

Class: XI (A+B) **(SUMMER HOLIDAYS' HOMEWORK)** **(Session:2026-27)**

PHYSICS **WORKSHEET**

1. A dimensionally correct formula is not necessarily perfectly correct. Justify this giving an example.
2. Suppose that the displacement of an object is related to time according to the expression $x=Bt^2$. What are the dimensions of B?
3. (a) Is it possible for two quantities to have the same dimensions but different units. (b) Is it possible for two quantities to have same units but different dimensions?
4. The period ' T ' of a simple pendulum is measured in time units and is described by $T=2\pi\sqrt{l/g}$ Where l is the length of the pendulum and ' g ' is the free fall acceleration in units of length divided by square of time. Show that this equation is dimensionally correct.
5. The velocity v of a particle depends upon the time ' t ' according to the equation.

$$v = \sqrt{ab} + bt + \frac{c}{d+t}$$

Determine the units of a, b, c and d. What physical quantities they represent. All have SI units

6. Each of the following equations was given by a student during an examination.

$$\frac{1}{2}mv^2 = \frac{1}{2}mv_0^2 + \sqrt{mgh}$$

$$v = v_0 + at^2$$

$$ma = v^2$$

Do the dimensional analysis of each equation and explain why the equations cannot be correct.

7. Suppose we are told that the acceleration ' a ' of a particle moving with uniform speed ' v ' in a circle of radius ' r ' is proportional to some power of r , say r^n , and some power of v^m . How can we determine the value of n and m .
8. If $y = (4x^2 - 8x)^{1/2}$ find value of x for which $\frac{dy}{dx} = 0$.
9. The radius of a sphere is increasing at the rate of 0.2 cm/s. Find the rate of change of its volume at the instant the radius becomes 5 cm.
10. $y = \sin \theta - \cos \theta$. Find the maximum or the minimum possible value of y .

CASE STUDY BASED

The nature of a physical quantity is described by its dimensions. All the physical quantities represented by derived units can be expressed in terms of some combination of seven fundamental or base quantities. We shall call these base quantities as the seven dimensions of the physical world, which are denoted with square brackets []. Thus, length has the dimension [L], mass [M], time [T], electric current [A], thermodynamic temperature [K], luminous intensity [cd], and amount of substance [mol]. The dimensions of a physical quantity are the powers (or exponents) to which the base quantities are raised to represent that quantity. Note that using the square brackets [] round a quantity means that we are dealing with 'the dimensions of' the quantity. In mechanics, all the physical quantities can be written in terms of the dimensions [L], [M] and [T]. For example, the volume occupied by an object is expressed as the product of length, breadth and height, or three lengths. Hence the dimensions of volume are $[L] \times [L] \times [L] = [L^3]$.

- (a) Name any three dimensionless quantities.
- (b) Name any two dimensional constants.
- (c) State the principle of homogeneity.
- (d) Can two dimensionally different quantities be multiplied or divided? Explain your answer giving examples.

Read the taught chapters from the NCERT book and underline the sentences you are not able to understand.

CREATIVITY BASED QUESTIONS

1. Visit any Science museum and make a detailed account of a project that fascinated you the most in a separate small sized note book.
2. Make a working model based on any topics of your entire Physics syllabus.

CHEMISTRY

- Update fair notebook with intext and exercise question answers of Chapter 1 Some Basic Concepts in Chemistry and Chapter-2 atomic structure (till the topic covered)
- To do correction work for class test in fair notebook.
- To solve and write the solutions to following questions based on chapter -1.

Chapter-1 Some Basic Concepts in Chemistry

1. 5.2 g of CaCO_3 when heated produced 1.99 g of carbon dioxide and the residue (CaO) left behind weighs 3.2 g. Show that these results illustrate the law of conservation of mass.
2. In an experiment, 2.4 g of iron oxide on reduction with hydrogen yields 1.68 g of iron. In another experiment 2.9 g of iron oxide give 2.03 g of iron on reduction with hydrogen. Show that above data illustrate the law of constant proportion.
3. Two oxides of a metal contain 27.6 % and 30.0 % of oxygen respectively. If the formula of the first oxide is M_3O_4 , find that of the second oxide.
4. X and Y are known to form two compounds, the X content in one is 5.93 % while in other is 11.2 %. Show that this data is in agreement with the law of multiple proportions.
5. Find the percentage composition of potassium chlorate (KClO_3).
6. The mass of 94.5 mL of a gas at STP is found to be 0.2231 g. Calculate its molecular mass.
7. You are supplied with a gas containing 0.32 g of oxygen. Calculate the number of moles and number of molecules present in it.
8. Carbon occurs in nature as a mixture of carbon- 12 and carbon -13 . The average atomic mass of carbon is 12.011. what is the percentage abundance of carbon 12 in nature?
9. A compound contains Carbon, Hydrogen and Oxygen as 71.23%,12.95% and 15.81 % respectively. What is the empirical formula of the compound?
10. How many grams of barium chloride (BaCl_2) are needed to prepare 100 cm^3 of 0.250 M BaCl_2 solution? [Given; atomic mass of Ba=137 u , Cl = 35.5 u].
11. Find the molarity and molality of 15 % solution of H_2SO_4 . (density of H_2SO_4 solution is 1.020 g cm^{-3}).
12. A solution contains 2.80 mole of Acetone and 8.20 mole of Chloroform. Calculate the mole fraction of acetone.
13. Assume that you have 1.39 mol of N_2 and 3.44 mol of H_2 .
 - (i) How many moles of ammonia can you make?
 - (ii) How many grams of which reactant will be left over?
14. Chlorine is prepared in laboratory by treating manganese dioxide (MnO_2) with aqueous hydrochloric acid according to the reaction:



How many grams of HCl reacts with 5.0 g of manganese dioxide ?

