Pengenalan Bahasa Inggris untuk Pembelajaran Matematika SMP

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KATA PENGANTAR

Pusat Pengembangan dan Pemberdayaan Pendidik dan Tenaga Kependidikan (PPPPTK) Matematika dalam melaksanakan tugas dan fungsinya mengacu pada tiga pilar kebijakan pokok Depdiknas, yaitu: 1) Pemerataan dan perluasan akses pendidikan; 2) Peningkatan mutu, relevansi dan daya saing; 3) Penguatan tata kelola, akuntabilitas, dan citra publik menuju insan Indonesia cerdas dan kompetitif.

Dalam rangka mewujudkan pemerataan, perluasan akses dan peningkatan mutu pendidikan, salah satu strategi yang dilakukan PPPPTK Matematika adalah meningkatkan peran Kelompok Kerja Guru (KKG) dan Musyawarah Guru Mata Pelajaran (MGMP) serta pemberdayaan guru inti/ guru pemandu/guru pengembang yang ada pada setiap kecamatan, kabupaten dan kota.

Sebagai upaya peningkatan mutu dimaksud maka lembaga ini diharapkan mampu memfasilitasi kegiatan-kegiatan yang terkait dengan implementasi pengembangan pembelajaran matematika di lapangan. Guna membantu memfasilitasi forum ini, PPPPTK Matematika menyiapkan paket berisi kumpulan materi/bahan yang dapat digunakan sebagai referensi, pengayaan, dan panduan di KKG/MGMP khususnya pembelajaran matematika, dengan topik-topik/bahan atas masukan dan identifikasi permasalahan pembelajaran matematika di lapangan.

Berkat rahmat Tuhan Yang Maha Esa, atas bimbingan-Nya penyusunan Paket Fasilitasi Pemberdayaan KKG/MGMP Matematika dapat diselesaikan dengan baik. Untuk itu tiada kata yang patut diucapkan kecuali puji dan syukur kehadirat-Nya.
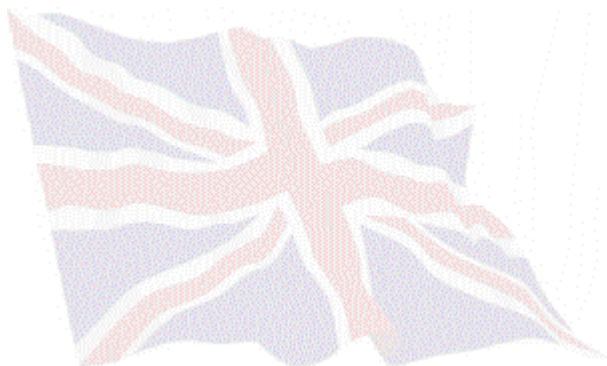
Dengan segala kelebihan dan kekurangan yang ada, paket fasilitasi ini diharapkan bermanfaat dalam mendukung peningkatan mutu pendidik dan tenaga kependidikan melalui forum KKG/MGMP Matematika yang dapat berimplikasi positif terhadap peningkatan mutu pendidikan.

Sebagaimana pepatah mengatakan, tiada gading yang tak retak, demikian pula dengan paket fasilitasi ini walaupun telah melalui tahap identifikasi, penyusunan, penilaian, dan editing masih ada yang perlu disempurnakan. Oleh karena itu saran, kritik, dan masukan yang bersifat membangun demi peningkatan kebermaknaan paket ini, diterima dengan senang hati teriring ucapan terima kasih. Ucapan terima kasih dan penghargaan setinggi-tingginya kami

sampaikan pula kepada semua pihak yang membantu mewujudkan paket fasilitasi ini, mudah-mudahan bermanfaat untuk pendidikan di masa depan.
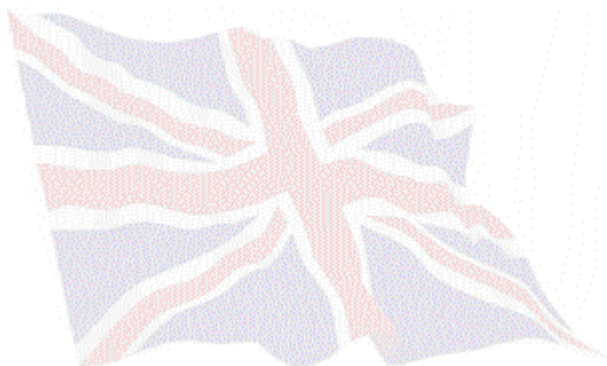
Yogyakarta,

Kepala,

KASMAN SULYONO

NIP.130352806

Daftar Isi

Daftar Isi

Bab I

Pendahuluan

A. Latar Belakang

Undang-undang RI No. 20 th. 2003 tentang Sisdiknas pada pasal 50 ayat (3) menyebutkan bahwa Pemerintah dan/atau Pemerintah Daerah menyelenggarakan sekurang-kurangnya satu satuan pendidikan pada semua jenjang pendidikan untuk dikembangkan menjadi satuan pendidikan yang bertaraf internasional. Sementara itu pada Visi dan Misi Renstra Depdiknas th. 2005-2009, salah satu diantaranya menyebutkan mewujudkan pendidikan masyarakat yang bermutu, berdaya saing, dan relevan dengan kebutuhan masyarakat.

Memperhatikan hal tersebut di atas, sekitar tahun 2005 atau 2006, mulailah di beberapa kota atau daerah bermunculan sekolah-sekolah yang membuka kelas *bilingual*, kelas internasional, maupun Sekolah Nasional Bertaraf Internasional (SNBI) atau Sekolah Bertaraf Internasional (SBI). Namun demikian kenyataan di lapangan, beberapa sekolah penyelenggara program tersebut nampaknya masih belum siap atau mengalami kendala baik menyangkut sumber daya manusia (SDM)-nya, maupun fasilitas pendukungnya.

Menyikapi fenomena tersebut, PPPPTK Matematika Yogyakarta yang salah satu tugasnya melaksanakan pengembangan dan pemberdayaan pendidik dan tenaga kependidikan sesuai dengan bidangnya, berusaha memberikan wacana, motivasi, serta membekali pengetahuan dasar tentang kemampuan berbahasa Inggris pada pembelajaran matematika SMP, khususnya bagi para guru/peserta diklat mulai tahun 2006. Sementara itu, menurut Laporan *Training Need Assessment* (TNA) PPPPTK Matematika Yogyakarta tahun 2007 menyebutkan bahwa materi bahasa Inggris untuk pembelajaran matematika SMP masih diperlukan baik itu untuk sekolah SBI maupun non-SBI. Di antara 268 responden TNA, 60,8% diantaranya

menyatakan memerlukan beberapa kiat menerjemahkan artikel/sumber belajar matematika dalam bahasa Inggris, 54,9% memerlukan tentang pelafalan beberapa *mathematical symbols and terms*, 53,7% memerlukan tentang pemahaman *mathematical symbols and terms*, dan 50,0% memerlukan tentang praktek *greetings and personal introduction*.

Tentunya apa yang disampaikan di sini masih sangat sederhana dan perlu dikembangkan lebih lanjut serta terobosan-terobosan atau inovasi di lapangan nanti. Berbicara bahasa Inggris yang bagi kita bukan sebagai bahasa ibu, adalah sangat wajar apabila dalam aplikasi sehari-harinya menemui beberapa kendala. Ini semua kembali kepada motivasi para peserta diklat ataupun para guru di lingkungan KKG/MGMP itu sendiri. Antonia (1981) menyebutkan; *Anyone who has learnt English as a second language will attest to the importance of practice as a learning strategy, willingness to practice is one of the strategies to be a good language learners* (seseorang yang belajar bahasa Inggris sebagai bahasa kedua akan merasakan pentingnya praktek sebagai strategi pembelajaran, keinginan/semangat untuk mempraktekkan adalah salah satu strategi untuk menjadi pembelajar bahasa Inggris yang baik). Dengan demikian apa yang disampaikan di paket ini masih sebagai pengantar, diharapkan para guru di lingkungan KKG/MGMP mendiskusikan dan mengembangkannya lebih lanjut, bahkan memulai untuk mempraktekkannya meski dari hal yang sangat kecil ini.

B. Tujuan Penulisan

Setelah mempelajari dan mendiskusikan Paket ini, diharapkan para guru di lingkungan KKG/MGMP dapat:

1. menyampaikan salam *(greetings)*, menghidupkan percakapan *(encouraging conversation),* dan menutup pembicaraan *(closing a conversation)* dalam bahasa Inggris.
2. membaca dan memahami beberapa *mathematical symbols* dan *mathematical terms* yang sering digunakan dalam pembelajaran

matematika.

3   memahami dan menerjemahkan beberapa topik matematika sederhana yang disajikan dalam bahasa Inggris.

C. Ruang Lingkup Penulisan

Paket Fasilitasi KKG/MGMP Pengenalan Bahasa Inggris untuk Pembelajaran Matematika SMP ini membahas beberapa hal, antara lain; memberi salam *(greetings)*, menghidupkan percakapan *(encouraging conversation)*, menutup pembicaraan *(closing a conversation)*, beberapa *mathematical symbols* dan *mathematical terms* yang sering digunakan dalam pembelajaran matematika, serta beberapa contoh artikel/tulisan pembelajaran matematika dalam bahasa Inggris.

Penyajiannya dilakukan dengan ceramah, tanya jawab, praktek, dan diskusi. Sementara itu, untuk penggunaan bahasa di paket ini adalah *bilingual* (campuran) antara bahasa Indonesia dan bahasa Inggris. Dengan bahasa Indonesia, dimaksudkan untuk mempermudah pemahaman isi paket, dan dengan bahasa Inggris dengan harapan agar juga kita lebih familiar dengan istilah/ungkapan dalam bahasa Inggris yang pada gilirannya nanti akan meningkatkan *English proficiency* kita.

D. Cara Menggunakan Paket.

Paket ini teridiri atas 5 (lima) Bab, bagian utama terdiri atas 3 Bab, yakni Bab II, III, dan IV. Pembaca diharapkan secara berkelompok membahas, berdiskusi dan praktek pada Bab II. *Greetings, Encouraging, and Closing Conversation*, Bab. III *Mathematical Symbols and Terms*, dan Bab IV *Reading and Understanding Some Mathematics Topics in Mathematics Learning*. Setelah membahas dan berdiskusi pada masing-masing Bab, Pembaca diharapkan mengerjakan Tugas di akhir masing-masing Bab tersebut. Alternatif jawaban dari Tugas tersebut ada pada Lampiran. Apabila dalam mempelajari paket ini mengalami kesulitan atau kendala, Pembaca dapat menghubungi PPPPTK Matematika dengan alamat:

Jl. Kaliurang Km. 6, Sambisari, Condongcatur, Depok, Sleman, Yogyakarta.

