



Province of the
EASTERN CAPE
EDUCATION

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

NOVEMBER 2014

**MECHANICAL TECHNOLOGY
MEMORANDUM**

MARKING: _____

This memorandum consists of 2 pages

Mechanical Technology November 2014 Memo Grade 11

Jiyuan Zhang



Mechanical Technology November 2014 Memo Grade 11:

Mechanical Technology ,2012

Thank you enormously much for downloading **Mechanical Technology November 2014 Memo Grade 11**. Most likely you have knowledge that, people have look numerous period for their favorite books with this Mechanical Technology November 2014 Memo Grade 11, but stop up in harmful downloads.

Rather than enjoying a fine ebook behind a mug of coffee in the afternoon, instead they juggled taking into account some harmful virus inside their computer. **Mechanical Technology November 2014 Memo Grade 11** is straightforward in our digital library an online entry to it is set as public thus you can download it instantly. Our digital library saves in compound countries, allowing you to acquire the most less latency times to download any of our books like this one. Merely said, the Mechanical Technology November 2014 Memo Grade 11 is universally compatible as soon as any devices to read.

<https://splashdogs.com/public/virtual-library/fetch.php/mathematics%20paper%20limpopo%20memo%202013.pdf>

Table of Contents Mechanical Technology November 2014 Memo Grade 11

1. Understanding the eBook Mechanical Technology November 2014 Memo Grade 11
 - The Rise of Digital Reading Mechanical Technology November 2014 Memo Grade 11
 - Advantages of eBooks Over Traditional Books
2. Identifying Mechanical Technology November 2014 Memo Grade 11
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Mechanical Technology November 2014 Memo Grade 11
 - User-Friendly Interface
4. Exploring eBook Recommendations from Mechanical Technology November 2014 Memo Grade 11
 - Personalized Recommendations
 - Mechanical Technology November 2014 Memo Grade 11 User Reviews and Ratings

- Mechanical Technology November 2014 Memo Grade 11 and Bestseller Lists
- 5. Accessing Mechanical Technology November 2014 Memo Grade 11 Free and Paid eBooks
 - Mechanical Technology November 2014 Memo Grade 11 Public Domain eBooks
 - Mechanical Technology November 2014 Memo Grade 11 eBook Subscription Services
 - Mechanical Technology November 2014 Memo Grade 11 Budget-Friendly Options
- 6. Navigating Mechanical Technology November 2014 Memo Grade 11 eBook Formats
 - ePub, PDF, MOBI, and More
 - Mechanical Technology November 2014 Memo Grade 11 Compatibility with Devices
 - Mechanical Technology November 2014 Memo Grade 11 Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Mechanical Technology November 2014 Memo Grade 11
 - Highlighting and Note-Taking Mechanical Technology November 2014 Memo Grade 11
 - Interactive Elements Mechanical Technology November 2014 Memo Grade 11
- 8. Staying Engaged with Mechanical Technology November 2014 Memo Grade 11
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Mechanical Technology November 2014 Memo Grade 11
- 9. Balancing eBooks and Physical Books Mechanical Technology November 2014 Memo Grade 11
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Mechanical Technology November 2014 Memo Grade 11
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Mechanical Technology November 2014 Memo Grade 11
 - Setting Reading Goals Mechanical Technology November 2014 Memo Grade 11
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Mechanical Technology November 2014 Memo Grade 11
 - Fact-Checking eBook Content of Mechanical Technology November 2014 Memo Grade 11
 - Distinguishing Credible Sources

