ESSENTIAL SKILLS

WORK READY YOUTH PROGRAM

NUMERACY WORKBOOK!

Skills Compétences Canada

Acknowledgement

The Essential Skills Work Ready Youth Program – Workbook Series was developed by Skills/Compétences Canada, with support from the Government of Canada.

Acknowledgement is given to Bow Valley College who were instrumental in developing the content of the workbooks.

For more information contact:

Skills/Compétences Canada

294 Albert Street, Suite 201 | Ottawa, Ontario | K1P 6E6
Fax: (613) 691-1404 | Toll Free: 1 (877) 754-5226

https://skillscompetencescanada.com/en/

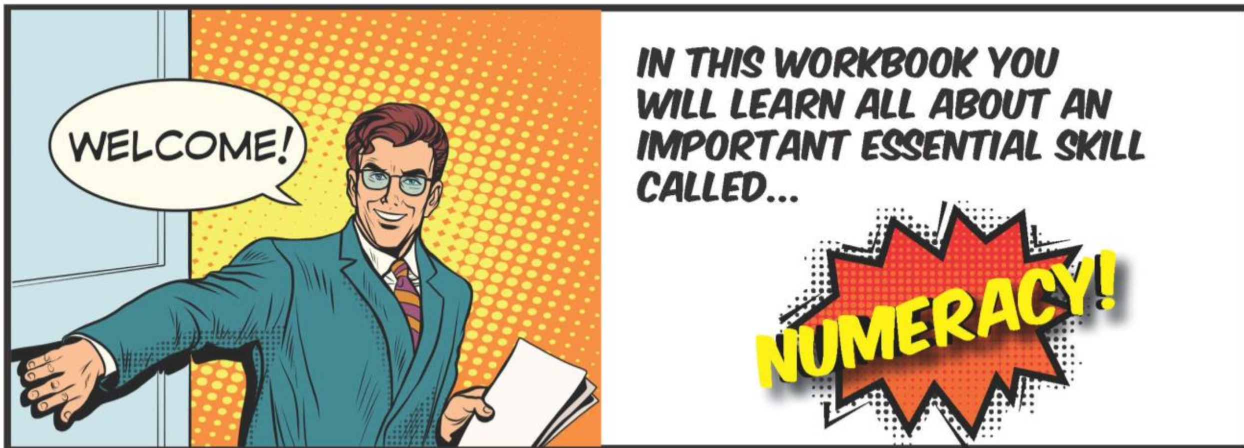
This document is distributed by Skills/Compétences Canada

NUMERACY

Use the table of contents to navigate through this workbook. Track your progress by putting a checkmark beside each topic you complete.

NUMERACY

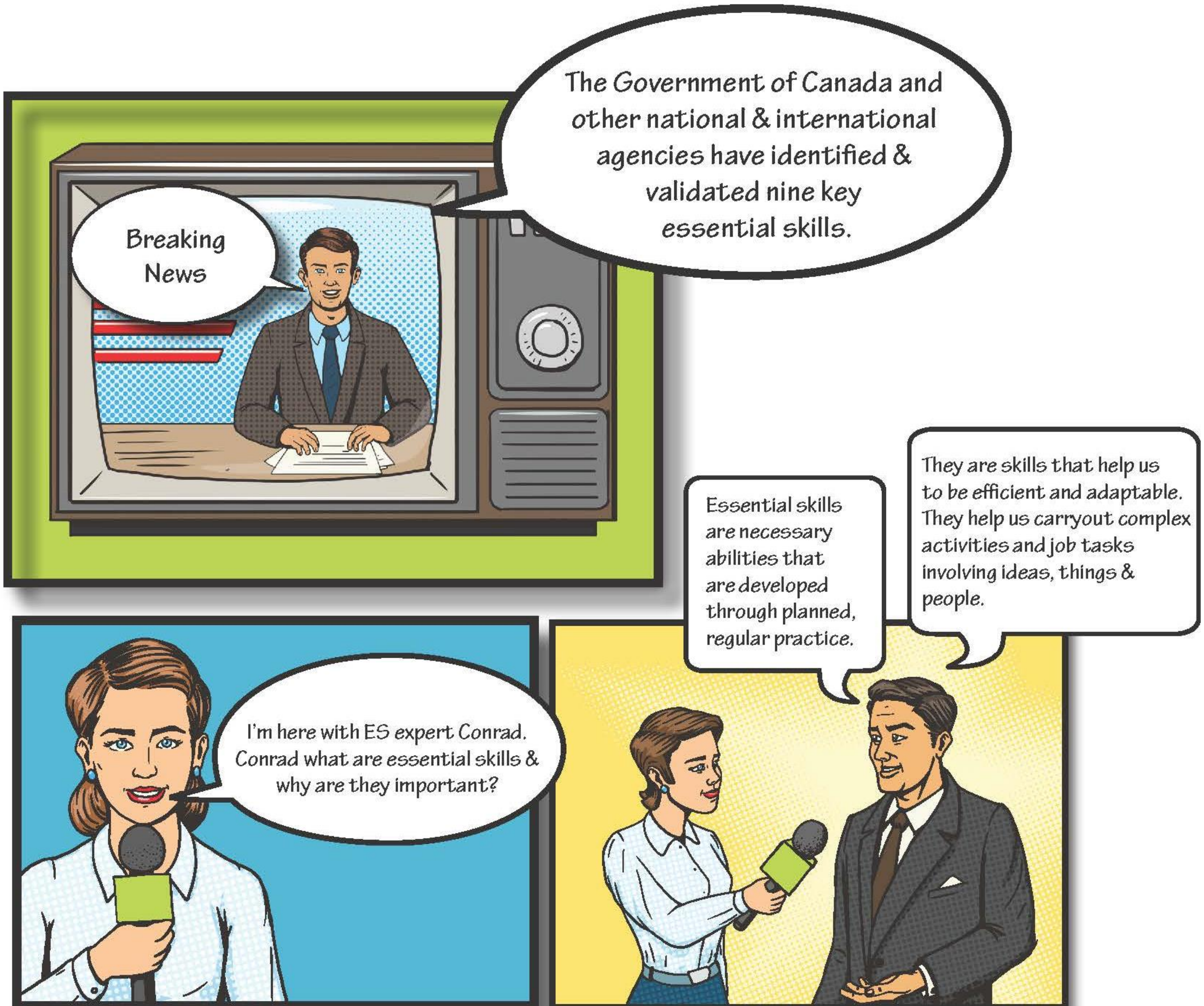
WELCOME TO THE ESSENTIAL SKILLS WORK READY YOUTH PROGRAM!



Q: HOW DO I USE THIS WORKBOOK?

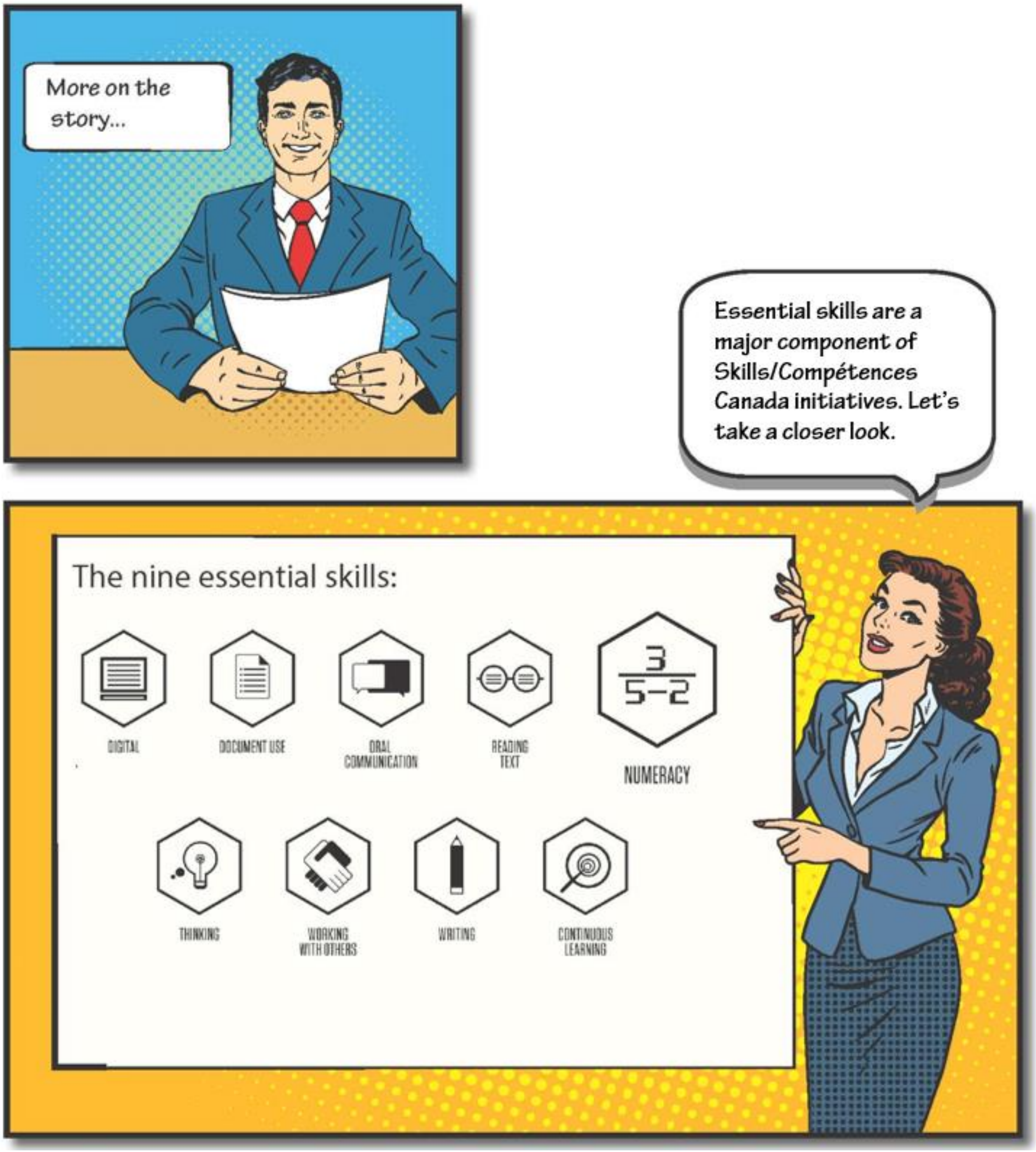
1. START BY REVIEWING THE INFORMATION AND FUN FACTS ABOUT NUMERACY AND ESSENTIAL SKILLS LOCATED AT THE BEGINNING OF THIS WORKBOOK
2. PRACTICE USING YOUR NUMERACY SKILLS IN THE "ES WORK-OUT" SECTION OF THE WORKBOOK
3. BUILD YOUR NUMERACY SKILLS IN THE "ES BOOSTER" SECTION OF THE WORKBOOK.
4. REVIEW THE ANSWERS IN THE ANSWER KEY SECTION OF THE WORKBOOK TO CHECK YOUR WORK FROM THE ES WORKOUT SECTION.
5. TRY THE ASSESSMENT QUESTIONS AT THE END OF THE WORKBOOK TO GET AN IDEA OF HOW STRONG YOUR NUMERACY SKILLS ARE.

INTRODUCING THE ESSENTIAL SKILLS



ESSENTIAL SKILLS ARE "ESSENTIAL" BECAUSE THEY ARE THE SKILLS THAT ALL PEOPLE NEED FOR WORK, LEARNING AND LIFE. THEY ARE ALSO THE FOUNDATION FOR LEARNING OTHER SKILLS.

THE NINE ESSENTIAL SKILLS



MEASURING ESSENTIAL SKILLS (ES)

Essential skills are measured on a 5 level scale (see below). The scale describes:

1. The complexity (difficulty) of an essential skills task, question, or problem.
2. The proficiency (ability) of a person in completing an essential skills task, question, or problem.

THE ES MEASUREMENT SCALE

skills need work — skills are adequate — skills are strong

Level 1	Level 2	Level 3	Level 4	Level 5

tasks are basic — tasks are complex

WHAT DO THE LEVELS MEAN?

- Tasks, questions, and problems at Levels 1 and 2 are less difficult than those at Levels 3, 4 and 5.
- People with essential skills at Levels 1 and 2 need to practice, in order to make their skills stronger. When we have skills at, or above, Level 3 we have skills that are strong enough to enable us to cope with new situations and to efficiently learn academic, technical or job-specific skills.
- Employers prefer to have workers who are efficient, capable, learners because they can accurately solve problems, complete their work, learn new processes and adapt to changes on the job.
- The skills are just as important in daily life. We all need to read information, fill out documents, make decisions about how much we can spend on things we want to buy, work and communicate effectively with friends, family, teachers and employers, and use computers and other digital technologies.

ESSENTIAL SKILLS MATTER

ESSENTIAL SKILLS ARE USED TO NAVIGATE OUR DAILY LIVES AND THE WORLD OF WORK AND THEY ALLOW US TO KEEP LEARNING SO WE DON'T GET LEFT BEHIND.

GIVE IT A TRY! MATCHING TASKS AND SKILLS

Look at the list below. What skills do you think you would need, to complete each task? Write the abbreviation for any of the skills you think would be used to complete the task. One is started for you as an example. *(HINT: they all require more than one skill.)*

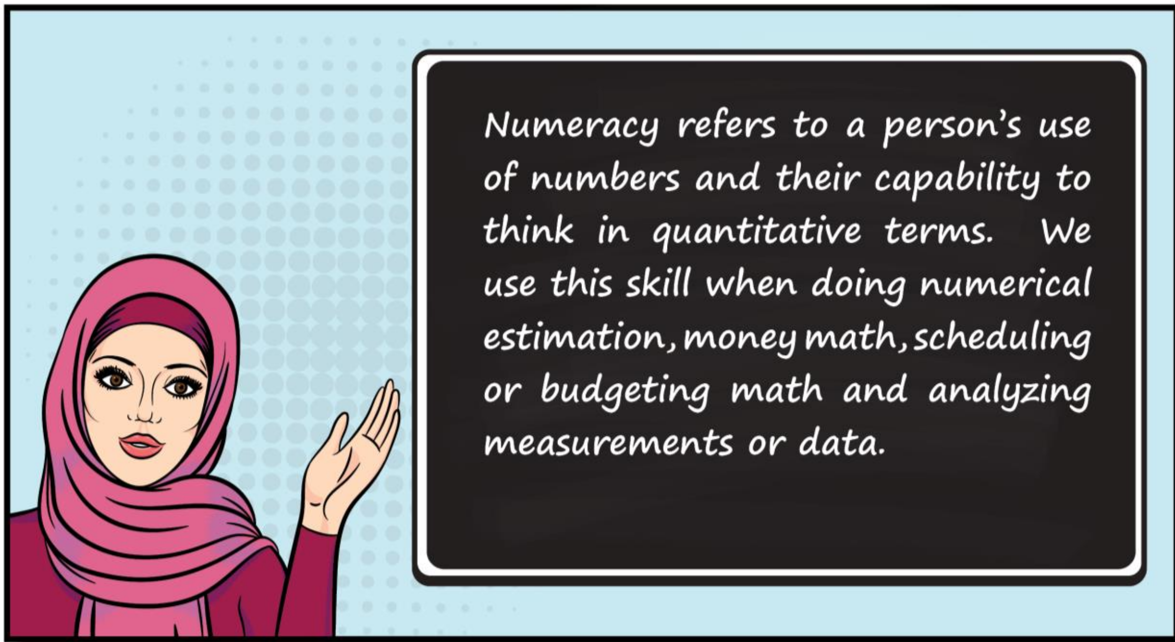
Task	Skill(s) Used
Find information to complete the set-up of a new iPhone	
Apply for a learners' license	
Book concert tickets	
Shop for new clothes	
Plan a weekend ski / snowboard trip	
Ask if you can use the car to go skiing	
Text your coach to say you will be late for practice, why, and how you will catch up	
Arrive at work early to learn the new customer payment system	TS6,
Use a transit schedule to get to your new job on time	

Essential Skills	
RT	Reading Text
DU	Using Documents
N	Numeracy
W	Writing
OC	Oral Communication
TS	Thinking Skills…
WWO	Working With Others
DS	Digital Skills
CL	Continuous Learning

1. Problem Solving
2. Decision Making
3. Critical Thinking
4. Planning & Organizing Tasks
5. Find Information
6. Use Memory

CHECK YOUR ANSWERS IN THE ANSWER KEY!

GETTING STARTED WITH NUMERACY



TYPES OF NUMERACY

1.	MEASUREMENT AND CALCULATION…	Measuring and describing the physical world, such as, size, shape, length, width, height, depth
2.	MONEY MATH…	Handling cash, preparing bills and making payments
3.	SCHEDULING, BUDGETING & ACCOUNTING MATH…	Managing time and money, to plan and track the use of time and money and to assess the value of either
4.	DATA ANALYSIS…	Analyzing numerical information
5.	NUMERICAL ESTIMATION…	Estimating anything that will result in a number

NUMERACY MAKES A DIFFERENCE

DID YOU KNOW, 60% OF THE MATH ADULTS DO ON A DAILY BASIS IS NUMERICAL ESTIMATION!

AT WORK

When you are working, the strength of your numeracy skills will help or hinder your ability to do a good job. When we have numeracy skills at levels 1 or 2, we are twice as likely to be unemployed as someone who has numeracy skills levels 3, 4 or 5. We also earn more during our working lifetime, if we have the skills to solve basic mathematical problems.

AT HOME

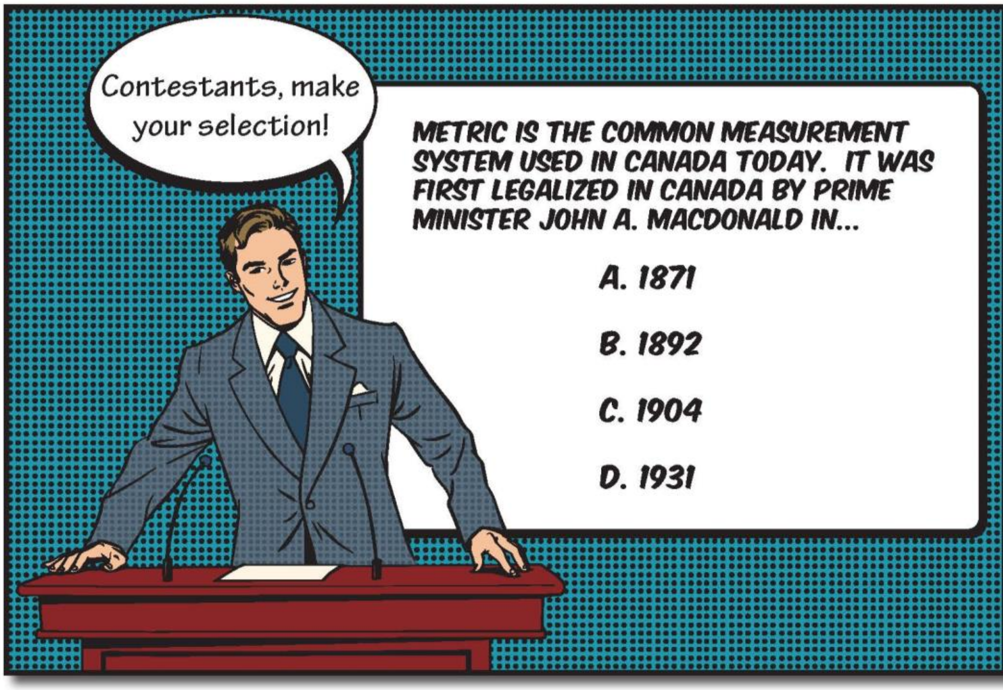
Numeracy skills make a difference in our non-working life too. With numeracy skills at levels 1 or 2, we are less likely to be able to do the kinds of calculations that help us save money on day-to-day tasks like buying groceries, or to be able to find or negotiate the best deals on the things we may buy through financing, like cell phone plans cars or choosing our first credit card. This means we are more likely to pay higher levels of interest and have higher levels of debt.

MEASURING NUMERACY

Just like the other essential skills, numeracy has 5 levels of complexity (difficulty). Task complexity depends on factors like the kind of information that is needed to complete the task and how serious the consequence of mistakes would be. If you test your numeracy skills, you will find that you are strongest in one of the 5 levels. This does not mean you don't have skills at other levels, but if your skills are below level 3, it means it would be a good idea to work on them.

10 COOL JOBS THAT USE NUMERACY!

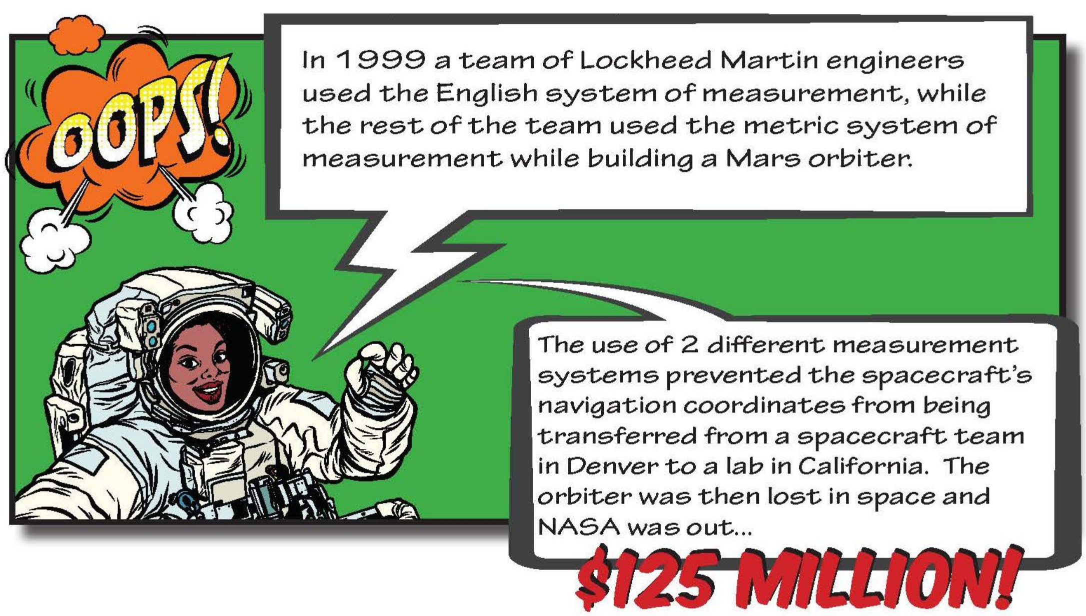
NUMERACY TRIVIA



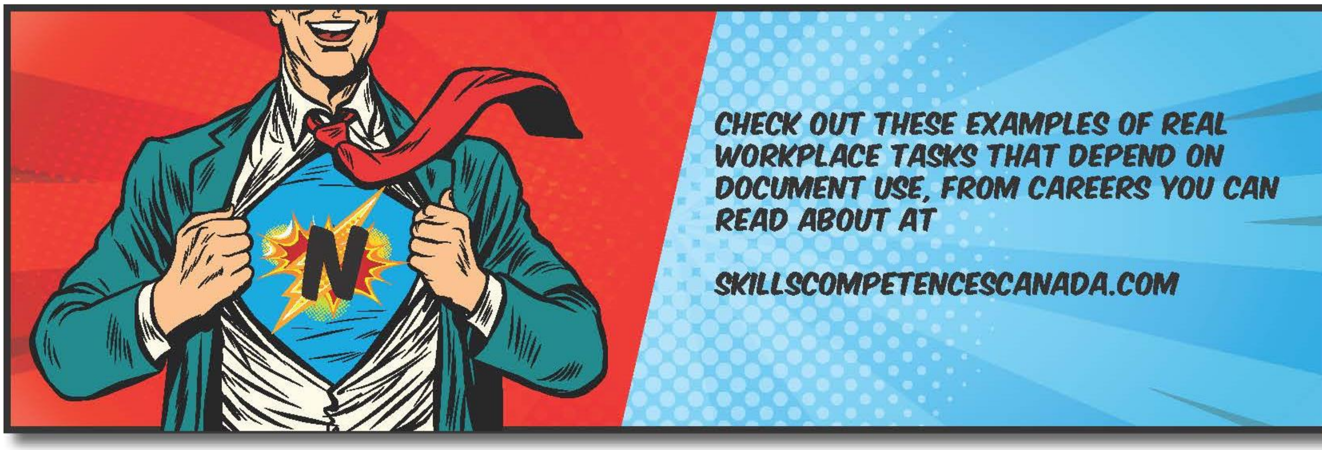
Answer: A in 1871 by John A. Macdonald

THINK NUMERACY MISTAKES AREN'T A BIG DEAL? THINK AGAIN!

Check out this story about metric confusion and a lost NASA satellite.



NUMERACY IN ACTION!



