

Grade 12
Essential Mathematics
Achievement Test

Marking Guide

January 2025

Grade 12 Essential Mathematics Achievement Test:
Marking Guide (January 2025)

This resource is available in print and electronic formats.

ISBN: 978-0-7711-6651-8 (print)

ISBN: 978-0-7711-6629-7 (pdf)

Copyright © 2025, the Government of Manitoba, represented by the Minister of Education and Early Childhood Learning.

Manitoba Education and Early Childhood Learning
Winnipeg, Manitoba, Canada

All exemplars and images found in this resource are copyright protected and should not be extracted, accessed, or reproduced for any purpose other than for their intended educational use in this resource. Sincere thanks to the students who allowed their original material to be used.

Permission is hereby given to reproduce this resource for non-profit educational purposes provided the source is cited.

This resource will be available on the Manitoba Education and Early Childhood Learning website at www.edu.gov.mb.ca/k12/assess/archives/index.html.

Websites are subject to change without notice.

Disponible en français.

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

Available in alternate formats upon request.

Contents

General Marking Instructions	1
Vehicle Finance	4
Statistics	20
Geometry and Trigonometry	36
Home Finance	54
Precision Measurement	78
Probability	90
Appendices	103
Appendix A: Table of Questions by Unit and Learning Outcome	105
Appendix B: Irregularities in Provincial Tests	107
<i>Irregular Test Booklet Report</i>	109
Appendix C: Marking Guidelines	111

General Marking Instructions

The *Grade 12 Essential Mathematics Achievement Test: Marking Guide (January 2025)* is based on *Grades 9 to 12 Mathematics: Manitoba Curriculum Framework of Outcomes (2014)*.

Please ensure that

- the student booklet number matches the number on the *Scoring Sheet*
- **only a pencil is used to complete the *Scoring Sheet***
- the final test mark is recorded on the *Scoring Sheet*
- the *Scoring Sheet* is complete and a copy has been made for school records

Please make no marks in the student test booklets. If the booklets have marks in them, the marks need to be removed by departmental staff prior to sample marking should the booklet be selected.

Once marking is completed, please forward the *Scoring Sheets* to Manitoba Education and Early Childhood Learning using the envelope provided (for more information, see the administration manual).

Marking

The recommended procedure for scoring student responses is as follows:

1. Read the *Marking Guide*.
2. Study the student samples provided and the rationales for the allotted marks.
3. Determine the mark for the student's response by comparing its features with the *Marking Guide* descriptions. The descriptions and samples only typify a student's response to a given question; an exact match is not anticipated.

The marks allocated to questions are based on the concepts associated with the learning outcomes in the curriculum. For each question, shade in the circle on the *Scoring Sheet* that represents the mark awarded based on the concepts. A total of these marks will provide the preliminary mark.

Errors

Marks are deducted if conceptual or communication errors are committed.

Conceptual Errors

As a guiding principle, students should only be penalized once for each error committed in the context of a test question. For example, students may choose an inappropriate strategy for a question, but carry it through correctly and arrive at an incorrect answer. In such cases, students should be penalized for having selected an inappropriate strategy for the task at hand, but should be given credit for having arrived at an answer consistent with their choice of strategy.

Each time a student makes one of the following errors, a 0.5 mark deduction will apply:

- arithmetic error
- procedural error
- terminology error in explanation
- lack of clarity in written responses

Communication Errors

Errors not conceptually related to the learning outcomes associated with the question are called “Communication Errors” (see Appendix C). These errors result in a 0.5 mark deduction. Each type of error can only be deducted once per test and is tracked in a separate section on the *Scoring Sheet*.

When a given response includes multiple types of communication errors, deductions are indicated in the order in which the errors occur in the response. No communication errors are recorded for work that has not been awarded marks. The total deduction may not exceed the marks awarded.

The student’s final mark is determined by subtracting the communication errors from the preliminary mark.

Example:

A student has a preliminary mark of 56. The student committed two E1 errors (0.5 mark deduction) and three E6 errors (0.5 mark deduction).

COMMUNICATION ERRORS / ERREURS DE COMMUNICATION					
Shade in the circles below for a maximum total deduction of 3 marks (0.5 mark deduction per error type). Refer to the <i>Marking Guide</i> for details.			Noircir les cercles ci-dessous pour une déduction maximale totale de 3 points (déduction de 0,5 point par type d’erreur). Consulter le <i>Guide de Correction</i> pour plus de détails.		
E1	E2	E3	E4	E5	E6
					
Final Answer / Réponse finale	Notation	Transcription / Transposition	Whole Units / Unités entières	Units / Unités	Rounding / Arrondissement

Test mark / Note au test :	56	—	1	=	55
	Preliminary Mark Note préliminaire		Communication Errors (maximum 3 marks) Erreurs de communication (maximum 3 points)		76

Marking Guidelines

Follow-through errors

Generally, a student will not be penalized more than once for the same error. A final answer will be deemed to be correct if it follows correctly from an incorrect intermediate step where marks were already lost. In multiple-part questions, if an error was made in Part A, but subsequent parts were completed appropriately based on the incorrect information in Part A, full marks will be awarded in subsequent parts.

Marks for follow-through errors will not be awarded if

- the answer is wrong and there are no part-mark increments available
- the error is conceptual in nature (e.g., the student used simply the cosine ratio when the question called for the use of the cosine law)

Additional-information errors

Students can occasionally provide too much information in their answers. When additional information is provided, it must be clearly indicated as such. For example, if a student is asked to calculate a probability, then full marks are awarded for a correct answer even if the odds are also present—provided this additional information is labelled “odds.”

Irregularities in Provincial Tests

During the administration of provincial tests, supervising teachers may encounter irregularities. Markers may also encounter irregularities during local marking sessions. The appendix provides examples of such irregularities as well as procedures to follow to report irregularities.

If a *Scoring Sheet* is marked with “0” only (e.g., student was present but did not attempt any questions) please document this on the *Irregular Test Booklet Report*.

Assistance

If any issue arises that cannot be resolved locally during marking, please call Manitoba Education and Early Childhood Learning at the earliest opportunity to advise us of the situation and seek assistance if necessary.

You must contact the person responsible for this project before making any modifications to the marking keys.

Sara MacPherson
Assessment Consultant
Grade 12 Essential Mathematics
Telephone: 204-793-7004
Email: sara.macpherson@gov.mb.ca

Vehicle Finance

Question 1

E5.V.1

4 marks

Tann is purchasing a sedan from a local dealership. The base price is \$31 583. The optional equipment package costs \$2580, and a tire upgrade costs \$350. The dealership has agreed to accept Tann's old car with a trade-in value of \$8295. There is an air-conditioning excise tax of \$100 and a freight charge of \$945.

A) Calculate the total purchase price, plus taxes, that Tann would pay for his vehicle.

Show your work. (2 marks)

Answer:

Pre-Tax Value	$= 31\,583 + 2580 + 350$	← 0.5 mark for addition
	$+ 100 + 945 - 8295$	← 0.5 mark for subtraction
	$= \$27\,263$	
Total Purchase Price	$= 27\,263 \times 1.12$	
	$= \$30\,534.56$	← 1 mark for purchase price

B) Tann has saved up \$5000 for a down payment, and will need to finance the remainder at a rate of \$30.66 per \$1000.

Calculate Tann's monthly payment.

Show your work. (2 marks)

Answer:

Loan amount	$= 30\,534.56 - 5000$	
	$= \$25\,534.56$	← 1 mark for loan amount
Monthly payment	$= 30.66 \times \frac{25534.56}{1000}$	
	$= \$782.89 / \text{month}$	← 1 mark for monthly payment

Exemplar 14 marks

A)

$$\begin{array}{r} \$31383 \\ + \$2580 \\ \$100 \\ \$945 \\ \hline \$35208 \\ - \$8295 \\ \hline \$26913 \\ \times 1.12 \\ \hline \$30142.56 \end{array}$$

B) downpayment
 $= \$5000$
 30.66×1000
 $= 30660 - 5000$
 $(= \$25660)$

Mark: 1.5 out of 4**Rationale:** 0.5 mark for subtraction in Part A

1 mark for purchase price in Part A (follow-through error)

Incorrect answer in Part B

Exemplar 24 marks

A) the total price
of the purchase base
is \$30522.56

$$\begin{array}{r} \text{base } \$31383 \\ \text{options } \$2580 \\ \text{tires } \$350 \\ \text{freight } \$945 \\ \hline \$35458 \\ - 8295 \text{ trade in} \\ \hline \$27163 \end{array}$$

$$\begin{array}{r} \$27163 \times 0.12 = \$3259.56 \\ + 100 \\ + 3259.56 \\ \hline \$30522.56 \end{array}$$

B) $\$30522.56 - 5000 = \25522.56
 $25522.56 \div 1000 = \$25.52$
 $30.66 \times 25.52 = \$782.44$

Mark: 3.5 out of 4**Rationale:** 0.5 mark for subtraction in Part A

1 mark for purchase price in Part A (follow-through error)

2 marks for correct answer in Part B (follow-through error)

E6 (rounding) in Part B

Exemplar 3

4 marks

A)

$$\begin{array}{r} 31\,583 \\ 2580 \\ 350 \\ 100 \\ + 945 \\ \hline 35558 \end{array} \times 1.12 = 39\,824.96$$
$$\begin{array}{r} 39\,824.96 \\ - 8295 \\ \hline \$31\,529.96 \end{array}$$

B)

$$\frac{\$31\,529.96}{\$1000} \times 30.66 = \$966.71$$

Mark: 2.5 out of 4**Rationale:** 0.5 mark for addition in Part A

1 mark for purchase price in Part A

1 mark for monthly payment in Part B (follow-through error)

Question 2 E5.V.1

1 mark

Choose the letter that best completes the statement below.

Identify a situation in which an owner may be required to pay their deductible.

- A) when buying a vehicle
- B) when insuring a vehicle
- C) when selling a vehicle
- D) when making a damage claim

Answer: D

Question 3 E5.V.1

3 marks

Joey wants to purchase a used vehicle. The private seller has listed the vehicle for \$24 500. The lien search on the car will cost \$25, and the safety inspection will cost \$65.

The book value for this vehicle is \$26 725.

Calculate the total cost of this vehicle, plus taxes. Show your work.

Answer:

$$\text{Vehicle RST} = 26\,725 \times 0.07$$

$$= \$1870.75$$

← 1 mark for RST on book value

$$\text{Safety} = 65 \times 1.05$$

$$= \$68.25$$

← 1 mark for safety value

$$\text{Total cost} = 24\,500 + 1870.75 + 68.25 + 25$$

$$= \$26\,464$$

← 1 mark for total cost

Exemplar 13 marks

$$24500 + 25 + 68.25 = \$ 24593.25$$

$$65 \times 1.05 = 68.25$$

Mark: 2 out of 3**Rationale:** 1 mark for safety value

1 mark for total cost (follow-through error)

E1 (final answer not indicated)

Exemplar 23 marks

Total : \$ 24,500

Lien search: \$25

Safety: $65 + 3^{\wedge} =$
 $65 \times 0.05 = \$68$ Book Value : $\$26,725 \times 0.07 = \$1,870.75$ Total : \$24,500 + \$25 + \$68 + \$1,870.75Total = \$26,463.75**Mark: 3 out of 3****Rationale:** Correct answer

E6 (rounding)

Exemplar 33 marks

vehicle: 24500

lien: 25

safety: 65

\$24590Book value = $26725 \times 0.07 = \$1870.75$ total = \$26460.75**Mark: 2 out of 3****Rationale:** 1 mark for RST on book value

1 mark for total cost (follow-through error)

Question 4 E5.V.1

2 marks

The fuel economy of a car driven 350 km on a warm fall day is 8.37 L / 100 km.

