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UTILIZATION OF MATHEMATICS IN OUR OFTEN IMPULSE.

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Abstract: The main purpose of this study is to explore the utilization of mathematics in Often life. From the analysis and interpretation of data, it is concluded that teachers have to play an vital role for awareness about mathematics. Historically, mathematics has been a subject that many students struggle with it. Most people will respond to the students by saying that they may need it or a future job or that it improves the critical thinking ability of the brain. Furthermore, it's interesting to note that if student's lack knowledge of mathematics then they won't know how it can be used in your life. In other words, learning mathematics will help mind come up with useful ways that math can be used. People often don't know what they don't know and until you fully grasp a new concept you won't realize what power it has.

***Index Terms* - useful, lack of knowledge, Purposes of Mathematics, Often, Workplace.**

I. Introduction

Most students would like to know why they have to study various mathematical concepts. Teachers usually cannot think of a real-life application for most topics or the examples that they have are beyond the level of most students. This study includes purposes of mathematics, the aims of mathematics education. But students may not be interested in these professions, so I have examine how mathematics can be useful outside the workplace in our daily life. When teachers try to convince their students that mathematics is useful in many professions, such as engineering and medical sciences, many of their students may not be interested in these occupations. For example students wanted to be computer game designers instead, but they wrongly believed that this profession did not require much mathematics. But actually computer programming required some mathematics. Mathematics involves not just concepts and procedural skills but also thinking processes. Therefore mathematical cognitive and metacognitive processes, such as investigation proficiency, problem solving strategies, communication skills, and critical and creative thinking are important in and outside the workplace in Our Often Impulse.

Purposes of Mathematics and Aims of Mathematics Education

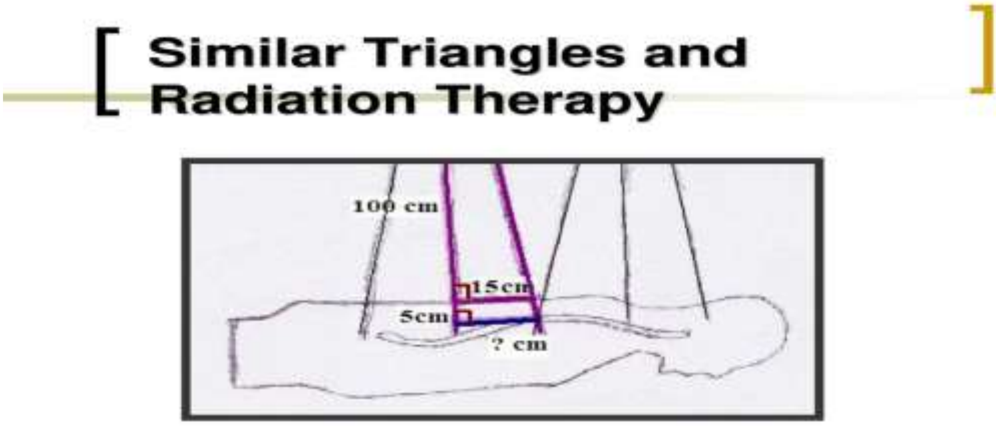
In ancient times, mathematical practices were divided into scientific mathematics and sub scientific mathematics. The former being mathematical knowledge pursued for its own sake without any intentions of applications; and the latter being specialists' knowledge that was applied in jobs such as architects, surveyors and accountants. Sub scientific mathematics was often transmitted on the job and not found in books, but in modern days where mathematics is divided into pure and applied mathematical knowledge, the latter is usually taught at higher levels in schools because of the utilitarian ideology of the industrial trainers and the technological pragmatists who argue that schools should prepare students for the workforce. However, groups with a purist ideology believe in studying mathematics for its own sake. However, the needs of the society may differ from the desires of individual students: the latter may not be interested to learn mathematics partly because they do not see the use of it, especially when most applications in the workplace are beyond their level, and partly because they may not be interested in professions that require a lot of mathematics. Therefore, there is a need to convince these students why they still need to study mathematics (and other subjects) which they may not need in their future working.