Kotak Pos 31 YK-BS Yogyakarta 55281

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atau dapat menghubungi penulis melalui e-mail: rwiddiharto@yahoo.com.

Bab II

Greetings, Encouraging and Closing Conversation

A. Tujuan Pembelajaran

Setelah mempelajari materi pada Bab II ini, diharapkan para guru di lingkungan KKG/MGMP matematika dapat memberikan salam *(greetings),* memperkenalkan diri *(personal introduction),* menghidupkan percakapan *(encouraging conversation),* serta menutup kegiatan pembelajaran *(closing conversation)* di kelas secara sederhana dalam bahasa Inggris.

B. Permasalahan

Sebagai guru matematika, adalah tugas yang berat (sekaligus menantang) apabila diminta untuk mengajar matematika dengan bahasa Inggris. Karena itu, begitu di depan kelas kadang mereka gugup, kurang percaya diri, tidak tahu dari mana harus memulai pembicaraan, bagaimana menghidupkan percakapan di kelas, maupun mengakhiri kegiatan pembelajaran di kelas.

C. Alternatif Pemecahannya.

Melakukan hal yang baru memang membutuhkan suatu kemampuan dan ketrampilan, namun kemampuan dan ketrampilan saja tidaklah cukup, harus didukung pula suatu tekad yang kuat yakni keberanian. Demikian halnya bagi teman guru yang diminta untuk mengajar dengan bahasa Inggris. Rasa takut, kurang percaya diri harus dibuang jauh-jauh untuk memunculkan keberanian. Kemampuan

dan ketrampilan bisa di tempuh dengan banyak latihan dan praktek *(learning by doing)*.

Untuk memulai suatu pembelajaran dan menjalin komunikasi yang kondusif dengan siswa atau orang lain, tidak jarang kita perlu memperkenalkan diri terlebih dahulu. Dalam perkenalan diri terdapat ungkapan-ungkapan khusus yang dapat digunakan untuk berkomunikasi dengan orang lain. Ringkasan ungkapan tersebut adalah sebagai berikut.

1. Salam perkenalan *(Greetings for first meetings)*

First Meeting	
Neutral	
How do you do?	I'm (very) pleased/delighted to meet you
	It's (very) nice to meet you.
Informal	
How do you do?	Nice/good to see you
Hello	Nice to have you with us
Hi *(very informal but more frequent*	Pleased to meet you
In American English)	
Reply to the Greeting	
Neutral	
How do you do?	It's (very) nice to meet you too.

	I'm pleased to meet you too.
Hello. How are you?	Fine, thanks. How about you?
Informal	
How do you do?	It's (very) nice to meet you, too.
Hello	Pleased to meet you, too.

Saat kita bertemu untuk kali pertama dengan seseorang pada situasi pribadi atau bisnis biasanya dilakukan jabat tangan. Pada saat ini kita dapat mengucapkan "How do you do?". Namun ungkapan ini hanya digunakan saat kita kali pertama berkenalan.

2. Memperkenalkan diri sendiri *(Identifying yourself)*

Saat kita memperkenalkan diri kepada orang lain, kita perlu menyampaikan informasi tidak hanya memberikan nama saja namun mungkin juga informasi lain yang berkaitan dengan kita sendiri serta situasi saat perkenalan berlangsung.

Identification	Relevant Information
Hello, I'm …	from ….
Hello, my name is …	I work for …
Hello, let me introduce myself,	I'm in charge of …
I'm …	I'm responsible for …

3. Salam dan perkenalan diri di kelas *(Greetings and personal introductions in a class)*

Salam (Greetings)

- Good morning/afternoon/evening, ladies and gentlemen/everyone.
- How do you do?
- Hello, how are you doing/how was your holiday?
- Hi, (folks/class), is everything okay/alright?
- We just studied about ……today we would like to learn about…….

4. Strategi dalam Perkenalan diri *(Strategies in personal introduction)*

   a. Slower speaking speed, don't rush.

   b. Louder volume and project the voice

   c. Clearer utterance of the words

   d. Establish eye contact with everyone

   e. Decide and follow the setting and the culture (stand up or sit down)

   f. Full self-confidence

5. Menghidupkan percakapan *(Encouraging conversation).*

   Untuk menjadikan suasana percakapan lebih hidup dan berkembang, maka ada beberapa ungkapan yang bisa digunakan antara lain sebagai berikut :

Encouraging Conversation
Using a short response to show that you are listening I see   Oh? Of course   Yes Really?   Mmmm
Repeating a key word or phrase A : The meeting lasted for two hours B : Two hours ?
Asking a follow-up information question What happened? How was it? What did you do to them?

6. Permohonan menyela kepada pembicara *(appealing to the speaker)*

   Dalam percakapan atau diskusi, kadang kita kurang mendengar atau tidak paham apa yang dikatakan orang lain, baik itu siswa kepada guru, maupun guru kepada siswa. Terkait dengan hal tersebut, kita bisa menyela

pembicaraan atau diskusi dengan cara antara lain sebagai berikut:

Appealing to the speaker
If you need the speaker to repeat something Pardon? Could you please repeat that? Execuse me? Would you mind repeating your question?
If the speaker is talking too quickly I'm sorry. Could you please speak a little more slowly? Would you mind speaking more slowly? I couldn't quite follow what you said.
If the speaker is talking too softly Sorry, I didn't hear what you said. Would you mind speaking a little louder?
If you do not understand the speaker I'm sorry, but I'm not sure I understand Sorry, but I don't understand what you mean. I'm not sure I follow you. Did you say that …?
If you need more help How do you pronounce/spell that? Would you please pronounce/spell that?

7. Berbicara di kelas *(Speaking out in class)*

    Untuk menarik perhatian guru atau orang lain yang sedang berbicara, kita bisa dengan mengacungkan tangan kita. Siswa bisa juga langsung memanggil nama gurunya (Bapak/Ibu …, Mr./Mrs …). Kadang kita juga bisa saja memberikan tanda-tanda tertentu atau *eye contact* dengan guru atau pembicara. Berikut adalah beberapa ungkapan yang bisa digunakan.

Speaking out in class
Signaling you want to speak Excuse me, ….

May I ask a question?

Could I make a comment?

Holding the floor

    a. Hesitating

        Well, umm ....   Umm, let's me see

        Umm, let's see   Let me think

    b. Repeating or rephrasing the question

        In other word, you want to know ....

        So, you're asking me ....

    c. Asking the instructor to repeat the question if you didn't understand

        Would you mind repeating the question, please?

        Would you please repeat that?

Avoiding answering

I'm not really sure   I'm afraid I don't know

I don't really know   I'm sorry, but I don't know

8.   Menutup percakapan/kegiatan pembelajaran di kelas

Untuk mengakhiri kegiatan pembelajaran, kita tidak secara tiba-tiba selesai begitu saja. Perlu adanya kesimpulan atau ringkasan dari permasalahan yang telah dibahas. Beberapa ungkapan yang bisa digunakan sebagai penutup untuk mengakhiri kegiatan pembelajaran antara lain sebagai berikut.

Closing a conversation
Signaling the end
Well, (pronounced in along, drawn – out way) ….
So, (also pronounced in along, drawn out way) ….
Well, okay ….
Well, listen, ….
Look at the time!
Well, I know you're busy

Ending
I should be going
I'm afraid I have to leave now. It's getting late.
I have to (get back to work/meet someone/get to class)
I'll let you get back to work now
Taking leave
Good-bye
See you (later/in class/tomorrow/soon)

Tugas 1:

1. Dalam kelompok kecil yang terdiri atas 3 orang, 2 orang diantaranya silakan mencoba mempraktekkan untuk memberi salam *(greetings)* dan memperkenalkan diri *(personal introduction)* sementara 1 orang yang lain mencatat garis besar pembicaraannya.

2. Misalkan dalam suatu kelas ada seorang siswa yang bertanya, coba kembangkan percakapan pendek *(short conversation)* sekitar 2-3 menit terkait dengan hal tersebut, praktekkan percakapan tersebut, secara bergantian.

3. Buatlah *closing a conversation* untuk mengakhiri kegiatan pembelajaran, berikan siswa tugas PR untuk mengerjakannya. Praktekkan conversation tersebut secara bergantian.

Bab III

Saying Mathematical Symbols and Terms

A. Tujuan Pembelajaran

Setelah mempelajari materi pada Bab III ini, diharapkan para guru di lingkungan KKG/MGMP matematika dapat membaca dan memahami istilah-istilah serta simbol-simbol matematika *(mathematical symbols and terms)* dalam bahasa Inggris yang sering digunakan dalam pembelajaran Matematika.

B. Permasalahan

Dalam mempelajari buku atau artikel matematika dalam bahasa Inggris, sering kali para guru mengalami kesulitan apa maksud/makna simbol matematika serta operasinya, bagaimana pula membacanya. Demikian juga kadang para Bapak/Ibu guru mengalami kesulitan memahami dan membaca istilah/ungkapan matematika dalam bahasa Inggris.

C. Alternatif Pemecahannya

Sebagai bahasa simbol, matematika dalam penyampaian materi cukup sarat dengan notasi dan operasi yang universal. Artinya makna dari simbol ataupun notasi tersebut baik di Indonesia maupun manca negara adalah sama. Notasi/simbol untuk operasi penjumlahan ("+") misalnya, adalah sama di manapun. Makna dari operasi penjumlahan itupun sama, 2 + 3 = 5, meski kita berada di belahan dunia yang lain, hasil dari "2 ditambah 3 adalah sama dengan 5". Ini berarti pemaknaan atas notasi/simbol matematika *(mathematical symbol)* sebenarnya tidak akan mengalami kesulitan, hanya saja pada aspek membacanya *(pronounce)* mungkin sedikit mengalami kendala. Sementara itu, untuk beberapa istilah/ungkapan matematika *(mathematical terms)*, memang perlu penjelasan karena untuk hal ini lebih kepada

bagaimana mengkomunikasikan makna ungkapan itu tidak secara simbolik saja tetapi juga secara deskriptif-naratif, sehingga komunikasi melalui bahasa Inggris menjadi suatu kebutuhan. Berikut ini adalah beberapa pemaknaan *mathematical symbol* dalam bahasa Inggris, serta bagaimana membacanya/pengucapannya. Sementara untuk *mathematical terms*, penjelasannya memang tetap dalam bahasa Inggris, ini dimaksudkan agar Bapak/Ibu guru Matematika di lingkungan KKG/MGMP juga mulai familiar dengan bahasa Inggris, ataupun istilah matematika dalam bahasa Inggris dan belajar menerjemahkanya. Jika ternyata masih mengalami kesulitan, bisa dibantu dengan kamus.

