

Grade 12  
Essential Mathematics  
Achievement Test

# **Marking Guide**

January 2020

Grade 12 essential mathematics achievement test.  
Marking Guide. January 2020

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This resource will also be available on the Manitoba Education website at [www.edu.gov.mb.ca/k12/assess/archives/index.html](http://www.edu.gov.mb.ca/k12/assess/archives/index.html).

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*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.

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# General Marking Instructions

The *Grade 12 Essential Mathematics Achievement Test: Marking Guide (January 2020)* 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 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 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 <input checked="" type="radio"/>	E2 <input type="radio"/>	E3 <input type="radio"/>	E4 <input type="radio"/>	E5 <input type="radio"/>	E6 <input checked="" type="radio"/>
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 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” 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 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

The average monthly heating cost for Rhong's house is \$265.

A) Calculate his total expected heating cost for 4 years. (1 mark)

**Answer:**

$$\begin{aligned}\text{Expected heating cost for 4 years} &= 265 \times 12 \times 4 \\ &= \$12\,720 \quad \leftarrow 1 \text{ mark}\end{aligned}$$

B) The heating cost will be reduced by 35% if Rhong installs heated floors.

Calculate his total expected heating cost for 4 years with heated floors. (2 marks)

**Answer:**

$$\begin{aligned}\text{Cost reduction} &= 12\,720 \times 0.35 \\ &= \$4452\end{aligned} \quad \leftarrow 1 \text{ mark}$$

$$\begin{aligned}\text{Expected cost} &= 12\,720 - 4452 \\ &= \$8268 \quad \leftarrow 1 \text{ mark}\end{aligned}$$

**Note to marker:** \$4452 does not have to be explicitly stated to be awarded full marks.

**OR**

**Answer:**

$$\begin{aligned}\text{Expected cost} &= 12\,720 \times \overbrace{0.65}^{1 \text{ mark}} \\ &= \$8268 \quad \leftarrow 1 \text{ mark}\end{aligned}$$



**Exemplar 1**

(3 marks)

A)  $265 \times 4 = 1060$

B)  $265 \times 0.35 = 92.75$

$$92.75 \times 4 = 371$$

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

Correct cost reduction in Part B (follow-through error) (1 mark)

Incorrect final answer in Part B

**Exemplar 2**

(3 marks)

A)  $265 \times 48 = \$12\,720$

B)  $\$12\,720 \times 0.35 = \$4\,452$

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

Correct cost reduction in Part B (1 mark)

**Exemplar 3**

(3 marks)

A)  $\$265 \times 12 = \$3\,180 \times 4 = \$12\,720 \times 1.12 = \$14\,246.40$

B)  $\$14\,246.40 \times 0.35 = \$4\,986.24$

$$\$14\,246.40 - \$4\,986.24 = \$9\,260.16$$

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

Correct cost reduction in Part B (follow-through error) (1 mark)

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

**Question 2**

E6.H.1

4 marks

Stella purchases a house in Winnipeg valued at \$215 000. She buys a comprehensive homeowner's insurance policy with a \$500 deductible.

- A) Calculate her annual premium, before taxes. Refer to the table on the following page.  
(3 marks)

**Answer:**

$$\text{First } \$200\,000 = \$771 \quad \leftarrow 1 \text{ mark}$$

$$\left. \begin{aligned} \text{Next } \$15\,000 &= \frac{15\,000}{1000} \times 3.50 \\ &= \$52.50 \end{aligned} \right\} \leftarrow 1 \text{ mark for process}$$

$$\begin{aligned} \text{Total} &= 771 + 52.50 \\ &= \$823.50 \quad \leftarrow 1 \text{ mark} \end{aligned}$$

- B) Describe one way Stella could reduce her annual insurance premium for this property.  
(1 mark)

**Sample Answers:**

- change insurance providers
- update wiring
- be claims free in order to receive a rebate
- reduce the content coverage
- reduce the third party liability coverage
- change from comprehensive coverage to standard coverage
- install alarm system
- increase deductible

