

Grade 12  
Essential Mathematics  
Achievement Test

# **Marking Guide**

January 2017

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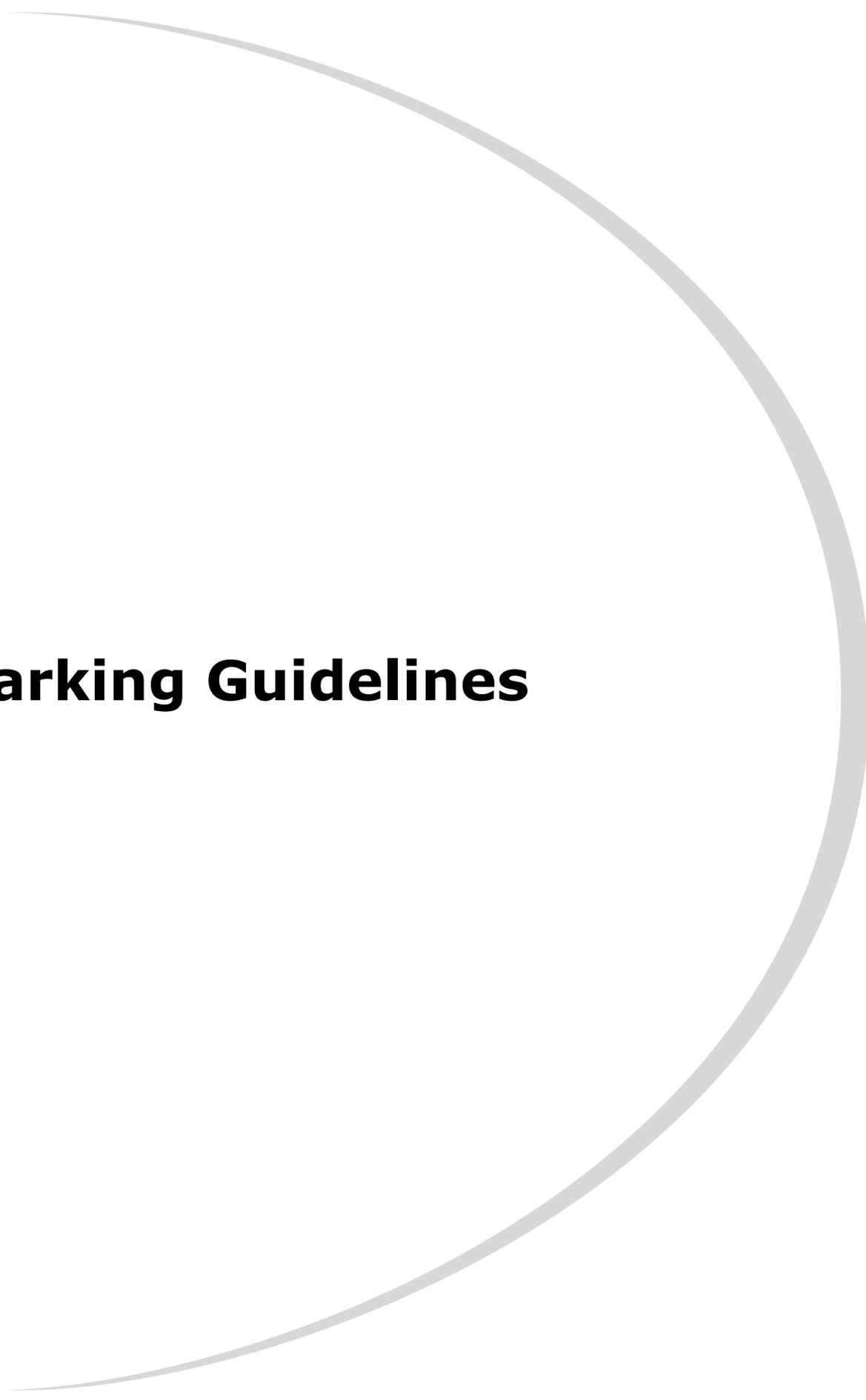
While the department is committed to making its publications as accessible as possible, some parts of this document are not fully accessible at this time.

Available in alternate formats upon request.

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# **Marking Guidelines**



# Marking Guidelines

The *Grade 12 Essential Mathematics Achievement Test: Marking Guide (January 2017)* 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 Training 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.

## 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 E4 errors (0.5 mark deduction).

| COMMUNICATION ERRORS/ERREURS DE COMMUNICATION  |                             |  |  |                                 |
|--|-----------------------------|--|--|---------------------------------|
| Shade in the circles below for a maximum total deduction of 2.5 marks (0.5 mark deduction per error type). Refer to <i>Marking Guide</i> for details |                             | Noircir les cercles ci-dessous pour une déduction maximale totale de 2,5 points (déduction de 0,5 point par type d’erreur). Consultez le <i>Guide de Correction</i> pour plus de détails |  |                                 |
| E1<br><input checked="" type="radio"/>   | E2<br><input type="radio"/> | E3<br><input type="radio"/>  | E4<br><input checked="" type="radio"/> | E5<br><input type="radio"/>     |
| Rounding/<br>Arrondissement  | Units/<br>Unités            | Transcription<br>Transposition   | Final Answer/<br>Réponse finale        | Whole Units/<br>Unités entières |

|                                   |                                       |   |   |   |           |
|-----------------------------------|---------------------------------------|---|---|---|-----------|
| <b>Test mark / Note au test :</b> | <b>56</b>                             | - | <b>1</b>  | = | <b>55</b> |
|                                   | Preliminary Mark<br>Note préliminaire |   | Communication Errors<br>(maximum 2.5 marks)<br>Erreurs de communication<br>(maximum 2,5 points) |   | <b>76</b> |

## Marking Guidelines

### Table Values

One mark will be awarded to a student that circles the correct value in a given table. In other words, this will be considered the equivalent of the student writing the correct value in the space provided.

## 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 the simple 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” and/or “NR” 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 Training 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.

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# Home Finance

## Question 1

E6.H.1

3 marks

Mika's monthly mortgage payment is \$1100. His annual heating bill is \$2160, his annual property tax bill is \$3600, and his annual income is \$66 000. The bank calculated his Gross Debt Service Ratio (GDSR) as follows:

$$GDSR = \frac{\left( \begin{array}{ccc} \text{Monthly} & \text{Monthly} & \text{Monthly} \\ \text{mortgage} & + \text{property} & + \text{heating} \\ \text{payment} & \text{taxes} & \text{costs} \end{array} \right)}{\text{Gross monthly income}} \times 100$$

$$\begin{aligned} GDSR &= \frac{(\$1100 + \$300 + \$2160)}{\$5500} \times 100 \\ &= \frac{\$3560}{\$5500} \times 100 \\ &= 64.73\% \end{aligned}$$

A) State the error made by the bank. (1 mark)

**Answer:**

The bank did not change the annual heating bill to a monthly heating bill.

**Note to marker:** Award 1 mark if the error is circled in the equation.

B) Determine the correct GDSR. (2 marks)

**Answer:**

Monthly heating cost:  $\$2160 \div 12$   
 $= \$180$

$$GDSR = \frac{(\$1100 + \$300 + \$180)}{\$5500} \times 100 \left. \begin{array}{l} \\ \\ \end{array} \right\} \leftarrow 1 \text{ mark for process}$$
$$= \frac{\$1580}{\$5500} \times 100$$

$$GDSR = 28.73\%$$

$\leftarrow$  1 mark

**Exemplar 1**

(3 marks)

A) He did not divide his annual Property tax by 12, to get monthly

B) 
$$\frac{\$1100 + \$300 + \$180}{\$5500}$$

$$\frac{1580}{5500} = 28.27\%$$

**Mark: 2 out of 3****Rationale:** Incorrect response in Part A

Correct answer in Part B (2 marks)

E3 (makes a transposition error: final answer)

**Exemplar 2**

(3 marks)

A) 
$$\begin{aligned} 2160 \div 12 &= 180 \\ 3600 \div 12 &= 300 \\ 66000 \div 12 &= 5500 \end{aligned}$$

B) 
$$GDSR = \frac{1580}{5500} \times 100 = 28.72\%$$

$$GDSR = \frac{1000 + 180 + 300}{5500}$$

$$\frac{1580}{5500} \times 100 \\ 28.72\%$$

**Mark: 3 out of 3****Rationale:** Correct response in Part A (1 mark)

E4 (final answer not clearly indicated)

Correct answer in Part B (2 marks)

E1 (rounds incorrectly)

**Exemplar 3**

(3 marks)

A) 
$$\frac{1100 + 300 + 180}{5500} \times 100$$

$$28.73\%$$

B) **Mark: 3 out of 3****Rationale:** Correct response in Part A (1 mark)

E4 (final answer not clearly indicated)

Correct answer in Part B (2 marks)

**Question 2**

E6.H.1

2 marks

Wilhelm is purchasing a property valued at \$192 000. The land transfer tax is calculated as follows:

| <b>Land Transfer Tax Table</b>                         |                 |                        |
|--|-----------------|------------------------|
| <b>Value of Property</b>                               | <b>Rate (%)</b> | <b>Tax Amount (\$)</b> |
| On the first \$30 000                                  | 0%              | \$0                    |
| On the next \$60 000<br>(i.e., \$30 001 to \$90 000)   | 0.5%            | \$300                  |
| On the next \$60 000<br>(i.e., \$90 001 to \$150 000)  | 1.0%            | \$600                  |
| On the next \$50 000<br>(i.e., \$150 001 to \$200 000) | 1.5%            |                        |
| On amounts in excess of \$200 000                      | 2.0%            |                        |
| Total Land Transfer Tax Due:                           |                 |                        |

Calculate the total land transfer tax due.

