LESSON 1

Equal and Equivalent sets

Definition:

- Equal sets are sets with the same type and same number of members/elements.
- Equivalent sets are sets with same number of members which may not necessarily be of the same type.

Examples

(i) P = {0, 2, 4, 6, 8} and Q = {2, 4, 6, 8, 0}
P and Q are **equal sets**.
We write P = Q.

(ii) X = {1, 2, 3, 4} and Y = {a, b, c, d}
X and Y are **equivalent sets.**
We can also write $X \leftrightarrow Y$
Or : $X \equiv Y$

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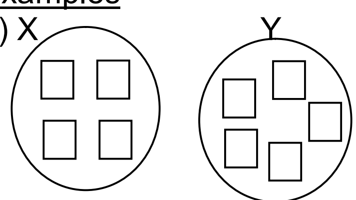
LESSON 2

Unequal sets

Unequal sets are sets with different number of members.

Examples

(i)



$X \neq Y$

X and Y are unequal sets.

(ii) P = {m, n, o, p, q} and Q = {1, 3, 5, 7, 9, 11, 13}
P and Q are unequal sets.

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LESSON 3

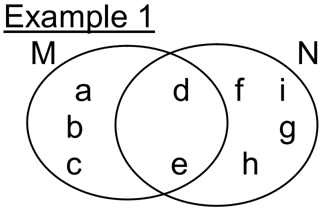
Intersection and Union of sets

Definition:

- Intersection of sets refers to the common elements in a given number of sets.
- Union of sets refers to the collection of all elements / members in the given sets together.

NB: When listing the members in a union of sets, the common members are listed once.

Example 1



List the elements of; (i) MnN (ii) MUN

Example 2

P = {1, 2, 3, 4, 5, 6} and R= {0, 2, 4, 6, 8}

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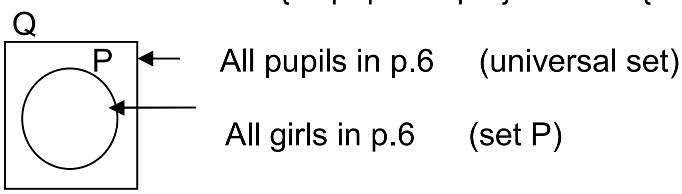
LESSON 4

Universal sets

A set of all members in the union set plus those outside the union set.

Example

Given that set Q = {all pupils in p.6} and P = {all girls in p.6}



Set P is part of set Q. Set P is a subset of set P.
Set Q is a universal set of P.

More on universal sets

A = {days of the week starting with letter T} B = {first 4 days}
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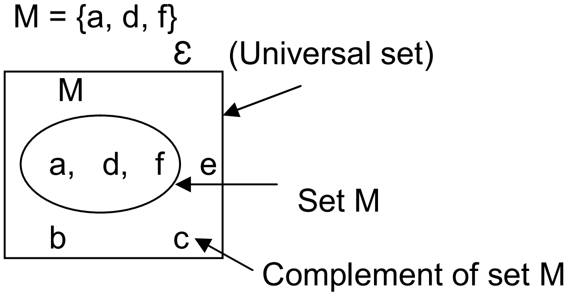
LESSON 5

Complement of sets

The complement of sets refers to a list of elements that do not belong to a particular / stated set.

Example

Given that Σ = {a, b, c, d, e,f}
M = {a, d, f}



We write; (M’) = {b, c, e}

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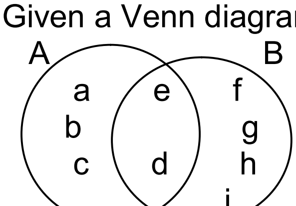
LESSON 6

Difference of sets

Example

Given a Venn diagram showing set A and B below



(i) Elements of set A which are not in B = {a, b, c}.
We write; A – B = {a, b, c}

- They are members of set A only.

(ii) Elements of set B which are not in A = {f, g, h, i}
We write; B – A = {f, g, h, i}

- They are members of set B only.

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LESSON 7

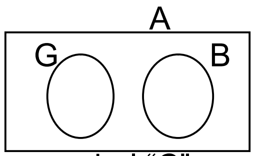
Subsets

Given that A is a set of all pupils in primary six.

G = {a set of pupils who are girls in primary six}

B = {a set of all pupils who are boys}

Set G and B are subsets of set A as can be seen on the Venn diagram below.



