400
						30^2	=	900
						40^2	=	1600
						50^2	=	2500

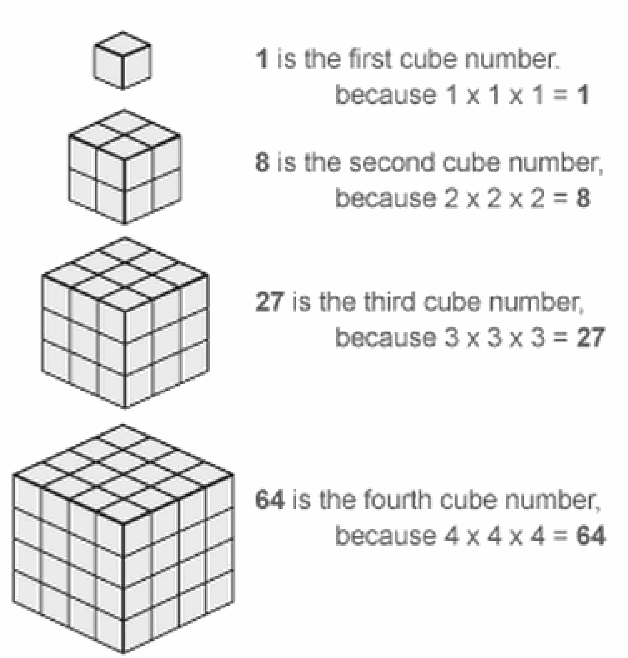
Facts to Remember	Illustration/ Example
The **square root** of a number is that number when **multiplied by itself** would give the original number. $\sqrt{}$ is the symbol used for the square root. e.g. $2^2 = 4$, so $\sqrt{4} = 2$ $\sqrt{4}$ is read as "the square root of 4". $\sqrt{9}$ is read as "the square root of 9".	A square root of **9** is 3, because the product of **3 and itself** is **9**.  $3^2 = 9$, so $\sqrt{9} = 3$
Square Roots	**Examples:** $\sqrt{1} = 1$ ………… $1^2 = 1$ $\sqrt{4} = 2$ ………… $2^2 = 4$ $\sqrt{9} = 3$ ………… $3^2 = 9$ $\sqrt{16} = 4$ ………… $4^2 = 16$ $\sqrt{25} = 5$ ………… $5^2 = 25$ $\sqrt{36} = 6$ ………… $6^2 = 36$ $\sqrt{49} = 7$ ………… $7^2 = 49$ $\sqrt{64} = 8$ ………… $8^2 = 64$ $\sqrt{81} = 9$ ………… $9^2 = 81$ $\sqrt{100} = 10$ ………… $10^2 = 100$ $\sqrt{121} = 11$ $11^2 = 121$ $\sqrt{144} = 12$ $12^2 = 144$ $\sqrt{169} = 13$ $13^2 = 169$ $\sqrt{196} = 14$ $14^2 = 196$ $\sqrt{225} = 15$ $15^2 = 225$

Facts to Remember	**Illustration/ Example**
The **cube** of a number is the product of the same number three times. OR The cube of a number is a multiplication in which the same number is used three times. e.g.	Cube Numbers



$4^3 = 4 \times 4 \times 4 = 64$

4^3 is read as "the cube of 4".



Cube Numbers

$$
\begin{array}{lcccccccccc}
0^3 & = & 0 & \times & 0 & \times & 0 & \ldots\ldots & 0^3 & = & 0 \\
1^3 & = & 1 & \times & 1 & \times & 1 & \ldots\ldots & 1^3 & = & 1 \\
2^3 & = & 2 & \times & 2 & \times & 2 & \ldots\ldots & 2^3 & = & 8 \\
3^3 & = & 3 & \times & 3 & \times & 3 & \ldots\ldots & 3^3 & = & 27 \\
4^3 & = & 4 & \times & 4 & \times & 4 & \ldots\ldots & 4^3 & = & 64 \\
5^3 & = & 5 & \times & 5 & \times & 5 & \ldots\ldots & 5^3 & = & 125 \\
6^3 & = & 6 & \times & 6 & \times & 6 & \ldots\ldots & 6^3 & = & 216 \\
7^3 & = & 7 & \times & 7 & \times & 7 & \ldots\ldots & 7^3 & = & 343 \\
8^3 & = & 8 & \times & 8 & \times & 8 & \ldots\ldots & 8^3 & = & 512 \\
9^3 & = & 9 & \times & 9 & \times & 9 & \ldots\ldots & 9^3 & = & 729 \\
10^3 & = & 10 & \times & 10 & \times & 10 & \ldots\ldots & 10^3 & = & 1000
\end{array}
$$

Facts to Remember	Illustration/ Example
A **sequence** or **pattern** is a set of numbers or objects that are in a particular order based on a rule. e.g. 3, 8, 13, 18, 23, 28, 33, 38, ... This sequence has a difference of 5 between each number. The sequence or pattern rule is "add 5".	**Example:** **27, 24, 21, 18, __** **Pattern rule:** "subtract 3" **27**, **24** = 27 – **3**, **21** = 24 – **3**, **18** = 21 – **3**, **15** = 18 – **3** The missing number in the sequence is **15**. **Example:** **3, 4, 6, 9, 13, 18, __** **Pattern rule:** Add 1 to the first number, add 2 to the second number, add 3 to the third number, etc. **3,** **4** = 3 + **1**, **6** = 4 + **2**, **9** = 6 + **3**, **13** = 9 + **4**, **18** = 13 + **5** The missing number in the sequence is **24**. **Example:** **64, 32, 16, 8, __** **Pattern rule:** Divide by 2 **64**, **32** = 64 ÷ **2**, **16** = 32 ÷ **2**, **8** = 16 ÷ **2**, **4** = 8 ÷ **2** The missing number in the sequence is **4**.

A. NUMBER - Fractions

Facts to Remember	Illustration/ Example
A **fraction** is a part of a whole.	

For the purpose of naming fractions, wholes are divided into equal parts.

$\frac{1}{2}$ → numerator → how many parts; → denominator → names the part

Here are some of the most common fractions, and how to call them:

$\frac{1}{2}$ is one-half

$\frac{1}{3}$ is one-third

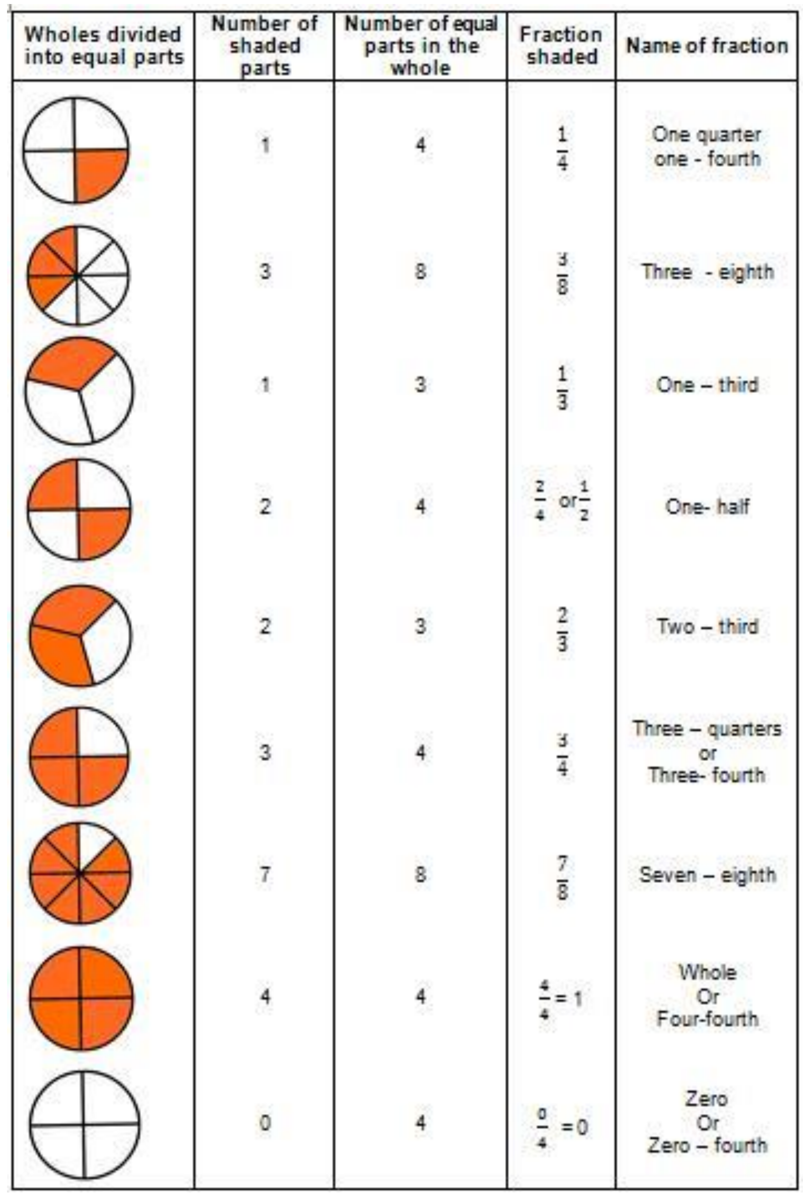
$\frac{1}{4}$ is one-quarter

$\frac{1}{5}$ is one-fifth and so on

$\frac{3}{7}$ is read as three-sevenths (or 3 out of 7)

A **unit fraction** is a fraction where the numerator is 1.

E.g. $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}$ and so on.



Wholes divided into equal parts	Number of shaded parts	Number of equal parts in the whole	Fraction shaded	Name of fraction
	1	4	$\frac{1}{4}$	One quarter one - fourth
	3	8	$\frac{3}{8}$	Three - eighth
	1	3	$\frac{1}{3}$	One – third
	2	4	$\frac{2}{4}$ or $\frac{1}{2}$	One- half
	2	3	$\frac{2}{3}$	Two – third
	3	4	$\frac{3}{4}$	Three – quarters or Three- fourth
	7	8	$\frac{7}{8}$	Seven – eighth
	4	4	$\frac{4}{4} = 1$	Whole Or Four-fourth
	0	4	$\frac{0}{4} = 0$	Zero Or Zero – fourth

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
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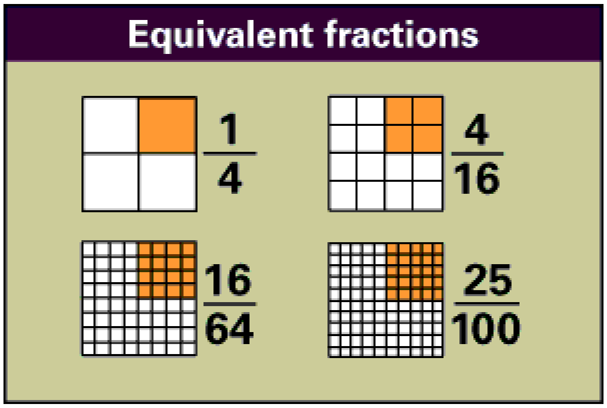
You can create equivalent fractions by multiplying or dividing both top and bottom by the same number.



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The rule to remember is:

"Change the bottom using multiply or divide, and the same to the top must be applied"

Here is why those fractions are really the same:

$$\frac{1}{4} \overset{\times 2}{=} \frac{2}{8} \overset{\times 2}{=} \frac{4}{16}$$

$$\times 2 \qquad \times 2$$

Here are some more equivalent fractions, this time by dividing:

$$\frac{25}{100} \overset{\div 5}{=} \frac{5}{20} \overset{\div 5}{=} \frac{1}{4}$$

$$\div 5 \qquad \div 5$$
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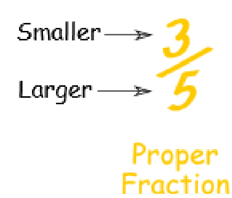
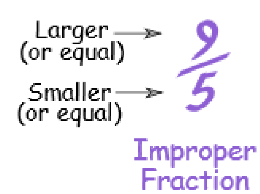
Ordering Fractions

When the numerator stays the same, and the denominator increases, the value of the fraction decreases, i.e. the fraction is smaller.

When the numerator stays the same, and the denominator decreases, the value of the fraction increases, i.e. the fraction is larger.
</td><td>
Example:

$\frac{1}{2}, \frac{1}{4}, \frac{1}{7}, \frac{1}{10}$ The fraction is getting smaller.

$\frac{3}{7}, \frac{3}{6}, \frac{3}{5}, \frac{3}{4}$ The fraction is getting larger.
</td></tr>
</table>

Facts to Remember	Illustration/ Example
We can **compare** two fractions to discover which is larger or smaller. There are two main ways to compare fractions: 1) Using the **same denominator**. Compare $\frac{3}{4}$ & $\frac{2}{3}$ $\frac{3 \times 3}{4 \times 3} = \frac{9}{12}$ $\frac{2 \times 4}{3 \times 4} = \frac{8}{12}$ $\frac{9}{12} > \frac{8}{12}$ 2) Using **decimal fractions**	**Example:** Which is bigger: $\frac{3}{8}$ or $\frac{5}{12}$? Solution: Make the denominators the same using equivalent fractions $\frac{3}{8} \underset{\times 3}{\overset{\times 3}{=}} \frac{9}{24}$ and $\frac{5}{12} \underset{\times 2}{\overset{\times 2}{=}} \frac{10}{24}$ $\frac{9}{24}$ is smaller than $\frac{10}{24}$, because 9 is smaller than 10. Answer: $\frac{5}{12}$ is the larger fraction. **Example:** $\frac{3}{8} = 0.375$ and $\frac{5}{12} = 0.4166$ so $\frac{5}{12}$ is bigger.
There are three types of fractions: 1) **Proper Fraction (Common Fraction)** - A fraction with a numerator smaller than its denominator. The value of the fraction is always less than one or a whole. 2) **Improper Fraction**- A fraction with its numerator larger than its denominator. Improper fractions always have a value greater than 1. 3) **Mixed Number** - A value expressed using both a whole number and a proper fraction e.g. $1\frac{1}{2}$ 1 is the whole number and $\frac{1}{2}$ is the fraction.	**Example:**   

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<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
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Conversion of an Improper Fraction to a Mixed Number

To convert an improper fraction to a mixed number, follow these steps:

- Find the number of wholes
- Express the remainder as a fraction

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Example:

Convert $\frac{11}{4}$ to a mixed number.

Solution:

$\frac{11}{4} = \frac{4}{4} + \frac{4}{4} + \frac{3}{4} = 1 + 1 + \frac{3}{4} = 2\frac{3}{4}$

$\frac{11}{4} =$ 2 wholes with a remainder of $\frac{3}{4}$

OR

$\begin{array}{lrl} & 2 & \rightarrow \text{Whole number} \\ \text{Denominator} \rightarrow 4 & \overline{)\,1\;\;1} & \\ & -\;\;8 & \\ & \overline{\;\;\;\;3} & \rightarrow \text{Remainder is } \frac{3}{4} \end{array}$

Answer: $2\frac{3}{4}$

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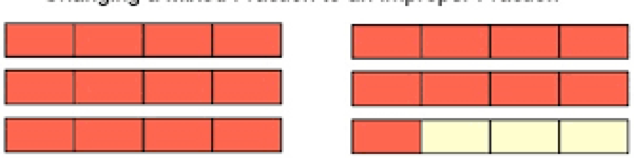
Conversion of a Mixed number to an Improper Fraction

To convert a mixed number to an improper fraction, follow these steps:

- Express wholes as fractions
- Simplify the numerator
- State the result

Changing a Mixed Fraction to an Improper Fraction



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

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

$= \frac{5 \times 4 + 1}{4}$

$= \frac{21}{4}$

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Example:

Convert $3\frac{2}{5}$ to an improper fraction.

Solution:

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

$= \frac{5}{5} + \frac{5}{5} + \frac{5}{5} + \frac{2}{5}$ (express wholes as fractions)

$= \frac{5+5+5+2}{5} = \frac{(3 \times 5) + 2}{5}$

$= \frac{17}{5}$ (simplify the numerator)

Answer: $\frac{17}{5}$

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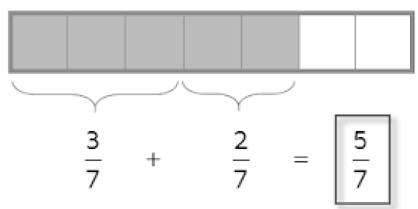
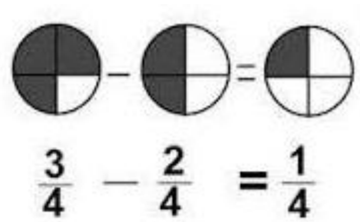
Facts to Remember	Illustration/ Example
Addition of fractions with the same denominator Add the numerator and keep the same denominator.	**Example:** Adding sevenths Three sevenths add two sevenths = five sevenths 
Subtraction of fractions with the same denominator Subtract the numerator and keep the denominator.	**Example:** Subtracting quarters Three quarters subtract two quarters = one quarter 
All whole numbers can be expressed as a fraction with a denominator of 1.	**Example:** Find $\frac{5}{6}$ $\times 24$. Solution: $\frac{5}{6} \times 24$ $= \frac{5}{6} \times \frac{24}{1}$ $= \frac{5}{\cancel{6}_1} \times \frac{\cancel{24}^4}{1}$ $= \frac{5 \times 4}{1 \times 1}$ $= \frac{20}{1}$ $= 20$ Answer: 20

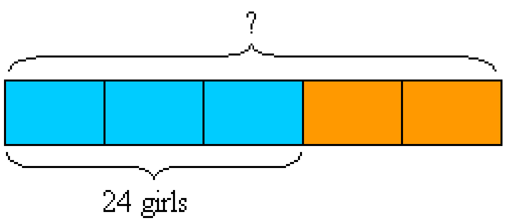
Facts to Remember	**Illustration/ Example**
Expressing one number as a fraction of another number	**Example:** What fraction of 60 is 45? Solution: $\frac{45}{60}$ → write 45 as the numerator of the fraction → write 60 as the denominator of the fraction Reduce the fraction to its lowest term. $\frac{45}{60} = \frac{45 \div 15}{60 \div 15} = \frac{3}{4}$ OR $\frac{45}{60} = \frac{45 \div 5}{60 \div 5} = \frac{9}{12}$ $\frac{9}{12} = \frac{9 \div 3}{12 \div 3} = \frac{3}{4}$
Finding the whole given a fractional part Draw diagrams to show information given about the fraction of a number.	**Example:** $\frac{2}{5}$ of a number is 20. What is the number? $\underbrace{\boxed{10}\boxed{10}}_{20}\boxed{10}\boxed{10}\boxed{10}$ $\frac{2}{5}$ of a number is 20. Therefore $\frac{1}{5}$ of the number is 10. The whole or $\frac{5}{5}$ of the number is 50. Answer: The number is 50.