## Manitoba Homeowner's Insurance Rates

Manitoba Homeowner's Insurance Rates (\$500 deductible)								
	Winnipeg		Area 2		Area 3		Area 4	
Amount	Standard	Comprehensive	Standard	Comprehensive	Standard	Comprehensive	Standard	Comprehensive
\$ 50 000	195	214	147	161	196	216	261	287
\$ 55 000	216	238	160	176	217	239	289	318
\$ 60 000	237	260	173	190	237	261	315	347
\$ 65 000	252	277	187	205	255	281	339	373
\$ 70 000	266	303	200	220	270	297	359	395
\$ 75 000	294	314	210	231	285	314	379	417
\$ 80 000	310	323	221	243	302	332	402	462
\$ 85 000	318	333	226	249	313	344	416	458
\$ 90 000	324	349	231	254	324	356	431	474
\$ 95 000	348	370	244	268	345	380	459	505
\$100 000	364	393	260	286	361	397	480	528
\$105 000	390	417	278	306	378	416	503	553
\$110 000	402	441	293	322	393	432	523	575
\$115 000	418	464	299	329	409	450	544	598
\$120 000	436	487	309	340	424	466	564	620
\$125 000	451	510	319	351	444	488	591	650
\$130 000	472	543	339	373	466	513	620	682
\$135 000	498	557	345	380	477	525	634	697
\$140 000	523	580	358	394	496	546	660	726
\$145 000	538	596	375	413	508	559	676	744
\$150 000	550	604	385	424	520	572	692	761
\$155 000	557	613	398	438	551	606	733	806
\$160 000	565	622	413	454	569	626	757	833
\$165 000	572	629	425	468	589	648	783	861
\$170 000	590	647	441	485	609	670	810	891
\$175 000	607	668	451	496	624	686	830	913
\$180 000	620	686	466	513	648	713	862	948
\$185 000	636	702	478	526	667	734	887	976
\$190 000	652	717	492	541	705	776	938	1032
\$195 000	678	742	504	554	720	792	958	1054
\$200 000	692	771	519	571	726	799	966	1063
Additional Amounts per \$1000 Coverage	Add: \$3.15	Add: \$3.50	Add: \$2.75	Add: \$3.03	Add: \$3.55	Add: \$3.91	Add: \$4.72	Add: \$5.19

**\$200 deductible—Increase premium by 10%**

**Exemplar 1**

(4 marks)

A)

$$\begin{array}{r} 215000 \\ \hline 1000 \end{array} \times 774.50 = 166517.50 \times 12 = 1,998,210.00$$

Handwritten notes above the calculation: 771, add 3.50, 774.50

B) She could try and live in one of the area for say area 3

**Mark: 1 out of 4****Rationale:** Correct cost on first \$200 000 in Part A (1 mark)

Incorrect process in Part A

Incorrect final answer in Part A

Incorrect response in Part B

**Exemplar 2**

(4 marks)

A)

$$771 + (3.50 \times 15) = \$823.5 + \$500 = \$1,323.50$$

B) Pay a higher deductible

**Mark: 3 out of 4****Rationale:** Correct cost on first \$200 000 in Part A (1 mark)

Correct process in Part A (1 mark)

Incorrect final answer in Part A (added deductible)

Correct response in Part B (1 mark)

## Exemplar 3

(4 marks)

A)

$$\begin{array}{r} 215\,000 = 771 \\ 15\,000 = 52.50 \\ \hline 823.50 \end{array}$$

$$771$$

$$15 \times 3.50 = 52.50$$

\$500 deductible

E1

$$823.50 \times 1.07 = \$881.15$$

B) Find another house that is cheaper

**Mark: 3 out of 4**

**Rationale:** Correct cost on first \$200 000 in Part A (1 mark)

Correct process in Part A (1 mark)

Correct final answer in Part A (1 mark)

Incorrect response in Part B

E1 (too much information is presented in the answer and the information is numerically and conceptually correct) (student added taxes)