13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

Mechanical Technology November 2014 Memo Grade 11 Introduction

Free PDF Books and Manuals for Download: Unlocking Knowledge at Your Fingertips In today's fast-paced digital age, obtaining valuable knowledge has become easier than ever. Thanks to the internet, a vast array of books and manuals are now available for free download in PDF format. Whether you are a student, professional, or simply an avid reader, this treasure trove of downloadable resources offers a wealth of information, conveniently accessible anytime, anywhere. The advent of online libraries and platforms dedicated to sharing knowledge has revolutionized the way we consume information. No longer confined to physical libraries or bookstores, readers can now access an extensive collection of digital books and manuals with just a few clicks. These resources, available in PDF, Microsoft Word, and PowerPoint formats, cater to a wide range of interests, including literature, technology, science, history, and much more. One notable platform where you can explore and download free Mechanical Technology November 2014 Memo Grade 11 PDF books and manuals is the internet's largest free library. Hosted online, this catalog compiles a vast assortment of documents, making it a veritable goldmine of knowledge. With its easy-to-use website interface and customizable PDF generator, this platform offers a user-friendly experience, allowing individuals to effortlessly navigate and access the information they seek. The availability of free PDF books and manuals on this platform demonstrates its commitment to democratizing education and empowering individuals with the tools needed to succeed in their chosen fields. It allows anyone, regardless of their background or financial limitations, to expand their horizons and gain insights from experts in various disciplines. One of the most significant advantages of downloading PDF books and manuals lies in their portability. Unlike physical copies, digital books can be stored and carried on a single device, such as a tablet or smartphone, saving valuable space and weight. This convenience makes it possible for readers to have their entire library at their fingertips, whether they are commuting, traveling, or simply enjoying a lazy afternoon at home. Additionally, digital files are easily searchable, enabling readers to locate specific information within seconds. With a few keystrokes, users can search for keywords, topics, or phrases, making research and finding relevant information a breeze. This efficiency saves time and effort, streamlining the learning process and allowing individuals to focus on extracting the information they need. Furthermore, the availability of free PDF books and manuals

fosters a culture of continuous learning. By removing financial barriers, more people can access educational resources and pursue lifelong learning, contributing to personal growth and professional development. This democratization of knowledge promotes intellectual curiosity and empowers individuals to become lifelong learners, promoting progress and innovation in various fields. It is worth noting that while accessing free Mechanical Technology November 2014 Memo Grade 11 PDF books and manuals is convenient and cost-effective, it is vital to respect copyright laws and intellectual property rights. Platforms offering free downloads often operate within legal boundaries, ensuring that the materials they provide are either in the public domain or authorized for distribution. By adhering to copyright laws, users can enjoy the benefits of free access to knowledge while supporting the authors and publishers who make these resources available. In conclusion, the availability of Mechanical Technology November 2014 Memo Grade 11 free PDF books and manuals for download has revolutionized the way we access and consume knowledge. With just a few clicks, individuals can explore a vast collection of resources across different disciplines, all free of charge. This accessibility empowers individuals to become lifelong learners, contributing to personal growth, professional development, and the advancement of society as a whole. So why not unlock a world of knowledge today? Start exploring the vast sea of free PDF books and manuals waiting to be discovered right at your fingertips.

FAQs About Mechanical Technology November 2014 Memo Grade 11 Books

How do I know which eBook platform is the best for me? Finding the best eBook platform depends on your reading preferences and device compatibility. Research different platforms, read user reviews, and explore their features before making a choice. Are free eBooks of good quality? Yes, many reputable platforms offer high-quality free eBooks, including classics and public domain works. However, make sure to verify the source to ensure the eBook credibility. Can I read eBooks without an eReader? Absolutely! Most eBook platforms offer web-based readers or mobile apps that allow you to read eBooks on your computer, tablet, or smartphone. How do I avoid digital eye strain while reading eBooks? To prevent digital eye strain, take regular breaks, adjust the font size and background color, and ensure proper lighting while reading eBooks. What the advantage of interactive eBooks? Interactive eBooks incorporate multimedia elements, quizzes, and activities, enhancing the reader engagement and providing a more immersive learning experience. Mechanical Technology November 2014 Memo Grade 11 is one of the best book in our library for free trial. We provide copy of Mechanical Technology November 2014 Memo Grade 11 in digital format, so the resources that you find are reliable. There are also many Ebooks of related with Mechanical Technology November 2014 Memo Grade 11. Where to download Mechanical Technology November 2014 Memo Grade 11 online for free? Are you looking for Mechanical Technology November 2014 Memo Grade 11 PDF? This

is definitely going to save you time and cash in something you should think about.