Facts to Remember

You can find the whole number given a fraction of the number using **bar modeling**.

e.g.

$\frac{3}{5}$ of a group of children were girls. If there were 24 girls, how many children were there in the group?



3 units = 24
1 unit = 24 ÷ 3 = 8
5 units = 5 × 8 = 40

There were 40 children in the group.

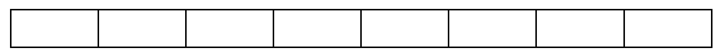
Illustration/ Example

Example:

Three-eighths of the town voted in an election. If 120 of the people voted, how many people lived in the town?

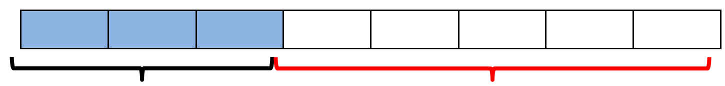
Solution:

Step 1. Draw the whole divided into eighths:



Step 2. Represent $\frac{3}{8}$:

For $\frac{3}{8}$, bracket 3 parts, then bracket the remaining parts.



$\frac{3}{8}$ voted = 120 $\qquad$ $\frac{5}{8}$ did not vote

Step 3. Divide 120 by 3 to find $\frac{1}{8}$ of the people who voted.

120 ÷ 3 = 40, which is $\frac{1}{8}$ of the people who voted

40	**40**	**40**	**40**	**40**	**40**	**40**	**40**

Step 4. Add all the parts to find the whole group:
40 + 40 + 40 + 40 + 40 + 40 + 40 + 40 = 320

Answer: 320 people lived in the town.

Other examples of worded problems are:

1. Kareem said that four fifths of his age is 16 years. How old is Kareem?

2. Charlie bought a book for $25.
   He paid $\frac{5}{6}$ of the regular price.

   What was the regular price of the book?

Facts to Remember	**Illustration/ Example**
Multiplication of Fractions Three-steps to multiply fractions: **Step 1.** Multiply the numerators **Step 2.** Multiply the denominators **Step 3.** Simplify the fraction if needed. OR Reduce the fractions and then multiply numerators and denominators.	**Example:** $\frac{1}{3} \times \frac{9}{16}$ **Step 1**. Multiply the numerators: $\frac{1}{3} \times \frac{9}{16} = \frac{1\times 9}{\ } = \frac{9}{\ }$ **Step 2**. Multiply the denominators: $\frac{1}{3} \times \frac{9}{16} = \frac{1 \times 9}{3 \times 16} = \frac{9}{48}$ **Step 3**. Simplify the fraction: $\frac{9 \div 3}{48 \div 3} = \frac{3}{16}$ (*Divide numerator and denominator by 3*) **Example:** $\frac{5}{6} \times \frac{2}{3} = \frac{5}{\cancel{6}_3} \times \frac{\cancel{2}^1}{3} = \frac{5\times1}{3\times3} = \frac{5}{9}$ **Example:** $\frac{5}{6} \times \frac{9}{10} = \frac{\cancel{5}^1}{\cancel{6}_2} \times \frac{\cancel{9}^3}{\cancel{10}_2} = \frac{1\times3}{2\times2} = \frac{3}{4}$
Make the whole number a fraction, by putting it over 1. Think of the whole number as being the numerator and 1 as the denominator: Example: $5 = \frac{5}{1}$	**Example:** $3 \times \frac{2}{9}$ Solution: Step 1: Put the whole over 1. $\frac{3}{1} \times \frac{2}{9}$ Step 2: Multiply numerators and denominators. $\frac{3 \times 2}{1 \times 9} = \frac{6}{9} = \frac{2}{3}$ Answer: $\frac{2}{3}$

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<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
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Multiplication of Mixed Numbers

To multiply mixed numbers, follow these steps:

Step 1. Convert to improper fractions

Step 2. Multiply the fractions

Step 3. Convert the result to mixed numbers

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Example:

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

Step 1. Convert both to improper fractions

$1\frac{1}{2} \times 2\frac{1}{5} = \frac{3}{2} \times \frac{11}{5}$

Step 2. Multiply the fractions (multiply the numerators and denominators):

$\frac{3}{2} \times \frac{11}{5} = \frac{3 \times 11}{2 \times 5} = \frac{33}{10}$

Step 3. Convert to a mixed number

$\frac{33}{10} = 3\frac{3}{10}$

Answer: $3\frac{3}{10}$

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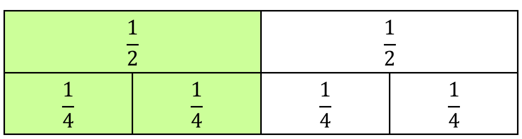
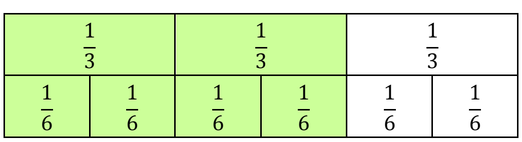
Division of Fractions



$\frac{1}{2} \div \frac{1}{4} = 2$ (two $\frac{1}{4}$ in one-half)

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



$\frac{2}{3} \div \frac{1}{6} = 4$ (four $\frac{1}{6}$ in two-thirds)

$$\mathbf{\frac{2}{3} \times \frac{6}{1} = \frac{12}{3} = 4}$$

Look at the pattern before we state the rule:

Step 1. Turn the **divisor** (2nd fraction) upside down, i.e. invert.

Step 2. Multiply the 1st fraction by the 2nd one.

Step 3. Simplify the answer, if needed.

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Example:

$\frac{2}{3} \div \frac{4}{5}$

Solution:

Step 1. Turn the **divisor** upside down:

$\frac{4}{5}$ becomes $\frac{5}{4}$

Step 2. Multiply the 1st fraction by the 2nd one:

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

(*multiply the numerators and the denominators*)

$\frac{2}{3} \times \frac{5}{4} = \frac{2 \times 5}{3 \times 4} = \frac{10}{12}$

Step 3. Simplify the fraction:

$\frac{10}{12} = \frac{5}{6}$

Answer: $\frac{5}{6}$

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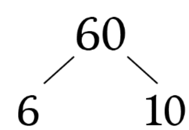
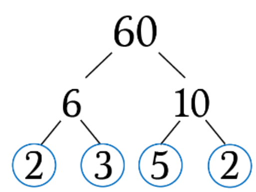
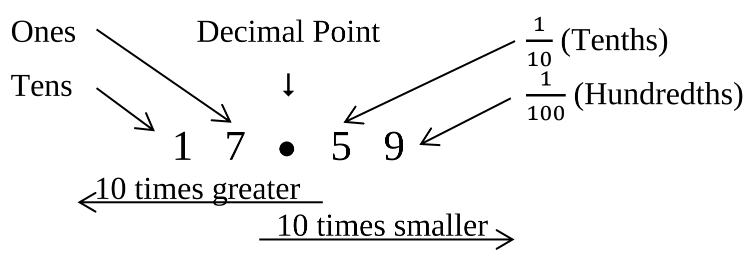
</table>

Facts to Remember	Illustration/ Example
Word problems involving fractions	**Example:** Martha spent $\frac{4}{9}$ of her allowance on food and shopping. What fraction of her allowance did she have left? Solution: $1 - \frac{4}{9} = \frac{9}{9} - \frac{4}{9} = \frac{5}{9}$ Answer: She had $\frac{5}{9}$ of her allowance left. **Example:** Sam had 120 teddy bears in his toy store. He sold $\frac{2}{3}$ of them at $12 each. How much money did he receive? Solution: Step 1. Calculate the number of teddy bears sold. $\frac{2}{3} \times \frac{120}{1} = \frac{2}{\cancel{3}_1} \times \frac{\cancel{120}^{40}}{1} = \frac{80}{1}$ He sold 80 teddy bears. Step 2. Calculate how much money he received. 80 × 12 = 960 He received $960. Answer: Sam received $960

Facts to Remember	Illustration/ Example
A **factor tree** breaks down a number into prime numbers. **Prime factorisation** is expressing a number as a product of its prime factors. Note that the **product** of the prime factorization is the original number.	**Example:** Make a factor tree for the number 60 Step 1. Begin by writing down the number 60. Step 2. Below it write down any factor pair whose product is 60. For example, write down 6 and 10 on the branches because $6 \times 10 = 60$. Step 3.  Step 4. Next repeat the process with the new branches. Since $2 \times 3 = 6$ and $5 \times 2 = 10$. Write the factors underneath their respective branches. Circle the **prime numbers.**  Prime Factorization: $2 \times 2 \times 3 \times 5 = 60$

A. NUMBER - Decimals	
Facts to Remember	**Illustration/ Example**
A **decimal number** is one which has whole number values and numbers with a fractional value (less than 1). The whole number is separated from the fractional number by a **decimal point**. The **first** digit after the decimal point is in the **tenths** place value. The **second** digit after the decimal point is in the **hundredths** place value. The **third** digit after the decimal point is in the **thousandths** place value.	As you move to the right in the place value chart, each number place is divided by 10. **Example:** 1000 ÷ 10 = 100 100 ÷ 10 = 10 10 ÷ 10 = 1 This is also true for digits to the right of the decimal point. **Example:** $1 \div 10 = \frac{1}{10}$ or 0.1 (one tenth) $\frac{1}{10} \div 10 = \frac{1}{100}$ or 0.01 (one hundredth) **Example:**  In the number shown above: There are 5 tenths, having a value of 0.5 or $\frac{5}{10}$ There are 9 hundredths, having a value of 0.09 or $\frac{9}{100}$
In consumer arithmetic, the decimal point is also used to separate dollars from cents in money.	**Examples:** $1.50 **represents** one dollar and fifty cents $5.25 **represents** five dollars and twenty-five cents $175.00 **represents** one hundred and seventy-five dollars

A. NUMBER - Decimals

Decimal Fractions in Expanded Notation

Example:

Express 17.59 using expanded notation.

$$17.59 = (1 \times 10) + (7 \times 1) + (5 \times \tfrac{1}{10}) + (9 \times \tfrac{1}{100})$$

$$= \quad 10 \quad + \quad 7 \quad + \quad 0.5 \quad + \quad 0.09$$

$$\begin{array}{r} 10 \\ 7 \\ 0.5 \\ 0.09 \\ \hline 17.59 \end{array}$$

OR

	T	**O**	**.**	**th**	**hth**
	1	0	.	0	0
		7	.	0	0
			.	5	0
+			.	0	9
	1	**7**	**.**	**5**	**9**

Answer: 17.59 = 10 + 7 + 0.5 + 0.09

Comparison of decimals

We can use the methods below to compare decimals:

Step 1. Set up a table with the **decimal point in the same place** for each number.

Step 2. Put in each number.

Step 3. Fill in the empty squares with zeros.

Step 4. Compare the numbers using the **first column on the left**.

Step 5. If the digits are equal move to the **next column to the right** until one digit is larger.

OR

Step 1. Line up the decimal point.

Step 2. Use zeros as place holders

Step 3. Visualize the numbers as whole numbers.

Step 4. Compare the numbers from smallest to largest.

Example:

Put the following decimals in ascending order:

1.5, 1.56, 0.8

Solution:

Ones	Decimal Point	Tenths	Hundredths	**Order**
1	.	5	0	**2nd**
1	.	5	6	**3rd**
0	.	8	0	**1st**

Answer:
The ascending order of decimals is 0.8, 1.5, 1.56.

Note:

To place numbers in **ascending order** start with the **smallest** number first.

To place numbers in **descending order** start with the **largest** number first.

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr>
<td>
Addition of decimal fractions

To add decimals follow these steps:

Step 1. Write the numbers, one under the other, with the decimal values one under the other.

Step 2. Use zeros as place holders.

Step 3. Then add, remembering to put the decimal point in the answer.
</td>
<td>
Example:

Add 1.45 to 1.3

Step 1.
Line up the decimals
<table>
<tr><th></th><th>O</th><th>.</th><th>th</th><th>hth</th></tr>
<tr><td></td><td>1</td><td>.</td><td>4</td><td>5</td></tr>
<tr><td>+</td><td>1</td><td>.</td><td>3</td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table>
Step 2.
Use zeros as place holders
<table>
<tr><th></th><th>O</th><th>.</th><th>th</th><th>hth</th></tr>
<tr><td></td><td>1</td><td>.</td><td>4</td><td>5</td></tr>
<tr><td>+</td><td>1</td><td>.</td><td>3</td><td>0</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table>
Step 3.
Add
<table>
<tr><th></th><th>O</th><th>.</th><th>th</th><th>hth</th></tr>
<tr><td></td><td>1</td><td>.</td><td>4</td><td>5</td></tr>
<tr><td>+</td><td>1</td><td>.</td><td>3</td><td>0</td></tr>
<tr><td></td><td>2</td><td>.</td><td>7</td><td>5</td></tr>
</table>
Answer: 2.75
</td>
</tr>
<tr>
<td>
Subtraction of decimal fractions

To subtract decimals, follow these steps:

Step 1. Write down the numbers, one under the other, with the decimal points one under the other.

Step 2. Use zeros as place holders.

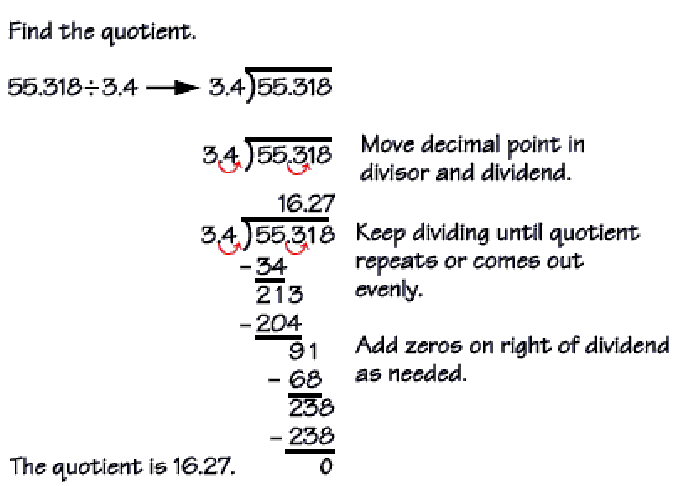
Step 3. Then subtract, remembering to put the decimal point in the answer.
</td>
<td>
Example:

Subtract 0.03 from 1.1

Step1.
Line up the decimals
<table>
<tr><th></th><th>O</th><th>.</th><th>th</th><th>hth</th></tr>
<tr><td></td><td>1</td><td>.</td><td>1</td><td></td></tr>
<tr><td>−</td><td>0</td><td>.</td><td>0</td><td>3</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table>
Step 2.
Use zeros as place holders
<table>
<tr><th></th><th>O</th><th>.</th><th>th</th><th>hth</th></tr>
<tr><td></td><td>1</td><td>.</td><td>1</td><td>0</td></tr>
<tr><td>−</td><td>0</td><td>.</td><td>0</td><td>3</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
</table>
Step 3.
Subtract
<table>
<tr><th></th><th>O</th><th>.</th><th>th</th><th>hth</th></tr>
<tr><td></td><td>1</td><td>.</td><td>1</td><td>0</td></tr>
<tr><td>−</td><td>0</td><td>.</td><td>0</td><td>3</td></tr>
<tr><td></td><td>1</td><td>.</td><td>0</td><td>7</td></tr>
</table>
Answer: 1.07
</td>
</tr>
</table>

Facts to Remember	Illustration/ Example
Multiplication of decimal fractions If we look at the answers we see a pattern. We can use the pattern to get a rule for multiplication by decimal fractions. **0.4 × 3 = 1.2** **0.23 × 5 = 1.15** **0.2 × 0.41 = 0.082** **Rule: the number of decimal places in the answer is the total number of decimal places from the numbers that are being multiplied.**	**Example:** **Tenths multiplied by Whole Numbers** 0.4 × 3 *Convert decimal fraction to regular fractions* $\frac{4}{10} \times \frac{3}{1} = \frac{12}{10}$ $\frac{12}{10} = 1.2$ 0.4 × 3 = 1.2 **Example:** **Hundredths multiplied by Whole Numbers** 0.23 × 5 *Convert decimal fraction to regular fractions* $\frac{23}{100} \times \frac{5}{1} = \frac{115}{100}$ $\frac{115}{100} = 1\frac{15}{100} = 1.15$ 0.23 × 5 = 1.15 **Example:** **Tenths multiplied by Hundredths** 0.2 × 0.41 *Convert decimal fraction to regular fractions* $\frac{2}{10} \times \frac{41}{100} = \frac{82}{1000}$ $\frac{82}{1000} = 0.082$ 0.2 × 0.41 = 0.082