**Question 3**

E6.H.1

3 marks

Calculate the missing values in the following amortization table. (3 marks)

Month	Monthly Mortgage Payment	Interest	Principal	Unpaid Balance
March	\$1034.00	\$711.68	\$322.32	\$189 423.00
April	\$1034.00	\$710.34		\$189 099.34
May		\$709.12	\$324.88	

**Answer:**

Month	Monthly Mortgage Payment	Interest	Principal	Unpaid Balance
March	\$1034.00	\$711.68	\$322.32	\$189 423.00
April	\$1034.00	\$710.34	\$323.66	\$189 099.34
May	\$1034.00	\$709.12	\$324.88	\$188 774.46

1 mark                      1 mark                      1 mark

(3 × 1 mark)

## Exemplar 1

(3 marks)

Month	Monthly Mortgage Payment	Interest	Principal	Unpaid Balance
March	\$1034.00	\$711.68	\$322.32	\$189 423.00
April	\$1034.00	\$710.34	\$ 323	\$189 099.34
May	\$1 034.00	\$709.12	\$324.88	

**Mark: 1 out of 3**

**Rationale:** Correct monthly mortgage payment (1 mark)

Incorrect principal

Incorrect unpaid balance

## Exemplar 2

(3 marks)

Month	Monthly Mortgage Payment	Interest	Principal	Unpaid Balance
March	\$1034.00	\$711.68	\$322.32	\$189 423.00
April	\$1034.00	\$710.34	323.60\$	\$189 099.34
May	1034.00	\$709.12	\$324.88	188.98826

E5

**Mark: 1 out of 3**

**Rationale:** Correct monthly mortgage payment (1 mark)

Incorrect principal

Incorrect unpaid balance

E5 (does not include units in final answer)

**Question 4**

E6.H.1

1 mark

Albert comes home from his vacation and finds that his basement has flooded.

Describe one maintenance task Albert could have done to reduce the risk of his basement flooding.

**Sample Answers:**

- ensure proper drainage around the outside of his house
- turn water off
- flush pipes/drain water lines
- check pipes for leaks



### Exemplar 1

(1 mark)

change the Filter or inspect the pipes for  
Leaks or Buildup

**Mark: 0.5 out of 1**

**Rationale:** Correct response (1 mark)  
Lack of clarity (which filter?) (0.5 mark deduction)

### Exemplar 2

(1 mark)

Check his pipes  
Make sure his windows are closed and not damaged

**Mark: 1 out of 1**

**Rationale:** Correct response (1 mark)

### Exemplar 3

(1 mark)

fix any leaks or cracks in  
his basement wall that  
water may come through

**Mark: 1 out of 1**

**Rationale:** Correct response (1 mark)

### Exemplar 4

(1 mark)

Ask a friend to check the basement and the plumbing regularly.

**Mark: 1 out of 1**

**Rationale:** Correct response (1 mark)

**Question 5**

E6.H.1

2 marks

Kelly's Statement and Demand for Taxes is shown in the table below.

Calculate the municipal taxes and the total taxes due. (2 marks)

Statement and Demand for Taxes			
	Total Portioned Assessment	Mill Rate	Tax Amount
Municipal Taxes	\$128 250	19.842	
Education Taxes	\$128 250	20.417	\$2618.48
Provincial Tax Credit			(\$700.00)
Total Taxes Due			

**Answer:**

Statement and Demand for Taxes			
	Total Portioned Assessment	Mill Rate	Tax Amount
Municipal Taxes	\$128 250	19.842	\$2544.74
Education Taxes	\$128 250	20.417	\$2618.48
Provincial Tax Credit			(\$700.00)
Total Taxes Due			\$4463.22

← 1 mark

← 1 mark

**Exemplar 1**

(2 marks)

Statement and Demand for Taxes			
	Total Portioned Assessment	Mill Rate	Tax Amount
Municipal Taxes	\$128 250	19.842	<del>\$2544.73</del>
Education Taxes	\$128 250	20.417	\$2618.48
Provincial Tax Credit			(\$700.00)
Total Taxes Due			<del>\$5863.21</del>