15. How many grams of KClO_3 must be decomposed to prepare 3.36 litre of Oxygen at STP ?

ENGLISH

Instructions: Attempt all questions to the best of your ability. Pay attention to grammar, spelling, and presentation. This assignment is designed to help you revise key concepts and express your creativity.

Have a wonderful and productive holiday!

Total Marks: 35

Short Creative & Critical Writing

1. **Poster + Slogan (5 Marks)** Design a poster on ONE of the following themes:

[5 Marks]

- *Healthy Mind, Healthy Body*
- *Digital Detox*

Include a **self-composed slogan**, creative drawings/symbols, and clear typography. Task to be done in Notebook

- **Idea & Relevance (2 marks):** Theme clarity; slogan original and apt.
- **Design & Visuals (2 marks):** Composition, use of space, readable typography.
- **Neatness (1 mark):** Colouring, labels, pasted in notebook.

2. Holiday Reflection Journal (5 Marks) Write a one-page reflection titled “*Three Things I Learnt Outside the Classroom This Holiday.*” Focus on family, travel, books, or personal growth. Marks for honesty, clarity, and neat presentation. Task to be done on a blank/coloured A3 size sheet

[5 Marks]

- **Content & Insight (3 marks):** Honest reflection; three clear learnings.
- **Expression (1 mark):** Coherence, grammar, vocabulary.
- **Presentation (1 mark):** One-page A3 sheet, neat handwriting/layout.

Long Creative & Critical Writing

3- Write a **short one-act play** (10–12 minutes) and prepare a performance plan for a small class production. **Day-by-day plan:**

[10 Marks]

Day 1: Brainstorm theme and characters; write a one-page synopsis and character list.

Day 2: Draft Act (dialogue, stage directions) — aim for 6–8 pages script.

Day 3: Revise dialogue for pacing and clarity; add props, costume, and set notes.

Day 4: Rehearsal plan: blocking, cues, and a 5-minute excerpt rehearsal (recorded on phone).

Day 5: Final script with director’s notes and a 2-page reflection on choices.

- **Script & Structure (3 marks):** Clear synopsis, coherent plot, dialogue quality.
- **Stagecraft & Practicality (2 marks):** Props, costumes, blocking, rehearsal plan.
- **Process & Reflection (2 marks):** Director’s notes + 2-page reflection.
- **Presentation (1 mark):** Typed/handwritten script clarity and completeness.

4 - Visual Storyboard: 6-Panel Comic (3 marks) Task: Create a 6-panel comic (hand-drawn or digital) that tells a complete story about a teenager making a difficult choice related to technology or the environment. Add one short caption per panel and a 50-word reflection on the moral/lesson.

[10 marks]

- **Narrative (1 mark):** Complete story arc across six panels.
- **Visual Sequencing (1 mark):** Panel flow, captions, clarity.
- **Reflection (1 mark):** 50-word moral/lesson.

OR

Create a 6-page **digital mini-magazine** combining writing, visuals, and short interactive elements (QR code to audio, poll results, or short video). Theme: *Holiday discoveries.*

[10 Marks]

Day 1: Plan sections (editorial, 2 features, photo essay, student poll, creative corner); assign word counts.

Day 2: Write two feature pieces (400–600 words total) and collect 6 photos/illustrations.

Day 3: Produce one interactive element (record a 90-second audio, create a 3-question poll and gather 10 responses).

Day 4: Layout magazine pages (digital or printable); add captions, credits, and a contents page.

Day 5: Final proofreading and export as a single PDF or shareable image set; prepare a 150-word editor’s statement.

- **Content & Variety (3 marks):** Editorial, two features, photo essay present and balanced.
- **Multimedia/Interactive Element (2 marks):** Working QR/audio/poll with evidence of responses.
- **Design & Layout (2 marks):** Readable pages, captions, contents page.
- **Editor’s Statement (1 mark):** 150-word rationale and polish.

(HOLIDAY HOMEWORK ASSIGNMENT)

Section A: Language & Expression (10 Marks)

1. Grammar in Context (4 Marks) Read the passage below and fill in the blanks with the correct **determiners, tenses, modals, or subject-verb forms.**

Last Sunday, our school organized _____ (a / an / the) awareness rally on environmental protection.

Many students _____ (participate) enthusiastically, while some teachers _____ (guide) them

throughout the event. By the time the rally ended, the principal _____ (announce) the winners of the poster competition.

Each student _____ (need / must / should) carry a water bottle, as the weather was hot. The slogans on the posters _____ (be) inspiring and creative. Neither the students nor the teachers _____ (was / were) tired, because the energy of the crowd kept them motivated.