1. Mathematical Symbols

   Terkait dengan topik *Mathematical symbols,* Lancelot Hogben (2005) menyebutkan:

   > *On the topic of mathematical symbols ….every meaningful mathematical statement can also be expressed in plain language. Many plain language statements of mathematical expression would fill several pages, while to express them in mathematical notation might take as little as one line. One of the ways to achieve this remarkable compression is to use symbols to stand for statements, instructions and so on*

   (pada topik simbol-simbol matematika…, setiap makna pernyataan matematika dapat dijelaskan dengan bahasa sederhana. Beberapa bahasa keseharian dalam menyatakan bentuk-bentuk aljabar tersebut akan membutuhkan beberapa halaman, sementara untuk menyatakan maksud tersebut dengan simbol/notasi matematika mungkin hanya sedikit sekitar satu baris. Satu cara untuk untuk mencapai penyingkatan makna ini adalah dengan menggunakan simbol untuk menjelaskan pernyataan, perintah, atau yang lain).

   Beberapa *mathematical symbols and terms* yang sering digunakan dalam pembelajaran matematika dan berhasil dikumpulkan antara lain dari *Dictionary of Mathematics* (Millington, 1971) maupun *Dictionary of Mathematics* (Borowski, 1989) serta dari internet

(http://www.bymath.com/symbols/symbols.html; diakses tgl 20 Februari 2008) adalah sebagai berikut:

Math symbols	Meaningful mathematics statement
$\equiv$	identically equal
$\cong$	congruent with
$\sim$	approximately
$\neq$	not equal to
$\leq$	less than or equal to
$\geq$	greater than or equal to
$\wedge$	logical and
$\vee$	logical or
$\forall$	for all
$\exists$	there exists
$\sum$	n-ary summation
$\angle$	angle
N	the set of natural numbers
Z	the set of whole numbers (integers)
R	the set of real numbers
$\varnothing$	an empty set
∞	an infinity sign
$x \in X$	an element x belongs to a set X
$x \notin X$	an element x doesn't belong to a set X
$X \subset Y$	a set X is a subset of a set Y
$X \cup Y$	a union of sets X and Y
$X \cap Y$	an intersection of sets X and Y
$+$	plus sign/added by
$-$	minus sign/subtracted by

×	multiplication/multiplied by
÷	division/divided by
√	square root/radical sign
⊥	orthogonal to/perpendicular
π	pi = 3,14159…
!	factorial
∫	integral
$[a,b]$	a numerical sign

2. How to say number and symbols

   a. How to say numbers and ordinal numbers

	Number forms	Number forms in English
1 digit numbers	0, 1, 2, 3, 4, 5, 6, 7, 8, 9	zero, one, two, three, four, five, six, seven, eight, nine
2 digit numbers	10, 11, 12, 13, 14, 15, 16, 17, 18, 19	ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, eighteen, nineteen
	20, 30, 40, 50, 60, 70, 80, 90	twenty, thirty, forty, fifty, sixty, seventy, eighty, ninety
3 digit numbers	100, 300, 500, …	one hundred, three hundred, five hundred, …
4 digit numbers	2000, 4000, …	two thousand, four thousand, …
5 digit numbers	10 000, 30 000, …	ten thousand, thirty thousand,…
6 digit numbers	300 000	three hundred thousand
7 digit numbers	5 000 000	five million
8 digit numbers	30 000 000	thirty million
9 digit numbers	500 000 000	five hundred million
10digit numbers	2 000 000 000	two billion

Ordinal numbers	Word	Abbreviation
1	first	1st
2	second	2nd
3	third	3rd
4	fourth	4th
5	fifth	5th
6	sixth	6th
7	seventh	7th
8	eight	8th
9	ninth	9th
10	tenth	10th

b. How to say number combination

Numbers	Break down	Explanation
47	equals(=) 40 + 7	This number has two digits. The highest is forty, the next value is seven. Therefore it should be 'forty seven'
683	equals (=) 600 + 80 + 3	This number has three digits. The highest value is six hundred followed by eighty followed by three. Therefore it should be 'six hundred and eighty three'
3562	equals (=) 3000 + 500 + 60 + 2	This number has four digits. The highest value is three thousand followed by five hundred followed by sixty followed by two. Therefore it should be 'three thousand five hundred and sixty two

c. How to say numbers with decimal point

Numbers	Break down	Explanation
3.7	equal (=) 3 + 0.7	This number has one digit. The highest value is three followed by zero point seven. Therefore it should be 'three point seven'
58.4	equal (=) 50 + 8 + 0.4	This number has two digits. The highest value is fifty followed by eight followed by zero point four.

		Therefore it should be ' fifty eight point four'
5.84	equal (=) 5 + 0.84	This number has one digit. The highest value is five followed by zero point eight four. Therefore it should be 'five point eight four'

d. How to say fraction

Generally, we can say a fraction sign (ex: $\frac{a}{b}$ or a/b) with word 'over', for example:

a. $\frac{37}{5}$, it should be said as 'thirty seven over five'.

b. $\frac{3}{7}$, it should be said as 'three over seven'

Note: The upper part of fraction called *a numerator*, the lower part of a fraction called *a denominator*.

c. Some fractions already have a designated name, but the value of the numerator should not more than the value of the denominator.

Example:

½ is half

$\frac{x}{3}$ is x-third; one-third, two-thirds, *not* five-thirds

$\frac{x}{4}$ is x-quarter; one-quarters, three-quarters, *not* seven-quarters

$\frac{x}{5}$ is x-fifth; one-fifth, two-fifths, three-fifths, *not* nine-fifths

3. How to say mathematical expression

Math expression	English expression
25 + 352 = 377	Twenty five plus three hundred and fifty two is three hundred and seventy seven

$45 - 56 = -11$	Forty five minus fifty six is negative eleven
$3 \times 7 = 21$	Three multiplied by seven is twenty one
$24 : 6 = 4$	Twenty four divided by six is four
$4^3 = 64$	Four raised to the power of three is sixty four *or* four cubed is sixty four.
$\sqrt{625} = 25$	The square root of six hundred and twenty five is twenty five
$\sqrt[3]{64} = 4$	The cube root of sixty four is four *or* the third root of sixty four is four
$\sqrt[5]{32} = 2$	The fifth root of thirty two is two
x + y = 12	x plus y is twelve
x = y − 10	The value of x is equal to the value of y minus ten
x < y + 3	The value of x is less than the value of y plus three

4. Mathematical Terms

Dalam pembelajaran Matematika dengan bahasa Inggris, selain beberapa *mathematical symbols* yang sering digunakan oleh para guru juga pemerhati Matematika adalah beberapa istilah matematika/*mathematical terms*. Untuk menghindari atau meminimalisir kesalahpahaman maka perlu beberapa terminologi yang diharapkan bisa membantu para guru menjelaskan istilah atau pengertian-pengertian tersebut.

Beberapa *mathematical terms* yang berhasil dikumpulkan dari berbagai sumber mengikuti urutan abjad antara lain sebagai berikut (http://math.about.com/library/bla.htm ; diakses tgl 20 Februari 2008) :

Algebra - a branch of mathematics that substitutes letters for numbers. An algebraic equation represents a scale, what is done on one side of the scale with a number is also done to the other side of the scale. The numbers are the constants

Algorithm – a step by step problem-solving procedures for solving computational mathematical problems

Angle – angles are formed by two rays that begin at the same point

Arc – a section or portion of the circumference of the circle

Area – the space measured in square units that any 2 dimensional shape or polygon occupies

Arithmetic – a branch of mathematics usually concerned with the four operations (adding, subtracting, multiplication, and division) of positive numbers

Array – a set of numbers that will follow a specific pattern. An orderly arrangement often in row, columns, or a matrix

Average – the middle or most common in a set of data. There are three types of average in mathematics- the mean, the median, and the mode.

Axis – the vertical and horizontal lines that make up the quadrants of coordinate plane. The vertical axis is usually referred to as the y axis and the horizontal axis is usually referred to as the x axis.

Base – the bottom of a shape, solid or three dimensional object. The base is what the object 'rests' on.

Base 10 – the numbering system in common use, in which each place to the left or right of the decimal represents a power of 10.

Bell curve – the shape of the graph that indicates the normal distribution.

Binomial – a polynomial equation with two terms usually joined by a plus or minus sign.

Calculus - the branch of mathematics involving derivatives and integrals. The study of motion in which changing values are studied.

Capacity - the amount a container will hold.

Centimeter - a measure of length. 2.5cm is approximately an inch. A metric unit of measurement.

Circumference - the complete distance around a circle or a square.

Chord - the segment which joins two points on a circle.

Coefficient - a factor of the term. x is the coefficient in the term x(a + b) or 3 is the coefficient in the term 3*y*.

Common factors - a factor of two or more numbers. A number that will divide exactly into different numbers.

Complementary angles - the two angles involved when the sum is 90°.

Composite number - a composite number has at least one other factor aside from its own. A composite number cannot be a prime number.

Cone - a three dimensional shape with only one vertex, having a circular base.

Conic section - the section formed by the intersection of a plane and a cone.

Constant - a value that doesn't change.

Coordinate - the ordered pair that states the location on a coordinate plane. Used to describe location and or position.

Congruent - objects and figures that have the same size and shape. The shapes can be turned into one another with a flip, rotation or turn.

Cosine - the ratio of the length (in a right triangle) of the side adjacent to an acute angle to the length of the hypotenuse

Cylinder - a three dimensional shape with a parallel circle and each end and joined by a curved surface.

Decagon - a polygon/shape that has ten angles and ten straight lines.

Decimal - a real number on the base ten standard numbering system.

Denominator - The denominator is the bottom number of a fraction. (Numerator is the top number) The denominator is the total number of parts.

Degree - the unit of an angle, angles are measured in degrees shown by the degree symbol: °

Diagonal - a line segment that connects two vertices in a polygon.

Diameter - a chord that passes through the centre of a circle. Also the length of a line that cuts the shape in half.

Difference - the difference is what is found when one number is subtracted

from another. Finding the difference in a number requires the use of subtraction.

Digit - digits are making reference to numerals. 176 is a 3 digit number.

Dividend - the number that is being divided. The number found inside the bracket.

Divisor - the number that is doing the dividing. The number found outside of the division bracket.

Edge - a line that joins a polygon or the line (edge) where two faces meet in a 3 dimensional solid.