**Answer:**

$$\$192\,000 - \$150\,000 = \$42\,000$$

$$\left. \begin{array}{l} \text{Tax on next } \$42\,000: \$42\,000 \times 0.015 \\ = \$630 \end{array} \right\}$$

← 1 mark for process

$$\begin{aligned} \text{Land transfer tax due: } & \$0 + \$300 + \$600 + \$630 \\ & = \$1530 \end{aligned}$$

← 1 mark

**Exemplar 1**

(2 marks)

$$\begin{array}{l}
 30\,000 \times 0\% = 30\,000 \\
 60\,000 \times 0.5\% = 300 \qquad 750 + 600 + 300 = 1650 \\
 60\,000 \times 0.01\% = 600 \qquad 1650 \times 1.13 = 1864.6 \\
 50\,000 \times 1.5\% = 750
 \end{array}$$

**Mark: 0 out of 2****Rationale:** Incorrect calculation of tax on next \$42 000

Incorrect final answer

E2 (does not include units in final answer)

E4 (final answer not clearly indicated)

Note: No communication error deductions because no marks were awarded.

**Exemplar 2**

(2 marks)

$$\begin{array}{l}
 \$30\,000 = \$0 \\
 \$60\,000 = \$300 \\
 \$60\,000 = \$600 \\
 \underline{\$42\,000 = \$630} \\
 = \$192\,000 \quad = \$1530 \quad = 3\% \\
 = 193\,530 \\
 -97\%
 \end{array}$$

**Mark: 2 out of 2****Rationale:** Correct answer (2 marks)

E4 (too much information is presented in the answer)

E4 (final answer not clearly indicated)

**Exemplar 3**

(2 marks)

$$\begin{array}{r}
 \$192,000 \\
 - \$150,000 \\
 \hline
 = \$42,000 \\
 = \$42,000 \\
 \times 0.015 \\
 \hline
 \$630
 \end{array}
 \qquad
 \begin{array}{r}
 \$300 \\
 + \$300 \\
 + \$630 \\
 \hline
 \$1230
 \end{array}$$

**Mark: 2 out of 2****Rationale:** Correct answer (2 marks)

E3 (makes a transcription error: the tax amount between \$90 000 to \$150 000)

**Question 3**

E6.H.1

3 marks

When purchasing a home a homeowner must consider one-time costs as well as on-going expenses.

State whether the following are one-time or on-going expenses.

i) Mortgage payment: \_\_\_\_\_

ii) Hiring movers: \_\_\_\_\_

iii) Land survey: \_\_\_\_\_

**Answer:**

i) Mortgage payment: on-going ← 1 mark

ii) Hiring movers: one-time ← 1 mark

iii) Land survey: one-time ← 1 mark

**Note to marker:** Award a maximum of 1 mark for each line.



**Question 4**

E6.H.1

2 marks

Josh has recently graduated from college and is looking for work in a new town.

Explain 2 reasons why Josh should rent rather than buy a place to live while searching for work.

Place one response per line.

1. \_\_\_\_\_

2. \_\_\_\_\_

**Sample answers:**

- little to no maintenance
- can move with little notice
- no need to be pre-approved from the bank
- cheaper initial purchase costs (no lawyer, land transfer tax, CMHC fee)
- utilities may be included
- faster move-in

(2 × 1 mark)

**Note to marker:** Award a maximum of 1 mark for each line.

**Note to marker:** Do not accept insufficient responses such as:

- cheaper
- easier

**Exemplar 1**

(2 marks)

1. He will have less expenses.
2. He will be able to save money.

**Mark: 0 out of 2****Rationale:** Two incorrect responses (insufficient explanations)**Exemplar 2**

(2 marks)

1. Josh will not have enough money to buy a place.
2. If Josh rents a place, he does not need to do repairs.

**Mark: 1 out of 2****Rationale:** One correct response (repairs) (1 mark)**Exemplar 3**

(2 marks)

1. He should rent because there are no maintenance costs.
2. The cost of insurance is cheaper.

**Mark: 2 out of 2****Rationale:** Two correct responses (2 marks)

**Question 5**

E6.H.1

3 marks

Bilal purchased a home for \$350 000 and made a minimum down payment of 5%. He obtained a mortgage at an interest rate of 4% over 25 years. The amortization rate is \$5.26 per thousand dollars borrowed.

A) Calculate the monthly mortgage payment. (2 marks)

**Answer:**

$$\begin{array}{l} \text{Down payment: } \$350\,000 \times 0.05 \\ \qquad \qquad \qquad = \$17\,500 \\ \\ \text{Mortgage amount: } \$350\,000 - \$17\,500 \\ \qquad \qquad \qquad = \$332\,500 \end{array} \left. \vphantom{\begin{array}{l} \text{Down payment: } \\ \text{Mortgage amount: } \end{array}} \right\} \leftarrow 1 \text{ mark for process}$$

Table value: \$5.26

$$\begin{array}{l} \text{Monthly payment: } \frac{\$332\,500}{1000} \times \$5.26 \\ \qquad \qquad \qquad = \$1748.95 \end{array} \quad \leftarrow 1 \text{ mark}$$

B) Calculate the total interest paid over 25 years. (1 mark)

**Answer:**

$$\begin{array}{l} \text{Total payments: } \$1748.95 \times 12 \times 25 \\ \qquad \qquad \qquad = \$524\,685 \end{array}$$

$$\begin{array}{l} \text{Interest paid: } \$524\,685 - \$332\,500 \\ \qquad \qquad \qquad = \$192\,185 \end{array} \quad \leftarrow 1 \text{ mark}$$

**Exemplar 1**

(3 marks)

A) *Down payment*  
 $350\,000 \times 0.05 = 17\,500$   
 $350\,000 - 17\,500 = \$322\,500$

$$\text{Monthly payment} = \frac{\text{Total Amount}}{1000} \times \text{table value}$$

$$\frac{322\,500}{1000} \times 5.26 = \$1696.35$$

*Table value*  
= 5.26

B) *Borrowed amount*  $\times 1\%$   
 $\frac{\quad}{12} =$

$$\frac{322,500 \times 5.26}{12} = \$145\,745.83$$

**Mark: 2 out of 3**

**Rationale:** Correct mortgage amount in Part A (1 mark)  
 Correct answer in Part A (follow-through error) (1 mark)  
 E3 (transcription error)  
 Incorrect answer in Part B

**Exemplar 2**

(3 marks)

A)  $\frac{\$5.26}{1000} = \frac{x}{\$350\,000} = \$1841$   
 $1841 \times 0.05 = \$92.05$   $\$1841 - 92.05 = \$1748.95$

B)  $25 \times 12 = 300$  monthly  
 $\$1748.95 \times 300 = \$524\,685$

**Mark: 2 out of 3**

**Rationale:** Correct answer in Part A (2 marks)  
 Incorrect answer in Part B

**Exemplar 3**

(3 marks)

A)  $\frac{\$5.26}{1000} = \frac{x}{350\,000}$  Monthly payment \$1841

B)  $25 \cdot 12 = 300$  payments  
 $1841 \cdot 300 = 552\,300$   
 $552\,300 - 350\,000 = I = \$202\,300$

**Mark: 2 out of 3**

**Rationale:** Incorrect mortgage amount calculation in Part A  
 Correct monthly payment in Part A (follow-through error) (1 mark)  
 Correct total interest paid in Part B (follow-through error) (1 mark)

**Question 6**

E6.H.1

3 marks

Jaiyi is purchasing a new high efficiency furnace. Her two options are as follows:

|          | <b>Initial Cost</b> | <b>Monthly Heating Cost</b> |
|----------|---------------------|-----------------------------|
| Option A | \$5000              | \$100                       |
| Option B | \$2000              | \$140                       |

- A) Calculate the difference in cost between Option A and Option B at the end of 5 years. (2 marks)

**Answer:**

$$\left. \begin{array}{l} \text{Option A: } (\$100 \times 60) + \$5000 = \$11\,000 \\ \text{Option B: } (\$140 \times 60) + \$2000 = \$10\,400 \end{array} \right\} \leftarrow 1 \text{ mark for process}$$

$$\begin{array}{l} \text{Difference: } \$11\,000 - \$10\,400 \\ \qquad \qquad = \$600 \end{array} \qquad \qquad \qquad \leftarrow 1 \text{ mark}$$

- B) Justify whether Jaiyi should choose Option A or Option B. (1 mark)

**Sample answers:**

- Jaiyi should choose Option A because, in the long run, she will save money.
- Jaiyi should choose Option B because the initial cost is less.

**Exemplar 1**

(3 marks)

A) Option A =  $5000 + (100 \cdot 62) = \$11\,200$   
Option B =  $2000 + (140 \cdot 62) = 8680$

B) With time, furnace A will start to give her money. The costs are lower and the furnace will stay for at least 10 years.

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

Correct response in Part B (1 mark)

**Exemplar 2**

(3 marks)

A)  $5 \times 12 = 60$   
 $100 \times 60 = \$6000$   
 $6000 + 5000 = \$11\,000$   
 $140 \times 60 = 8400$   
 $8400 + \$2000 = \$10\,400$   
 $11000 - \$10\,400 = \$600$

B) Jaiyi should choose Option A because the monthly heating cost is less expensive but Option B will be the better choice because in the long term it is less expensive.

**Mark: 2 out of 3****Rationale:** Correct answer in Part A (2 marks)

Incorrect response in Part B

**Exemplar 3**

(3 marks)

A) Option A  
 $\$100 \times 12 = \$1200$   
Heating cost for five years =  
 $\$1200 \times 5 = \$6000$

Option B  
 $\$140 \times 12 = \$1680$   
Heating cost for five years =  
 $\$1680 \times 5 = \$8400$   
difference =  $8400 - 6000 = \$2400$

B) Jaiyi should choose Option A because there are a lot less costs and she can save \$2400 of her own money,

**Mark: 2 out of 3****Rationale:** Correct final answer in Part A (follow-through) (1 mark)

Correct response in Part B (follow-through) (1 mark)

# Probability

## Question 7

E6.P.1

2 marks

State the probability of 43% as a fraction and a decimal.