The rally proved that _____ (every / all / both) members of the school community can contribute to change. We realized that we _____ (ought to / dare / may) take responsibility for protecting our environment.

2. Error Hunt (3 Marks) The paragraph below contains 8–10 errors in spelling, punctuation, tense, or concord. Identify and correct them.

A- Yesterday the students was very excited for the science exhibition. Many of them have prepared models since two weeks, but some forget to bring their charts. The teacher say that every student must submit their work on time. Neither the principal nor the teachers was happy with the careless attitude. However, the effort of few students were appreciated, and they recieved prizes.

B- Last week our class plan a trip to the museum. Everyone were excited and discuss the exhibits loudly. The teacher say that students must behave properly. Neither the guide nor the teachers was happy when some students forget the rules. However, the effort of a few students were appreciated, and they recieve praise for their discipline.

3 :- Speech Writing (7 Marks) Prepare a 2-minute speech for the morning assembly on ONE of these:

- *The Power of Positive Thinking*
- *Why Discipline Shapes Destiny*

4- Fill in the blanks with suitable prepositions or articles.

1. She is interested _____ learning new languages.
2. The book was placed _____ the shelf near the window.
3. He is _____ honest boy who always speaks the truth.
4. We walked _____ the park and enjoyed the fresh air.
5. There is _____ university in our town that offers good courses.

5- The following sentences each contain one error. Rewrite them correctly.

1. The teacher along with the students were present.
2. He is senior than me in age.
3. She did not knew the answer.
4. One of my friend is coming today.
5. The news are very shocking.

4- Podcast Interview Simulation Imagine you are interviewing few famous environmentalist, author or You tube influencers. Draft 8–10 questions for each one of them and write their possible answers. Pick **any 5** out of the given personalities. One sample question is given for each personalities to give an idea of the level of questions expected :-

(6 x 5 = 30)

- **Malala Yousafzai** – Nobel Peace Prize laureate, education activist [“What motivated you to continue advocating for girls’ education even after facing such personal danger?”]
- **Barack Obama** – Former US President, author & speaker[“How did writing your books help you reflect on your journey as a leader?”]
- **Arundhati Roy** – Indian novelist & activist [“What role do you believe literature plays in shaping political awareness?”]
- **Ruskin Bond** – Beloved Indian author of children’s literature[“Why do you think children connect so deeply with stories set in the hills?”]

- **Greta Thunberg** – Climate activist[“What message do you want young people to carry forward about climate action?”]
- **David Attenborough** – Natural historian & broadcaster[“Which moment in your career made you feel the strongest connection to nature?”]
- **CarryMinati** – Indian YouTuber & comedian[“How do you balance humor with responsibility when millions watch your content?”]
- **Bhuvan Bam** – YouTuber, singer, actor [“What inspired you to blend music and comedy in your creative journey?”]
- **Prajakta Koli** – YouTuber & actress (*MostlySane*)[“How do you use your platform to talk about social issues while staying relatable?”]
- **A.R. Rahman** – Oscar-winning Indian composer[“What is your process for creating music that feels both spiritual and modern?”]
- **Amitabh Bachchan** – Legendary Bollywood actor[“What lessons from your long career in cinema do you think young actors should learn?”]
- **Taylor Swift** – Global singer-songwriter[“How do you transform personal experiences into songs that resonate globally?”]

Instructions :- All the work must be done in English Notebook with proper presentation.

BIOLOGY

CH- 4 ANIMAL KINGDOM

Section A: Multiple Choice Questions (1 mark each)

1. Which of the following is a diploblastic and radially symmetrical animal?
 - a) Earthworm
 - b) Jellyfish
 - c) Tapeworm
 - d) Roundworm
2. In which phylum is the notochord present at least in some stages of development?
 - a) Mollusca
 - b) Echinodermata
 - c) Chordata
 - d) Arthropoda
3. Flame cells are the excretory structures in:
 - a) Annelida
 - b) Platyhelminthes
 - c) Arthropoda
 - d) Echinodermata
4. Which phylum includes animals with a water vascular system?
 - a) Mollusca
 - b) Echinodermata
 - c) Arthropoda
 - d) Cnidaria

Section B: Very Short Answer Questions (2 marks each)

5. Define the term **coelom**. Mention types of coelom with one example each.
6. Name the characteristic features of **Phylum Cnidaria**.
7. Write two differences between **open** and **closed circulatory system**.

Section C: Short Answer Questions (3 marks each)

8. Compare the features of **Arthropoda** and **Annelida** under the following heads:
 - a) Body segmentation

- b) Circulatory system
- c) Appendages

Section D: Competency-Based Questions (4 marks each)

9. A marine zoologist collected a new organism with radial symmetry, no segmentation, spiny skin, and a unique water vascular system.

- a) Identify the phylum.
- b) List any two other features of the organisms in this phylum.
- c) What kind of larval stage do they have?
- d) Give an example.

10. Case-based question:

Priya observed a small elongated animal with a flat body in a water sample from a pond. It had no coelom and appeared to be a parasite.