The car makes the same trip in the winter during a snow storm and consumes 34.4 L of fuel.

A) Calculate the fuel economy of the vehicle during the snow storm. Show your work. (1 mark)

Answer:

$$\frac{FE}{100} = \frac{34.4 \text{ L}}{350 \text{ km}}$$

$$FE = \frac{34.4}{350} \times 100$$

$$= 9.82857...$$

$$= 9.83 \text{ L / 100 km}$$

← 1 mark

B) Justify one possible reason why there is a difference between the two fuel economies.
(1 mark)

Sample answers:

- snow storm conditions can cause the vehicle to have a greater variation in speed
- snow decreases the vehicle's traction
- cold temperatures decrease the vehicle's efficiency

Exemplar 12 marks

A) $FE = \frac{8.37 \text{ L}}{350 \text{ km}} \times 100$
 $= 2.39 \text{ km/L}$

B) You would be driving slower in the snowstorm due to bad visibility

Mark: 1 out of 2

Rationale: Incorrect answer in Part A
Correct answer in Part B

Exemplar 22 marks

A) $\frac{\text{L} \times 100}{\text{km}} \quad \frac{34.4 \times 100}{350} = 4.11 \text{ L/100 km}$

B) the difference between the weather.

Mark: 1 out of 2

Rationale: Award full marks
0.5 mark deduction for arithmetic error in Part A
0.5 mark deduction for lack of clarity in Part B (what difference?)

Exemplar 32 marks

A) $\frac{34.4}{350} \times 100 = 9.2 \text{ L}$ B) Wind pushing the vehicle around
Fuel Economy = 9.2 L

Mark: 1 out of 2

Rationale: Correct answer in Part A
0.5 mark deduction for arithmetic error in Part A
Correct answer in Part B
0.5 mark deduction for lack of clarity in Part B (how does wind effect fuel economy?)
E5 (unit error) in Part A

Question 5

E5.V.1

1 mark

Choose the letter that best completes the statement below.

Identify the type of coverage that protects a driver against damage to another person or their property in a collision.

- A) All Purpose
- B) Loss of Use
- C) Third-Party Liability
- D) Pleasure

Answer: C

THIS PAGE WAS INTENTIONALLY LEFT BLANK.

Question 6 E5.V.1

2 marks

A truck has a retail price of \$74 325. Tyrone was told that the truck would depreciate 20% in the first year, and 15% per year after that.

Calculate the value of the truck after the second year. Show your work.

Answer:

$$\begin{aligned}\text{Value after first year} &= 74\,325 \times 0.80 \\ &= \$59\,460 && \leftarrow 1 \text{ mark for year 1 value}\end{aligned}$$

$$\begin{aligned}\text{Value after second year} &= 59\,460 \times 0.85 \\ &= \$50\,541 && \leftarrow 1 \text{ mark for year 2 value}\end{aligned}$$

OR**Answer:**

$$\begin{aligned}\text{Depreciation in year 1} &= 74\,325 \times 0.20 \\ &= \$14\,865 && \leftarrow 0.5 \text{ mark for depreciation in year 1}\end{aligned}$$

$$\begin{aligned}\text{Value after first year} &= 74\,325 - 14\,865 \\ &= \$59\,460 && \leftarrow 0.5 \text{ mark for year 1 value}\end{aligned}$$

$$\begin{aligned}\text{Depreciation in year 2} &= 59\,460 \times 0.15 \\ &= \$8\,919 && \leftarrow 0.5 \text{ mark for depreciation in year 2}\end{aligned}$$

$$\begin{aligned}\text{Value after second year} &= 59\,460 - 8\,919 \\ &= \$50\,541 && \leftarrow 0.5 \text{ mark for year 2 value}\end{aligned}$$

Note to marker: Award full marks if a student uses the first method and multiplies by 0.80 and 0.85 in one step, and has the correct answer.

Exemplar 12 marks

$$\begin{array}{r} 74525 \\ - 14865 \\ \hline = 59570 \text{ first year} \\ 59570 \\ - 8905.5 \\ \hline = 50464.50 \text{ second year} \end{array}$$

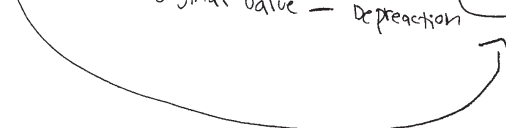
Mark: 1.5 out of 2**Rationale:** Award full marks

0.5 mark deduction for arithmetic error in year 1 value

E5 (missing units)

Exemplar 22 marks

First year = present value $\times$ Depreciation

$$\begin{array}{l} 74325 \times 0.20 \\ \text{first } \boxed{= \$14865} \end{array}$$
$$\begin{array}{l} 14865 \times 0.15 \\ \boxed{= \$2229.75} \text{ second} \end{array}$$
$$\begin{array}{l} 74325 - 14865 \\ \text{Resell value} = \$59460 \\ \text{value} = \text{original value} - \text{Depreciation} \end{array}$$
$$\begin{array}{l} 74325 - 2229.75 \\ \text{second } \boxed{= 72095.25} \end{array}$$


Mark: 1 out of 2**Rationale:** 0.5 mark for depreciation in year 1

0.5 mark for year 1 value

Exemplar 32 marks

$$\begin{array}{l} 74325 \times 0.80 = 59460 \\ 59460 \times 0.65 = \boxed{38649} \end{array}$$

after the second year it's worth

$$\boxed{38649}$$

Mark: 1 out of 2**Rationale:** 1 mark for year 1 value

Question 7 E5.V.1

3 marks

Sunrise had repairs done to his vehicle.

Calculate Sunrise's total cost by completing the invoice.

Answer:

Description	Quantity	Price per unit	Cost
Tire Rotation	no charge	no charge	not applicable
Oil Filter	1	\$7.50 / filter	\$7.50
Oil	4 L	\$10.80 / L	\$43.20 ← 0.5 mark
Windshield wipers	2	\$23.99 / pair	\$23.99
Replace emergency brake cable	1	\$166.42 / cable	\$166.42
Labour	6 h	\$73.50 / hour	\$441.00 ← 0.5 mark
		Subtotal	\$682.11 ← 0.5 mark
		GST	\$34.11 ← 0.5 mark
		RST	\$47.75 ← 0.5 mark
		Total	\$763.97 ← 0.5 mark

Exemplar 1

3 marks

Description	Quantity	Price per unit	Cost
Tire Rotation	no charge	no charge	not applicable
Oil Filter	1	\$7.50 / filter	\$7.50
Oil	4 L	\$10.80 / L	\$43.20
Windshield wipers	2	\$23.99 / pair	\$23.99
Replace emergency brake cable	1	\$166.42 / cable	\$166.42
Labour	6 h	\$73.50 / hour	\$441
Subtotal			\$682.11
GST			\$34.10
RST			\$47.74
Total			\$763.95

Mark: 3 out of 3

Rationale: Correct answer

E6 (rounding for both GST and RST)

Exemplar 2

3 marks

Description	Quantity	Price per unit	Cost
Tire Rotation	no charge	no charge	not applicable
Oil Filter	1	\$7.50 / filter	\$7.50
Oil	4 L	\$10.80 / L	\$10.80
Windshield wipers	2	\$23.99 / pair	\$23.99
Replace emergency brake cable	1	\$166.42 / cable	\$166.42
Labour	6 h	\$73.50 / hour	\$441
Subtotal			\$1331.82
GST			$\$1331.82 \times 0.05 = \66.59
RST			$\$1331.82 \times 0.07 = \93.23
Total			\$1491.64

Mark: 2 out of 3

Rationale: 0.5 mark for labour cost

0.5 mark for GST

0.5 mark for RST

0.5 mark for total (follow-through error)

Exemplar 3

3 marks

Description	Quantity	Price per unit	Cost
Tire Rotation	no charge	no charge	not applicable
Oil Filter	1	\$7.50 / filter	\$7.50
Oil	4 L	\$10.80 / L	\$43.2
Windshield wipers	2	\$23.99 / pair	\$23.99
Replace emergency brake cable	1	\$166.42 / cable	\$166.42
Labour	6 h	\$73.50 / hour	\$441
Subtotal			\$682.11
GST			5%
RST			7%
Total			238.73

Mark: 1.5 out of 3

Rationale: 0.5 mark for oil cost

0.5 mark for labour cost

0.5 mark for subtotal

E6 (rounding on oil)

THIS PAGE WAS INTENTIONALLY LEFT BLANK.

Statistics

Question 8

E5.S.1

3 marks

Here are the weights of several parcels delivered by Canada Post last week.

1.2 kg	1.3 kg	1.9 kg	1.3 kg
1.8 kg	0.9 kg	1.3 kg	1.5 kg

A) Calculate the mean weight of the parcels. Show your work. (2 marks)

Answer:

$$\begin{aligned}\text{Mean} &= \frac{(1.2 + 1.3 + 1.9 + 1.3 + 1.8 + 0.9 + 1.3 + 1.5)}{8} &< 1 \text{ mark for addition} \\ &= \frac{11.2}{8} &< 1 \text{ mark for division} \\ &= 1.4 \text{ kg}\end{aligned}$$

B) Choose the letter that best completes the statement below.

Identify the true statement regarding the weights of the parcels. (1 mark)

- A) The median is greater than the mean.
- B) There is no mode.
- C) The mode and the median are equal.
- D) The mean is less than the mode.

Answer: C

Exemplar 1

2 marks

A) $1.2 + 1.3 + 1.9 + 1.3 + 1.8 + 0.9 + 1.3 + 1.5 = 11.8 \text{ kg} \div 8 = 1.5 \text{ kg}$
Mean weight = 1.5 kg

Mark: 1.5 out of 2**Rationale:** Award full marks

0.5 mark deduction for arithmetic error in Part A

E2 (inappropriate use of equal sign)

E6 (rounding)

Exemplar 2

2 marks

A) $1.2 + 1.3 + 1.9 + 1.3 + 1.8 + 0.9 + 1.3 + 1.5 \div 8 = 9.89$

Mark: 1.5 out of 2**Rationale:** Award full marks

0.5 mark deduction for arithmetic error in Part A

E5 (missing units)

Question 9

E5.S.2

2 marks

Here are the hours worked by a store's employees last week:

Employee	Hours
Sylvain	10
Richard	35
Céleste	40
Ell	36
Lyna	42
Barry	8
René	12
Paul	30
Sydney	15
Alysa	40
Phoebe	20
Geneviève	28
Mal	24

Calculate Richard's percentile rank. Show your work. (2 marks)

Answer:

$$PR = \frac{8}{13} \times 100$$

← 0.5 mark for the value of b

← 0.5 mark for the value of n

$$= 61.53846...$$

$$= 61^{\text{st}} \text{ or } 62^{\text{nd}} \text{ or } P_{61} \text{ or } P_{62}$$

← 1 mark for calculating the percentile rank

Exemplar 12 marks

$$\begin{aligned} PR &= \frac{b}{n} \times 100 \\ &= \frac{3}{13} \times 100 \\ &= 23.08 \text{ Percentile} \end{aligned}$$

Mark: 1.5 out of 2

Rationale: 0.5 mark for the value of n
1 mark for calculating the percentile rank

Exemplar 22 marks

$$\begin{aligned} \text{percentile rank} &= \frac{B}{n} (100) \\ &= \frac{8}{13} \\ &= \boxed{0.62} \end{aligned}$$

Mark: 1 out of 2

Rationale: 0.5 mark for value of b
0.5 mark for value of n

Exemplar 32 marks

61 percentile

Mark: 1 out of 2

Rationale: 1 mark for calculating the percentile rank

Exemplar 42 marks

$$\frac{11}{13} \times 100 = 84.62\%$$

Mark: 0.5 out of 2

Rationale: 0.5 mark for value of n

Question 10 E5.S.1

3 marks

Given the measures of central tendency:

Median = 5

Mode = 8

Mean = 5

State the six whole numbers that meet the criteria above, using the numbers 1 to 9.