Find Mechanical Technology November 2014 Memo Grade 11 :

mathematics paper limpopo memo 2013

mathematics paper 4h 7 november 2014

mathematics paper 4june 1ms 9709

mathematics paper 1 november 2013 exemplar

mathematics essentials g2

mathematics grade 1paper march 24

mathematics paper 1 kese 2014

mathematics paper 1 novembr 2014 examination

mathematics p1 limpopodoe november2014

mathematical proofs solutions manual

mathematics p2 grade 12 prelim

mathematics november exam p1 2013 grade 10

mathematics p1 november 2014 grade 11 from limpopo

mathematics final exam paper 2 grade 10 scope

mathematics paper 1 non calculator home sqa

Mechanical Technology November 2014 Memo Grade 11 :

how are supercars made technology book for kids 4th grade children - Dec 07 2022

web they re made with more muscle and are therefore much more expensive than your regular cars this book will take you behind the scenes of the production of these super cars learn the technology that made them strong

how are supercars made technology book for kids 4th grade children - Apr 30 2022

web how are supercars made technology book for kids 4th grade children s how things work books baby professor amazon sg books

how are supercars made technology book for kids 4th grade - Feb 09 2023

web technology book for kids 4th grade children s how things work books ebook written by baby professor read this book using google play books app on your pc android ios devices download for offline reading highlight bookmark or take notes

while you read how are supercars made

how are supercars made technology book for kids 4th grade children - Feb 26 2022

web buy how are supercars made technology book for kids 4th grade children s how things work books paperback book by baby professor from as low as 4 17 free shipping on all orders over 10 no coupon code needed

how are supercars made technology book for kids 4th grade children - Nov 06 2022

web you know cars you rode in one but do you know super cars these are cars that can go very fast they re made with more muscle and are therefore much more expensive than your regular cars this book will take you behind the scenes of the produ

how are supercars made technology book for kids 4th grade children - Oct 05 2022

web may 15 2018 how are supercars made technology book for kids 4th grade children s how things work books kindle edition by professor baby download it once and read it on your kindle device pc phones or tablets use features like

bookmarks note taking and highlighting while reading how are supercars made

how are supercars made technology book for kids 4th grade children - Aug 15 2023

web mar 15 2017 these are cars that can go very fast they re made with more muscle and are therefore much more expensive than your regular cars this book will take you behind the scenes of the production of these super cars learn the technology that made them strong and powerful on the road buy today

pdf how are supercars made technology book for kids 4th - Apr 11 2023

web technology book for kids 4th grade children s how things work books before now i have by no means experienced a passion about examining books how are supercars made technology book for kids 4th grade children s how things work books the only real time which i ever study a reserve go over to cover was again at school when

how are supercars made technology book for kids 4th grade children - Mar 30 2022

web buy how are supercars made technology book for kids 4th grade children s how things work books online on amazon eg at best prices fast and free shipping free returns cash on delivery available on eligible purchase

how are supercars made technology book for kids 4th grade children - Jul 14 2023

web buy how are supercars made technology book for kids 4th grade children s how things work books by baby professor isbn 9781541917651 from amazon s book store everyday low prices and free delivery on eligible orders

how are supercars made technology book for kids 4th grade children - Jul 02 2022

web how are supercars made technology book for kids 4th grade children s how things work books ebook professor baby amazon in kindle store

how are supercars made technology book for kids 4th grade children - Jan 08 2023

web they re made with more muscle and are therefore much more expensive than your regular cars this book will take you

behind the scenes of the production of these super cars learn the technology that made them strong and powerful on the road

how are supercars made technology book for kids 4th grade children - Aug 03 2022

web they re made with more muscle and are therefore much more expensive than your regular cars this book will take you behind the scenes of the production of these super cars learn the technology that made them strong and powerful on the road

description how are supe yumpu - Jan 28 2022

web technology book for kids 4th grade children s how things work books before now i have by no means experienced a passion about examining books how are supercars made technology book for kids 4th grade children s how things work books the only real time which i ever study a reserve go over to cover was again at school when

how are supercars made technology for kids 4 publications - Dec 27 2021

web this book introduces readers to the developing technology of electric cars including a look at the technology s future vivid photographs and easy to read text aid comprehension for early readers features include a table of contents an infographic fun facts making connections questions a glossary and an index qr