The symbol “C” means “is a subset of”

Listing all subsets from a given set.

Note:

- An empty set and the given set are subsets of any set.
- The list starts with an empty set and ends with the major set itself.

Examples

(i) A = {a} Subsets of set A are as listed below.

{ } , {a}

(ii) B = {a, b} Subsets of set B are; { } , {a} , {b} , {a, b}

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LESSON 8

Finding the number of subsets.

NOTE:

- A set with one element can be used to form 2 subsets.
- A set with two members can be used to form 4 subsets.
- A set of three members can be used to form 8 subsets.

Therefoer, Number of subsets = 2^n

Example

A = {x, y, z}. Find number of subsets in set A.

Solution

2^n = No. of subsets

Where n stands for number of elements in the given set.

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

4×2

$= 8$ subsets

(ii) How many subsets can be obtained from a set which has six members?

Solution

2^n = No. of subsets

$2^6 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$4 \times 4 \times 2$

16×2

$= 64$ subsets

Finding the number of proper subsets.

Formula:

$2^n - 1$ = No. of proper subsets.

<u>Example 1</u>

Find the number of proper subsets in a set with 3 elements.

$2^n - 1$ = No. of proper subsets

$2^3 - 1 = (2 \times 2 \times 2) - 1$

$8 - 1$

$= 7$ proper subsets

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LESSON 9

<u>Finding the number of elements when the number of subsets is given</u>

Example

Find the number of elements in a set which has 16 subsets.

Steps

- Prime factorize the given number of subsets.

$$\begin{array}{r|l} 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \\ \hline & 1 \end{array}$$

- Express the prime factors in powers of 2.

$16 = 2 \times 2 \times 2 \times 2$

$= 2^4$

- Apply the formula for number of subsets.

2^n = No. of subsets

$2^n = 16$

$2^n = 2^4$

- Council the bases and remain with the powers.

n = 4 elements.

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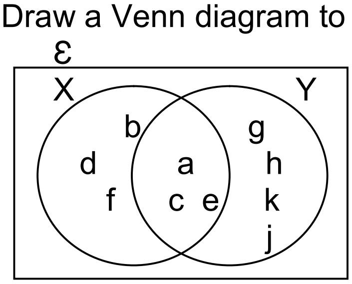
LESSON 10

<u>Solving problems using a Venn diagram.</u>

Example

If X = {a, b, c, d, e, f} and Y = {a, c, e, g, h, i, j}

(i) Draw a Venn diagram to show the intersection of X and Y.



(ii) How many elements are in set X?

(iii) Find n(Y)

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LESSON 11

<u>Drawing a Venn diagram for number of elements.</u>

Given that A = {a, b, c, d, e, f, g, u} and B = {d, e, f, g, h, I, j, k}

- Comparing listed elements with number of elements in A and B.

A = {a, b, c, d, e, f, g, u} and B = {d, e, f, g, h, I, j, k}

n(A) = 7

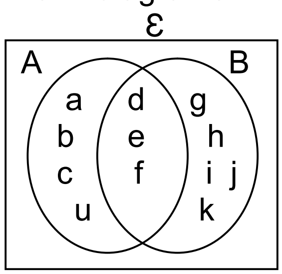
n(B) = 8

AnB = {d, e, f} n(AnB)= 3

A-B = {a, b, c, u} n(A-B) = 4

B-A = {g, h, I, j, k} n(B-A) = 5

Venn diagrams



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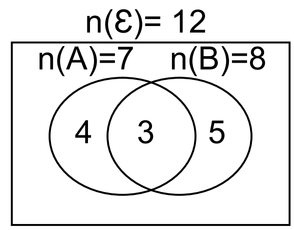
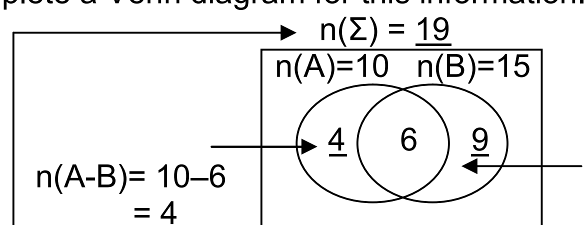


LESSON 12

<u>Drawing and representing information on Venn diagrams.</u>

Given that ; n(A) = 10, n(B) = 15, n(AnB) = 6.

