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Websites are subject to change without notice.

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While the department is committed to making its publications as accessible as possible, some parts of this document are not fully accessible as this time.

Available in alternate formats upon request.
DESCRIPTION

Total Possible Marks: 73  Maximum Time: 120 minutes
This test consists of six parts:

<table>
<thead>
<tr>
<th>Learning Unit</th>
<th>Suggested Time to Complete</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home Finance</td>
<td>15–20 minutes</td>
<td>12</td>
</tr>
<tr>
<td>Probability</td>
<td>10–15 minutes</td>
<td>12</td>
</tr>
<tr>
<td>Vehicle Finance</td>
<td>15–20 minutes</td>
<td>16</td>
</tr>
<tr>
<td>Geometry and Trigonometry</td>
<td>15–20 minutes</td>
<td>14</td>
</tr>
<tr>
<td>Precision Measurement</td>
<td>10–15 minutes</td>
<td>9</td>
</tr>
<tr>
<td>Statistics</td>
<td>10–15 minutes</td>
<td>10</td>
</tr>
</tbody>
</table>

Please turn off your cell phone and all other such devices.
DIRECTIONS

♦ Show all your work.
♦ Use your Formula Sheet and your study sheet.
♦ Use a scientific calculator. Graphing calculators are not permitted.
♦ Show complete answers in the space(s) provided in this booklet.
♦ Provide explanations and justifications.
♦ Use a well-organized method to communicate your answer.
♦ Let the mark values for each question guide you in answering the question.
♦ Express answers in decimal and percentage form to two decimal places when rounding, unless otherwise indicated.

Example: \( \frac{15}{29} = 0.52 \text{ or } 51.72\% \)

Remember

♦ Include units in your final answer.
♦ Some answers are to be given as decimal values. Rounding too early in your solution may result in an inaccurate final answer for which full marks will not be given.
**Directing Words**

Some questions may include directing words such as *explain, state, and calculate*. These words are explained below.

<table>
<thead>
<tr>
<th>The word</th>
<th>The question is asking for…</th>
</tr>
</thead>
<tbody>
<tr>
<td>identify/choose</td>
<td>the appropriate answer(s) from a given list of choices</td>
</tr>
<tr>
<td>state</td>
<td>a word, sentence, or number, without an explanation</td>
</tr>
<tr>
<td>describe/explain</td>
<td>words or symbols, diagrams, charts or graphs, or other methods that clearly show what you are thinking</td>
</tr>
<tr>
<td>justify/support</td>
<td>an explanation, information, or evidence that shows why your method, idea, or answer is correct</td>
</tr>
<tr>
<td>sketch/illustrate</td>
<td>a reasonably neat picture or diagram (not necessarily to scale) that clearly shows or explains an idea, concept, or method</td>
</tr>
<tr>
<td>calculate/determine</td>
<td>a mathematical formula, an algebraic equation, or a numerical calculation to solve a problem</td>
</tr>
</tbody>
</table>

**PLEASE WAIT UNTIL INSTRUCTED TO TURN THE PAGE.**
Cia bought a house for $298 500. She made the minimum down payment of 5%.

Calculate the amount of Cia’s down payment.
Blair plans to buy a house. He is considering the following 2 similar houses.

<table>
<thead>
<tr>
<th></th>
<th>House A</th>
<th>House B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost</td>
<td>$250 000</td>
<td>$240 000</td>
</tr>
<tr>
<td>Furnace</td>
<td>New furnace (high efficiency)</td>
<td>Used furnace (needs replacing in 5 years at a cost of $10 000)</td>
</tr>
</tbody>
</table>

Justify which house Blair should buy with reference to the heating costs over time.
Mamadou’s house insurance policy has a deductible of $1000. The annual premium is $1500. If no claim is made during the year, he receives a 10% discount on the premium the following year.

Calculate the total amount paid over the 2 year period, before taxes.

<table>
<thead>
<tr>
<th>Summary</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>no claim made</td>
</tr>
<tr>
<td>Year 2</td>
<td>claim made</td>
</tr>
</tbody>
</table>
Question 4

A property has a portioned assessment of $198 000. The municipal tax rate is 18.2 mills. Education taxes are $1960. The property has a frontage of 45 feet. There is a local improvement levy of $9.42 per foot for lane paving.

Calculate the total taxes due if the provincial tax credit is $700.
Question 5

Explain why a bank usually limits the Gross Debt Service Ratio (GDSR) to 32% when determining if a homebuyer will be approved for a mortgage.
Darcy and Marco have qualified for a $300 000 mortgage with two payment options. Option 1 is a 4.5% loan for 25 years with a monthly rate of $5.50 per thousand borrowed. Option 2 is a 6.5% loan for 20 years during which they would have paid a total of $482 400.