E6

**Mark: 1 out of 2**

**Rationale:** Correct municipal tax (1 mark)  
Incorrect total tax due  
E6 (rounds incorrectly)

**Exemplar 2**

(2 marks)

Statement and Demand for Taxes			
	Total Portioned Assessment	Mill Rate	Tax Amount
Municipal Taxes	\$128 250	19.842	<del>\$2544.73</del>
Education Taxes	\$128 250	20.417	\$2618.48
Provincial Tax Credit			(\$700.00)
Total Taxes Due			4463.21

E6

E5

**Mark: 2 out of 2**

**Rationale:** Correct municipal tax (1 mark)  
Correct total tax due (follow-through error) (1 mark)  
E5 (does not include units in final answer)  
E6 (rounds incorrectly)

**Question 6**

E6.H.1

3 marks

Federico is calculating his Gross Debt Service Ratio (GDSR) using the information below.

Monthly mortgage payment	\$975
Monthly property tax	\$395
Monthly heating cost	\$110
Gross annual income	\$49 500

Calculate Federico's GDSR. (3 marks)

**Answer:**

$$\begin{aligned}\text{Gross monthly income} &= \frac{49\,500}{12} \\ &= \$4125\end{aligned}$$

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

$$= \frac{(975 + 395 + 110)}{4125}$$

$$= 0.36 \quad \text{or} \quad 35.88\%$$

{ No mark for 1 correct substitution  
or  
1 mark for 2 or 3 correct substitutions  
or  
2 marks for all correct substitutions

← 1 mark

### Exemplar 1

(3 marks)

$$\text{GDSR} = \frac{\text{monthly mortgage payment} + \text{monthly property taxes} + \text{monthly heating costs}}{\text{Gross Monthly Income}}$$

$$\text{GDSR} = \frac{(\$975 + \$395 + \$110)}{\$49,500} = 0.029$$

E6

**Mark: 2 out of 3**

**Rationale:** Three correct substitutions (1 mark)

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

E6 (rounds incorrectly)

### Exemplar 2

(3 marks)

$$\frac{\$975 + 395 + 110}{4125} = 0.36\%$$

$$49,500 \div 12 = 4,125$$

**Mark: 2 out of 3**

**Rationale:** All correct substitutions (2 marks)

Incorrect final answer (inappropriate application of percent symbol)

### Exemplar 3

(3 marks)

$$975 \times 12 = 11,700$$

$$395 \times 12 = 4,740$$

$$110 \times 12 = 1,320$$

$$\frac{11,700 + 4,740 + 1,320}{49,500}$$

$$A = 36\%$$

E6

**Mark: 3 out of 3**

**Rationale:** All correct substitutions (2 marks)

Correct final answer (1 mark)

E6 (does not express the answer to the appropriate number of decimal places)

# Probability

## Question 7

E6.P.1

1 mark

Sonya won a prize in a contest.

All of the prizes are listed below.

- 12 t-shirts
- 7 jerseys
- 6 gift cards

Calculate the probability, as a percent, that she won a t-shirt.

**Answer:**

$$\begin{aligned} & \frac{12}{25} \times 100 \\ & = 48\% \end{aligned}$$

← 1 mark

**Exemplar 1**

(1 mark)

$$12 + 7 + 6 = 25$$

$$\frac{12}{25} = 48\% \text{ t-shirts}$$

$$\frac{7}{25} = 28\% \text{ jerseys}$$

$$\frac{6}{25} = 24\% \text{ gift cards}$$

**Mark: 1 out of 1****Rationale:** Correct answer (1 mark)**Exemplar 2**

(1 mark)

$$0.48 \quad 48\%$$

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

(1 mark)

$$\frac{12}{25} = 0.48 \quad \boxed{\text{E2}}$$

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

E2 (answer expressed in an alternate form than requested)

**Question 8**

E6.P.1

1 mark

Choose the letter that best completes the statement below.