1. Aerospace Technologists, may develop and monitor schedules for aircraft maintenance and overhaul projects. …They monitor parts delays, time requirements, equipment usage and availability. They adjust schedules to meet deadlines. (Scheduling, Budgeting and Accounting Level 3)

2. Heavy Equipment Mechanics analyze pressure, power, torque, compression and electrical energy readings to assess equipment performance and troubleshoot faults, e.g. analyze series of energy readings produced by computerized engine analyzers to determine the cause of electrical faults. (Data Analysis Level 3)

3. Hairstylists reconcile payments and commissions received from salon owners to their financial records. (Money Math Level 2)

4. Motorcycle Mechanics use geometry calculations to align wheels, chains, pulleys and sprockets. For example, they use protractors to measure steering rake angles. They may use laser levels to align wheels. They may use protractors, shims and spacers to bring chains, pulleys and sprockets into line. (Measurement & Calculation Level 3)

5. Auto Service Technicians take precise measurements using specialized tools, e.g. measure mechanical parts, such as cylinder walls, brake disks and bearings using calipers, dial micrometers and plastigauge strips. (Measurement & Calculation Level 3)

NUMERACY IN ACTION!

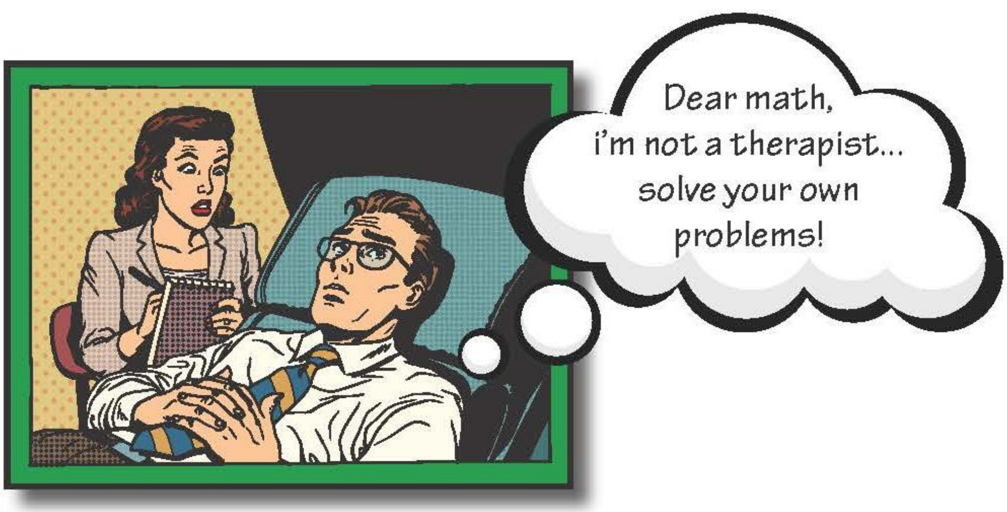
6. Cooks may schedule sequences of activities. (Scheduling, Budgeting & Accounting Level 3)

7. Landscape Technicians and Specialists analyze data on a number of variables such as diseases, pests and treatments in trees, shrubs, plants and lawns, outside temperatures, rainfalls and soil acidity. They interpret data to identify relationships between variables and assess the effectiveness of treatments. (Data Analysis Level 3)

8. Electronic Assemblers, Fabricators, Inspectors and Testers estimate time required to complete a job in order to prepare bids. The estimate is based on past experience, the quality of products being manufactured and the labour involved. (Numerical Estimation Level 3)

9. Precision Machinists may analyze performance data for tool and die sets under controlled and simulated conditions. ... For example, they may interpret pressure patterns on prototypes to determine if pressure points are causing premature wear on tool and die sets. (Data Analysis Level 3)

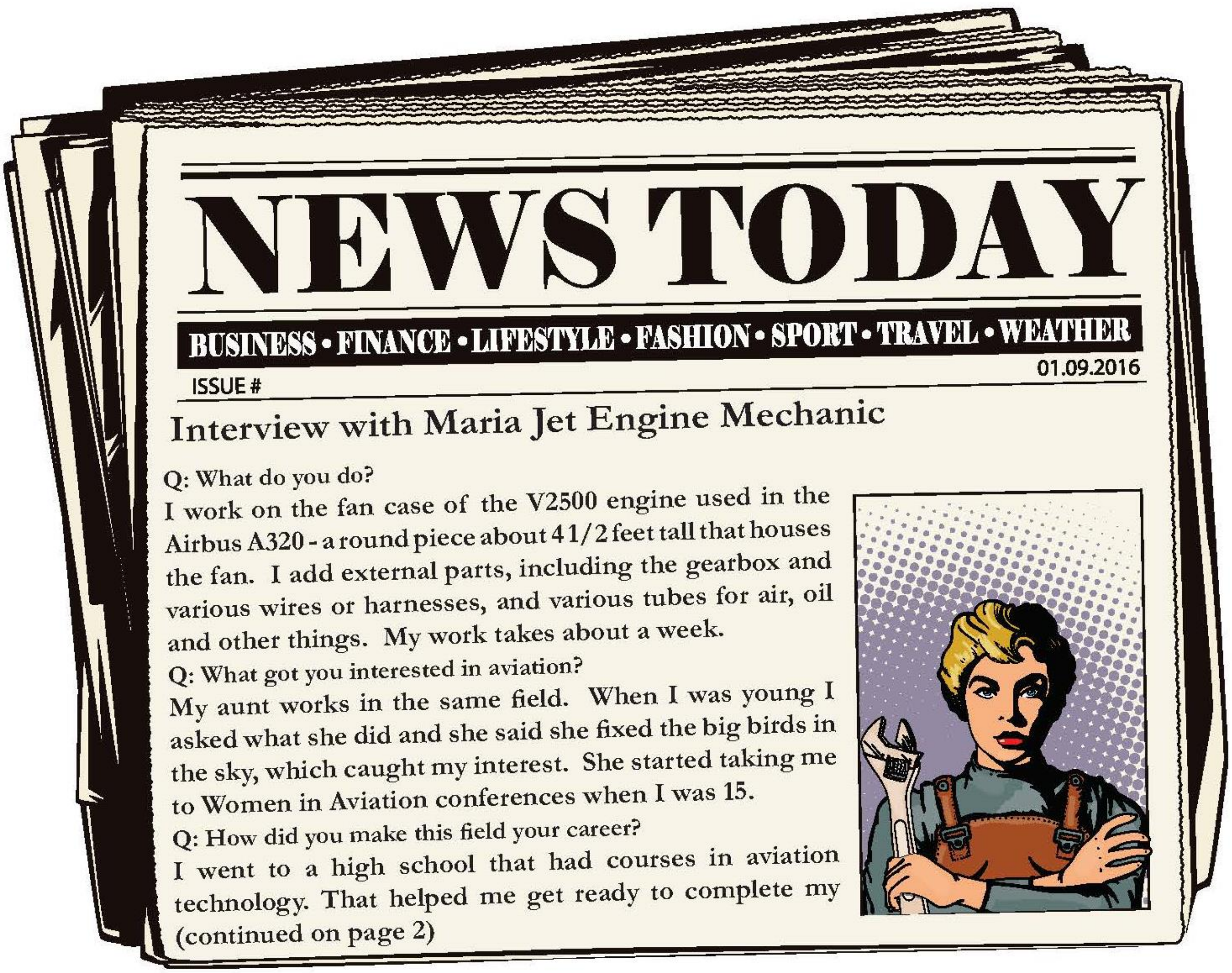
10. Fashion designers measure the length, width and thickness and calculate the square footage of irregularly shaped fabrics to determine the number of products that can be cut from them and with what amount of waste. (Measurement & Calculation Level 3)



NUMERACY IN THE NEWS

NUMERACY IN THE WORKPLACE – AN INTERVIEW WITH MARIA, A JET ENGINE MECHANIC

Jet Engine Mechanics diagnose, adjust, repair, or overhaul aircraft engines and assemblies, such as hydraulic and pneumatic systems. Important skills for the job include solving complex problems, troubleshooting, critical thinking, analysis, reading, oral communication, using complex documents and numeracy (of course)!



NEWS TODAY

BUSINESS • FINANCE • LIFESTYLE • FASHION • SPORT • TRAVEL • WEATHER

ISSUE # 01.09.2016

Interview with Maria Jet Engine Mechanic

Q: What do you do?

I work on the fan case of the V2500 engine used in the Airbus A320 - a round piece about 4 1/2 feet tall that houses the fan. I add external parts, including the gearbox and various wires or harnesses, and various tubes for air, oil and other things. My work takes about a week.

Q: What got you interested in aviation?

My aunt works in the same field. When I was young I asked what she did and she said she fixed the big birds in the sky, which caught my interest. She started taking me to Women in Aviation conferences when I was 15.

Q: How did you make this field your career?

I went to a high school that had courses in aviation technology. That helped me get ready to complete my (continued on page 2)

Edited from: https://www.nytimes.com/2016/11/13/jobs/pratt-whitney-delta-aviation-jessica-duke.html?rref=collection%2Fcolumn%2Fvocations&action=click&contentCollection=business&region=stream&module=stream_unit&version=search&contentPlacement=2&pgtype=collection&_r=0

NUMERACY IN THE NEWS

interview continued from page 1...

aviation maintenance technician certification and then my employer came to the school as part of a job fair and offered me a job, if I finished my certification. That was about 11 years ago. Since then they have paid for me to do two more certificates and now I am in a program to become a quality engineer, which will prepare me to ensure the engines are perfect after they are repaired.

Q: What is your work space like?
It is about the size of two football fields. I'm near several co-workers who do the same job. We stand to work, so we need to walk around and stretch every so often to keep our blood circulating and remain focused.

Q: How long have you been in this job?
I worked on different engine parts for a while, but when I saw people working on the fan case I knew I wanted to do this job. At one Women in Aviation conference, an astronaut told me my job was pretty cool and I thought, "Wow."

Q: What does your aunt think of it all?
She calls every day to see how I am doing; she has been a great mentor. It's important to have other women in the field to guide you and encourage you.

THINK ABOUT IT...

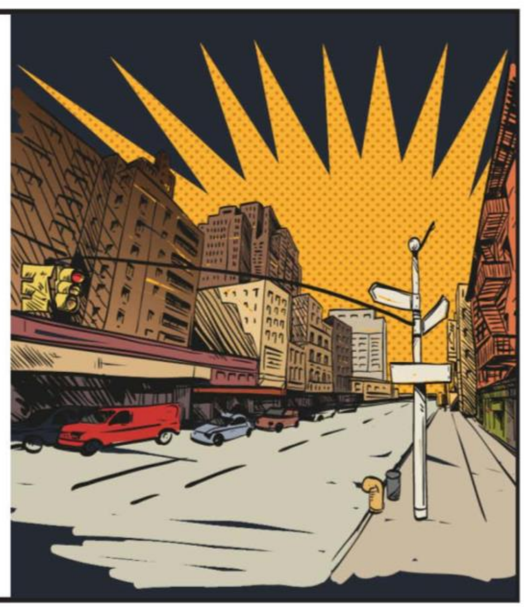
NUMERACY BITS AND BITES

The first-time flier was very nervous as he sat down and buckled up his seat before takeoff. He turned to the flight attendant and asked, “About how often do planes like this crash?”

She thought for a moment and replied, “Usually, just once.”

WEIRD JOBS! 1-2-3 GO!

When the streets of Indonesia’s capital, Jakarta, kept getting more crowded in the 1990s, the municipal administration enforced a consequential rule: During rush hour, there should be at least 3 people in each car. To allow drivers to cheat the rule, passengers-for-hire emerged. They wait along crowded streets to be picked up by drivers, in order to fulfill the minimum occupancy per car. According to the Jakarta Post, passengers-for-hire do not earn a lot of money, though. Those asked by the newspaper earned a bit more than $ 1 per ride. Asked about the law’s efficiency, one of the passengers replied “Of course it doesn’t work. It just creates job opportunities for people like me.”



At $ 1.00 per ride, how much will a professional passenger make in a week if she has four rides each day on Monday, Tuesday and Wednesday, seven rides on Thursday and six rides on Friday?

Answer: (4 x 3) + (7 + 6) = $ 25.00

NUMERACY BITS AND BITES

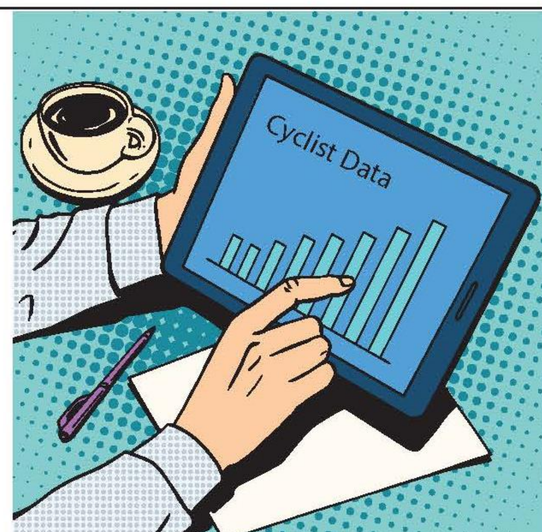
HEY, DO YOU LOVE BIKES AND MAKING THE WORLD A BETTER PLACE?

Bikes without borders believes in the bicycle as a means of increasing access to vital health services, economic opportunity, educational empowerment and independence.

Visit their site at:
www.bikeswithoutborders.org/

FYI...

According to Statistics Canada 207,785 Canadians regularly cycle to work every day!



NUMERACY BITS AND BITES

TEEN FLIES CESSNA ACROSS COUNTRY ALONE!

Ontario teenager, Matthew Gougeon flew 5000 km (3000 miles) alone, possibly becoming one of the youngest pilots to fly solo across Canada.

http://thechronicleherald.ca/novascotia/119062-teen-flies-cessna-across-country-alone

COLOSSAL CARROT CAKE!

Bakers in BC created the worlds largest carrot cake. It measured six metres by six metres by 10 centimetres high. The batter used 500 kilograms of carrots, 4,300 eggs, 500 kilograms of sugar and 625 kilograms of flour. The cake was baked individually in pans — 600 times! And it took 10 bakers several days to complete the task!

http://www.cbc.ca/news/canada/british-columbia/colossal-carrot-cake-batters-world-record-1.3841686

DID YOU KNOW…

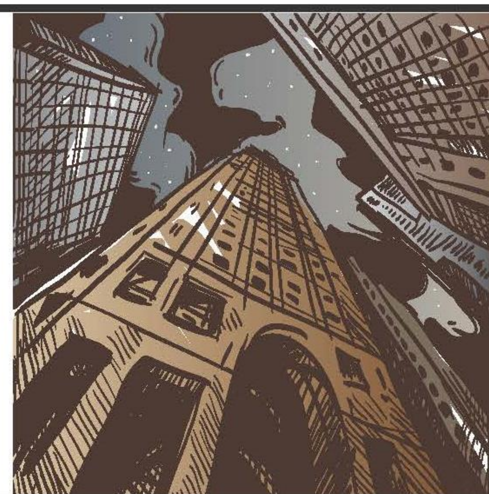
A career in baking offers a variety of areas in which to specialize. Bakers are responsible for making breads, bagels, pretzels, cakes, muffins, cookies and pastries as well as chocolate and candy, sugar sculptures and icing. They can prepare many different baked goods or specialize in just one. Depending on their experience and training, they may hire, train and supervise other baking personnel, order and control supplies and stock, and price the various products as well. Bonus – they get to eat some of what they make!

NUMERACY BITS AND BITES

BUILDERS OF THE "HIGH STEEL"

Ironworkers fabricate, construct and join scaffolding, steel buildings, bridges and ornamental ironwork.

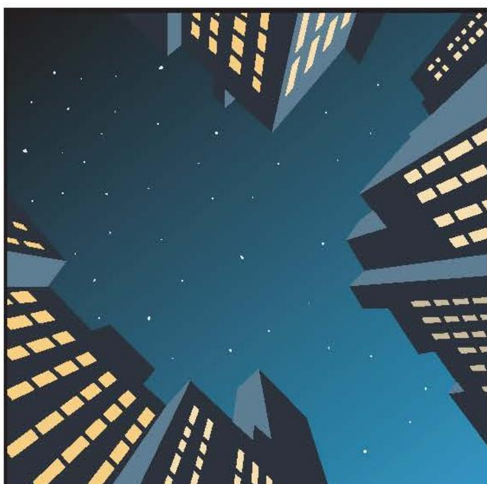
What kind of person make a good Ironworker? Ironworker might be the job for you if you:
- aren't afraid of heights
- have good agility and balance
- are cooperative with others
- are able to act quickly in an emergency situation



AN INDIGENOUS TRADITION – MOHAWK IRONWORKERS

The Mohawk Ironworkers of Kahnawake, Akwesasne and Six Nations are said to be "the best ironworkers on the planet." Oral history tells that Indigenous peoples began to work as ironworkers when, in 1886, the Canadian Pacific Railway (CPR) began construction on a bridge that would span the St. Lawrence River, connecting the Kahnawake Mohawk reserve to Montreal, Quebec.

Early on, it was evident that the people of Kahnawake excelled and they were soon highly sought after for the construction of skyscrapers. Their balance, agility, grace and bravery on the high beams was recognized around the world.



SKY·SCRAP·ER

/'SKĪ,SKRĀPER/

NOUN

THE TERM "SKYSCRAPER" WAS FIRST APPLIED TO BUILDINGS OF STEEL FRAME CONSTRUCTION OF AT LEAST 10 STORIES (140 FT.). TODAY, SKYSCRAPERS ARE DEFINED AS "A MULTI-STORY BUILDING WHOSE ARCHITECTURAL HIGHT IS AT LEAST 100 M OR 330 FT.

NUMERACY BITS AND BITES

THINK YOU'VE GOT WHAT IT TAKES TO BE AN IRONWORKER?

Check out these sample questions for the Red Seal exam (answers at bottom of page).

Question 1	Question 2
If, when installing a set of stairs, it takes 4 ironworkers 3 hours to complete a job, how many hours will it take 3 iron workers to complete the same job?	How many 20 ft. sections of tower weighing 2400 lb. each can be hoisted and placed inside an elevator shaft at the same time with a crane capacity of 5 tons, a building height of 210 ft. and an under-hook height of 273 ft.?
A. 3 hours B. 4 hours C. 6 hours D. 12 hours	A. 2 B. 3 C. 4 D. 5

http://www.red-seal.ca/s.1mpl.2.2x.1mQ.5.2st.3.4ns-eng.html?tid=132

"Rule of THumb" means...estimation!

The saying "Rule of Thumb" is an expression that is believed to have started with carpenters who used the length from the tip to the base of their thumbs, rather than rulers, for estimating measurements. Estimation is easily learned and can help workers make quick approximations for many things, such as measurements, times, amounts, etc.

ANSWERS: QUESTION 1 (b) QUESTION 2 (b)

ES WORKOUT!

PUT YOUR SKILLS TO WORK!

GIVE YOUR SKILLS A WORKOUT IN THIS SECTION OF THE WORKBOOK. SKILLS, LIKE MUSCLES, GET STRONGER THE MORE WE USE THEM. BUILD YOUR ES MUSCLES BY WORKING INDEPENDENTLY TO COMPLETE ALL OF THE WORKOUTS. YOU CAN CHECK YOUR ANSWERS IN THE ANSWER KEY.

NUMERACY

Use the table of contents to navigate through this workbook. Track your progress by putting a checkmark beside each topic you complete.

1. IMPORTANT INFO ABOUT COOKIES

THE RESULTS ARE IN!

The results of the 2013 Canada Cookie Consumption Survey – conducted by Loblaw to celebrate the 25th anniversary of the President's Choice Decadent Chocolate Chip Cookie – confirmed that 45% of Canadians who eat cookies preferred chocolate chips to any other flavour.

The statistics also revealed some regional differences in how cookies are consumed. About a third of the residents of Alberta, B.C., Manitoba, Newfoundland and Labrador, Ontario and P.E.I. are cookie eaters. Most eat one cookie every day.

The survey also revealed that Quebec had the greatest number of cookies consumed in each sitting. Half the cookie eaters in the province admitted to eating two at a time.

But cookie consumption was found to be lower in New Brunswick, Nova Scotia and Saskatchewan. Just around one-quarter of the population in each of those three provinces eat a daily cookie. But 8% of Saskatchewanians like eating cookies for breakfast, 30%of New Brunswickers like to eat cookies at work and 18% of Albertans like to eat their cookies in bed.

http://o.canada.com/life/food/chocolate-chips-triumph-in-national-canadian-cookie-survey

1. Complete the table below using the information in the article.
(*data analysis level 2*)

Province	2013 population (rounded)	% of pop. who are daily cookie eaters	Actual # of daily cookie eaters
B.C.	4,589,000		
New Brunswick	755,800		
Ontario	13,556,200		
Saskatchewan	1,105,000		

COOKIE RECIPE!

Ingredients – 24 Cookies
1 cup butter softened
1 ¼ cups packed brown sugar
¾ cups granulated sugar
2 eggs
3 teaspoons vanilla
3 cups all purpose flour
1 teaspoon salt
1 teaspoon baking powder
¼ teaspoon baking soda
3 cups good-quality semi-sweet chocolate chips or chunks

Method
In a large bowl, beat together brown sugar and granulated sugar. Beat in eggs, 1 at a time; beat in vanilla. In separate bowl whisk together flour, salt, baking powder and baking soda; stir into butter mixture. Stir in chocolate chips. *(Make ahead: shape into disc, wrap in plastic wrap and refrigerate for up to 3 days or freeze in freezer bag for up to 1 month. Bring to room temperature before continuing with recipe.)*

Roll by 2 tbsp. into balls. Arrange 3 inches apart, on parchment paper-lined rimless baking sheets; flatten slightly.

Bake 1 sheet at a time, in 350F (180C) oven until tops are no longer shiny. 13 – 15 minutes. Let cool on pans for 2 minutes; transfer directly to racks to cool.

http://www.canadianliving.com/food/recipe/the-ultimate-chocolate-chip-cookies

Use the cookie recipe to answer the questions that follow.

2. What is the total amount of sugar in the recipe?
(*measurement and calculation level 2*)

3. How many pounds of butter are in the recipe? (*Hint: 1 pound = 2 cups*)
(*measurement and calculation level 2*)

4. If the baking sheet holds 1 dozen cookies, following the instructions in the recipe, how much cooking time should the baker allow to bake all the cookies?
(*measurement and calculation level 2*)

2. CESSNA

NEED HELP? TRY THE BOOSTER.

- ROUNDING BOOSTER

TEENAGER TAKES FLIGHT!

In July of 2012, Ontario teenager Matthew Gougeon climbed out the cockpit of his Cessna 182 on a Thursday afternoon and possibly became the youngest pilot to fly solo across Canada. On his incredible journey, Gougeon said he was awed by the Rocky Mountains, nervous when he skirted around Ontario lightning storms and felt vulnerable when, outside of Thunder Bay, a huge C-130 Hercules flew over his small Cessna 182.

HOW MUCH DOES SPEED COST?					
Aircraft name	Cruise Speed (mph)	Fuel Burn (gph)	Miles per Gallon (mpg)	Fuel Cost per mph ($/mph)	Aircraft Price
1970 C-172	125	8.5	14.7	$0.24	$35,000
1970 C-182	160	12.5	12.8	$0.27	$67,000
1970 C-210	175	15	11.7	$0.30	$82,000
1980 C-210	175	15	11.7	$0.30	$151,000

http://www.planeandpilotmag.com/article/understanding-speed-in-airplanes/#.WQjrURPyupo

Use the information in the table above to answer the questions about the aircraft and the trip.

1. How many more miles per gallon of fuel can a Cessna 182 fly than a 1970 Cessna 210?
(*measurement and calculation level 2*)

2. Gougeon flew about 5,000 km (approx. 3000 mi). How many gallons of fuel did he need to complete his trip?
(*measurement and calculation level 2*)

3. Toronto to Sudbury is approximately 255 miles. How long would it take to fly to Sudbury in a Cessna 182? Round to 1 decimal place.
(*measurement and calculation level 2*)

4. How many gallons of fuel would be needed to make the trip from Toronto to Sudbury? Round to the nearest whole number.
(*measurement and calculation level 2*)

5. Fuel for the Toronto to Sudbury trip is estimated to cost $ 2.75 a gallon. If that cost were to increase by 3%, how much needs to be budgeted for fuel for a return trip? Round your answer to the nearest $ 10, making sure there are sufficient funds for the purchase. (*measurement and calculation level 3*)

3. GREEN HAIR

HAIR SALON GOES GREEN!

Troy Bellefontaine, owner of Beauty Mark in Fort Simpson, N.W.T. wants to be the greenest salon owner in the North. In order to achieve this goal, he has joined Green Circle Salons, a group that helps salons recycle up to 95% of their waste. His salon, has room for just two clients at a time and produces about a "garbage bag" a week of hair and other garbage from foils and hair dye tubes. At Beauty Mark, a $ 1.50 fee for the recycling service gets passed on to each customer. Bellefontaine says that doesn't cover the cost of shipping, which he estimates at an additional $ 3.00 per customer; a cost that he covers. To keep costs and emissions down, Troy drives his recycling to Edmonton every few months, when he picks up salon supplies.
http://www.cbc.ca/news/canada/north/green-salon-fort-simpson-1.3922335

Use the information above to answer the following questions:

1. What is the total estimated cost of the recycling, per client?
(*money math level 2*)

2. If a typical garbage bag holds about 30 litres of trash, how many litres of trash was the salon sending to the landfill each year, before the recycling program?
(*measurement and calculation level 2*)

3. If the salon is now diverting the maximum amount of waste, how much trash will be sent to the landfill each year?
(*measurement and calculation level 2*)

4. How many garbage bags will be required to send the trash to the landfill?
(*measurement and calculation level 1*)

5. More salons becoming involved in the project could help to lower recycling costs. If total costs were to be reduced by 6%, and that saving was proportionately passed on to the client, what would the new fee per client be for the recycling program? Round your answer to the nearest 5 cents.
(*measurement and calculation level 3*)

4. MARIA IS A JET ENGINE MECHANIC

NEED HELP? TRY THE BOOSTERS.