Answer:

1 3 4 6 8 8

← 1 mark for median of 5

← 1 mark for mode of 8

← 1 mark for mean of 5

Exemplar 13 marks

3 6 4 2 4 7

Mark: 1 out of 3**Rationale:** 1 mark for median of 5

Exemplar 23 marks

1 2 2 8 8 9

$$\text{Median } \frac{2+8}{2} = 5$$

$$\text{mode} = 8, 8$$

$$\text{mean } \frac{30}{6} = 5$$

Mark: 2 out of 3**Rationale:** 1 mark for median of 5
1 mark for mean of 5

Exemplar 33 marks

-2 1 5 5 8 8

Mark: 1 out of 3**Rationale:** 1 mark for median of 5

Question 11 E5.S.1

1 mark

Explain why an outlier would be removed from a data set before calculating the mean.

Sample answers:

- Outliers are not representative of the data set
- Outliers could significantly affect the mean

Exemplar 1

1 mark

An outlier should be taken out of the data set before calculating the mean because it produces a "false" mean, there is a number(s) that is abnormal to the data set.

Mark: 1 out of 1

Rationale: Correct answer

Exemplar 2

1 mark

To make it equal amount on both sides. Cut a equal amount of numbers from top and the bottom.

Mark: 0 out of 1

Rationale: Incorrect answer

Exemplar 3

1 mark

To make it more accurate

Mark: 0.5 out of 1

Rationale: Award full marks

0.5 mark deduction for lack of clarity (accurate how?)

Question 12 E5.S.1

3 marks

In a store, there are three different types of calculators: standard, scientific and graphing.

The prices and quantities sold in the last three months are shown below:

Calculator	Cost	Quantities sold
standard	\$18.95	127
scientific	\$32.50	84
graphing	\$150.47	56

Calculate the average price of the calculators sold, using a weighted mean.

Show your work.

Answer:

$$\left. \begin{array}{l} 127 \times 18.95 = \$2406.65 \\ 84 \times 32.50 = \$2730 \\ 56 \times 150.47 = \$8426.32 \end{array} \right\} \leftarrow 1 \text{ mark for multiplication}$$

$$\begin{aligned} \text{Total} &= 2406.65 + 2730 + 8426.32 && \leftarrow 1 \text{ mark for addition} \\ &= \$13\,562.97 \end{aligned}$$

$$\begin{aligned} \text{Weighted mean} &= \frac{13\,562.97}{(127 + 84 + 56)} \\ &= \frac{13\,562.97}{267} && \leftarrow 1 \text{ mark for calculating the mean} \\ &= 50.79764... \\ &= \$50.80 \end{aligned}$$

OR

Answer:

$$\begin{aligned} \text{Weighted mean} &= 18.95 \left(\frac{127}{267} \right) + 32.50 \left(\frac{84}{267} \right) + 150.47 \left(\frac{56}{267} \right) && \leftarrow 1 \text{ mark for mean quantities} \\ & && \leftarrow 1 \text{ mark for multiplication} \\ &= 9.01 + 10.22 + 31.56 && \leftarrow 1 \text{ mark for addition} \\ &= \$50.79 \end{aligned}$$

Exemplar 13 marks

$$\frac{\$18.95 \times 127 + \$32.50 \times 84 + 150.47 \times 56}{3}$$
$$= \$4526.99$$

Mark: 2 out of 3**Rationale:** 1 mark for multiplication
1 mark for addition

Exemplar 23 marks

Calculator	Cost		Quantities sold
standard	\$18.95	X	127
scientific	\$32.50	X	84
graphing	\$150.47	X	56

 $= 267$

$$\text{sta} = \$2406.65 \div 267 = 9.01$$
$$\text{Sci} = \$32.50 \times 84 \div 267 = 10.22$$
$$\text{gra} = \$150.47 \times 56 \div 267 = 31.55$$

Mark: 2 out of 3**Rationale:** 1 mark for mean quantities
1 mark for multiplication
E6 (rounding)

Exemplar 3

3 marks

Calculator	Cost	Quantities sold
standard	\$18.95	127
scientific	\$32.50	84
graphing	\$150.47	56

$$\$201.92 \quad 267$$

$$\text{weight mean} = \frac{\text{purchase price}}{\text{quantity sold}}$$

$$= \frac{\$201.92}{267} \times 100$$
$$= \boxed{\$75.63}$$

Mark: 0.5 out of 3**Rationale:** 1 mark for calculating the mean

0.5 mark deduction for procedural error

THIS PAGE WAS INTENTIONALLY LEFT BLANK.

Question 13 E5.S.1

2 marks

Maxime recorded his resting heart rate, in beats per minute, over the past week. He calculated the trimmed mean by eliminating the highest and lowest results.

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Heart rate	70	75	72	66	79	68	70

Here is his work:

$$\text{TRIMMED MEAN} = \frac{68 + 70 + 70 + 72 + 75}{7} = \frac{355}{7} = 50.71$$

THE MEAN IS 51 BEATS PER MINUTE.

A) Explain Maxime's error. (1 mark)

Answer:

Maxime divided by 7 instead of by 5.

B) Calculate the correct trimmed mean. (1 mark)

Answer:

$$\text{Trimmed mean} = \frac{355}{5}$$

= 71 beats per minute

← 1 mark

Exemplar 1

2 marks

A) he divides by 7 instead of 5 after trimming the biggest and smallest numbers off

B)
$$\frac{68 + 70 + 70 + 72 + 75 - 295}{5} = 59$$

the mean is 59 beats per minute

Mark: 1.5 out of 2**Rationale:** Correct answer in Part A

0.5 mark deduction for arithmetic error in Part B

Exemplar 2

2 marks

A) He didn't reduce the # he divided with

B)
$$68 + 70 + 70 + 72 + 75 = \frac{355}{5} = 71 \text{ beats/min}$$

Mark: 2 out of 2**Rationale:** Correct answer in Part A

Correct answer in Part B

E2 (inappropriate use of equal sign) in Part B

Exemplar 3

2 marks

A)

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Heart rate	70	75	72	66	79	68	70

66 68 70 70 72 75 79

He divided by 7 instead of 5

B) $68 + 70 + 70 + 72 + 75 = \frac{355}{5} =$

Mark: 2 out of 2

Rationale: Correct answer in Part A
 Correct answer in Part B
 E1 (final answer not stated) in Part B
 E2 (inappropriate use of equal sign) in Part B

Exemplar 4

2 marks

A)

Day	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Heart rate	70	75	72	66	79	68	70

~~66~~ 68 70 70 72 78 79

Max has the wrong denominator. It should be 5 instead of 7.

B) $\frac{68 + 70 + 70 + 72 + 75}{5} = \frac{355}{5} = 71$

↑
trimmed mean

Mark: 2 out of 2

Rationale: Correct answer in Part A
 Correct answer in Part B
 E5 (missing units) in Part B

THIS PAGE WAS INTENTIONALLY LEFT BLANK.

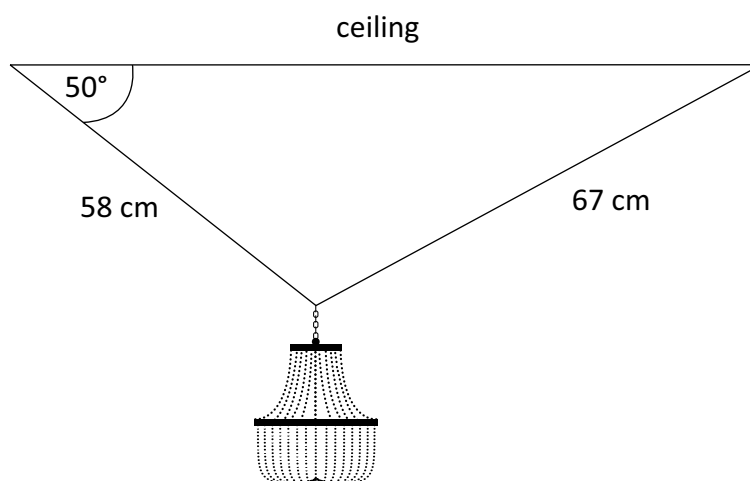
Geometry and Trigonometry

Question 14 E6.G.1

2 marks

A chandelier is suspended from the ceiling by two chains. One chain is 58 cm long and the other is 67 cm long.

Calculate the angle the longer chain makes with the ceiling. Show your work.



Answer:

$$\frac{\sin 50}{67} = \frac{\sin x}{58}$$

← 0.5 mark for identifying sine law

← 0.5 mark for substituting

$$\sin^{-1}\left(\frac{58 \sin 50}{67}\right) = x$$

$$\sin^{-1}(0.66314...) = x$$

$$41.54001... = x$$

$$41.54^\circ = x$$

← 1 mark for consistent angle

Exemplar 12 marks

$$\frac{\sin 50}{67\text{cm}} = \frac{\sin \theta}{58\text{cm}}$$

$$(\sin 50)(58\text{cm}) = (67\text{cm})(\sin \theta)$$

$$\frac{44.43}{67} = \frac{(67\text{cm})(\sin \theta)}{67\text{cm}}$$

$$0.66 = \sin \theta$$

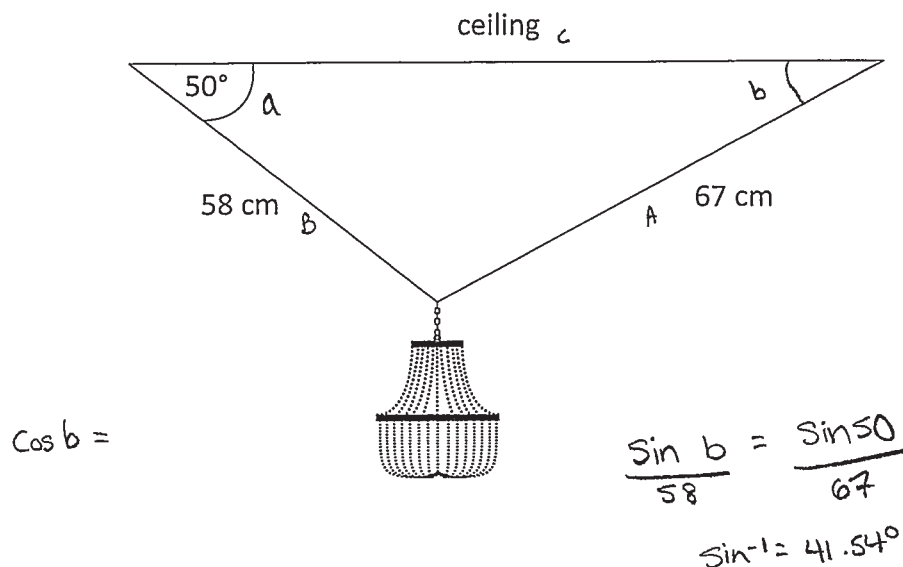
$$\sin^{-1}(0.66) = \theta$$

$$41.30^\circ = \theta$$

Mark: 2 out of 2

Rationale: Correct answer
E6 (rounds too soon)

Exemplar 22 marks

**Mark: 2 out of 2**

Rationale: Correct answer
E2 (notation error in line 2)

Exemplar 32 marks

$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\frac{\sin 50}{67} = \frac{\sin B}{58}$$

$$\sin^{-1} 0.663 = \sin B$$

$$41.5^\circ$$

Mark: 2 out of 2**Rationale:** Correct answer

E3 (notation error in line 3 and 4)

E6 (rounds incorrectly)

Exemplar 42 marks

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$\frac{\sin 50^\circ}{67} = \frac{\sin 130}{58}$$

$$\frac{58 \sin 50}{67 \sin 130} = 59.98^\circ \text{ or } 60^\circ$$

Mark: 0.5 out of 2**Rationale:** 0.5 mark for identifying sine law

THIS PAGE WAS INTENTIONALLY LEFT BLANK.