The number that does **not** represent a probability is:

A) 0.002

B) 1.2

C) 20%

D)  $\frac{1}{2}$

**Answer:**     B



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**Question 9**

E6.P.1

1 mark

Mica is planning an outdoor activity for her club.

The weather forecast is as follows:

June 17	Probability of rain	30%
June 18	Odds for rain	3 : 8

Explain which day Mica should choose if she hopes to avoid rain.

**Answer:**

She should choose June 18 since the probability of rain is 27.27% which is better than 30% probability of rain on June 17.

<b>Exemplar 1</b>	(1 mark)
-------------------	----------

June 17	Probability of rain	30%
June 18	Odds for rain	3 : 8

37.5%

June 17, Because there is only 30% chance of Rain.

**Mark: 0 out of 1**

**Rationale:** Incorrect response

<b>Exemplar 2</b>	(1 mark)
-------------------	----------

June 17	Probability of rain	30%
June 18	Odds for rain	3 : 8

$\frac{3}{33}$

June 18, because the probability is lower

**Mark: 1 out of 1**

**Rationale:** Correct response (1 mark)

<b>Exemplar 3</b>	(1 mark)
-------------------	----------

Jun 17 : 30% of rain

Jun 18 :  $8+3=11$

$\approx 3\%$  no rain

27% of rain

E3

Mica should choose June 17 because there is only 27% chance of rain.

**Mark: 1 out of 1**

**Rationale:** Correct response (1 mark)

E3 (makes a transcription error)

**Question 10**

E6.P.1

3 marks

Allison is bidding on a computer contract. The probability of winning the contract is 35%. The contract is worth \$12 500. Allison spends \$1600 to prepare her bid.

Calculate the expected value of the contract. (3 marks)

**Answer:**

$$\begin{aligned}P(\text{win}) &= 35\% & \$ \text{ gain} &= 12\,500 - 1600 \\P(\text{lose}) &= 65\% & &= \$10\,900 \\& & \$ \text{ loss} &= \$1600 \\EV &= P(\text{win}) \times \$ \text{ gain} - P(\text{lose}) \times \$ \text{ loss} \\&= \underbrace{(0.35)(10\,900)}_{1 \text{ mark}} - \underbrace{(0.65)(1600)}_{1 \text{ mark}} \\&= 3815 - 1040 \\&= \$2775 & \leftarrow 1 \text{ mark}\end{aligned}$$

**OR****Answer:**

$$\begin{aligned}\text{Average earning} &= (0.35)(12\,500) & \leftarrow 1 \text{ mark for process} \\&= \$4375 & \leftarrow 1 \text{ mark} \\EV &= 4375 - 1600 \\&= \$2775 & \leftarrow 1 \text{ mark}\end{aligned}$$

**Note to marker:** Award one mark for a follow-through error only if two correct values have been used in the process.

### Exemplar 1

(3 marks)

$$\frac{35}{65}(12500-1600) + \frac{65}{35}(0-1600)$$

$10400 \qquad -1600$

$$5869.23 - (-2471.43) =$$
$$\$8340.66$$

**Mark: 0 out of 3**

**Rationale:** Incorrect  $P(\text{win}) \times \$\text{gain}$   
Incorrect  $P(\text{lose}) \times \$\text{loss}$   
Incorrect final answer

### Exemplar 2

(3 marks)

$$EV = 35 \times 12500 - 65 \times 1600$$

$$EV = 437500 - 104000$$

$$EV = 333500$$

E5

**Mark: 1 out of 3**

**Rationale:** Incorrect  $P(\text{win}) \times \$\text{gain}$   
Incorrect  $P(\text{lose}) \times \$\text{loss}$   
Correct final answer (follow-through error; incorrect representation of probability counts as one incorrect value) (1 mark)  
E5 (does not include units in final answer)

### Exemplar 3

(3 marks)

expected value  $(.35)(12500) - (.65)(1600)$

$$4375 - 1040$$
$$= 3335$$

E5

**Mark: 2 out of 3**

**Rationale:** Incorrect  $P(\text{win}) \times \$\text{gain}$   
Correct  $P(\text{lose}) \times \$\text{loss}$  (1 mark)  
Correct final answer (follow-through error) (1 mark)  
E5 (does not include units in final answer)

**Question 11**

E6.P.1

2 marks

A survey company asked a random sample of 300 people to identify their favourite television program.