A) Calculate the monthly mortgage payment for Option 1. (1 mark)

B) Calculate the total amount paid over the 25 years in Option 1. (1 mark)

C) Justify why Darcy and Marco might choose Option 1 instead of Option 2. (1 mark)
Preventative home maintenance can help a homeowner avoid expensive emergency repairs.

Describe 1 preventative maintenance task that you can do to ensure the roof of your house remains in good condition.
Probability

Question 8

Given the following spinner:

A) State the probability, in fraction form, of the spinner landing on 4. (1 mark)

B) State the probability, as a percent, of the spinner landing on a number less than 4. (1 mark)
A company states that the theoretical probability of manufacturing a defective calculator is 1.3%. Natalie samples 200 calculators and finds that 4% of them are defective. She immediately takes a second sample of 1000 calculators and finds that 1.8% of them are defective.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Sample Size</th>
<th>Percent Defective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 1</td>
<td>200</td>
<td>4%</td>
</tr>
<tr>
<td>Sample 2</td>
<td>1000</td>
<td>1.8%</td>
</tr>
</tbody>
</table>

Explain why her second sample is closer to the theoretical probability than her first.
The probability of being selected as a jury member is 0.07.

Calculate the probability, in decimal form, of not being selected.
State the odds against a soccer game ending in a tie score if the probability of a tie is \( \frac{9}{225} \).
The probability of having green eyes is 3 out of 25.

Calculate the expected number of people who have green eyes in a group of 150 people.
“Pick the Marble” is a game that involves picking one marble out of a bag. In the bag, 32% of the marbles are red, 4% are green, and 64% are blue. It costs $2 to play, and the prizes are listed in the table below.

<table>
<thead>
<tr>
<th>Colour</th>
<th>Probability of Winning</th>
<th>Prizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>32%</td>
<td>Stuffed animal valued at $10</td>
</tr>
<tr>
<td>Green</td>
<td>4%</td>
<td>Stuffed animal valued at $15</td>
</tr>
<tr>
<td>Blue</td>
<td>64%</td>
<td>Nothing</td>
</tr>
</tbody>
</table>

Calculate the expected value for the game.
Each letter of the word **MULTIPLICATION** is written on a different card. The cards are shuffled and placed face down on a table. One card is selected and then replaced.

A) State the probability of selecting a card with the letter L or P. (1 mark)

B) State the odds in favour of selecting a card with the letter A. (1 mark)

C) State the odds **against** selecting a card with a vowel (A, E, I, O, U). (1 mark)
Vehicle Finance

Question 15

2 marks

Shania wants to know how much tax she will pay on a new vehicle if she buys a $17 000 vehicle and trades in her current vehicle valued at $4000.

Calculate the amount of tax she will pay for this new vehicle.
Describe 2 advantages of leasing a car rather than financing the purchase of a similar new car.

Place one response per line.

1. 

2. 
Jean is financing the purchase of a new vehicle. She has saved money for the down payment. The table below shows the details of the purchase.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Price of new vehicle</td>
<td>$26 000</td>
</tr>
<tr>
<td>Trade-in value of current vehicle</td>
<td>$2000</td>
</tr>
<tr>
<td>Tax</td>
<td>$3120</td>
</tr>
<tr>
<td>Down payment</td>
<td>$3000</td>
</tr>
<tr>
<td>Monthly payment</td>
<td>$544.39</td>
</tr>
<tr>
<td>Term</td>
<td>48 months</td>
</tr>
</tbody>
</table>

A) Calculate the total amount borrowed. (1 mark)

B) Calculate the total monthly payments paid over the term of the loan. (1 mark)

C) Calculate the finance charge (interest). (1 mark)
Hugo is going to lease a car. He will pay $384.20 per month, after taxes, for 36 months. He will make a down payment of $1500.

Calculate the total cost paid by Hugo at the end of the 36-month lease.
Describe 2 factors, other than the make, model, and year of the vehicle, that can affect the cost of your car insurance.

Place one response per line.

1. 

2. 
José and Shurjeel went on a road trip and recorded the following information:

<table>
<thead>
<tr>
<th>Distance Driven</th>
<th>Amount of Gas Used</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>1200 km</td>
<td>45 L</td>
</tr>
<tr>
<td>Tuesday</td>
<td>800 km</td>
<td>38 L</td>
</tr>
<tr>
<td>Wednesday</td>
<td>1400 km</td>
<td>47 L</td>
</tr>
<tr>
<td>Total</td>
<td>3400 km</td>
<td>130 L</td>
</tr>
</tbody>
</table>

A) Calculate the fuel economy for the trip in L/100 km. (1 mark)

B) Calculate the cost of gas per litre for the trip. (1 mark)
Alise is taking her car in for servicing. She needs the oil changed and an air filter replaced. The cost of labour is $95 per hour. The following table shows the details of the servicing.