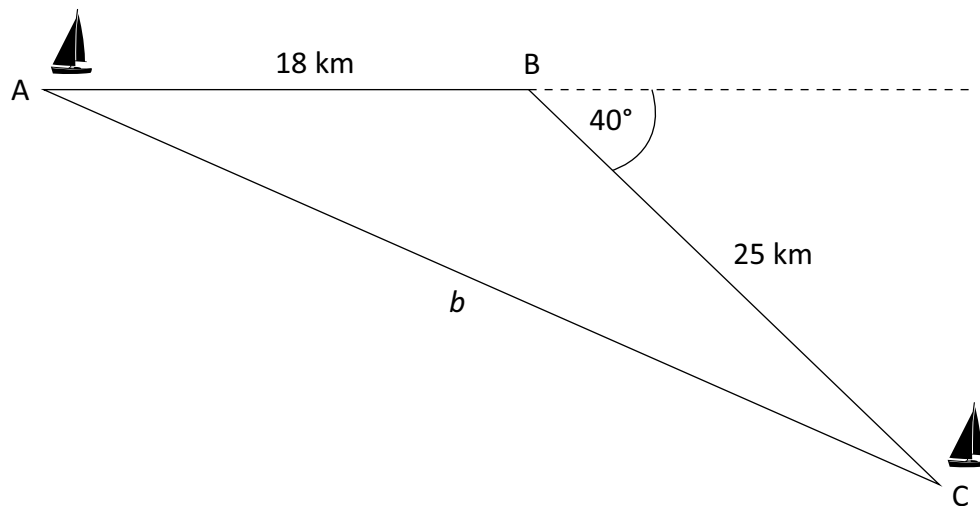
Question 15 E6.G.1

3 marks

A boat travels 18 km east, then changes course and travels 25 km, 40° south of east.

Calculate the distance, b , that the boat is from its original location.

Show your work.

**Answer:**

$$\angle B = 180 - 40 = 140^\circ$$

← 1 mark for calculating $\angle B$

$$b^2 = 25^2 + 18^2 - 2(25)(18)\cos 140^\circ$$

← 0.5 mark for identifying cosine law

← 0.5 mark for substituting

$$b^2 = 949 - 900\cos 140^\circ$$

$$\sqrt{b^2} = \sqrt{1638.43999\dots}$$

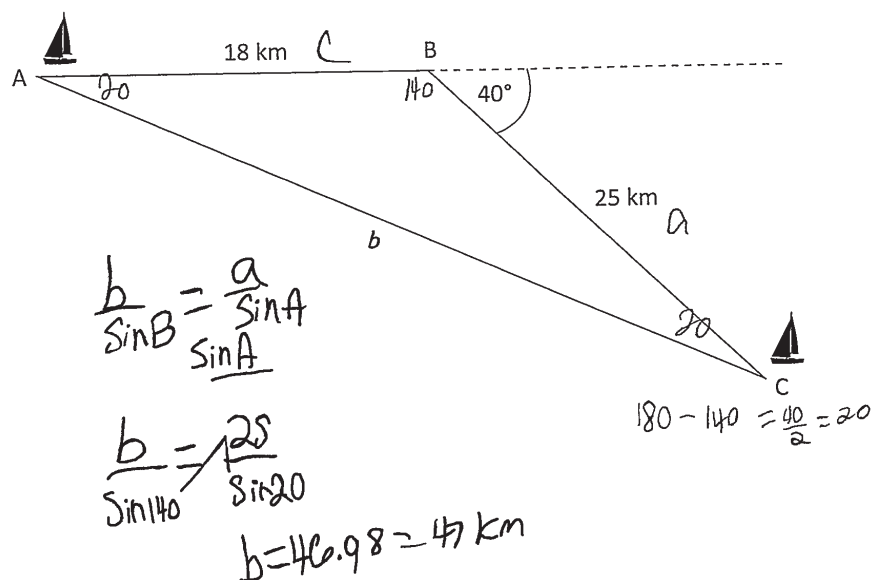
$$b = 40.47764\dots$$

$$b = 40.48 \text{ km}$$

← 1 mark for consistent length

Exemplar 1

3 marks

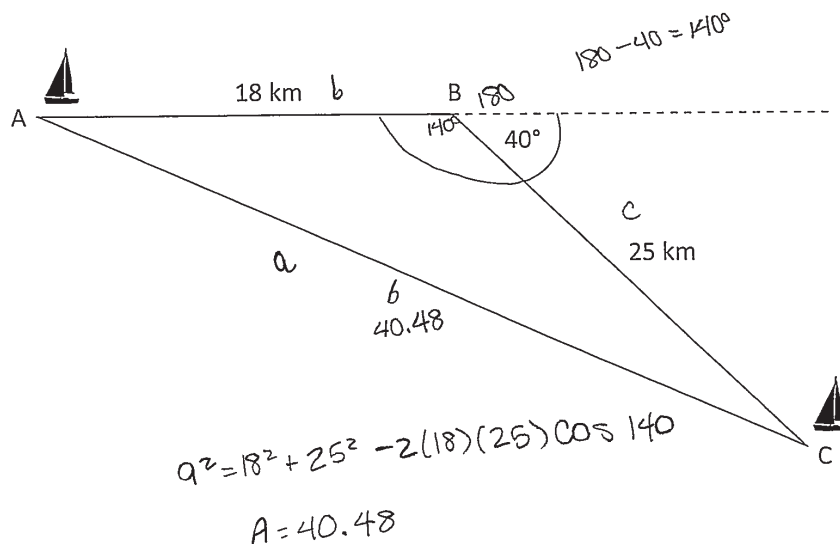


Mark: 1 out of 3

Rationale: 1 mark for calculating $\angle B$

Exemplar 2

3 marks



Mark: 3 out of 3

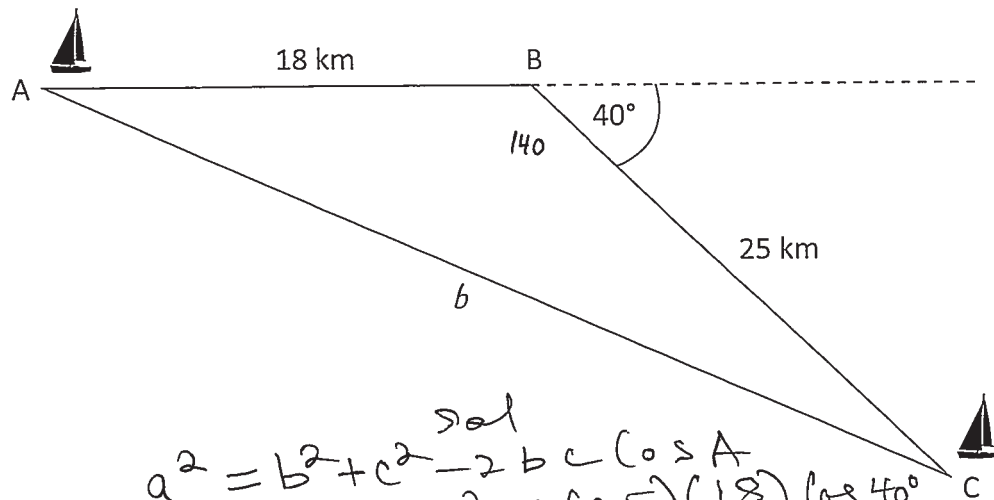
Rationale: Correct answer

E2 (notation error) ("A" not "a")

E5 (missing units)

Exemplar 3

3 marks



sol

$$a^2 = b^2 + c^2 - 2bc \cos A$$
$$a^2 = 25^2 + 18^2 - 2(25)(18) \cos 40^\circ$$
$$\sqrt{a^2} = \sqrt{259.56}$$
$$a = 16.11$$

Mark: 2.5 out of 3

Rationale: 1 mark for calculating $\angle B$

0.5 mark for identifying cosine law

1 mark for consistent length (follow-through error)

E5 (missing units)

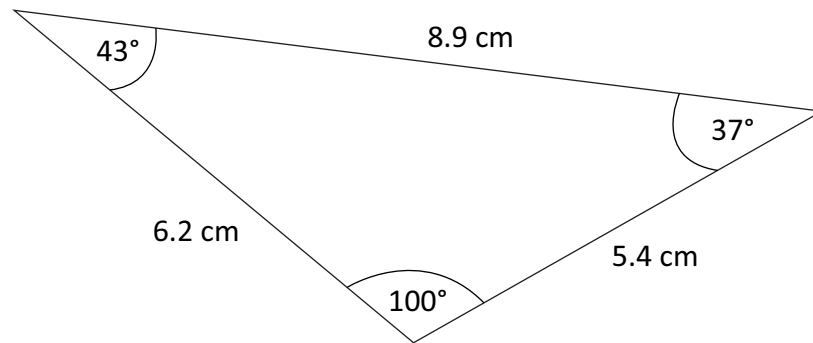
THIS PAGE WAS INTENTIONALLY LEFT BLANK.

Question 16 E6.G.1

1 mark

A student solved a triangle and found all missing sides and angles.

Explain how you know that the student made an error in their calculations.

**Sample answers:**

- The shortest side is not across from the smallest angle.

- $$\frac{8.9}{\sin 100^\circ} = \frac{x}{\sin 37^\circ}$$

$$\frac{8.9 \sin 37^\circ}{\sin 100^\circ} = x$$

$$5.4 \text{ cm} = x$$

$$5.4 \neq 6.2$$

Exemplar 1

1 mark

The side length adjacent to the 37° is higher than the side adjacent to the 43° . Higher angles should have higher sides.

Mark: 0.5 out of 1**Rationale:** Award full marks

0.5 mark deduction for terminology error (adjacent)

Exemplar 2

1 mark

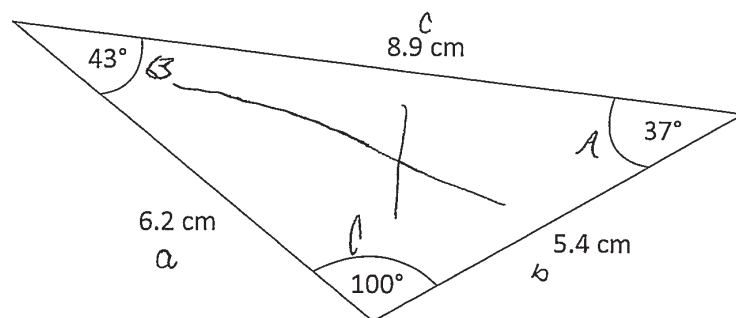
B/c when you plug in those #'s to sin formula, the opposite sides and angles do not add up

Mark: 0.5 out of 1**Rationale:** Award full marks

0.5 mark deduction for lack of clarity (add up how?)

Exemplar 3

1 mark



$$\frac{\sin A}{a} = \frac{\sin B}{b}$$

$$\frac{(5.4) \sin 37}{6.2} = \frac{\sin B}{5.4}$$

$$0.52 = \sin B$$

$$\sin^{-1}(0.52) = \angle B$$

$$\boxed{31.6 = \angle B}$$

Because the angles don't correspond with sides when calculated

Mark: 1 out of 1

Rationale: Correct answer

Exemplar 4

1 mark

$$\frac{\sin 43}{5.4} = \frac{\sin 37}{6.2} = \frac{\sin 100}{8.9}$$

$$\begin{array}{ccc} 0.13 & 0.09 & 0.011 \\ & 0.10 & \end{array}$$

The answers are not the same

Mark: 1 out of 1

Rationale: Correct answer

Question 17 E6.G.2

1 mark

Choose the letter that best completes the statement below.