- a) To which phylum does this animal most likely belong?
- b) What are the main body features of this phylum?
- c) Give an example of an organism from this phylum that affects human health.
- d) What is the type of symmetry in these organisms?

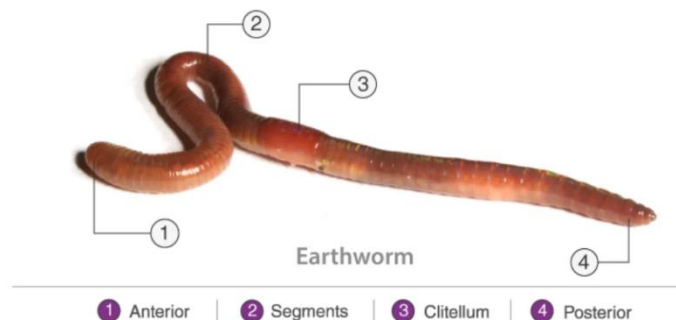
Section E: Long Answer Questions (5 marks)

11. Discuss the distinguishing features of the following phyla with examples:

- a) Porifera
- b) Ctenophora
- c) Mollusca
- d) Echinodermata
- e) Hemichordata

Section F: Diagram-Based Question (5 marks)

12. Observe the diagram below and answer the questions that follow:



- a) Identify the organism and the phylum it belongs to.
- b) Label the parts 1-4.
- c) What type of body symmetry does this organism exhibit?
- d) Write two characteristic features of this organism.

“The Animal Kingdom Explorer Scrapbook”

☐ Objective

To explore the diversity of the Animal Kingdom creatively by designing an interactive scrapbook that highlights the unique (peculiar) features of different phyla.

☐ Task Overview

Each student will create a creative scrapbook titled:

☐ “Journey Through the Animal Kingdom” ☐

Your scrapbook will act like a mini museum + travel diary, where each page represents a different phylum.

☐ Content Guidelines

☐ 1. Phyla to be Covered

Include the following major phyla:

Porifera
Cnidaria (Coelenterata)
Platyhelminthes
Nematoda
Annelida
Arthropoda
Mollusca
Echinodermata
Chordata

☐ 2. Each Phylum Page Must Include

Make every page unique and visually attractive:

☐ Title with Creative Heading

Example: “Arthropoda – The Armoured Survivors”

☐ Peculiar Features (Key Characteristics)

(Write in bullet points or creative diagrams)

☐ Pictures / Diagrams

(Hand-drawn / printed / magazine cut-outs)

☐ Fun Fact Box

(Something surprising or interesting)

☐ Real-life Examples

(At least 2–3 organisms)

☐ Make It EXTRA Creative (Compulsory Enhancements)

☐ 3. “Animal Talk Section”

Write a short imaginative dialogue (3–4 lines) where the organism “speaks” about itself.

Example:

"Hi! I am a starfish. I can regenerate my arms if they break!"

☐ 4. Use Creative Elements

Pop-ups / flaps / foldable pages

3D elements (threads, clay, leaves, etc.)

Color coding for each phylum

Mind maps or flowcharts

☐ 5. Add a “Phylum Map”

Create a classification flowchart showing how all phyla are connected.

☐ 6. Comparative Table (Last Page)

Make a summary table comparing:

Symmetry

Body cavity

Segmentation

Level of organization

☐ 7. Bonus Innovation (Optional but Rewarded)

Add a QR code linking to a video/explanation

Include a mini quiz at the end

Create a cover page with theme (Ocean life / Jungle / Evolution journey)

☐ Presentation Guidelines

Use A4/A3 sheets or a scrapbook

Neat handwriting and proper labeling

Use colors, headings, and borders

Avoid excessive copying – keep it original

PHYSICAL EDUCATION

1. Prepare a project file on yoga as preventive measure of lifestyle diseases. (**Use A4 colour sheets)

Three asana each for the following lifestyle diseases:-

1. Obesity
 2. Diabetes
 3. Asthma
 4. Hypertension
 5. Back pain.
2. Each Lifestyle disease should contain 3 Asanas and details about-
1. Causes,
 2. Procedure
 3. Benefits
 4. Contraindications
3. Suitable pictures should be pasted along each asana (size and posture, prefer colour pic's from magazines, newspaper etc.
- **** (Use self/your own color printed pic's against the described asanas)
4. Informative & printed matter in sort of research, medical, nutrition, etc. can also be pasted in your project.
- ***** Video diary with standing, sitting and lying posture asana. Use a good app with proper effects and text details etc. to be maintained and shared to the teacher concerned. (Approx. 30-35 sec. video clip with at least 8-10 asanas, also keep your video below 12mb)
- ***** Try regular practice of asanas for first 20 days and then make a video; it will help you get perfect pose for the digital diary.