Facts to Remember	**Illustration/ Example**
	Example: Calculate the product of 3.7 × 2.8 Solution: $\begin{array}{cccccc l} & & & 3 & . & 7 & \text{1 decimal place} \\ & \times & & 2 & . & 8 & \text{1 decimal place} \\ \hline & 7 & & 4 & & 0 & \\ & 2 & & 9 & & 6 & \\ \hline 1 & 0 & . & 3 & & 6 & \text{2 decimal places} \end{array}$ Answer: 10.36
Multiplication of decimal fractions by powers of 10 × **10** – shift the decimal point 1 place to the right × **100** – shift the decimal point 3 places to the right × **1000** – shift the decimal point 3 places to the right	**Example:** **Multiplication by 10** $0.5 \times 10 = \frac{5}{\cancel{10}_1} \times \frac{\cancel{10}^1}{1} = \frac{5}{1} = \mathbf{5}$ $0.25 \times 10 = \frac{25}{\cancel{100}_{10}} \times \frac{\cancel{10}^1}{1} = \frac{25}{10} = \mathbf{2.5}$ **Multiplication by 100** $0.31 \times 100 = \frac{31}{\cancel{100}_1} \times \frac{\cancel{100}^1}{1} = \frac{31}{1} = \mathbf{31}$ $0.15 \times 100 = \frac{15}{\cancel{100}_1} \times \frac{\cancel{100}^1}{1} = \frac{15}{1} = \mathbf{15}$ **Multiplication by 1000** $0.014 \times 1000 = \frac{14}{\cancel{1000}_1} \times \frac{\cancel{1000}^1}{1} = \frac{14}{1} = \mathbf{14}$ $0.75 \times 1000 = \frac{\mathbf{75}}{\cancel{100}_1} \times \frac{\cancel{1000}^1}{1} = \frac{750}{1} = \mathbf{750}$

Facts to Remember	**Illustration/ Example**
Division of a decimal number by a whole number **Step 1.** Put the decimal point in the same spot as the dividend (the number being divided). **Step 2.** Continue division just as you would with whole numbers.	**Example:** Divide 9.1 by 7. Put the decimal point in the quotient directly above the decimal point in the dividend. $$\begin{array}{r} 1.3 \\ 7\overline{)9.1} \\ -\underline{7.} \\ 2.1 \\ -\underline{2.1} \\ 0 \end{array}$$ Answer: 1.3
Division of a decimal number by another decimal number **Step 1.** Express as a fraction using the dividend as the numerator and divisor as the denominator **Step 2.** Multiply by 10, or 100, or 1000, etc. until the divisor becomes a whole number. **Step 3.** Continue division just as you would with whole numbers. e.g. 	**Example:** $8.64 \div 1.2$ Solution: Step 1. Express as a fraction: $8.64 \div 1.2 = \frac{8.64}{1.2}$ Step 2. Multiply numerator and denominator by 10: $\frac{8.64 \times 10}{1.2 \times 10} = \frac{86.4}{12}$ Step 3. $$\begin{array}{r} 7.2 \\ 12\overline{)86.4} \\ -\underline{84} \\ 2.4 \\ -\underline{2.4} \\ 0 \end{array}$$ Answer: 7.2

Facts to Remember	**Illustration/ Example**
Division of decimal fractions by powers of 10 When dividing a decimal by: ÷ **10** – shift the decimal point 1 place to the left ÷ **100** – shift the decimal point 2 places to the left ÷ **1000** – shift the decimal point 3 places to the left	**Examples:** 3.24 ÷ 10 = 0.324 2.1 ÷ 100 = 0.021 310.5 ÷ 1000 = 0.310 5
Word problems involving decimal numbers	**Example:** What is the total length of these three pieces of ribbon: 0.1m, 0.22m, and 0.38m? Solution: $\begin{array}{rcccccc} & 0 & . & 1 & 0 & \text{m} \\ & 0 & . & 2 & 2 & \text{m} \\ + & 0 & . & 3 & 8 & \text{m} \\ \hline & 0 & . & 7 & 0 & \text{m} \\ \hline \end{array}$ Answer: The total length is 0.7m **Example:** A student earns \$11.75 per hour for gardening. If she worked 21 hours this month, then how much did she earn? Solution: To solve this problem, we will multiply \$11.75 by 21. $\begin{array}{cccccccl} \$ & & 1 & 1 & . & 7 & 5 & \quad \text{2 decimal places} \\ & & \times & & & 2 & 1 & \quad \text{0 decimal places} \\ \hline \$ & & 1 & 1 & & 7 & 5 & \\ \$ & 2 & 3 & 5 & & 0 & 0 & \\ \hline \$ & 2 & 3 & 6 & . & 7 & 5 & \quad \text{2 decimal places} \\ \hline \end{array}$ Answer: The student earns \$236.75.

Facts to Remember	Illustration/ Example
Conversion of a Fraction to a Decimal Fraction To convert a fraction to a decimal fraction: **Step 1.** Find an equivalent base ten fraction. **Step 2.** Express as a decimal fraction OR Divide the numerator by the denominator.	**Example:** Convert $\frac{1}{4}$ to a decimal fraction. Solution 1: $\frac{1}{4} = \frac{1 \text{ x } 25}{4 \text{ x } 25} = \frac{25}{100} = 0.25$ Solution 2: $\begin{array}{rrrrr} & 0 & . & 2 & 5 \\ \hline 4 \vert & 1 & . & 0 & 0 \\ & - & & 8 & \\ \hline & & & 2 & 0 \\ & - & & 2 & 0 \\ \hline & & & & 0 \\ \hline \end{array}$ Align the decimal point. Keep adding zeros. Answer: 0.25

A. NUMBER - Approximation and Computational Estimation	
Facts to Remember	**Illustration/ Example**
Approximation produces a useful result to get an estimation of the answer. This is called a rough check or guess estimate. Rough estimates can prevent wrong answers for calculations. Approximating means **rounding**. You can **round up** or **round down**. The symbol ≏, means "is approximately equal to".	The length of a new pencil can be estimated at about 8cm.
Rounding Numbers To round a number use the following steps: **Step 1.** Identify the digit of the value to which you are approximating. **Step 2.** Look at the digit to the immediate right, • If it is 5 or more (5, 6, 7, 8, 9) round up by adding 1 to the digit on the left. • If is less than 5 (4, 3, 2, 1, 0) round down. **Step 3.** Replace the digits to the right of the rounded value with **zeros**.	**Example:** Round 86 to the nearest 10. Solution: Step 1. 8 is the digit in the place value column to which you are rounding. Step 2. 6 is more than 5 so round up by adding 1 to the 8 which is the tens digit, so the tens digit is now 9. Step 3. Replace the ones digit which is 6 with a zero. Answer: 86 ≏ 90, to the nearest 10. **Example:** Round 143 to the nearest 100. Solution: Step 1. 1 is the digit in the place value column to which you are rounding. Step 2. 4 is less than 5 so round down. Step 3. Replace both the tens digit and the ones digit on the right of the 1 with a zeros. Answer: 143 ≏ 100, to the nearest 100.

Facts to Remember	Illustration/ Example
	Examples: 84 ♎ 90, to the nearest 10 45 ♎ 50, to the nearest 10 32 ♎ 30, to the nearest 10 459 ♎ 500, to the nearest 100 398 ♎ 400, to the nearest 100 201 ♎ 200, to the nearest 100 145 ♎ 150 to the nearest 10 145 ♎ 100 to the nearest 100 365 ♎ 370 to the nearest 10 365 ♎ 400 to the nearest 100 726 ♎ 730 to the nearest 10 726 ♎ 700 to the nearest 100

Facts to Remember	Illustration/ Example
Rounding Decimal Numbers To round a decimal number use the following steps: **Step 1.** Identify the digit of the value to which you are approximating. **Step 2.** Look at the digit to the immediate right, • If it is 5 or more (5, 6, 7, 8, 9) round up by adding 1 to the digit on the left. • If is less than 5 (4, 3, 2, 1, 0) round down. Rounding to **tenths** means **there is only one digit** after the decimal point. Rounding to **hundredths** means **there are only two digits** after the decimal point.	**Example:** What is 1.2735 rounded to the nearest tenth? Solution: Step 1. Identify the digit in the tenths column: 1 . 2 7 3 5 Step 2. Look at the digit to the immediate right 1 . 2 <u>**7**</u> 3 5 The digit "7" at the immediate right is **more than 5**, so round up by adding 1 to 2: 2 + 1 = **3**. Answer: 1.3 to the nearest tenth. **Example:** What is 3.1416 rounded to the nearest hundredth? Solution: Step 1. Identify the digit in the hundredths column: 3 . 1 4 1 6 Step 2. Look at the digit to the immediate right 3 . 1 4 <u>**1**</u> 6 The digit "1" at the immediate right is **less than 5**, so round down. Answer: 3.14 to the nearest hundredth.

Facts to Remember	Illustration/ Example
	Example: Ellen wanted to buy a DVD player for $49.95, a DVD holder for $19.95 and a pair of earphones for $21.95. Is $85.00 enough money for Ellen to buy all three items? Solution: The phrase **enough money** tells us that we need to **estimate** the sum of the three items. We will estimate the sum by rounding each amount to the nearest dollar. We must then compare our estimated sum with $85.00 to see if Ellen has enough money to buy these items. $\begin{array}{rcr} \$49.95 & \rightarrow & \$50.00 \\ \$19.95 & \rightarrow & \$20.00 \\ +\ \$21.95 & \rightarrow & +\ \$22.00 \\ \hline & & \$92.00 \end{array}$ The estimated cost is $92. Answer: $85.00 is not enough for Ellen to buy all three items.

<table>
<tr><th colspan="2">A. NUMBER - Percent</th></tr>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>Percent means “out of 100”.

The symbol % means percent.</td><td>Example:
20% means “20 out of 100” or $\frac{\mathbf{20}}{\mathbf{100}}$</td></tr>
<tr><td>To find a percent of a given quantity:

Step 1. Express the percent as a fraction

Step 2. Multiply the fraction by the quantity

Step 3. Simplify</td><td>Example:
Find 5% of 80.
Solution:
$\frac{\cancel{5}^{1}}{\cancel{100}_{\cancel{5}_{1}}} \times \frac{\cancel{80}^{4}}{1} = \frac{4}{1} = 4$
Answer: 4</td></tr>
<tr><td>Conversion of a Percent to a Fraction

To convert a percent to a fraction:
Step 1. Express the percent as a fraction

Step 2. Simplify the fraction (reduce it to its lowest terms)</td><td>Example:
Convert 12% to a fraction.
Solution:
$12\% = \frac{12}{100} = \frac{12 \div 4}{100 \div 4} = \frac{3}{25}$
Answer: $\frac{3}{25}$</td></tr>
<tr><td>The whole is 100%.

e.g.
25 students in a class
100% of students in the class = 25

e.g.
Joy’s allowance is $150.00
100% of Joy’s allowance = $150.00

e.g.
Farmer Joe picks 780 oranges
100% of Farmer Joe’s oranges = 780</td><td>Example:
If the whole is 20 then 5 out of 20 is the equivalent of 25%.
$\frac{5}{20} \times \frac{100}{1} = \frac{\cancel{5}^{1}}{\cancel{20}_{4}} \times \frac{100}{1} = \frac{100}{4} = 25\%$

Example:
If the whole is 10 then 2 out of 10 is the equivalent of 20%.
$\frac{2}{10} \times \frac{100}{1} = \frac{\cancel{2}^{1}}{\cancel{10}_{5}} \times \frac{100}{1} = \frac{100}{5} = 20\%$</td></tr>
</table>

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>

Conversion of a Decimal to a Percent

To convert a decimal fraction to a percent:

Step 1. Express the decimal fraction as a fraction.

Step 2. Multiply by 100.

Remember:
Shortcut for multiplying by 100 is shifting the decimal point two places to the right.

</td><td>

Example:

Express 0.1 as a percent.

Solution:

$0.1 \times 100 = \frac{1}{10} \times \frac{100}{1} = \frac{100}{10} = 10\%$

OR

$0.1 \times 100 = 10\%$

Answer: 10%

Example:

Express 0.675 as a percent.

Solution:

$0.675 \times 100 = \frac{675}{1000} \times \frac{100}{1} = \frac{675}{\cancel{1000}_{10}} \times \frac{\cancel{100}^{1}}{1} = \frac{675}{10} = 67.5\%$

OR

$0.675 \times 100 = 67.5\%$

Answer: 67.5%

</td></tr>
<tr><td>

Conversion of a Percent to a Decimal

To convert a percent to a decimal:

Step 1. Express the percent as a fraction.

Step 2. Simplify the fraction (reduce it to its lowest terms).

Step 3. Divide the numerator by the denominator.

</td><td>

Example:

$10\% = \frac{10}{100} = \frac{1}{10} = 0.1$

Example:

$67.5\% = \frac{67.5}{100} = 0.675$

</td></tr>
</table>

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>

Conversion of a Fraction to a Percent

To convert from a fraction to a percent:

Step 1. Multiply the fraction by 100.

Step 2. Include % symbol.

OR

Step 1. Convert the fraction to a decimal by dividing the numerator by the denominator

Step 2. Then convert the decimal to a percentage by multiplying by 100%. **Include % symbol.**

</td><td>

Example:

Express $\frac{3}{25}$ as a percentage.

Solution:

$\frac{3}{\cancel{25}_1} \times \frac{\cancel{100}^4}{1} = 12\%$

OR

Convert the fraction to a decimal:

$\frac{3}{25} = 0.12$

Multiply the decimal by 100:

$0.12 \times 100 = 12\%$

Answer: 12%

</td></tr>
<tr><td>

Expression of a quantity as a percent of another

To express one quantity as a **percent** of another,

- Make sure that both quantities are expressed in the same units.
- Write the given quantity as a fraction of the total
- Multiply the fraction by 100.
- Simplify.

</td><td>

Example:

Peter scored 45 marks out of 60 in a test.
Express Peter's score as a percent.

Percent of mark $= \frac{45}{60} \times 100 = \frac{\cancel{45}^3}{\cancel{60}_4} \times \frac{100}{1} = \frac{3}{4} \times \frac{100}{1} = 75\%$

Answer: 75%.

</td></tr>
<tr><td>

To calculate the whole (or part) given a part expressed as a percent.

</td><td>

Example:

If 60% of a number is 9, then what is the number?

Solution:

60% of a number = 9

1% of a number = $\frac{9}{60}$

100% of a number = $\frac{\cancel{9}^3}{\cancel{60}\,\cancel{20}_1} \times \frac{\cancel{100}^5}{1} = \frac{15}{1} = 15$

Answer: The number is 15.

</td></tr>
</table>

Facts to Remember	Illustration/ Example
Word problems involving percent	**Example:** If 5% of China plays tennis, how many people would you expect to play tennis out of a group of 320 Chinese? Solution: Number of tennis players = 5% of 320 = 5% x 320 $= \frac{5}{100}$ x 320 = 16 Answer: 16 people

<table>
<tr><th colspan="2">B. MEASUREMENT - Money</th></tr>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>

Trinidad and Tobago Currency
(not drawn to scale)

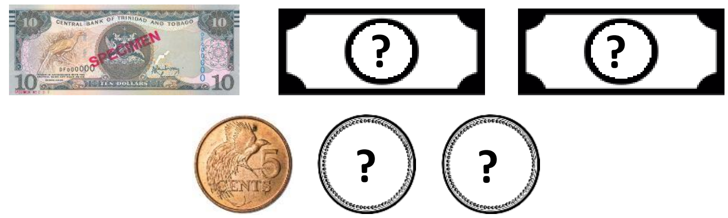
Dollar Bills

Coins

</td><td>

Example:

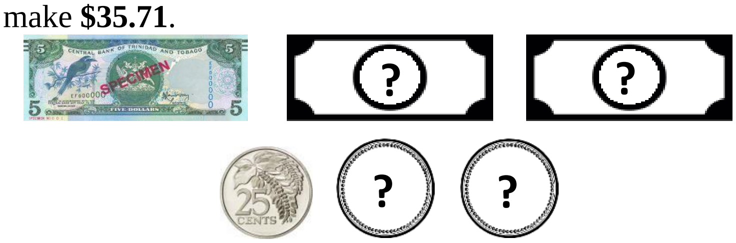
Insert the missing values on the bills and coins required to make **$20.35**.



Answer:

Bills: $5, $5 and Coins: 5¢ , 25¢

Insert the missing values on the bills and coins required to make **$35.71**.



Answer:

Bills: $20, $10 and Coins: 1¢ , 50¢

</td></tr>
<tr><td>

A **budget**

</td><td>

Example:

Sam earned $2 500.00 in April.

Sam's budget for April:

- $420.00 at the supermarket
- $150.00 on electricity
- $100.00 on gas
- $160.00 on phone and internet
- $115.00 on insurance (car, house)
- $650.00 on rent
- $200.00 in savings

That is a total of $1 795.00.

How much money does Sam have left over?

Solution:

$2 500.00 − $1 795.00 = $705.00

Answer: Sam has $705.00 left over.