Identify which of the following is a regular polygon:

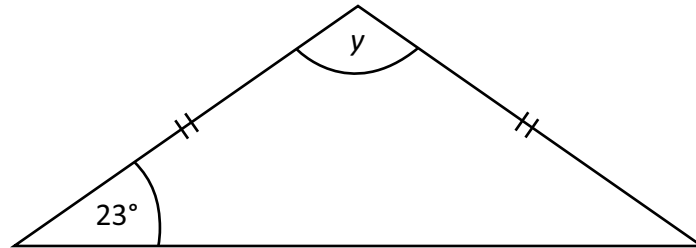
- A) right triangle
- B) square
- C) trapezoid
- D) circle

Answer: B

Question 18 E6.G.2

2 marks

Given the following triangle:



A) Calculate the measure of angle y . (1 mark)

Answer:

$$\begin{aligned} y &= 180^\circ - 23^\circ - 23^\circ \\ &= 134^\circ \end{aligned}$$

← 1 mark

B) State the type of triangle. (1 mark)

Answer:

Isosceles or Obtuse

Exemplar 1

2 marks

A) $23+23=46$
 $180-46=134$

B) Isosceles

Mark: 2 out of 2

Rationale: Correct answer in Part A
Correct answer in Part B
E5 (missing units) in Part A

Exemplar 2

2 marks

A) $180-46=140^\circ$

B) Isosceles

Mark: 1.5 out of 2

Rationale: Award full marks
0.5 mark deduction for arithmetic error in Part A
Correct answer in Part B

Question 19 E6.G.2

1 mark

The sum of the interior angles of a regular polygon is 2340° .

Calculate the number of sides for the polygon.

Answer:

$$2340^\circ = 180^\circ (n - 2)$$

$$\frac{2340^\circ}{180^\circ} = n - 2$$

$$13 = n - 2$$

$$15 = n$$

← 1 mark

Exemplar 11 mark

$$180 \times (15 - 2) = 2340^\circ$$

Mark: 1 out of 1**Rationale:** Correct answer

E1 (final answer not stated)

Exemplar 21 mark

$$\begin{array}{rcl} 2340 & = & 180(n-2) \\ +2 & & +2 \end{array}$$

$$\frac{2342}{180} = \frac{180(n)}{180}$$

$$13 = n$$

Mark: 0 out of 1**Rationale:** Incorrect answer

Exemplar 31 mark

$$2340 \div 180 = 13$$

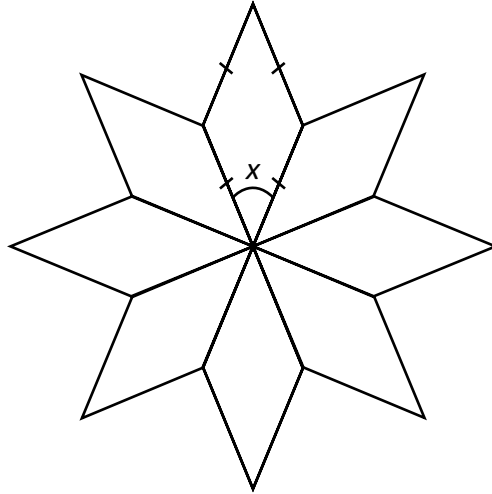
13 sides.

Mark: 0 out of 1**Rationale:** Incorrect answer

Question 20 E6.G.2

2 marks

The centre of a Star Blanket contains an 8-pointed star made up of congruent quadrilateral quilt pieces.



A) Calculate the central angle, x , of each quadrilateral quilt piece that makes up the star. (1 mark)

Answer:

$$x = \frac{360}{8}$$

$$= 45^\circ$$

← 1 mark

B) Choose the letter that best completes the statement below.

Identify one property that does not apply to each quadrilateral quilt piece. (1 mark)

- A) Diagonals are equal length.
- B) Opposite sides are parallel.
- C) Adjacent angles add up to 180° .
- D) Diagonals bisect each other.

Answer: A

Exemplar 11 mark

$$\text{A) } C = \frac{360}{4} = 90^\circ$$
$$x = 90^\circ$$

Mark: 0 out of 1**Rationale:** Incorrect answer in Part A

Exemplar 21 mark

$$\text{A) } \text{Centre Angle} = \frac{360}{8} \Rightarrow 45$$

Mark: 1 out of 1**Rationale:** Correct answer in Part A
E5 (missing units)

Exemplar 31 mark

$$\text{A) } \frac{\angle A = 180(n-2)}{n}$$
$$\frac{\angle A = 180(4-2)}{4}$$
$$\angle A = 90^\circ / 2 = \boxed{45^\circ \text{ (5 x)}}$$

Mark: 0 out of 1**Rationale:** Incorrect process in Part A

Home Finance

Question 21 E6.H.1

4 marks

Clara is looking to buy a house with monthly property taxes of \$191 and monthly heating costs of \$107. Clara's gross weekly income is \$750 and she anticipates a monthly mortgage payment of \$455.

A) Calculate Clara's Gross Debt Service Ratio. (3 marks)

Show your work.

Answer:

$$\begin{aligned}\text{Gross monthly income} &= \frac{750 \times 52}{12} \\ &= \$3250\end{aligned}$$

$$GDSR = \frac{(455 + 191 + 107)}{3250}$$

← 1 mark for addition of monthly costs
← 1 mark for calculating monthly income

$$= \frac{753}{3250}$$

← 1 mark for calculating *GDSR*

$$\begin{aligned}&= 0.23169... \\ &= 0.23 \text{ or } 23.17\%\end{aligned}$$

B) Justify whether Clara will qualify for the mortgage. (1 mark)

Answer:

Yes, Clara's GDSR is well below the 0.32 (32%) threshold.

Exemplar 14 marks

A)
$$\text{GDSR} = \frac{\text{Monthly mortgage} + \text{Monthly property} + \text{monthly heating}}{\text{gross monthly income}} \times 100$$

$$= \frac{\$455 + \$191 + \$107}{\$750} \times 100$$

$$= \$100.40$$

B) Clara cannot qualify for mortgage

Mark: 2 out of 4

Rationale: 1 mark for addition of monthly costs
1 mark for calculating GDSR (follow-through error)
Incorrect answer in Part B (no justification)
E5 (incorrect units) in Part A

Exemplar 24 marks

A)
$$\frac{455 + 107 + 191}{750} \times 100 = 56.23\%$$

B) No

Mark: 1 out of 4

Rationale: 1 mark for addition in Part A
Incorrect answer in Part B (no justification)

Exemplar 3

4 marks

A) $\frac{191 + 167 + 455}{750(4)} = \times 100 = 25.1$

B) Yes, because the GDSR is less than 32%, she will be able to afford the unforeseen costs.

Mark: 3 out of 4

Rationale: 1 mark for addition of monthly costs
1 mark for calculating GDSR (follow-through error)
Correct answer in Part B (follow-through)
E5 (missing units) in Part A

THIS PAGE WAS INTENTIONALLY LEFT BLANK.

Question 22 E6.H.1

1 mark

State one closing cost that is associated with buying a house, other than the down payment.

Sample answers:

- Land transfer tax
- Land survey fee
- Mortgage default insurance fees (CMHC)
- Legal fees
- Adjustment fees

Exemplar 1

1 mark

home insurance

Mark: 0 out of 1**Rationale:** Incorrect answer

Exemplar 2

1 mark

home inspection

Mark: 1 out of 1**Rationale:** Correct answer

Exemplar 3

1 mark

Property tax

Mark: 0 out of 1**Rationale:** Incorrect answer

Exemplar 4

1 mark

Buying a fridge

Mark: 0 out of 1**Rationale:** Incorrect answer

Question 23 E6.H.1

2 marks

Homeowners pay a Land Transfer Tax when purchasing a property. The tax is calculated according to the following schedule:

Value of Property	Rate
On the first \$30 000	0%
On the next \$60 000 (i.e., \$30 001 to \$90 000)	0.5%
On the next \$60 000 (i.e., \$90 001 to \$150 000)	1.0%
On the next \$50 000 (i.e., \$150 001 to \$200 000)	1.5%
On amounts in excess of \$200 000	2.0%

Juan bought a house in Dauphin for \$189 000. They already know that for the first \$150 000, the land transfer tax will cost \$900.

Calculate the total land transfer tax. Show your work.

Answer:

$$\begin{aligned}\text{Excess amount} &= 189\,000 - 150\,000 && \leftarrow 0.5 \text{ mark for subtraction} \\ &= \$39\,000\end{aligned}$$

$$\begin{aligned}\text{Tax on amount excess of \$150 000} &= 39\,000 \times 0.015 && \leftarrow 1 \text{ mark for calculating tax on excess} \\ &= \$585\end{aligned}$$

$$\begin{aligned}\text{Total Land Transfer Tax} &= 900 + 585 && \leftarrow 0.5 \text{ mark for addition} \\ &= \$1485\end{aligned}$$

Exemplar 12 marks

$$39000 \times 0.05 = 1950 + 900 = 2850 \$$$

Mark: 1 out of 2

Rationale: 0.5 mark for subtraction
0.5 mark for addition
E2 (inappropriate use of equal signs)

Exemplar 22 marks

$$149000 - 50000 = 99000 \times 0.015 = \begin{array}{r} \$900 \\ \$2085 \\ \hline \text{total } \$2985 \end{array}$$

Mark: 1.5 out of 2

Rationale: 1 mark for calculating tax on excess (follow-through error)
0.5 mark for addition
E2 (inappropriate use of equal signs)

Exemplar 32 marks

$$60,000 \times 0.005 = \$300$$

$$60,000 \times 0.01 = \$600$$

$$50000 \times 0.015 = \$750$$

$$39000 \times 0.02 = \$780$$

$\$2430$

Mark: 1 out of 2

Rationale: 0.5 mark for subtraction
0.5 mark for addition

Question 24 E6.H.1

1 mark

Loïc wants to buy a house and he is considering two similar houses. One house is located in Area 2 for home insurance, while the other house is located in Area 3.

Explain why home insurance in Area 2 is less expensive than in Area 3.

Sample answers:

- A home in Area 2 is closer to a fire hydrant than a home in Area 3.
- A home in Area 2 is closer to fire and emergency services than a home in Area 3.

Exemplar 1

1 mark

Area 2 is cheaper because its closer to the middle of town therefore easier to get to if there is an accident

Mark: 0.5 out of 1**Rationale:** Award full marks

0.5 mark deduction for lack of clarity (no reference to emergency services)

Exemplar 2

1 mark

Area 3 more people, City.

Mark: 0 out of 1**Rationale:** Incorrect answer

Exemplar 3

1 mark

because Area 2 is located in a worse area than Area 3.

Mark: 0 out of 1**Rationale:** Incorrect answer

Question 25 E6.H.1

3 marks

You need to buy a new high efficiency furnace and have two options:

	Option A: Geothermal Heating System	Option B: Electric Heating System
Purchase price	\$16 000	\$3800
Operating cost per year	\$700	\$1450

The Manitoba Government offers a \$7500 rebate on the purchase price of a geothermal system.

You are planning to sell your house in 2 years.

A) Calculate the total cost of the geothermal heating system after 2 years. (1 mark)

Answer:

$$\text{Total cost after rebate} = 16\,000 - 7500$$

$$= \$8500$$

$$\text{Total cost after 2 years} = 8500 + (700 \times 2)$$

$$= \$9900$$

← 1 mark

B) Calculate the total cost of the electric heating system after 2 years. (1 mark)

Answer:

$$\text{Total cost after 2 years} = 3800 + (1450 \times 2)$$

$$= \$6700$$

← 1 mark

C) Justify which heating system you would choose. (1 mark)

Sample answers:

- The geothermal heating system because it increases the value of the house.
- The electric heating system because it is less expensive over 2 years, by \$3200.