- **PERIMETER BOOSTER**
- **MEASUREMENT CONVERSIONS – METRIC TO METRIC BOOSTER**

HELPING JETS TAKE FLIGHT!

In the article Maria is a Jet Engine Mechanic Maria says her work area is “almost five football fields” and that it’s important to walk around and stretch every so often. A typical football field is 48.5 metres by 109 metres.

1. If Maria walks the perimeter of her work area, how far does she walk?
(*measurement and calculation level 2*)

2. If the average walking speed is 5km/hour, how long will it take her to walk the perimeter once? (*Hint: you will need to know how many metres are in a kilometre.*)
(*measurement and calculation level 2*)

Employers paying for you to continue your education is a terrific benefit and one that can be worth a lot of money. Maria says that, in the 11 years she's worked there, her employer has paid for her to complete two programs.

3. If the first program cost $8000 and the second cost $12500, on average, how much did the company pay each year towards Maria's further education? Round your answer to the nearest dollar.
(*money math level 2*)

According to researchers at Stanford University, talking scheduled walking breaks during the work day is not only good for your body, but also helps you to be more creative in your job. The Canadian Heart and Stroke Foundation further recommends that adults age 20-50 walk 7,000- 10,000 steps a day to maintain general good health. You can track your number of steps using a pedometer or other type of step / fitness calculator.

4. Use the following information to calculate what a "step" means for you and how far you walk on a typical day.
(*measurement and calculation level 3*)

Calculate your stride (the length of 1 step)

A. You need 2 markers (coins work) and a long flat walking surface (sidewalk, hallway)
B. Place a marker where you are going to start
C. Walk 20 steps and place the second marker where you end up
D. Measure the distance between the two markers in centimeters
E. Repeat steps C-E five times and <u>average</u> the answers to get the most accurate result
F. Divide the result by 20. This is the length of your stride

5. Using the length of your stride in the calculation, if you walk the recommended 10,000 steps a day, how far will you have walked? Convert your answers to kilometres. (*measurement and calculation level 3*)

6. Using a distance calculator, such as an online map program, in the table below enter the distance for each of three trips. Then, using the length of your stride in the calculation, enter the number of steps in each trip. (trip example – home to school) (*measurement and calculation level 3*)

TRIP	Distance in km	# of steps

5. HAIR PLANNING

MIXING IT UP!

Hair stylists help people to look and feel their best. Styles change and evolve and stylists need to upgrade and learn new skills, to keep up with new trends, products and styles. In the salon, hair stylists must be able to manage their time so that clients are not kept waiting and they must be able to correctly calculate formulas for hair products, to avoid errors such as applying incorrect colour or treatment products.

Blonde on Blonde Brightener

Blonde on Blonde ensures hair remains shiny and healthy looking even after blow-drying. The one-of-a-kind formula creates gleaming, long-term shine. It also smells good and is hypo-allergenic.

Standard off-scalp application:

Mix: in a plastic bowl - 1 level scoop of Blonde on Blonde and 120 ml (4 fl. oz.) of conditioner of your choice. Mix thoroughly.

Apply: to dry, unwashed hair using an off-the-scalp technique

Process: at room temperature until desired volume is reached. (Min. 10 min.) Rinse completely. Shampoo lightly.

Use the document above to answer the first two questions on the next page.

1. You need 1 ½ times the standard quantity of Blonde on Blonde for your client's hair. How much of each ingredient do you need to mix?
(*measurement and calculation level 2*)

2. You estimate that your client's hair will need to process for 2 ½ times the minimum recommended time for Blonde on Blonde. How long will it need to process?
(*scheduling budgeting and accounting level 2*)

KEEPING ON SCHEDULE!

In the salon, hair stylists must be able to manage their time so that clients are not kept waiting.

APPOINTMENT SCHEDULE		
4:00 PM	**4:15 PM**	**4:30 PM**
tint [45min]		
4:45 PM	**5:00 PM**	**5:15 PM**
	trim [15 min]	woman [45min]
5:30 PM	**5:45 PM**	**6:00 PM**

Use the appointment schedule above to answer the following questions:

3. Based on the schedule above, what time will the stylist finish work?
(*scheduling, budgeting & accounting level 1*)

4. The 5:15 PM client arrived 10 minutes late and has requested an extra conditioning treatment that will add 15 minutes to her appointment. Based on the schedule above, what time will the stylist finish work?
(*scheduling, budgeting & accounting level 2*)

COLOUR CONTROL!

Hairstylists compare measurements of time, temperature and fluid volume to specifications outlined in product information sheets and colour charts so that they can control the outcomes of hair colouring treatments.
(*data analysis level 1*)

5. In the Colour Processes chart, what is the most common ratio of hair colour to developer? (*data analysis level 2*)

COLOUR PROCESSES			
Process	**Hair Colour**	**Developer**	**Timing**
Permanent Colour	2 oz.	2 oz. 20 volume	45 minutes
Double pigment Permanent colour	2 oz.	1 oz. 40 volume	45 minutes
Intense colour	1 oz. SHADE + 1 oz. AMPLIFIER	2 oz. 20 volume	45 minutes
Demi Permanent	1 oz.	1 oz. 20 volume	1 minute – 1 day
Semi Permanent	1 oz.	1 oz. 10 volume	15 – 20 Minutes
Toner	1 oz.	1 oz. 10 volume	15 – 20 minutes
Gloss	2 oz. Colour Gloss		10 – 15 minutes w/Heat
Glaze	2 oz. Colour Gloss		10 – 15 minutes w/Heat
Camo Colour	2 oz. Colour Gloss +1 oz. Colour Gloss	3 oz. 10 volume	15 minutes
High Lift Colour	2 oz.	2 oz. 60 volume	45 minutes

6. If the client wants demi-permanent colour to last three weeks, how long should it be left on? (*measurement and calculation level 2*)

7. What is the total amount of product required for Camo color? (*measurement and calculation level 1*)

8. It takes 40 minutes once the semi-permanent color process is complete to finish a hair appointment. If the client has to leave by the salon by 3:45 p.m. what is the latest time that the color can be applied? (*scheduling, budgeting & accounting level 2*)

6. LOST IN SPACE

NEED HELP? TRY THE BOOSTERS:

- ***MEASUREMENT CONVERSIONS – METRIC TO IMPERIAL / IMPERIAL TO METRIC BOOSTER***
- ***ROUNDING BOOSTER***

3-2-1 LAUNCH!

NASA lost a $125M satellite because the teams of scientists building the satellite used different measurement systems and failed to notice errors in conversion. A simple, but costly mistake. Use the Measurement Conversions - Metric to Imperial / Imperial to Metric to help you complete the conversions below. Calculate to 2 decimal places.

1. Convert the measurements below from Imperial to metric.
(*measurement and calculation level 2*)

6 feet to metres

5 miles to kilometres

7.5 yards to metres

2. Convert the measurements below from metric to Imperial.
(*measurement and calculation level 2*)

5 centimetres to inches

23 kilometres to miles

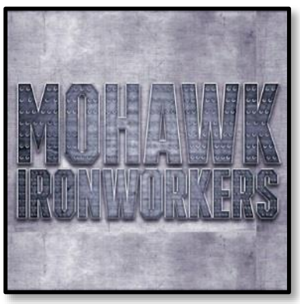
13 metres to feet

3. Conversion errors can happen when items used to complete a project are measured using different systems. Recalculate the measurements for the seven items on the materials list so that all are in metric. Round to the closest tenth.
(*measurement and calculation level 2*)

1	12.5 ft. hose	
2	3 m copper tubing	
3	3 pieces of plastic pipe @ 6-in. ea.	
4	4 ft. x 8 ft. sheet plywood cut in 17 in. strips	
5	1.5 kilos nails	
6	15.5 square ft. tile	
7	9 yards outdoor tarp	

7. HIGH STEEL

KEEPING SAFE IN THE SKY!



Mohawk Ironworkers is a 13-part half hour documentary series that celebrates the steely determination of the Mohawk ironworkers of Kahnawake, Akwesasne and Six Nations who are said to be "the best ironworkers on the planet."

http://aptn.ca/mohawkironworkers/

Using a mixture of dramatic HD "high steel" footage, on the job and home-life reality shooting and archival material, each half hour episode presents a fascinating visual and moving story of the ironworkers and their families – as they face the realities of one of the most dangerous jobs on the planet. Episodes like Training for Steel and Women of Steel, describe the history of the ironworkers, how training has changed and how women are succeeding and prospering in the trade. The series premiered Tuesday, September 6, 2016 on APTN. http://aptn.ca/mohawkironworkers/

A group of Kahnawake ironworkers in the 1950s.

PHOTO: KANIEN'KEHAKA ONKWAWENNA RAOTITIOHKWA CULTURAL CENTER

Ironworkers help build skyscrapers. A skyscraper is "*a multi-story building with an architectural height of at least 100 m or 330 ft.*" The tallest building in Canada is First Canadian Place in Toronto. It is 298 m (978'). The chart below shows some of the tallest buildings in the world.

TALLEST BUILDINGS IN THE WORLD						
RANK	BUILDING	COUNTRY	HEIGHT	HEIGHT	FLOORS	COST
			ft.	m		
1	Burj Khalifa	UAE	2717	828	163	1.63B
2	Shanghai Tower	China	2073	632	128	2.4B
3	Abraj Al-Bait Clock Tower	Saudi Arabia	1971	601	120	14.49B
11	Petronas Towers 1 & 2	Malaysia	1483	452	88	1.65B
31	Empire State Building	USA	1250	381	102	41M
83	Chrysler Building	USA	1047	319	77	20M
103	First Canadian Place	Canada	978	298	72	85M (est.)

https://en.wikipedia.org/wiki/List_of_tallest_buildings

Use the information in the Tallest Buildings chart to answer the questions below.

1. Assuming all the floors in a building are the same height, calculate the cost per floor of the buildings ranked 1, 2, 31 and 103. Round to the nearest dollar.
(*scheduling, budgeting and accounting math level 2*)

#1

#2

#31

#103

2. What is the cost per metre to build each of the same buildings? Round to the nearest dollar.
(*scheduling, budgeting and accounting math level 2*)

#1

#2

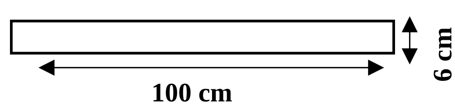
#31

#103

3. What would it cost to build the Empire State Building today assuming that, with inflation, 1dollar in 1931 = 16 dollars in 2016?
(*scheduling, budgeting and accounting math level 3*)

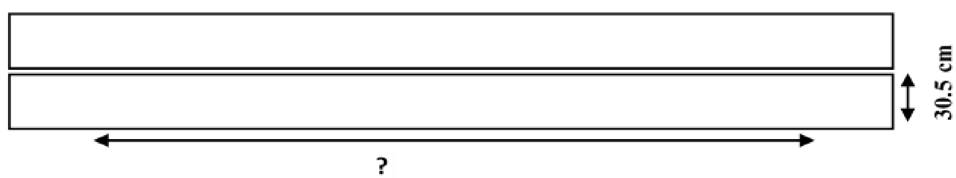
BEAMS OF STEEL!

One of the reasons it became possible to build skyscrapers was because of the use of steel in the construction. Steel beams need to be deep enough to support their length and the weight of any load that will be placed on them. A beam should be about 6 cm deep for every 100 cm in length.



1. The beam below is 6 metres long. How deep should it be?
(*measurement and calculation level 2*)

2. The beams shown below are each about 30.5 cm deep. Rounded to the nearest metre, what is the longest the beams can be and still be strong enough?
(*measurement and calculation level 2*)



3. The floor of the building you are working on is 40 m wide. 40 m steel beams are to be placed every 2.4 m across the space. To the nearest whole number, how many beams will be needed? Make a labelled diagram of your answer.
(*measurement and calculation level 3*)

Ironworkers calculate distances and angles when placing structural steel and rebar. They may calculate the spacing of supports and reinforcing bars. They total lengths and widths to ensure supports and reinforcing bars are evenly placed. They calculate distances and angles to lay out materials for cutting and fabrication.

(measurement and calculation math level 3)

Check out the Essential Skills profile for Ironworkers
http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=123&lang=eng

What other trades work on building skyscrapers? On the next page, for you to explore, is a list of some of the other trades, along with links to the essential skills profile for each.

TRADES THAT BUILD SKYSCRAPERS

Construction craft labourers

http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=18&lang=eng

Mobile Crane operators

http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=61&lang=eng

Concrete finishers

http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=16&lang=eng

Elevator constructors

http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=297&lang=eng

Lathers (Internal Systems Mechanics)

http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=131&lang=eng

Construction Electricians

http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=17&lang=eng

Plumbers

http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=38&lang=eng

8. STAYING SAFE ON THE ROAD

NEED HELP? TRY THE BOOSTER.

- ***ROUNDING BOOSTER***

HITTING THE ROAD FOR WORK!

Many people drive to and from work each day and some jobs require workers to drive as part of their jobs. Plumbers or caterers for example, may have to drive to more than one location, to get their work done. Data on road safety and on workplace accidents is a helpful reminder to all of us to be careful and especially to young people, who, according to research, are far more likely to be injured or killed on the road and on the worksite. Use the data in Safe on the Roads in 2014? and the data tables found on *page 3*, to answer the questions below. Round your answers to the nearest whole number.

1. How many licensed drivers were there in Canada in 2014?
(*data analysis level 2, document use level 2, reading level 2*)

2. How many collisions resulting in fatalities involved drivers 16-24?
(*data analysis level 2, document use level 2, reading level 2*)

3. How many collisions resulting in serious injuries involved drivers 16-24?
(*data analysis level 2, document use level 2, reading level 2*)

4. Create and administer your own survey related to safe driving. Collect the information and create a table or graph that represents your results. Compare your results to the Safe on the Road results on page 4. Determine if your results are similar or different. If they are different, what do you think might be the reason(s) for the difference?
(*data analysis level 3, document use level 3, digital technology level 2, oral communication 2, critical thinking 3*)

To help you get started, on the next page there is some background information on surveys and some helpful suggestions.

To help with your survey plan, here is some background on surveys and a few suggestions.

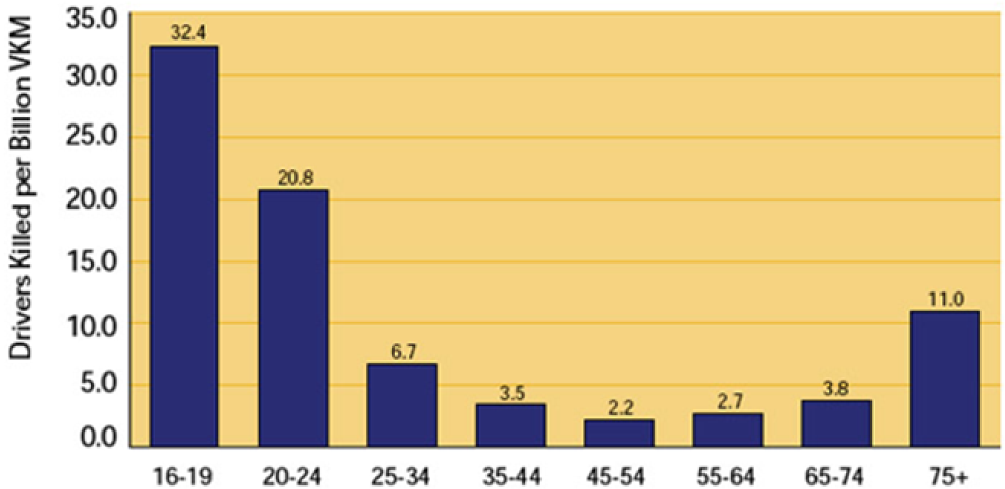
1. Good survey questions are short and easy to understand.
2. A question should have only one part. For example, do not ask questions like
   - Do you drive to work every day and have you ever had an accident?
     - The question is problematic because you will not know from the respondent's answer whether he/she is answering the question about driving to work every day or having had an accident. Without knowing the difference, your data will be inaccurate.
3. It's a good idea to limit your survey to 10-15 questions so people don't get bored.
4. Your survey should, at a minimum, collect information on the following:
   - Age
   - Ever in a car accident
   - Ever injured in a car accident
   - Questions on driving habits, such as
     - Do you text while driving?
5. Other possible questions are:
   - How many years have you been driving?
   - How far do you drive each week?
6. Decide who you will survey. Will you survey just one type of respondent or several? Some options are:
   a. Classmates
   b. Parents or other relatives
   c. Friends
   d. Co-workers

Staying Safe on the Road

SAFE ON THE ROADS in 2014?

According to Canada's *Safe on the Road*, while only 13% of licensed drivers were aged 16-24, 24% of fatalities and 26% of those seriously injured were 16 to 24 years of age. Young drivers 16 to 24 years of age continue to be at higher risk of being killed in motor vehicle collisions per distance traveled than all other age groups, as noted below:

Figure 8: Young drivers are overrepresented as victims



Number of Licensed Drivers by Age (Canada: 2014)			
Age	Males	Females	Total
16-19	601,391	553,183	1,154,574
19-24	1,015,355	940,890	1,956,245
Total collisions resulting in fatalities (2014)			1667
Total collisions resulting in serious injuries (2014)			110,500

Source for graphic and text:
http://www.tc.gc.ca/eng/motorvehiclesafety/tp-tp15145-1201.htm

9. SKYSCRAPERS AND THE PRICE OF FAME

NEED HELP? TRY THE BOOSTER.

- **CALCULATING PERCENT BOOSTER**

KING KONG!

One of the most famous movie skyscrapers is the Empire State Building (New York City 1931). It was seen in *James and the Giant Peach* (1996) and destroyed by an alien ship in *Independence Day* (1996), and by Godzilla and the US military in the 1998 *Godzilla* movie. The Empire State Building's observation deck features prominently in *Sleepless in Seattle* (1993) and the tower stars in the movie *Empire* (1964 film), where it is seen in a continuous eight-hour-five-minute shot of the building at night. But perhaps its most famous appearance was when it was being climbed by the giant ape, King Kong. Between 1933 and 2005 there were three King Kong movies made.

https://www.pinterest.com/imloveit/king-kong/

	1933	1976	2005
Budget	$672,000 USD ($12M adjusted for inflation)	$24M USD ($100M adjusted)	$207 million USD ($256M adjusted)
Box Office	$2.28M USD ($51M adjusted)	$90.6M USD ($377M adjusted)	$550.5 million USD ($681M adjusted)
Running Time	100 minutes	134 minutes	187 minutes
Height of Kong	12.2m (40 ft.)	5.49 m (18 ft.)	7.7 m (25 ft.)
Tower Climbed	Empire State Building	World Trade Centre	Empire State Building

Use the adjusted amounts to complete questions 1, 2, 3 and 4.

1. How much did each movie make?
(*money math level 2*)

1933

1976

2005

2. How many times the original investment did each movie make? Calculate to two decimal points.
(*money math level 3*)

1933

1976

2005

3. What was the percentage return on investment (ROI) for each version?
(*scheduling budgeting and accounting math level 2*)

1933

1976

2005

4. If the 2005 version of King Kong had been made in Canada, what would the cost have been in Canadian dollars? Assume that the exchange rate is 1 Canadian dollar = .76 of a US dollar.
(*scheduling, budgeting and accounting math level 2*)

1933

1976

2005

5. Using the original values, rounded to the nearest dollar, what was the production cost per minute for each movie?
(*scheduling budgeting and accounting math level 2*)

In 2017, a fourth movie, *Kong: Skull Island,* was added to the King Kong franchise.

Filmed in Northern Vietnam, on the island of Oahu Hawaii, and on Australia's Gold Coast, the film was directed by Jordan Vogt-Roberts and starred Tom Hiddlestone, Samuel L. Jackson, John Goodman, and Brie Larsen.

The film opened March 10, 2017 to coincide with the franchise's 84th anniversary.

Interestingly, Skull Island actually cost less to produce than the 2005 King Kong movie. It cost 185 million versus 207 million for the 2005 movie.

6. According to the film industry, a film needs to make roughly 2 times its production costs to be considered profitable. Using the cost to produce Skull Island and an average ticket price of $ 11, calculate how many tickets would have to be sold for the film to be profitable. (*measurement and calculation level 2*)

Producers, directors, choreographers and others who oversee and control the technical and artistic aspects of film, television, radio, dance and theatre productions:

- May create and monitor budgets. For example, …create and monitor operating budgets. They consider factors such as costs of overhead, labour, equipment, materials and supplies. They forecast production expenses and income from funding sources and ticket sales. They monitor these budgets to accommodate variations in costs and revenue. (scheduling, budgeting and accounting level 4)

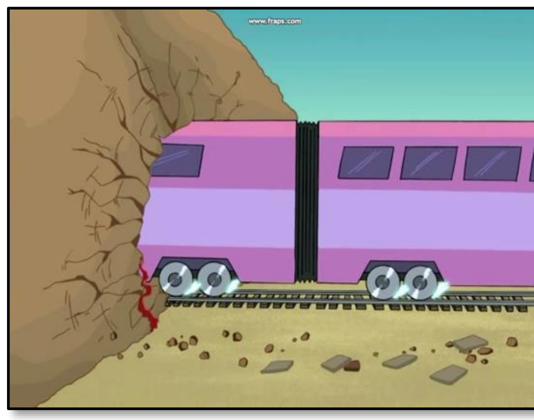
Check out the Essential Skills profile for Producers, Directors, Choreographers and Related Occupations
http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=248&lang=eng

10. TUNNEL TROUBLE

NEED HELP? TRY THE BOOSTER.

- **PERIMETER BOOSTER**

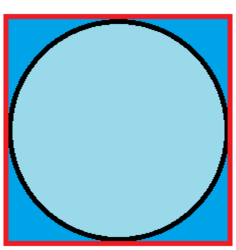
KEEPING ON TRACK!


https://www.youtube.com/watch?v=h_JZhldWQPA

The French train operator (SNCF) has discovered that 2,000 new trains it ordered, based on measurements provided by the rail operator (RFF), are too wide for many platforms. The error has so far cost RFF over 50m euros ($68.4M) and it is likely to cost more. There are more than 1,000 platforms to be adjusted. The error seems to have happened because RFF gave measurements of platforms built less than 30 years ago, but many of the platforms were built more than 50 years ago, when trains were a little slimmer. This means the platform edges are too close to the tracks and the trains cannot get in.

http://www.smartcitiesdive.com/ex/sustainablecitiescollective/are-light-rail-tunnels-really-cost-prohibitive/1089228/

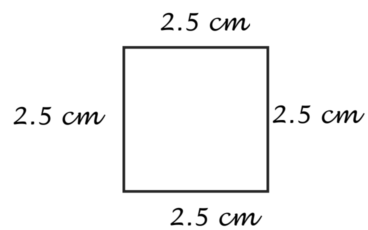
Getting a train through a tunnel is like putting a circle in a square. The measurements have to be exactly right or it won't fit. The distance around the outside of a square or other figure is called perimeter (P). The distance around the outside of a circle is called perimeter or circumference (C).



Learn how to calculate the distance around different shapes by reading the Perimeter Booster then calculate the perimeter of the shapes below. (*Hint: Write the dimensions on the images first.*)

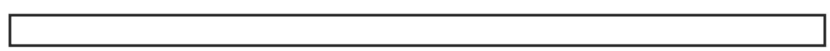
1. Square - is done for you
(*measurement and calculation level 2*)

Length = 2.5 cm
Width = 2.5 cm
P = 2.5 x 4
P = 10



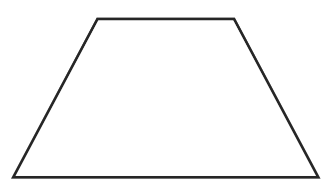
2. Rectangle
(*measurement and calculation level 2*)

Length = 3 m
Width = 9 cm
P =



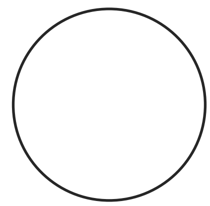
3. Trapezoid
(*measurement and calculation level 3*)

Sides = 1.2 m
Big base = 2 x side
Small base = 76 cm
P =



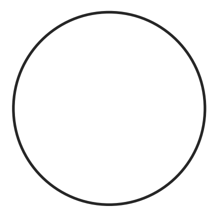
4. Circle
(*measurement and calculation level 2*)

Radius = 35 cm
C =



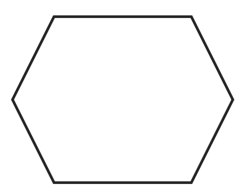
5. Circle
(*measurement and calculation level 2*)

Diameter = 4 yards less 2 in
C =



6. Hexagon
(*measurement and calculation level 2*)

Side = 12 mm
P =



CAN YOU GET THE TRAIN THROUGH THE TUNNEL?