<table>
<thead>
<tr>
<th>Parts</th>
<th>Cost of Parts</th>
<th>Labour Hours Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil and filters</td>
<td>$50</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Calculate the total cost Alise will pay after taxes.
George needs to build walls to support his garden. The dimensions of the garden are indicated below.

Determine the measure of angle A in George’s garden.
Given the following diagram of a tower with supporting wires:

Identify which of the following is true.

A) \( \frac{\sin 8^\circ}{48} = \frac{\sin 65^\circ}{50.6} \)

B) \( \frac{\sin 8^\circ}{50.6} = \frac{\sin 65^\circ}{48} \)

C) \( 50.6^2 = 7.3^2 + 48^2 - \left[(2)(7.3)(48)\cos 8^\circ\right] \)

D) \( 7.3^2 = 48^2 + 50.6^2 - \left[(2)(48)(50.6)\cos 8^\circ\right] \)

Answer: ________
Margo is building a model airplane. The measure of $\angle BAC$ is $82^\circ$, $BD$ is $25.69$ cm and $\angle ABD$ is $35^\circ$.

Calculate the length of the front edge of the wing $AB$. 

[Diagram of an airplane with angles and lengths labeled.]
The wheelchair ramp illustrated below forms a triangle.

Identify which of the following terms describes this triangle.

A) equilateral triangle  
B) isosceles triangle  
C) obtuse triangle  
D) right triangle  

Answer: __________
Question 26

Given the following regular polygon:

Calculate or illustrate the total number of diagonals that can be drawn. If illustrating, clearly state the total number of diagonals.
Question 27

Justify why the following statement is false.

“If a quadrilateral has one pair of parallel sides and one pair of congruent sides, then the quadrilateral must be a parallelogram.”
Calculate how many sides a regular polygon has if the sum of the interior angles is 1980°.
Precision Measurement

Question 29

1 mark

Explain which of the following thermometers is more precise.

![Thermometer A](image1)

![Thermometer B](image2)
Question 30

Choose the letter that best completes the sentence below.

How close a measurement is to the true value refers to:

A) tolerance
B) accuracy
C) precision
D) uncertainty

Answer: __________
Jordana is having a ring made by a jeweller. Her ring is to weigh 4.86 grams.

Calculate the uncertainty of the weight of her ring.

Do not round your final answer.
Jonalee is a veterinarian. Her thermometer indicated a dog’s temperature to be 38.6°C.

State the precision of the thermometer she used.

Do not round your final answer.
Mario is installing a subfloor using sheets of plywood. He measures a sheet of plywood to be 225 cm long using the tape measure shown below.

Calculate the minimum possible length of the sheet of plywood.

Do not round your final answer.
Choose the letter that best completes the sentence below.

The tolerance expression that allows for a maximum value greater than 16.5 cm is:

A) \( 16.5 \text{ cm} + 0.5 \text{ cm} \)

B) \( 16.5 \text{ cm} \quad 15.5 \text{ cm} \)

C) \( 16 \text{ cm} \pm 0.5 \text{ cm} \)

D) \( 16.5 \text{ cm} \quad 0 \quad 1 \text{ cm} \)

Answer: _________
Oumar is cutting lenses for a pair of glasses. In order for the lenses to fit into the frame, the lenses need to have a minimum thickness of 1.896 mm and a maximum thickness of 2.022 mm.

State the measurement in the form:

\[
\text{maximum value} \pm \text{tolerance}
\]

Do not round your final answer.
An iron needs to be heated to a temperature between 230°F and 280°F.

State the measurement in the form:

\[
\text{nominal value } \pm \frac{1}{2} \text{ (tolerance)}
\]

Do not round your final answer.
Marc must write an entrance exam to enter university. He must receive a minimum grade of 75% to be accepted.

Last year his mark was in the 70th percentile. He was not accepted. This year his mark is in the 80th percentile.

Justify why it cannot be determined if Marc will be accepted into university this year.
Financial institutions use credit scores to decide whether people qualify for a loan.

Below is a list of credit scores for people applying for a bank loan.

<table>
<thead>
<tr>
<th>620</th>
<th>655</th>
<th>706</th>
<th>722</th>
<th>722</th>
</tr>
</thead>
<tbody>
<tr>
<td>768</td>
<td>775</td>
<td>778</td>
<td>780</td>
<td>784</td>
</tr>
<tr>
<td>784</td>
<td>800</td>
<td>803</td>
<td>816</td>
<td>824</td>
</tr>
<tr>
<td>824</td>
<td>831</td>
<td>840</td>
<td>849</td>
<td>852</td>
</tr>
</tbody>
</table>

Calculate the percentile rank for a credit score of 800.
Réjean entered one of his paintings in the provincial art show. The table below shows the points he received and the weight of each category.