Exemplar 13 marks

A) $16000 - 7500 = \$8500$
 $700 \times 2 = \$1400$
 $8500 + 1400 = \$9900$

B) $3800 + 2900 = \$6700$

$$1450 \times 2 = \$2900$$

C) Electric, it is cheaper to buy and
to operate

Mark: 3 out of 3

Rationale: Correct answer in Part A
Correct answer in Part B
Correct answer in Part C
E1 (final answer not indicated) in Part B

Exemplar 23 marks

A)
$$\begin{array}{r} \$16000.00 \\ - \$7500.00 \\ \hline \$8500.00 \\ + \$700.00 \\ \$700.00 \\ \hline \$9900.00 \end{array}$$

B)
$$\begin{array}{r} \$3800.00 \\ + \$1450.00 \\ \hline \$1450.00 \\ \hline \$6700.00 \end{array}$$

C) I would choose the geothermal system since it's cheaper
as long as you are only there for two more years

Mark: 2 out of 3

Rationale: Correct answer in Part A
Correct answer in Part B
Incorrect answer in Part C

Exemplar 3

3 marks

A) \$ 26000

$$+ 700$$

$$= \$16700$$

$$- 7500$$

$$= \$9200$$

B) \$ 3800

$$+ \$1450$$

$$= \$5250$$

c) I would choose
option B.

Mark: 1 out of 3**Rationale:** Incorrect answer in Part A

Correct answer in Part B (follow-through error)

Incorrect answer in Part C (no justification)

THIS PAGE WAS INTENTIONALLY LEFT BLANK.

Question 26 E6.H.1

1 mark

Describe one reason why renting a property may be more beneficial than buying a similar property.

Sample answers:

- A shorter term commitment may make it easier to move.
- Lower monthly costs may make it possible to save money.
- A job with extensive travel may not make it possible to meet home insurance requirements.

Exemplar 11 mark

Renting is better because repairs are free.

Mark: 0.5 out of 1**Rationale:** Award full marks

0.5 mark deduction for lack of clarity (type of repairs?)

Exemplar 21 mark

Its less work, sure there is preventative maintenance but if something breaks like electrical or plumbing you don't have to pay

Mark: 1 out of 1**Rationale:** Correct answer

Exemplar 31 mark

Utilities included with rent.

Mark: 0.5 out of 1**Rationale:** Award full marks

0.5 mark deduction for lack of clarity (utilities are not always included with rent)

Question 27 E6.H.1

2 marks

Stanley's home insurance annual premium is \$1820. His deductible is \$600. If he does not make a claim during the year, he receives a 5% discount on the premium the following year.

Calculate the total cost Stanley will pay over a 2-year period if he does not make a claim in year 1, but does make a claim in year 2. Show your work.

Answer:

$$\begin{aligned}\text{Discount} &= 1820 \times 0.05 \\ &= \$91 \quad \leftarrow 0.5 \text{ mark for calculating discount}\end{aligned}$$

$$\begin{aligned}\text{Year 2 cost} &= 1820 - 91 + 600 \\ &= \$2329 \quad \leftarrow 1 \text{ mark for year 2 cost}\end{aligned}$$

$$\begin{aligned}\text{Total cost} &= 1820 + 2329 \\ &= \$4149 \quad \leftarrow 0.5 \text{ mark for total cost}\end{aligned}$$

Exemplar 12 marks

$$1820 \times 0.05 = 91$$

$$1820 - 91 = 1729 + 1820 = \$3549$$

Mark: 1 out of 2**Rationale:** 0.5 mark for calculating discount

0.5 mark for total cost (follow-through)

E2 (inappropriate use of equal signs)

Exemplar 22 marks

$$1820 \times 2 = 3640 + 600 = 4240$$

$$4240 \times 0.05 = 212$$

$$4240 - 212 = \$4028$$

Mark: 1 out of 2**Rationale:** 1 mark for year 2 cost

E2 (inappropriate use of equal signs)

Exemplar 32 marks

$$1820(0.05) = 91$$

year 1 $\rightarrow$ 1820year 2 $\rightarrow$ 1729
+ 600

$$= \$2329$$

Mark: 1.5 out of 2**Rationale:** 0.5 mark for calculating discount

1 mark for year 2 cost

Question 28 E6.H.1

1 mark

Choose the letter that best completes the statement below.

A couple purchased a home and their mortgage had an interest rate of 7.5%. Their first month's interest was \$2225.

Identify the amount of their mortgage.

- A) \$3560
- B) \$29 666.67
- C) \$200 250
- D) \$356 000

Answer: D

THIS PAGE WAS INTENTIONALLY LEFT BLANK.

Question 29 E6.H.1

3 marks

Calculate the total annual property tax owing for the following situation.

Assessed Value	\$255 200
Portioned Percentage	45%
Municipal Mill Rate	16.923 mills
Education Tax	\$2347.51
Provincial Tax Credit	−\$700

Show your work.

Answer:

$$\begin{aligned}\text{Portioned assessment} &= 255\,200 \times 0.45 && \leftarrow 1 \text{ mark for calculating portioned assessment} \\ &= \$114\,840\end{aligned}$$

$$\begin{aligned}\text{Municipal tax} &= 114\,840 \times \frac{16.923}{1000} && \leftarrow 1 \text{ mark for calculating municipal tax} \\ &= \$1943.44\end{aligned}$$

$$\begin{aligned}\text{Total property tax due} &= 1943.44 + 2347.51 + (-700) && \leftarrow 1 \text{ mark for calculating total} \\ &= \$3590.95 && \text{annual property tax}\end{aligned}$$

Exemplar 13 marks

$$\frac{253200}{1000} (16.923)$$
$$\$4318.74 + \$2347.51 + \$700$$
$$\boxed{\$13666.26}$$

Mark: 1 out of 3**Rationale:** 1 mark for municipal tax (follow-through error)

Exemplar 23 marks

$$\frac{45}{1000} = \$1993.44 + 2347 - 700$$
$$\boxed{= \$3590.44}$$

Mark: 3 out of 3**Rationale:** Award full marks

E2 (inappropriate use of equal signs)

E6 (rounds too soon)

Exemplar 33 marks

$$255200 (0.45) \quad \frac{114840}{1000} \times 16923$$
$$1943.44 - 700$$
$$\boxed{\$1243.43}$$

Mark: 2 out of 3**Rationale:** 1 mark for calculating portioned assessment

1 mark for calculating municipal tax

Question 30 E6.H.1

1 mark

Perlah is purchasing a home in Ste. Rose du Lac for \$217 000. She has saved \$23 000 for a down payment. The bank offers her an amortization rate of \$7.28 per thousand dollars borrowed.

Perlah calculated her monthly mortgage payment as follows:

$$\begin{aligned} 217\ 000 \times \frac{7.28}{1000} \\ = \$1579.76 \end{aligned}$$

Explain Perlah's error.

Answer:

Perlah did not subtract the down payment before multiplying by the amortization rate.

Exemplar 11 mark

she didn't add the down payment

Mark: 0 out of 1**Rationale:** Incorrect answer

Exemplar 21 mark

she didn't use the correct amount of loan

Mark: 0.5 out of 1**Rationale:** Award full marks

0.5 mark deduction for lack of clarity (use how?)

Exemplar 31 mark

$$MP = \frac{194\,000}{1000} \times \$7.28$$

$MP = \$1\,412.32$

she didn't account for her
down payment.

Mark: 1 out of 1**Rationale:** Correct answer

Exemplar 41 mark

didn't use the down payment

Mark: 0.5 out of 1**Rationale:** Award full marks

0.5 mark deduction for lack of clarity (use how?)

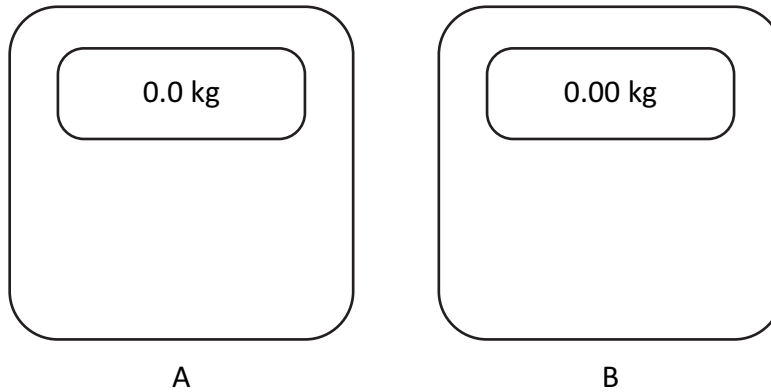
Precision Measurement

Note: Do not round answers in this unit.

Question 31 E5.P.1

1 mark

Justify why scale B would give a more precise measurement.



Answer:

Scale B shows a greater number of decimal places.

Exemplar 11 mark

because it calculating to the nearest 0.00

Mark: 1 out of 1**Rationale:** Correct answer

Exemplar 21 mark

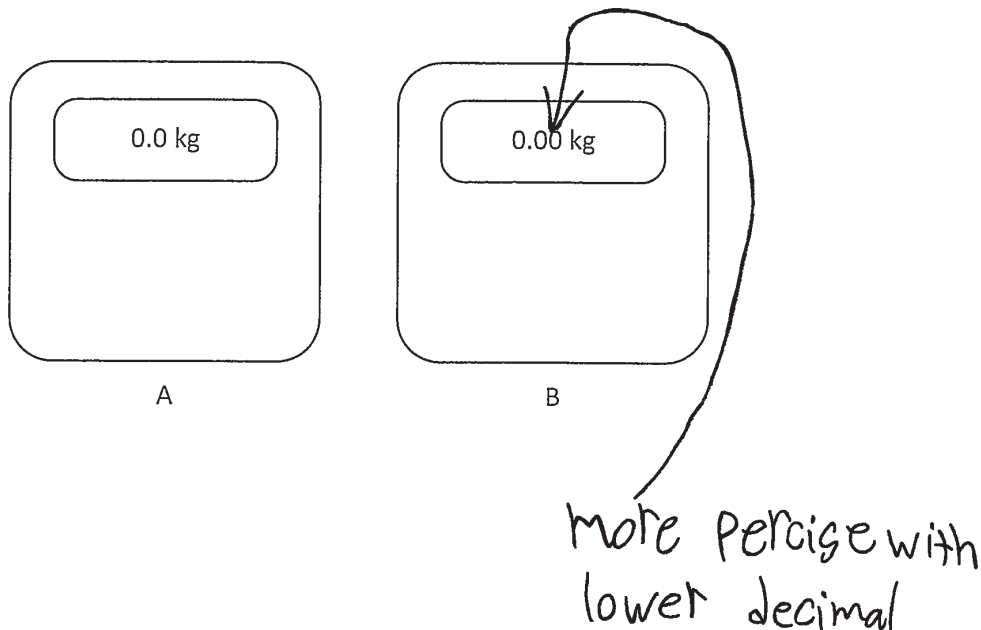
Scale B has precision of 0.01 kg

Scale A has precision of 0.1 kg

Scale B will be more accurate

Mark: 1 out of 1**Rationale:** Correct answer

Exemplar 31 mark

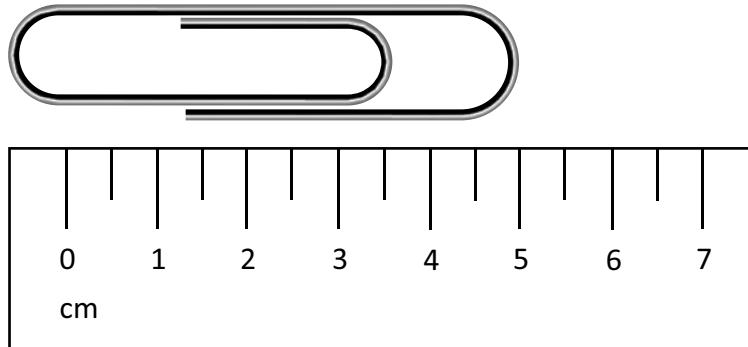
**Mark: 0.5 out of 1****Rationale:** Award full marks

0.5 mark deduction for terminology error (lower decimal)

Question 32 E5.P.1

1 mark

A paper clip is measured using the ruler as shown.