Draw and complete a Venn diagram for this information.



n(A-B)= 10–6
= 4

n(B-A)=15-6
= 9

n(Σ) = 4 + 6 + 9
= 19

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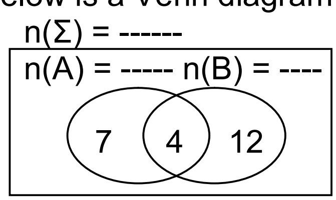
Lesson 13

<u>Finding number of elements in sets.</u>

Below is a Venn diagram showing number of elements in set A and B.



(a) How many elements are in set A?
n(A) = 7 + 4
= 11

(b) Find the number of elements in set B.
n(B) = 4 + 14
= 16

(c) Find the number of elements in the universal set.
n(Σ) = 7 + 4 + 12
= 23

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LESSON 14

<u>Probability</u>

Definition

- Probability is the measure of chances.
- The chance of an event occuring.

Formula;

Prob. = $\frac{\text{n(Expected outcome)}}{\text{n(Possible outcome)}}$

Prob. = $\frac{\text{n(Event)}}{\text{n(Sample space}}$

Prob. = $\frac{n(E)}{n(S)}$

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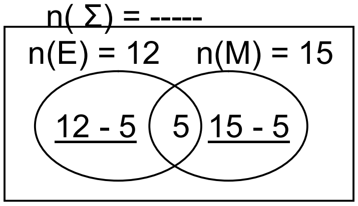
LESSON 15

Application of sets.

In a class, 12 pupils like English (E), 15 pupils like Maths (M) and 5 pupils like both Maths and English.

(a) Show the information on a Venn diagram.

n(Σ) = -----



(b) How many pupils like Maths only?

(c) How many pupils like English only?

(d) How many pupils are in the class?

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LESSON 16

More application of sets

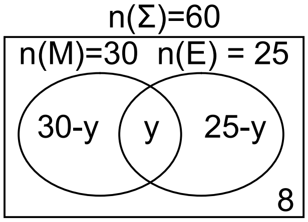
Example

In a class of 60 pupils, 30 pupils like Mathematics (M), 25 pupils like English (E) and 8 pupils like none of the two subjects.

(a) Draw a Venn diagram and fill in the information.

Let y be the number of pupils who like both subjects.

n(Σ)=60



(b) Find the number of pupils who like both subjects.

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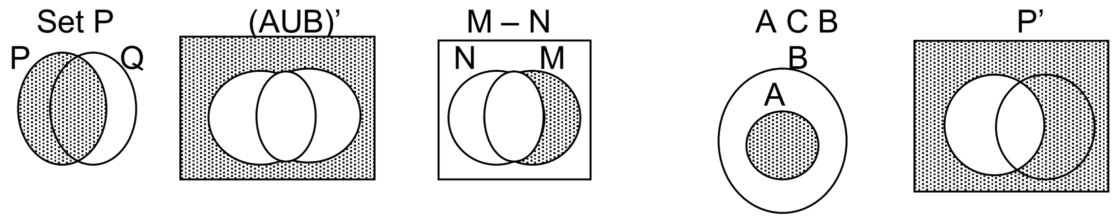
LESSON 17

Shading and naming different parts of a Venn diagram



LESSON 18

<u>Place values and Values of digits in whole numbers</u>

The table below shows the order of place values of whole numbers.

Etc	T/Th	Th	H	T	O

Examples

1. Find the place values of 5 in the number; 653,401

H/Th	T/Th	Th	H	T	O
6	5	3	4	0	1

Tens of thousands

2. Find the value of 4 in; 1,024,893

M	H/Th	T/Th	Th	H	T	O
1	0	2	4	8	9	3

4 Thousands = 4 x 1000
= 4,000

<u>Note;</u> A digit multiplied by its place value gives it value.

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<u>LESSON 19</u>

<u>Expanding whole numbers</u>

Numbers can be written in expanded form using;

(i) Place values.

(ii) Values.

(iii) Powers of base ten.

Examples

1. Write 46,627 in expanded form.

(i) Using place values

T/th	Th	H	T	O
4	6	6	2	7

46,627 = (4 x 10000) + (6x1000) + (6x100) + (2x10) + (7 x 1)

(ii) Using values.