how are supercars made technology book for kids 4th grade children - Sep 04 2022

web mar 15 2017 how are supercars made technology book for kids 4th grade children s how things work books baby professor 9781541917651 books amazon ca

how are supercars made technology book for kids 4th grade - May 12 2023

web you know cars you rode in one but do you know super cars these are cars that can go very fast they re made with more muscle and are therefore much more expensive than your regular cars this book will take you behind the scenes of the production of these super cars learn the technology that made them strong and powerful on the road

how are supercars made technology book for kids 4th grade children - Jun 13 2023

web may 15 2018 you know cars you rode in one but do you know super cars these are cars that can go very fast they re made with more muscle and are therefore much more expensive than your regular cars this book will take you behind the scenes of the production of these super cars learn the technology that made them strong and

buy how are supercars made technology book for kids 4th grade children - Jun 01 2022

web how are supercars made technology book for kids 4th grade children s how things work books paperback 15 march 2017 by baby professor author 114 ratings see all formats and editions kindle edition 0 00 this title and over 1 million more available with kindle unlimited 302 99 to buy

how are supercars made technology book for kids 4th grade - Mar 10 2023

web how are supercars made technology book for kids 4th grade children s how things work books book read reviews from world s largest community for reade

heat equation with the crank nicolson method on matlab - Jun 13 2023

web mar 10 2022 i am trying to implement the crank nicolson method in matlab of this equation $\frac{du}{dt} = \frac{d^2u}{dx^2} f(x,t)$ $u(0,t) = 0$ $u(1,t) = 0$ $u(x,0) = u_0(x)$ with $f(x,t) = 20 \exp(50x) \cdot 10^{-2}$ if $t \leq 2$ else $f(x,t) = 0$ $x \in [0,1]$ $t \in [0,1]$ the boundary conditions are $u(0,x) = 0$ $u(1,t) = 0$ here is my mathematical thinking of the form $u = \sum_{n=1}^{\infty} b_n \sin(n\pi x) e^{-\lambda_n^2 t}$

the crank nicolson method with matlab code using lu youtube - Jan 28 2022

web the crank nicolson method with matlab code using lu decomposition thomas algorithm lecture 06 youtube

how to solve crank nicolson method with neumann matlab - Jul 02 2022

web apr 7 2020 i need to solve a 1d heat equation $u_{xx} = u_t$ by crank nicolson method the temperature at boundaries is not given as the derivative is involved that is value of $u_x(0,t) = 0$ $u_x(1,t) = 0$ i solve the equation through the below code but the result is wrong because it has simple and known boundaries

crank nicolson github topics github - Dec 07 2022

web feb 28 2021 a python script that displays an animation of an electron propagation and its interaction with arbitrary potential the program solves the two dimensional time dependant schrödinger equation using crank nicolson algorithm

2d crank nicolson adi scheme matlab answers matlab - Jun 01 2022

web may 27 2016 2d crank nicolson adi scheme learn more about finite difference scheme i have the 1d dimensional problem solved and here is the code modelo de sel kov en 1d find the treasures in matlab central and discover how the community can help you start hunting

crank nicolson scheme for the 1d heat equation me 448 548 in - Mar 10 2023

web crank nicolson scheme requires simultaneous calculation of u at all nodes on the $k+1$ mesh line $t_{i+1} = t_i + \Delta t$ $n \times k+1$ $k+1 \times 0 \leq t \leq 0.3$ stability the crank nicolson method is unconditionally stable for the heat equation the benefit of stability comes at a cost of increased complexity of solving a linear system of

crank nicolson method to solve pde matlab answers matlab - Dec 27 2021

web mar 9 2022 crank nicolson method to solve pde follow 49 views last 30 days show older comments hana bachi on 9 mar 2022 edited hana bachi on 9 mar 2022 cp4 pdf hello i have the below when i run it i get the following error message says index in position 1 exceeds array bounds

urgent write a matlab code using the crank nicolson chegg - Feb 26 2022

web write a matlab code using the crank nicolson method with thomas algorithm with $k=0.01$ and $h=0.1$ numerical methods show transcribed image text expert answer