</td></tr>
</table>

Facts to Remember	Illustration/ Example
If an article is sold for more than it cost, then it is said to have been sold at a **profit** **Profit = Selling Price – Cost Price** **Profit %** $= \frac{\text{Profit}}{\text{Cost Price}} \times 100$ $= \frac{\text{Selling Price} - \text{Cost Price}}{\text{Cost Price}} \times 100$ If an article is sold for less than it cost, then it is said to have been sold at a **loss.** **Loss = Cost Price – Selling Price** **Loss %** $= \frac{\text{Cost Price} - \text{Selling Price}}{\text{Cost Price}} \times 100$	**Example:** A store owner bought a shirt for \$10.00 and sold it for \$13.00. a) Calculate the profit made on the sale of the shirt. b) Determine the profit percent. Solution: a) Profit = Selling price – Cost price = \$13.00 – \$10.00 = \$3.00 Answer: The profit is \$3.00 b) Profit % $= \frac{\text{Selling Price} - \text{Cost Price}}{\text{Cost Price}} \times 100$ $= \frac{\text{Profit}}{\text{Cost Price}} \times 100$ $= \frac{3}{10} \times 100 = 30\%$ The profit percent is 30% **Example:** A vase that cost \$60.00 was sold for \$50.00. Find the loss percent. Solution: Loss = Cost price – Selling price = \$60.00 – \$50.00 = \$10.00 Loss % $= \frac{\text{Cost Price} - \text{Selling Price}}{\text{Cost Price}} \times 100$ $= \frac{\text{Loss}}{\text{Cost Price}} \times 100$ $= \frac{10}{60} \times \frac{100}{1} = 16\frac{2}{3}\%$ Answer: The loss percent is $16\frac{2}{3}\%$

Facts to Remember	Illustration/ Example
	Example: A car was bought for \$60 000.00 and then sold for \$75 000.00. What is the profit percent? Solution: $\textbf{Profit \%} = \frac{\text{Profit}}{\text{Cost Price}} \times 100$ $= \frac{\text{Selling Price} - \text{Cost Price}}{\text{Cost Price}} \times 100$ $= \frac{75000 - 60000}{60000} \times 100$ $= \frac{15000}{60000} \times 100 = 25\%$ Answer: The profit percent is 25%.
Value Added Tax or **V.A.T.** is applied to both goods and services in **Trinidad and Tobago** and is included in the final price of the product. **V.A.T.** is charged at a rate of **12.5%** • 12.5 % = $\frac{1}{8}$ (for easy calculation) OR • 12.5% = $\frac{1}{2}$ of 25% (find 25% and then find half of the amount)	**Example:** Mr. Ram's bill at a restaurant is \$240.00. V.A.T. of 12.5% is added. How much money must Mr. Ram pay? Solution 1: $12.5\% = \frac{1}{8}$ V.A.T. $= \frac{1}{8} \times \$240 = \frac{1}{\cancel{8}_1} \times \frac{\cancel{\$240}^{30}}{1} = \$30$ Solution 2: 25% of 240 $= \frac{25}{100} \times \frac{\$240}{1} = \$60$ $12.5\% = \frac{1}{2}$ of 25% $\frac{1}{2}$ of \$60 = \$30 V.A.T. = \$30 Total to be paid = Amount + V.A.T. = \$240.00 + 30.00 = \$270.00 Answer: Mr. Ram must pay \$270.00 in total.

Facts to Remember	Illustration/ Example
Percentage discount is equal to $$\frac{\text{Marked Price} - \text{Selling Price}}{\text{Marked Price}} \times 100$$	**Example:** A watch bought for \$160.00 is sold for \$140.00. a) Calculate the discount. b) Calculate the percentage discount. Solution: a) Discount = Marked Price – Selling Price = \$160.00 – \$140.00 = \$20.00 Answer: The discount is \$20.00 b) Percentage discount: $= \frac{\text{Discount}}{\text{Marked Price}} \times \frac{100}{1}$ $= \frac{\cancel{\$20.00}^{1}}{\cancel{\$160.00}_{8}} \times \frac{100}{1}$ = 12.5% Answer: The percentage discount is 12.5%.
	Example: The marked price of a dress is \$400.00. Anna paid \$300.00 for the dress. How much discount did she receive? Solution: Discount = Marked Price – Selling Price = \$400.00 – \$300.00 = \$100.00 Answer: Anna received a \$100.00 discount. **Example:** The marked price of a lamp is \$300.00. a) If a 20% discount is given, calculate the sale price. b) If the V.A.T. is charged at 12.5%, calculate the amount of V.A.T. paid on the discounted price. c) Calculate the cost of the lamp.

Facts to Remember	Illustration/ Example
	Solution: a) 20% of \$300.00 = $\frac{20}{\cancel{100}} \times \frac{\$3\cancel{00}}{1}$ = \$60.00 Sale price = Marked Price – Discount = \$300.00 – \$60.00 = \$240.00 Answer: The sale price is \$240.00 b) **Hint: To calculate V.A.T. use 12.5% = $\mathbf{\frac{1}{8}}$** Price after discount is \$240.00 V.A.T. = 12.5% of \$240.00 = $\frac{1}{\cancel{8}_1} \times \frac{\cancel{\$240.00}^{\$30.00}}{1}$ = \$30.00 Answer: V.A.T. worth \$30.00 was paid on the discounted price. c) V.A.T. inclusive price = \$240.00 + V.A.T. = \$240.00 + \$30.00 = \$270.00 Answer: The total cost of the lamp is \$270.00.

Facts to Remember	Illustration/ Example
Important Terms related to **Wages:** **Fortnightly** means 2 weeks or 14 days A **wage** is the money received for work that is done daily, weekly or fortnightly. A **salary** is money received for work done monthly or yearly. **Rate** of pay is the amount being paid for the time spent at work. An **hourly rate** is the amount of money paid for an hour spent at work. A **daily rate** is the amount of money paid for a day spent at work. **Overtime** means extra hours worked at a given rate.	**Example**: Mr. Khan works for 5 days a week from 8:00 a.m. to 3:00 p.m. He is paid a rate of \$80.00 per hour. a) Calculate his daily wage. b) Calculate his weekly wage. Solution: a) No. of hours worked = 7 hours Hourly rate = \$80.00 Daily Wage = \$80.00 × 7 = \$560.00 Answer: His daily wage is \$560.00 b) No. of days worked per week = 5 days Daily wage = \$560.00 Weekly Wage = \$560.00× 5 = \$2 800.00 Answer: His weekly wage is \$2 800.00 **Example**: Fred earns \$20.00 per hour for a regular 8 hour day. He worked for 12 hours on Monday. Calculate his total wage for Monday if he is paid at a rate of \$30.00 per hour for the extra hours of work. Solution: No. of regular hours = 8hrs Hourly rate = \$20.00 Pay for regular hours = \$20.00 × 8 = \$160.00 Overtime hours = 12 hrs – 8 hrs = 4 hrs Pay for overtime hours = \$30.00 × 4 = \$120.00 Total wage for Monday = \$160.00 + \$120.00 = \$280.00 Answer: His total wage for Monday is \$280.00

Facts to Remember	Illustration/ Example
Calculation of Simple Interest Money deposited in a bank will earn interest at the end of the year. **Principal (P):** Money deposited or borrowed. **Time (T):** Period for which money is borrowed or invested. It is calculated using years. **Rate (R):** This is the amount you pay for borrowing. It is stated as a percentage. **Simple Interest (SI):** The money earned or the money paid on a loan. If interest is always calculated on the original principal, it is called simple interest. To calculate Simple Interest use the formula: **SI = Principal × Rate × Time** OR **SI = P × R × T** When Rate is expressed as a percentage the formula is often seen as: $\mathbf{SI} = \dfrac{\mathbf{P \times R \times T}}{\mathbf{100}}$ **Amount:** The total of the Principal and the Simple Interest To calculate the Amount use the formula: **Amount = Principal + Simple Interest**	**Example:** Calculate the simple interest on \$460.00, at 5% per annum for 3 years. Simple interest $= \dfrac{P \times R \times T}{100}$ $= \dfrac{\$460.00 \times 5 \times 3}{100}$ $= \$69.00$ **Example:** Simon wanted to borrow \$1 800.00 to buy new tyres for his car. He was told he could take a loan for 30 months at 10% simple interest per year. a) Calculate how much interest the bank will charge. b) Calculate the Amount he will need to pay the bank. Solution: a) P = \$1 800.00 R = 10% $T = \frac{30}{12} = 2.5$ years $SI = \dfrac{\mathbf{P \times R \times T}}{\mathbf{100}} = \dfrac{\$1\,800.00 \times 10 \times 2.5}{100} = \$450.00$ Answer: The bank will charge \$450.00 in interest. b) Amount = Principal + Simple Interest = \$1 800.00 + \$450.00 = \$2 250.00 Answer: He will need to repay \$2 250.00 to the bank.

Facts to Remember	Illustration/ Example
Comparing Unit Prices can be a good way of finding which choice is the “best buy”.	**Example:** Which are cheaper, 10 pencils for \$4.00 or 6 pencils for \$2.70? Solution: Find the Unit Cost: • \$4.00 ÷ 10 = \$0.40 per pencil • \$2.70 ÷ 6 = \$0.45 per pencil The lower Unit Cost is the better bargain. Answer: 10 pencils for \$4.00 are cheaper.

<table>
<tr><th colspan="2">B. MEASUREMENT - Linear Measure</th></tr>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>
The standard unit for measuring length is the metre.

Other units which are used for measuring length are,

millimetre
centimetre
kilometre

We can measure how long things are, or how tall, or how far apart they are by using these measures.
</td><td>
A centimetre (cm) is approximately:

the length of a staple
the width of a fingernail
the width of 5 CD's stacked on top of each other
the thickness of a notepad.
the radius (half the diameter) of a one cent coin

A metre (m) is approximately:

the width of a doorway
the height of a countertop
five steps up a staircase
the depth of the shallow end of a swimming pool
the width of a dining table
the height of a 5 year old
shoulder to opposite wrist of an adult
outstretched arms of a child
waist high on an adult
one long step of an adult male.

A kilometre (km) is approximately:

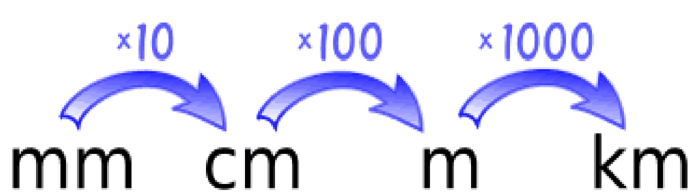
$2\frac{1}{2}$ laps around an athletic track
The distance walked in 12 minutes

</td></tr>
<tr><td>
A non-standard unit is a unit of measure expressed in terms of an object.

Non-standard units can be objects such as a shoe, a toothpick, a paper clip or a hand span.
</td><td>
Example:
What is the length of the pencil?

Answer: The length of the pencil is 5 paper clips long.
</td></tr>
<tr><td>
Conversion Table of Metric measurements for Length
</td><td>
10 millimetres (mm) = 1 centimetre (cm)

100 centimetres = 1 metre (m)

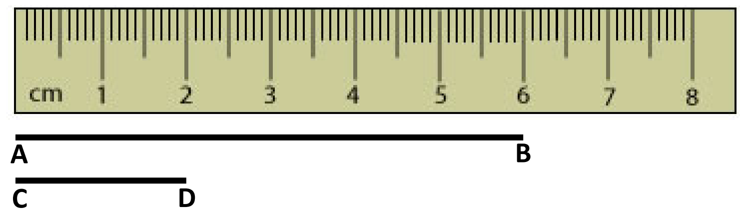
1 000 metres = 1 Kilometre (Km)


</td></tr>
</table>

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>Two lengths can be compared</td><td>

Example:

How much longer is the line AB than the line CD?



Solution:

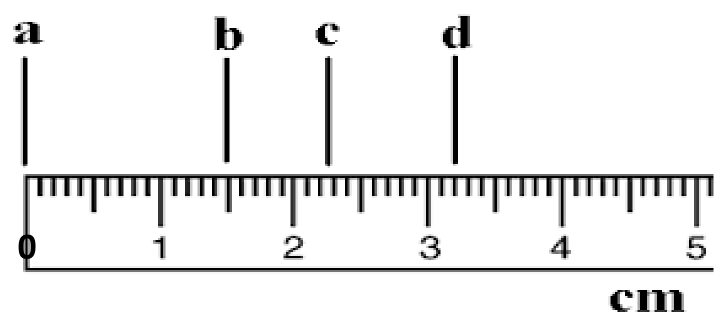
Length of AB = 6 cm
Length of CD = 2 cm
6 cm – 2 cm = 4 cm

Answer: AB is 4 cm longer than CD.

</td></tr>
<tr><td>Read and record linear measures using decimal notation.</td><td>

Example:

Four points a, b, c and d are illustrated below on a ruler:



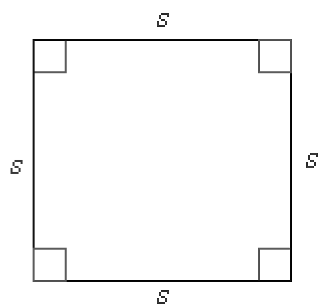
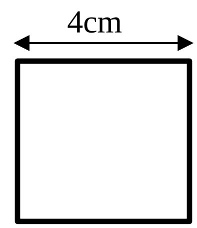
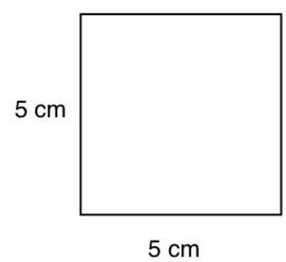
Record of Distances

<table>
<tr><th>Distance</th><th>Measure in Millimetres</th><th>Measure in Centimetres</th></tr>
<tr><td>a to b</td><td>15 mm</td><td>1.5 cm</td></tr>
<tr><td>a to c</td><td>23 mm</td><td>2.3 cm</td></tr>
<tr><td>a to d</td><td>32 mm</td><td>3.2 cm</td></tr>
<tr><td>b to c</td><td>8 mm</td><td>0.8 cm</td></tr>
<tr><td>b to d</td><td>17 mm</td><td>1.7 cm</td></tr>
<tr><td>c to d</td><td>9 mm</td><td>0.9 cm</td></tr>
</table>

</td></tr>
</table>

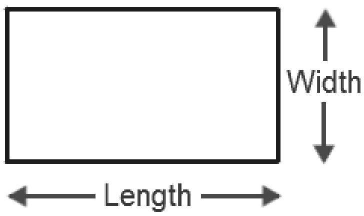
Facts to Remember	Illustration/ Example
Solve problems involving addition and subtraction of measures in **(a) metres and centimetres** **(b) kilometres and metres**	**Example:** In the Summer Olympic Games, athletes compete in races of the following lengths: 100 meters, 200 meters, 400 meters, 800 meters, 1500 meters, 5000 meters and 10,000 meters. If a runner were to run in all these races, how many kilometers would he run? $\begin{array}{r} 10{,}000 \\ 5{,}000 \\ 1{,}500 \\ 800 \\ 400 \\ 200 \\ +\quad 100 \\ \hline 18{,}000 \end{array}$ To figure out how many kilometers he would run, you need to first add all of the lengths of the races together and *then* convert that measurement to kilometers. 1000m = 1km 18000 m = $\frac{18\ 000}{1\ 000}$ km = 18 km The runner would run 18 kilometers.
Subtraction of metric measures **Sometimes it is necessary to convert all values to the same unit before attempting to subtract.** Align place values then subtract as required.	**Example:** The length of a rope is 80 m. If a piece of 35 m 40 cm length is cut, what length of the rope is left? Solution: Total length of the rope = 80m Piece cut from the rope = 35m 40cm $\begin{array}{crr} & m & cm \\ & 79 & \\ & \cancel{80} & {}^{1}00 \\ - & 35 & 40 \\ \hline & 44 & 60 \\ \hline \end{array}$ Regrouping is required: 1m = 100cm Hence, the length of the rope left = 44m 60c m.

Facts to Remember	**Illustration/ Example**
Solving problems involving measures in metres and millimetres	**Example:** Coach Kelly brought 32 litres of water to the football game, and she divided the water equally aamong 8 coolers. How much water would each cooler contain, in millimetres? Solution: 1L = 1 000 ml 32L = 32 × 1 000 mL = 32 000 mL $\frac{32\ 000\ \text{mL}}{8}$ = 4 000 mL Answer: Each cooler contains 4 000 millilitres of water.

B. MEASUREMENT - Perimeter	
Facts to Remember	**Illustration/ Example**
Perimeter is the distance around a two-dimensional shape. In other words, perimeter is the distance around any flat or plane shape. A **polygon** is a shape enclosed by three or more straight sides. To find the **perimeter** of a **polygon**, calculate the sum of all the lengths of its sides.	
Square  The perimeter of a **square** is calculated using the formula, S + S + S + S OR S × 4 where S is the length of each side.	**Example:**  length of side = 4cm Perimeter of square = 4cm + 4cm + 4cm + 4cm = 16 cm **Example:** A square has a side of length 5 cm. Find the perimeter of the square.  length of side = 5cm Perimeter of Square = 5cm × 4 = 20 cm

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>

Rectangle



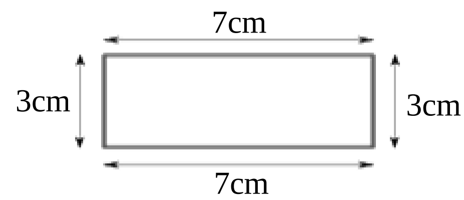
The perimeter of a **rectangle** is calculated using the formula,

L + L + W + W
OR
2L + 2W
(opposite sides are equal)

where L is the length of the rectangle
and W is the width of the rectangle.

</td><td>

Example:



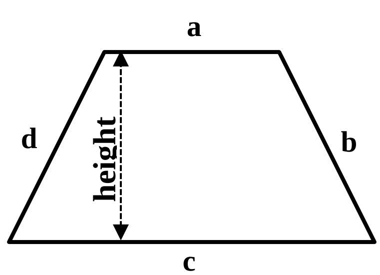
Perimeter of rectangle

= 7cm + 3cm + 7cm + 3cm

= 20cm

</td></tr>
<tr><td>

Trapezium



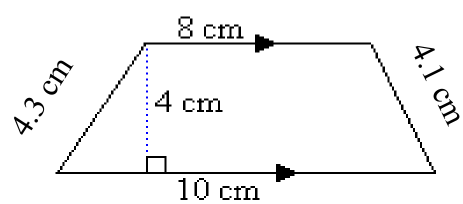
The perimeter of a **trapezium** is calculated using the formula,

Perimeter
= length of side **a** + length of side **b**
+ length of side **c** + length of side **d**
OR
Sum of the lengths of all four sides

</td><td>

Example:

Find the perimeter of the trapezium below.