Fraction: \_\_\_\_\_

Decimal: \_\_\_\_\_

**Answer:**

Fraction:  $\frac{43}{100}$  ← 1 mark

Decimal: 0.43 ← 1 mark



**Question 8**

E6.P.1

2 marks

A sports store sells lacrosse sticks. Out of 500 sold, 55 are defective. The manufacturer says that 5 out of 100 is the expected number of defective sticks.

A) State the theoretical probability of a stick being defective. (1 mark)

**Answer:**

$\frac{5}{100}$  or 0.05 or 5% or five out of one hundred or 5 : 100

**Note to marker:** Accept equivalent representations.

B) State the experimental probability of a stick being defective. (1 mark)

**Answer:**

$\frac{55}{500}$  or 0.11 or 11% or fifty-five out of five hundred or 55 : 500

**Note to marker:** Accept equivalent representations.

**Exemplar 1**

(2 marks)

A)  $\frac{5}{100}$        $\frac{55}{500} = 11$        $\frac{55}{100}$

$= \frac{55}{100} \frac{55}{100}$

B)  $\frac{55}{100} \times 100$   
 = 11 sticks would be defective

**Mark: 0 out of 2**

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

**Exemplar 2**

(2 marks)

A) 500 sold  
 25 broken

B) 500 sold  
 55 broken

**Mark: 0 out of 2**

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

**Exemplar 3**

(2 marks)

A)  $5 / 100 = .05 \times 500 = 25$

B)  $55 / 100 = .55 \times 500 = 275$

**Mark: 1 out of 2**

**Rationale:** Correct answer in Part A (1 mark)  
 E4 (too much information is presented in answer)  
 E4 (final answer not clearly indicated)  
 Incorrect answer in Part B

**Question 9**

E6.P.1

3 marks

The probability of winning a computer programming contract is 28%. The contract is worth \$12 000 but it costs \$2300 to prepare the contract.

Calculate the expected value (EV) of the contract.

**Answer 1:**

$$\text{\$gain: } \$12\,000 - \$2300 = \$9700$$

$$\text{\$loss: } \$2300$$

$$EV = P(\text{win}) \times \text{\$gain} - P(\text{lose}) \times \text{\$loss}$$

$$EV = (0.28)(\$9700) - (0.72)(\$2300)$$

{ 0 marks for 1 correct substitution  
OR  
1 mark for 2 or 3 correct substitutions  
OR  
2 marks for 4 correct substitutions

$$EV = \$2716 - \$1656$$

$$EV = \$1060$$

← 1 mark

**OR**

**Answer 2:**

$$\text{Average earnings: } (0.28)(\$12\,000)$$

$$= \$3360 \quad \leftarrow 2 \text{ marks}$$

$$EV = \$3360 - \$2300$$

$$= \$1060 \quad \leftarrow 1 \text{ mark}$$

**Exemplar 1**

(3 marks)

$$\begin{aligned}EV &= P(\text{win}) \times \$\text{gain} - P(\text{lose}) \times \$\text{loss} \\ &= 28\% \times 9700 - 0 \times 0 \\ &= 271600 - 0 \\ &= \$271600\end{aligned}$$

**Mark: 1 out of 3****Rationale:** 2 correct substitutions (1 mark)  
Incorrect final answer**Exemplar 2**

(3 marks)

$$\begin{aligned}P(.28) \times (12000) - P(.72) \times (2300) \\ 3360 - 1656 \\ EV = \$1704\end{aligned}$$

**Mark: 2 out of 3****Rationale:** 3 correct substitutions (1 mark)  
Correct final answer (follow-through error) (1 mark)**Exemplar 3**

(3 marks)

$$.28 \times 9700 - .72 \times 2300 = \$4372$$

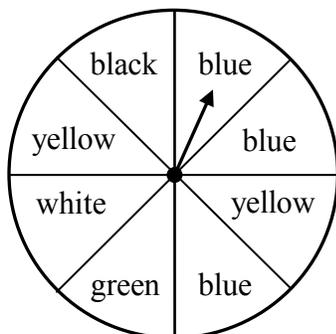
**Mark: 2 out of 3****Rationale:** 4 correct substitutions (2 marks)  
Incorrect final answer

**Question 10**

E6.P.1

2 marks

Given the following spinner:



A) State the probability of the arrow landing on yellow. (1 mark)

**Answer:**

$\frac{2}{8}$  or 0.25 or 25% or two out of eight or 2 : 8

**Note to marker:** Accept equivalent representations.

B) State the odds in favour of the arrow landing on blue. (1 mark)

**Answer:**

3 : 5 or 3 to 5

**Note to marker:** Accept equivalent representations.

**Exemplar 1**

(2 marks)

A)  $0.25\%$

B)  $3:8$

**Mark: 0 out of 2****Rationale:** Incorrect answer in Part A

Incorrect answer in Part B

**Exemplar 2**

(2 marks)

A)  $2:8$  or  $1:4$   
 $\frac{2}{8}$  or  $\frac{1}{4}$

B)  $2:6$  or  $1:3$   
 $\frac{2}{6}$  or  $\frac{1}{3}$

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

Incorrect answer in Part B

**Exemplar 3**

(2 marks)

A)  $\frac{2}{8} = \frac{1}{4}$

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

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

Incorrect answer in Part B

**Question 11** E6.P.1

1 mark

During a hockey season, 75 of the 400 games went into overtime.

State the odds **against** a game going into overtime.

**Answer:**

325 : 75    or    325 to 75

**Note to marker:** Accept equivalent representations.

**Exemplar 1**

(1 mark)

 $400:75$ **Mark: 0 out of 1****Rationale:** Incorrect answer

**Question 12**

E6.P.1

1 mark

Choose the letter that best completes the statement below.

Probability compares the number of favourable outcomes to the

- a) odds for the event
- b) odds against the event
- c) total number of outcomes
- d) theoretical probability

**Answer:**     c)



# Vehicle Finance

## Question 13

E5.V.1

2 marks

State 2 costs of operating a vehicle, other than car payments and car insurance.

Place one response per line.

1. \_\_\_\_\_

2. \_\_\_\_\_

### Sample answers:

- fuel
- oil changes
- tune-up
- replacing tires
- driver's license
- paying for repairs due to accidents
- paying for parking or traffic tickets

(2 × 1 mark)

**Note to marker:** Award a maximum of 1 mark for each line.

**Exemplar 1**

(2 marks)

1.     *maintenance*
2.     *car wash*

**Mark: 1 out of 2****Rationale:** One correct response (car wash is a form of maintenance) (1 mark)**Exemplar 2**

(2 marks)

1.     *buying gas*
2.     *any repairs or maintenance*

**Mark: 2 out of 2****Rationale:** Two correct responses (2 marks)

**Question 14**

E5.V.1

3 marks

Izzy wants to buy a new car with a base price of \$22 500 before taxes. She wants the following options worth \$2450 before taxes: leather seats, sunroof, and chrome wheels.

A) State the sticker price of the car. (1 mark)

**Answer:**

$$\begin{aligned} & \$22\,500 + \$2450 \\ & = \$24\,950 \qquad \leftarrow 1 \text{ mark} \end{aligned}$$

B) Izzy has a car to trade-in worth \$12 250.

Calculate the total cost of her new car after taxes. (2 marks)

**Answer:**

$$\begin{aligned} \text{Total cost before tax: } & \$24\,950 - \$12\,250 \\ & = \$12\,700 \qquad \leftarrow 1 \text{ mark} \end{aligned}$$

$$\begin{aligned} \text{Total cost after tax: } & \$12\,700 \times 1.13 \\ & = \$14\,351 \qquad \leftarrow 1 \text{ mark} \end{aligned}$$

**Exemplar 1**

(3 marks)

A)  $\$12\,700$

B)  $\$14\,351$

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

Correct cost after tax in Part B (1 mark)

**Exemplar 2**

(3 marks)

A) 
$$\begin{array}{r} 22,500 \\ +2450 \\ \hline 24\,950 \\ -12\,250 \\ \hline 12\,700 \\ -1.13 \\ \hline 12\,698.87 \end{array}$$

B) 
$$\begin{array}{r} 12\,698.87 \\ +1.13 \\ \hline 12\,700 \end{array}$$

**Mark: 2 out of 3****Rationale:** Correct answer in Part A (1 mark)

E2 (does not include units in final answer)

E4 (final answer not clearly indicated)

E4 (too much information is presented in answer)

Correct answer in Part B (1 mark)

E2 (does not include units in final answer)

**Exemplar 3**

(3 marks)

A) 
$$\begin{aligned} 22,500 + 2450 - 12\,250 \\ = \$12\,700.00 \end{aligned}$$

B) 
$$\begin{aligned} 12\,700.00 \times 1.13 \\ = \$14351.00 \end{aligned}$$

**Mark: 2 out of 3****Rationale:** Incorrect answer in Part A

Correct answer in Part B (2 marks)

**Question 15**

E5.V.1

3 marks

Barry wants to lease a new car valued at \$23 275 before taxes. The payment for the car is \$340 per month plus taxes for a 4-year lease with a down payment of \$2000.