Ellipse - an ellipse looks like a slightly flattened circle. A plane curve. Orbits take the form of ellipses.

End point - the 'point' at which a line or a curve ends.

Equilateral - all sides are equal.

Equation - a statement showing the equality of two expressions usually separated by left and right signs and joined by an equals sign.

Even number - a number that can be divided or is divisible by 2.

Event - often refers to the outcome of probability. Answers questions like 'What is the probability the spinner will land on red?'

Evaluate - to calculate the numerical value.

Exponent - the number that gives reference to the repeated multiplication required. The exponent of 3^4 is the 4.

Expressions - symbols that represent numbers or operations. A way of writing something that uses numbers and symbols.

Face - the face refers to the shape that is bounded by the edges on a 3 dimensional object.

Factor - a number that will divide into another number exactly. (The factors of 10 are 1, 2 and 5).

Factoring - the process of breaking numbers down into all of their factors.

Factorial notation - often in combinatory, you will be required to multiply consecutive numbers. The symbol used in factorial notation is ! When you see *x*!, the factorial of *x* is needed.

Factor tree - a graphical representation showing the factors of a specific number.

Fibonacci sequence - a sequence whereby each number is the sum of the two numbers preceding it.

Figure - two dimensional shapes are often referred to as figures.

Finite - not infinite. Finite has an end.

Flip - a reflection of a two dimensional shape, a mirror image of a shape.

Formula - a rule that describes the relationship of two or more variables. An equation stating the rule.

Fraction - a way of writing numbers that are not whole numbers. The fraction is written like 1/2.

Frequency - the number of times an event can happen in a specific period of times. Often used in probability.

Furlong - a unit of measurement - the side length of one square of an acre. One furlong is approximately 1/8 of a mile, 201.17 meters and 220 yards.

Geometry - the study of lines, angles, shapes and their properties. Geometry is concerned with physical shapes and the dimensions of the objects.

Graphing calculator - a larger screen calculator that's capable of showing/drawing graphs and functions.

Graph theory - a branch of mathematics focusing on the properties of a variety of graphs.

Greatest common factor (GCF) - the largest number common to each set of factors that divides both numbers exactly. E.g., the greatest common factor of 10 and 20 is 10.


Hexagon - a six sided and six angled polygon. Hex means 6.

Histogram - a graph that uses bars where each bar equals a range of values.

Hyperbola - one type of conic section. The hyperbola is the set of all points in a plane. The difference of whose distance from two fixed points in the plane is the positive constant.

Hypotenuse - the longest side of a right angled triangle. Always the side that's opposite of the right angle.
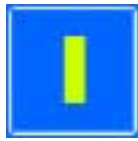
Identity - an equation that is true for values of their variables.

Improper fraction - a fraction whereby the denominator is equal to or greater than the numerator. E.g., 6/4

Inequality - a mathematical equation containing either a greater than, less than or not equal to symbols.

Integers - whole numbers, positive or negative including zero.

Irrational - a number that cannot be represented as a decimal or as a fraction. A number like pi is irrational because it contains an infinite number of digits that keep repeating, many square roots are irrational numbers.

Isosceles - a polygon having two sides equal in length.

Kilometer - a unit of measure that equals 1000 meters.

Knot - a curve formed by an interlacing piece of spring by joining the ends.

Like terms - terms with the same variable and the same exponents/degrees.

Like fractions - fractions having the same denominator. *(Numerator is the top, denominator is the bottom)*

Line - a straight inifinite path joining an infinite number of points. The path can be infinite in both directions.

Line segment - a straight path that has a beginning and an endpoints.

Linear equation - an equation whereby letters represent real numbers and whose graph is a line.

Line of symmetry - a line that divides a figure or shape into two parts. The two shape must equal one another.

Logic - sound reasoning and the formal laws of reasoning.
Logarithmn - a power to which a base, [actually 10] must be raised to produce a given number. If nx = a, the logarithm of a, with n as the base, is x.

Mean - the mean is the same as the average. Add up the series of numbers and divide the sum by the number of values.

Median - the Median is the 'middle value' in your list or series of numbers. When the totals of the list are odd, the median is the middle entry in the list

after sorting the list into increasing order. When the totals of the list are even, the median is equal to the sum of the two middle (after sorting the list into increasing order) numbers divided by two.

Midpoint - a point that is exactly half way between two set points.

Mixed numbers - mixed numbers refer to whole numbers with fractions or decimals. Example 3 1/2 or 3.5.

Mode - the mode in a list of numbers refers to the list of numbers that occur most frequently. A trick to remember this one is to remember that mode starts with the same first two letters that most does. Most frequently - Mode.

Monomial - an algebraic expression consisting of a single term.

Multiple - the multiple of a number is the product of the number and any other whole number. *(2,4,6,8 are multiples of 8)*

Multiplication - often referred to as 'fast adding'. Multiplication is the repeated addition of the same number 4x3 is the same as saying 3+3+3+3.

Natural numbers - regular counting numbers.

Negative number - a number less than zero. For instance - a decimal .10

Net - often referred to in elementary school math. A flattened 3-D shape that can be turned into a 3-D object with glue/tape and folding.

Nth root - the nth root of a number is the number needed to multiply by itself 'n' times in order to get that number. For instance: the 4th root of 81 is 3

because

$3 \times 3 \times 3 \times 3 = 81$.

Norm - the mean or the average - an established pattern or form.

Numerator - the top number in a fraction. In 1/2, 1 is the numerator and 2 is the denomenator. The numerator is the portion of the denominator.

Number line - a line in which points all correspond to numbers.

Numeral - a written symbol referring to a number.

Obtuse angle - an angle having a measure greater than 90° and up to 180°.

Obtuse triangle - a triangle with at least one obtuse angle as described above.

Octagon - a polygon with 8 sides.

Odds - the ratio/likelihood of an event in probability happening. The *odds* of flipping a coin and having it land on heads has a 1-2 chance.

Odd number - a whole number that is not divisible by 2.

Operation - refers to either addition, subtraction, multiplication or division which are called the four operations in mathematics or arithmetic.

Ordinal - ordinal numbers refer to the position: first, second, third etc.

Order of operations - a set of rules used to solve mathematical problems. BEDMAS is often the acronym used to remember the order of operations.

BEDMAS stands for '*brackets, exponents, divison, multiplication, addition and subtraction.*

Outcome - used usually in probability to refer to the outcome of an event.

Parralellogram - a quadrilateral that has both sets of opposite sides that are parallel.

Parabola - a type of curve, any point of which is equally distant from a fixed point, called the focus, and a fixed straight line, called the directrix.

Pentagon - a five sided polygon. Regular pentagons have five equal sides and five equal angles.

Percent - a ratio or fraction in which the second term on denominator is always 100.

Perimeter - the total distance around the outside of a polygon. The total distance around is obtained by adding tegether the units of measure from each side.

Perpendicular - when two lines or line segments intersect and form right angles.

Pi - the symbol for Pi is actually a greek letter. Pi is used to represent the ratio of a circumference of a circle to its diameter.

Plane - when a set of points joined together form a flat surface, the plan can extend without end in all directions.

Polynomial - an algebraic term that has 2 or more monomials. Polynomials include variables and always have one or more terms.

Polygon - line segments joined together to form a closed figure. Rectangles, squares, pentagons are all examples of polygons.

Prime numbers - prime numbers are integers that are greater than 1 and are only divisible by themselves and 1.

Probability - the likelihood of an event happening.

Product - the sum obtained when any two or more numbers are multiplied together.

Proper fraction - a fraction where the denominator is greater than the numerator.

Protractor - a semi-circle device used for measuring angles. The edge is subdivided into degrees.

Quadrant - one quarter (*qua*) of the plane on the cartesian coordinate system. The plane is divided into 4 sections, each section is called a quadrant.

Quadradic equation - an equation that can be written with one side equal to 0. Asks you to find the quadratic polynomial that is equal to zero.

Quadrilateral - a four (quad) sided polygon/shape.

Quadruple - to multiply or to be multiplied by 4.

Qualitative - a general description of properties that cannot be written in numbers.

Quartic - a polynomial having a degree of 4.

Quintic - a polynomial having a degree of 5.

Quotient - the solution to a division problem.

Radius - a line segment from the center of a circle to any point on the circle. Or the line from the center of a spere to any point on the outside edge of the sphere. The radius is the distance from the center of a circle/sphere to the outside edge.

Ratio - the relation between to quantities. Ratios can be expressed in words, fractions, decimals or percents. E.g., the ratio given when a team wins 4 out of 6 games can be said a 4:6 or four out of six or $\frac{4}{6}$.

Ray – a straight line with one endpoint. The line extends infinitely.

Range - the difference between the maximum and the minimum in a set of data.

Rectangle - a parallelogram which has four right angles.

Repeating decimal - a decimal with endlessly repeating digits. E.g., 88 divided by 33 will give a 2.6666666666666

Reflection - a mirror image of a shape or an object. Obtained from flipping the

image/object.

Remainder - the number that is left over when the number cannot be divided evenly into the number.

Right angle - an angle that is 90°.

Right triangle - a triangle having one angle equal to 90°.

Rhombus - a parallelogram with four equal sides, sides are all the same length.

Scalene triangle - a triangle with 3 unequal sides.

Sector - an area between an arc and two radiuses of a circle. Sometimes referred to as a wedge.

Slope - the slope shows the steepness or incliine of a line, determined from two points on the line.

Square root - the square root of a number. E.g., the square root of 144 is 12.

Stem and leaf - a graphic organizer to organize and compare data. Similar to a histogram, organizes intervals or groups of data.

Subtraction - the operation of finding the difference between two numbers or quantities. A process of 'taking away'.

Supplementary angles - two angles are supplementary if their sum totals 180°.

Symmetry - two halves which match perfectly.

Tangent - when an angle in a right triangle is X, the tangent of X is the ratio of lengths of the side opposite X to the side adjacent to X.

Term - a part of an algebraic equation or a number in a sequence or a series or a product of real numbers and/or variables.

Tessellation - congruent plane figures/shapes that cover a plane completely without overlapping.

Translation - a term used in geometry. Often called a slide. The figure or shape is moved from each point of the figure/shape in the same direction and distance.

Transversal - a line that crosses/intersects two or more lines.

Trapezoid - a quadrilateral with exactly two parallel sides.

Tree diagram - used in probability to show all of the possible outcomes or combinations of an event.

Triangle - three sided polygon.

Trinomial - an algebraic equation with 3 terms – polynomial

Unit - a standard quantity used in measurement. An inch is a unit of length, a centimeter is a unit of length a pound is a unit of weight.