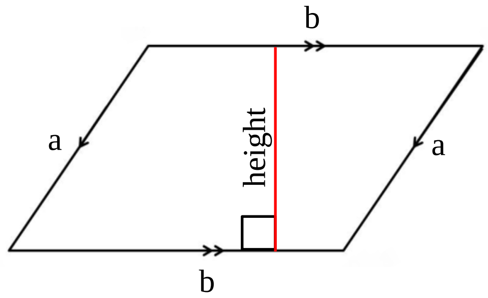
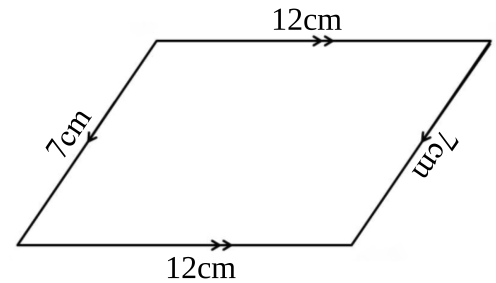


Perimeter of trapezium

= 10 + 8 + 4.3 + 4.1

= 26.4 cm

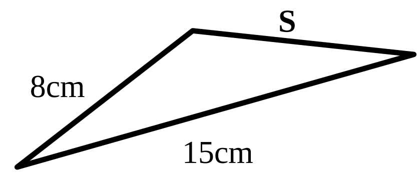
</td></tr>
</table>

Facts to Remember	**Illustration/ Example**
Parallelogram  The perimeter of a **parallelogram** is calculated using the formula, a + b + a + b OR 2(a + b)	**Example:**  Perimeter of parallelogram = 12cm + 7cm + 12cm + 7cm = 38cm

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>Solving problems involving perimeter (finding unknown sides)</td><td>
Example:

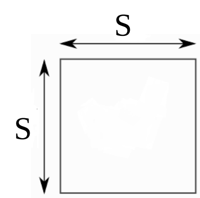
The perimeter of the triangle is 26 cm (not drawn to scale).

What is the length of the missing side?



Solution:
Total length of known sides = 15cm + 8cm = 23 cm
Length of missing side: S = 26cm – 23cm = 3cm

Answer: The length of the missing side is 3cm.

Example:
The perimeter of the square is 6 cm (not drawn to scale).
What is the length of each side of the square?


Solution:
Perimeter = S + S + S + S = 4 × S = 6cm
$S = \frac{6}{4} = 1.5cm$
Answer: Length of each side of the square is 1.5cm

Example:
The perimeter of the rectangle is 36cm and its length is 12cm.
Calculate the width of the rectangle.


Solution:
Perimeter = W + 12cm + W + 12cm = 36cm
2W + 24cm = 36cm
2W = 36cm – 24cm = 12cm
$W = \frac{12cm}{2} = 6cm$
Answer: The width of the rectangle is 6cm.
</td></tr>
</table>

Facts to Remember

A **circle** is a closed curve on a plane surface where all the points on the curve are the same distance from the centre.

- A **Radius (r)** is any straight line from the centre of the circle to a point on the circumference.

  The plural of radius is **radii**.

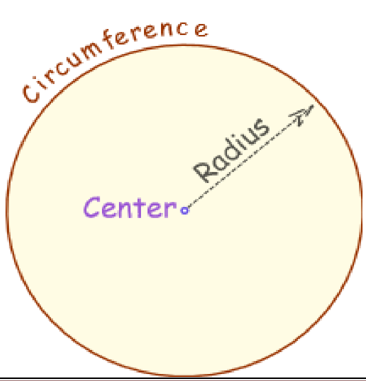
- A **Diameter (D)** is any straight line from one point on the circumference to another point on the circumference that passes through the centre of the circle.

  The diameter is twice the length of the radius.
  i.e. Diameter = 2 × Radius
  OR
  D = 2 × r

- The **Circumference(C)** of a circle is the distance once around the circle
  - $\mathbf{C = 2 \times \pi \times r}$
  - $\mathbf{C = \pi \times D}$
  - $\boldsymbol{\pi = \dfrac{C}{D}}$
  - $\boldsymbol{\pi = \dfrac{C}{2 \times r}}$

  The perimeter of a circle is its circumference.

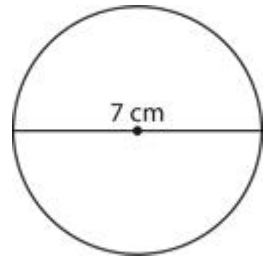
- **Pi (π)** is approximately equal to $\frac{22}{7}$ or 3.14



Illustration/ Example

Example:

Calculate the circumference of the circle of diameter 7cm shown below.



Solution:

Circumference = $\pi \times$ Diameter

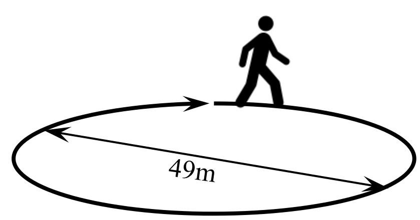
$= \frac{22}{7} \times \frac{7}{1}$

= 22 cm

Answer: The circumference is 22cm.

Example:

If you walk around a circle which has a diameter of 49m, how far will you walk?



Solution:

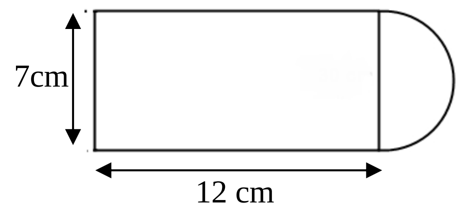
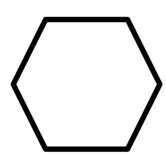
The distance walked will be the circumference.

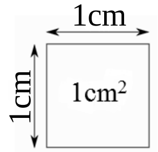
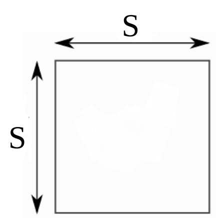
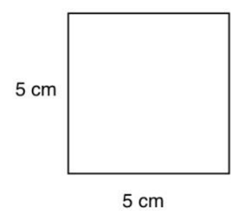
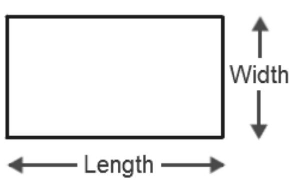
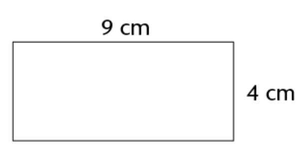
Circumference = $\pi \times$ Diameter

$= \frac{22}{\cancel{7}_1} \times \frac{\cancel{49}^{7}\,\text{m}}{1}$

= 154m

Answer: The distance you will walk is 154m.

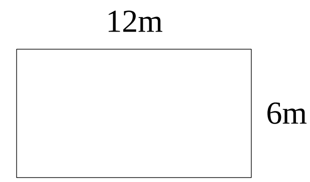
Facts to Remember	Illustration/ Example
Solve problems involving perimeter of polygons	**Example:** What is the perimeter of the shape below?  Solution: Divide the shape into a rectangle and a semicircle. Sum of lengths of the rectangular section: = 12cm + 7cm + 12cm = 31cm (Be careful when adding sides, there are only three sides to be added.) Circumference of circle = $\pi \times$ D $= \frac{22}{7} \times \frac{7}{1} = 22\text{cm}$ Length of curved side = Length of semicircle = 22cm ÷ 2 = 11cm Sum of lengths of the rectangular section + Length of semicircle: = 31cm + 11cm = 42cm Answer: Perimeter of the shape is 42cm. **Example:** The hexagon has a perimeter of 36cm. What is the length of one side of the hexagon if all sides are equal?  Solution: Perimeter = S + S + S + S + S + S = 36cm 6S = 36cm $S = \frac{36\text{cm}}{6} = 6\text{cm}$ Answer: The length of one side of the hexagon is 6cm.

B. MEASUREMENT - Area	
Facts to Remember	**Illustration/ Example**
Area and its units The **area** of a shape is the total number of square units that fill the shape. The unit of measure for area is the **square metre**: $1m \times 1m = \mathbf{1m^2}$ The **square centimetre**, $1cm \times 1cm = \mathbf{1cm^2}$, is also used as a unit to measure smaller areas.  (**not drawn to scale**)	**Example:** A **square metre** is about: • half the area of a doorway • the area of a door is approximately 2 m^2 (approximately $2m \times 1m$). **Example:** The size of a dollar bill is approximately 112cm^2 (approximately $16cm \times 7cm$).
Square  **Area** of Square = $S \times S = S^2$	**Example:** A square has a side of length 5 cm. Find the area of the square.  length of side = 5cm Area of Square = $5cm \times 5cm$ = 25 cm^2 Answer: Area of Square is 25 cm^2
Rectangle  L represents the length of the rectangle B represents the width of the rectangle **Area** of Rectangle = $L \times B$	**Example:** A rectangle has a length of 9 cm and a width of 4cm. Find the area of the rectangle.  L = 9cm and B = 4cm Area of Rectangle = $9cm \times 4cm$ = 36 cm^2 Answer: Area of rectangles is 36 cm^2

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td></td><td>

Example:

The floor of a room shown below has to be covered with 12 cm square tiles.
How many tiles will be needed to cover the entire area of the floor?



Solution:

Area of the floor = L × B = 12m × 6m = 72 m^2

1 m^2 = 10 000 cm^2

So $72m^2$ = 72 × 10 000 cm^2 = 720 $000cm^2$

Area of 1 square tile = 12 x 12 cm^2 = 144 cm^2

No. of tiles needed to cover floor = $\frac{720\,000}{144}$ = 5000 tiles

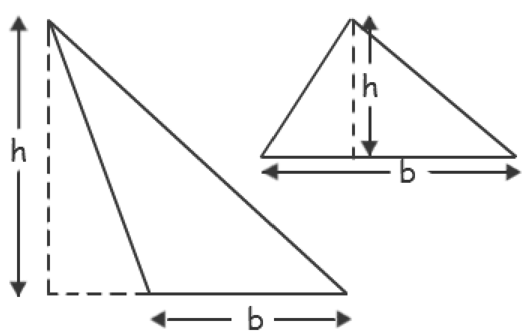
OR

Computation can be done as follows:

$\frac{1200 \times 600}{12 \times 12}$ = 100 × 50 = 5000 tiles

</td></tr>
<tr><td>

Triangle



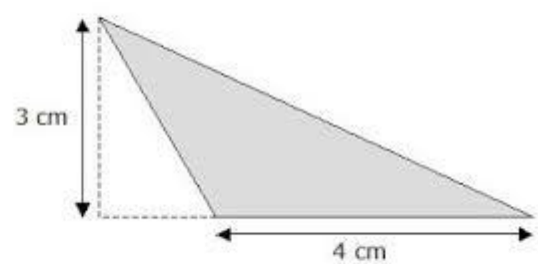
b is the base of the triangle
h is the height of the triangle

Area of a triangle is : $\frac{b \times h}{2}$

</td><td>

Example:

A triangle has a height of 3 cm and a base of 4cm.
Find the area of the triangle.



Area $= \frac{b \times h}{2}$

$= \frac{1}{2} \times 4cm \times 3cm$

$= \frac{1}{2} \times 12cm^2$

$= 6cm^2$

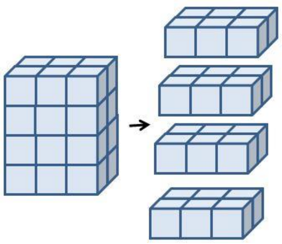
Area of the triangle is $6cm^2$

</td></tr>
</table>

B. MEASUREMENT - Volume

Facts to Remember	Illustration/ Example
Calculate volume by counting cubes	**Examples:**

We can calculate the volume of objects/shapes by counting cubes.

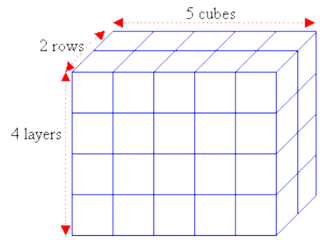


This cuboid has 4 layers of 8 cubes.

It has a volume of 32 cubes.

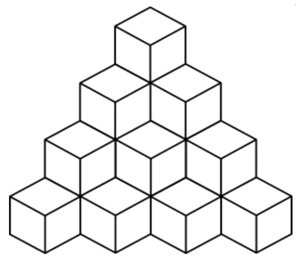
If these cubes are 1 cm cubes then the volume of the cuboid is 32 cm^3.

Examples:



Volume of cuboid:
4 layers of 10 cubes
$= 4 \times 10$ cubes
$= 40$ cubes

The volume of this shape can be calculated like this:



layer 1: 1 cube

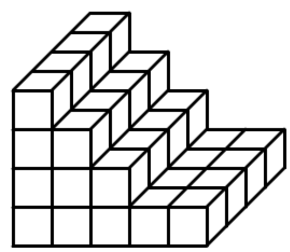
layer 2: $2 + 1 = 3$ cubes

layer 3: $3 + 2 + 1 = 6$ cubes

layer 4: $4 + 3 + 2 + 1 = 10$ cubes

Volume of shape
$= 10$ cubes $+ 6$ cubes $+ 3$ cubes $+ 1$ cubes
$= 20$ cubes

Calculate the volume of the shape below:



layer 1: $1 \times 4 = 4$ cubes
layer 2: $2 \times 4 = 8$ cubes
layer 3: $3 \times 4 = 12$ cubes
layer 4: $5 \times 4 = 20$ cubes

Volume of shape = 44 cubes

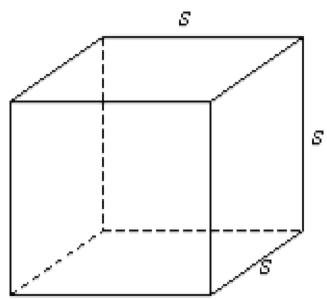
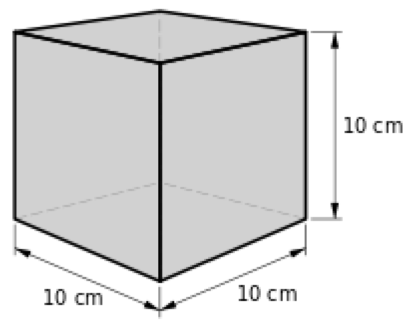
Another method of counting:

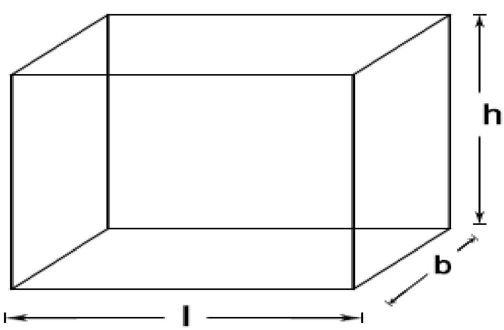
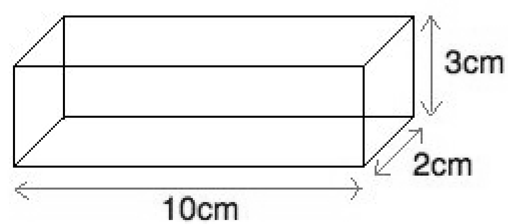
11 rows of 4 cubes = 44 cubes

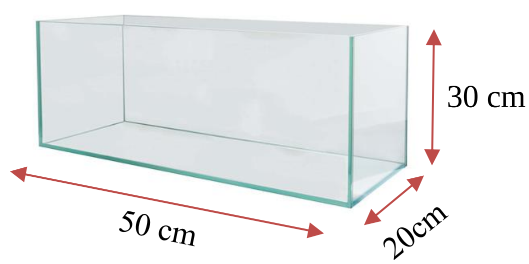
Other suitable methods of counting cubes can be used.

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>Volume is the amount of space that an object occupies.

It is measured in cubic units.

Volume has three dimensions.</td><td></td></tr>
<tr><td>Cube

Volume of cube = s × s × s = s^3</td><td>Example:
Find the volume of a cube with a side of length 10cm.

Solution:
Volume of cube = 10cm × 10cm × 10cm
= 1 000cm^3

Answer: Volume is 1 000cm^3</td></tr>
<tr><td>Cuboid

Volume of cuboid = length × breadth × height
= $l \times b \times h$</td><td>Example:
Find the volume of a cuboid with length 10cm, breadth 2cm and height 3cm.

Solution:
Volume of cuboid = length × breadth × height
= 10cm × 2cm × 3cm
= 60cm^3
Answer: Volume is 60cm^3</td></tr>
</table>

Facts to Remember	Illustration/ Example
Capacity is the amount that something can hold. **The units of capacity are litres (L or l) and millilitres (mL or ml).**	**Example:** The pack below holds $\frac{1}{4}$ litre of milk. Mummy bought 6 of these packs.  What is the total volume of milk in cm^3 that Mummy got from the 6 packs? Solution: Volume of one $\frac{1}{4}$ litre pack = 1 000cm^3 ÷ 4 = 250cm^3 Volume of six $\frac{1}{4}$ litre packs = 250cm^3 × 6 = 1 500cm^3 OR Six $\frac{1}{4}$ litre packs = 6 × $\frac{1}{4}$ litres $= \frac{6}{1} \times \frac{1}{4} = \frac{6}{4}$ = 1.5 litres Recall, 1 L = 1000 cm^3 Therefore, 1.5 L = 1.5 × 1 000 cm^3 = 1 500 cm^3 Answer: Total volume of milk is 1500 cm^3 **Example:** The aquarium below has length 50cm, breadth 20cm and height 30cm. What is the capacity of the aquarium in litres? 