A) Calculate the total cost for leasing this car. (2 marks)

**Answer:**

$$\begin{aligned} \text{Monthly lease payment: } & \$340 \times 1.13 \\ & = \$384.20 \qquad \leftarrow 1 \text{ mark} \end{aligned}$$

$$\begin{aligned} \text{Total cost for leasing: } & (\$384.20 \times 4 \times 12) + \$2000 \\ & = \$20\,441.60 \qquad \leftarrow 1 \text{ mark} \end{aligned}$$

B) State the residual value of the car before taxes using a 40% residual rate. (1 mark)

**Answer:**

$$\begin{aligned} & \$23\,275 \times 0.40 \\ & = \$9310 \qquad \leftarrow 1 \text{ mark} \end{aligned}$$

**Exemplar 1**

(3 marks)

- A) 2000
- B)  $23275 \times 0.4$   
 = 9310 before  
 = 10,520.30 after

**Mark: 1 out of 3**

**Rationale:** Incorrect monthly lease payment in Part A  
 Incorrect total leasing cost in Part A  
 Correct answer in Part B (1 mark)  
 E2 (does not include units in final answer)

**Exemplar 2**

(3 marks)

- A) *month*  
 payment:  $340 \times 4 \times 12 = \$16,320 + 2000$   
 =  $\boxed{\$18,320}$
- B) *Residual*  
 rate:  $0.4\% \times 23,275 \times 1.13$   
 =  $\boxed{\$10,520.30}$

**Mark: 1 out of 3**

**Rationale:** Incorrect monthly lease payment in Part A  
 Correct total leasing cost in Part A (follow-through error) (1 mark)  
 Incorrect answer in Part B

**Exemplar 3**

(3 marks)

- A)  $\boxed{\$20441.60}$
- B)  $23275$   
 $\times .40$   
 $\boxed{\$9310}$

**Mark: 2 out of 3**

**Rationale:** Correct total leasing cost in Part A (1 mark)  
 Correct answer in Part B (1 mark)

**Question 16**

E5.V.1

3 marks

Emily brought her vehicle into a service centre in Manitoba for a tune-up. The tune-up included the following items:

| Item                      | Details   | Cost            |
|---------------------------|-----------|-----------------|
| Replace windshield wipers | 2 wipers  | \$12 per wiper  |
| Oil change                | 4 L oil   | \$3 per litre   |
|                           | 1 filter  | \$22 per filter |
| Labour                    | 2.5 hours | \$110 per hour  |

Calculate the total cost of the tune-up after taxes.

**Answer:**

$$\text{Parts: } 2 \times \$12 = \$24$$

$$4 \times \$3 = \$12$$

$$1 \times \$22 = \underline{\$22}$$

$$\$58$$

← 1 mark

$$\text{Labour: } \$110 \times 2.5$$

$$= \$275$$

← 1 mark

$$\text{Subtotal: } \$275 + \$58$$

$$= \$333$$

$$\text{Total with taxes: } \$333 \times 1.13$$

$$= \$376.29$$

← 1 mark

**Exemplar 1**

(3 marks)

$$12 \times 1.13 + 3 \times 1.13 + 22 * 1.13 + 110 \times 2.5$$

$$= \$316.81$$

**Mark: 1 out of 3**

**Rationale:** Incorrect parts  
 Correct labour (1 mark)  
 Incorrect total with taxes

**Exemplar 2**

(3 marks)

$$\$12 + \$3 + \$22 + \$110 = 147 \times 1.13 = \$166.11$$

**Mark: 1 out of 3**

**Rationale:** Incorrect parts  
 Incorrect labour  
 Correct total with taxes (follow-through error) (1 mark)

**Exemplar 3**

(3 marks)

| Item                      | Details   | Cost            |     |
|---------------------------|-----------|-----------------|-----|
| Replace windshield wipers | 2 wipers  | \$12 per wiper  | 24  |
| Oil change                | 4 L oil   | \$3 per litre   | 12  |
|                           | 1 filter  | \$22 per filter | 22  |
| Labour                    | 2.5 hours | \$110 per hour  | 275 |

*\$376.29 Tune up cost*

**Mark: 3 out of 3**

**Rationale:** Correct parts (calculated each individually) (1 mark)  
 Correct labour (1 mark)  
 Correct total with taxes (1 mark)

**Question 17**

E5.V.1

2 marks

Zoë's vehicle uses 7.6 L of fuel for every 100 km driven. The cost of fuel is \$1.05/litre, including taxes.

Calculate the cost of fuel for Zoë to drive her vehicle 2000 km.

**Answer:**

$$2000 \text{ km} \times \frac{7.6 \text{ L}}{100 \text{ km}} \times \frac{\$1.05}{1 \text{ L}} \leftarrow 1 \text{ mark for process}$$

$$= \$159.60 \quad \leftarrow 1 \text{ mark}$$

**Exemplar 1**

(2 marks)

 $159.6$ **Mark: 1 out of 2**

**Rationale:** Correct cost of fuel (1 mark)  
E4 (monetary value is not expressed to two decimal places)  
E2 (does not include units in final answer)

**Exemplar 2**

(2 marks)

$$7.6 \times 2000 = 15200$$
$$15200 \times 1.05 = \boxed{\$159.60}$$

**Mark: 1 out of 2**

**Rationale:** Incorrect process  
Correct cost of fuel (follow-through error) (1 mark)

**Exemplar 3**

(2 marks)

$$152 \times 1.05 = 159.6$$

**Mark: 2 out of 2**

**Rationale:** Correct answer (2 marks)  
E4 (monetary values are not expressed to two decimal places)  
E2 (does not include units in final answer)

**Exemplar 4**

(2 marks)

$$7.6 \times 20 = 152L's$$
$$152 \times 1.05 = \cancel{\$}159.6$$

**Mark: 2 out of 2**

**Rationale:** Correct answer (2 marks)  
E4 (monetary values are not expressed to two decimal places)

**Question 18**

E5.V.1

1 mark

Choose the letter that best completes the sentence below.

When purchasing car insurance, third party liability is the

- a) amount you pay every year for insurance
- b) amount you pay for extra coverage against damage to another person or their property
- c) one-time lump sum payment you pay to the insurance company when you first buy the car
- d) amount of the insurance claim you must pay when you are at fault for causing an accident

**Answer:**     b)



**Question 19**

E5.V.1

2 marks

A) A car worth \$29 000 depreciates 30% in the first year.

State the depreciation amount after the first year. (1 mark)

**Answer:**

$$\begin{aligned} \text{Depreciation amount after first year: } & \$29\,000 \times 0.3 \\ & = \$8700 \end{aligned} \quad \leftarrow 1 \text{ mark}$$

B) The same car depreciates 20% in the second year.

State the amount the car depreciated in the second year-. (1 mark)

**Answer:**

$$\begin{aligned} \text{Value of car after first year: } & \$29\,000 - \$8700 \\ & = \$20\,300 \\ \\ \text{Depreciation amount after second year: } & \$20\,300 \times 0.2 \\ & = \$4060 \end{aligned} \quad \leftarrow 1 \text{ mark}$$

**Exemplar 1**

(2 marks)

A)  $\text{Year 1 } \$29000 \times 0.30 = 8700 \quad 29000 - 8700$   
 $= \underline{\$20300}$   
 $\text{after year 1} = \$20300$

B)  $\text{Year 2 } \$203000 \times 0.20 = 4060 \quad 203000 - 4060$   
 $= \underline{\$198940}$   
 $\text{after year 2} = \$198940$

**Mark: 0 out of 2**

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

**Exemplar 2**

(2 marks)

A)  $29000 \times .30 = 8700$  (First Year)

B)  $29000 - 8700 = \$20300$  (First Year)  
 $20300 \times .20 = 6090$  (Second Year)  
 $20300 - 6090 = \underline{\$14210}$  (Second Year)

**Mark: 1 out of 2**

**Rationale:** Correct answer in Part A (1 mark)  
E2 (does not include units in final answer)  
Incorrect answer in Part B

**Exemplar 3**

(2 marks)

A)  $29,000 \times 0.3 = 8700$

B)  $20,300 \times 0.2 = \boxed{4060} + 8700 = 12,760$

**Mark: 2 out of 2**

**Rationale:** Correct answer in Part A (1 mark)  
E2 (does not include units in final answer)  
Correct answer in Part B (1 mark)  
E2 (does not include units in final answer)

# Geometry and Trigonometry

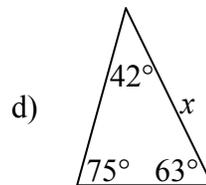
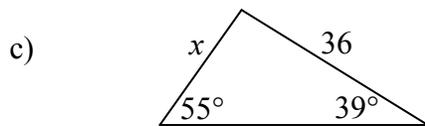
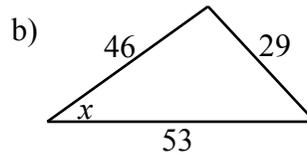
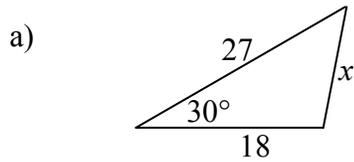
## Question 20

E6.G.1

1 mark

Choose the letter that best completes the statement below.

The triangle that would require only the Sine Law to solve for  $x$  is



Answer:     c)



**Question 21**

E6.G.2

2 marks

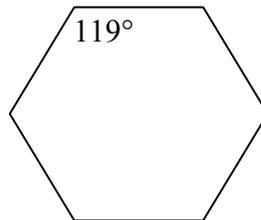
A standard soccer ball is made up of different shapes including hexagons sewn together to form a ball.

A) State the sum of the interior angles of a regular hexagon. (1 mark)

**Answer:**

$$\begin{aligned} &180^\circ(6 - 2) \\ &= 720^\circ \quad \leftarrow 1 \text{ mark} \end{aligned}$$

B) Paulo has the following piece of material that he is using to make a soccer ball.



Justify whether the piece of material shown above is a regular polygon. (1 mark)

**Answer:**

This is not a regular polygon because all of the angles are not  $120^\circ$ .