Uniform - all the same. Having the same in size, texture, color, design etc.

Variable - when a letter is used to represent a number or number in equations and or expressions. E.g., in 3x + y, both y and x are the variables.

Venn diagram - a Venn diagram is often two circles (can be other shapes) that might be overlap or independent each other. The overlapping part usually contains information that is pertinent to the labels on both sides of the Venn diagram. For instance: one circle could be labeled 'Odd Numbers', the other circle could be labeled 'Two Digit Numbers' the overlapping portion must contain numbers that are odd and have two digits. Thus, the overlapping portions shows the relationship between the sets. (*Can be more than 2 circles.*)

Volume - a unit of measure. The amount of cubic units that occupy a space. A measurement of capacity or volume.

Vertex- a point of intersection where two (or more) rays meet, often called the corner. Wherever sides or edges meet on polygons or shapes. The point of a cone, the corners of cubes or squares.

Whole number - a whole number doesn't contain a fraction. A whole number is an integer which has 1 or more units and can be positive or negative.

X-axis - the horizontal axis in a coordinate plane.

X-intercept - the value of X when the line or curve intersects or crosses the x axis.

x - a symbol most often used to represent an unknown quantity in an equation.

Y-axis - the vertical axis in a coordinate plane.

Y-intercept - the value of y when the line or curve intersects or crosses the y axis.

Yard - a unit of measure. A yard is approximately 91.5 cm. A yard is also 3 feet.

Tugas 2:

1. Tulislah *mathematical expressions* berikut ini dengan kalimat Bahasa Inggris, kemudian praktekkan untuk membacanya dengan teman Anda :

   a. $13 + 128 = 141$ f. $5^3 = 125$

   b. $-2 - 7 = -9$ g. $\sqrt[4]{625} = 5$

   c. $53 \times 2 = 106$ h. $x + 3 < 8$

   d. $32 : 4 = 8$

   e. $-\dfrac{1}{3} + \dfrac{2}{4} = \dfrac{1}{6}$

2. Apakah yang dimaksud dengan *mathematical terms* berikut ini, jelaskan !

   a. Arc

   b. Complementary angle

   c. Greatest Common Factor (GCF)

   d. Obtuse triangle

   e. Protactor

3. Jodohkanlah antara *mathematical terms* dalam bahasa Inggris dan bahasa Indonesia berikut ini:

Bhs. Inggris
Chord
Denominator
Obtuse angle
Paralellogram
Whole number

Bhs. Indonesia
Jajargenjang
Sudut tumpul
Penyebut
Persegipanjang
Tali busur
Bilangan bulat

Bab IV

Reading and Understanding some Mathematics Topics in Mathematics Learning

A. Tujuan Pembelajaran

Setelah mempelajari materi pada Bab IV ini, diharapkan para guru di lingkungan KKG/MGMP matematika SMP dapat menjelaskan simbol dan istilah matematika *(mathematical symbols and terms)* dalam bahasa Inggris yang sering digunakan dalam pembelajaran matematika dan dapat menerjemahkan artikel matematika sederhana dalam bahasa Inggris.

B. Permasalahan

Dalam membaca buku atau artikel matematika dalam bahasa Inggris, sering kali para guru mengalami kesulitan dalam menerjemahkan tulisan/artikel tersebut.

C. Alternatif Pemecahannya

Guna mendukung pemahaman beberapa *mathematical symbols* dan *mathematical terms* sebagaimana yang telah disampaikan pada Bab III, berikut ini akan disampaikan beberapa topik pembelajaran Matematika khususnya bagi jenjang SMP. Namun sebelumnya perlu kami sampaikan beberapa *tips* yang sekiranya bisa digunakan dalam memahami tulisan atau artikel yang ditulis dalam bahasa Inggris khususnya topik Matematika antara lain sebagai berikut.

1. Munculkan *image*/kesan bahwa belajar bahasa Inggris bukanlah sesuatu yang sulit atau tidak bisa dilakukan.

2. Sebagai bahasa simbol, Matematika dalam bahasa Inggris tidak menggunakan banyak kata-kata, tetapi lebih fokus pada konteks keseluruhan dari simbol-simbol yang digunakan.

3. Awali dengan membaca keseluruhan secara sepintas (*scanning*) artikel atau tulisan tersebut, jangan terjebak/terpaku pada satu atau dua kata yang mungkin tidak bisa dipahami/sulit terjemahannya.

4. Temukan benang merah/pikiran utama dari tulisan tersebut, yang mungkin perlu di-*break-down* pada pikiran utama tiap paragraf.

5. Apabila ternyata secara sepintas masih banyak kata-kata yang belum dipahami (belum ditemukan terjemahannya), perlu merujuk kepada kamus.

6. Dengan beberapa kata yang telah ditemukan terjemahannya dan simbol-simbol matematika yang ada, cobalah merangkai makna dengan melihat konteks yang ada kemudian menulis terjemahan bebasnya.

Sementara itu, dalam melatih pengucapan (*pronounciation*) beberapa *mathematical symbols* and *mathematical terms*, ada beberapa *tips* yang bisa digunakan dalam membantu melancarkan upaya tersebut. *Tips* tersebut antara lain adalah sebagai berikut:

1. Munculkan semangat *just do it*, jangan berpikir tentang *grammar* dulu.

2. Kebenaran *pronounciation*-nya kemudian, tetapi upayakan penyebutan *mathematics symbol and mathematics terms* benar.

3. Untuk mengecek kebenaran, *pronounciation*-nya bisa dilihat pada kamus atau mungkin *transtool* di computer.

4. Untuk melatih ketrampilan, upayakan selalu untuk mempraktekkannya *just practice, drill and practice,* terlibat aktif dalam *conversation*.

5. Mendengarkan *music*, *news,* dan menonton film dalam bahasa Inggris akan membantu penguasaan *English proficiency* kita.

Sebagai latihan, berikut ini adalah beberapa topik (http://www.bymath.com; diakses tgl 20 Februari 2008) yang bisa digunakan untuk membantu pemahaman (*understanding*) sekaligus pengucapan (*pronounciation*).

a. Arithmetics

Arithmetical operations

Addition (addends, sum). Subtraction (minuend, subtrahend, difference). Multiplication (multiplicand, multiplier, product, factors). Division (dividend, divisor, quotient, dividing integers, fraction, divisible numbers, remainder, division without remainder, division with remainder). Raising to a power (power, base of a power, index or exponent of a power, value of a power). Extraction of a root (root, radicand, index or degree of a root, value of a root, square root, cube root). Mutually inverse operations.

Addition – an operation of finding a sum of some numbers: 11 + 6 = 17. Here 11 and 6 – *addends*, 17 – the *sum*. If addends are changed by places, a sum is saved the same: 11 + 6 = 17 and 6 + 11 = 17.

Subtraction – an operation of finding an addend by a sum and another addend:
17 – 6 = 11. Here 17 is a *minuend*, 6 – a *subtrahend*, 11 – the *difference*.

Division – an operation of finding one of factors by a product and another factor:
48 : 4 = 12. Here 48 is a *dividend*, 4 – a *divisor*, 12 – the *quotient*. At *dividing integers* a quotient can be not a whole number. Then this quotient can be present as a *fraction*. If a quotient is a whole number, then it is called that numbers are *divisible*, i.e. one number is divided *without remainder* by another. Otherwise, we have a division *with remainder*. For example, 23 isn't divided by 4 ; this case can be written as: 23 = 5 · 4 + 3. Here 3 is a *remainder*.

Raising to a power. To raise a number to a whole (second, third, forth, fifth etc.) *power* means to repeat it as a factor two, three, four, five and so on. The number, repeated as a factor, is called a *base of a power*; the quantity of factors is called an *index* or an *exponent of a power*; the result is called a *value of a power*. A raising to a power is written as:

$$3^5 = 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 243 \,.$$

Here 3 – a base of the power, 5 – an exponent (an index) of the power, 243 – a value of the power.
The second power is called a *square*, the third one – a *cube*. The first power of any number is this number.

Extraction of a root – an operation of finding a base of a power by the power and its exponent:

$$\sqrt[5]{243} = 3.$$

Here 243 – a *radicand*, 5 – an *index* (*degree*) *of the root*, 3 – a *value of the root*. The second root is called a *square root,* the third root – a *cube root*. The second degree of square root is written:

$$\sqrt{16} = 4.$$

Addition and subtraction, multiplication and division, raising to a power and extraction of a root are two by two *mutually inverse operations*.

Greatest common factor

Common factor of some numbers.
Greatest common factor (GCF). Finding GCF.

Common factor of some numbers - a number, which is a factor of each of them. For example, numbers 36, 60, 42 have common factors 2 and 3 . Among all common factors there is always the greatest one, in our case this is 6. This number is called a *greatest common factor* (GCF).

To find a *greatest common factor* (GCF) of some numbers it is necessary:

1) to express each of the numbers as a product of its *prime factors*, for example:

$$360 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 ,$$

2) to write *powers of all prime factors* in the factorization as:

$$360 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 = 2^3 \cdot 3^2 \cdot 5^1 ,$$

3) to write out all *common factors* in these factorizations;

4) to take *the least power* of each of them, meeting in the all factorizations;

5) to multiply these powers.

E x a m p l e .

Find GCF for numbers: 168, 180 and 3024.

S o l u t i o n .

$$168 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 7 = 2^3 \cdot 3^1 \cdot 7^1,$$

$$180 = 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 = 2^2 \cdot 3^2 \cdot 5^1,$$

$$3024 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3 \cdot 7 = 2^4 \cdot 3^3 \cdot 7^1.$$

Write out the least powers of the common factors 2 and 3 and multiply them:

$$GCF = 2^2 \cdot 3^1 = 12.$$

Least common multiple

Common multiple of some numbers.
Least common multiple (LCM). Finding LCM.

Common multiple of some numbers is called a number, which is divisible by each of them. For example, numbers 9, 18 and 45 have as a common multiple 180. But 90 and 360 are also theirs common multiples. Among all common multiples there is always the least one, in our case this is 90. This number is called a *least common multiple* (LCM).

To find a *least common multiple* (LCM) of some numbers it is necessary:

1) to express each of the numbers as a product of its *prime factors*, for example:

   $$504 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 7,$$

2) to write *powers of all prime factors* in the factorization as:

   $$504 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 7 = 2^3 \cdot 3^2 \cdot 7^1,$$

3) to write out *all prime factors*, presented at least in one of these numbers;

4) to take *the greatest power* of each of them, meeting in the factorizations;

5) to multiply these powers.

E x a m p l e .