T/th	Th	H	T	O
4	6	6	2	7

7x1 = 7
2 x 10 = 20
6 x 100 = 600
6 x 1,000 = 6,000
4 x 10,000 = 40,000

46,627 = 40,000 + 6,000 + 600 + 20 + 7

(iii) Using powers

10^4	10^3	10^2	10^1	10^0
4	6	6	2	7

46,627 = $(4 \times 10^4) + (6 \times 10^3) + (6 \times 10^2) + (2 \times 10^1) + (7 \times 10^0)$

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LESSON 20

Writing the expanded number as a single number

Examples

1. What number has been expanded to give;

400,000+ 60,000 + 7,000 + 90 + 2

- Add the values to come up with a single number.

$$\begin{array}{r} 400{,}000 \\ 60{,}000 \\ 7{,}000 \\ 90 \\ +\quad 2 \\ \hline 467{,}092 \\ \hline \end{array}$$

2. Express $(3 \times 10^4) + (5 \times 10^2) + (9 \times 10^1) + (4 \times 10^0)$ as a single number.

$(3 \times 10^4) = (3 \times 10000) = 30000$

$(5 \times 10^2) = (5 \times 100) = 500$

$(9 \times 10^1) = (9 \times 10) = 90$

$(4 \times 10^0) = (4 \times 1) = + 4$

$= \underline{\mathbf{30594}}$

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LESSON 21

Writing number figures in words

Example

Write **1,486,019** in words.

Millions	Thousands			Units		
M	H/Th	T/Th	Th	H	T	O
1	4	8	6	0	1	9

1,486,019 = One million, four hundred eighty six thousand, nineteen.

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LESSON 22

Writing number words in figures.

Example

1. Write in figures; five million, four hundred thousand, seven hundred sixteen.

Five million = 5,000,000

Four hundred thousand = 400,000

Seven hundred sixteen = + 716

= 5,400,716

2. Write eighteen million, three hundred seventy five thousand, nine hundred twenty six in figures.

Millions		Thousands			Units		
T/M	M	H/Th	T/Th	Th	H	T	O
1	8	3	7	5	9	2	6

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LESSON 23

Rounding off a whole number to the required place values

Examples

1. Round off 1648 to the nearest hundreds.

Th H|T O {4 is nearer to 0 than 10 so you add 0 to the digit in hundreds}

1 6 4 8

+ **0**

1600

:. 1648 $\simeq$ 1600

2. Round off 68,729 to the nearest thousands.

T/Th Th|H T O

6 8 7 2 9

+ 1 .

6 9 0 0 0

:. 68,729 $\simeq$ 69,000

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LESSON 24

Basic Roman Numerals

Hindu arabic	1	5	10	50	100	500	1000
Roman Numerals	I	V	X	L	C	D	M

Changing Roman Numerals to Hindu Arabic Numerals

Examples

1. Write CXXVI in Hindu Arabic Numerals.

CXXVI = C + XX + VI

100 + 20 + 6

= 126

2. Write CCCXCIX in Hindu Arabic Numerals.

CCCXCIX = CCC + XC + IX

300 + 90 + 9

= 399

3. Write DCXXIV in Hindu Arabic.

DCXXIV = DC + XXX + IV

600 + 30 + 4

= 634

4. Express **MCCLVIII** in Hindu Arabic system.

MCCLVIII = M + CC + L + VIII

1000 + 200 + 50 + 8

= 1,258

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LESSON 25

Expressing Hindu Arabic Numerals as Roman Numerals

Examples

1. Write 75 in Roman Numerals.

75 = 70 + 5
LXX + V
= LXXV

2. Express 768 in Roman Numerals.

768 = 700 + 60 + 8
DCC + LX + VIII
= DCCLXVIII

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LESSON 26

Addition of whole numbers

Examples

1. Add: 1,784,364 + 336,897

```
  1,784,364
+   336,897
  2,121,261
```

2. Builders laid 249,898 bricks for a building in a day and laid another 1,847,304 to complete the building. How many bricks were used to erect the building?

```
    249,898
+ 1,847,304
  2,097,202 bricks
```

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LESSON 27

Subtraction of whole numbers.