**Exemplar 1**

(2 marks)

A)  $119 \times 6 = 714^\circ$

B) *It is regular because it is in the standard form of a hexagon and isn't an odd-looking six-sided shape.***Mark: 0 out of 2****Rationale:** Incorrect answer in Part A

Incorrect response in Part B

**Exemplar 2**

(2 marks)

A)  $180(n-2)$   
 $180 \times 4$   
 $180 = 720$

B) *it is irregular because the sum of all angles is not 720***Mark: 1 out of 2****Rationale:** Correct answer in Part A (1 mark)

E2 (does not include units in final answer)

Incorrect response in Part B (insufficient response)

**Exemplar 3**

(2 marks)

A)  $S = 180(n-2)$   
 $180(6-2)$   
 $180(4)$   
 $720 \quad S = 720^\circ$

B) *Yes it is because all sides are equal in length.***Mark: 1 out of 2****Rationale:** Correct answer in Part A (1 mark)

Incorrect response in Part B

**Exemplar 4**

(2 marks)

A)  $720^\circ$

B) *It can't be a regular polygon because the interior angles must all be  $120^\circ$  for a hexagone.***Mark: 2 out of 2****Rationale:** Correct answer in Part A (1 mark)

Correct response in Part B (1 mark)

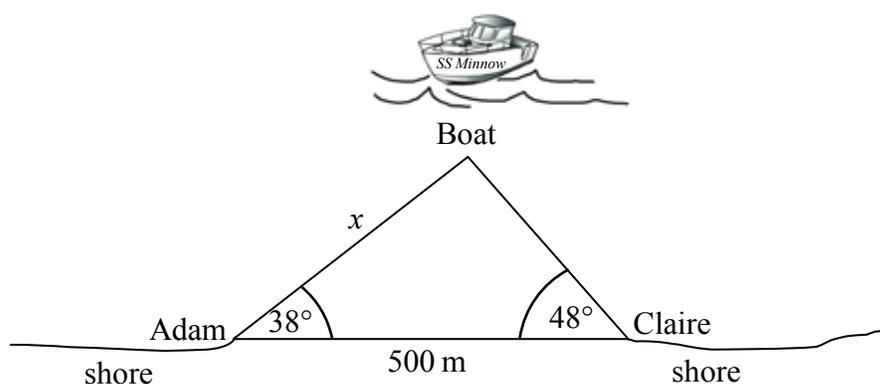
**Question 22**

E6.G.1

4 marks

A boat has drifted away from the shore. Adam and Claire are 500 m apart on the shore. The angle between the boat, Adam, and Claire is  $38^\circ$ , while the angle between the boat, Claire, and Adam is  $48^\circ$ .

Calculate the distance ( $x$ ) Adam must swim to reach the boat.

**Answer:**

$$\angle ABC = 180^\circ - (38^\circ + 48^\circ)$$

$$= 94^\circ$$

← 1 mark for identification of third angle

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

$$\left. \begin{aligned} \frac{\sin 94^\circ}{500} &= \frac{\sin 48^\circ}{x} \end{aligned} \right\}$$

← 1 mark for identification of sine law

$$\left. \begin{aligned} x &= \frac{500(\sin 48^\circ)}{\sin 94^\circ} \end{aligned} \right\}$$

← 1 mark for substitution/process

$$x = 372.48 \text{ metres}$$

← 1 mark

**Exemplar 1**

(4 marks)

$$\frac{\sin 94}{500} = \frac{\sin 48}{x}$$

$$1566.25574\dots$$

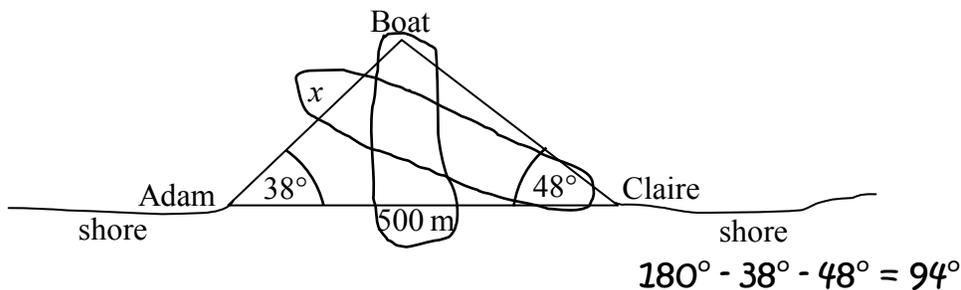
$$1566.26 \text{ m}$$

**Mark: 3 out of 4**

**Rationale:** Correct identification of sine law (1 mark)  
 Correct third angle (1 mark)  
 Correct substitutions (1 mark)  
 Incorrect final answer

**Exemplar 2**

(4 marks)



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

$$\frac{500 \text{ m}}{\sin 94^\circ} = \frac{b}{\sin 48^\circ} = 371.57 \text{ m}$$

**Mark: 3 out of 4**

**Rationale:** Correct identification of sine law (1 mark)  
 Correct third angle (1 mark)  
 Correct substitutions (1 mark)  
 Incorrect final answer

**Exemplar 3**

(4 marks)

$$180 - 38 - 48 = 94^\circ$$

$$\frac{x}{\sin 48} = \frac{500}{\sin 94}$$

$$x = \frac{\sin 48 \times 500}{\sin 94}$$

$$x = 372 \text{ m.}$$

He must swim 372 m to reach the boat.

**Mark: 4 out of 4****Rationale:** Correct identification of sine law (1 mark)

Correct third angle (1 mark)

Correct substitutions (1 mark)

Correct final answer (1 mark)

E4 (does not express the answer to the appropriate number of decimal places)

**Exemplar 4**

(4 marks)

$$\frac{\sin 94 \times \sin 48}{500} = x$$

$$x = \underline{372.5 \text{ m}}$$

**Mark: 4 out of 4****Rationale:** Correct identification of sine law (1 mark)

Correct third angle (1 mark)

Correct substitutions (1 mark)

Correct final answer (1 mark)

E4 (does not express the answer to the appropriate number of decimal places)

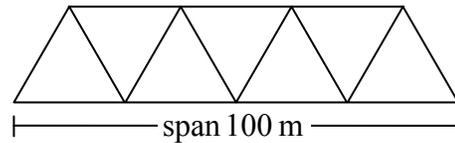


**Question 23**

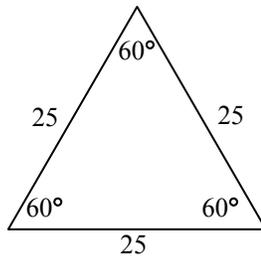
E6.G.2

2 marks

A student is solving a math question involving a 100 metre truss bridge. The bridge is made of 7 equilateral triangles as shown in the diagram below.

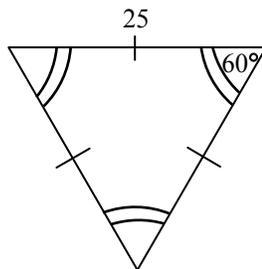


Sketch 1 of the bridge's triangles and state all side and angle measurements.

**Answer 1:**

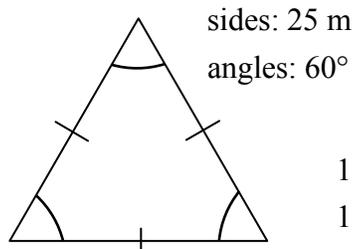
1 mark for three 25 m sides

1 mark for three 60° angles

**OR****Answer 2:**

1 mark for three 25 m sides

1 mark for three 60° angles

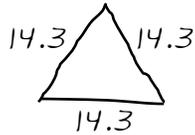
**OR****Answer 3:**

1 mark for three 25 m sides

1 mark for three 60° angles

**Exemplar 1**

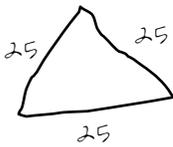
(2 marks)



angles :  $180(3 - 2) = 180^\circ$   
each angle =  $60^\circ$

**Mark: 1 out of 2****Rationale:** One correct answer (angles) (1 mark)**Exemplar 2**

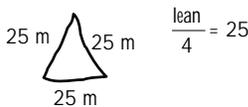
(2 marks)

**Mark: 1 out of 2****Rationale:** One correct answer (sides) (1 mark)

E2 (does not include units in final answer)

**Exemplar 3**

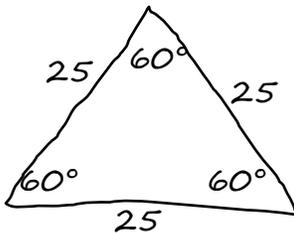
(2 marks)



$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$
$$= \frac{25^2 + 25^2 - 25^2}{2 \cdot 25 \cdot 25} = 0.5 = \boxed{50^\circ}$$

**Mark: 1 out of 2****Rationale:** One correct answer (sides) (1 mark)**Exemplar 4**

(2 marks)

**Mark: 2 out of 2****Rationale:** Two correct answers (2 marks)

E2 (does not include units in final answer)

**Question 24**

E6.G.2

2 marks

The sum of the interior angles of a regular polygon is  $2160^\circ$ .

Calculate the number of sides of this regular polygon.