Find LCM for numbers: 168, 180 and 3024.

S o l u t i o n

$168 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 7 = 2^3 \cdot 3^1 \cdot 7^1$,

$180 = 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 = 2^2 \cdot 3^2 \cdot 5^1$,

$3024 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 3 \cdot 7 = 2^4 \cdot 3^3 \cdot 7^1$.

Write out the greatest powers of all prime factors: $2^4, 3^3, 5^1, 7^1$ and multiply them:

LCM $= 2^4 \cdot 3^3 \cdot 5 \cdot 7 = 15120$.

Vulgar (simple) fractions

Vulgar fraction (denominator, numerator).
Proper fraction. Improper fraction.
Mixed number (integer and fractional parts).
Converting of a mixed number into a vulgar
improper fraction and back. Reciprocal fractions.

A part of a unit or some equal parts of a unit is called a *vulgar (simple) fraction*. A number of equal parts into which a unit has been divided, is called a *denominator*; a number of these taken parts, is called a *numerator*. A fraction record:

$$\frac{3}{7} \quad \text{or} \quad 3/7 .$$

Here 3 – a numerator, 7 – a denominator.

If a numerator is less than a denominator, then the fraction is less than 1 and called a *proper* fraction. If a numerator is equal to a denominator, the fraction is equal to 1. If a numerator is greater than a denominator, the fraction is greater than 1. In both last cases the fraction is called an *improper* fraction. If a numerator is divisible by a denominator, then this fraction is equal to a quotient: $\dfrac{63}{7} = 9$. If a division is executed with a remainder, then this improper fraction can be presented as a *mixed number:*

$$\frac{65}{7} = 9\frac{2}{7}.$$

Here 9 – an incomplete quotient (an integer part of the mixed number), 2 – a remainder (a numerator of the fractional part), 7 – a denominator . It is often necessary to solve a reverse problem – to convert a mixed number into a fraction. For this purpose, multiply an integer part of a mixed number by a denominator and add a numerator of a fractional part. It will be a numerator of a vulgar fraction, and its denominator is saved the same.

E x a m p l e . Convert $8\frac{5}{9}$ into a vulgar fraction

S o l u t i o n. 1) $8 \cdot 9 = 72$;

2) $72 + 5 = 77$

3) $\frac{77}{9}$

So, $8\frac{5}{9} = \frac{77}{9}$

Reciprocal fractions are two fractions whose product is 1. For example, 3/7 and 7/3 ; 15 /1 and 1/15 and so on.

b. Geometry

Parallel straight lines

Parallel straightlines. Distance between parallel straight lines. Angles with correspondingly parallel sides. Corresponding angles. Alternate interior and exterior angles. One-sided interior and exterior angles. Angles with correspondingly perpendicular sides. Proportional segments. Thales' theorem.

Two straight lines AB and CD (Fig.11) are called *parallel straight lines*, if they lie in the same plane and don't intersect however long they may be continued. The designation: AB|| CD. All points of one line are equidistant from another line. All straight lines, parallel to one straight line are parallel between

themselves. It's adopted that an angle between parallel straight lines is equal to zero. An angle between two parallel *rays* is equal to zero, if their directions are the same, and 180 deg, if the directions are opposite. All perpendiculars (AB, CD, EF, Fig.12) to the one straight line KM are parallel between themselves. Inversely, the straight line KM, which is perpendicular to one of parallel straight lines, is perpendicular to all others. A length of perpendicular segment, concluded between two parallel straight lines, is a *distance* between them.
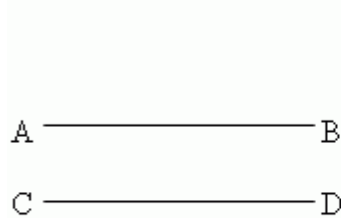
Fig. 11
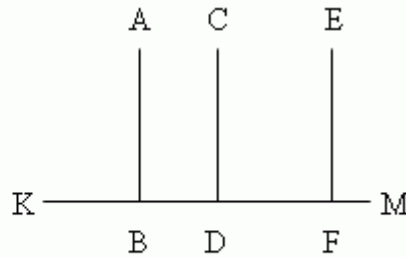
Fig. 12

At intersecting two parallel straight lines by the third line, eight angles are formed   (Fig.13), which are called two-by-two:
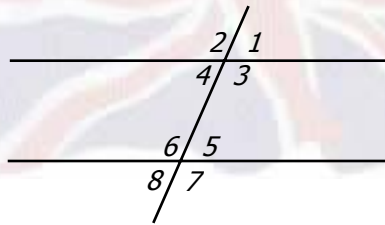
Fig. 13

1) *corresponding angles* (*1* and *5; 2* and *6; 3* and *7; 4* and *8*); these angles are equal two-by-two: ($\angle 1 = \angle 5; \angle 2 = \angle 6; \angle 3 = \angle 7; \angle 4 = \angle 8$);
2) *alternate interior angles* (*4* and *5; 3* and *6*); they are equal two-by-two;
3) *alternate exterior angles* (*1* and *8; 2* and *7*); they are equal two-by-two;
4) *one-sided interior angles* (*3* and *5; 4* and *6*); a sum of them two-by-two is equal to180 deg ($\angle 3 + \angle 5 = 180$ deg; $\angle 4 + \angle 6 = 180$ deg);
5) *one-sided exterior angles* (*1* and *7; 2* and *8*); a sum of them two-by-two is equal to180 deg ($\angle 1 + \angle 7 = 180$ deg; $\angle 2 + \angle 8 = 180$ deg).

Angles with *correspondingly parallel sides* either are equal one to another, (if both of them are acute or both are obtuse, $\angle 1 = \angle 2$, Fig.14), or sum of them is 180 deg ($\angle 3 + \angle 4 = 180$ deg, Fig.15).
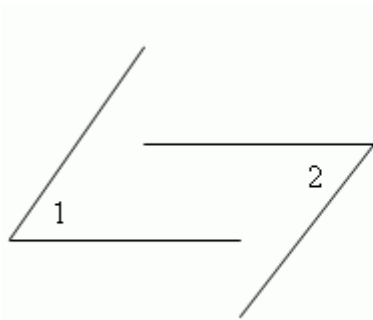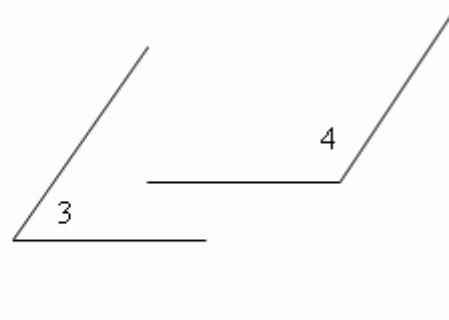
Fig. 14   Fig. 15

Angles with *correspondingly perpendicular sides* are also either equal one to another (if both of them are acute or both are obtuse), or sum of them is 180 deg.
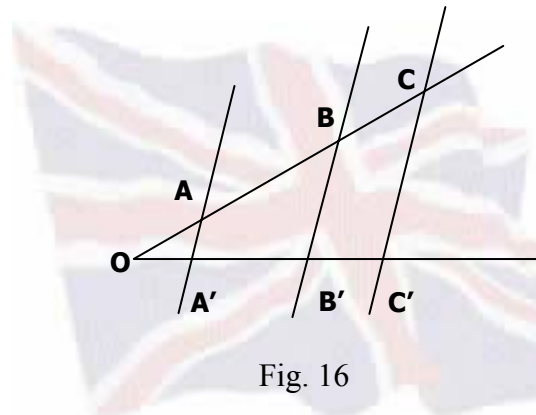

Fig. 16

Thales' theorem. At intersecting sides of an angle by parallel lines (Fig.16), *the angle sides are divided into the proportional segments:*

$$\frac{OA}{OA'} = \frac{OB}{OB'} = \frac{OC}{OC'} = \frac{AB}{A'B'} = \frac{BC}{B'C'} = \frac{AC}{A'C'}.$$

Triangle

Triangle. Acute-angled triangle. Right-angled triangle. Obtuse-angled triangle. Isosceles triangle. Equilateral triangle. Scalene triangle. Main properties of triangles. Theorems about congruence of triangles. Remarkable lines and points of a triangle. Pythagorean theorem. Relation of sides for an arbitrary triangle.

Triangle is a polygon with three sides (or three angles). Sides of triangle are signed often by small letters, corresponding to designations of opposite vertices, signed by capital letters.
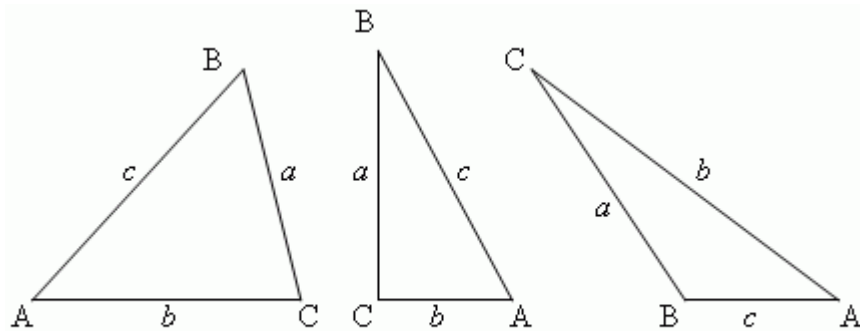

Fig. 20   Fig. 21   Fig. 22

If all the three angles are acute (Fig.20), then this triangle is an *acute-angled triangle*; if one of the angles is right (∠C, Fig.21), then this triangle is a *right-angled triangle*; sides *a, b*, forming a right angle, are called *legs*; side *c*, opposite to a right angle, called a *hypotenuse*; if one of the angles is obtuse (∠B, Fig.22), then this triangle is an *obtuse-angled triangle.*
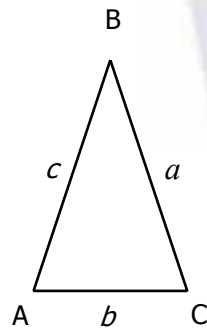
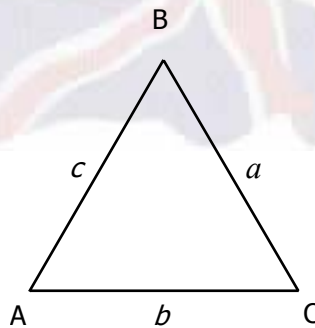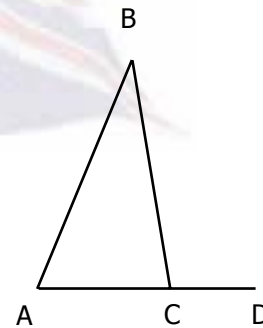Fig. 23   Fig. 24   Fig. 25

A triangle ABC is an isosceles triangle (Fig.23), if the two of its sides are equal (a = c); these equal sides are called lateral sides, the third side is called a base of triangle. A triangle ABC is an equilateral triangle (Fig.24), if all of its sides are equal ($a = b = c$). In general case (a b c) we have a *scalene triangle.*

Main properties of triangles. In <u>any triangle:</u>

1. *An angle, lying opposite the greatest side, is also the greatest angle, and inversely.*

2. *Angles, lying opposite the equal sides, are also equal, and inversely.* In particular, all angles in an *equilateral triangle* are also equal.