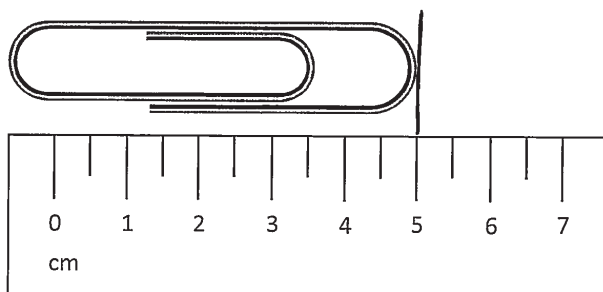
Explain why stating a measurement of 5 cm would be inaccurate.

Answer:

The paper clip was placed at the edge of the ruler instead of positioning it at 0 cm.

Exemplar 1

1 mark



because it does completely
touch where 5 cm would be.
It would maybe be 4.8 or 4.9 cm

Mark: 0 out of 1

Rationale: Incorrect answer

Exemplar 2

1 mark

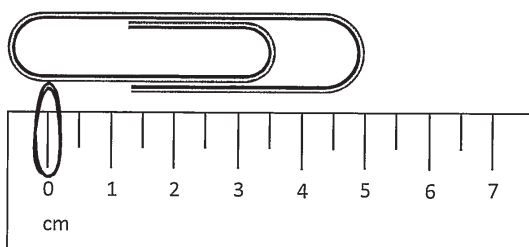
5 cm would be inaccurate because it doesn't
have smaller measurements that can actually
show the correct size.

Mark: 0 out of 1

Rationale: Incorrect answer

Exemplar 3

1 mark



Mark: 0.5 out of 1

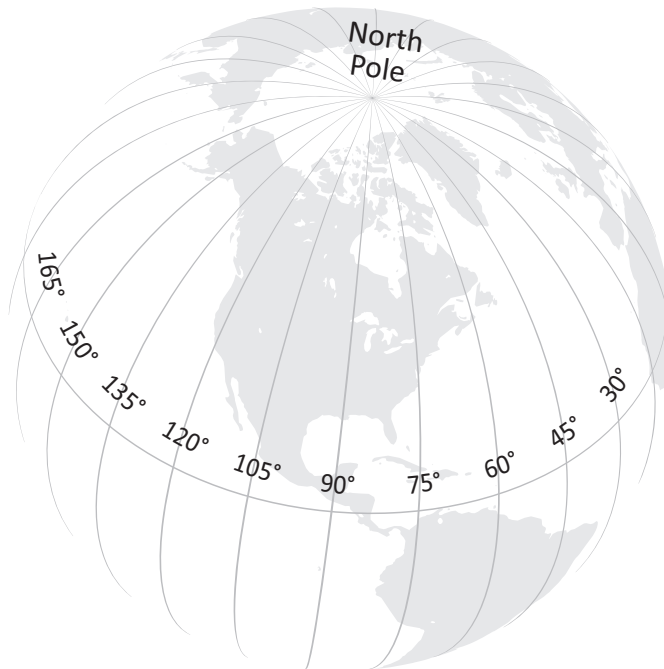
Rationale: Award full marks

0.5 mark deduction for lack of clarity (not explained)

Question 33 E5.P.1

2 marks

Given the following globe;



A) state the precision of the globe's longitude measurements. (1 mark)

Answer:

15° ← 1 mark

B) state the uncertainty of the globe's longitude measurements. (1 mark)

Answer:

± 7.5° ← 1 mark

Note to marker: ± is not required.

Exemplar 1

2 marks

A) 1°

B) 0.5°

Mark: 1 out of 2

Rationale: Incorrect answer in Part A
Correct answer in Part B (follow-through error)

Exemplar 2

2 marks

A) 15°

B) 30°

Mark: 1 out of 2

Rationale: Correct answer in Part A
Incorrect answer in Part B

Question 34 E5.P.1

2 marks

A can of soda is filled to 355 mL and has a tolerance of 3 mL. The nominal value of 355 mL is the midpoint of the acceptable values.

State the maximum and minimum volumes of soda.

Answer:

Maximum: 356.5 mL ← 1 mark for maximum value

Minimum: 353.5 mL ← 1 mark for minimum value

Exemplar 1

2 marks

Maximum: $355 + 3 = 358 \text{ ml}$ Minimum: $355 - 3 = 352 \text{ ml}$ **Mark: 1 out of 2****Rationale:** 1 mark for minimum value (follow-through error)

Exemplar 2

2 marks

Maximum: $335 \text{ ml} + \frac{1}{2}(3) = 336.5 \text{ ml}$ Minimum: $335 \text{ ml} - \frac{1}{2}(3) = 333.5$ **Mark: 2 out of 2****Rationale:** 1 mark for maximum value

1 mark for minimum value

E3 (transcription error)

E5 (missing units)

Question 35 E5.P.1

2 marks

Baking directions for cookies are to place them in the oven for 10 to 12 minutes.

A) State the tolerance of the baking time. (1 mark)

Answer:

2 minutes

← 1 mark

B) Explain one reason why tolerance is important when considering the baking time. (1 mark)

Sample answers:

- The cookies could be underbaked or overbaked.
- Oven temperatures could vary.

Exemplar 1

2 marks

A) tolerance = + or - 2

B) Tolerance is important because it can be the difference of the product coming out raw or baked to perfection

Mark: 1 out of 2

Rationale: Incorrect answer in Part A
Correct answer in Part B

Exemplar 2

2 marks

A) $\begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix}^+$

B) if you go over 2mins the cake could be overdone
if you go under 2mins the cake will be underdone

Mark: 1 out of 2

Rationale: Incorrect answer in Part A
Correct answer in Part B

Question 36 E5.P.1

2 marks

Ryanne has a wooden board that she measures to be $100 \text{ cm} \pm 0.5 \text{ cm}$.

She needs to remove 30 cm using the same measuring tape.

Calculate the final length of the board and express the answer in the form:

measurement $\pm$ uncertainty

Answer:

$$100 \text{ cm} \pm 0.5 \text{ cm}$$

$$\underline{-30 \text{ cm} \pm 0.5 \text{ cm}}$$

$$70 \text{ cm} \pm 1 \text{ cm}$$

← 1 mark for the measurement

← 1 mark for the uncertainty

Exemplar 12 marks

$$100\text{cm} - 30\text{cm} \\ = \boxed{70\text{cm} \pm 0.5}$$

Mark: 1 out of 2**Rationale:** 1 mark for the measurement

Exemplar 22 marks

$$30\text{cm} \pm 0.5\text{cm} = \begin{matrix} 30.5\text{cm} \\ 29.5\text{cm} \end{matrix}$$

Mark: 0 out of 2**Rationale:** Incorrect answer

Exemplar 32 marks

$$= 100 \pm 30\text{cm}$$

Mark: 0 out of 2**Rationale:** Incorrect answer

Probability

Question 37 E6.P.1

1 mark

The odds of being selected to sing in a televised competition are 2:48.

Calculate the probability of not being selected for this competition.

Answer:

$\frac{48}{50}$ or 0.96 or 96% or $\frac{24}{25}$

← 1 mark

Note to marker: Accept equivalent representations.

THIS PAGE WAS INTENTIONALLY LEFT BLANK.

Question 38 E6.P.1

3 marks

A graduation committee is selling tickets as a fundraiser and offers the following prizes:

Prize amount	Probability of winning
\$100	$\frac{1}{50}$
\$25	$\frac{1}{25}$
\$5	$\frac{1}{10}$
\$0	$\frac{21}{25}$

A ticket for the fundraiser costs \$5.

Calculate the expected value if you purchase one ticket. Show your work.

Answer:

$$\begin{aligned}EV &= \left(\frac{1}{50}\right)(95) + \left(\frac{1}{25}\right)(20) + \left(\frac{1}{10}\right)(0) + \left(\frac{21}{25}\right)(-5) \\&= 1.9 + 0.8 + 0 + (-4.2) \\&= -\$1.50\end{aligned}$$

← 1 mark for calculating gain
← 0.5 mark for calculating breakeven
← 0.5 mark for calculating loss

← 1 mark for addition

OR**Answer:**

$$\begin{aligned}EV &= \left(\frac{1}{50}\right)(100) + \left(\frac{1}{25}\right)(25) + \left(\frac{1}{10}\right)(5) - 5 \\&= 2.00 + 1.00 + 0.50 - 5.00 \\&= -\$1.50\end{aligned}$$

← 1.5 marks for calculating gain
← 0.5 mark for subtracting ticket cost

← 1 mark for addition

Exemplar 13 marks

$$EV = \left(\frac{1}{25}\right)(125) + \left(\frac{21}{25}\right)(-5)$$

5 + -4.2

$$EV = 0.8$$

Mark: 1.5 out of 3

Rationale: 0.5 mark for calculating loss
1 mark for addition
E6 (rounding)

Exemplar 23 marks

$$EV = \left(\frac{1}{50}\right)(\$95) + \left(\frac{1}{25}\right)(\$20) + \left(\frac{1}{10}\right)(0) - \left(\frac{21}{25}\right)(5)$$
$$EV = 1.9 + 0.8 + 0 - 4.2$$
$$EV = 1.52 - 4.2$$

$EV = -2.68$

Mark: 2.5 out of 3

Rationale: Award full marks
0.5 mark deduction for arithmetic error
E5 (missing units)

Exemplar 33 marks

$$\left(\frac{1}{50}\right)(95) + \left(\frac{1}{25}\right)(20) + \left(\frac{1}{10}\right)(0) - \left(\frac{21}{25}\right)(5)$$
$$1.9 + 0.8 + 0 - 4.2$$
$$= -1.5$$

Mark: 3 out of 3

Rationale: Award full marks
E5 (missing units)
E6 (rounding)

Question 39 E6.P.1

1 mark

A company assembles 2650 vehicles this month and can expect 0.3% of the vehicles to be defective.

Calculate how many vehicles they can expect to be defective this month.

Answer:

Number of defective vehicles = 0.003×2650

= 7.95

= 7 or 8 vehicles

← 1 mark

Exemplar 11 mark

$$2690 \times 0.3 = \underline{795}$$

Mark: 0 out of 1**Rationale:** Incorrect answer

Exemplar 21 mark

$$2650 \times 0.03 = 79.5 \text{ or } 80 \text{ vehicles}$$

to be defective

Mark: 0.5 out of 1**Rationale:** Award full marks
0.5 mark deduction for procedural error

Exemplar 31 mark

$$3650 \times 0.003 = 10.95$$

↳ 11 vehicles
may be defective
this month.

Mark: 1 out of 1**Rationale:** Award full marks
E3 (transcription error)

Exemplar 41 mark

$$2650 \times .003 = 7.95$$

7.95 vehicles could be defective

Mark: 1 out of 1**Rationale:** Award full marks
E4 (whole units)

Question 40 E6.P.1

2 marks

Aly has a 20-sided die, numbered from 1 to 20.