**Answer 1:**

$$\left. \begin{array}{l} S = 180^\circ(n - 2) \\ 2160^\circ = 180^\circ(n - 2) \\ \frac{2160^\circ}{180^\circ} = n - 2 \\ 12 = n - 2 \\ n = 14 \end{array} \right\} \begin{array}{l} \leftarrow 1 \text{ mark for substitution/process} \\ \\ \\ \leftarrow 1 \text{ mark} \end{array}$$

**OR****Answer 2:**

| Number of sides | Sum of interior angles |
|-----------------|------------------------|
| 3               | $180^\circ$            |
| 4               | $360^\circ$            |
| 5               | $540^\circ$            |
| $\vdots$        | $\vdots$               |
| <u>14</u>       | $2160^\circ$           |

}  $\leftarrow 1 \text{ mark for substitution/process}$

1 mark

**OR****Answer 3:**

$$\left. \begin{array}{l} S = 180^\circ(n - 2) \\ 2160^\circ = 180^\circ(n - 2) \\ 2160^\circ = 180^\circ n - 360^\circ \\ 2520^\circ = 180^\circ n \\ \frac{2520^\circ}{180^\circ} = n \\ n = 14 \end{array} \right\} \begin{array}{l} \leftarrow 1 \text{ mark for substitution/process} \\ \\ \\ \\ \leftarrow 1 \text{ mark} \end{array}$$

**Exemplar 1**

(2 marks)

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

$$\frac{2160}{-2} = \frac{180^\circ(n - 2)}{-2}$$

$$\frac{+1080}{-1} = \frac{+90(n)}{-1}$$

$$\frac{1080}{90} = \frac{90(n)}{90}$$

$$12 = n$$

**Mark: 1 out of 2**

**Rationale:** Correct substitution (1 mark)  
Incorrect final answer

**Exemplar 2**

(2 marks)

$$180 \div 2160 = 12$$

Decagon has 10 sides

$$\text{sum of int. angle} = 1440^\circ$$

$$1440 + 180 + 180 + 180 + 180 = 2160$$


4 sides

$$10 + 4 = 14 \text{ sides}$$

**Mark: 2 out of 2**

**Rationale:** Correct process (1 mark)  
Correct final answer (1 mark)

**Exemplar 3**

(2 marks)

$$\frac{2160}{180} = \frac{180^\circ(n - 2)}{180}$$

$$12 = (n - 2)$$

$$+2 \quad +2$$

$$14 = n$$

**Mark: 2 out of 2**

**Rationale:** Correct process (1 mark)  
Correct final answer (1 mark)

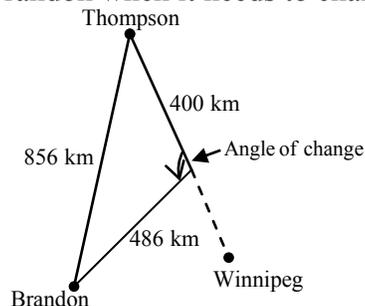
**Question 25**

E6.G.1

3 marks

An air ambulance is flying from Thompson to Winnipeg. After travelling 400 km, the plane is re-routed to Brandon.

Calculate the angle of change if the plane is 486 km from Brandon when it needs to change its direction.

**Answer 1:**

$$a^2 = b^2 + c^2 - (2bc \cos A)$$

← 1 mark for identification of cosine law

$$856^2 = 400^2 + 486^2 - (2(400)(486) \cos A)$$

$$732\,736 = 396\,196 - (388\,800 \cos A)$$

$$336\,540 = -388\,800 \cos A$$

$$\cos A = -0.8655\dots$$

$$A = \cos^{-1}(-0.8655\dots)$$

$$A = 149.9497$$

$$A = 149.95^\circ$$

← 1 mark for substitution/process

← 1 mark

**OR****Answer 2:**

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

← 1 mark for identification of cosine law

$$\cos A = \frac{486^2 + 400^2 - 856^2}{2(486)(400)}$$

$$\cos A = \frac{236\,196 + 160\,000 - 732\,736}{388\,800}$$

← 1 mark for substitution/process

$$\cos A = \frac{-336\,540}{388\,800}$$

$$\cos A = -0.865586419$$

$$A = 149.95^\circ$$

← 1 mark

**Exemplar 1**

(3 marks)

$$\cos A = \frac{486^2 + 856^2 - 400^2}{2 \times 486 \times 856}$$

$$\cos A = \frac{808,932}{832,032}$$

$$A = \cos^{-1} \left[ \frac{808,932}{832,032} \right]$$

$$A = 13.5^\circ$$

The angle of change is  $13.5^\circ$

**Mark: 2 out of 3**

**Rationale:** Correct identification of cosine law (1 mark)

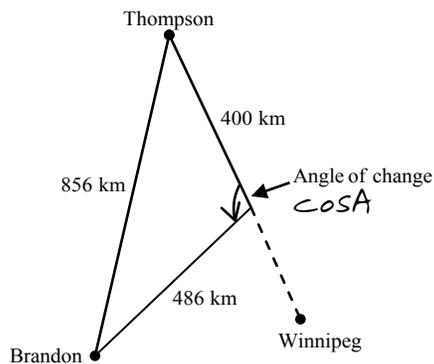
Incorrect substitution

Correct final answer (follow-through error) (1 mark)

E4 (does not express the answer to the appropriate number of decimal places)

**Exemplar 2**

(3 marks)



$$\cos A = \frac{a^2 - b^2 - c^2}{-2bc}$$

$$\cos A = \frac{856^2 - 400^2 - 486^2}{-2(400)(486)}$$

$$\cos A = \frac{336540}{-388800}$$

$$\cos A = -0.865586...$$

$$149.9512...$$

$$\boxed{149.95^\circ}$$

**Mark: 3 out of 3**

**Rationale:** Correct identification of cosine law (1 mark)

Correct process (1 mark)

Correct final answer (1 mark)

**Exemplar 3**

(3 marks)

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\cos A = \frac{400^2 + 486^2 - 856^2}{2 \cdot 400 \cdot 486}$$

$$\cos A = \frac{-336540}{3888000}$$

$$\overset{\cos^{-1}}{\cos} A = 0.865586419 \overset{\cos^{-1}}$$

$$A = 149^\circ$$

**Mark: 3 out of 3**

**Rationale:** Correct identification of cosine law (1 mark)  
Correct process (1 mark)  
Correct final answer (1 mark)  
E1 (rounds incorrectly)

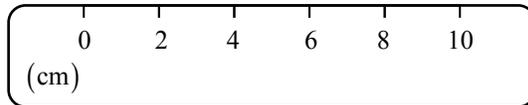


# Precision Measurement

**Question 26** E5.P.1

1 mark

Given the measuring device below:



State the precision.

Precision: \_\_\_\_\_

**Answer:**

Precision: 2 cm

**Exemplar 1**

(1 mark)

Precision:           cm          **Mark: 0 out of 1****Rationale:** Incorrect answer**Exemplar 2**

(1 mark)

Precision:           .5 cm          **Mark: 0 out of 1****Rationale:** Incorrect answer**Exemplar 3**

(1 mark)

Precision:           2          **Mark: 1 out of 1****Rationale:** Correct answer

E2 (does not include units in final answer)

Given the following form of tolerance for a measurement:

$$5.3 \text{ cm } \begin{matrix} +0.4 \text{ cm} \\ -0.3 \text{ cm} \end{matrix}$$

A) State the maximum value. (1 mark)

**Answer:**

5.7 cm

B) State the minimum value. (1 mark)

**Answer:**

5.0 cm

C) State the tolerance. (1 mark)

**Answer:**

0.7 cm

**Exemplar 1**

(3 marks)

A)  $0.4\text{ cm}$

B)  $0.3\text{ cm}$

C)  $0.1\text{ cm}$

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

Incorrect answer in Part B

Correct answer in Part C (follow-through) (1 mark)

**Exemplar 2**

(3 marks)

A)  $5.3 + .3 = 5.6$

B)  $5.3 - .4 = 4.9$

C)  $.7$

**Mark: 2 out of 3****Rationale:** Incorrect answer in Part A

Correct answer in Part B (follow-through) (1 mark)

Correct answer in Part C (1 mark)

E2 (does not include units in final answer)

**Exemplar 3**

(3 marks)

A)  $5.3 + 0.4 = \boxed{5.7\text{ cm}}$

B)  $5.3 - 0.3 = \boxed{5\text{ cm}}$

C)  $5.7 - 5 = \frac{0.7\text{ cm}}{2}$   
 $= \boxed{\pm 0.35\text{ cm}}$

**Mark: 2 out of 3****Rationale:** Correct answer in Part A (1 mark)

Correct answer in Part B (1 mark)

E4 (does not express answer to appropriate number of decimal places)

Incorrect answer in Part C

**Question 28**

E5.P.1

2 marks

Jen is a carpenter and needs to measure a piece of wood to 12 inches. She can use a yard stick with no incremental measurements or a tape measure with 1 inch increments.

A) State which device Jen should use. (1 mark)

**Answer:**

Tape measure

B) State the uncertainty of the device you chose in Part A. (1 mark)

**Sample answers:**

yard stick: 0.5 yards

tape measure: 0.5 inches

**Exemplar 1**

(2 marks)

A) *Tape measure*B) *inch***Mark: 1 out of 2****Rationale:** Correct answer in Part A (1 mark)

Incorrect answer in Part B

**Exemplar 2**

(2 marks)

A) *yardstick*B) *half a stick***Mark: 1 out of 2****Rationale:** Incorrect answer in Part A

Correct response in Part B (follow-through) (1 mark)

**Exemplar 3**

(2 marks)

A) *tape measure*B)  $1'' \pm .5$ **Mark: 2 out of 2****Rationale:** Correct response in Part A (1 mark)

Correct response in Part B (1 mark)

E4 (final answer not clearly indicated)

**Question 29**

E5.P.1

1 mark

Explain why the concept of tolerance is important when installing closet doors.

**Answer:**

There is a range of acceptable values so that the closet doors will cover the door opening and still be able to close properly.

**Note to marker:** Responses must reference the notion of being too big **and** too small in order to be awarded the mark.