Facts to Remember	**Illustration/ Example**
	Solution: Step 1: Find the volume of the aquarium. $= L \times B \times H$ $= 50cm \times 20cm \times 30cm = 30\ 000\ cm^3$ Step 2: Convert cm^3 to litres. Recall, $1\ L = 1000\ cm^3$ $6\ 000\ cm^3 = \frac{6\ 000}{1\ 000}\ L = 6\ L$ Answer: The capacity of the aquarium is 6 L. **Example:** A drinking glass holds 250ml of water. How many glasses of water are needed to fill a mug having a capacity of 2 litres? Solution: Recall, 1 000 mL = 1 L Capacity of mug in millilitres: $2\ L = 2 \times 1\ 000\ mL = 2\ 000\ mL$ No. of glasses needed to fill the mug = $\frac{2\ 000\ mL}{250\ mL} = 8$ Answer: 8 glasses of water are needed to fill a mug.

<table>
<tr><th colspan="2">B. MEASUREMENT - Mass</th></tr>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>

The **mass** of an object refers to how heavy an object can be because of the amount of matter it contains.

The standard unit of mass in the metric system is the **kilogram** (kg).

The **gram** (g) is the unit used for measuring very small objects.

1 kilogram = 1 000 grams

e.g.

A dictionary has a mass of approximately one kilogram.

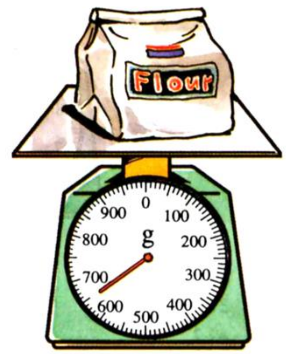
e.g.

A paperclip weighs about one gram.

</td><td>

Example:

What is the weight of the sack of flour in kilograms?



Solution:

1 kg = 1 000 g

The sack of flour weighs 650 g

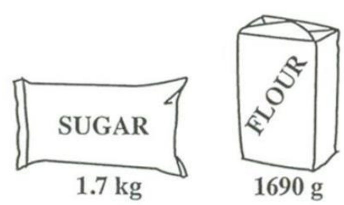
650 g = $\frac{650}{1000}$ = 0.65 kg

(R*ecall: To divide by 1000, move the decimal point 3 places to the left*)

Answer: The weight of the sack of flour is 0.65 kg

Example:

What is the difference in grams between the masses of the packs of sugar and flour shown below?



Solution:

Recall, 1 kg = 1 000g

Mass of sugar = 1.7 kg = 1 700 g

Mass of flour = 1 690 g

Mass of sugar – mass of flour = 1 700g – 1 690g
= 10 g

Answer: 10 g

</td></tr>
</table>

<table>
<tr><th colspan="2">B. MEASUREMENT - Time</th></tr>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr>
<td>

We can convert units of time:

60 seconds = 1 minute
60 minutes = 1 hour
24 hours = 1 day
7 days = 1 week
52 weeks = 1 year

Time is measured using a clock or a watch.

a.m. refers to morning.

p.m. refers to afternoon, evening and night.

</td>
<td>

Example:

Sam watched a movie that was 150 minutes long.
State the length of the movie in hours.

Solution:

1 hour = 60 minutes

150 minutes = $\frac{150}{60}$ = 2 $\frac{1}{2}$ hours

Answer: The movie was 2 $\frac{1}{2}$ hours long.

</td>
</tr>
<tr>
<td>

A clock or watch is called **analog** when the time is indicated by the positions of rotating hands on the face, and hours marked from 1 to 12.

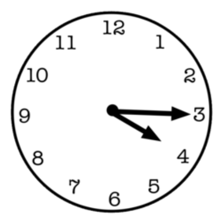
If it has three moving hands, then we can tell the **hours**, the **minutes**, and the **seconds**.

If it has two moving hands, then we can tell the hours and the minutes but not the seconds.

</td>
<td>

Example:

Ria and her family arrived at the mall in the afternoon at the time shown on the clock below. They spent $1\frac{3}{4}$ hours at the mall.
What time did Ria and her family leave the mall?



Solution:

Time shown on the clock is 4:15.

$1\frac{3}{4}$ hours later can be calculated as follows:

1 hour later is 5:15

$\frac{3}{4}$ hour later is 5:15 + 45 minutes = 6:00

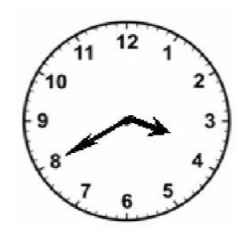
OR

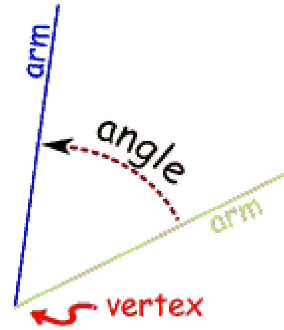
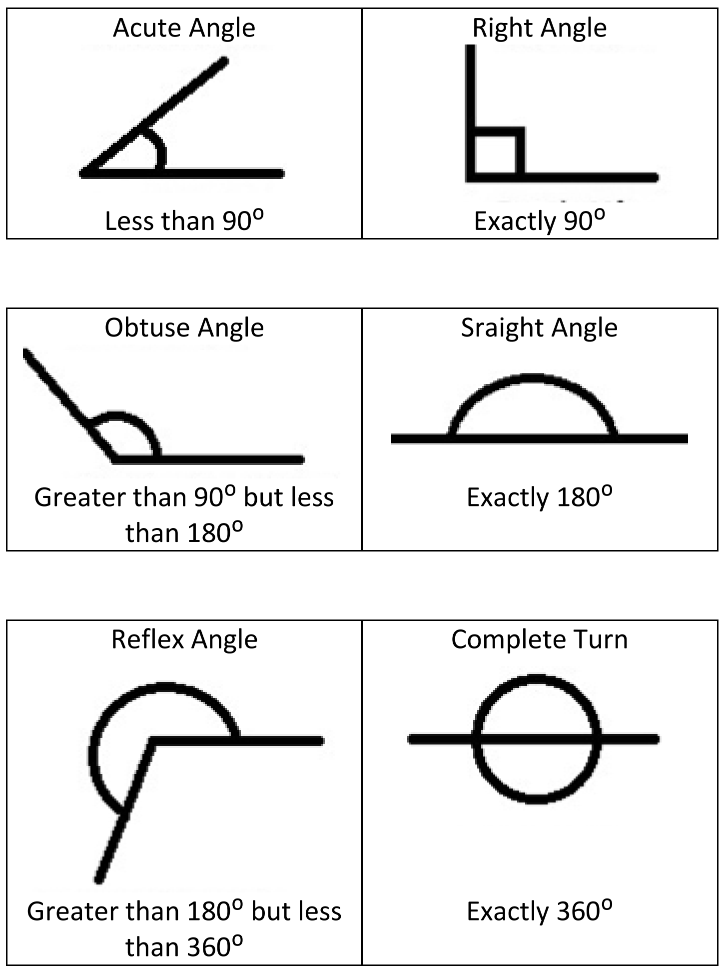
Computation can be done as follows:

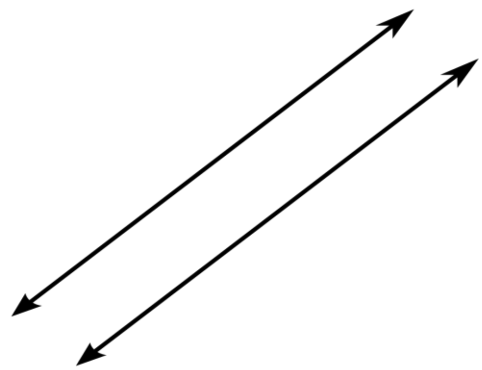
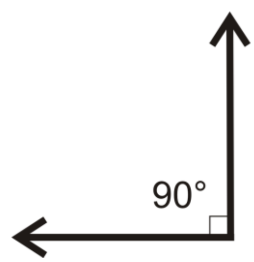
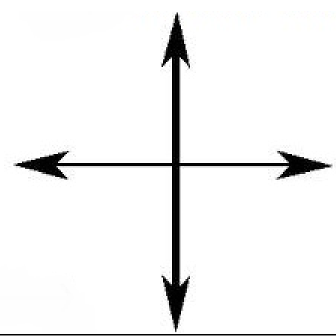
$$\begin{array}{rcl} \text{hr} & & \text{min} \\ 4 & : & 15 \\ \underline{1} & \underline{:} & \underline{45} \; + \\ \underline{6} & \underline{:} & \underline{00} \end{array} \quad \text{(15mins + 45mins = 60 mins = 1 hour)}$$

Answer: Ria and her family left the mall at 6 p.m.

</td>
</tr>
</table>

Facts to Remember	Illustration/ Example
A **digital** clock displays the time in numerals where the hours, minutes, and sometimes seconds are indicated by digits.  	**Example:** Write the time shown on the clock in digital notation.  Answer: 3:40 **Example:** Write the time shown on the clock in digital notation.  Answer: 8:00:06

C. GEOMETRY - Angles and Lines	
Facts to Remember	**Illustration/ Example**
An **angle** is the amount of turn between two straight lines at a fixed point (the **vertex**).	
Types of angles	

Facts to Remember	**Illustration/ Example**
A **straight line** is the shortest distance between two points.	
Parallel lines are always the same distance apart and will never meet or intersect.	**Example:** 
Perpendicular lines are at right angles (90^{O}) to each other.	**Example**:  **Example**: 

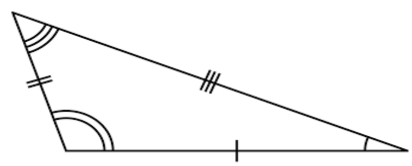
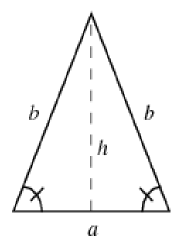
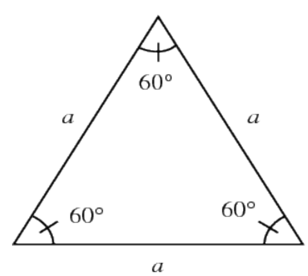
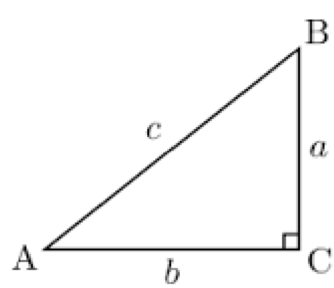
C. GEOMETRY - Plane Shapes

Facts to Remember

Types of Triangles:

A triangle is a three-sided plane shape.

A plane or flat shape has two dimensions.

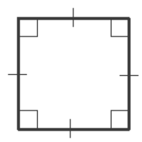
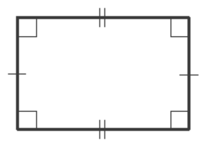
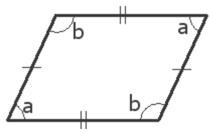
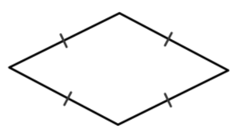
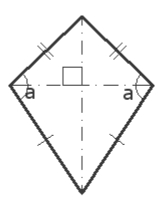
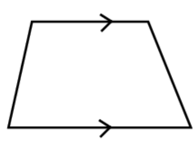
Name	Shape	Properties
Scalene Triangle		**No** two sides are equal; **No** two angles are equal
Isosceles Triangle		**Two** equal sides; **Two** equal angles
Equilateral Triangle		**Three** equal sides; **Three** equal 60° angles
Right-angled Triangle		A line is **perpendicular** to another if it meets or crosses it at right angles (90°). A **right angled triangle** has one 90°angle (right angle). The little square in the corner tells us it is a right-angled triangle.

Facts to Remember

Types of Quadrilaterals:

A quadrilateral is a four-sided plane shape.

A plane or flat shape has two dimensions.

Name	Shape	Properties
Square		All sides are equal; Opposite sides are equal and parallel; All angles are equal; All angles are right angles (90^{O})
Rectangle		Opposite sides are equal and parallel; Four equal angles; All angles are right angles (90^{O})
Parallelogram		Opposite sides are equal Opposite sides are parallel
Rhombus		All sides are equal; Opposite sides are parallel;
Kite		Two pairs of equal sides
Trapezium		One pair of opposite sides are parallel

<table>
<tr><th colspan="2">C. GEOMETRY - Solids</th></tr>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>

A **solid** has three dimensions.

A **face** is any of the flat or curved surfaces of a solid.

An **edge** is where two faces meet.

All solids have one or more edges and faces.

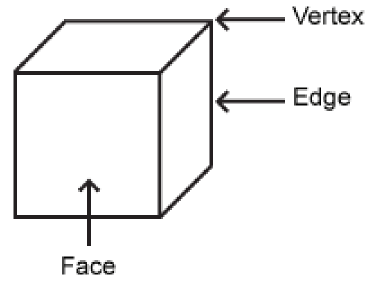
A **vertex** is a point where three or more edges meet.

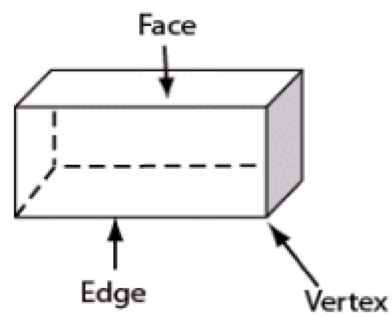
The plural of vertex is **vertices**.

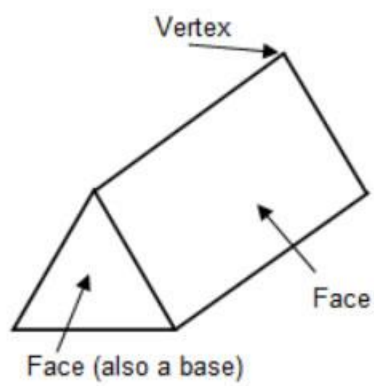
A solid may have no vertex, one vertex or more than one vertex.

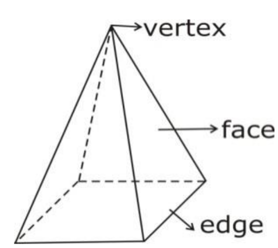
</td><td>

Examples:

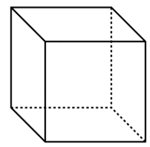
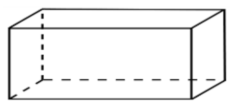
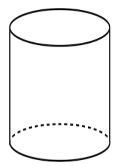
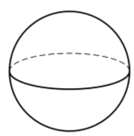
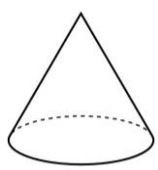
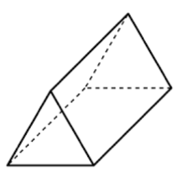
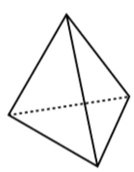
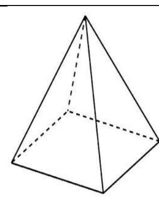


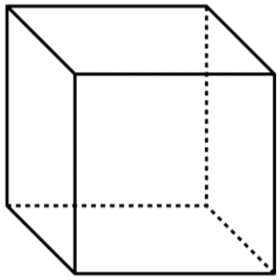
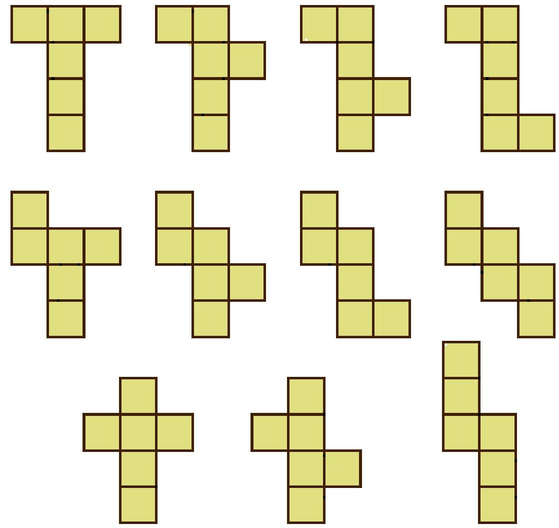
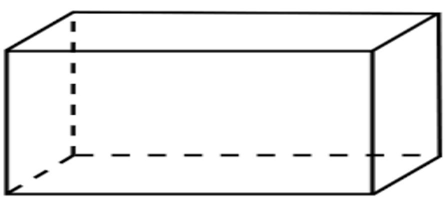
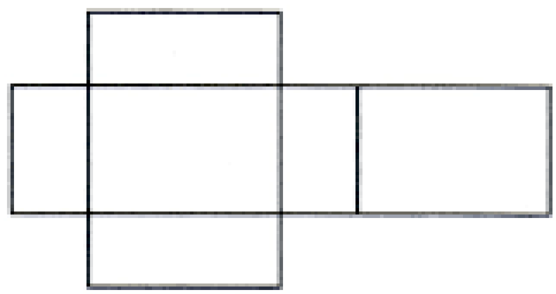
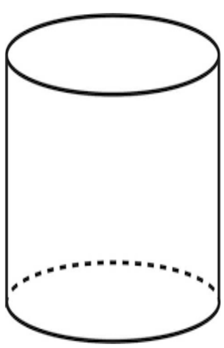
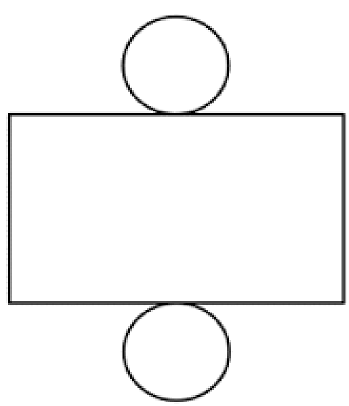