A) Determine the probability of Aly rolling an odd number greater than 20. (1 mark)

Answer:

0

← 1 mark

B) Determine the odds of Aly rolling a multiple of 4. (1 mark)

Answer:

5 : 15 or 1 : 3

← 1 mark

THIS PAGE WAS INTENTIONALLY LEFT BLANK.

Question 41 E6.P.1

2 marks

A box contains 4 blue candies and 5 orange candies.

A) Calculate the probability of randomly picking a blue candy. (1 mark)

Answer:

$\frac{4}{9}$ or 0.44 or 44.44% ← 1 mark

B) The blue candy in part A was eaten and not replaced in the box.

Calculate the probability of randomly picking another blue candy. (1 mark)

Answer:

$\frac{3}{8}$ or 0.38 or 37.5% ← 1 mark

Note to marker: Accept equivalent representations.

Exemplar 12 marks

A) $\frac{4}{9}$ 44%

B) $\frac{3}{8}$ 38%

Mark: 2 out of 2**Rationale:** Award full marks

E6 (rounding) in Part A and B

Exemplar 22 marks

A) $P(\text{Blue}) = \frac{4}{9}$

B) $P(\text{Blue}) = \frac{3}{9}$

Mark: 1 out of 2**Rationale:** Correct answer in Part A

Incorrect answer in Part B

Exemplar 32 marks

A) $5:9$

B) $4:8$

Mark: 1 out of 2**Rationale:** Incorrect answer in Part A

Correct answer in Part B (follow-through error)

Question 42 E6.P.1

2 marks

A candle manufacturer produces candles in five different fragrances. Their sales in May are shown in the following table:

Candle Fragrance	Number Sold in the Month of May
Lavender	163
Fir	95
Vanilla	182
Cinnamon	73
Maple	42

A) Calculate the theoretical probability of a customer choosing the fir fragrance. (1 mark)

Answer:

$$\frac{1}{5} \text{ or } 0.20 \text{ or } 20\%$$

← 1 mark

B) Calculate the experimental probability of a customer choosing the fir fragrance. (1 mark)

Answer:

$$\begin{aligned} \text{Total sold} &= 163 + 95 + 182 + 73 + 42 \\ &= 555 \end{aligned}$$

$$P(\text{fir}) = \frac{95}{555} \text{ or } \frac{19}{111} \text{ or } 0.17 \text{ or } 17.12\%$$

← 1 mark

Exemplar 1

2 marks

A) $\frac{95}{555} = 12.12\%$

B) $\frac{1}{5} = 20\%$

Mark: 1 out of 2

Rationale: Incorrect answer in Part A
Correct answer in Part B (follow-through error)

Exemplar 2

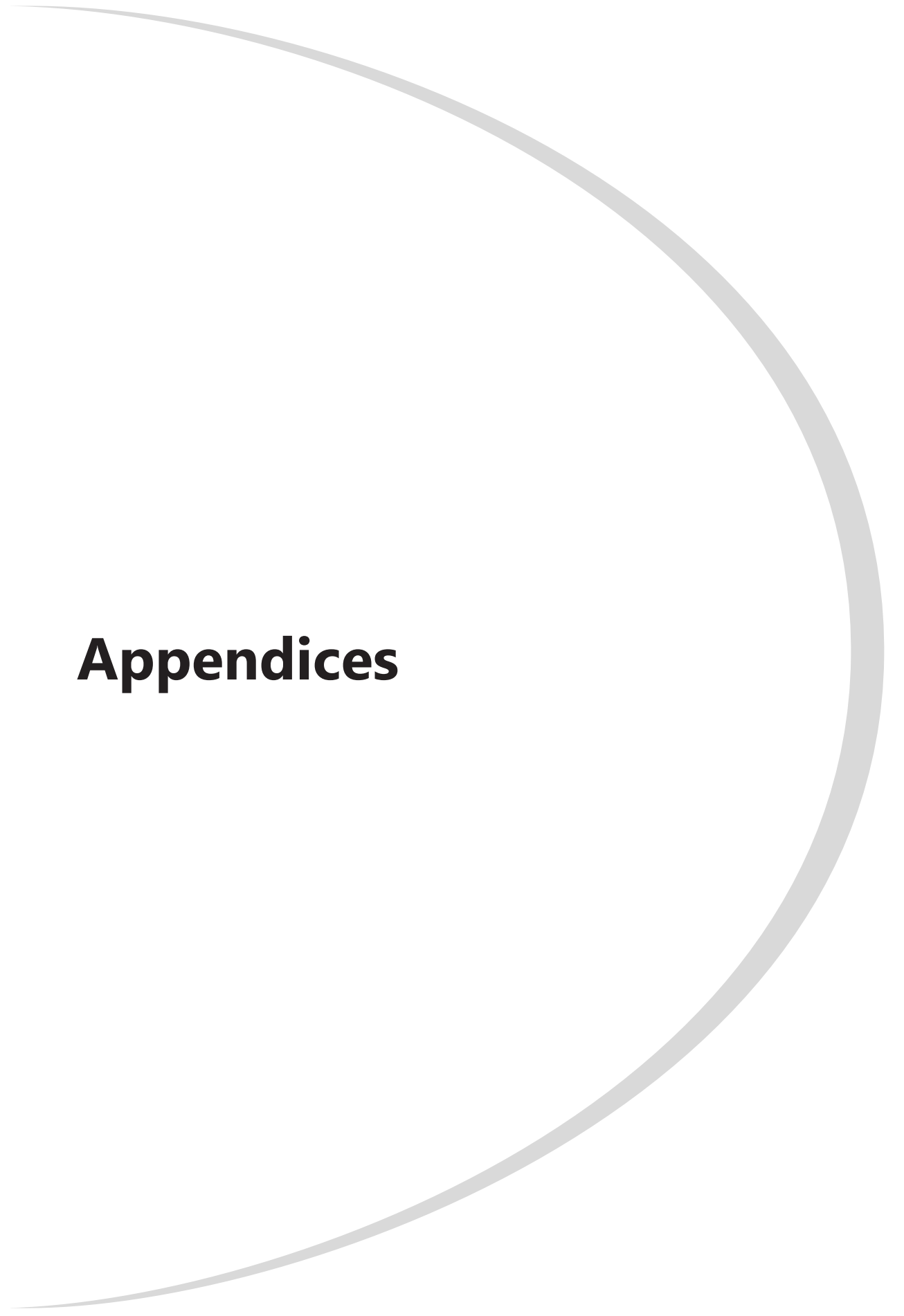
2 marks

A) $\frac{95}{555}$

B) $95/555$

Mark: 1 out of 2

Rationale: Incorrect answer in Part A
Correct answer in Part B



Appendices

Appendix A: Table of Questions by Unit and Learning Outcome

Vehicle Finance		
Question	Learning Outcome	Mark
1 a)	E5.V.1	2
1 b)	E5.V.1	2
2	E5.V.1	1
3	E5.V.1	3
4 a)	E5.V.1	1
4 b)	E5.V.1	1
5	E5.V.1	1
6	E5.V.1	2
7	E5.V.1	3
		Total = 16

Statistics		
Question	Learning Outcome	Mark
8 a)	E5.S.1	2
8 b)	E5.S.1	1
9	E5.S.2	2
10	E5.S.1	3
11	E5.S.1	1
12	E5.S.1	3
13 a)	E5.S.1	1
13 b)	E5.S.1	1
		Total = 14

Geometry and Trigonometry		
Question	Learning Outcome	Mark
14	E6.G.1	2
15	E6.G.1	3
16	E6.G.2	1
17	E6.G.2	1
18 a)	E6.G.2	1
18 b)	E6.G.2	1
19	E6.G.2	1
20 a)	E6.G.2	1
20 b)	E6.G.2	1
		Total = 12

Home Finance		
Question	Learning Outcome	Mark
21 a)	E6.H.1	3
21 b)	E6.H.1	1
22	E6.H.1	1
23	E6.H.1	2
24	E6.H.1	1
25 a)	E6.H.1	1
25 b)	E6.H.1	1
25 c)	E6.H.1	1
26	E6.H.1	1
27	E6.H.1	2
28	E6.H.1	1
29	E6.H.1	3
30	E6.H.1	1
		Total = 19

Precision Measurement		
Question	Learning Outcome	Mark
31	E5.P.1	1
32	E5.P.1	1
33 a)	E5.P.1	1
33 b)	E5.P.1	1
34	E5.P.1	2
35 a)	E5.P.1	1
35 b)	E5.P.1	1
36	E5.P.1	2
		Total = 10

Probability		
Question	Learning Outcome	Mark
37	E6.P.1	1
38	E6.P.1	3
39	E6.P.1	1
40 a)	E6.P.1	1
40 b)	E6.P.1	1
41 a)	E6.P.1	1
41 b)	E6.P.1	1
42 a)	E6.P.1	1
42 b)	E6.P.1	1
		Total = 11

Appendix B: Irregularities in Provincial Tests

A Guide for Local Marking

During the marking of provincial tests, irregularities are occasionally encountered in test booklets. The following list provides examples of irregularities for which an *Irregular Test Booklet Report* should be completed and sent to the department:

- completely different penmanship in the same test booklet
- incoherent work with correct answers
- notes from a teacher indicating how he or she has assisted a student during test administration
- student offering that he or she received assistance on a question from a teacher
- student submitting work on unauthorized paper
- evidence of cheating or plagiarism
- disturbing or offensive content
- no responses provided by the student or only incorrect responses (“0”)

Student comments or responses indicating that the student may be at personal risk of being harmed or of harming others are personal safety issues. This type of student response requires an immediate and appropriate follow-up at the school level. In this case, please ensure the department is made aware that follow-up has taken place by completing an *Irregular Test Booklet Report*.

Except in the case of cheating or plagiarism where the result is a provincial test mark of 0%, it is the responsibility of the division or the school to determine how they will proceed with irregularities. Once an irregularity has been confirmed, the marker prepares an *Irregular Test Booklet Report* documenting the situation, the people contacted, and the follow-up. The original copy of this report is to be retained by the local jurisdiction and a copy is to be sent to the department along with the test materials.

Irregular Test Booklet Report

Test: _____

Date marked: _____

Booklet No.: _____

Problem(s) noted: _____

Question(s) affected: _____

Action taken or rationale for assigning marks: _____

Follow-up: _____

Decision: _____

Marker's Signature: _____

Principal's Signature: _____

For Department Use Only—After Marking Complete

Consultant: _____

Date: _____

Appendix C: Marking Guidelines

Errors that are conceptually related to the learning outcomes associated with the question will result in a 1 mark deduction.

Each time a student makes one of the following errors, a 0.5 mark deduction will apply:

- arithmetic error
- procedural error
- terminology error in explanation
- lack of clarity in written responses

Communication Errors

The following errors, which are not conceptually related to the learning outcomes associated with the question, may result in a 0.5 mark deduction. Each error can only be deducted once per test and is tracked in a separate section on the *Scoring Sheet*.

The total mark deduction for communication errors for any student response is not to exceed the marks awarded for that response. For example, there would be no communication error deductions if no marks were awarded for a given response.

E1 (Final answer)

- final answer not stated
- final answer not clearly indicated
- answer presented in another part of question

E2 (Notation)

- notation error
- inappropriate use of equal sign

E3 (Transcription/Transposition)

- makes a transcription error (inaccurate transferring of information from one part of the page to another)
- makes a transposition error (changing order of digits)

E4 (Whole Units)

- does not use whole units in contextual questions involving discrete data (e.g., people, cans of paints)

E5 (Units)

- uses incorrect units of measure
- does not include units in final answer (e.g., missing dollar sign for monetary values, missing degrees for angles)
- answer stated in gradians or radians instead of degrees

E6 (Rounding)

- rounds incorrectly
- rounds too soon
- does not express the answer to the appropriate number of decimal places (e.g., monetary values are not expressed to two decimals)