**Exemplar 1**

(1 mark)

*So that the closet doors will fit perfectly.*

**Mark: 0 out of 1****Rationale:** Incorrect response (insufficient explanation)**Exemplar 2**

(1 mark)

*Tolerance is important installing closet doors because not all doors are going to be the same size so you have to account for that and tolerance helps you determine that level of accuracy.*

**Mark: 0 out of 1****Rationale:** Incorrect response**Exemplar 3**

(1 mark)

*You need tolerance to make sure the doors will fit properly after installing the mechanisms that allow them to open.*

*You also need the tolerance to allow the doors to fit snugly in place with the mechanisms and not have a bunch of room in between.*

**Mark: 1 out of 1****Rationale:** Correct response (1 mark)

**Question 30**

E5.P.1

2 marks

A refrigerator has a maximum temperature of  $37.5^{\circ}\text{F}$  and a minimum temperature of  $32.7^{\circ}\text{F}$ .

State the tolerance in the form: nominal value  $\begin{matrix} + \text{ tolerance} \\ -0 \end{matrix}$

**Answer:**

$\underbrace{32.7^{\circ}\text{F}}_{\text{nominal value}} \begin{matrix} +4.8^{\circ}\text{F} \\ -0 \end{matrix} \leftarrow \text{1 mark for tolerance}$

1 mark  
for  
nominal  
value

**Exemplar 1**

(2 marks)

$$4.8 \frac{37.5}{32.7}$$

**Mark: 0 out of 2****Rationale:** Incorrect nominal value  
Incorrect tolerance

E2 (does not include units in final answer)

Note: No communication error deductions because no marks were awarded.

**Exemplar 2**

(2 marks)

4.8

0

**Mark: 1 out of 2****Rationale:** Missing nominal value

Correct tolerance (1 mark)

E2 (does not include units in final answer)

**Exemplar 3**

(2 marks)

TOLERANCE  $4.8^{\circ}\text{F}$ NOMINAL VALUE  $35.1^{\circ}\text{F}$ **Mark: 1 out of 2****Rationale:** Incorrect nominal value

Correct tolerance (1 mark)

**Exemplar 4**

(2 marks)

$$37.5 - 32.7 = 4.8$$

$$37.5^{\circ}\text{F} \frac{+0}{-4.8}$$

$$32.7^{\circ}\text{F} \frac{+4.8}{-0}$$

**Mark: 2 out of 2****Rationale:** Correct nominal value (1 mark)

Correct tolerance (1 mark)

**Question 31**

E5.P.1

1 mark

A lemonade bottling company fills 500 mL bottles.

Explain why the company should be accurate when measuring the amount of lemonade it puts in each bottle.

**Sample answers:**

- The company must be accurate to avoid overfilling and spilling.
- The company must be accurate for quantity control.
- Customer satisfaction—ensure bottle isn't under filled.

**Exemplar 1**

(1 mark)

*Because they notice the amount of a lemonade bottle is 500 mL. So they need to fill all bottles with correct 500 mL.*

**Mark: 0 out of 1****Rationale:** Incorrect response (insufficient explanation)**Exemplar 2**

(1 mark)

*If they put 500 ml in and there precision is 1 ml it may over fill a little.*

**Mark: 0 out of 1****Rationale:** Incorrect response (insufficient explanation)**Exemplar 3**

(1 mark)

*Because the bottle says 500 mL so the consumers expect 500 mL.*

**Mark: 1 out of 1****Rationale:** Correct response (1 mark)**Exemplar 4**

(1 mark)

*Because they don't want to put more in some bottles because they are probably all selling for the same price.*

**Mark: 1 out of 1****Rationale:** Correct response (1 mark)

# Statistics

## Question 32

E5.S.1

3 marks

Mackenzie weighs herself every week for 10 weeks. The following are her weights in pounds:

125 122 124 126 128 130 129 131 130 130

A) State the mean to one decimal place. (1 mark)

**Answer:**

$$\begin{aligned} \text{Mean: } & \frac{1275}{10} \\ & = 127.5 \text{ pounds} \end{aligned} \quad \leftarrow 1 \text{ mark}$$

B) State the mode. (1 mark)

**Answer:**

$$\text{Mode: } 130 \text{ pounds} \quad \leftarrow 1 \text{ mark}$$

C) State the median to one decimal place. (1 mark)

**Answer:**

$$\begin{aligned} \text{Median: } & \frac{(128 + 129)}{2} \\ & = 128.5 \text{ pounds} \end{aligned} \quad \leftarrow 1 \text{ mark}$$

**Exemplar 1**

(3 marks)

A) 130 lbs three times

B)  $\frac{128 + 130}{2} = 129 \text{ lbs}$

C)  $\frac{125 + 122 + 124 + 126 + 120 + 130 + 129 + 131 + 130 + 130}{10} = 127.5 \text{ lbs}$

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

Correct answer in Part B (1 mark)

Incorrect answer in Part C

**Exemplar 2**

(3 marks)

A)  $\frac{1275}{10} = 127.5$

B) 130

C) 122, 124, 125, 126, 128, 129, 130, 130, 130, 131  
 $\frac{128 + 129}{2} = 128.5$

**Mark: 3 out of 3****Rationale:** Correct answer in Part A (1 mark)

Correct answer in Part B (1 mark)

Correct answer in Part C (1 mark)

E2 (does not include units in final answers in Parts A, B, and C)

**Exemplar 3**

(3 marks)

A) 
$$\frac{125 + 122 + 124 + 126 + 128 + 130 + 129 + 131 + 130 + 130}{10}$$

127.5 or 128

B) 130

C) ~~122~~, ~~124~~, ~~125~~, ~~126~~, 128, 129, ~~130~~, ~~130~~, ~~130~~, ~~131~~

128.5 or 129

**Mark: 3 out of 3****Rationale:** Correct answer in Part A (1 mark)

Correct answer in Part B (1 mark)

Correct answer in Part C (1 mark)

E2 (does not include units in final answers in Parts A, B, and C)

E4 (final answer not clearly indicated in Part A and Part C)



**Question 33**

E5.S.1

2 marks

Mathville has a population of 1 200 000 people and Megatropolis has a population of 3 108 000 people. The following table shows the percentage of people who speak English as their first language.

|              | Population | % of people who speak English as a First Language |
|--------------|------------|---|
| Mathville    | 1 200 000  | 84.6%   |
| Megatropolis | 3 108 000  | 65.3%   |

Calculate the percentage of people who speak English as their first language in both cities combined using a weighted mean.

**Answer:**

$$1\,200\,000 \times 0.846 = 1\,015\,200$$

$$3\,108\,000 \times 0.653 = 2\,029\,524$$

$$\text{Weighted mean} = \frac{1\,015\,200 + 2\,029\,524}{4\,308\,000} \times 100$$

$$= 70.68\%$$

} ← 1 mark for process

} ← 1 mark

**Exemplar 1**

(2 marks)

$$\text{Mathville} = 1,200,000 \times .846 = 1,015,200$$

$$\text{Megatropolis} = 3,108,000 \times .653 = 2,029,524$$

**Mark: 1 out of 2**

**Rationale:** Correct process (1 mark)  
Incorrect final answer

**Exemplar 2**

(2 marks)

|              | Population | % of people who speak English as a First Language |                  |
|--------------|------------|---|------------------|
| Mathville    | 1 200 000  | 84.6%   | 8460             |
| Megatropolis | 3 108 000  | 65.3%   | 6530             |
|              |            |   | 14 990           |
|              |            |   | <u>4 308 000</u> |
|              |            |   | = 0.347%         |
|              |            |   | = 0.34%          |

**Mark: 1 out of 2**

**Rationale:** Incorrect process  
Correct final answer (follow-through error) (1 mark)  
E1 (rounds incorrectly)

**Exemplar 3**

(2 marks)

$$1\,200\,000 \times 0.846 = 1\,015\,200$$

$$3\,108\,000 \times 0.653 = 2\,029\,524$$

$$\underline{\hspace{1.5cm}} \\ 3\,044\,724$$

$$1\,200\,000 + 3\,108\,000$$

$$= 4\,308\,000$$

$$\frac{3\,044\,724}{4\,308\,000} \times 100$$

$$= 70\%$$

**Mark: 2 out of 2**

**Rationale:** Correct process (1 mark)  
Correct final answer (1 mark)  
E1 (rounds incorrectly)  
E4 (does not express the answer to the appropriate number of decimal places)

**Question 34**

E5.S.2

2 marks

In a school, 236 students wrote a test. Jesse scored 60 out of 93 on the test and 127 students scored lower than him.

A) State Jesse's percentile rank. (1 mark)

**Answer:**

$$\begin{aligned} PR &= \frac{b}{n} \times 100 \\ &= \frac{127}{236} \times 100 \\ &= 53.81 \end{aligned}$$

$\therefore$  53 or 53rd or  $PR_{53}$  ← 1 mark

or

54 or 54th or  $PR_{54}$

B) State Jesse's mark as a percentage. (1 mark)

**Answer:**

$$\begin{aligned} \text{Percentage} &= \frac{60}{93} \times 100 \\ &= 64.52\% \end{aligned}$$

← 1 mark

**Exemplar 1**

(2 marks)

A)  $PR = \frac{B}{N} \times 100$   
 $\frac{60}{127} \times 100 = 47th \quad PR$

B)  $\frac{60}{93} \times 100 = 64.5\%$

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

Correct answer in Part B (1 mark)

E4 (does not express the answer to the appropriate number of decimal places)

**Exemplar 2**

(2 marks)

A)  $\frac{127}{236} \times 100 = 54$

B)  $\frac{60}{93} \times 100 = 65\%$

**Mark: 2 out of 2****Rationale:** Correct final answer in Part A (1 mark)

Correct answer in Part B (1 mark)

E4 (does not express the answer to the appropriate number of decimal places)

**Question 35**

E5.S.1

3 marks

Braedon is a Winnipeg real estate agent who has sold 6 houses in the last 5 weeks. The selling prices were as follows:

|           |           |             |           |          |           |
|-----------|-----------|-------------|-----------|----------|-----------|
| \$250 000 | \$375 000 | \$1 877 000 | \$275 000 | \$87 000 | \$400 000 |
|-----------|-----------|-------------|-----------|----------|-----------|

A) State the mean. (1 mark)

**Answer:**

$$\begin{aligned} \text{Mean: } & \frac{\$3\,264\,000}{6} \\ & = \$544\,000 \end{aligned} \quad \leftarrow 1 \text{ mark}$$

B) State the trimmed mean by removing the highest and lowest values. (1 mark)

**Answer:**

$$\begin{aligned} \text{Trimmed mean: } & \frac{\$1\,300\,000}{4} \\ & = \$325\,000 \end{aligned} \quad \leftarrow 1 \text{ mark}$$

C) Justify which mean would be a better indicator of the average selling price of a house in Winnipeg. (1 mark)

**Answer:**

The trimmed mean would be the better indicator of the average selling price because the outliers (highest and lowest price) significantly change the overall average.