Economics

1. Micro Economics studies the behaviour of an _____ unit.

- a) Individual Economic b) As a whole c) Both A and B d) None

2. What are the causes of Economic problems?

- a) Unlimited human wants b) Scarcity of economic resources
c) Alternative uses of resources d) All of the above

3. Abbreviate MOC _____

- a) Marginal object character b) Marginal opportunity cost
c) Both A and B d) None

4. Abbreviate PPF _____

- a) Production Possibility Frontier b) Possibility Production Frontier
c) A is False d) B is False

5. What are the reasons for the Rightward shift of PPC?

- a) Migration b) War c) Skill development programme d) None

6. When the marginal utility is equal to zero, what will the total utility be?

- A) Maximum B) Laws of return C) Minimum D) None of the above

7. Which of the following is the basis of diminishing marginal utility?

- A) Law of demand B) Laws of return C) Law of supply D) None of the above

8. A consumer is in equilibrium when the marginal utilities are _____ .

- A) Increasing B) Equal C) Minimum D) Highest

9. Why is a consumer's spending restricted?

- A) Due to the utility maximization B) Due to the budget constraint
C) Due to the demand curve D) Due to the marginal utility

10. When MU is positive, what happens to TU?

- A) It decreases. B) It becomes the highest. C) It remains constant. D) It increases.

11. What will be the MU when TU is maximum?

12. Which direction does the indifference curve slope?

13. What is a consumer surplus?

14. What is the point of satiety?

15. Calculate the missing figures:

Units	1	2	3	4	5
TU	16	-----	-----	-----	40
MU	-----	12	8	6	-----

16. Write the formula of the following terms:

- Marginal Utility = _____
- Total Utility = _____
- Budget Line = _____
- Consumer Equilibrium in case of one commodity = _____
- Consumer Equilibrium in case of two commodity = _____

COMPUTER SCIENCE WITH PYTHON

Topic: Python Programming

- 'Python is an interpreted high level language'. What does it mean to you?
 - What is the difference between interactive mode and script mode in Python?
 - What does a cross platform language mean?
 - What is the difference between a keyword and an identifier?
 - How many types of strings are supported in Python?
 - What factors guide the choice of identifiers in program?
 - What is the error in following Python program with one statement?

```
print ("My name is ", name)
```

Suggest a solution.
 - Write a program to obtain temperature in Celsius and convert it into Fahrenheit using formula $F = C \times 9 / 5 + 32$.
 - Predict the output :

```
F = 2
S = 3
T = F * S
print(F,S,T)
F = F + S + T
T = S * F
print(F,S,T)
```
 - Write a program to accept radius from the user and print its area.
 - Write a program that asks for your height in centimeters and then convert your height to feet and inches.
 - Write a program to read details like name, class, age of a student and then print the details firstly in same line and then in separate lines. Make sure to have break lines in these two different types of prints.
 - What are data types? What are Python's built in core data types?
 - What is a function? How is it useful?
 - Write a python program to count the number of characters (character frequency) in a string.
- Email all programs with your name and class to sandeepsinghsgs@gmail.com

HOLIDAY HOMEWORK

CLASS XI- MATHS

Trigonometric Functions

1. If $\sin \theta = \frac{3}{5}$, $\tan \varphi = \frac{1}{2}$, $\frac{\pi}{2} < \theta < \pi < \varphi < \frac{3\pi}{2}$ then find the value of $8 \tan \theta - \sqrt{5} \sec \varphi$.
 $\left(A = \frac{-7}{2} \right)$
2. If $\sin A = \frac{3}{5}$, $0 < A < \frac{\pi}{2}$, $\cos B = \frac{-12}{13}$, $\pi < B < \frac{3\pi}{2}$, find the value of $\sin(A - B)$, $\cos(A + B)$, $\tan(A - B)$
3. If A lies in the fourth quadrant and $\cos A = \frac{5}{13}$, find the value of $\frac{13 \sin A + 5 \sec A}{5 \tan A + 6 \csc A}$
4. If $\cos \theta = \frac{-1}{2}$ and $\pi < \theta < \frac{3\pi}{2}$, find the value of $4 \tan^2 \theta - 3 \cos^2 \theta$
5. If $\sin A = \frac{3}{5}$, $0 < A < \frac{\pi}{2}$ and $\cos B = \frac{-12}{13}$, $\pi < B < \frac{3\pi}{2}$ then find the following:
 (i) $\sin(A - B)$ (ii) $\cos(A + B)$ (iii) $\tan(A - B)$ $\left(A = \frac{-16}{65}, \frac{-33}{65}, \frac{16}{63} \right)$
6. Find the value of $\tan(A + B)$, given that $\cot A = \frac{1}{2}$, $\sec B = \frac{-5}{3}$, $\pi < A < \frac{3\pi}{2}$, $\frac{\pi}{2} < B < \pi$
7. Prove the following:
 - a) $\cos 570^\circ \sin 510^\circ + \sin(-330^\circ) \cos(-390^\circ) = 0$
 - b) $\frac{\cos(2\pi + \theta) \csc(2\pi + \theta) \tan\left(\frac{\pi}{2} + \theta\right)}{\sec\left(\frac{\pi}{2} + \theta\right) \cos(\theta) \cot(\pi + \theta)} = 1$
 - c) $\frac{\cos(90^\circ + \theta) \sec(-\theta) \tan(180^\circ - \theta)}{\sec(360^\circ - \theta) \sin(180^\circ + \theta) \cot(90^\circ - \theta)} = -1$
 - d) $\sin^2 \frac{\pi}{4} + \sin^2 \frac{3\pi}{4} + \sin^2 \frac{5\pi}{4} + \sin^2 \frac{7\pi}{4} = 2$
 - e) $\sin 600^\circ \tan(-690^\circ) + \sec 840^\circ \cot(-945^\circ) = \frac{3}{2}$
 - f) $\cos 306^\circ + \cos 234^\circ + \cos 162^\circ + \cos 18^\circ = 0$
 - g) $\sin^2 54^\circ - \sin^2 72^\circ = \sin^2 18^\circ - \sin^2 36^\circ$
8. In any quadrilateral ABCD, prove that: $\sin(A + B) + \sin(C + D) = 0$
9. Prove that:
 - a) $\tan 315^\circ \cot(-405^\circ) + \cot 495^\circ \tan(-585^\circ) = 2$
 - b) $\cos 510^\circ \cos 330^\circ + \sin 390^\circ \cos 120^\circ = -1$
 - c) $\sin \frac{8\pi}{3} \cos \frac{23\pi}{6} + \cos \frac{13\pi}{3} \sin \frac{35\pi}{6} = \frac{1}{2}$
 - d) $\cos 570^\circ \sin 510^\circ + \sin(-330^\circ) \cos(-390^\circ) = 0$