Example

1. Subtract 875,575 from 2,200,950

```
  2,200,950
-   875,575
  1,343,375
```

2. A diary industry produced 6,500,650 litres of milk and sold 5,650,945 litres. How many litres were left?

```
  6,500,650 litres
- 5,650,945 litres
    849,505 litres
```

:. 849,505 litres were left.

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LESSON 28

Multiplication of whole numbers

Examples

1. Multiply: 1324 by 132

```
      1324
     x 132
      2648
     3972
  + 1324  .
   174,768
```

2. A company has 850 workers who earn sh. 5,560 each per day. How much does the company spend on wages every day?

   1 worker gets sh. 5,560

   850 workers will be give; sh 5,560 x 850

```
                5,560
               x  850
                 0000
              27800
          + 44480    .
   Sh.     4,726,000
```

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LESSON 29

Division of whole numbers

Examples

1. Divide 25025 by 5

```
          05005
       5 ⌡25025
  0x2 – 0
          25
  5x5 – 25
            00
   0x5 -    0
            0 2
0x5          - 0
               25
5x5          - 25
```

2. Divide 6360 b y 120

```
                  53 .
          120⌡ 6360
5 x120       - 600
                360
3x 120        - 360
```

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LESSON 30

Combined operations on whole numbers

Examples

1. Work out: 13 + 5 x 4 + 17
   13 (5 x 4) + 17
   13 + 20 + 17
   = 50

2. Simplify (8 - 5) – (3 x 2) + (2 x 2)
   3 – 6 + 4
   (3 + 4) – 6
   7 – 6
   = 1

3. Work out: 9 – 11 + 4(6 ÷ 8)
   $9 - 11 + \left(4 \times \frac{6}{8}\right)$
   9 – 11 + 3
   (9 + 3) – 11
   12 – 11
   = 1

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LESSON 31
Divisibility tests

Divisibity test for 2
A number is divisible by 2 if its last digit is 0, 2, 4, 6 or 8.
Or A number is divisible by 2 if its last digit is an even number.
Eg 1372, 248, 904, etc

Divisibility test for 3
A number is divisible by 3 if the sum of its digits is a multiple of 3. E.g 300, 132, 303, 912, etc

Divisibility test for 4
A number is divisible by 4 if its last two digits are zeros or if its last two digits form a multiple of 4. E.g 124, 500, 364, 15684 etc.

Divisibility test for 5
A number is divisible by 5 if its last digit is 0 ro 5. Eg 25, 10, 345, 130, 4005, 915 etc.

Divisibility test for 10
A number is divisible by 10 if its last digit is 0. eg 830, 50, 110, 2020 etc
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LESSON 32
Types of numbers

Whole numbers and counting numbers
(1) Whole numbers are complete numbers.
- They begin with zero plus counting numbers.
Below is a set of consecutive whole numbers.
{0, 1, 2, 3, 4, 5, 6, 7, 8, 9,-----}
(2) **Counting numbers** are numbers we use in counting.
- They begin with 1.
(3) **Even and odd numbers.**
Even numbers are numbers exactly divisible by 2 while odd numbers give remainder 1 when divided by 2.
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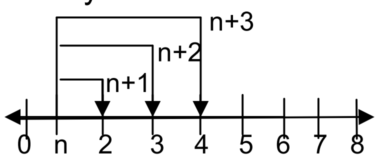
LESSON 33
Finding consecutive counting numbers.
Remember:
Counting numbers follow the pattern of (+1).
If the first counting number is n, then;
the second will be n+1
the third will be (n+1)+1= n+2
the 4^{th} will be (n+2)+1 = n+3
Study the number line below about consecutive counting numbers.



Example : The sum of three consecutive counting numbers is 24. If the first number is n, find the value of n and list those numbers.
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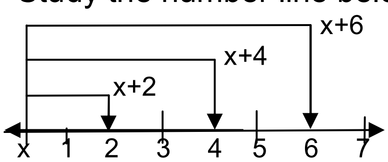
LESSON 34
Finding consecutive even and odd numbers.
Remember; even and odd numbers consider the pattern of 2.
E.g if x is the first even or odd number, then;
-the second will be x+2.
-the third will be (x+2)+2= x+4
-the 4^{th} will be (x+4)+2= x+6.
Study the number line below showing the sequence of even and odd numbers.