<table>
<thead>
<tr>
<th>Category</th>
<th>Points Received (out of 100)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Originality</td>
<td>92</td>
<td>35%</td>
</tr>
<tr>
<td>Design</td>
<td>87</td>
<td>40%</td>
</tr>
<tr>
<td>Colour</td>
<td>77</td>
<td>25%</td>
</tr>
</tbody>
</table>

Calculate the final score on Réjean’s painting using a weighted mean.
A store sells shoes with sizes ranging from 7 to 12. The following table shows sales for the last month.

<table>
<thead>
<tr>
<th>Size</th>
<th>Quantity Sold</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td>9</td>
<td>25</td>
</tr>
<tr>
<td>10</td>
<td>43</td>
</tr>
<tr>
<td>11</td>
<td>5</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
</tr>
</tbody>
</table>

Choose the letter that best completes the sentence below.

The measure of central tendency that represents the most popular shoe size is:

A) mean
B) median
C) mode
D) weighted mean

Answer: ____________
Environment Canada recorded the following maximum daily temperatures for Thompson for one week in October 2016.

<table>
<thead>
<tr>
<th>Maximum Daily Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunday</td>
</tr>
<tr>
<td>1.70°C</td>
</tr>
</tbody>
</table>

A) Calculate the mean temperature for the week. (1 mark)

B) Calculate the trimmed mean temperature for the same week by removing the highest and lowest temperatures. (1 mark)
Sidi works as a sales clerk at Cycle Sports. During the first 12 days of the month, the store sold the following numbers of bikes:

<table>
<thead>
<tr>
<th></th>
<th>16</th>
<th>32</th>
<th>27</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>23</td>
<td>19</td>
<td>32</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>20</td>
<td>35</td>
<td>33</td>
<td></td>
</tr>
</tbody>
</table>

Calculate the median and the mode of this data.

Median: ________ bikes

Mode: ________ bikes
# Formula Sheet: Essential Mathematics

<table>
<thead>
<tr>
<th>Name of Formula</th>
<th>Details</th>
<th>Formula</th>
</tr>
</thead>
</table>
| **Percentile Rank**  
(*PR*) | \( b = \) number of raw scores below the given score  
\( n = \) total number of raw scores | \( PR = \frac{b}{n} \times 100 \) |
| **Simple Interest**  
(*I*) | \( P = \) principal  
\( r = \) annual interest rate  
\( t = \) time in years | \( I = Prt \) |
| **Gross Debt Service Ratio**  
(*GDSR*) | | \( GDSR = \frac{\text{Monthly mortgage + property + heating}}{\text{Monthly taxes + costs}} \times \frac{\text{Gross monthly income}}{\text{Gross monthly income}} \) |
| **Fuel Economy in L/100 km**  
(*FE*) | | \( FE = \frac{\text{Fuel used in litres}}{\text{Distance in km}} \times 100 \) |
| **Expected Value**  
(*EV*) | \( P = \) probability | \( EV = P(\text{win}) \times \text{gain} - P(\text{lose}) \times \text{loss} \) |
| **Sum of Interior Angles of Polygons**  
(*S*) | \( n = \) number of sides | \( S = 180^\circ (n - 2) \) |
| **Central Angle of Regular Polygons**  
(*C*) | \( n = \) number of sides | \( C = \frac{360^\circ}{n} \) |
| **Number of Diagonals in a Polygon**  
(*D*) | \( n = \) number of sides | \( D = \frac{n(n - 3)}{2} \) |

## Trigonometric Laws

- **Sine Law**
  \[
  \frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}
  \]
- **Cosine Law**
  \[
  a^2 = b^2 + c^2 - 2bc \cos A
  \]

## Tax Rates

- **Federal Goods and Services Tax (GST)**  
  5\% |
- **Provincial Provincial Sales Tax (PST)**  
  8\% |
### Taxes on Vehicle Purchases

<table>
<thead>
<tr>
<th></th>
<th>PST</th>
<th>GST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buying New</td>
<td>PST</td>
<td>GST</td>
</tr>
<tr>
<td>Buying Used from a Dealership</td>
<td>PST</td>
<td>GST</td>
</tr>
<tr>
<td>Buying Used (Private Sale)</td>
<td>PST calculated on greater of book value or purchase price</td>
<td>No GST</td>
</tr>
<tr>
<td>Safety</td>
<td>No PST</td>
<td>GST</td>
</tr>
<tr>
<td>Materials and Labour</td>
<td>PST</td>
<td>GST</td>
</tr>
<tr>
<td>Lien Search</td>
<td>No PST</td>
<td>No GST</td>
</tr>
</tbody>
</table>

### Taxes on Home Insurance

<table>
<thead>
<tr>
<th></th>
<th>PST</th>
<th>GST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homeowner’s/Tenant’s Insurance</td>
<td>PST</td>
<td>No GST</td>
</tr>
</tbody>
</table>