7. If the tunnel opening is square and one side is 4.2 metres, and you need an added 36 cm of clearance on each side, for the train, what is the maximum radius of a round train going through the tunnel?
(*measurement and calculation level 3*)

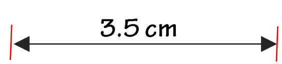
MAKE A DRAWING TO SCALE

A scale drawing is one that shows a real space or object, with the sizes made smaller or larger by a certain, consistent amount. That amount is called the scale.

It is shown on the drawing as the scale length followed by a colon (:) and the actual length of the real space or object. For example, a drawing might show a scale of 1 cm:10 cm. This would mean that any section of the space or object in the drawing, drawn to the size of 1 cm would have a size of 10 cm in the real world. For example, a measurement of 15 cm on the drawing of a chair would be 150 cm on the real chair.

Scale: 1:10

Scale drawings also make use of the "alphabet of lines" which is a set of line-based symbols that give meaning to the drawings. One of the most common lines you will see is a *dimension line*. It is a thin line that is a double ended arrow. It has small bars to indicate the start and end of the line. The measurement it represents will be shown in the middle.



Graph paper is very useful when creating scale drawings. Graph paper has been provided on the pages that follow. Each square on the paper = .25 cm.

8. Make a scale diagram of your answer for question 7. Use the scale 1 cm = .5 m. Show the measurements on the drawing.
(*measurement and calculation level 3*)

9. Measure the perimeter of your room. Make a scale diagram of the room. Use the scale 2 cm = 1 m.
(*measurement and calculation level 3*)

11. AREA AND VOLUME

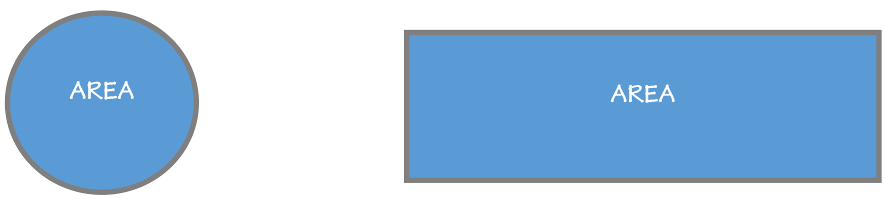
NEED HELP? TRY THE BOOSTERS.

- CALCULATING AREA BOOSTER
- CALCULATING VOLUME BOOSTER
- METRIC TO METRIC CONVERSION BOOSTER
- METRIC TO IMPERIAL / IMPERIAL TO METRIC CONVERSION BOOSTER

WHAT'S ON THE INSIDE?

Just as it is useful to know how to calculate perimeter (distance around the outside of an object), it's useful to be able to calculate the size of the space that is enclosed by or taken up by an object. The size of this space is called the area or volume.

Area refers to the space inside a two-dimensional shape or object, like a square or a rectangle or a circle.



Volume refers to the amount of space inside a three-dimensional object.

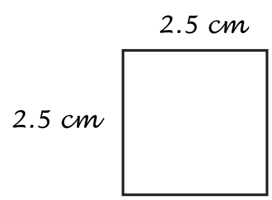
Units of area are *squared* – square metres, centimetres, feet, inches, etc. They are written as m^2, cm^2, $ft.^2$ etc.
Units of volume are *cubed* – cubic metres, centimetres, feet inches etc. They are written as m^3, cm^3, $ft.^3$ etc.

AREA

Area of squares and rectangles is calculated as length (l) x width (w). The answer is described in square units – cm^2, $ft.^2$, etc.
Calculate the area of each of the shapes below. Remember to show the units in your answer. Round to two decimal places.

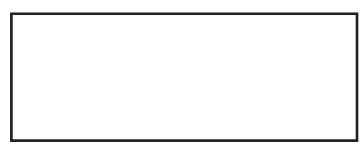
1. The square is done for you, as an example.
(*measurement and calculation level 2*)

Length = 2.5 cm
Width = 2.5 cm
A = 2.5 x 2.5
A = 6.25 cm^2

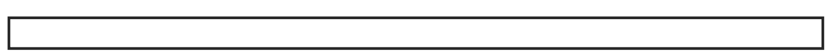


2. Calculate the area of the rectangle.
(*measurement and calculation level 2*)

Length = 3 ft.
Width = 1 ft.
A =



3. Calculate the area of the rectangle.
(*measurement and calculation level 2*)



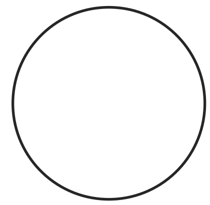
Length = 3 m
Width = 9 cm
A =

4. Calculate the area of the circle.
(*measurement and calculation level 2*)

Area of a circle is calculated as pi x radius squared. Remember, pi = 3.14 and radius is half of diameter. The answer is described in square units – cm^2, $ft.^2$, etc.

Radius = 35 cm

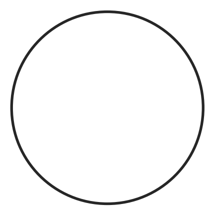
A =



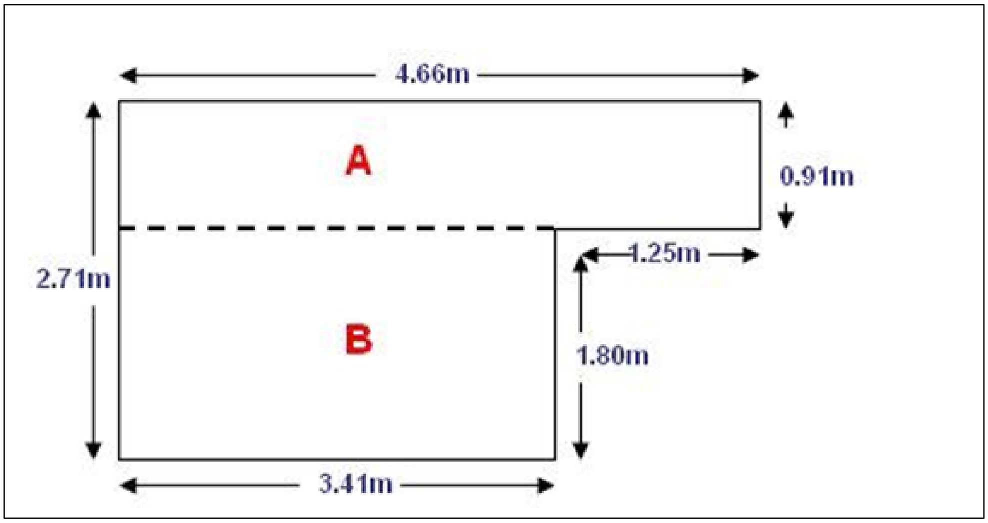
5. Calculate the area of the circle. Show your answer in inches and in feet.
(*measurement and calculation level 2*)

Diameter = 4 yards less 2 in

A =



6. Calculate the total area of the floor in the room shown below. Round to two decimal places. (*measurement and calculation level 2*)



Tile setters calculate area to determine the number of tiles required to complete a floor. Check out the skills tile setters need here.

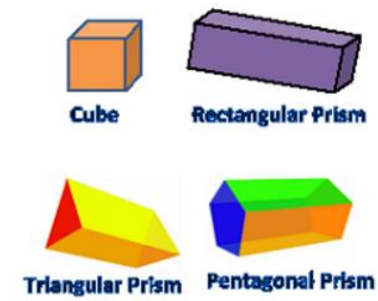
http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=320&lang=eng

7. The tile setter needs to lay a subfloor in the room above, before tiling. The plywood comes in 4 ft. x 8 ft. sheets. How many full sheets of plywood need to be purchased to complete the job? (*Hint: 1 m^2 is equal to about 10.76 $ft.^2$*)
(*measurement and calculation level 3*)

WHAT ELSE IS ON THE INSIDE?

VOLUME

Common 3-dimensional shapes are known as regular polyhedrons. Volume of regular polyhedrons is calculated as length (l) x width (w) x height (h).

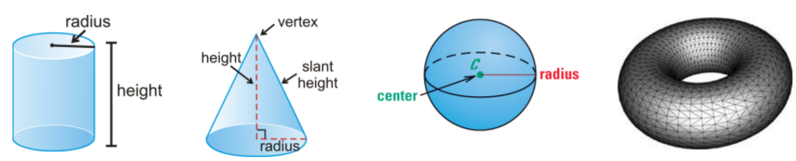


Regular Polyhedrons have

- straight edges
- flat sides called faces
- corners called vertices

Common shapes like cylinders are known as 3-Dimensional Shapes with Curves.

- Cylinders
- Cones
- Spheres
- Tori



Volume of 3-dimensional shapes with curves is calculated as pi x radius squared x height. Remember pi = 3.14 and radius is half of the diameter.

Calculate the volume of each of the shapes below. Answers should be described in cubed units – cm^3, $ft.^3$, etc. Remember to show the units in your answer.

1. Calculate the volume of the cube. (regular polyhedron with 6 equal faces)

Cube is done for you as an example.

(*measurement and calculation level 2*)

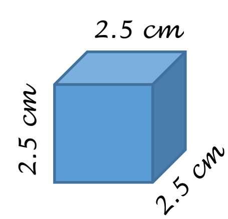
Length = 2.5 cm

Width = 2.5 cm

Height = 2.5 cm

V = 2.5 x 2.5 x 2.5

V = 15.63 cm^3



2. Calculate the volume of the rectangular prism (This is a regular polyhedron also called a cuboid. It has 6 faces that are rectangles)
(*measurement and calculation level 2*)

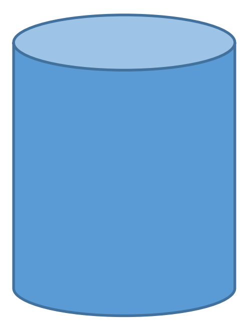
Length = 3 ft.
Width = 1 ft.
Height = 1.5 ft.
V =

3. Calculate the volume of the rectangular prism (This is a regular polyhedron also called a cuboid. It has 6 faces that are rectangles) Show your answer in cm and m.
(*measurement and calculation level 2*)

Length = 3 m
Width = 9 cm
Height = 9 cm
V =
V =

4. Calculate the volume of the cylinder. (This is a 3-dimensional shape with curves)
(*measurement and calculation level 2*)

Radius = 35 cm
Height = 70 cm
V =

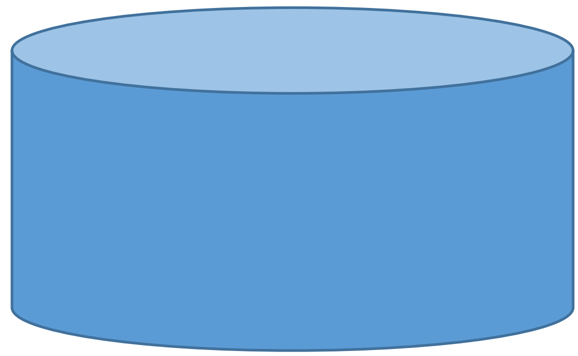


5. Calculate the volume of the cylinder (This is a 3-dimensional shape with curves) (*measurement and calculation level 2*)

Diameter = 4 yards less 2 in

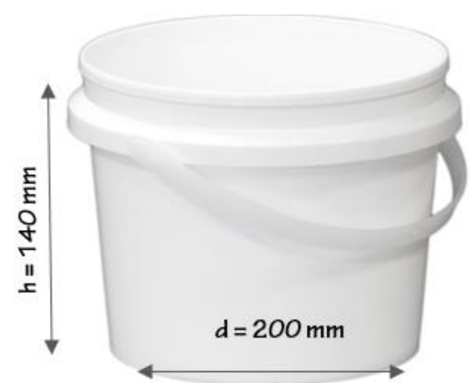
Height = 2.5 ft.

V =



Landscape technicians use volume calculations to prepare fertilizer, fungicide, herbicide and insecticide mixtures. Check out the skills landscape technicians need here: http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=129&lang=eng

6. The landscape technician needs to mix 180 ml of liquid fertilizer concentrate into 4 litres of water. What is the volume of the bucket below? Show your answer in litres. (Hint: 1 cubic millilitre is one-millionth of a litre.) Is the bucket large enough to hold the mixture? (*measurement and calculation level 3*)

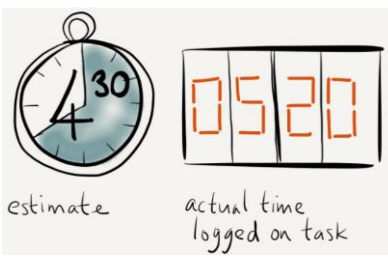


12. ESTIMATION

NEED HELP? TRY THE BOOSTERS.

- ROUNDING BOOSTER
- AREA BOOSTER
- PERIMETER BOOSTER

HOW MUCH?



The ability to estimate is necessary in daily life and at work. *About 60% of the math that adults do on a daily basis is estimation.* We estimate all sorts of things - whether we think we have time to write that essay later or if we need to do it now, whether we need to get gas to get somewhere, or how much we have to spend until payday.

http://wpsmith.net/wp-content/uploads/2015 /09/time-estimation-v-actual-time.jpg

Estimation is critical to many decisions made at work. For example, packing problems are a common challenge for industries and packing capacity is much easier to estimate when materials are of a common size and shape. Just recently Canadian National Railway (CN), developed a new and safer way to transport, by rail, bitumen, the heavy oil mined in the oil sands. The technology turns bitumen into floating, waterproof tablets the size of a bar of soap and can be shipped by rail with less risk of explosion or water contamination. This is an amazing step forward in terms of safe shipping of bitumen. But what's one of the outstanding problems to be solved?

According to Janet Drysdale, vice-president of corporate development at CN, "*…we want to perfect the pellet in terms of its shape, its size and the exact composition of polymer that we use in it". The pellets, currently in round form, will eventually be produced as flat squares or rectangles, so that they are stackable as a dry good."*

Once they can be stacked, CN will be able to estimate how many can be shipped in a rail car. You can read the whole story at the link below.

http://www.theglobeandmail.com/news/national/cn-develops-technology-that-could-make-bitumen-transportation-safer/article34082304/

An important part of estimating accurately is understanding rounded numbers. Rounded numbers are used when an approximation of a value or number is needed, rather than an exact amount. A rounded number has *about* the same value as the number you start with, but is less exact.

1. Follow the instructions to round each of the numbers described in the table below. (*estimation level 1*)

Question	Answer
103 to the nearest 10	
103 to the nearest 100	
279 to the nearest 100	
84 to the nearest ten	
8.4 to the nearest whole number	
17.82 to the nearest 10	

Some things we estimate are the time needed to get ready for something, whether or not we should add gas to the car before going somewhere, and whether we will have time to complete a task later or we need to do it now.

2. Look at the table of activities below. In Column 1 enter the length of time, in minutes, that you think it takes you to do each activity. Then do the activity and time yourself and enter the actual time in Column 2. How good an estimator are you?
(*estimation level 1, measurement and calculation 1, data analysis 1*)

How long does it take…	Column 1 ESTIMATE	Column 2 ACTUAL
… to get from home to school or work?		
… to brush your teeth?		
… for toast to pop up?		
… to have a shower?		
… for water to boil?		
… to charge your phone?		

Many of the trades on a construction project use estimation to quickly calculate time and material needs.

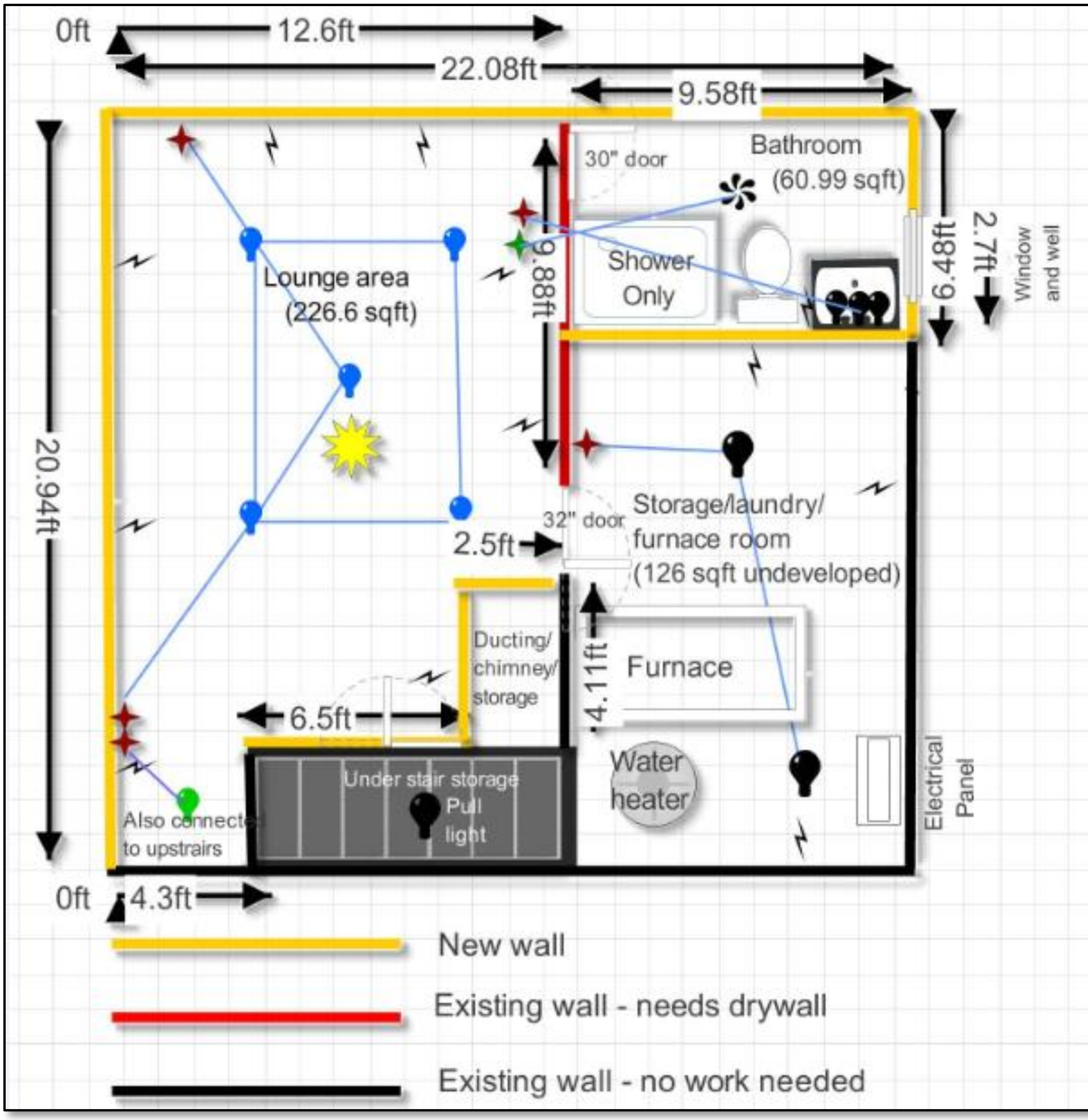
3. Using the Permit Plan on the next page, provide your best estimate for each of the questions in the table below. Round to the nearest whole numbers. Write your estimates in Column 1 in the table. (Hint: New walls also need drywall.)
(*estimation level 2*)

Next calculate the answers using the actual figures in the plan and enter the answers in Column 2. Compare them to your estimate.
(*measurement and calculation level 2*)

2% is a typical margin for error in a construction job. That is, budgets are built assuming that actual figures will be either 2% above or 2% below the final calculations. Calculate the percentage margin of error between your estimates and the actuals and enter that number in Column 3. Use + to indicate if your estimate was higher than the actual and – if it was below. Were you close?
(*data analysis 1, measurement and calculation level 3*)

	Column 1 ESTIMATE	Column 2 ACTUAL	Column 3 % DIFFERENCE
Approximately how big is the bathroom?			
Approximately how many feet of wall need drywall?			
Approximately how many square feet is the lounge area?			
Approximately what percentage of the perimeter will be new wall?			

PERMIT PLAN


0ft
12.6ft
22.08ft
9.58ft
Bathroom
(60.99 sqft)
30" door
Shower
Only
9.88ft
6.48ft
2.7ft
Window
and well
Lounge area
(226.6 sqft)
20.94ft
2.5ft
32" door
Storage/laundry/
furnace room
(126 sqft undeveloped)
Ducting/
chimney/
storage
4.11ft
Furnace
6.5ft
Under stair storage
Pull
light
Water
heater
Electrical
Panel
Also connected
to upstrairs
0ft
4.3ft
New wall
Existing wall - needs drywall
Existing wall - no work needed

Here are some other ways estimation is used at work…

Web Developers

- Estimate distances and dimensions when viewing web pages and designs. (*level 1*)
- Estimate the time required to complete project tasks. They may need to consider factors such as complexity of tasks and number of management approval levels. Failure to create accurate estimates can damage their organizations' reputations. (*level 2*)

Check out the essential skills profile for web developers here:
http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=354&lang=eng

Construction Estimators

- Estimate the time needed to complete construction projects. They consider factors such as the complexity and size of the projects, the weather conditions expected during construction, equipment and materials needed and special requirement for particular types of jobs. (*level 2*)
- Estimate profits. They consider factors such as potential variations in cost and charge rates, potential project delays and possible cost overruns. Most factors are known but fluctuations can occur within + or −2%. (*level 3*)

Check out the essential skills profile for construction estimators here:
http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=333&lang=eng

Millwrights

- Estimate weights and distances, e.g. estimate the weight of gearboxes and motors to select appropriate lifting devices and procedures to move them. (*level 1*)
- Estimate time required to complete installation and repair tasks. They consider the type of operation, the complexity of the equipment involved and past experience with similar tasks. (*level 2*)

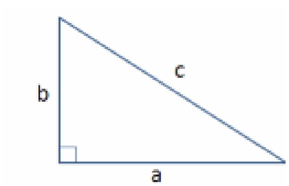
Check out the essential skills profile for millwrights here:
http://www.jobbank.gc.ca/es_view_profile-eng.do?prof_id=54&lang=eng

13. THE RIGHT, RIGHT ANGLE

NEED HELP? TRY THE BOOSTER.

- **PYTHAGOREAN THEORY BOOSTER**

PYTHAGORAS – NOT JUST YESTERDAY'S MAN



Pythagoras was one famous mathematician! He had a formula named after him that is still used today by architects, building and landscape planners, carpenters, tile setters and many others. It's called the Pythagorean Theory and it states that:

In a right angle triangle, the length of the hypotenuse (side c)^2 is equal to the sum of (side a)^2 and (side b)^2. It's usually written as $a^2+b^2=c^2$

In construction, when square corners are needed, it is Pythagoras to the rescue; although, the theory is often called the *3, 4, 5 rule.*

Using the theory/rule will always yield a right angle. For example, to ensure the corner of a wooden deck is square, measure 3 units (ft., in., m, cm) down one side and 4 of the same units (ft., in., m, cm) down the other side. Next, measure from the end of the 3- measurement to the end of the 4-measurement.

If the third measurement is 5, you know the corner is square. If it is not 5, ensure the measurements of the two sides are 3 and 4.

FINDING X WITH HELP FROM PYTHAGORAS

Use the Pythagorean Theorem to find the value of X for each of the following skateboard ramps, which are all right triangles. Round your final answers to one decimal point. Show your calculations. Remember to show the units in your answer.

1.

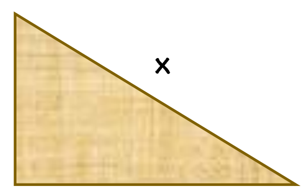
(*measurement and calculation level 2*)

a = 3 cm

b = 4 cm

c = x

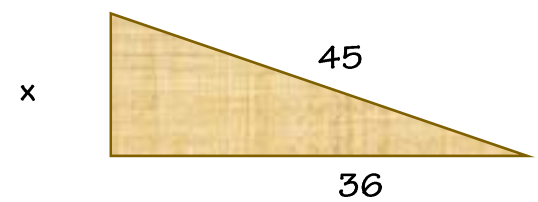
c =



2.

(*measurement and calculation level 2*)

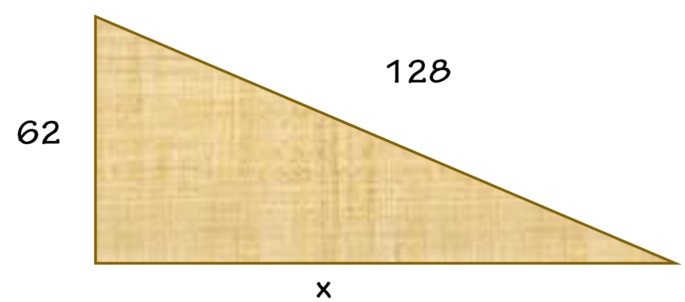
a = x
b = 4 ft.
c = 5 ft.
a =



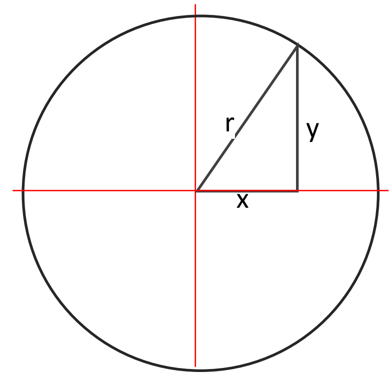
3.