e) $3\sin\frac{\pi}{6}\sec\frac{\pi}{3} - 4\sin\frac{5\pi}{6}\cot\frac{\pi}{4} = 1$

f)
$$\frac{\cos(2\pi + \theta)\operatorname{cosec}(4\pi + \theta)\tan\left(\frac{\pi}{2} + \theta\right)}{\sec\left(\frac{\pi}{2} + \theta\right)\cos(-\theta)\cot(\pi + \theta)} = 1$$

10. In any cyclic quadrilateral ABCD, prove:

a) $\tan A + \tan B + \tan C + \tan D = 0$

b) $\cos(180^\circ - A) + \cos(180^\circ + B) + \cos(180^\circ + C) - \sin(90^\circ + D) = 0$

11. Find x from the following equation: $\operatorname{cosec}(90^\circ + \theta) + x \cos \theta \cot(90^\circ + \theta) = \sin(90^\circ + \theta)$

12. If A,B,C,D are angles of a cyclic quadrilateral, prove that:

$\cos A + \cos B + \cos C + \cos D = 0$

13. Find x from the following equation:

a) $\operatorname{cosec}(270^\circ + A) = \cos(180^\circ + A) + x \sin(90^\circ + A) \cot(270^\circ + A)$

b) $x \cot(90^\circ + A) + \tan(90^\circ + A) \sin A + \operatorname{cosec}(90^\circ + A) = 0$

14. Prove that:

a) $\tan 8\theta - \tan 6\theta - \tan 2\theta = \tan 8\theta \tan 6\theta \tan 2\theta$

b) $\tan 70^\circ = \tan 20^\circ + 2 \tan 50^\circ$

c) $\frac{\cos 11^\circ + \sin 11^\circ}{\cos 11^\circ - \sin 11^\circ} = \tan 56^\circ$

d) $\frac{\cos 15^\circ - \sin 15^\circ}{\cos 15^\circ + \sin 15^\circ} = \frac{1}{\sqrt{3}}$

15. If $A + B = \frac{\pi}{4}$, prove that $(1 + \tan A)(1 + \tan B) = 2$

16. Evaluate : a) $\cos(-1125^\circ)$ b) $\tan\left(\frac{11\pi}{6}\right)$ c) $\operatorname{cosec}(-1200^\circ)$

17. Prove that :

a) $\frac{\sin(A+B) + \sin(A-B)}{\cos(A+B) + \cos(A-B)} = \tan A$

b) $\frac{\sin(A-B)}{\cos A \cos B} + \frac{\sin(B-C)}{\cos B \cos C} + \frac{\sin(C-A)}{\cos C \cos A} = 0$

c) $\tan 13\theta - \tan 9\theta - \tan 4\theta = \tan 13\theta \tan 9\theta \tan 4\theta$

d) $\tan 15^\circ + \tan 30^\circ + \tan 15^\circ \tan 30^\circ = 1$

e) $\tan 36^\circ + \tan 9^\circ + \tan 36^\circ \tan 9^\circ = 1$

f) $\frac{\cos 8^\circ - \sin 8^\circ}{\cos 8^\circ + \sin 8^\circ} = \tan 37^\circ$

g) $\frac{\cos 9^\circ + \sin 9^\circ}{\cos 9^\circ - \sin 9^\circ} = \tan 54^\circ$

h) $\tan 50^\circ = \tan 40^\circ + 2 \tan 10^\circ$

i) $\tan\left(\frac{\pi}{4} + A\right) \tan\left(\frac{\pi}{4} - A\right) = 1$

j) $(1 + \tan A)(1 + \tan B) = 2 \tan A$, where $A - B = \frac{\pi}{4}$

k) $\tan 75^\circ - \tan 30^\circ - \tan 75^\circ \tan 30^\circ = 1$

18. If $\tan x + \tan\left(x + \frac{\pi}{3}\right) + \tan\left(x + \frac{2\pi}{3}\right) = 3$, then prove that : $\frac{3 \tan x - \tan^3 x}{1 - 3 \tan^2 x} = 1$