Of those surveyed:

- 30 people identified Program A
- 84 people identified Program B
- 74 people identified Program C
- 112 people identified Program D

Calculate how many people would be expected to identify Program D if 5000 people were surveyed. (2 marks)

**Answer:**

$$\text{Probability of Program D} = \frac{112}{300} \text{ or } 0.37\overline{3} \quad \leftarrow 1 \text{ mark}$$

$$\begin{aligned} \text{Number of people} &= (0.37\overline{3})(5000) \\ &= 1866.\overline{6} \\ &= 1866 \text{ or } 1867 \text{ people} \quad \leftarrow 1 \text{ mark} \end{aligned}$$

**Note to marker:** Award one mark for a follow-through error only if the numerator or the denominator is substituted correctly when calculating the probability.

**OR**

**Answer:**

$$\begin{aligned} \text{Ratio} &= \frac{5000}{300} \\ &= 16.\overline{6} \quad \leftarrow 1 \text{ mark} \end{aligned}$$

$$\begin{aligned} \text{Number of people} &= 112(16.\overline{6}) \\ &= 1866.\overline{6} \\ &= 1866 \text{ or } 1867 \text{ people} \quad \leftarrow 1 \text{ mark} \end{aligned}$$

**Exemplar 1**

(2 marks)

$$\frac{112}{300} \times 5000 = \frac{1866.6}{5000}$$

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

Incorrect final answer

**Exemplar 2**

(2 marks)

$$\frac{5000}{300} \times 112 = 186 \text{ people choose Program D}$$

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

Incorrect final answer

**Exemplar 3**

(2 marks)

$$\frac{112}{30 + 84 + 74 + 112} = \% \text{ of people who Picked Program D}$$

$$37.33\% =$$

$$5000 \times 37.33\% = 1866.67 \text{ people}$$

E4

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

Correct final answer (1 mark)

E4 (does not use whole units in contextual questions involving discrete data)

### Exemplar 4

(2 marks)

$$\frac{112}{300} = 37\%$$

E6

$$5000 \times 0.37 = 1850$$

**Mark: 2 out of 2**

**Rationale:** Correct ratio (1 mark)  
Correct final answer (1 mark)  
E6 (rounds too soon)



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**Question 12**

E6.P.1

2 marks

Each year, a market gardener randomly grows either peas, beans, carrots, or onions.

The table below indicates which vegetable was grown each year for the past 10 years.

Year	Vegetable
2010	peas
2011	beans
2012	beans
2013	carrots
2014	onions
2015	peas
2016	carrots
2017	beans
2018	peas
2019	beans

- A) State the experimental probability that the gardener will grow beans in 2020. (1 mark)

**Answer:**

$\frac{4}{10}$  or 0.4 or 40% or four out of ten or 4 : 10

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

- B) State the theoretical probability that the gardener will grow carrots in 2020. (1 mark)

**Answer:**

$\frac{1}{4}$  or 0.25 or 25% or one out of four or 1 : 4

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

**Exemplar 1**

(2 marks)

A)  $\frac{4}{10}$  or 40%

B)  $\frac{2}{10}$  20%

**Mark: 1 out of 2**

**Rationale:** Correct answer in Part A (1 mark)  
Incorrect answer in Part B

**Exemplar 2**

(2 marks)

A) 2:5

B) 1:5

**Mark: 1 out of 2**

**Rationale:** Correct answer in Part A (1 mark)  
Incorrect answer in Part B

**Question 13**

E6.P.1

1 mark

The odds **against** Nico randomly selecting a country song from a playlist are 345 : 105.

State the probability, as a fraction, of Nico **not** selecting a country song.