(*measurement and calculation level 2*)

a = 62 m
b = x
c = 128 m



The Theorem can also help us to find the radius of a circle. The basic equation of a circle is $x^2+y^2 = r^2$ - when x and y are any two points on the circle and r is the radius.

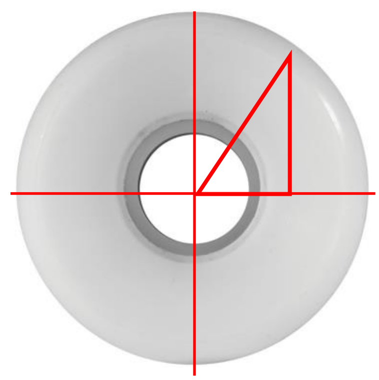


Find the value of x, y or r in the following right triangles using the Pythagorean Theorem. Round your final answers to one decimal point.

Write the measurements on the triangle sides.

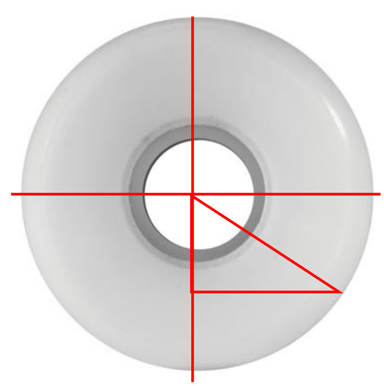
4. (*measurement and calculation level 2*)

x = 8 cm
y = 5 cm
r = ?



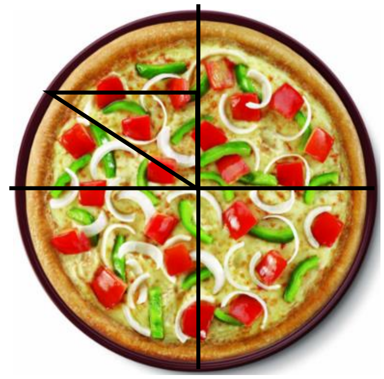
5. (*measurement and calculation level 2*)

x = ?
y = 3 m
r = 10 m



6. (*measurement and calculation level 2*)

x = 12.5
y = ?
r = 18.5



BUILD YOUR ESSENTIAL SKILLS!

IN THIS SECTION OF THE WORKBOOK, YOU CAN GIVE YOUR SKILLS A BOOST BY REVIEWING SOME ESSENTIAL SKILLS BASICS.

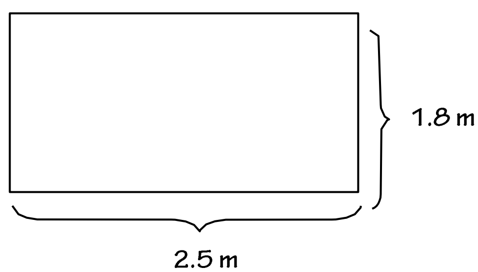
NUMERACY

Use the table of contents to navigate through this workbook. Track your progress by putting a checkmark beside each topic you complete.

1. NUMERACY BOOSTER – AREA

Area is the amount of space inside the boundary of a flat (2-dimensional) object such as a rectangle, triangle or circle. This Booster describes steps to calculating area for three two-dimensional shapes; rectangle, circle and right angle triangle.

CALCULATING THE AREA OF A RECTANGLE



Basics you need to know:

- Area of rectangles and squares is calculated as length(L) x width(W)
- Answers are expressed as "squared" numbers for example, m^2 or $ft.^2$
- Width(W) may be called height(H)

<u>Step 1</u>: State what you know in WORDS.

- Length (L) of this rectangle = 2.5 meters
- Width (W) (might be called height (H)) of this rectangle = 1.8 meters
- Area of a rectangle = length x width

<u>Step 2</u>: Turn the words into a formula.

1. A = L x W

Step 3: Insert the measurements you know into the formula and solve for the unknowns.

Hint: keep the measurement units attached to your calculations, so you don't forget them in the final answer. (e.g.) m, cm, in., ft.

A = LxW
A = 2.5 m x 1.8 m
A = 4.5 m^2

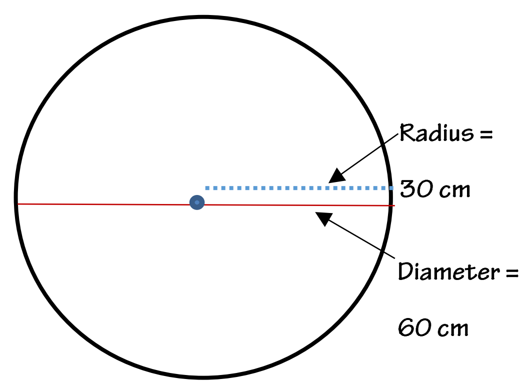
Step 4: State the answer in a sentence.

The area of the rectangle is 4.5 m^2

CALCULATING THE AREA OF A CIRCLE

Basics you need to know:

- Diameter (d) = 2 x radius (r)
- Radius (r) = ½ the diameter (d x .5)
- There is a measurement called pi
- pi is the *ratio* of *any* circle's circumference to its diameter
- pi (π) = 3.14 (approximately)
- The symbol for pi is π



To calculate area of a circle:

- pi x radius(r) squared

Step 1: State what you know in WORDS.

- Diameter of this circle = 60 cm
- Radius of this circle = 30 cm
- pi = 3.14

Step 2: Turn the words into a formula.

$A = \pi r^2$

Step 3: Insert the measurements you know into the formula and solve the unknowns.

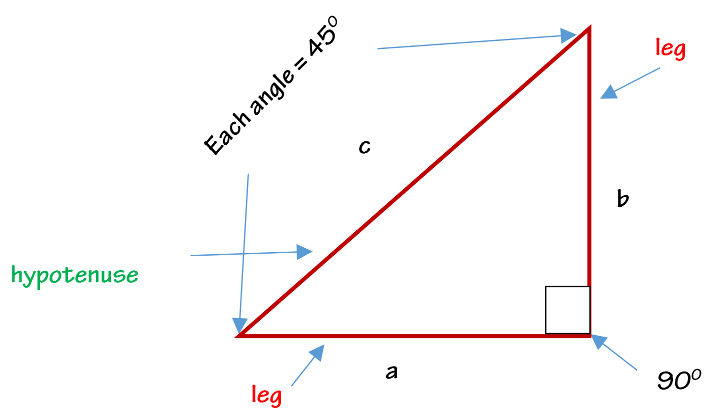
$A = \pi r^2$
A = 3.14 (30 cm x 30 cm)
A = 2826 cm^2

Step 4: State the answer in a sentence.

The area of the circle is 2826 cm^2

CALCULATING THE AREA OF A RIGHT ANGLE TRIANGLE

A right angle triangle is a triangle in which one angle is a right angle (that is, a 90-degree (900) angle). The sum of the other two angles is equal to 900. Right angle triangles have 2 legs and 1 hypotenuse. The hypotenuse is always the side opposite the right (900) angle.



Basics you need to know:

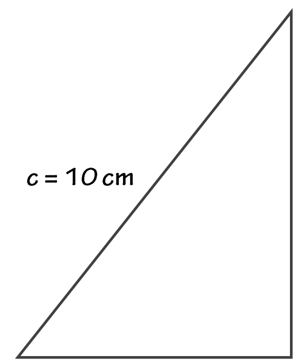
- Area of right angle triangles is calculated as
    - a side length x b side length divided by 2 (or times 0.5)
    - A = ab / 2

    OR

    - A = 0.5(axb)
- Answers are expressed as "squared" numbers for example, m^2 or $ft.^2$

Step 1: State what you know in WORDS.

- In the triangle to the right, a = 8 cm and b = 6 cm



Step 2: Turn the words into a formula.

- Area = a x b ÷ 2

  OR

- Area = a x b x .5

Step 3: Insert the measurements you know into the formula and solve the unknowns.

Option 1	Option 2
A = 8 cm x 6 cm ÷ 2	A = 8 cm x 6 cm x 0.5
A = 48 cm ÷ 2	A = 48 cm x 0.5
A = 24 cm^2	A = 24 cm^2

Step 4: State the answer in a sentence.

The area of the triangle is 24 cm^2.

2. NUMERACY BOOSTER – PYTHAGOREAN THEORY

This Booster describes steps to using Pythagorean Theory to determine if a corner is square.

PYTHAGOREAN THEORY

Pythagoras was a Greek philosopher born in Samos.

He was a smart guy who said some cool things like:

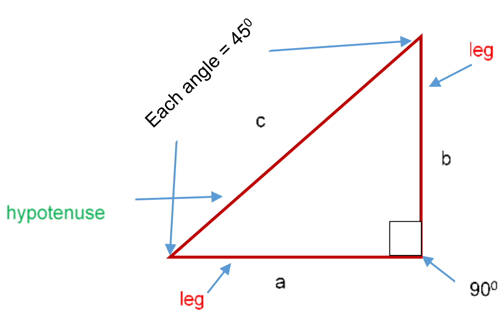
“Rest satisfied with doing well, and leave others to talk of you as they please.”

“The oldest, shortest words — "yes" and "no" — are those which require the most thought.”

He also came up with a theory about right angle triangles known as the Pythagorean Theorem. It states that:

http://www.resourceaholic.com/2014/09/pythagoras.html

In a right-angle triangle, the length of the (hypotenuse)^2 is equal to the sum of (side a)^2 and (side b)^2.



How Does It Work?

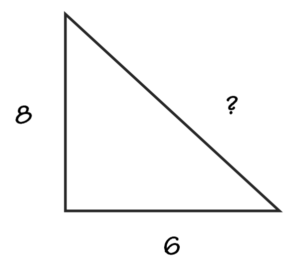
A right-angle triangle is a triangle in which one angle is a right angle (that is, a 90-degree (90^O) angle). The sum of the other two angles is equal to 90^O. Right angle triangles have 2 legs and 1 hypotenuse and the hypotenuse is always the side opposite the right (90^O) angle. Pythagorean Theory states that $a^2 + b^2 = c^2$

So, if you know the measurements of any of the two sides of a right-angle triangle, you can figure out the measurement of the third side.

Let's try it.

The triangle to the right has an a-side that is 6 cm and a b-side that is 8 cm.

What is the length of the c-side (hypotenuse)?



(6 cm x 6 cm) + (8 cm x 8 cm) = c^2

36 cm^2 + 64 cm^2 = c^2

c^2 = 100 cm^2

The important final step:

You need to find the square root of c^2 in order to know the length of c. In this case:

c = √100 cm^2

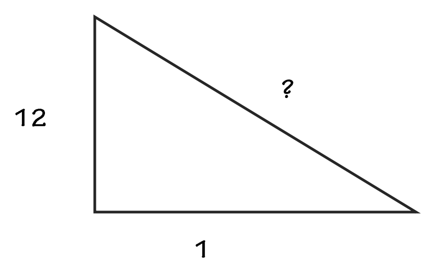
10 x 10 = 100 The square root of 100 = 10

c = 10 cm

Here's another one.

The triangle to the right has an a-side that is 12 ft. and a b-side that is 16 ft.

What is the length of the c-side (hypotenuse)?



(12 ft. x 12 ft.) + (16 ft. x16 ft.) = c^2

144 ft.^{2} + 256 ft.^{2} = c^2

c^2 = 400 ft.^{2}

The important final step:

You need to find the square root of c^2 in order to know the length of c. In this case:

c = √400 ft.^{2}

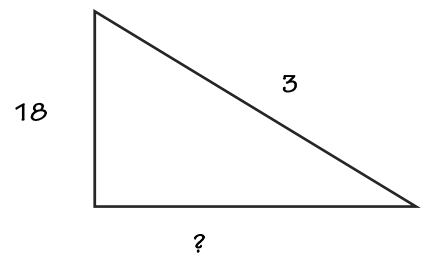
20 x 20 = 400 The square root of 400 = 20

c = 20 ft.

ONE MORE

The triangle to the right has an a-side that is 18 cm and a c-side that is 30 cm.

What is the length of the b-side?



(18 cm x 18 cm) + (b x b) = 30x30 cm

$324\ cm^2 + X\ cm^2 = 900\ cm^2$

$900\ cm^2 - 324\ cm^2 = 576\ cm^2$

$b^2 = 576\ cm^2$

THE IMPORTANT FINAL STEP:

You need to find the square root of b^2 in order to know the length of b. In this case:

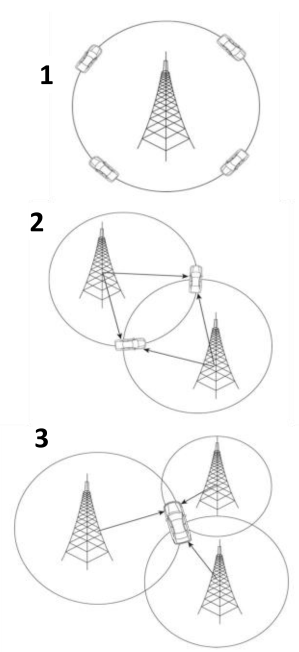
$b = 576\ cm^2$

24 x 24 = 576 The square root of 576 = 24

b-side = 24 cm

PYTHAGOREAN THEORY – STILL RELEVANT IN THE DIGITAL WORLD

Also thanks to Pythagoras's theory, a cell phone can be located, using a process called cell tower triangulation. It's the same math that powers a 'find my phone' app and helps 911 operators locate you, in an emergency, by using your phone signal.



Here's a really simplified explanation as to how it works:

Three cell phone towers communicate with a cell phone to determine its location.

Using the strength of the signal:

1. The first tower calculates the distance to the phone.
2. Then a second tower calculates distance to the phone.
    - Where the distances overlap between the first and second towers, there is a possible position for the phone.
3. Finally, a third tower is used to calculate distance and the location is locked down.

3. Numeracy Booster – Conversions Metric to Imperial/ Imperial to Metric

It is useful to be able to convert measurements quickly and accurately. Most Canadian government services use metric measures, but some industries, such as construction and aerospace, also use Imperial measures. In addition, Canada's largest trading partner, the United States, mainly uses the Imperial system, so we often use goods and services that are expressed in Imperial measures.

Converting a measurement only changes the expression used, not the amount. The measurement of the red line below expressed as inches is 1 inch. The measurement may also be expressed as 2.54 centimetres. This does not change the length of the line, only the way in which it is described.

USING CONVERSION TABLES

Conversion from Imperial to metric or metric to Imperial can be calculated quickly, using conversion tables.

Steps to follow to use a conversion table

1. Determine which TYPE OF UNIT will be converted, before referring to specific tables. Will the conversion be for length, volume, mass, area, etc?
2. Determine which system you are moving FROM and which system you are moving TO.
3. Find the table that corresponds to this movement; is it Imperial to Metric or Metric to Imperial?
4. Locate the correct conversion factor from the table.
   - For example, the conversion factor to change inches to centimetres is 2.54. That is, there are 2.54 centimetres in 1 inch.
5. Multiply units by the conversion factor.
   - To convert 10 inches to centimetres, multiply 10 x the conversion factor of 2.54.
6. Round the decimal to the required number of places. *See the Rounding Booster for help.*

Example: Convert 20 metres to yards (metric to Imperial) and round to two decimal places.

1. Find the correct table for the conversion.
   - metres and yards are measures of length

2. Determine system FROM and system TO.
   - in this case, FROM Metric (20 metres) TO Imperial (yards)

3. Locate the table showing Metric to Imperial Conversions for Length
   - See below

4. Find the conversion factor for metres to yards
   - 1 metre = 1.0936 yards

5. Multiply units by conversion factor
   - 20 m x 1.0936 = 21.872 yd.

6. Round the answer to two decimal places
   - 21.87 yd.

LENGTH

Imperial unit	Metric (SI) unit
Inch	2.54 centimetres
Foot	30.48 centimetres
Yard	0.91 metres
Mile	1.61 kilometres

Metric (SI) unit	Imperial unit
Centimetre	0.39 inches
Metre	3.28 feet
Metre	1.0936 yards
Kilometre	0.62 miles

Example: Convert 37 square yards to metres (Imperial to metric) and round to two decimal places.

1. Find tables for area conversions
   - square units are measures of area

2. Determine system FROM and system TO
   - In this case FROM Imperial (square yards) TO metric (square metres)

3. Locate the tables showing Imperial to Metric Conversions for Area

4. Find conversion factor for square yards to square metres
   - 1 sq. yd. = 0.84 sq. m

5. Multiply units by conversion factor
   - 37 sq. yd. x 0.84 = 31.08 sq. m

6. Round the answer to the nearest tenths
   - 37 sq. yards = 31.08 sq. m (or 31.1 sq. m)

AREA

Imperial	Metric (SI) unit
Acre	0.40 hectare
Square inch	6.45 square centimetres
Square foot	0.09 square metres
Square yard	0.84 square metres
Square mile	2.60 square kilometres

Imperial	Metric (SI) unit
Hectare	2.47 acres
Square centimetre	0.16 square inches
Square metre	10.76 square feet
Square metre	1.20 square yards
Square kilometre	0.39 square miles

Converting Temperature

Celsius to Fahrenheit	Fahrenheit to Celsius
F = (C x 1.8) + 32	C = (F – 32) ÷ 1.8

Convert 20° Celsius to Fahrenheit
F = (20 x 1.8) + 32
F = 36 + 32
F = 68

Convert 72° Fahrenheit to Celsius
C = (72 – 32) ÷ 1.8
C = 40 ÷ 1.8
C = 22.22°

TABLES FOR COMMON INDUSTRY CONVERSIONS

LENGTH

Imperial unit	Metric (SI) unit
Inch	2.54 centimetres
Foot	30.48 centimetres
Yard	0.91 metres
Mile	1.61 kilometres

Metric (SI) unit	Imperial unit
Centimetre	0.39 inches
Metre	3.28 feet
Metre	1.0936 yards
Kilometre	0.62 miles

AREA

Imperial	Metric (SI) unit
Acre	0.40 hectare
Square inch	6.45 square centimetres
Square foot	0.09 square metres
Square yard	0.84 square metres
Square mile	2.60 square kilometres

Metric (SI) unit	Imperial
Hectare	2.47 acres
Square centimetre	0.16 square inches
Square metre	10.76 square feet
Square metre	1.20 square yards
Square kilometre	0.39 square miles

Weight (Mass)

Imperial	Metric (SI) unit
Ounce (weight)	28.35 grams
Pound UK	0.45 kilograms
ton (2400 pounds US)	1.02 metric tons
ton (2000 pounds UK)	0.91 metric tons

Metric (SI) unit	Imperial
Gram	0.035 ounces
Kilogram	2.21 pounds
Metric ton (1000 kg)	0.98 UK tons
Metric ton (1000 kg)	1.10 US tons

Volume (Capacity)

Imperial	Metric (SI) unit
Fluid ounce (UK)	28.41 millilitres
Fluid ounce (US)	29.57 millilitres
Quart (UK)	1.14 litres
Quart (US)	0.95 litres
Gallon (UK)	4.55 litres
Gallon (US)	3.79 litres

Metric (SI) unit	Imperial
100 millilitres	3.52 fluid ounces (UK)
100 millilitres	3.38 fluid ounces (US)
1 litre	0.88 quarts (UK)
1 litre	1.06 quarts (US)
1 litre	0.22 gallon (UK)
1 litre	0.26 gallons (US)

Temperature

Celsius to Fahrenheit	Fahrenheit to Celsius
$F = (C \times 1.8) + 32$	$C = (F - 32) \div 1.8$

HANDY DANDY TABLE OF MULTIPLIERS

Multiply	by	to get	Multiply	by	to get
mm	.0394	in.	in.	25.4	mm
m	39.3701	in.	in.	.0254	m
m	3.2808	ft.	ft.	.3048	m
m	1.0936	yd.	yd.	.9144	m
km	3280.84	ft.	ft.	.0003048	km
Multiply	**by**	**to get**	**Multiply**	**by**	**to get**
mm^2	.0016	in.^{2}	in.^{2}	645.16	mm^2
cm^2	.155	in.^{2}	in.^{2}	6.4516	cm^2
m^2	10.7639	ft.^{2}	ft.^{2}	.0929	m^2
m^2	1.1960	yd.^{2}	yd.^{2}	.8361	m^2
km^2	.3861	mi.^{2}	mi.^{2}	2.59	km^2

4. NUMERACY BOOSTER – METRIC TO METRIC CONVERSION

THE METRIC SYSTEM IS ALSO KNOWN AS THE SYSTEM INTERNATIONAL (SI). METRIC UNITS ARE MULTIPLES OF TEN (OR HUNDRED OR TENTHS ETC.) WHICH MAKES THEM EASY TO CONVERT AS YOU JUST NEED TO MOVE THE DECIMAL THE CORRECT NUMBER OF SPACES LEFT OR RIGHT.

CONVERTING METRIC TO METRIC

The metric system uses the prefixes shown in the table below to describe measurements. The shaded prefixes (Hecto, Deca and Deci) are not as commonly used in the workplace as Kilo, Centi and Milli. The Unit is the base size of a measurement

The rows below the prefixes, list some of the associated metric units.

KILO (1000)	HECTO (100)	DECA (10)	UNIT (1)	DECI (1/10)	CENTI (1/100)	MILLI (1/1000)
kilometer km	hectometre hm	decametre dam	metre m	decimeter dm	centimetre cm	millimetre mm
kilogram kg	hectogram hg	decagram dag	gram g	decigram dg	centigram cg	milligram mg
kiloliter kl	hectoliter hl	decalitre dal	litres l	deciliter dl	centiliter cl	millilitre ml

A trick to help remember the names and order of metric units is to try to make up a sentence in which the words start with the first letters of the prefixes. An example is below.

Kyle Handed Dave 1 Dangerous Cutting Machine

Steps to follow to use a conversion table

1. Decide which unit you are changing FROM and which unit you are changing TO.
2. Starting at the FROM unit, count over to the TO unit.
3. Remember if you moved right or left.
4. The number of spaces you counted over is the number of places you will move the decimal
5. Move the decimal in the same direction you moved on the table.
6. Remember to include the unit in the answer.

Example:

32 mm = X m

You want to change from millimetres to metres. Use the table and count over from millimetres to metres.

Kilometre (1000)	Hectometre (100)	Decametre (10)	metre (1)	Decimetre (1/10)	Centimetre (1/100)	Millimetre (1/1000)
km	hm	dam	m	dm	cm	mm

.032 m ← .32 dm ← 3.2 cm ← 32. mm

32 mm = .032 m

You need to move the decimal three spaces. When you do, you can see that 32 mm is the same as 0.032 m.

Moving from right to left

Move the decimal one space to the left for each cell you move in the table. You are moving from many smaller units to fewer bigger units.

Moving from left to right

Move the decimal one space to the right for each cell you move in the table. You are moving from fewer bigger units to many smaller units.

REMEMBER

It is only the units that are changing; not the actual size of the shape or object being measured. A line that is 2000 mm is the same length as a line that is 2 m. See the example on the next page.

Example

A fence line is 35 000 mm. How many metres is it?

Are you moving from big to small units or small to big? Answer = Small to big

Steps:

1	Place a decimal at the end of the number you are converting	35 000.
2	Find the prefix of the known amount in the conversion table	milli
3	Locate the prefix or the base unit you are converting to	metre
4	Move the decimal point the same number of places (and in the same direction) that you move on the table.	right to left 3 spaces

Kilometre (1000)	Hectometre (100)	Decametre (10)	metre (1)	Decimetre (1/10)	Centimetre (1/100)	Millimetre (1/1000)
km	hm	dam	m	dm	cm	mm

35. m   350.00   3500.0   35 000.

Converting square units

When you convert units that are squared you DOUBLE the number of spaces you move the decimal.

Examples

SMALL TO BIG		
mm - cm / mm² - cm²	cm – m / cm² – m²	mm – m / mm² – m²
mm to cm – 1 space left	cm to m – 2 spaces left	mm to m – 3 spaces left
mm² to cm² – 2 spaces left	cm² to m² – 4 spaces left	mm² to m² – 6 spaces left
876213 mm² = 8762.13 cm²	256 cm² = .0256 m²	4789 mm² = .004789 m²

BIG TO SMALL		
cm – mm / cm² – mm²	m – cm / m² –cm²	m – mm / m² – mm²
cm to mm – 1 space right	m to cm – 2 spaces right	m to mm – 3 spaces right
cm² to mm² – 2 spaces right	m² to cm² – 4 spaces right	m² to mm² – 6 spaces right
42239 cm² = 4223900 mm²	765 m² = 7 650 000 cm²	56m² = 56 000 000 mm²

5. NUMERACY BOOSTER – MATHEMATICAL SYMBOLS

THIS BOOSTER DESCRIBES SOME OF THE COMMON SYMBOLS USED IN MATHEMATICS.

THE BASICS OF MATH SYMBOLS

The table on the next page describes symbols commonly used in mathematics.