19. Prove that:

a) $\frac{1 + \sin 2\theta + \cos 2\theta}{1 + \sin 2\theta - \cos 2\theta} = \cot \theta$

b) $\frac{\cos 2\theta}{1 + \sin 2\theta} = \tan\left(\frac{\pi}{4} - \theta\right)$

c) $\frac{\cot \theta + \operatorname{cosec} \theta - 1}{\cot \theta - \operatorname{cosec} \theta + 1} = \cot \frac{\theta}{2}$

d) If $\tan \frac{x}{2} = \frac{n}{m}$, find the value of $m \cos x + n \sin x$

20. Show that: $\sqrt{2 + \sqrt{2 + \sqrt{2 + 2 \cos 8\theta}}} = 2 \cos \theta$

21. Prove that :

a) $\frac{\sin 2\theta}{1 - \cos 2\theta} = \cot \theta$

b) $\frac{1 + \sin \theta - \cos \theta}{1 + \sin \theta + \cos \theta} = \tan \frac{\theta}{2}$

c) $\sqrt{\frac{1 - \cos 2\theta}{1 + \cos 2\theta}} = \tan \theta$

d) $\sqrt{2 + \sqrt{2 + 2 \cos 4\theta}} = 2 \cos \theta$

e) $\frac{\sin 2\theta + \sin \theta}{1 + \cos \theta + \cos 2\theta} = \tan \theta$

f) $\cos 4\theta = 1 - 8 \sin^2 \theta + 8 \sin^4 \theta$

22. If $\sin x = \frac{\sqrt{5}}{3}$ and $\frac{\pi}{2} < x < \pi$, find the value of $\sin \frac{x}{2}, \cos \frac{x}{2}, \tan \frac{x}{2}$.

23. Prove that : $\cos^4 \frac{\pi}{8} + \cos^4 \frac{3\pi}{8} + \cos^4 \frac{5\pi}{8} + \cos^4 \frac{7\pi}{8} = \frac{3}{2}$

24. Prove that: $\left(1 + \cos \frac{\pi}{8}\right)\left(1 + \cos \frac{3\pi}{8}\right)\left(1 + \cos \frac{5\pi}{8}\right)\left(1 + \cos \frac{7\pi}{8}\right) = \frac{1}{8}$

25. Prove that : $\sin^4 \frac{\pi}{8} + \sin^4 \frac{3\pi}{8} + \sin^4 \frac{5\pi}{8} + \sin^4 \frac{7\pi}{8} = \frac{3}{2}$

26. Prove that: $\cos 5A = 16 \cos^5 A - 20 \cos^3 A + 5 \cos A$

27. Prove that :

a) $\frac{\sin 5x + \sin 3x}{\cos 5x + \cos 3x} = \tan 4x$

- b) $\frac{\sin x - \sin y}{\cos x + \cos y} = \tan\left(\frac{x - y}{2}\right)$
- c) $\frac{\cos x - \cos 2x + \cos 3x}{\sin x - \sin 2x + \sin 3x} = \cot 2x$
- d) $\frac{(\cos x - \cos 3x)(\sin 8x + \sin 2x)}{(\sin 5x - \sin x)(\cos 4x - \cos 6x)} = 1$
- e) $\frac{\sin A + 2\sin 3A + \sin 5A}{\sin 3A + 2\sin 5A + \sin 7A} = \frac{\sin 3A}{\sin 5A}$
- f) $\frac{\sin 3A + \sin 5A + \sin 7A + \sin 9A}{\cos 3A + \cos 5A + \cos 7A + \cos 9A} = \tan 6A$
- g) $\frac{\sin(x + y) - 2\sin x + \sin(x - y)}{\cos(x + y) - 2\cos x + \cos(x - y)} = \tan x$
- h) $\cos 40^\circ + \cos 50^\circ + \cos 70^\circ + \cos 80^\circ = \cos 10^\circ + \cos 20^\circ$
- i) $\cos \theta - \cos 3\theta + \cos 5\theta - \cos 7\theta = 4\sin \theta \sin 4\theta \cos 2\theta$
- j) $\sin \theta + \sin\left(\frac{2\pi}{3} + \theta\right) + \sin\left(\frac{4\pi}{3} + \theta\right) = 0$
- k) If $\frac{\sin x}{a} = \frac{\cos x}{b}$, prove that $a \sin 2x + b \cos 2x = b$