**Answer:**

$$\frac{345}{450} \quad \text{or} \quad \frac{23}{30}$$

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

**Exemplar 1**

(1 mark)

$$\frac{105}{345} = 0.304$$

$\rightarrow 0.31$

$\rightarrow 31\%$

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

(1 mark)

$$- \frac{345}{105}$$

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

(1 mark)

$$\frac{345}{450} \quad \frac{3}{4}$$

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

# Vehicle Finance

## Question 14 E5.V.1

2 marks

A new sport utility vehicle is worth \$34 000. The depreciation rate is 25% per year.

Calculate the value of the vehicle after 2 years. (2 marks)

**Answer:**

$$\left. \begin{array}{l} \text{Year 1: } 34\,000 \times 0.25 = 8500 \\ 34\,000 - 8500 = \$25\,500 \\ \text{Year 2: } 25\,500 \times 0.25 = \$6375 \end{array} \right\} \leftarrow 1 \text{ mark for process}$$

$$\begin{aligned} \text{Value of vehicle} &= 25\,500 - 6375 \\ &= \$19\,125 \end{aligned} \quad \leftarrow 1 \text{ mark}$$

**OR**

**Answer:**

$$\begin{aligned} \text{Value after Year 1: } 34\,000 \times 0.75 &= \$25\,500 & \leftarrow 1 \text{ mark} \\ \text{Value after Year 2: } 25\,500 \times 0.75 &= \$19\,125 & \leftarrow 1 \text{ mark} \end{aligned}$$

**OR**

**Answer:**

$$\begin{aligned} 34\,000 \times (1 - 0.25)^2 & \quad \leftarrow 1 \text{ mark for process} \\ = \$19\,125 & \quad \leftarrow 1 \text{ mark} \end{aligned}$$

**Exemplar 1**

(2 marks)

$$34\,000 - 25\% - 25\% = 6375$$

E5

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

E5 (does not include units in final answer)

**Exemplar 2**

(2 marks)

$$34,000 \times 0,25 = 8500 \times 2 = 17000$$

$$34,000 - 17000 = \$17000$$

**Mark: 1 out of 2****Rationale:** Incorrect process

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

**Question 15** E5.V.1

3 marks

A vehicle has a fuel economy of 12 L/100 km.

The driving distance from Cross Lake to Thompson is 258 km.

- A) Calculate the number of litres of gas required to drive from Cross Lake to Thompson.  
(2 marks)

**Answer:**

$$\frac{12}{100} = \frac{x}{258} \quad \leftarrow 1 \text{ mark for process}$$

$$x = 30.96 \text{ L} \quad \leftarrow 1 \text{ mark}$$

**OR****Answer:**

$$FE = \frac{\text{L}}{\text{km}} \times 100$$

$$12 = \frac{x}{258} \times 100 \quad \leftarrow 1 \text{ mark for substitution}$$

$$x = 30.96 \text{ L} \quad \leftarrow 1 \text{ mark}$$

- B) The cost of gas is \$1.19/L.

Calculate the total cost of gas for this trip. (1 mark)

**Answer:**

$$\begin{aligned} & 30.96 \times 1.19 \\ & = \$36.84 \quad \leftarrow 1 \text{ mark} \end{aligned}$$



**Exemplar 1**

(3 marks)

A)  $FE = \frac{12L}{258Km} \times 100$

$$FE = 0.047 \times 100$$

$$FE = 4.65L/100Km$$

E5

B)  $4.65 \times 1.19 = \$5.53/L$

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

Correct final answer in Part A (follow-through error) (1 mark)

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

E5 (uses incorrect units of measure)

**Exemplar 2**

(3 marks)

A)  $\frac{L}{Km} \times 100 =$

$$\frac{258}{100} = 2.58 \times 12 = 30.96L$$

$$\rightarrow 31L/258Km$$

E6

B)  $31 \times 1.19 = \$36.89$

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

Correct final answer in Part A (1 mark)

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

E6 (does not express answer to appropriate number of decimal places)

<b>Exemplar 3</b>
-------------------

(3 marks)

A)  $12 \times 2.58 = 30.96L$

B)  $30.96 \times 1.19 = \$36.84$

**Mark: 3 out of 3**

**Rationale:** Correct process in Part A (alternate process) (1 mark)

Correct final answer in Part A (1 mark)

Correct answer in Part B (1 mark)

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**Question 16**

E5.V.1

1 mark

Justify why someone would finance the purchase of a vehicle instead of leasing an identical vehicle.