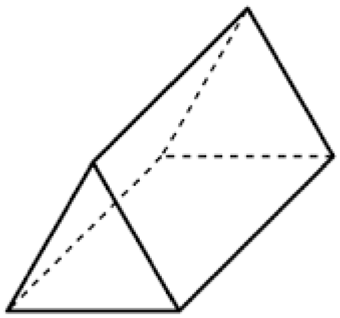
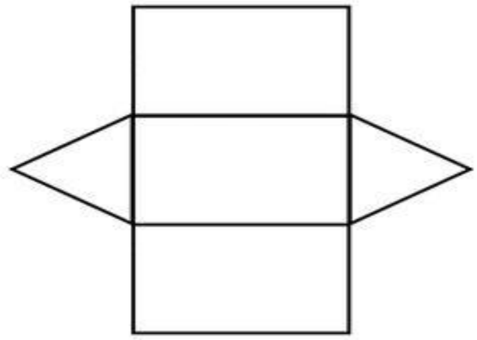
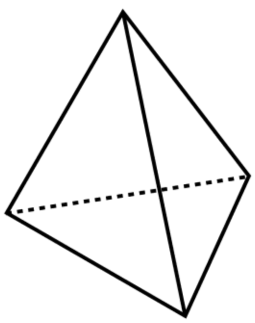
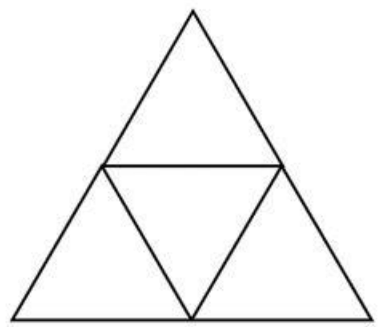
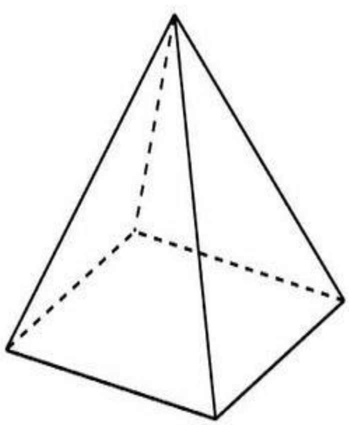
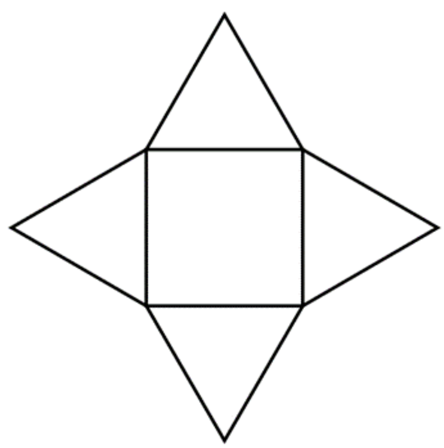


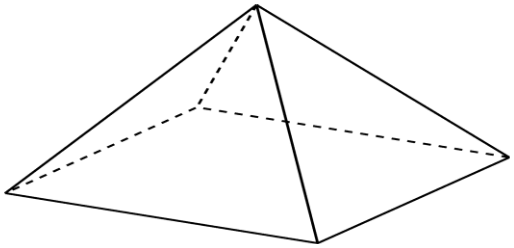
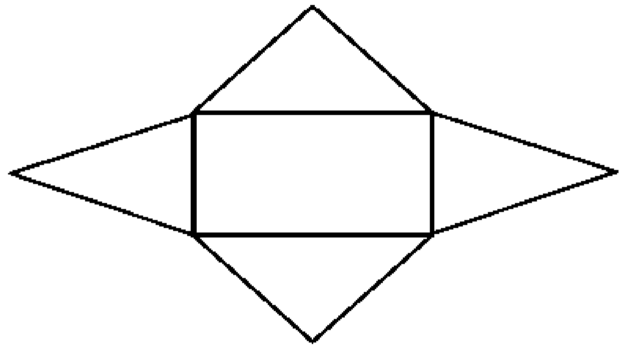
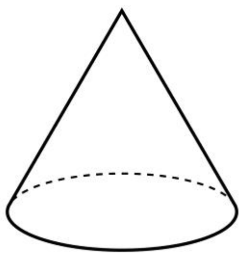
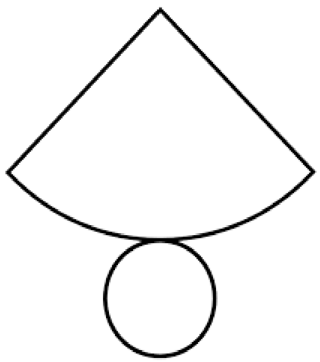
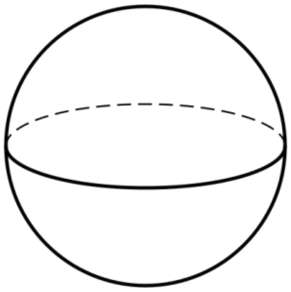


</td></tr>
</table>

Facts to Remember				
Types of Solids				
Name	Shape	No. of Edges	No. of Faces	No. of Vertices
Cube		12	6	8
Cuboid		12	6	8
Cylinder		2	3	0
Sphere		0	1	0
Cone		1	2	1 Apex
Triangular Prism		9	5	6
Triangular-based Pyramid		6	4	4
Square-based Pyramid		8	5	5

Facts to Remember	Illustration/ Example
Cube 	There are 11 nets of a cube 
Cuboid 	**Example:** Net of a cuboid 
Cylinder 	**Example:** Net of a Cylinder 

Facts to Remember	Illustration/ Example
Triangular Prism 	**Example:** Net of Triangular Prism 
Triangular-based Pyramid 	**Example:** Net of Triangular-based Pyramid 
Square-based Pyramid 	**Example:** Net of Square-based Pyramid 

Facts to Remember	Illustration/ Example
Rectangular-based Pyramid 	**Example:** Net of Rectangular-based Pyramid 
Cone 	**Example:** Net of a Cone 
Sphere 	

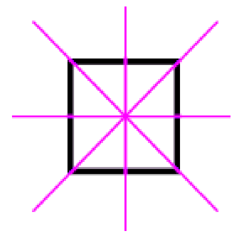
C. GEOMETRY - Symmetry

Facts to Remember

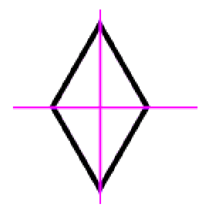
- A **line of symmetry** is any line along which a shape can be folded so that one half fits exactly onto the other half (no overlapping).
- The line of symmetry is also called the '**mirror line**'; it can be horizontal, vertical or at any angle.
- Some shapes have no lines of symmetry.
- A circle has an infinite number of lines of symmetry.

Illustration/ Example

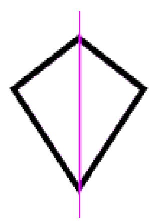
Examples:



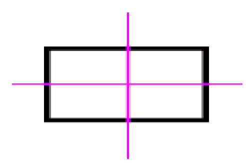
A square has 4 lines of symmetry



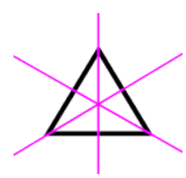
A rhombus has 2 lines of symmetry



A kite has 1 line of symmetry



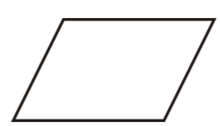
A rectangle has 2 lines of symmetry



An equilateral triangle has 3 lines of symmetry

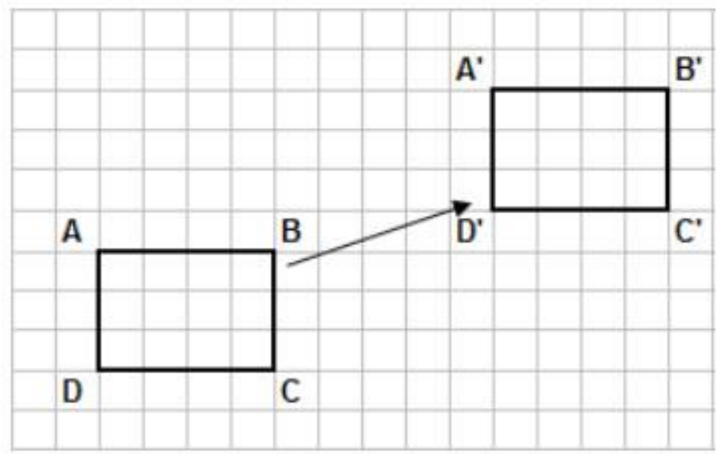
Non-examples_

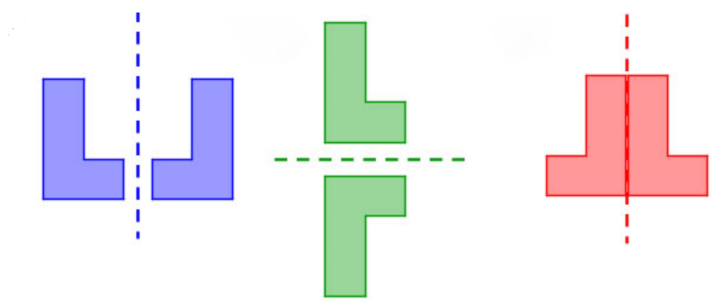
The scalene triangle does not possess any lines of symmetry.



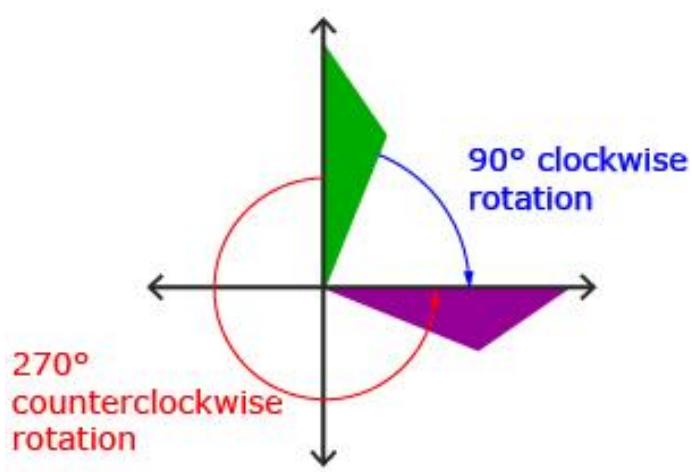
The parallelogram does not possess any lines of symmetry.

<table>
<tr><th colspan="2">C. GEOMETRY - Slides, Flips and Turns</th></tr>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>A slide is the movement of an object in a straight line.

When you slide an object,
the position changes
the image is the same size as the object
the image is the same shape as the object
the orientation of the object and its image is the same.</td><td>Example:

</td></tr>
<tr><td>A flip of an object will create a mirror image.

When you flip an object,
the position changes
the image is the same size as the object
the image is the same shape as the object but the orientation changes
the distances of the object and its image from the mirror line are the same.</td><td>Example:
</td></tr>
<tr><td>A turn means to rotate about a point. A turn is also called a rotation.

A complete turn measures 360°
$\frac{1}{4}$ turn measures 90°
$\frac{1}{2}$ turn measures 180°
$\frac{3}{4}$ turn measures 270°

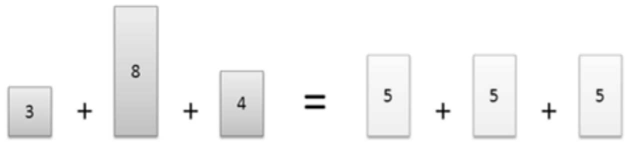
When you turn an object,
the position changes
the image is the same size as the object
the image is the same shape as the object
the orientation of the object and its image is the same.
In a complete turn the object and its image are in the same position.</td><td>Example:

</td></tr>
</table>

D. STATISTICS

Facts to Remember

The **Mean** is that quantity which represents an even spread for a set of values.

Mean of the numbers 3, 8 and 4 is 5.

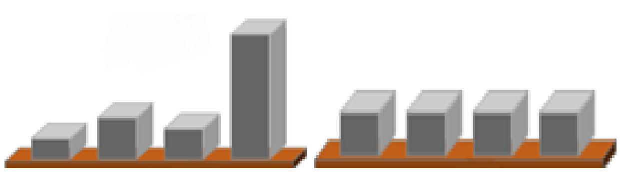


$$\frac{3+8+4}{3} = \frac{15}{3} = 5$$

Mean of the numbers 6, 11 and 7 is 8.

$$\frac{6+11+7}{3} = \frac{24}{3} = 8$$

Mean of the numbers 4, 8, 6 and 18 is 9.



4 + 8 + 6 + 18 = 9 + 9 + 9 + 9

$$\frac{4+8+6+18}{4} = \frac{36}{4} = 9$$

To calculate the **mean**:

- **Add** all the numbers.
- **Divide by how many** numbers that were added.

The **Mode** refers to the value or item that is most popular or the one which occurs most frequently in a set of data.

Illustration/ Example

Example:

The table below shows Adam's cricket scores for five days in a week.

Calculate his mean score for that week.

Days of the Week	Cricket Scores
Monday	9
Tuesday	11
Wednesday	17
Thursday	28
Friday	15

Solution:

Mean score = $\frac{9+11+17+28+15}{5} = \frac{80}{5} = 16$

Answer: Adam's mean score for that week is 15.

Example:

The mean of 20 and 10 is the same as the mean of 16 and another number.

What is the other number?

Solution:

Mean of 20 and 10 = $\frac{20+10}{2} = \frac{30}{2} = 15$

If the mean of 16 and another number is 15, then the total of these two numbers is $15 \times 2 = 30$.

Since 16 is one of the numbers, the other number is $30 - 16 = 14$

Answer: The other number is 14.

Example:

Find the mode, for the following shirt sizes:
13, 18, 13, 14, 13, 16, 14, 21, 13

Answer: The modal shirt size is 13.

Facts to Remember	**Illustration/ Example**
Frequency Table / Tally Chart	**Example:**

The scores awarded for a test given to a Standard 5 class of 12 students were as follows:
6, 7, 5, 7, 7, 8, 7, 6, 7, 6 , 8, 7

a) Construct a tally chart for the scores.
b) Calculate the mean.
c) Find the mode.

Solution:

a)

Step 1:
Construct a table with three columns. The first column shows what is being tallied.

Step 2.
The 1st score is 6, so put a tally mark against 6 in the 2nd column. The 2nd score is 7, so put a tally mark against 7 in the 2nd column. The 3rd score is 5, so put a tally mark against 5 in the 3rd column. Continue to tally **all** scores. **Remember, every 5th tally mark is drawn across the previous 4 tally marks.**

Step 3:
Count the number of tally marks for each score and write it in third column.

Answer:

Tally of Scores awarded to Students

<table>
<tr><th>Score</th><th>Tally</th><th>Frequency</th></tr>
<tr><td>5</td><td>|</td><td>1</td></tr>
<tr><td>6</td><td>|||</td><td>3</td></tr>
<tr><td>7</td><td>𝍸 |</td><td>6</td></tr>
<tr><td>8</td><td>||</td><td>2</td></tr>
</table>

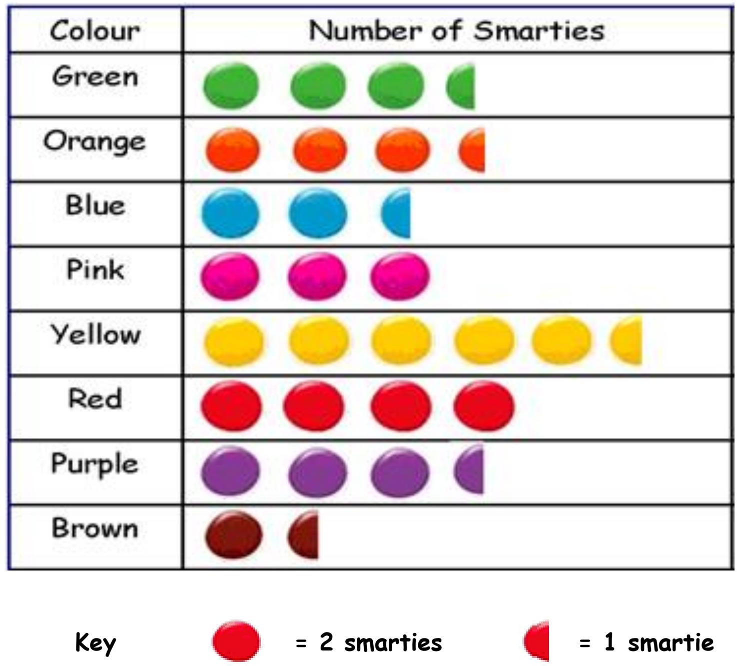
b) Mean $= \frac{6+7+5+7+7+8+7+6+7+6+8+7}{12}$

$= \frac{81}{12} = 6.75$

Answer: The mean score is 6.75.

c) Answer: Mode or Modal Score is 7.

Facts to Remember	Illustration/ Example
A **Pictograph** is a way of representing data using pictures. Each picture represents a certain number of items.	**Example:** The pictograph below represents the number of smarties in a pack:

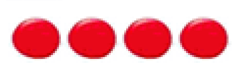


a) How many red smarties were in the pack?
b) What was the modal colour?
c) Which coloured smarties were equal in number?
d) What was the total number of smarties in the pack?
e) What fraction of the total number of smarties was pink?