28. Prove that: $\frac{\cos 8A \cos 5A - \cos 12A \cos 9A}{\sin 8A \cos 5A + \cos 12A \sin 9A} = \tan 4A$

29. Prove that: $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{16}$

30. Prove that: $\cos 10^\circ \cos 30^\circ \cos 50^\circ \cos 70^\circ = \frac{3}{16}$

31. Prove the following :

a) $\frac{\sin 3A \cos 2A - \sin 6A \cos A}{\sin A \sin 2A - \cos 2A \cos 3A} = \frac{\sin 3A}{\cos A}$

b) $\frac{\sin 3A \cos 4A - \sin A \cos 2A}{\sin 4A \sin A + \cos 6A \cos A} = \tan 2A$

c) $\frac{\sin 2A \sin 3A - \sin A \sin 4A + \sin 5A \sin 2A}{\cos 4A \cos 5A - \cos 3A \cos 6A + \cos 5A \cos 2A} = \tan 4A \tan 3A$

d) $\cos 20^\circ \cos 40^\circ \cos 60^\circ \cos 80^\circ = \frac{1}{16}$

e) $\sin 10^\circ \sin 50^\circ \sin 60^\circ \sin 70^\circ = \frac{\sqrt{3}}{16}$

f) $\tan 20^\circ \tan 30^\circ \tan 40^\circ \tan 80^\circ = 1$

COMPLEX NUMBERS

1. Find the value of x and y ($x, y \in R$) if : $2y + (3x - y)i = 5 - 2i$
2. Express $3i^3 + 6i^{16} - 7i^{29} + 4i^{27}$ in the form $x + iy$ where $x, y \in R$.
3. Evaluate : $\left(i^{41} + \frac{1}{i^{257}}\right)^9$
4. If $Z_1 = 1 - i, Z_2 = -2 + 4i$, find $\text{Im}\left(\frac{Z_1 Z_2}{Z_1}\right)$.
5. Find the conjugate of the complex number: $\frac{1}{2 - 3i}$
6. Write the following complex numbers in the polar form:
(i) $-2 - 2i$ (ii) $\frac{1}{1 + i}$
7. Find the complex conjugate of $\frac{(8 - 3i)(6 - i)}{2 - 2i}$.
8. Find the multiplicative inverse of $\left(\frac{3 + 4i}{4 - 5i}\right)$
9. Find the modulus and argument of $\frac{1 + 2i}{1 - 3i}$
10. If $(a + ib)^2 = (x + iy)$, prove that $(a^2 + b^2)^2 = (x^2 + y^2)$
11. Find x and y if $\frac{(1 + i)x - 2i}{3 + i} + \frac{(2 - 3i)y + i}{3 - i} = i$
12. For what values of x and y are the numbers $-3 + ix^2y$ and $x^2 + y + 4i$ complex conjugates? (x, y are real numbers.)
13. Solve the following quadratic equations:
(i) $6x^2 - 17ix - 12 = 0$
(ii) $3x^2 + 7ix + 6 = 0$
(iii) $x^2 - (7 - i)x + 18 - i = 0$
(iv) $x^2 - (3\sqrt{2} - 2i)x - 6\sqrt{2}i = 0$
(v) $2x^2 - (3 + 7ix)x + 9i - 3 = 0$
14. Find the square root of: (i) $-8 - 6i$, (ii) $-5 + 12i$, (iii) $-i$

Ch: Permutations

1. How many even numbers of 3 digits can be formed with the digits 1,2,3,4,6 if no digit is repeated?
2. How many numbers of six digits can be formed from the digits 0,1,3,5,7 and 9, which are divisible by 10 and no digit is repeated?
3. Find the number of different signals that can be generated by arranging at least 2 flags in order (one below the other) on a vertical staff, if five different flags are available.
4. How many numbers greater than 1000 and less than 4000 can be formed with the digits 0,1,2,3,4 if (a) repetition of digits is allowed (b) repetition of digits is not allowed?
5. How many odd numbers greater than 80000 can be formed using the digits 2,3,4,5 and 8 if each digit is used only once in a number?
6. Three dice are rolled. Find the number of possible outcomes in which at least one die shows a 5.
7. Evaluate: (a) $12! - 10!$ (b) $\frac{9!}{5! \times 4!}$
8. Which of the following is true? (a) $(2 + 3)! = 2! + 3!$ (b) $(2 \times 3)! = 2! \times 3!$
9. Find x , if: $\frac{1}{9!} + \frac{1}{10!} = \frac{x}{11!}$
10. If ${}^{11}P_r = {}^{12}P_{r-1}$, find r .
11. Find r , if $5 \cdot {}^4P_r = 6 \cdot {}^5P_{r-1}$
12. If ${}^{2n-1}P_n \cdot {}^{2n+1}P_{n-1} = 22 : 7$, find n .
13. How many words can be made from the letters of the word MONDAY assuming that no letter is repeated if (a) 4 letters are used at a time (b) All letters are used at a time? (c) All letters are used but the first letter is a vowel?
14. The letters of the word TRIANGLE are arranged in such a way that vowel and consonants remain together. How many different arrangements will be obtained?
15. Four different mathematics books, six different physics books and two different chemistry books are to be arranged on a shelf. How many different arrangements are possible if (a) the book in a particular subject must all stand together (b) only the mathematics books must stand together?
16. In how many ways can 5 children be arranged in a row such that two boys Akash and Samir are (a) always together (b) never together?
17. How many different 8 letter words can be formed out of the letters of the word DAUGHTER so that (a) The word starts with D and ends with R (b) Position of H remains unchanged (c) Relative position of vowels and consonants remain unaltered (d) No two vowels are together (e) All vowels never occur together?
18. How many words can be formed with the letters of the word EQUATION? In how many of them (a) vowels occur together (b) the vowels never occur together (c) the vowels and the consonants are together?
19. In how many ways can 5 boys and 3 girls be seated in a row so that no two girls are together?