[matlab codes for crank nicolson method npdes lecture 20](#) - Mar 30 2022

web dr h khalil 413 subscribers 3k views 2 years ago matlab codes for crank nicolson method we don t have hidden fees

[general mex implementation of thomas algorithm](#) - Nov 06 2022

web mar 10 2020 mex c c implementation of thomas algorithm or tridiagonal matrix algorithm for real and complex data mldivide has a great tridiagonal matrix solver for sparse matrices and there are other implementations of thomas algorithm out there see below but i needed a faster way to solve tridiagonal systems for complex data this

implementing crank nicolson method in matlab stack overflow - Jan 08 2023

web feb 14 2013 implementing crank nicolson method in matlab ask question asked 10 years 6 months ago modified 8 years 4 months ago viewed 13k times 3 i am trying to implement the crank nicolson method in matlab and have managed to get an implementation working without boundary conditions ie $u(0,t) = u(L,t) = 0$

pdf heat conduction 1d crank nicolson method researchgate - May 12 2023

web jun 18 2021 the one dimensional heat equation is implicitly and numerically solved via the crank nicolson method cnm using the thomas algorithm tdma in the matlab programming environment the

[how can i implement crank nicolson algorithm in matlab](#) - Aug 03 2022

web how can i implement crank nicolson algorithm in matlab it s known that we can approximate a solution of parabolic equations by replacing the equations with a finite difference equation namely

how to solve 1d heat equation by crank nicolson method - Aug 15 2023

web feb 18 2020 accepted answer jiali correctresult.jpg i need to solve a 1d heat equation by crank nicolson method the temperture on both ends of the interval is given as the fixed value $u(0,t) = u(L,t) = 0.5$ i solve the equation through the below code but the result is wrong attached figures are the correct result i don t know why

[matlab program with the crank nicholson method for the diffusion](#) - Sep 04 2022

web may 24 2019 about press copyright contact us creators advertise developers terms privacy policy safety how youtube works test new features nfl sunday ticket press copyright

[3 numerically solving pde s crank nicholson algorithm](#) - Feb 09 2023

web crank nicholson algorithm which has the virtues of being unconditionally stable i e for all $k \Delta t$ and also is second order accurate in both the x and t directions i e one can get a given level of accuracy with a coarser grid in the time direction and hence less computation cost this is the algorithm

[matlab code for crank nicolson scheme of finite difference method](#) - Apr 11 2023

web nov 10 2020 matlab code for crank nicolson scheme of finite difference method follow 22 views last 30 days show older comments ragul kumar on 10 nov 2020 commented priya m priya m on 5 oct 2022 dear sir i am trying to solve the finite

difference method for crank nicolson scheme to 2d heat equation please let me know if you have

crank nicolson example file crank example with matlab code - Jul 14 2023

web use the crank nicolson method to solve for the temperature distribution of the thin wire insulated at all points except at its ends with the following specifications 10 cm rod length assume $x = 2 \text{ cm}$ $t = 0.1 \text{ s}$ $k = 0.835 \text{ cm}^2/\text{s}$

thomas algorithm matlab code program youtube - Apr 30 2022

web may 13 2021 thomas algorithm matlab code program matlab program with solver syntax of thomas algorithm for tridiagonal matrix is explained matlab thomas algorithm show more matlab program with solver

crank nicolson method only check matlab answers matlab - Oct 05 2022

web jan 12 2020 crank nicolson method only check learn more about crank nicolson hi guys i am pretty new in matlab and i have a really difficult homework for me it is difficult we have to find approximation of using cn method and we know that and crank nicolson using newton method v0 1 2 v0 y u y0 w deal 1 u0

din en iso 13920 b f metallbautechnik - Aug 14 2023

web iso 13920 1996 e 5 indications on drawings 4 the designation of the selected tolerance class as specified in table 1 and table 2 e g en iso 139204 or its combination

din en iso 13920 general tolerances for welded constructions - Nov 05 2022

web mar 6 2018 ts en iso 13920 nisan 2002 kaynak kaynaklı yapılar için genel toleranslar uzunluk ve açö boyutları biçim ve konum 1 kapsam bu standard