Basics you need to know:

- Mathematics use symbols to represent "operations"
- A math "operation" is a process you follow to solve a problem.
    - some examples are addition, subtraction, division and multiplication
- Symbols are also used in math to represent things such as the properties of numbers.
    - for example the % symbol indicates that a number represents a percentage of another number
        - 25% of 430 = 107.5
        - 107.5 = 25% OF 430

SYMBOL	MEANING	READ AS	EXAMPLE
+	addition	plus	6 + 4 = 10
-	subtraction	minus	10 – 4 = 6
×	multiplication	times *or* multiplied by	*a = 10 b = 4* a x b = c 10 x 4 = 40
●	multiplication	times or multiplied by	a ● b = c 10 ●4 = 40
*	multiplication	times or multiplied by	a * b = c 10 * 4 = 40
No symbol. The "juxtaposition" (two things placed close together) of the numbers indicates the operation.	multiplication	times or multiplied by	ab = c
/ — ÷	division	divided by	20 / 4 = 5 $\frac{20}{4} = 5$ 20 ÷ 4 = 5
=	equal to	equals	3 + 4 = 7 N = 7
%	percent (out of 100)	percent	65%
:	ratio	to is to	1:1 (1 to 1) 1:100 (1 is to 100)
<	inequality	less than	2 < 6
>	inequality	greater than	6 > 2
≠	inequality	is not equal to	5 ≠ 9
√	square root	square root of *or* root of	√25 = 5
×	Cross multiplication	Cross (or times)	a = 9; b = 12; c = 3; d = 4 $\frac{a}{b} = \frac{c}{d}$ a x d = b x c 9 x 4 = 36 12 x 3 = 36

6. NUMERACY BOOSTER – PERCENT

A PERCENTAGE IS AN AMOUNT "OUT OF" 100. THIS BOOSTER DESCRIBES STEPS TO CHANGING FRACTIONS TO PERCENTAGES, CHANGING PERCENTAGES TO FRACTIONS AND CHANGING DECIMALS TO PERCENTAGES AND PERCENTAGES TO DECIMALS.

WHAT IS A PERCENTAGE?

A percentage is the numerator (number above the line) of a fraction in which the denominator (number below the line) is 100.

$$\frac{10}{100}$$

10 ← numerator

100 ← denominator

All of the fractions in the table below can be turned into percentages.

$$\frac{10}{20} \quad \frac{7}{100} \quad \frac{3\,½}{16} \quad \frac{347}{599} \quad \frac{64}{30}$$

A percentage is "out of" 100. The percentage sign is %.

$\frac{7}{100}$ 7 "out of" 100 is already a percentage. It would be written as 7%.

When do you use percentages?

Percentages are used to make comparisons. For example:

- A cell phone is on sale for 20% off (comparing new price to original price)
- GST is 5% (comparing sales tax to price of a good or service)
- You got 80% on your math exam (comparing the number of points you got to the total number possible)
- You tipped your waiter 15% (comparing the amount of the tip to the cost of your meal)

How do you change an "out of" fraction to a percentage?

RULE:
To change an "out of" fraction to a percentage, multiply the numerator by 100 and divide by the denominator

As long as you have 2 numbers (an "out of" situation), you can find the percentage. For example, you get 56 "out of" 60 on a test.

Step 1: Turn the "out of" statement into a fraction - in this case: $\frac{56}{60}$

Step 2: Multiply the top number by 100. 56 x 100 = 5600. Now you have: $\frac{5600}{60}$

Step 3: Divide the numerator (5600) by the denominator (60) 5600÷60 = 93.33% or, rounded to the closest whole number, 93%.

How do you change a percentage to an "out of" fraction?

RULE:
To change a percentage to a fraction, place the percentage number over 100 (and reduce if necessary)

If you have a percentage, make it "out of" 100.

Example 1: 93% on your math test becomes 93/100

Example 2: 60% on your math test becomes 60/100

How do you reduce fractions?

RULE:
To reduce a fraction, divide the top and bottom number by the highest number that divides into the top and bottom numbers exactly.

Sometimes you may be asked to reduce the fraction.

Reducing a fraction means making it as simple as possible.

For example, you can reduce 60/100 to 3/5 by dividing 60 and 100 by 20.

60÷20 = 3

100÷20 = 5

20 is the highest number than can be exactly divided into both 60 and 100 so the reduced fraction is 3/5.

How do you change a decimal to a percentage?

Rule:

To change a decimal to a percentage, multiply by 100.

Multiplying a decimal by 100 means you need to move the decimal 2 places to the right. For example, 1.25 as a percentage is 1.25 x 100 = 125%

How do you change a percentage to a decimal?

Rule:

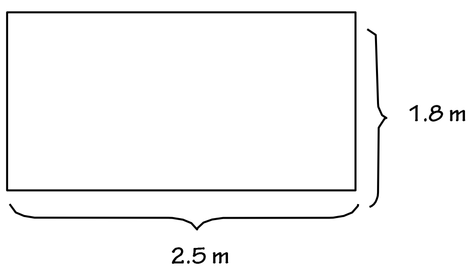
To change a percentage to a decimal, divide by 100.

Dividing a decimal by 100 means you need to move the decimal 2 places to the left. For example, 125% as a decimal is125 ÷ 100 = 1.25

7. NUMERACY BOOSTER – PERIMETER

PERIMETER IS THE TOTAL DISTANCE AROUND A TWO-DIMENSIONAL SHAPE. THIS BOOSTER DESCRIBES STEPS TO CALCULATING PERIMETER FOR THREE TWO-DIMENSIONAL SHAPES; RECTANGLE, CIRCLE AND OCTAGON.

CALCULATING THE PERIMETER OF A RECTANGLE



<u>Step 1</u>: State what you know in WORDS.

- Length (L) of this rectangle = 2.5 meters
- Width (W) (might be called height (H)) of this rectangle = 1.8 meters

<u>Step 2</u>: Determine how you will calculate the perimeter. There are 3 options.

1. Perimeter of a rectangle = Length + Width + Length + Width
2. Perimeter of a rectangle = 2 x (Length + Width)
3. Perimeter of a rectangle = 2 x Length + 2 x Width

<u>Step 3</u>: Turn the words into a formula.

1. P = 2 (L + W)
2. P = 2L + 2W
3. P = L + W + L + W

Step 4: Insert the measurements you know into the formula and solve the unknowns.

Option 1	Option 2	Option 3
P = 2 (L + W)	P = 2L + 2W	P = L + W + L + W
P = 2 (2.5 m + 1.8 m)	P = 2 x 2.5 m + 2 x 1.8 m	P = 2.5 m + 1.8 m + 2.5 m + 1.8
P = 2 (4.3 m)	P = 5 m + 3.6 m	P = 8.6 m
P = 8.6 m	P = 8.6 m	

Step 5: State the answer in a sentence.

The perimeter of the rectangle is 8.6 m (or 860 mm)

CALCULATING THE PERIMETER OF A CIRCLE

The perimeter distance of a circle is called the circumference

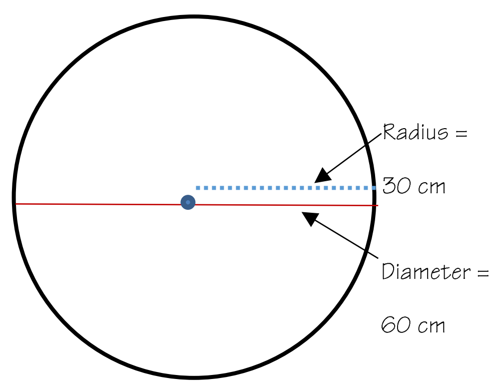
Basics you need to know:

- Diameter (d) = 2 x radius (r)
- Radius (r) = ½ the diameter (d x .5)
- There is a measurement called pi
- pi is the *ratio* of *any* circle's circumference to its diameter
- pi is written using this symbol π
- The value of π = 3.14 (approximately)

To calculate circumference:

- pi x diameter(d)

  OR
- 2 x pi x radius(r)



Step 1: State what you know in WORDS.

- Diameter of this circle = 60 cm
- Radius of this circle = 30 cm
- Pi = 3.14

Step 2: Determine how you will calculate the circumference. There are 2 options.

1. pi(π) x diameter(d)
2. 2 x pi(π) x radius(r)

Step 3: Turn the words into a formula.

1. $C = \pi d$
2. $C = 2 \pi r$

Step 4: Insert the measurements you know into the formula and solve the unknowns.

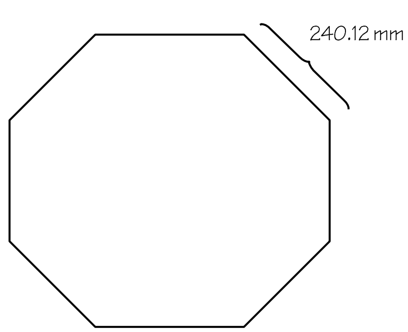
Option 1	Option 2
$C = \pi d$	$C = 2 \pi r$
C = 3.14 x 60 cm	C = 2 x 3.14 x 30 cm
C = 188.4 cm	C = 188.4 cm

Step 5: State the answer in a sentence.

The circumference of the circular window is 188.4 cm

CALCULATING THE PERIMETER OF A REGULAR OCTAGON

An octagon has 8 sides. A regular octagon has 8 sides that are all the same length.



Step 1: State what you know in WORDS.

- There are 8 sides (s) in an octagon
- Each side (s) of this octagon = 240.12 mm

Step 2: Determine how you will calculate the perimeter. There are 2 options.

1. Perimeter (P) = 8 x side measurement (s)
2. Perimeter (P) = side(s) + side(s) + side(s) + side(s) + side(s) + side(s) + side(s) + side(s)

Step 3: Turn the words into a formula.

1. P = 8 x s
2. P = s + s + s + s + s + s + s + s

Step 4: Insert the measurements you know into the formula and solve the unknowns.

Option 1	Option 2
P = 8 x s	P = s + s + s + s + s + s + s +s
P = 8 x 240.12 mm	P = 240.12 +240.12 +240.12 +240.12 +240.12 +240.12 +240.12 +240.12 +240.12 +240.12 +240.12
P = 1920.96 mm	P = 1920.96 mm

Step 5: State the answer in a sentence.

The perimeter of the octagon is 1920.96 mm

8. NUMERACY BOOSTER - ROUNDING

ROUNDED NUMBERS ARE USED WHEN AN APPROXIMATION (ESTIMATION) OF A NUMBER IS NEEDED, RATHER THAN AN EXACT AMOUNT. A ROUNDED NUMBER HAS ABOUT THE SAME VALUE AS THE NUMBER YOU START WITH.

ROUNDING RULES AND HINTS

RULES

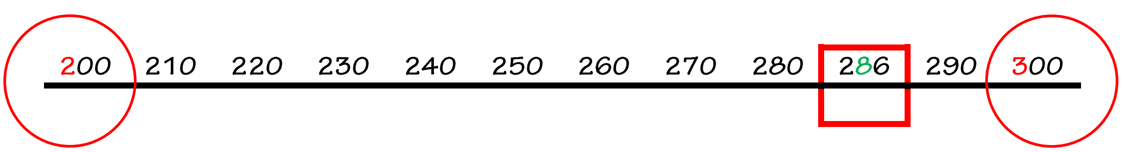
- If the number you are rounding to is followed by a 5, 6, 7, 8, or 9, round the number up.
- If the number you are rounding to is followed by a 0,1,2,3 or 4, round the number down.
- All numbers to the right of the place being rounded will be zeroes.

EXAMPLE

"*Round 286 to the nearest hundred*". 286 is between 200 and 300.

The 8, following the 2 that is in the hundreds place, means that we must round the number up.

The nearest hundred is 300. (All numbers to the right of the hundreds place become zero so the answer is 300.)



HINTS

- Underline the place (ten, hundred, thousand) you are rounding to. Underlining will help you to keep clear which number is being rounded. 286
- You can check your answer using a number line.

EXAMPLE

Sometimes all that is needed to answer a question is a rounded number. For example, if you have 2456 jellybeans in a jar you can round the number to respond to a question about how many jellybeans you have.

Round 2456 to the nearest hundred.

Underline the <u>4</u>, as that is in the <u>hundreds place</u>. 2456.

The number, following the 4 is 5 so we know we have to round up. All numbers to the right of the underlined one will be zeroes. 2456 to the nearest hundred – the 4 becomes 5 and the numbers that follow become zeroes. The answer is 2500.

2400	2410	2420	2430	2440	2450	2456	2460	2470	2480	2490	2500

Ask yourself how important it is to be accurate and then determine what place you are rounding to. Is it the nearest ten, hundred, thousand, etc.? For example, looking at your 2456 jellybeans. Your friend has asked how many are in the jar.

1. Rounded to the nearest ten (24<u>5</u>6) it is 2460. (*want to give pretty accurate information*)
2. Rounded to the nearest hundred (2456) it is 2500. (*want to be in the ballpark*)
3. Rounded to the nearest thousand (2456) it is 2000. (*want to undersell so don't have to share too much*)
4. Rounded to the nearest ten thousand (_2456) it is 0. (*joking with her* ☺)

   (0 is the answer is because 2456 falls between 0 and 10 000, but is closer to zero. Check it on the number line below.)

0	1000	2000	2456	3000	4000	5000	6000	7000	8000	9000	10 000

Note: All the numbers to the right of the places you were rounding to have become zeroes.

WALK THE (NUMBER) LINE

A number line is a great tool for practicing or for checking that a rounding answer is correct.

Example: the instruction to "*round $ 36.00 to the nearest ten dollars*" means you need to decide which multiple of ten 36 is closest to; is it 30 or is it 40?

30 31 32 33 34 35 36 37 38 39 40

When you look at the number line above, you see that 36 is closer to 40 than to 30. It is only 4 away from 40, but 6 away from 30. So, rounding $ 36. to the nearest ten dollars would make it $ 40.

Example: the instruction is to "*round 231 to the nearest ten*". This means you need to decide which ten is closest to 231; is it 230 or 240?

230 231 232 233 234 235 236 237 238 239 240

When you look at the number line above, you see that 231 is closer to 230 than to 240. It is only 1 away from 230 but 9 away from 240. So, rounding 231 to the nearest ten would make it 230.

When rounding to the nearest hundred, you need to decide which hundred the number is closest to.

Example: the instruction is to "*round 231 to the nearest hundred*". This means you need to decide which multiple of one hundred 231 is closest to; is it 200 or 300?

200 210 220 230 231 240 250 260 270 280 290 300

When you look at the number line above, you see that 231 is closer to 200 than to 300. It is only 31 away from 200 but 69 away from 300. So, rounding 231 to the nearest hundred would make it 200.

ROUNDING WHOLE NUMBERS

Rounding whole numbers means estimating to the nearest unit - one, ten, hundred, thousand, ten thousand, or other higher power of ten.

When we are rounding whole numbers, we are rounding numbers to the left of the decimal.
8 000 000.0

PLACE	EXAMPLE
Millions	8,000,000.0
Hundred thousands	800,000.0
Ten thousands	80,000.0
Thousands	8,000.0
Hundreds	800.0
Tens	80.0
Ones	8.0

Example: the instruction is to "*round $ 70,690.00 to the nearest ten thousand*". This means you need to decide which multiple of ten thousand $ 76,690.00 is closest to; is it 80,000.00 or 70,000.00?

70,000 71,000 72,000 73,000 74,000 75,000 76,000 76,690 77,000 78,000 79,000 80,000

When you look at the number line above, you see that 76,690 is closer to 80,000 than to 70,000. So, rounding $ 76,690.00 to the nearest ten thousand would make it $ 80,000.00.

The other way we can decide it by looking at the number to the right of the 7 in the ten thousands place. 7<u>6</u>,690. The number is 6 which tells us that the 7 needs to be rounded up to 8.

ROUNDING DECIMAL NUMBERS

Rounding decimal numbers means estimating to the nearest unit (one), tenth, hundredth, thousandth, ten thousandth or further smaller power of ten. Otherwise, the steps work in the same way as for whole numbers. One place to the left of the decimal point is the *ones* place. One place to the right of the decimal point is the *tenths* place.

ones ● *tenths*

PLACE	EXAMPLE
Millions	8,000,000.0
Hundred thousands	800,000.0
Ten thousands	80,000.0
Thousands	8,000.0
Hundreds	800.0
Tens	80.0
Ones	8.0
Tenths	0.8
Hundredths	0.08
Thousandths	0.008
Ten thousandths	0.0008
Hundred thousandths	0.00008
Millionths	0.000008

Whole numbers: Millions to Ones

Decimal numbers: Tenths to Millionths

Example: the instruction to "*round 6.88 to the nearest tenth*" means you need to decide which multiple of tenths 6.88 is closest to; is it 6.8 or is it 6.9?

6.80 6.81 6.82 6.83 6.84 6.85 6.86 6.87 6.88 6.89 6.90

From the number line, and following the steps of underlining and checking the number following the tenths place 6.88, we can determine that 6.88 would be rounded to 6.9.

Sometimes you will be asked to round decimals to the nearest whole number. This means you must round the number to the ONES place.

Example: the instruction to "*round 23.87 to the nearest whole number*" means you need to decide what the closest ONE is; is it 23 or 24.

23.0 23.1 23.2 23.3 23.4 23.5 23.6 23.7 23.8 $\boxed{23.87}$ 23.9 24.0

The answer is 24, because the 8 following the 3 determines we must round the number 3 up to 4.

Sometimes you will be asked to round to three decimal places or two decimal places. The steps are the same.

- Look to the place that is three to the right of the decimal or two to the right of the decimal
- Underline that place
- Look at the number to the right of the one you are rounding.
    - is it 0, 1, 2, 3, or 4? Round down
    - Is it 5, 6, 7, 8, or 9? Round up

Example: "*round 23.874809 to three decimal places*"

Underline the 4

Look at the number to the right of the one you are rounding.

- is it 0, 1, 2, 3, or 4? Round down
- Is it 5, 6, 7, 8, or 9? Round up

The number is 8 so round up and the answer is 23.875. With decimals, we do not write in all the zeroes to the right, as they just mean there are no numbers in those places.

Rounding up can be confusing when a number moves place value.

Example: "*round 2.399 to the nearest hundredth*"

Underline the 9 in the hundredths place

Look at the number to the right of the one you are rounding. 2.399

- is it 0, 1, 2, 3, or 4? Round down
- Is it 5, 6, 7, 8, or 9? Round up

The number to the right of the one you are rounding is 9 so you must round up.

9 rounds up to 10.

This means that you must put a zero in the place you are rounding to and add one more to the number to the left.

Look at the progression below.

2.39~~9~~

2.390 (second 9 becomes a 0 because all numbers to the right of the number being rounded become 0)

2.3~~9~~0

2.300 (9 in the hundreds place rounds up to 10 – shown as 0)

2.~~3~~00

2.4 (rounding the 9 to 10 means add 1 to the number to the left so 3 becomes 4)

Remember the rules:

If the number you are rounding to is followed by a 5,6,7,8 or 9, round the number up.

2.399 rounds to 2.400 or 2.4

ANSWERS FROM THE ES WORKOUT!

IN THIS SECTION OF THE WORKBOOK, YOU CAN CHECK YOUR ANSWERS FOR THE ESSENTIAL SKILLS WORKOUTS YOU COMPLETED!

NUMERACY

Use the table of contents to navigate through this workbook. Track your progress by putting a checkmark beside each topic you complete.

0. MATCHING TASKS AND SKILLS

USE THE ANSWERS BELOW TO CHECK YOUR WORK.

Suggested responses are below You may have thought of more/other essential skills for getting the job done.

Task	Skill(s) Used
Find information to complete the set-up of a new iPhone	RT, DS,DU, TS1 & 5
Apply for a learners' license	RT, DU,W, TS5
Book concert tickets	DU, DS,RT, TS2
Shop for new clothes	N, TS2, OC,
Plan a weekend ski / snowboard trip	TS2, 4, 5, DU, N, RT, DS, WWO, OC
Ask if you can use the car to go skiing	OC, WWO,
Text your coach to say you will be late for practice, why, and how you will catch up	DS, W, TS1 & 4
Arrive at work early to learn the new customer payment system	TS1, 6, 4, CL,N, OC
Use a transit schedule to get to your new job on time	DU, TS1, N, DS

Essential Skills	
RT	Reading Text
DU	Using Documents
N	Numeracy
W	Writing
OC	Oral Communication
TS	Thinking Skills…
WWO	Working With Others
DS	Digital Skills
CL	Continuous Learning

1. Problem Solving
2. Decision Making
3. Critical Thinking
4. Planning & Organizing Tasks
5. Find Information
6. Use Memory

ANSWER KEY

1. IMPORTANT INFO ABOUT COOKIES

USE THE ANSWERS BELOW TO CHECK YOUR WORK.

1. Complete the table below using the information in the article.
(*data analysis level 2*)

Province	2013 population (rounded)	% of pop. who are daily cookie eaters	Actual # of daily cookie eaters
B.C.	4,589,000	33%	1,514,370
New Brunswick	755,800	25%	188,950
Ontario	13,556,200	33%	4,473,546
Saskatchewan	1,105,000	25%	276,250

2. What is the total amount of sugar in the recipe?
(*measurement and calculation level 2*)

2 cups (1¼ + ¾)

3. How many pounds of butter are in the recipe? Hint: 1 pound = 2 cups
(*measurement and calculation level 2*)

½ pound

4. If the baking sheet holds 1 dozen cookies, following the instructions in the recipe, how much cooking time should the baker allow to bake all the cookies?
(*measurement and calculation level 2*)

26 - 30 minutes

2. CESSNA

USE THE ANSWERS BELOW TO CHECK YOUR WORK.

HOW MUCH DOES SPEED COST?					
Aircraft name	Cruise Speed (mph)	Fuel Burn (gph)	Miles per Gallon (mpg)	Fuel Cost per mph ($/mph)	Aircraft Price
1970 C-172	125	8.5	14.7	$0.24	$35,000
1970 C-182	160	12.5	12.8	$0.27	$67,000
1970 C-210	175	15	11.7	$0.30	$82,000
1980 C-210	175	15	11.7	$0.30	$151,000

1. How many more miles per gallon of fuel can the Cessna 182 fly than a 1970 Cessna 210?
(*measurement and calculation level 2*)

1.1 mpg

2. Gougeon flew about 5,000 km (approx. 3000 mi). How many gallons of fuel did he need to complete his trip?
(*measurement and calculation level 2*)

234.37 gallons

3. Toronto to Sudbury is approximately 255 miles. How long would it take to fly to Sudbury in a Cessna 182? Round to 1 decimal place.
(*measurement and calculation level 2*)

1.6 hours

4. How many gallons of fuel would be needed to make the trip from Toronto to Sudbury? Round to the nearest whole number.
(*measurement and calculation level 2*)

20 gallons

5. Fuel for the Toronto to Sudbury trip is estimated to cost $ 2.75 a gallon. If that cost were to increase by 3%, how much needs to be budgeted for fuel for a return trip? Round your answer to the nearest $ 10, making sure there are sufficient funds for the purchase.
(*measurement and calculation level 3*)

Round trip = 255 mi. x 2 = 510 mi.
510 mi. ÷ 12.8 mpg = 40 gallons of fuel @ 2.75 ea. = $110.00
110.00 x 3% = $3.30
110.00 + 3.30 = $113.30
Rounded to nearest $10.00 with enough to buy required fuel = $120.00

3. GREEN HAIR

USE THE ANSWERS BELOW TO CHECK YOUR WORK.

1. What is the total estimated cost of the recycling, per client? (*money math level 2*)

$1.50 + $3.00 = $4.50

2. If a typical garbage bag holds about 30 litres of trash, how many litres of trash was the salon sending to the landfill each year, before the recycling program? (*measurement and calculation level 2*)

1 bag x 52 weeks x 30 l = 1560 litres

3. If the salon is now diverting the maximum amount of waste, how much trash will be sent to the landfill each year? (*measurement and calculation level 2*)

1560 x .05 = 78 litres

4. How many garbage bags will be required to send the trash to the landfill? (*measurement and calculation level 1*)

78/30 = 2.6 bags

5. More salons becoming involved in the project could help to lower recycling costs. If total costs were to reduce by 6%, and that saving was proportionately passed on to the client, what would the new fee per client be for the recycling program? Round your answer to the nearest 5 cents. (*measurement and calculation level 3*)

($1.50+$3.00).06 = 27
$0.27 x .33 = .08
$1.50 - .08 = $1.42

Answer $1.40

4. MARIA IS A JET ENGINE MECHANIC

USE THE ANSWERS BELOW TO CHECK YOUR WORK.

1. If Maria walks the perimeter of her work area, how far is that?
(*measurement and calculation level 2*)

The distance is 1575 metres

Calculation: (109 x 2) + (48.5 x 2) x 5 = 1575

2. If the average walking speed is about 5km/hour, how long will it take her to walk the perimeter once? *Hint: you will need to know how many metres are in a kilometre.*
(*measurement and calculation level 2*)

It will take her approx. 18.9 minutes.

Calculation: 5000 m = 60 min.
5000 / 60 = 1575 / x
1575x 60 / 5000 = 94,500 / 5000
94,500 / 5000 = 18.9

Employers paying for you to continue your education is a terrific benefit and one that can be worth a lot of money. Maria says that, in the 11 years she's worked there, her employer has paid for her to complete two programs.

3. If the first program cost $8000 and the second cost $12500, on average, how much did the company pay each year towards Maria's further education? Round your answer to the nearest dollar.
(money math level 2)

The Company spent an average of $1,863.63 per year.