Applications of Mathematical Knowledge in the Workplace

In secondary syllabus and textbooks are mostly arithmetical applications such as profit and loss, discount, commission, interest rates, hire purchase, money exchange and taxation. But what about workplace uses of algebra, geometry, trigonometry? Usually, many of these applications are beyond the level of most students. However, this section will illustrate some suitable real-life applications which teachers can discuss with their students.

1. Use of Similar Triangles in Radiation Oncology

Geometry plays a very important role in radiation oncology (the study and treatment of tumours) when determining safe level of radiation to be administered to spinal cords of cancer patients (WGBH Educational Foundation, 2002). Figure shows how far apart two beams of radiation must be placed so that they will not overlap at the spinal cord, or else a double dose of radiation will endanger the patient.



In this case, the distance of the radiation source from the back of the patient is 100 cm and 15 cm is only the length on the back. The actual length on the spinal cord, x cm, can be determined using a property of similar triangles: 100/105= 15/x. It implies value of x is 15.75cm Therefore, the actual length is longer by 0.75 cm. If the two beams of radiation are placed only 2 × 15 cm = 30 cm (instead of 2 × 15.75 cm = 31.5 cm) apart, then 2 × 0.75 cm = 1.5 cm of the spinal cord will be exposed to a double dose of radiation.

2. Encoding of Computer Data using Large Prime Numbers

Before computer data are sent through the Internet, especially sensitive data like online banking, they are encoded so that hackers cannot make use of the data unless they know how to decode. Ronald Rivest, Adi Shamir and Leonard Adleman have invented the very secure RSA cryptosystem which makes use of very large primes and a complicated number theory. To break the code, hackers need to decompose a very large composite number into its two very big prime factors using trial division. Even with the fastest computers, this will take years because trial division for very large numbers is an extremely tedious process. there are three other things that teachers can do with their students. The first thing to discuss is how big these primes are. Teachers can introduce to their students the search for very large Mersenne primes. Mersenne (1588-1648) used the formula Mp = 2p – 1, where p is prime, to generate big primes, but Mp is only prime for certain values of p, e.g., M2, M3, M5 and M7 are primes but M11 is not a prime. The largest known prime, M43,112,609, found by Edson Smith on 23 Aug 2008, contains 12 978 189 digits. But because of their study, with the invention of computers, there is now a very secure way of protecting sensitive computer data.

3. Use of Differentiation in Economics

Most undergrad level core micro and macro involves fairly simple differentiation, you will do a lot of optimisation and use the chain rule and product rules a lot. One thing you will have to get used to in economics is seeing things written as functions and differentiating them.

You are always differentiating to find '**marginals**'. The concept of 'marginals' (marginal revenue, marginal product, marginal cost) etc is about the most important concept in microeconomics, because all decisions are taken 'at the margin'. Do you increase production by another unit or just produce at the level you are doing? Well if your marginal revenue (the amount of revenue you will earn by producing another unit of output) is higher than your marginal cost (the amount it will cost you to produce another unit) then go for it. If your marginal cost is higher then you don't. As you produce more your MR will fall and your MC will rise so you will maximise profits by producing where MR = MC. Basic golden rule of micro!

Because MR is basically the 'change in revenue over the change in output' you find it by differentiating total revenue with respect to output. Total revenue is price x quantity. So you have TR= PQ , MR= d(TR)/dQ so MR= d(PQ)/dQ ,

Mathematical Knowledge Outside the Workplace

Although mathematics is useful in many professions, what if students end up with occupations that do not require much mathematics? Does that mean the mathematics education that they have received is all gone to waste? Therefore, I will discuss in this section how mathematics is useful outside the workplace in everyday life, e.g. understanding everyday events and analysing newspaper reports, even when the students have become adults holding jobs that do not need mathematics.