**Exemplar 1**

(3 marks)

A) 
$$\frac{375\,000 + 1\,877\,000 + 275\,000 + 87\,000 + 400\,000}{5}$$
  

$$= \underline{\$602\,800}$$

B) 
$$\frac{250\,000 + 375\,000 + 275\,000 + 400\,000}{5}$$
  

$$= \underline{\$260\,000}$$

C) *The trimmed mean would be better.*

**Mark: 0 out of 3****Rationale:** Incorrect answer in Part A

Incorrect answer in Part B

Incorrect answer in Part C (insufficient justification)

**Exemplar 2**

(3 marks)

A) 
$$\frac{250\,000 + 375\,000 + 1\,877\,000 + 275\,000 + 87\,000 + 400\,000}{6}$$
  

$$= \underline{\$544\,000}$$

B) 
$$\frac{1\,300\,000}{6} = \underline{\$21\,666.67}$$

C) *Trimmed mean because it takes out the highest and lowest selling price.*

**Mark: 1 out of 3****Rationale:** Correct answer in Part A (1 mark)

Incorrect answer in Part B

Incorrect answer in Part C (insufficient justification)

**Exemplar 3**

(3 marks)

A)  $\frac{3\,264\,000}{6} = 544\,000$

B)  $\frac{\cancel{87\,000}, 250\,000, 275\,000, 375\,000, 400\,000, \cancel{1\,877\,000}}{4} = 325\,000$

C) *Trimmed mean because it gets rid of the lowest and highest prices so its more suited to the selling price.*

**Mark: 3 out of 3****Rationale:** Correct answer in Part A (1 mark)

Correct answer in Part B (1 mark)

Correct answer in Part C (1 mark)

E2 (does not include units in Part A and Part B)



**Question 36**

E5.S.2

1 mark

The following statistics are available on family income for a community:

|                 |          |          |          |          |
|-----------------|----------|----------|----------|----------|
| Family income   | \$62 000 | \$70 000 | \$80 000 | \$90 000 |
| Percentile rank | 25th     | 50th     | 75th     | 85th     |

State the percentage of people who earn between \$62 000 and \$90 000.

**Answer:**

$$85 - 25$$

$$= 60\%$$

← 1 mark

**Exemplar 1**

(1 mark)

50th - 75th

**Mark: 0 out of 1****Rationale:** Incorrect answer**Exemplar 2**

(1 mark)

60%

**Mark: 1 out of 1****Rationale:** Correct answer (1 mark)**Exemplar 3**

(1 mark)

25 25th → 85th      15

$$25 + 15 = 40$$

62 000 25th percentile so 25% makes less

90 000 85th percentile so 15% makes more

$25\% + 15\% = 40\%$  makes more or less

Therefore 60% of people earn between

62 000 and 90 000

**Mark: 1 out of 1****Rationale:** Correct answer (1 mark)





# **Appendices**



## Appendix A: Table of Questions by Unit and Learning Outcome

| <b>Home Finance</b>    |                         |                   |
|------------------------|-------------------------|-------------------|
| <b>Question</b>        | <b>Learning Outcome</b> | <b>Mark</b>       |
| 1 a)                   | E.6.H.1                 | 1                 |
| 1 b)                   | E.6.H.1                 | 2                 |
| 2                      | E.6.H.1                 | 2                 |
| 3                      | E.6.H.1                 | 3                 |
| 4                      | E.6.H.1                 | 2                 |
| 5 a)                   | E.6.H.1                 | 2                 |
| 5 b)                   | E.6.H.1                 | 1                 |
| 6 a)                   | E.6.H.1                 | 2                 |
| 6 b)                   | E.6.H.1                 | 1                 |
|                        |                         | <b>Total = 16</b> |
| <b>Probability</b>     |                         |                   |
| <b>Question</b>        | <b>Learning Outcome</b> | <b>Mark</b>       |
| 7                      | E6.P.1                  | 2                 |
| 8 a)                   | E6.P.1                  | 1                 |
| 8 b)                   | E6.P.1                  | 1                 |
| 9                      | E6.P.1                  | 3                 |
| 10 a)                  | E6.P.1                  | 1                 |
| 10 b)                  | E6.P.1                  | 1                 |
| 11                     | E6.P.1                  | 1                 |
| 12                     | E6.P.1                  | 1                 |
|                        |                         | <b>Total = 11</b> |
| <b>Vehicle Finance</b> |                         |                   |
| <b>Question</b>        | <b>Learning Outcome</b> | <b>Mark</b>       |
| 13                     | E5.V.1                  | 2                 |
| 14 a)                  | E5.V.1                  | 1                 |
| 14 b)                  | E5.V.1                  | 2                 |
| 15 a)                  | E5.V.1                  | 2                 |
| 15 b)                  | E5.V.1                  | 1                 |
| 16                     | E5.V.1                  | 3                 |
| 17                     | E5.V.1                  | 2                 |
| 18                     | E5.V.1                  | 1                 |
| 19 a)                  | E5.V.1                  | 1                 |
| 19 b)                  | E5.V.1                  | 1                 |
|                        |                         | <b>Total = 16</b> |

| <b>Geometry and Trigonometry</b> |                         |                   |
|----------------------------------|-------------------------|-------------------|
| <b>Question</b>                  | <b>Learning Outcome</b> | <b>Mark</b>       |
| 20                               | E6.G.1                  | 1                 |
| 21 a)                            | E6.G.2                  | 1                 |
| 21 b)                            | E6.G.2                  | 1                 |
| 22                               | E6.G.1                  | 4                 |
| 23                               | E6.G.2                  | 2                 |
| 24                               | E6.G.2                  | 2                 |
| 25                               | E6.G.1                  | 3                 |
|                                  |                         | <b>Total = 14</b> |
| <b>Precision Measurement</b>     |                         |                   |
| <b>Question</b>                  | <b>Learning Outcome</b> | <b>Mark</b>       |
| 26                               | E5.P.1                  | 1                 |
| 27 a)                            | E5.P.1                  | 1                 |
| 27 b)                            | E5.P.1                  | 1                 |
| 27 c)                            | E5.P.1                  | 1                 |
| 28 a)                            | E5.P.1                  | 1                 |
| 28 b)                            | E5.P.1                  | 1                 |
| 29                               | E5.P.1                  | 1                 |
| 30                               | E5.P.1                  | 2                 |
| 31                               | E5.P.1                  | 1                 |
|                                  |                         | <b>Total = 10</b> |
| <b>Statistics</b>                |                         |                   |
| <b>Question</b>                  | <b>Learning Outcome</b> | <b>Mark</b>       |
| 32 a)                            | E5.S.1                  | 1                 |
| 32 b)                            | E5.S.1                  | 1                 |
| 32 c)                            | E5.S.1                  | 1                 |
| 33                               | E5.S.1                  | 2                 |
| 34 a)                            | E5.S.2                  | 1                 |
| 34 b)                            | E5.S.2                  | 1                 |
| 35 a)                            | E5.S.1                  | 1                 |
| 35 b)                            | E5.S.1                  | 1                 |
| 35 c)                            | E5.S.1                  | 1                 |
| 36                               | E5.S.2                  | 1                 |
|                                  |                         | <b>Total = 11</b> |

# 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 (all “NR”) 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.:** \_\_\_\_\_

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**Problem(s) noted:** \_\_\_\_\_

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**Question(s) affected:** \_\_\_\_\_

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**Action taken or rationale for assigning marks:** \_\_\_\_\_

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**Follow-up:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Decision:** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Marker's Signature:** \_\_\_\_\_

**Principal's Signature:** \_\_\_\_\_

|  |
|--|
| <p><b>For Department Use Only—After Marking Complete</b></p> <p><b>Consultant:</b> _____</p> <p><b>Date:</b> _____</p> |
|--|

# Appendix C:

## Communication Errors

### Communication Errors

Communication errors are errors not conceptually related to the learning outcomes associated with the question. The following communication errors will 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 (Rounding)

- rounds incorrectly
- rounds too soon

#### E2 (Units)

- uses incorrect units of measure
- does not include units in final answer  
(e.g., missing \$ for monetary values, missing % for GDSR, missing degrees for angles)

#### E3 (Transcription/Transposition)

- makes a transcription error (inaccurate transferring of information)
- makes a transposition error (changing order of digits)

#### E4 (Final Answer)

- final answer not clearly indicated  
(e.g.,  $\frac{3}{4}$  and 3:1 presented, but final answer not indicated)
- answer is presented in another part of the question
- does not express the answer to the appropriate number of decimal places  
(e.g., monetary values are not expressed to two decimal places)
- too much information is presented in the answer

#### E5 (Whole Units)

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