Example: The sum of three consecutive even numbers is 36. Find those numbers.
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LESSON 35
Triangular numbers

Tiangular numbers are numbers got by adding consecutive counting numbers.

sequence	Pattern	No.
1	*	1
1 + 2	* * *	3
1 + 2 + 3	* * * * * *	6
1 + 2 + 3 + 4	* * * * * * * * * *	10

Below is a set of triangular numbers.
{1, 3, 6, 10, 15, 21, 28, 36….}
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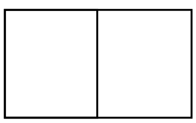
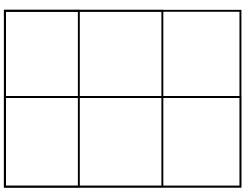
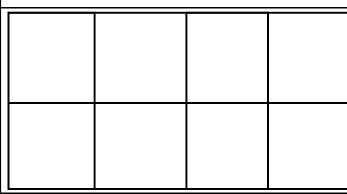
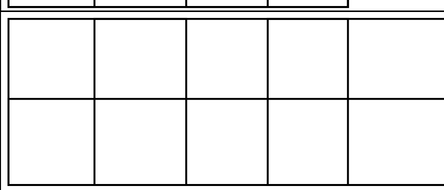
LESSON 36

<u>Rectangular numbers</u>

Rectangular numbers are numbers got by arranging squares to form a rectangle.
Study the pattern below.

Sequence	Pattern	No.
1 by 2		2
2 by 3		6
2 by 4		8
2 by 5		10

Below is a set of rectangular numbers.
{2, 6, 8, 10, 12, 14, 15……}
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LESSON 37

<u>Square numbers.</u>

Square numbers are numbers got by multiplying two equal numbers.
e.g $3 \times 3 = 9$
$a \times a = a^2$
Study the table below showing the pattern of square numbers.

Sequence	Pattern	Square number
1 x 1	*	1
2 x 2	* * * *	4
3 x 3	* * * * * * * * *	9
4 x 4	* * * * * * * * * * * * * * * *	16

Square numbers = {1, 4, 9, 16, 25, 36, 49, 64,…..}
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LESSON 38
Prime and composite numbers.
1. Prime numbers are numbers which have only two factors 1 and itself.
2. Composite numbers are numbers which have more than two factors.
3. A factor is a number that divides another in an exact number of time.
F_2 = {1, 2},
F_3 = {1, 3},
F_4 = {1, 2, 4},
F_5 = {1, 5},
F_6 = {1, 2, 3, 6},
F_7 = {1, 7}
F_8 = {1, 2, 4, 8},
F_9 = {1, 3, 9},
F_{10} = {1, 2, 5, 10},
F_{11} = {1, 11},
F_{12} = {1, 2, 3, 4, 6, 12}
Numbers with two factors only are Prime numbers.
These are; {2, 3, 5, 7, 11 ….}

Numbers with more than two factors are Composite numbers.
These are; {4, 6, 8, 9, 12 …..}
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LESSON 39
Factors of numbers.

A factor is number that divides another in an exact number of time.

Example

Find the factors of 24.

Solution

$F_{24} = 1 \times 24$

2×12

3×8

4×6

$F_{24} = \{1, 2, 3, 4, 6, 8, 12, 24\}$

Note:

- 1 is a factor of every number.

-1 is the least common factor of every number.

- A number is a factor of itself.

Common factors

A common factor is the one that appears in two or more sets of factors of numbers.

Example

Find the common factors of 12 and 18.

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LESSON 40

Prime factorization of numbers.

Prime factorization is a way of finding the prime factors of a given number.

In this case you divide the given number by the possible consecutive prime numbers using the ladder or factor tree methods.

Examples

1. Find the prime factors of 54 (Give your answer in multiplication form)

$$\begin{array}{r|l} 2 & 54 \\ \hline 3 & 27 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$F_{54} = 2 \times 3 \times 3 \times 3$

2. Prime factorize 36 and give your answer in subscript form)

$$\begin{array}{r|l} 2 & 36 \\ \hline 2 & 18 \\ \hline 3 & 9 \\ \hline 3 & 3 \\ \hline & 1 \end{array}$$

$F_{36} = \{2_1, 2_2, 3_1, 3_2\}$

3. Prime factorize 18 and give your answer in power form.

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LESSON 41

Finding the prime factorized number

Example

Find the number which has been prime factorized to get

$\{2_1, 2_2, 2_3, 3_1\}$

The number for ;