1. Intensity of Earthquakes using Logarithm

Logarithm is used in the Richter scale to measure the magnitude of an earthquake, complications arise when the difference in magnitude is not an integer. The Richter scale is a measurement of earthquake magnitudes based on the formula R= ln (x/0.001) where x is the intensity of the earthquake as registered on a seismograph. Teachers can get their students to find x in terms of R by transforming the logarithmic form to the index form i.e. $x = 0.001\times10^{R}$. To compare two intensities x2 and x1, we have $\frac{x2}{x1}=\frac{0.001*10^{R2}}{0.001*10^{R1}} = 10^{R2-R1}$

Thus, to contrast the strength of two earthquakes, we just need to find the difference in magnitude $d = R_2 - R_1$ and then calculate 10^{d} . For example, the difference in magnitude between the Indonesian earthquake that set off the tsunami, and the recent earthquake in Northern Italy, is d = 9.0 − 4.8 = 4.2, and so the Indonesian earthquake is $10^{4.2} \approx 15800$ times stronger than the Italian one. Although the difference of 4.2 in magnitude looks small, the difference in intensity is actually a lot bigger.

2. Use of Lcm and Hcf to calculate time and length

Suppose A, B and C start at the same time in the same direction to run around a circular stadium. round in 252 seconds, B in 308 seconds and C in 198 seconds, all starting at the same point. After what time will they again at the starting point ? L.C.M. of 252, 308 and 198 = 2772. So, A, B and C will again meet at the starting point in 2772 sec. i.e., 46 min. 12 sec

What is the greatest possible length of three tables which can be used to measure exactly the lengths 800 cm, 420 cm and 1220 cm? Required length = HCF of 800 cm, 420 cm, 1220 cm = 20 cm

3. Use of Average in Meteorological

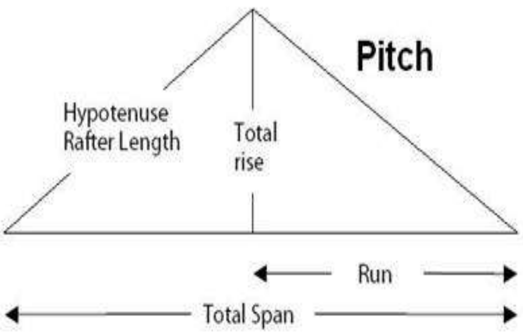
The average temperature of a day of a week was calculated to be 58.4 deg. Celsius and it was later found that one temperature was misread as 56 deg. Celsius instead of 65 deg. Celsius. What is the correct temperature? Actual total temp. is (20 × 58.4 - 56 + 65) = 1177 deg. Cel. Actual average temperature is 1177/20 = 58.85deg. cel.

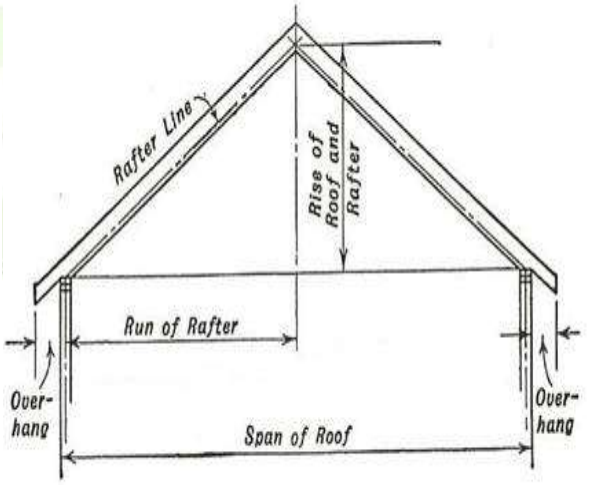
4. Mathematics in Construction

In the real world of building construction there are many rich problems which can be used to build sense making and reasoning skills for students. The Pythagorean Theorem is used extensively in designing and building structures, especially roofs. Gable roofs, for example, are made by placing two right triangles together. Specialized terms help to explain the triangle relationships in roof construction.

The span is the length from the outside wall to the outside wall of a building. Because construction is often made up of multiple layers of wood, building plans often provided detailed descriptions to make clear where to begin or end measurements.

The RUN is one-half the span. Units of run are typically based on 12 inches.





Carpenters do not refer to the angle of a roof as 30^0 or 60^0, but prefer to use the pitch of the roof.

The pitch is a ratio of vertical to horizontal measurements.

If a plan calls for a 6/12 pitch roof, then the architect wants the slope of the roof to go up six inches for every 12 inches of horizontal run. Carpenters prefer to use Pitch in calculations instead of rise and run.