Calculation: (8000 + 12500) ÷ 11 = $1,863.63

4. (measurement and calculation level 3)

The length of your stride

5. (measurement and calculation level 3)

Distance covered in 10,000 of your steps

6. (measurement and calculation level 3)

TRIP	Distance in km	# of steps

5. HAIR PLANNING

USE THE ANSWERS BELOW TO CHECK YOUR WORK.

1. You need 1 ½ times the standard quantity of Blonde on Blonde for your client's hair. How much of each ingredient do you need to mix?
(*measurement and calculation level 2*)

1 ½ scoops blonde on blonde
2 oz. conditioner

2. You estimate that your client's hair will need to process for 2 ½ time the minimum recommended time for Blonde on Blonde. How long will it need to process?
(*scheduling budgeting and accounting level 2*)

10 x 2.5 = 25 minutes

APPOINTMENT SCHEDULE		
4:00 PM	**4:15 PM**	**4:30 PM**
tint [45min]		
4:45 PM	**5:00 PM**	**5:15 PM**
	trim [15 min]	woman [45min]
5:30 PM	**5:45 PM**	**6:00 PM**

3. Based on the schedule above, what time will the stylist finish work? (*scheduling, budgeting and accounting level 1*)

6:00 PM

4. The 5:15 PM client arrived 10 minutes late and has requested an extra conditioning treatment that will add 15 minutes to her appointment. What time will the stylist finish work?
(*scheduling, budgeting and accounting level 2*)

6:25 PM

5. In the Colour Processes chart below, what is the most common ratio of hair colour to developer?
(*data analysis level 2*)

COLOUR PROCESSES			
Process	**Hair Colour**	**Developer**	**Timing**
Permanent Colour	2 oz.	2 oz. 20 volume	45 minutes
Double pigment Permanent colour	2 oz.	1 oz. 40 volume	45 minutes
Intense colour	1 oz. SHADE + 1 oz. AMPLIFIER	2 oz. 20 volume	45 minutes
Demi Permanent	1 oz.	1 oz. 20 volume	1 minute – 1 day
Semi Permanent	1 oz.	1 oz. 10 volume	15 – 20 Minutes
Toner	1 oz.	1 oz. 10 volume	15 – 20 minutes
Gloss	2 oz. Colour Gloss		10 – 15 minutes w/Heat
Glaze	2 oz. Colour Gloss		10 – 15 minutes w/Heat
Camo Colour	2 oz. Colour Gloss +1 oz. Colour Gloss	3 oz. 10 volume	15 minutes
High Lift Colour	2 oz.	2 oz. 60 volume	45 minutes

1 to 1

6. If the client wants demi-permanent colour to last three weeks, how long should it be left on?
(*measurement and calculation level 2*)

21 minutes

7. What is the total amount of product required for Camo color?
(*measurement and calculation level 1*)

6 oz.

8. It takes 40 minutes once the semi-permanent color process is complete to finish a hair appointment. If the client has to leave by the salon by 3:45 p.m. what is the latest time that the color can be applied?
(*scheduling, budgeting and accounting level 2*)

2:45 PM

6. LOST IN SPACE

USE THE ANSWERS BELOW TO CHECK YOUR WORK.

NASA lost a $ 125M satellite because the teams of scientists building the satellite used different measurement systems and failed to notice errors in conversion. A costly mistake. Use the Measurement Conversions - Metric to Imperial / Imperial to Metric Booster to help you complete the conversions below. Calculate to 2 decimal places.

1. Convert the measurements below from Imperial to metric.
(*measurement and calculation level 2*)

6 feet to metres = 1.83 m

5 miles to kilometres = 8.05 km

7.5 yards to metres = 6.86 m

2. Convert the measurements below from metric to Imperial.
(*measurement and calculation level 2*)

5 centimetres to inches = 1.97 in.

23 kilometres to miles = 14.29 mi.

13 metres to feet = 42.65 ft.

3. Recalculate the measurements for the items on the materials list so that all are in metric. Round to the closest tenth.
(*measurement and calculation level 2*)

1	12.5 ft. hose	3.8 m
2	3 m copper tubing	3 m
3	3 pieces of plastic pipe @ 6-in. ea.	3 @ 15.2 cm ea.
4	4 ft. x 8 ft. sheet plywood cut in 17 in. strips	1.2 m x 2.4 m 43.1 cm strips
5	1.5 kilos nails	1.5 kilos
6	15.5 square ft. tile	1.4 m^2
7	9 yards outdoor tarp	8.2 m

7. HIGH STEEL

USE THE ANSWERS BELOW TO CHECK YOUR WORK.

SOME OF THE TALLEST BUILDINGS IN THE WORLD.

TALLEST BUILDINGS IN THE WORLD						
RANK	BUILDING	COUNTRY	HEIGHT	HEIGHT	FLOORS	COST
			ft.	m		
1	Burj Khalifa	UAE	2717	828	163	1.63B
2	Shanghai Tower	China	2073	632	128	2.4B
3	Abraj Al-Bait Clock Tower	Saudi Arabia	1971	601	120	14.49B
11	Petronas Towers 1 & 2	Malaysia	1483	452	88	1.65B
31	Empire State Building	USA	1250	381	102	41M
83	Chrysler Building	USA	1047	319	77	20M
103	First Canadian Place	Canada	978	298	72	85M (est.)

1. Assuming all the floors in a building are the same height, calculate the cost per floor of the buildings ranked 1, 2, 31 and 103. Round to the nearest dollar.
(*scheduling, budgeting and accounting math level 2*)

Floor#	Cost per floor
1	10,000,000
2	18,750,000
31	401, 961
103	1,180, 556

2. What is the cost per metre to build each of the same buildings? Round to the nearest dollar.
(*scheduling, budgeting and accounting math level 2*)

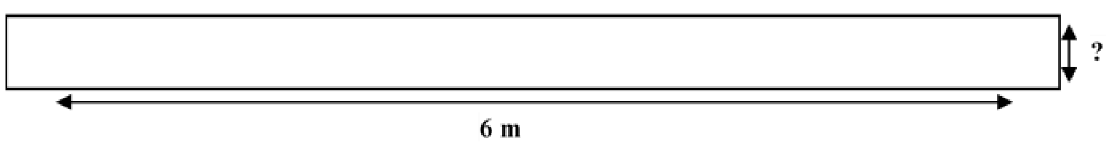
Floor#	Cost per m
1	1,968,599
2	3,797,468
31	107,612
103	285,235

3. What would it cost to build the Empire State Building today assuming that, with inflation, $ 1 in 1931 = $ 16 in 2016?
(*scheduling budgeting and accounting math level 2*)

656,000,000

One of the reasons it became possible to build skyscrapers was because of the use of steel in the construction. Steel beams need to be deep enough to support their length and the weight of any load that will be placed on them. A beam should be about 6 cm deep for every 100 cm in length.

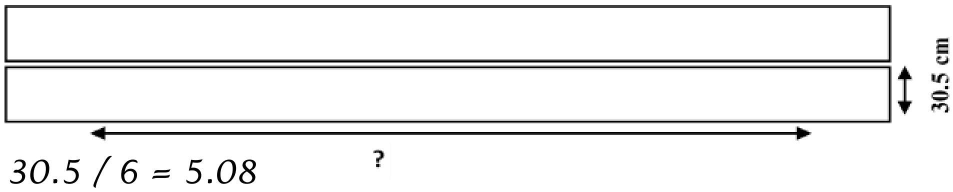
1. The beam below is 6 metres long. How deep should it be?
(*measurement and calculation level 2*)



6 m = 600 cm

6 cm x 6 = 36 cm deep

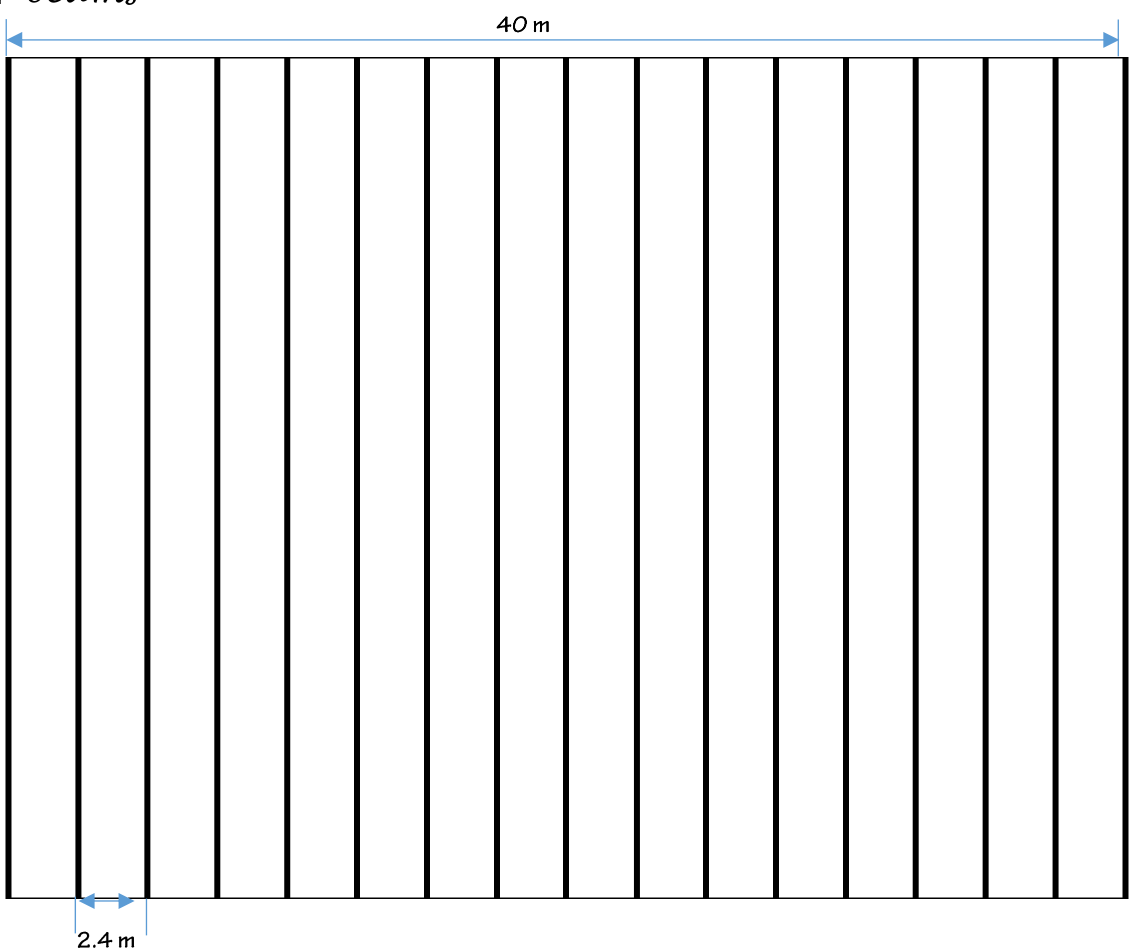
2. The beams shown below are each about 30.5 cm deep. Rounded to the nearest metre, what is the longest the beams can be and still be strong enough?
(*measurement and calculation level 2*)



30.5 / 6 = 5.08
Nearest metre = 5 m

3. The floor of the building you are working on is 40 m wide. 40 m steel beams are to be placed every 2.4 m across the space. To the nearest whole number, how many beams will be needed? Make a labelled diagram of your answer.
(*measurement and calculation level 3*)

17 beams



8. STAYING SAFE ON THE ROAD

USE THE ANSWERS BELOW TO CHECK YOUR WORK.

Use the data in Safe on the Roads in 2014? and the data tables, to answer the questions below. Round your answers to the nearest whole number.

1. How many licensed drivers were there in Canada in 2014?
(*data analysis level 2, document use level 2, reading level 2*)

23,929,377 = 100% of drivers
Calculation:
1,154,574+1,956,245 = 3,110,819 (13% of all drivers)
3,110,819/13 = x/100
311,081,900/13 = 23,929,377

2. How many collisions resulting in fatalities involved drivers 16-24?
(*data analysis level 2, document use level 2, reading level 2*)

400
Calculation:
24% of 1,667
1,667 x .24 = 400

3. How many collisions resulting in serious injuries involved drivers 16-24?
(*data analysis level 2, document use level 2, reading level 2*)

28,730
Calculation:
26% of 110,500
110,500 x .26

4. Complete your own survey

(*data analysis level 3, document use level 3, digital technology level 2, oral communication 2, critical thinking 3*)

9. SKYSCRAPERS AND THE PRICE OF FAME

USE THE ANSWERS BELOW TO CHECK YOUR WORK.

Use the adjusted amounts to complete questions 1, 2, 3 and 4.

1. How much did each movie make?
(*money math level 2*)

1933
\$51M - \$12M = 39M

1976
\$377M - \$100M = 277M

2005
\$681M - \$256M = 425M

2. How many times the original investment did each take in at the box office? Calculate to two decimal points.
(*money math level 3*)

1933
51M ÷ 12M = 4.25 times

1976
377M ÷ 100M = 3.77 times

2005
681M ÷ 256M = 2.66 times

3.

What was the percentage return on investment (ROI) for each version?
(*scheduling budgeting and accounting math level 2*)

1933
$39 \div 12 = x \div 100 = 325\%$

1976
$277 \div 100 = x \div 100 = 277\%$

2005
$425 \div 256 = x \div 100 = 166\%$

4.

If the 2005 version of King Kong had been made in Canada, what would the cost have been in Canadian dollars? Use the adjusted amount and assume 1 Canadian dollar = .76 of a US dollar.
(*scheduling budgeting and accounting math level 2*)

$256M \times 1.24 = \$317,444,000$

5.

Using the original values, rounded to the nearest dollar, what was the production cost per minute for each movie?
(*scheduling budgeting and accounting math level 2*)

1933
$672,000 \div 100 = \$6,720/minute$

1976
$24M \div 134 = \$179,104/minute$

2005
$207M \div 187 = \$1,106,952/minute$

6. According to the film industry, a film needs to make roughly 2 times its production costs to be considered profitable. Using the cost to produce Skull Island and an average ticket price of $ 11, calculate how many tickets would have to be sold for the film to be profitable. (*measurement and calculation level 2*)

Answers will vary.

Actual cost = 185M
185M x 2 = 370M
370M ÷ 11 = 33,636,364 (33636363.63 rounded)
The movie would need to sell 33,636,364 tickets

10. TUNNEL TROUBLE

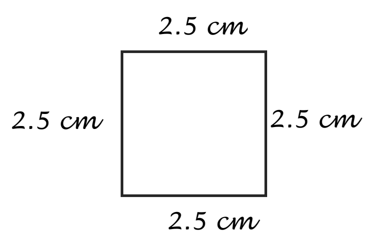
USE THE ANSWERS BELOW TO CHECK YOUR WORK.

Calculate the perimeter of the shapes below

1.

This is an example.
Square (*Hint: all sides are equal*)
(*measurement and calculation level 2*)

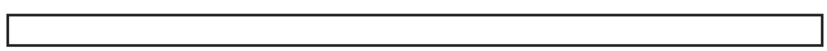
Length = 2.5 cm
Width = 2.5 cm
P = *2.5 x 4*
P = *10 cm*



2.

Rectangle
(*measurement and calculation level 2*)

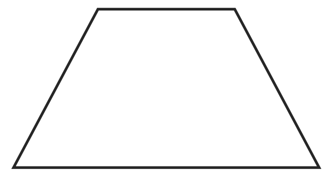
Length = 3 m
Width = 9 cm



Convert m to cm
P = *(300 x 2) + (9 cm x 2)*
P = *618 cm* **or** *6.18 m*

3.

Trapezoid (*Hint: only 1 side length is given, so they must be equal*)
(*measurement and calculation level 3*)



Side = 1.2 m (120 cm)

Big base = 2 x side

Small base = 76 cm

Convert m to cm or cm to m

P = (120 cm x 2) + (240+ 76)

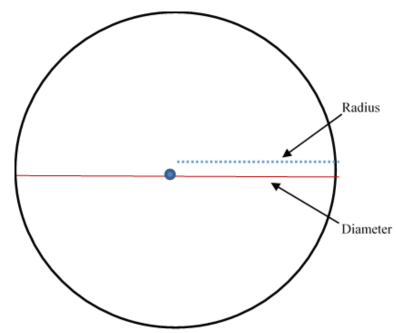
OR

P = (1.2 m x 2) + (2.4 m + .76 m)

P = 556 cm **or** 5.56 m

4.

Circle (*Hint: $C = \pi d$ or $C = 2\pi r$*)
(*measurement and calculation level 2*)



Radius = 35 cm

C = 2 x (3.14 x 35)

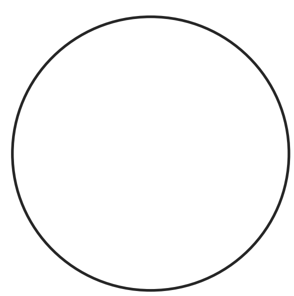
OR

C = 3.14 x 70

C = 219.8

5.

Circle (*Hint: 1 yard = 36 in.*)
(*measurement and calculation level 2*)

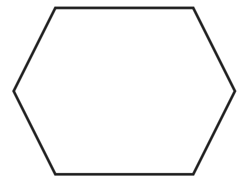


Diameter = 4 yards less 2 in

C = (4 x 36 in. - 2 in.) x 3.14

C = 445.88 in.

Hexagon (*Hint: in a regular hexagon, the 6 sides are equal*)
(*measurement and calculation level 2*)



6.

P = 12 mm x 6
P = 72 mm

7.

If the tunnel opening is square and one side is 4.2 metres, and you need an added 36 cm of clearance on each side, what is the maximum radius of a round train going through the tunnel? (*measurement and calculation level 3*)

External P = 4.2 m x 4 = 16.8 m
Internal P = (4.2 m - .36 m) x 4
Internal P = 3.84 x 4 = 15.36 m
r = d x .5
r = 3.84 x .5
r = 1.92 m

8.

Make a scale diagram of your answer for question 7. Use the scale 1 cm = .5 m.
(*measurement and calculation level 3*)

Answer is on the next page

9.

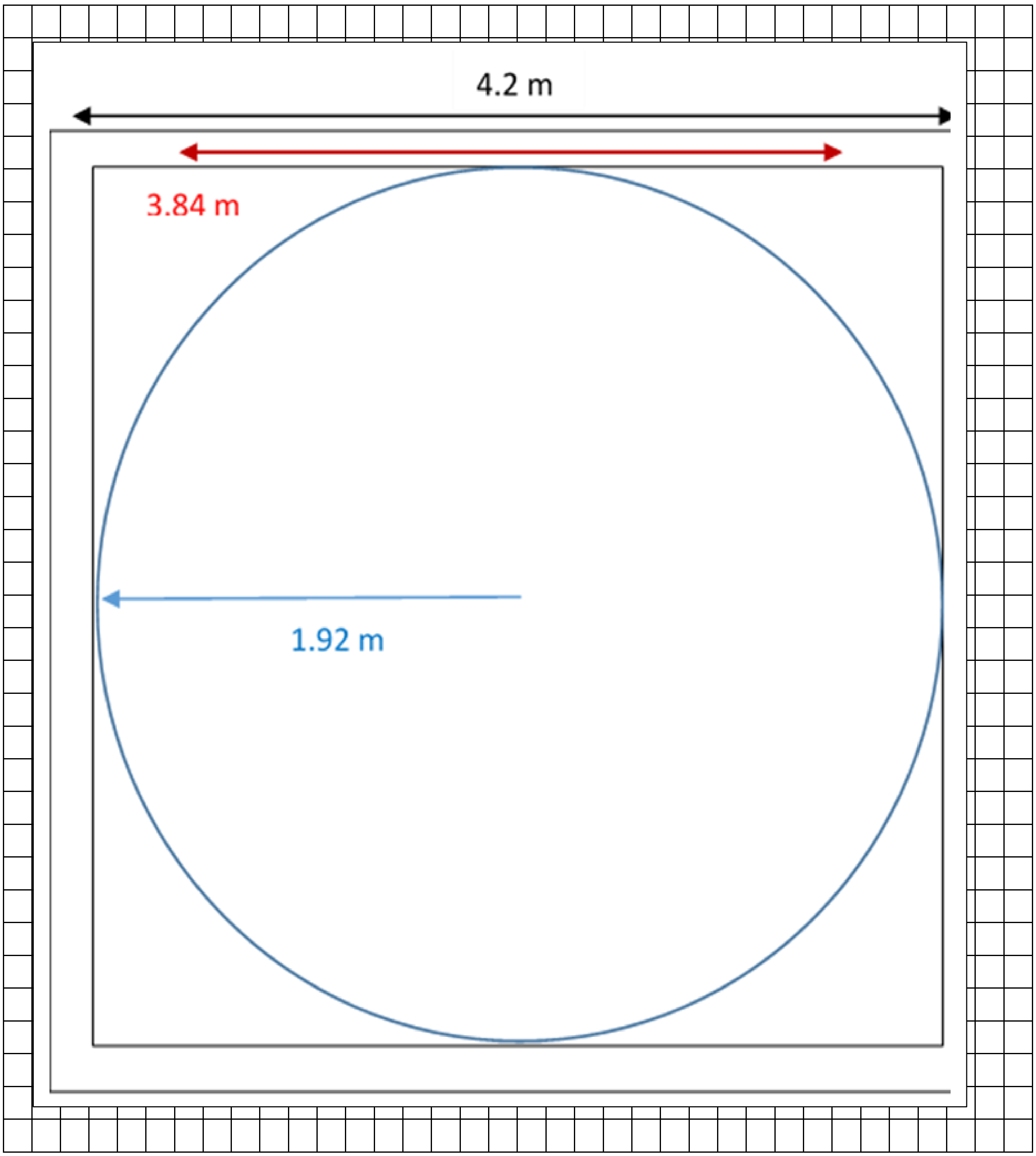
Measure the perimeter of your room. Make a scale diagram of the room. Use the scale 2 cm = 1 m.
(*measurement and calculation level 3*)

Answers to question 8

4.2 m = ~ 32.8 squares width and height

3.84 m = ~ 31.8 squares width and height

1.92 m = ~ 16 squares



11. AREA AND VOLUME

USE THE ANSWERS BELOW TO CHECK YOUR WORK.

AREA

Area of squares and rectangles is calculated as length (l) x width (w). The answer is described in square units – cm^2, $ft.^2$, etc.

Calculate the area of each of the shapes below. Remember to show the units in your answer. Round to two decimal places.

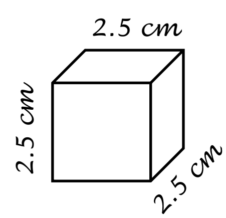
1. The square is done for you, as an example.
(*measurement and calculation level 2*)

Length = 2.5 cm

Width = 2.5 cm

A = 2.5 x 2.5

A = 6.25 cm^2

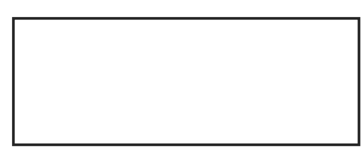


2. Calculate the area of the rectangle.
(*measurement and calculation level 2*)

Length = 3 ft.

Width = 1 ft.

A = 3 $ft.^2$



3.

Calculate the area of the rectangle.
(*measurement and calculation level 2*)

Length = *3 m*

Width = *9 cm*

A = *2700 cm²*

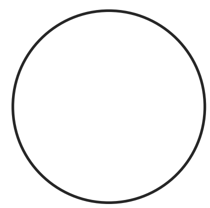
A = *27 m²*

4.

Calculate the area of the circle.
(*measurement and calculation level 2*)

Area of a circle is calculated as pi x radius squared. Remember, pi = 3.14 and radius is half of diameter. The answer is described in square units – cm^2, $ft.^2$, etc.

Radius = *35 cm*



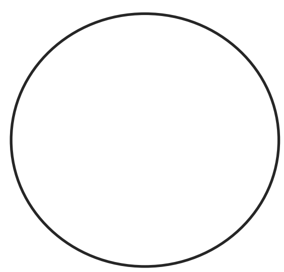
A = *3.14 (35x35)*

A = *3846.5 cm²*

5.