Solution:

a)

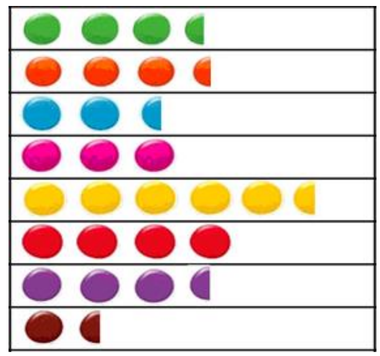
If  represent s 2 smarties

Then  represents 2×4 = 8 smarties

Answer: 8 red smarties were in the pack

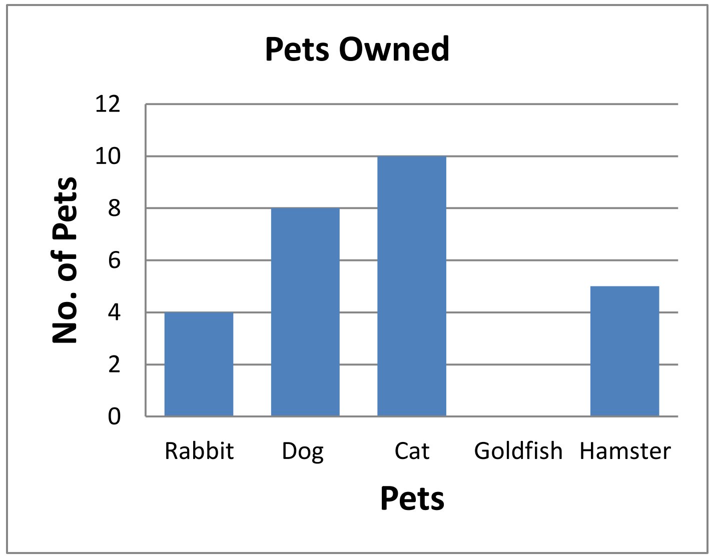
b) Yellow smarties occurred the most.

Answer: Yellow is the modal colour

Facts to Remember	**Illustration/ Example**
	c) There were 7 green smarties, 7 orange smarties and 7 purple smarties. Answer: The green, orange and purple coloured smarties were equal in number. d)  7 Green 7 Orange 5 Blue 6 Pink 11 Yellow 8 Red 7 Purple 3 Brown TOTAL 54 Answer: The total number was 54 smarties (e) No. of pink smarties = 6 Total no. of smarties = 54 $\frac{\text{No. of pink smarties}}{\text{Total no. of smarties}} = \frac{6}{54} = \frac{1}{9}$ Answer: $\frac{1}{9}$ of the total number of smarties were pink

<table>
<tr><th>Facts to Remember</th><th>Illustration/ Example</th></tr>
<tr><td>A Bar Graph is a graphical display of data using bars of different heights or lengths.</td><td>
Example:

The incomplete bar graph below shows the pets owned by 32 students in a Standard 5 class.



a) How many more students own cats than rabbits?
b) What percent of the class owns dogs?
c) How many students own hamsters?
d) Complete the graph by drawing the bar to represent the number of students who own goldfish.

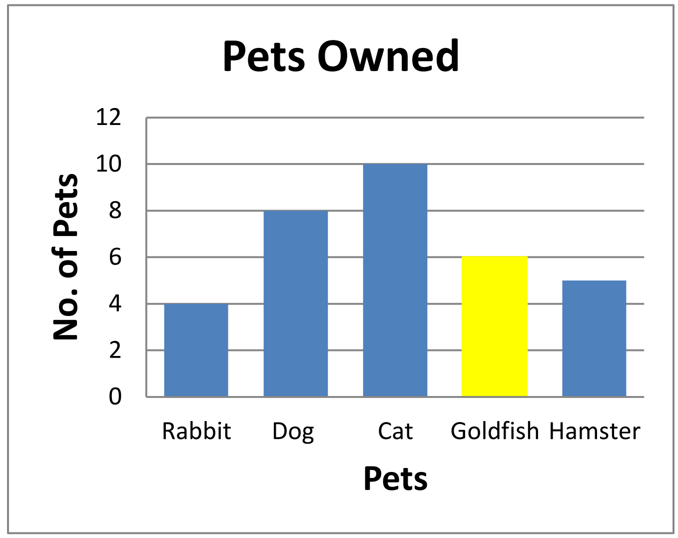
Solution:

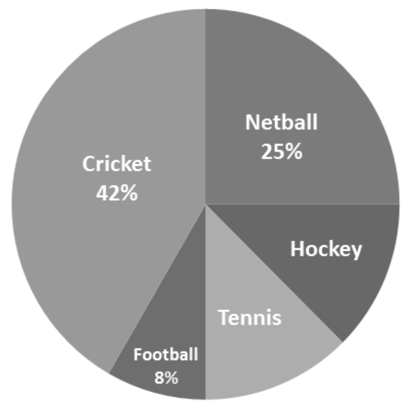
a) No. of students who own cats = 10
No. of students who own rabbits = 4
No. who own cats – No. who own rabbits
= 10 – 4
= 6

Answer: 6 more students own cats than rabbits

b) No. of students who own dogs = 8
Total no. of students in the class = 32
Percent of the class who owns dogs
$= \frac{8}{32} \times \frac{100}{1} = 25\%$

Answer: 25% of the class owns dogs.
</td></tr>
</table>

Facts to Remember	Illustration/ Example
	c) Answer: 5 students own hamsters d) Answer: 

Facts to Remember	Illustration/ Example
A **Pie Chart** uses sectors of a circle to show information. The pie chart represents the whole or 100%	**Example:** The pie chart represents the sports students play at Excel Primary Academy. 50 students at the school play Netball. a) How many students are there in the school? b) How many students play football? c) If an equal number of students play Hockey and Tennis, what fraction of the students play Hockey?  Solution: a) No. of students who play Netball =50 Percent of students who play Netball = 25% 25% of the school population = 50 students 1% of the school population = $\frac{50}{25}$ students 100% of the school population = $\frac{50}{25} \times \frac{100}{1}$ students = 200 students Answer: There are 200 students in the school b) No. of students who play football = 8% of 200 students = $\frac{8}{100} \times \frac{200}{1}$ students = 16 students Answer: 16 students play football

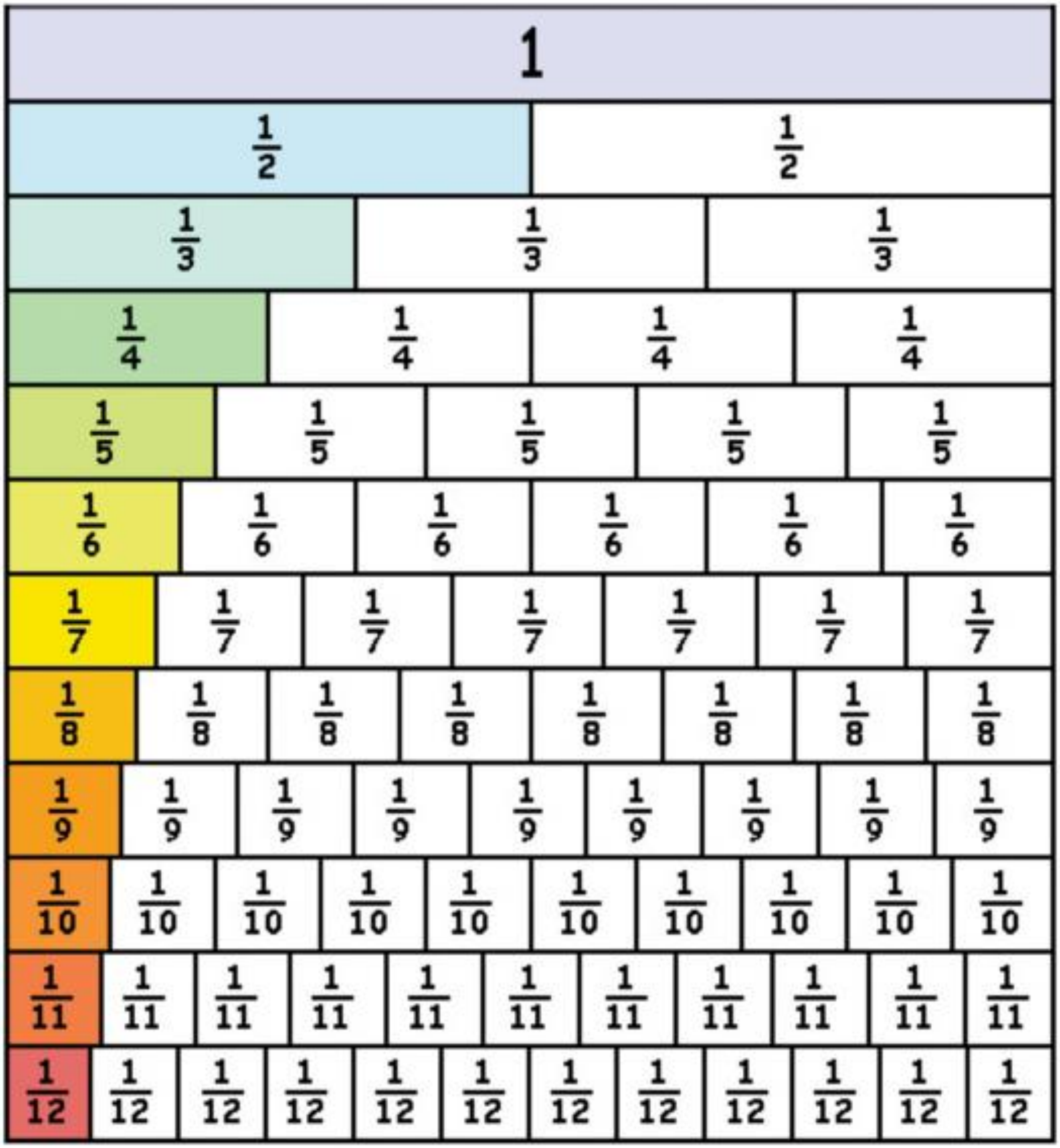
Facts to Remember	Illustration/ Example
	c) Percent who play Hockey $= \frac{100\% - (25\% + 42\% + 8\%)}{2}$ $= \frac{100\% - 75\%}{2}$ $= \frac{25\%}{2}$ = 12.5% Fraction of the students who play Hockey $= \frac{\text{Percent who play Hockey}}{100\%}$ $= \frac{12.5\%}{100\%}$ $= \frac{1}{8}$ Answer: $\frac{1}{8}$ of the students play Hockey

Mathematics Facts

Squares, Roots and Cubes

Square Numbers				Square roots				Cube Numbers		
0^2	=	**0**		$\sqrt{1}$	=	1		0^3	=	**0**
1^2	=	**1**		$\sqrt{4}$	=	2		1^3	=	**1**
2^2	=	**4**		$\sqrt{9}$	=	3		2^3	=	**8**
3^2	=	**9**		$\sqrt{16}$	=	4		3^3	=	**27**
4^2	=	**16**		$\sqrt{25}$	=	5		4^3	=	**64**
5^2	=	**25**		$\sqrt{36}$	=	6		5^3	=	**125**
6^2	=	**36**		$\sqrt{49}$	=	7		6^3	=	**216**
7^2	=	**49**		$\sqrt{64}$	=	8		7^3	=	**343**
8^2	=	**64**		$\sqrt{81}$	=	9		8^3	=	**512**
9^2	=	**81**		$\sqrt{100}$	=	10		9^3	=	**729**
10^2	=	**100**		$\sqrt{121}$	=	11		10^3	=	**1000**
11^2	=	**121**		$\sqrt{144}$	=	12				
12^2	=	**144**		$\sqrt{169}$	=	13				
13^2	=	**169**		$\sqrt{196}$	=	14				
14^2	=	**196**		$\sqrt{225}$	=	15				
15^2	=	**225**								
16^2	=	**256**								
17^2	=	**289**								
18^2	=	**324**								
19^2	=	**361**								
20^2	=	**400**								
30^2	=	**900**								
40^2	=	**1600**								
50^2	=	**2500**								

Fraction Wall



Equivalence

Fraction	Decimal	Percent
$\frac{1}{2}$	0.5	50%
$\frac{1}{3}$	0.333…	$33.3\dot{3}\%$
$\frac{2}{3}$	0.666…	$66.6\dot{6}\%$
$\frac{1}{4}$	0.25	25%
$\frac{3}{4}$	0.75	75%
$\frac{1}{5}$	0.2	20%
$\frac{2}{5}$	0.4	40%
$\frac{3}{5}$	0.6	60%
$\frac{4}{5}$	0.8	80%
$\frac{1}{8}$	0.125	12.5%
$\frac{3}{8}$	0.375	37.5%
$\frac{5}{8}$	0.625	62.5%
$\frac{7}{8}$	0.875	87.5%
$\frac{1}{10}$	0.1	10%
$\frac{3}{10}$	0.3	30%
$\frac{7}{10}$	0.7	70%
$\frac{9}{10}$	0.9	90%

Equivalent Fractions

$$\frac{1}{2} = \frac{2}{4} = \frac{4}{8} = \frac{5}{10} = \frac{50}{100}$$

$$\frac{1}{4} = \frac{2}{8} = \frac{25}{100}$$

$$\frac{1}{5} = \frac{2}{10} = \frac{20}{100}$$

$$\frac{2}{5} = \frac{4}{10} = \frac{40}{100}$$

$$\frac{3}{5} = \frac{6}{10} = \frac{60}{100}$$

$$\frac{4}{5} = \frac{8}{10} = \frac{80}{100}$$

Problem Solving involving Money

Cost Price: Price the retailer pays for an item

Selling Price: Price at which the retailer sells an item

A **profit** is gained when an article is sold for ***more*** than what it cost

Profit = Selling Price – Cost Price

Profit % $= \dfrac{\text{Profit}}{\text{Cost Price}} \times 100$

$= \dfrac{\text{Selling Price} - \text{Cost Price}}{\text{Cost Price}} \times 100$

A **loss** is made when an article is sold for ***less*** than what it cost.

Loss = Cost Price – Selling Price

Loss % $= \dfrac{\text{Loss}}{\text{Cost Price}} \times 100$

$= \dfrac{\text{Cost Price} - \text{Selling Price}}{\text{Cost Price}} \times 100$

Profit and loss are often expressed as percentages of the cost price. They are often called **gain or profit percent** or **loss percent**.

A **Discount** is the difference between the Marked Price and the Selling Price. It is a reduction in the Marked Price.

% Discount $= \dfrac{\text{Discount}}{\text{Marked Price}} \times 100$

$= \dfrac{\text{Marked Price} - \text{Selling Price}}{\text{Marked Price}} \times 100$

Value Added Tax or **V.A.T.** is tax on goods and services. It is included in the total cost.

V.A.T. is charged at a rate of 12.5% or $\frac{1}{8}$ of the value of the goods or services.

Plane Shapes and Measures

TRIANGLE

Perimeter:	Side + Side + Side		
Side:	Perimeter – (Side + Side)		
Area:	$\frac{B \times H}{2}$	OR	$\frac{1}{2} \times B \times H$

SQUARE

Perimeter:	Side $\times$ 4
Side:	Perimeter $\div$ 4
Area:	Side $\times$ Side
Side:	$\sqrt{\text{Area}}$

RECTANGLE

Perimeter:	(L + B) $\times$ 2	OR	2L + 2B
Area:	L $\times$ B		
Length:	A $\div$ B		
Breadth:	A $\div$ L		

CIRCLE

Circumference:	$D \times \pi$		
Diameter:	$C \div \pi$	OR	$2 \times r$
Radius:	D $\div$ 2	OR	$\frac{1}{2} \times D$

Use $\pi = \frac{22}{7}$

Solids and Measures

CUBE

Volume:	$S \times S \times S$	OR	S^3
Side:	$\sqrt[3]{\text{Volume}}$		
Surface Area:	$S \times S \times 6$	OR	Area of Face $\times 6$

CUBOID

Volume:	$L \times B \times H$
Length:	$\frac{\text{Volume}}{B \times H}$
Breadth:	$\frac{\text{Volume}}{L \times H}$
Height:	$\frac{\text{Volume}}{L \times B}$

Metric System

Quantity	Unit of measure	Other Units of measure	Conversion of Units
Length	**metre (m)**	millimetre (mm) centimetre (cm) kilometre (km)	10 millimetres = 1 centimetre 100 centimetres = 1 metre 1000 metres = 1 kilometre
Mass	**gram (g)**	kilogram (kg)	1 kilogram = 1000 grams
Area	**square metres (m^2)**	square centimetres (cm^2) square kilometres (km^2)	1 square metre = 10 000 square centimetres 1 m^2 = 100 cm x 100 cm = 10 000 cm^2
Volume	**cubic metres (m^3)** *(for solids and liquids)*	cubic centimetre (cm^3)	1 litre = 1000 millilitres 1 millilitre = 1 cm^3 1 000 ml = 1 000 cm^3
	litre (l or L) *(for liquids)*	millilitre (ml or mL)	
Time	**hour (hr)**	minute (min), second (s)	1 hour = 60 minutes 1 minute = 60 seconds

Strategy for Solving Problems

Step 1: Understand the Problem

- ✖ Read the problem carefully.
- ✖ Identify what information you are given (known) and what you are asked to find or show (unknown).
- ✖ Can you restate the problem in your own words?
- ✖ Draw a picture or diagram to help you understand the problem.
- ✖ Is this problem similar to another problem you have solved?

Step 2: Devise A Plan

- ✖ Can one of the problem solving strategies you know be used?
- ✖ Often a considerable amount of creativity is required to develop a plan.

- Look for a Pattern
- Draw a Picture/Diagram
- Use Objects
- Solve a Simpler Problem
- Guess and Check
- Make an Organized List/Table
- Act It Out
- Work Backwards
- Use a Number Sentence
- Use Logical Reasoning

Step 3: Carry Out The Plan

- ✖ Implement your chosen strategy/strategies until the problem is solved.
- ✖ Check each step in your solution as you implement it.
- ✖ Can you see clearly if each step is correct?
- ✖ Can you prove it?
- ✖ Don't be afraid to start over, modify, or change your plan.
- ✖ Give yourself a reasonable length of time to solve the problem.

Step 4: Look Back

- ✖ Carefully examine the solution obtained.
- ✖ Is your answer reasonable?
- ✖ Can you check the results in the reverse order?
- ✖ Have you checked that all the relevant information was used?
- ✖ Are the appropriate units of measure stated?