$2_1, 2_2, 2_3, 3_1 = 2 \times 2 \times 2 \times 3$

4×6

$= 24$

<u>Finding the unknown prime factor</u>

Example

The prime factgors of 60 are 2 x 2 x p x 5. Find the value of p.

$$\begin{array}{r|l} 2 & 60 \\ \hline 2 & 30 \\ \hline 3 & 15 \\ \hline 5 & 5 \\ \hline & 1 \end{array}$$

If $F_{60} = \{2 \times 2 \times p \times 5\}$

and also $F_{60} = 2x2xpx5$

Then p = 5

OR $F_{60} = \{2 \times 2 \times p \times 5\}$

So, $2 \times 2 \times p \times 5 = 60$

$(2 \times 2 \times 5) \times p = 60$

$20p = 60$

$\frac{20p}{20} = \frac{60}{20}$

$p = 3$

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LESSON 42

<u>Values of powers of numbers</u>

Example

1. Find the value of 2^4

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

4×4

$= 16$

2. Find the value of $5^0 + 3^2$

$1 + (3 \times 3)$

$1 + (9)$

$= 10$

<u>Expressing a number as a product of another number</u>

Example

Write 32 in the powers of 2.

$$\begin{array}{r|l} 2 & 32 \\ \hline 2 & 16 \\ \hline 2 & 8 \\ \hline 2 & 4 \\ \hline 2 & 2 \\ \hline & 1 \end{array}$$

$F_{32} = 2 \times 2 \times 2 \times 2 \times 2$

$\underline{= 2^5}$

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LESSON 43

<u>Finding more values of numbers in power form</u>

Example

Find the value of x^2 if x = 6.

$x^2 = x \times x$

$= 6 \times 6$

$x^2 = 36$

Addition of numbers in power form.

Example

1. Find the value of $4^3 + 3^2$

$4^3 + 3^2 = (4 \times 4 \times 4) + (3 \times 3)$

$64 + 9$

$= 73$

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LESSON 44

Subtraction of numbers involving powers.

Example

Find the value of $2^6 - 6^2$

$2^6 – 6^2 = 2x2x2x2x2x2 – 6x6$

$4 \times 4 \times 4 – 36$

$16 \times 4 – 36$

$64 – 36$

$= 28$

Multiplication of numbers in power form.

Example

Simplify: $2^2 \times 3^2$

$(2 \times 2) \times (3 \times 3)$

4×9

$= 36$

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LESSSON 45

Powers of the same base

Rule 1 When multiplying powers of the same base, we add the powers/indices.

Rule 2 When dividing powers of the same base, we subtract the powers/indices.

Example

1. $3^3 \times 3^2 = 3^{3+2}$ or 3x3x3 x3x3

$= 3^5$ $= 3^5$

2. Simplify $2^5 - 2^3$

$2^5 – 2^3 = 2^{5-3}$ or $\frac{2x2x2x2x2}{2x2x2}$

$= 2^2$ $= 2^2$

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LESSON 46

Representing prime factors of numbers on a Venn diagram

Steps taken

(i) Prime factorize the given numbers.

NB: Represent the elements in set notation form.

(ii) Identify the prime factors in the difference of sets and those in the intersection.

(iii) Then draw a Venn diagram and represent the elements following their identity.

Example

Draw a Venn diagram to show the prime factors of 30 and 36.

2	30
3	15
5	5
	1

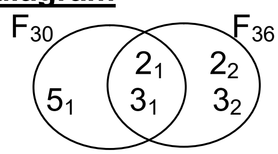
2	36
2	18
3	9
3	3
	1

$F_{30} = \{2_1, 3_1, 5_1\}$

$F_{36} = \{2_1, 2_2, 3_1, 3_2\}$

Common factors / Intersection = $\{2_1, 3_1\}$

<u>Venn diagram</u>



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LESSON 47

<u>Finding the GCF and LCM from the Venn diagram</u>

NOTE: The product of the intersection gives the GCF while that of the union gives the LCM.

Example

Find the GCF and LCM of 8 and 12 using a Venn diagram

* Draw a Venn diagram to represent the members first.