Calculate the area of the circle. Show your answer in inches and in feet.
(*measurement and calculation level 2*)

Diameter = *4 yards less 2 in.*



d= *4x36 -2 = 142*

A = *3.14(142 in./2 x 142 in./2)*

A = *3.14(71in. x 71 in.)*

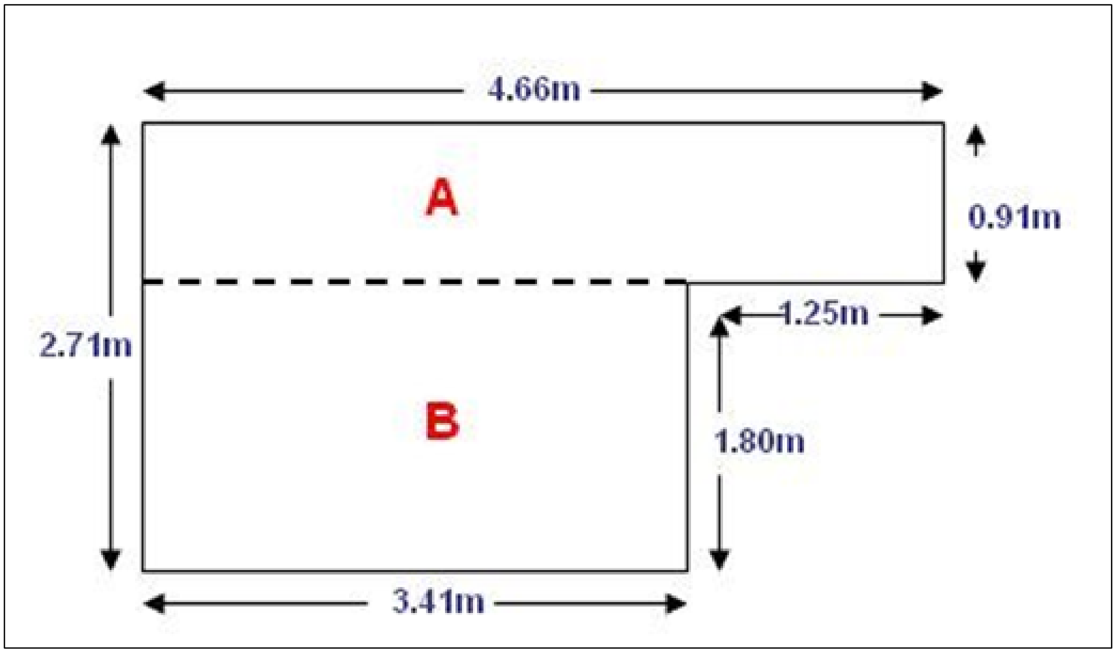
A = *15,828.74 in.²*

A = *15,828.74 in² / 12*

A = *1319.06 ft.²*

6. Calculate the total area of the floor in the room shown below. Round to two decimal places. (*measurement and calculation level 2*)

A = $(4.66\ m \times .91\ m) + (3.41\ m \times 1.8\ m)$
A = $4.24\ m^2 + 6.14\ m^2$
A = $10.38\ m^2$



7. The tile setter needs to lay a subfloor in the room above, before tiling.

The plywood comes in 4 ft. x 8 ft. sheets. How many full sheets of plywood need to be purchased to complete the job? (*Hint: 1 m^2 is equal to about 10.76 ft.^{2}*)
(*measurement and calculation level 3*)

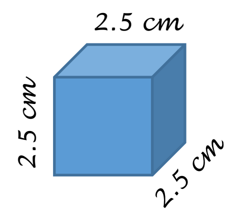
Plywood 4 ft. x 8 ft. = $32\ ft.^2$
$10.38\ m^2 = ?\ ft.^2$
$10.38\ m^2 = 10.38\ m^2 \times 10.76\ ft.^2$
$10.38\ m^2 = 111.69\ ft.^2$
sheets of plywood required = $111.69\ ft.^2 / 32\ ft.^2$
sheets of plywood required = 4 full sheets

VOLUME

Calculate the volume of each of the shapes below. Answers should be described in cubed units – cm^3, $ft.^3$, etc. Remember to show the units in your answer.

1. Calculate the volume of the cube. (regular polyhedron with 6 equal faces)
Cube is done for you as an example.
(*measurement and calculation level 2*)

Length = 2.5 cm
Width = 2.5 cm
Height = 2.5 cm
V = $2.5 \times 2.5 \times 2.5$
V = 15.63 cm^3



2. Calculate the volume of the rectangular prism (This is a regular polyhedron also called a cuboid. It has 6 faces that are rectangles)
(*measurement and calculation level 2*)

Length = 3 ft.
Width = 1 ft.
Height = 1.5 ft.
V = 4.5 $ft.^3$

3. Calculate the volume of the rectangular prism (This is a regular polyhedron also called a cuboid. It has 6 faces that are rectangles) Show your answer in cm and m.
(*measurement and calculation level 2*)

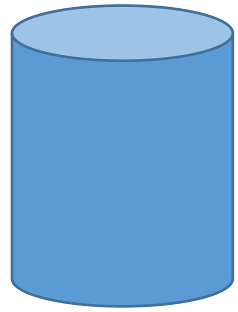
Length = 3 m
Width = 9 cm
Height = 9 cm
V = 24,300 cm^3
V = .0243 m^3

4. Calculate the volume of the cylinder. (This is a 3-dimensional shape with curves)
(*measurement and calculation level 2*)

Radius = 35 cm

V = 3.14 (35x35) x 70

V = 269,255 cm^3



5. Calculate the volume of the cylinder (This is a 3-dimensional shape with curves)
(*measurement and calculation level 2*)

diameter = 4 yards less 2 in.

d = 142 in.

height = 2.5 ft.

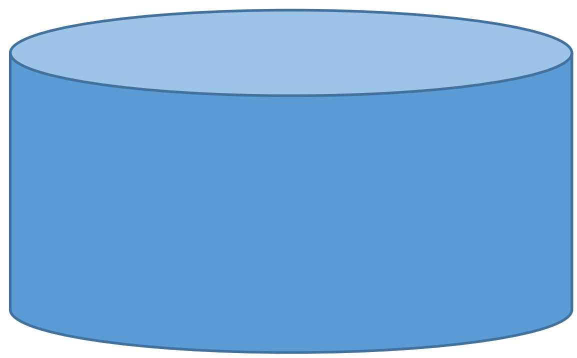
h = 30 in.

r = ½ d

r = 71 in.

V = 3.14(71 x 71)30

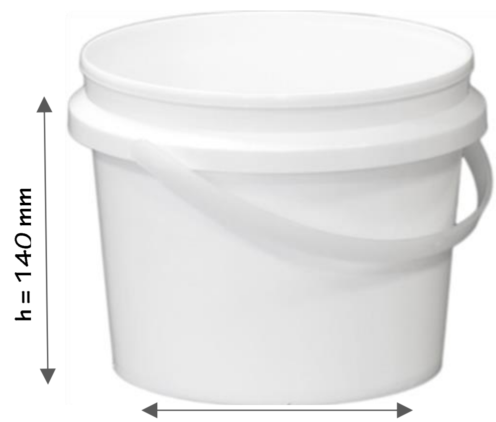
V = 474,862.2 $yd.^3$



6. The landscape technician needs to mix 180 ml of liquid fertilizer concentrate into 4 litres of water. What is the volume of the bucket below? Show your answer in litres. (*Hint: 1 cubic millilitre is one-millionth of a litre.*) Is the bucket large enough to hold the mixture? (*measurement and calculation level 3*)

$V = \pi r^2 x h$

$V = 3.14(100x100)140$
$V = 4{,}396{,}000\ mm^3$
$V = 4.396\ L^3$



Yes the bucket is large enough. It needs to have total capacity of at least 4.18 litres (4,000,180 mm) and it is almost 4.4. litres.

12. ESTIMATION

USE THE ANSWERS BELOW TO CHECK YOUR WORK.

1. Follow the instructions to round each of the numbers described in the table below. (*estimation level 1*)

Question	Answer
103 to the nearest 10	100
103 to the nearest 100	100
279 to the nearest 100	300
84 to the nearest ten	80
8.4 to the nearest whole number	8
17.82 to the nearest 10	20

2. How long does it take?
(*estimation level 1, measurement and calculation 1, data analysis 1*)

Self scored

3. Using the Permit Plan on the next page, provide your best estimate for each of the questions in the table below. Round to the nearest whole numbers. Write your estimates in Column 1 in the table. (*Hint: New walls also need drywall.*)
(*estimation level 2*)

Next calculate the answers using the actual figures in the plan. Compare them to your estimate. Were you close?
(*measurement and calculation level 2*)

2% is a typical margin for error in a construction job. That is, budgets are built assuming that actual figures will be either 2% above or 2% below the final calculations. Calculate the percentage margin of error between your estimates and the actuals and enter that number in Column 3. Use + to indicate if your estimate was higher than the actual and – if it was below. Were you close?
(*data analysis level 1, measurement and calculation level 2*)

POSSIBLE ANSWERS

	Column 1 ESTIMATE	Column 2 ACTUAL	Column 3 % DIFFERENCE
Approximately how big is the bathroom?	*60 sq. ft. or about 1/6 of the total space*	*60.99 sq. ft.*	*- 0.1%*
Approximately how many feet of wall need drywall?	*78 ft.* *(21+22+6+10+ 3+6)*	*77.66 ft.* *(20.94+22.08+6.48+ 9.58+9.58+2.5+6.5)*	*+ 1%*
Approximately how many square feet is the lounge area?	*227 sq. ft.*	*226.6 sq. ft.*	*+ 0.2%*
Approximately what percentage of the perimeter will be new wall?	*60%*	*P = (22.08 x 2) + (20.94 x 2)* *P = 86.04 ft* *P new wall: 20.94 + 22.08 + 6.48 = 49.5 ft* *49.5 ÷ 86.04 =* ***57%***	*+1*

13. THE RIGHT, RIGHT ANGLE

USE THE ANSWERS BELOW TO CHECK YOUR WORK.

Pythagorean Theorem

In a right angle triangle, the length of the hypotenuse (side c)^2 is equal to the sum of (side a)^2 and (side b)^2.

It's usually written as

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

Find the value of X in the following right triangles using the Pythagorean Theorem. Round your final answers to one decimal point. Show your calculations.

Remember to show the units in your answer.

1.

(*measurement and calculation level 2*)

a = 3 cm

$a^2 = 9\ cm^2$

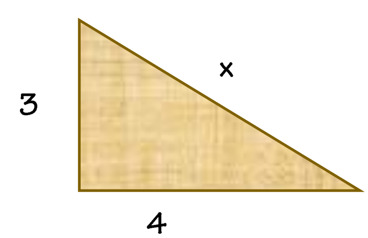
b = 4 cm

$b^2 = 16\ cm^2$

$9\ cm^2 + 16\ cm^2 = 25\ cm^2$

$C^2 = 25\ cm^2$

$c = 5\ cm$



2.

(*measurement and calculation level 2*)

a = x

b = 4 ft.

$b^2 = 16$ ft.^{2}

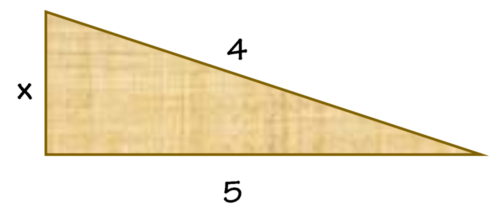
c= 5 ft.

$c^2 = 25$ ft.^{2}

$a^2 = 25$ ft.^{2} - 16 ft.^{2}

$a^2 = 9$ ft.^{2}

$a = 3$ ft.



3.

(*measurement and calculation level 2*)

a = 62 m

$a^2 = 3844$ m^2

b = x

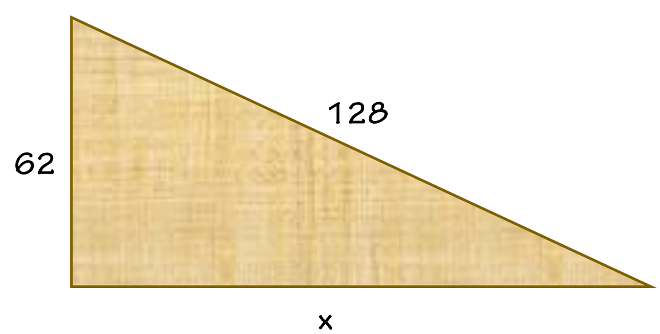
c = 128 m

$c^2 = 16384$ m^2

$b^2 = 16384$ m^2 - 3844 m^2

$b^2 = 12540$ m^2

$b = 112$m (111.98 m rounded)

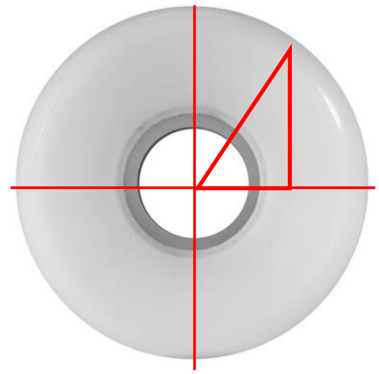


Find the value of x, y or r in the following right triangles using the Pythagorean Theorem. Round your final answers to one decimal point.

Write the measurements on the triangle sides.

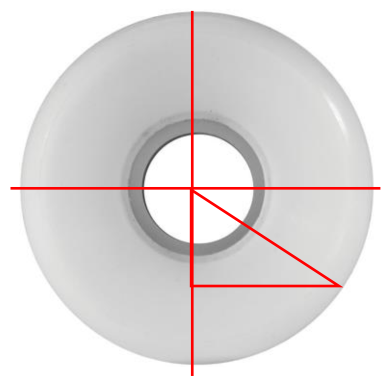
4. (measurement and calculation level 2)

$x = 8$ cm
$x^2 = 64$ cm²
$y = 5$ cm
$y^2 = 25$ cm²
$64 + 25 = r^2$
$r^2 = 93$ cm²
$r = 9.6$ cm (9.64 rounded)



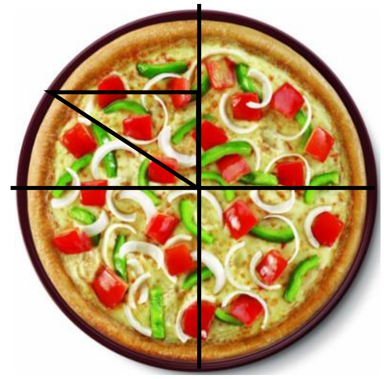
5. (measurement and calculation level 2)

$x = ?$
$y = 3$ m
$y^2 = 9$ m²
$r = 10$ m
$r^2 = 100$ m²
$x^2 + 9$ m² $= 100$ m²
$x^2 = 100$ m² $- 9$ m²
$x^2 = 91$ m²
$x = 9.5$ m (9.53 rounded)



6.

(*measurement and calculation level 2*)



$x = 12.5$

$x^2 = 156.25$

$y = ?$

$r = 18.5$

$r^2 = 342.25$

$156.25 + y^2 = 342.25$

$y^2 = 342.25 - 156.25$

$y^2 = 186$

$y = 13.6$ (13.63 rounded)

ESSENTIAL SKILLS! WORK READY YOUTH PROGRAM

ES ASSESSMENT!

NUMERACY

Use the table of contents to navigate through this workbook. Track your progress by putting a checkmark beside each topic you complete.

NUMERACY
SKILL TESTING QUESTIONS

TRY THE 14 QUESTIONS BELOW THEN TURN TO THE ANSWER KEY TO SEE HOW WELL YOU DID.

1. You want to arrive at the movie theatre at 7:20 pm. It takes about 15 to 17 minutes to walk to the theatre. At approximately what time should you leave home?

a) 7:00 pm

b) 7:05 pm

c) 7:10 pm

2. The total length of the bolt is 24 mm. What is the length of the bolt screw head?

a) 10 mm

b) 5 mm

c) 6 mm

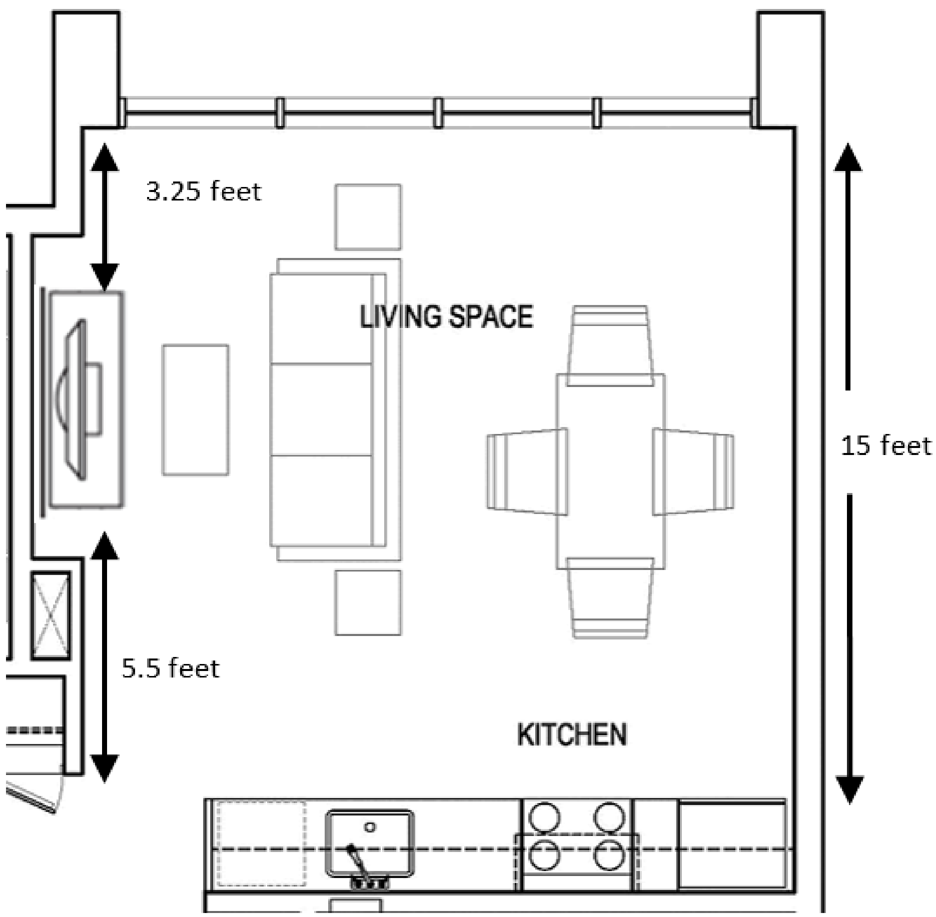
3. You want to buy eight iTunes songs from three albums (a total of 24 songs). If each song costs $0.99 and each album costs $9.99, which option is less expensive?

a) Buying the 3 albums

b) Buying the songs individually

c) Buying 2 albums and 8 songs

4. Your family is going to install a new entertainment unit with TV and games console. What is the length of the entertainment unit?



a) 6.25 feet

b) 8.75 feet

c) 7 feet

5. How much money would you save by buying a student weekly pass, instead of individual tickets? You need two tickets a day, five days a week.

Student Transit Pricing	
each ticket	$2.25
weekly pass	$10.25

a) $12.25

b) $8.25

c) $5.50

6. What is the volume of the aquarium?

a) 8 ft.

b) 9 m3

c) 18 m2

7. The car you are saving to buy costs $ 5 000. How many more weeks do you still need to save?

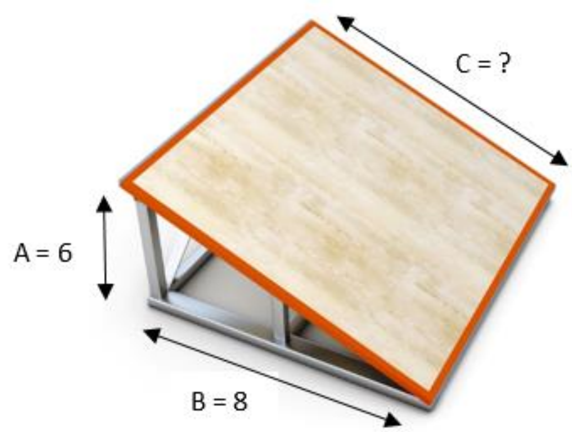
Money saved for car	$2750
Amount parents will pay	$1500
Weekly income from part time job	$85
Weekly allowance	$20

a) 7 weeks

b) 8 weeks

c) 9 weeks

8. If $A^2 + B^2 = C^2$, what is the length of C for the skateboard ramp?

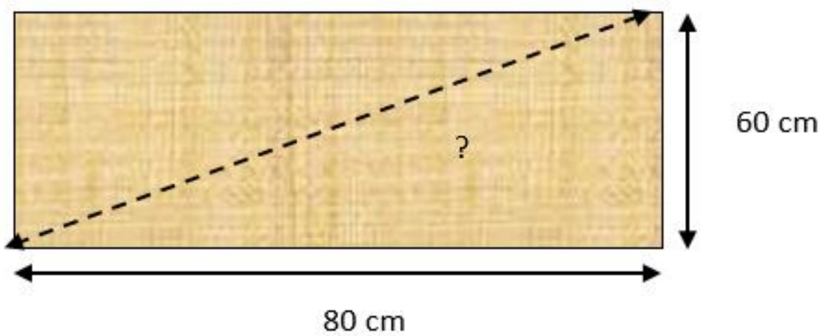


a) 100

b) 14

c) 10

9. You are building a small work table. What should the diagonal distance across the table be if the table is square (90°)?



a) 100 cm

b) 140 cm

c) 143 cm

10. What is the average number of visitors in the afternoons to the temporary trade exhibit for the week?

		Visitors
Mon	AM	16
	PM	11
Tues	AM	21
	PM	14
Wed	AM	13
	PM	16
Thur	AM	17
	PM	13
Fri	AM	18
	PM	21

a) 15

b) 16

c) 17

11. How many millilitres (ml) of liquid in total are required for the Risotto recipe?

Risotto ingredients			
2cups 473g Risotto Rice	3cups 750mL vegetable broth	1/2cup 125mL dry white wine	1/3cup 78g chopped fresh chives
400g mixed mushrooms sliced	2 garlic cloves crushed	1 medium brown onion finely chopped	50g butter
1/3cup 78g finely grated parmesan cheese			

a) 875

b) 3 ½

c) 800

12. You must share your data plan with your sister, who uses more data than you do. Which company has the best data plan for dollar value?

Carrier	Kall-me	Chime	Arrow
Data Included	1 GB (shareable)	1 GB	1 GB (sharable)
Additional Data Usage Rate	5¢ per MB	$10 per 500 MB	$5 per 100 MB for the first 1500 MB, 5¢ per MB thereafter

a) Kall-me

b) Chime

c) Arrow

13. Concrete is purchased by volume. Volume is calculated as length x width x height (depth). How much concrete needs to be ordered for a pad that is 10 m x 7 m x 10 cm?

a) 700 cm^3

b) 7 m^3

c) 7000 cm^3

14. A client with long hair will require a double batch of colour. In total, how many millilitres of formulas 2 and 3 need to be mixed?

How to Create the Brown/Blonde combo *Bronde*

(Bronde is a term sometimes used to describe clients that want to be blonde, but not too blonde.)

To create a formula for a client with hair colour at existing level 7:

- Formula 1: Crisp Professional Cream Color 9/A 1 full scoop + 20 volume developer
- Formula 2: Crisp Kaleidoscope Bleach (Beige) 100 ml + 30 volume developer
- Formula 3: Crisp Color Sheen 8N 75 ml + 10 volume developer

Foil in formula 1 and 2 and apply formula 3 in between the packets on all remaining strands of hair.

a) 40

b) 215

c) 350

NUMERACY

SKILL TESTING QUESTIONS

ANSWER KEY

HOW DID YOU DO ON THE 14 QUESTIONS?

1. You want to arrive at the movie theatre at 7:20 pm. It takes about 15 to 17 minutes to walk to the theatre. At approximately what time should you leave home?

a) 7:00 pm

Estimation – Level 1

2. The total length of the bolt is 24 mm. What is the length of the bolt screw head?

c) 6 mm

Measurement and Calculation – Level 2

3. You want to buy eight iTunes songs from three albums (a total of 24 songs). If each song costs $0.99 and each album costs $9.99, which option is less expensive?

b) Buying the songs individually

Money Math – Level 2

4. Your family is going to install a new entertainment unit with TV and games console. What is the length of the entertainment unit?

a) 6.25 feet

Measurement and Calculation – Level 2

5. How much money would you save by buying a student weekly pass, instead of individual tickets? You need two tickets a day, five days a week.

a) $12.25

Money Math – Level 2

6. What is the volume of the aquarium?

b) 9 m^3 (Hint: volume is always in cubed (^{3}) dimensions)

Measurement and Calculation – Level 3

7. The car you are saving to buy costs $ 5 000. How many more weeks do you still need to save?

b) 8 weeks

Scheduling and Budgeting – Level 2

8. If A2 + B2 = C2, what is the length of C for the skateboard ramp?

c) 10

Measurement and Calculation – Level 2

9. You are building a small work table. What should the diagonal distance across the table be if the table is square (90°)?

a) 100 cm

Measurement and Calculation – Level 2

10. What is the average number of visitors in the afternoons to the temporary trade exhibit for the week?

a) 15

Data Analysis – Level 2

11. How many millilitres (ml) of liquid in total are required for the Risotto recipe?

a) 875

Measurement and Calculation – Level 1

12. You must share your data plan with your sister, who uses more data than you do. Which company has the best data plan for dollar value?

a) Kall-me

Scheduling and Budgeting – Level 2

13. Concrete is purchased by volume. Volume is calculated as length x width x height (depth). How much concrete needs to be ordered for a pad that is 10 m x 7 m x 10 cm?

b) 7 m3

Measurement and Calculation – Level 2

14. A client with long hair will require a double batch of colour. In total, how many millilitres of formulas 2 and 3 need to be mixed?

c) 350

Measurement and Calculation – Level 2

How did you do? Enter the number of answers, in each level, that you got correct.

NUMERACY			
Type of Numeracy	Level 1 /2	Level 2 /11	Level 3 /1
Measurement & Calc.			
Money Math			
Data Analysis			
Sched & Budgeting			
Estimation			

80 – 100% correct – skills may be in upper Level 2 and might be quite quickly improved to Level 3, with practice.

60 – 80% correct – skills may be in low to mid-level 2. They need to be improved, but some of the basics are likely in place and so it might be possible to improve reasonably quickly.

<60% - skills could definitely use some practice.