3. *A sum of triangle angles is equal to 180 deg.*

   From the two last properties it follows, that each angle in an equilateral triangle is equal to 60 deg.

4. Continuing one of the triangle sides (AC , Fig. 25), we receive an *exterior* angle ∠BCD.

   An exterior angle of a triangle is equal to a sum of interior angles, not supplementary with it: ∠BCD = ∠A + ∠B.

5. *Any side of a triangle is less than a sum of two other sides and more than their difference* ($a < b + c$, $a > b − c$, $b < a + c$, $b > a − c$, $c < a + b$, $c > a − b$).

Theorems about congruence of triangles.

Two triangles are congruent, if they have accordingly equal:

a) *two sides and an angle between them;*

b) *two angles and a side, adjacent to them;*

c) *three sides.*

Theorems about congruence of right-angled triangles.

Two *right-angled* triangles are congruent, if one of the following conditions is valid:

1) their legs are equal;

2) a leg and a hypotenuse of one of triangles are equal to a leg and a hypotenuse of another;

3) a hypotenuse and an acute angle of one of triangles are equal to a hypotenuse and an acute angle of another;

4) a leg and an adjacent acute angle of one of triangles are equal to a leg and an adjacent acute angle of another;

5) a leg and an opposite acute angle of one of triangles are equal to a leg and an opposite acute angle of another.

Remarkable lines and points of triangle.

Altitude (height) of a triangle is a *perpendicular, dropped from any vertex to an opposite side* (or to its continuation). This side is called a *base* of triangle in this case. Three heights of triangle always intersect in one point, called an *orthocenter* of a triangle. An orthocenter of an acute-angled triangle (point O, Fig.26) is placed inside of the triangle; and an orthocenter of an obtuse-angled triangle (point O, Fig.27) – outside of the triangle; an orthocenter of a right-angled triangle coincides with a vertex of the right angle.
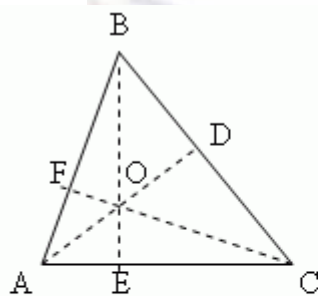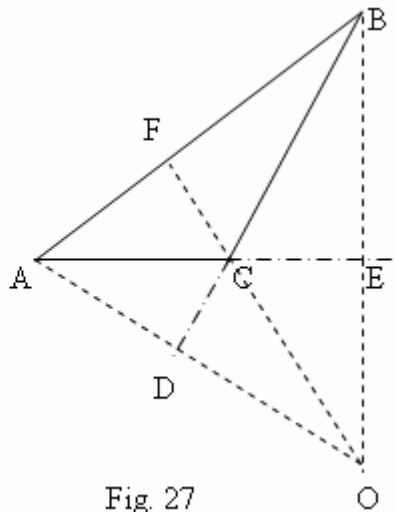

Fig. 26

Fig. 27

Median is a *segment, joining any vertex of triangle and a midpoint of the opposite side. Three medians of triangle* (AD, BE, CF, Fig.28) *intersect in one point* O (always lied inside of a triangle), which is a *center of gravity* of this triangle. This point divides each median by ratio 2:1, considering from a vertex.

Bisector is a segment of the angle bisector, from a vertex to a point of intersection with an opposite side. *Three bisectors of a triangle* (AD, BE, CF, Fig.29) *intersect in the one point* (always lied inside of triangle), *which is a center of an inscribed circle*
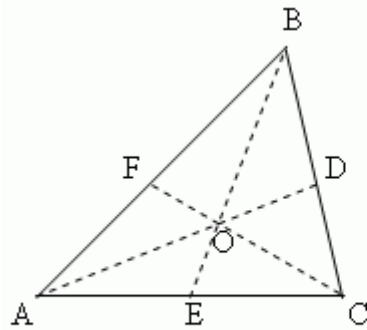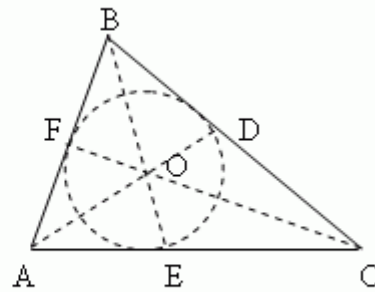
Fig. 28   Fig. 29

A bisector divides an opposite side into two parts, proportional to the adjacent sides; for instance, on Fig.29 AE : CE = AB : BC .

Midperpendicular is a perpendicular, drawn from a middle point of a segment (side).Three midperpendiculars of a triangle (ABC, Fig.30), each drawn through the middle of its side (points K, M, N, Fig.30), intersect in one point O, which is *a center of circle, circumscribed* around the triangle (circumcircle).
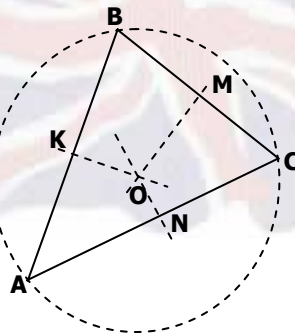

Fig. 30

In an acute-angled triangle this point lies inside of the triangle; in an obtuse-angled triangle - outside of the triangle; in a right-angled triangle - in the middle of the hypotenuse. An orthocenter, a center of gravity, a center of an inscribed circle and a center of a circumcircle coincide only in an equilateral triangle.

Pythagorean theorem. In a right-angled triangle a square of the hypotenuse length is equal to a sum of squares of legs lengths.

A proof of Pythagorean theorem is clear from Fig.31. Consider a right-angled triangle ABC with legs *a, b* and a hypotenuse *c.*
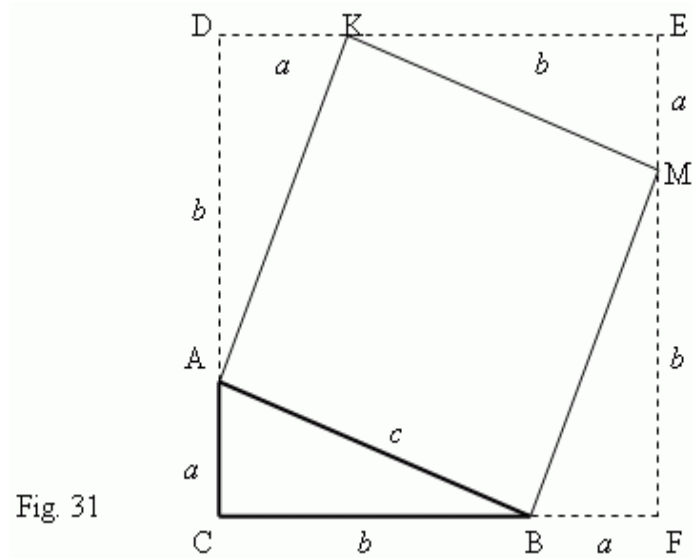
Fig. 31

Build the square AKMB, using hypotenuse AB as its side. Then continue sides of the right-angled triangle ABC so, to receive the square CDEF, the side length of which is equal to $a + b$. Now it is clear, that an area of the square CDEF is equal to $(a + b)^2$. On the other hand, this area is equal to a sum of areas of four right-angled triangles and a square AKMB, that is

$$c^2 + 4\left(ab / 2\right) = c^2 + 2\,ab,$$

hence,

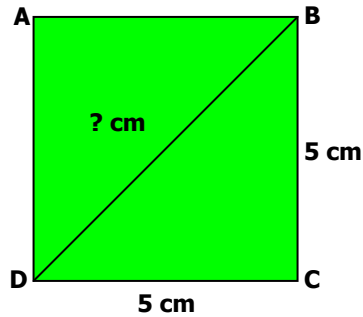$$c^2 + 2\,ab = (a + b)^2,$$

and finally, we have:

$$c^2 = a^2 + b^2.$$

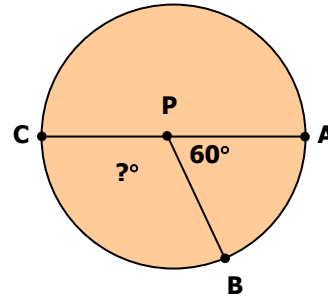*** Good luck, guys ?!***

Tugas 3 :

1. Deskripsikan gambar berikut dengan bahasa Inggris sementara teman yang lain mengamati pembahasan Anda :

a.

b.

2. Dalam kelompok kecil yang beranggotakan 3-4 orang dan dengan bantuan kamus yang ada, pilihlah salah satu topik/artikel pada BAB IV di atas, dan cobalah untuk menerjemahkannya. Kemudian tukar dengan kelompok lain untuk saling mengoreksi.