Length of rafter = $\sqrt{(rise)^2-(run)^2}$ $\tan\theta = \frac{rise}{run}$ = Pitch= $\frac{P}{1}$

5. Banking of Roads

In the above discussion, we see that the maximum permissible velocity with which a vehicle can go round a level curved road depends on μ, the coefficient of friction between tires and road. The value of μ decreases when road is wet or extra smooth or tires of the vehicle are worn out. Thus force of friction is not a reliable source for providing the required centripetal force to the vehicle. Especially in hilly areas where the vehicle has to move constantly along the curved track, the maximum speed at which it can run will be very low. If any attempt is made to run it at a greater speed, the vehicle is likely to skid and go out of track. In order that the vehicle can go round the curved track at a reasonable speed without skidding, the sufficient centripetal force is managed for it by raising the outer edge of the track a little above the inner edge. It is called banking of the circular track or **Banking of Roads**.

Consider a vehicle of weight 'Mg' moving round a curved path of radius 'r' with speed 'V' on a road banked through angle θ. If OA is banked road and OX is horizontal line, then ∠AOX = θ is called angle of **banking of road**. Refer **Fig (2)**

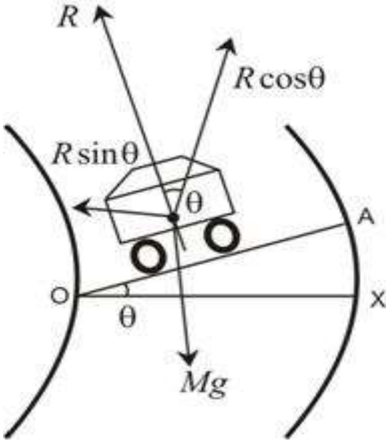


Fig.(2) Vehicle moving on Banked Road

Following forces are involved:

1. The weight 'Mg' acting vertically downwards
2. The reaction 'R' of the ground to the vehicle acting along normal to the banked road OA in upward direction
3. The vertical component R.Cos θ of R will balance the weight of the vehicle.
4. The horizontal component R.Sin θ of R will provide necessary centripetal force to the vehicle.

Thus, R.cos θ = Mg ….(1)

And R.Sin θ = Mv^2/r ….(2)

On dividing equation (1) & equation (2),we get $\frac{R.Sin\ \theta}{R.cos\ \theta} = \frac{Mv^2/r}{Mg}$

$$\tan\theta = v^2/rg \qquad ….(3)$$

Knowing 'v' and 'r1', we can calculate θ. If 'h' is the height AX of outer edge of the road then from fig.(3),

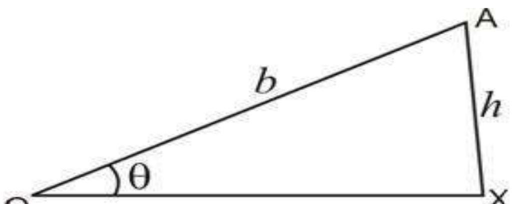


Fig 3

OX= $\sqrt{OA^2 - AX^2} = \sqrt{b^2 - h^2}$ hence tan θ= $\frac{AX}{OX} = \frac{h}{\sqrt{b^2-h^2}}$ ….(4)

From equations (3) & (4) we get $\tan\theta = v^2/rg = \frac{h}{\sqrt{b^2-h^2}}$

From above we can calculate h. usually h < < b. Therefore. h^2 is negligible, hence, $\tan\theta = v^2/rg = \frac{h}{b}$

Roads are generally banked for the average speed of vehicles passing over them. However, if the speed of a vehicle is somewhat less or more than this, the self adjusting state friction will operate between tyre and road and vehicle will not skid.

Conclusion

Mathematics is of practical value in many professions. It is not just the mathematical knowledge itself but the thinking processes acquired in genuine mathematical problem solving and investigation that can be applied to unfamiliar situations in other fields. Mathematical knowledge and processes are also useful outside the workplace in everyday life to understand and interpret certain events and news reports so as not to be deceived or swayed by others' opinions without any reasonable basis, thus improving one's own quality of life when one is able to lead a meaningful and responsible life. Teachers should impress upon their students the usefulness of mathematics in their daily life, and they should prepare their students for the future by focusing on the essential skills and processes that are required in the workplace.

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