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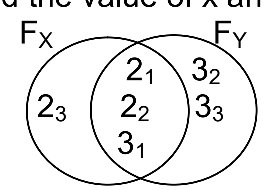
LESSON 48

<u>Finding the unknown values in the Venn diagram</u>

Example

Find the value of x and y



If $F_x = \{2_1, 2_2, 2_3, 3_1\}$

Value of $x = 2 \times 2 \times 2 \times 3$

4×6

$x = 24$

If $y = \{2_1, 2_2, 3_1, 3_2, 3_3$

$= 108$

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LESSON 49

<u>Multiples of numbers</u>

A multiple of a number is a product of that number with other numbers.
Example
1. Find the multiples of 8
M_8 = {8, 16, 24, 32, 40, 48,---}
2. List down the multiples of 9 between 17 and 50.

M9 = {9, 18, 27, 36, 45, 54---}
M_9 between 17 and 50 are;
{18, 27, 36, 45}

Finding the Lowest Common Multiple
Example
Find the Lowest Common Multiple of 6 and 8.
* List the multiples of 6 and 8.
* Identify the common multiples of 6 and 8.
* Identify the least common multiple of 6 and 8.
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LESSON 50
Finding the LCM and GCF using prime factorization
Example
Find the GCF of 12 and 18.
* Prime factorize 12 and 18 using the ladder method as you highlight the common factors of 12 and 18.
* The product of the common factors is the GCF of 12 and 18.

Example 2
Find the LCM of 12 and 15
* The product of the factors of 12 and 15 after the prime factorization is the LCM of 12 and 15.

2	12	15
2	6	15
3	3	15
5	1	5
	1	1

LCM = 2 x 2 x 3 x 5
= 4 x 15
= 60

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LESSON 51
Application of GCF and LCM.
Example
1. What is the biggest divisor of 9 and 12?
Interpretation: What is the biggest number that can be divided by 9 and 12 and leave no remainder?

2	9	12
2	9	6
3	9	3
3	3	1
	1	1

GCF = 3
The number is 3

2. What number can be divede by 6 or 9 to give a remainder of 3?
Guideline: LCM + Remainder.

2	6	9
3	3	9
3	1	3
	1	1

LCM = 18

The number= 18 + 3

= 21

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LESSON 52

Square numbers.

A square number is a product of two equal numbers.

Example

1. Find the square of 27.

The square of 27 = 27^2

27 x 27

= 729

2. Find the square of p

The square of p = p x p

= p^2

Square roots of whole numbers.

Example

Find the square root of 81.

* Prime factorize the given number (81).
* Pair the prime factors and drop one from each pair.
* Multiply the remaining ones to obtain the square root.

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LESSON 53

Squares of fractions.

Example

Find the square of $^5/_8$

Square of $^5/_8$ = $(^5/_8)^2$

$= \frac{5 \times 5}{8 \times 8}$

$= \frac{25}{64}$

Square roots of fractions

Example

Find the square root of 1/16

$\frac{1}{16} = \frac{1}{16}$

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

= ¼

Find the square root of $\frac{25}{100}$

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LESSON 54

Squares of decimals.

Example
Find the square of 0.4
* Express the given decimal into a common fraction.
* Find the square of the common fraction, then express the answer back to a decimal.
The square of 0.4 = $(0.4)^2$

$$= \left(\frac{4}{10}\right)^2$$

$$= \frac{4 \times 4}{10 \times 10}$$

$$= \frac{16}{100}$$

$$= \underline{0.16}$$

Square roots of decimals.
Example
Find the square root of 0.36
* Exapress the decimal into a common fraction.
* Find the square root of the common fraction then express the answer back to decimals
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LESSON 55
Application of square roots.
Examples
1. Solve: $4h^2 = 144$
* First elliminate the coeficient of x by dividing it on either side of the equation.

$$\frac{4x^2}{4} = \frac{144}{4}$$

$$x^2 = 36$$

* Elliminate the square on the unknown by introducing the square root sign on each side.

$$\sqrt{x^2} = \sqrt{36}$$

$$\underline{x = 6}$$

2. Solve: $3h^2 + 25 = 100$

$$3h^2 + 25 - 25 = 100 - 25$$

$$3h^2 + 0 = 75$$

$$\frac{3h^2}{3} = \frac{75}{3}$$

$$h^2 = 25$$

$$\sqrt{h^2} = \sqrt{25}$$

$$\underline{h = 5}$$

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