Bab V

Penutup

A. Rangkuman dan Saran

1. Beberapa kegitan dalam *Greetings, Encouraging, and Closing Conversation.*

   a. Salam perkenalan *(Greetings for first meeting: Hello, Hi, How do you do?, How are you?, etc.)*

   b. Memperkenalkan diri sendiri *(Identifying yourself: Hello, I'm…., Hello my name is …., Hello, let me introduce myself, I'm…, etc.)*

   c. Strategi dalam perkenalan diri (*Strategies in personal introduction*)

      1) *Slower speaking speed, don't rush.*

      2) *Louder volume and project the voice*

      3) *Clearer utterance of the words*

      4) *Establish eye contact with everyone*

      5) *Decide and follow the setting and the culture*

      6) *Full self-confidence*

   d. Menghidupkan percakapan *(Encouraging conversation: I see, Of Course, Really? …,etc)*

   e. Permohonan menyela kepada pembicara *(Appealing to the speaker: Pardon, Execuse me, I'm sorry …., Would you mind ….., etc)*

   f. Menutup percakapan/kegiatan pembelajaran *(Closing conversation: Well, … So,….., Well Okay, …., etc)*

2. Beberapa kegiatan *Saying Mathematical Symbol and Terms.*

   a. How to say numbers (such as: 0 – zero; 1– one; 3 – three; 11 – eleven; 12 – twelve; 13 – thirteen; 47 – forty seven; 253 – two hundred and fifty three, 4271 – four thousand two hundred and seventy one; etc.)

   b. How to say numbers with decimal point (such as: 3.7 – three point seven; 4.67 – four point sixty seven)

c. *How to say mathematical expression (such as: 3 − 25 = -22 ; three minus twenty five is negative twenty two, $2^3 = 8$; two raised to the power of three is eight ; etc.)*

3. Beberapa Mathematical terms yang ada dalam pembahasan modul ini antara lain:

- *angle*	- *base*	- *complementary angle*	- *diagonal*
- *arc*	- *circumference*	- *cone*	- *edge*
- *average*	- *chord*	- *degree*	- *etc.*

4. Beberapa *tips* dalam memahami tulisan atau artikel dalam bahasa Inggris:

   a. munculkan *image*/kesan bahwa belajar bahasa Inggris bukanlah sesuatu yang sulit atau tidak bisa dilakukan.

   b. sebagai bahasa simbol, Matematika dalam bahasa Inggris tidak menggunakan banyak kata-kata, tetapi lebih fokus pada konteks keseluruhan dari simbol-simbol yang digunakan.

   c. awali dengan membaca keseluruhan secara sepintas (*scanning*) artikel atau tulisan tersebut, jangan terjebak/terpaku pada satu atau dua kata yang mungkin tidak bisa dipahami/sulit terjemahannya.

   d. temukan benang merah/pikiran utama dari tulisan tersebut, yang mungkin perlu di-*break-down* pada pikiran utama tiap paragraph.

   e. apabila ternyata secara sepintas masih banyak kata-kata yang belum dipahami (belum ditemukan terjemahannya), perlu merujuk kepada kamus.

   f. dengan beberapa kata yang telah ditemukan terjemahannya dan simbol-simbol matematika yang ada, cobalah merangkai makna dengan melihat konteks yang ada kemudian menulis terjemahan bebasnya.

5. Beberapa *tips* dalam melatih pengucapan (*pronounciation*) dalam bahasa Inggris:

   a. munculkan semangat *just do it*, jangan berpikir tentang *grammar* dulu.

   b. kebenaran *pronounciation*-nya kemudian, tetapi upayakan penyebutan *mathematics symbol and mathematics terms* benar.

   c. untuk mengecek kebenaran, *pronounciation*-nya bisa dilihat pada kamus atau mungkin *transtool* di computer.

d. untuk melatih ketrampilan, upayakan selalu untuk mempraktekannya *just practice, drill and practice,* terlibat aktif dalam *conversation.*

e. mendengarkan *music, news,* dan menonton film dalam bahasa Inggris akan membantu penguasaan *English proficiency* kita.

Bahasa Inggris dalam pembelajaran Matematika yang disampaikan di sini, masih sangatlah sederhana dan butuh pengembangan lebih lanjut. Setidaknya, yang sedikit ini mudah-mudahan akan mampu memotivasi khususnya para guru Matematika untuk sudi dan bersedia memperdalam bahasa Inggris. Era global telah merambah hampir segala aspek kehidupan manusia (termasuk dunia pendidikan) dan tentunya kita tidak bisa tinggal diam sebagai penonton yang pasif. Akan tetapi sebaliknya, kita harus mengambil peran dan tidak boleh terbawa arus yang akan menyeret kita. Tuntutan perbaikan kesejahteraan yang dimulai dari peningkatan kompetensi guru juga harus disikapi positif oleh para guru, dan peningkatan kemampuan berbahasa Inggris adalah salah satu dari sekian banyak kemampuan yang mesti diupayakan.

Kami yakin tulisan ini masih banyak kekurangan dan perlu penyempurnaan. Saran, kritik dan masukan demi perbaikan tulisan ini sangat dibutuhan. Semoga tulisan yang amat sederhana ini dapat memberikan sumbangan yang tidak kecil dalam rangka ikut mencerdaskan anak bangsa di negeri tercinta ini, amien.

B. Evaluasi

Choose the best answer by crossing the option (A, B, C, or D) that suitable with given questions.You will be considered **success** *in acquiring this material if you do correctly at least 7 (seven) questions.*

1. Word phrasing in greetings for first meeting such as …..

   a. I'm sorry

   b. Would you mind

   c. How do you do?

   d. I see

2. Word phrasing in identifying ourselves such as ….

   a. How are you?

   b. Hello, let me introduce myself

   c. Really?

   d. Thank you

3. Word phrasing in closing conversation such as ….

   a. Well okay

   b. Of course

   c. Pardon

   d. Hello

4. In mathematical expression such: $\dfrac{2}{3}+\dfrac{4}{5}=1\dfrac{7}{15}$, we might say ….

   a. Two over three plus four over five is one seven over fifteen

   b. Two over three and four over five is one seven over fiveteen

   c. Two over three plus four over five is one and seven over fifteen

   d. Two over three plus four over five is one seven and over fiveteen

5. In mathematical expression such: $\sqrt[3]{293}=7$, we might say ….

   a. The three root of two hundred ninety three is seven

   b. The three root of two hundred and ninety three is seven

   c. The cube root of two hundred ninety three is seven

   d. The cube root of two hundred and ninety three is seven

6. A mathematical term that formed by two rays in which begin at the same point is ….

   a. Arc

   b. Angle

   c. Circumference

   d. Chord

7. The segment which joins two points on a circle is ….

    a. Arc

    b. Angle

    c. Chord

    d. Section

8. A parallelogram which has four right angles is ….

    a. Rhombus

    b. Rectangle

    c. Trapezoid

    d. Kite

9. A number that can be divided or is divisible by two is …..

    a. Whole number

    b. Natural number

    c. Even number

    d. Odd number

10. In your job as a cashier, a customer gives you a Rp. 100.000,00 bill to pay for a T – shirt that costs Rp. 85.000,00. How much change should you give back?

    a. Rp. 185.000,00

    b. Rp. 115.000,00

    c. Rp. 70.000,00

    d. Rp. 15.000,00

crm-m@ret awal2008***

Lampiran

TUGAS 1 :

Alternatif Jawaban

1. Adit   : Hello, how are you?

    Atsil   : Fine thanks, how about you?

    Adit   : Very good.

    Atsil   : What's your name?

    Adit   : My name's Adit

             I work for SMP 1 Yogyakarta

    Atsil   : What subject do you teach Mr. Adit?

    Adit   : I teach mathematics at 8th grade.

    Atsil   : Well, nice to meet you.

    Adit   : Nice to meet you too.

2. Teacher   : Well, we have just studied the property of right triangle.

                   Any question so far?

    Student   : Excuce me, may I ask a question Mrs.Yanti?

    Teacher   : No problem, let's speak out Alfi.

    Student   : Could you explain what the hypothenuse is?

    Teacher   : Well, let's watch this right triangle ABC?

                   The hyphotenuse is the longest side of a right triangle.

    Student   : Could I say that the hyphotenuse always the side that's opposite

                   of the right angle?

    Teacher   : OK, that's true. In other word, the hypotenuse is located in the

                   opposite of the right angle.

3. Teacher   : Well, we have just studied the property of right triangle.

                   To strengthen your understanding, let me give you the home

                   work.

    Student   : Yes Sir, what's page?

Teacher   : OK, let's open your book page 25.

Student   : Which exercise and what number ?

Teacher   : Well... Exercise 2 , and do the odd numbers only. Remember, you have to try first. Don't give up! Any question ?

Student   : No, thanks.

Teacher   : Okay, time is up. Good luck, and see you tomorrow.

Student   : See you.

TUGAS 2 :

Alternatif Jawaban.

1. a. Thirteen plus twenty eight is one hundred and fourty one.
   b. Negative two minus seven is negative nine.
   c. Fifty three multiplied by two is one hundred and six.
   d. Thirty two divided by four is eight
   e. Negative one third plus two quaters is one sixth
   f. Five raised to the power of three is one hundred and twenty five
   g. The fourth root of six hundred anf twenty five is five.
   h. The value of x plus three is less than eight

2. a. Arc – a section or portion of the circumference of the circle
   b. Complementary angle – the two angels involved when the sum is 90°
   c. Greatest Common Factor (GCF) – the largest number common to each set of factors that divides both number exactly
   d. Obtuse triangle - a triangle with at least has one obtuse angle.
   e. Protactor – a semi-circle device used for measuring angles.

3. a. Chord ---- tali busur
   b. Denominator --- penyebut
   c. Obtuse angel --- sudut tumpul
   d. Parallelogram --- jajargenjang
   e. Whole number --- bilangan bulat

TUGAS 3:

Alternatif Jawaban:

1. a. It is a square. The length of a each side is 5 cm. The name of this square is ABCD. Could you determine the length of diagonal AC?

   b. It is a circle in which P is a centre point. AC is a diameter. AP is equal to PC and we call them radius. The measure of angle APB is 60°. Could you determine the measure of angle CPB?

2. In the group, please cross check each other what you have done. By discussing in your group, try to grade the work that have been done by the other groups.

EVALUASI:

Kunci Jawaban

1. C
2. B
3. A
4. C
5. D
6. B
7. C
8. B
9. C
10. D

References

Borowski, E.J & Borwein J.M. 1989. *Dictionary of Mathematics*. Great Britain: Collins Glasgow.

Chandra Segaran, Antonia. 1981. *Problems of Learning English as a Second Language*. Singapore: SEAMEO Regional Centre.

Lewis, Larry. 1982. *Basic Algebra*. England Cliffs, NJ: Prentice Hall, Inc.

Marpaung & Giri Saptoaji. 2002. *Communicative English* Bahan Ajar Diklat Kewidyaiswaraan Berjenjang Tingkat I. Jakarta: LAN- RI.

Matthews, C. 1994. *Speaking Solution*. New Jersey: Prentice Hall Inc.

Millington T.A.& Millington W. 1971. *Dictionary of Mathematic*. New Jersey: Barners & Noble Inc.

Newbury, John. 1981 *Basic Numeracy Skills and Practice*. The Mc.Milan Press Ltd.

http://www.bymath.com/symbols/symbols.html (diakses tgl. 20 Februari 2008)

http://math.about.com/library/bla.htm (diakses tgl. 20 Februari 2008)

http://www.roma.unisa.edu.au/07305/symbols.htm (diakses tgl. 20 Februari 2008)

http://en.wikipedia.org/wiki/mathematics (diakses tgl. 2 Maret 2008)

http://www.bymath.com/studyguide/geo/sec/geo3.htm (diakses tgl. 2 Maret 2008)