din en iso 13920 techstreet com - Aug 02 2022

web iso 13920 specifies general tolerances for linear and angular dimensions and for shape and position of welded structures in four classes these being based on customary workshop

iso 13920 2023 welding general tolerances for welded - Jan 07 2023

web this standard has been revised by iso 13920 2023 abstract specifies general tolerances for linear and angular dimensions and for shape and position of welded structures in four

türk standardı - Oct 24 2021

ts en iso 13920 kaynak toleransları free download pdf - Oct 04 2022

web Ön söz bu standard cen tarafından kabul edilen en iso 13920 1996 standardı esas alınarak tse metalurji hazırlık grubu na bağlı tahribatsız muayene ve kaynak Özel

din en iso 13920 - Apr 29 2022

web aug 16 2017 iso 13920 bf pdf august 16 2017 author hoang category computer file formats reference technology

science computing and information technology

[iso 13920 bf pdf free download pdf](#) - Mar 29 2022

web aug 3 2017 din en iso 13920 august 3 2017 author tomjey category engineering tolerance metrology mechanical engineering reference evaluation report this link

[schweißkonstruktionen bauforumstahl](#) - Dec 26 2021

web ts iso 14520 1 nisan 2004 ics 13 220 10 gazli yangin söndürme sistemleri fiziksel Özellikler ve sistem tasarımı bölüm 1 genel kurallar

welding general tolerances for welded constructions - May 11 2023

web iso 13920 1996 en welding general tolerances for welded constructions dimensions for lengths and angles shape and position this standard has been withdrawn

standard detayı tse - Mar 09 2023

web en iso 13920 august 1996 descriptors welding welded construction shape position location dimensions length angles geometry dimensional tolerances angular

iso 13920 1996 en welding general tolerances for - Apr 10 2023

web ts en iso 13920 2023 yararlanılan kaynak en iso 13920 1996 uluslararası karşılıklar iso 13920 eqv en iso 13920 eqv bs en iso 13920 eqv din en iso 13920

pdf iso 13920 pdf limber s academia edu - Nov 24 2021

web ts en iso 13920 2023 yararlanılan kaynak en iso 13920 1996 uluslararası karşılıklar iso 13920 eqv en iso 13920 eqv bs en iso 13920 eqv din en iso 13920

ts en iso 13920 kaynak toleransları 123dok com - Sep 03 2022

web nov 1 1996 din en iso 13920 welding general tolerances for welded constructions dimensions for lengths and angles shape and position iso 13920 1996 german

iso 13920 1996 welding general tolerances for welded - Dec 06 2022

web nov 1 1996 din en iso 13920 november 1 1996 general tolerances for welded constructions tolerances for lengths angles shape and position iso 13920 1996 this

standard detayı tse - Sep 22 2021

pdf din en iso 13920 free download pdf - Feb 25 2022

web description download din en iso 13920 free in pdf format

pdf din en iso 13920 free download pdf epdxf com - Jan 27 2022

web 1 din en iso 13920 schweißen allgemeintoleranzen für schweißkonstruktionen längen u winkelmaße form u lage 2 din en 1090 2 technische regeln für die

international iso standard 13920 - Jul 13 2023

web 1 scope this document specifies general tolerances for linear and angular dimensions and for shape and position of welded structures in four tolerance classes based on

europaen standard en iso 13920 uscc ua - Feb 08 2023

web this document specifies general tolerances for linear and angular dimensions and for shape and position of welded structures in four tolerance classes based on customary

iso 13920 2023 en welding general tolerances for welded - Jun 12 2023

web iso 13920 2023 e foreword iso the international organization for standardization is a worldwide federation of national standards bodies iso member bodies the work of

iso 13920 en standard eu - Jul 01 2022

web download or read online ebook standard din en iso 13920 in pdf format from the best user guide database is 456 and sp 34 and the other two as per is 13920 free

iso 13920 bf pdf pdf international organization for - May 31 2022

web status standard released 2023 08 standard number din en iso 13920 name welding general tolerances for welded constructions dimensions for lengths and