**Sample answers:**

- If you choose to keep the vehicle, it will be cheaper to finance.
- There are no limits on kilometres driven.
- You can modify the vehicle.
- You can consider the vehicle an asset.
- You don't have to worry about keeping the vehicle in pristine condition because you are not returning it.

**Note to marker:** Do not accept “cheaper” or “ownership” without further explanation.

### Exemplar 1

(1 mark)

you will be able to pay off the amount of the vehicle monthly, while being the full owner of it. Rather than renting.

Mark: 0 out of 1

Rationale: Incorrect response

### Exemplar 2

(1 mark)

- They don't have to worry about going over a # of km.

- Don't need to worry about any repairs.

Mark: 0 out of 1

Rationale: Incorrect response (repairs)

### Exemplar 3

(1 mark)

When leasing, the car is not owned by the person and it has restricted km.

Mark: 1 out of 1

Rationale: Correct response (1 mark)

**Question 17** E5.V.1

3 marks

Ha-joon takes his truck to the repair shop because he needs a new radiator and a new headlight. The repair shop charges \$85 per hour for labour.

The service details are shown in the table below.

Service	Cost of Parts	Hours of Labour Required
Radiator	\$650	1.5
Headlight	\$10	0.5

Calculate the total amount Ha-joon will need to pay, after taxes. (3 marks)

**Answer:**

Total parts cost = \$660

Total labour cost =  $2 \times 85$   
= \$170 } ← 1 mark for process or correct total labour cost

Subtotal =  $170 + 660$   
= \$830 } ← 1 mark for process or correct subtotal

Total amount =  $830 \times 1.12$   
= \$929.60 ← 1 mark

**OR**

**Answer:**

Subtotal =  $[650 + (85)(1.5)] + [10 + (85)(0.5)]$   
 $\underbrace{\hspace{1.5cm}}_{\substack{\text{1 mark for} \\ \text{radiator parts} \\ \text{and labour}}} \quad \underbrace{\hspace{1.5cm}}_{\substack{\text{1 mark for} \\ \text{headlight} \\ \text{parts and labour}}}$

Total amount =  $(777.50 + 52.50) \times 1.12$   
= \$929.60 ← 1 mark

**Exemplar 1**

(3 marks)

\$ 85 per hour .

$$650 \times 1.5 = \$975$$

$$10 \times 0.5 = 5$$

650

+10

$$660 \times 2 = \$1320$$

$$+ 85 \times 2 = 170$$

$$1320 + 170 = \boxed{\$1490}$$

**Mark: 1 out of 3****Rationale:** Correct total labour cost (1 mark)

Incorrect subtotal

Incorrect final answer

**Exemplar 2**

(3 marks)

$$650 + 10 = 660 \times 1.12 = 739.20$$

$$2 \text{ hr of labour} \times 85 = 170.00$$

$$\boxed{\$909.20}$$

**Mark: 2 out of 3****Rationale:** Correct total labour cost (1 mark)

Correct subtotal (1 mark)

Incorrect final answer (no tax calculated on labour)

### Exemplar 3

(3 marks)

\* Labour  
Materials used  $\text{gst} = 5\% \text{ or } 0.05$

$$\begin{aligned} 650 \times 0.05 &= 32.5 + 650 = 682.50 \\ 10 \times 0.05 &= 0.5 + 10 = 10.50 \end{aligned}$$

~~682.50~~ + ~~10.50~~ = 693.00

$$1.5 + 0.5 = 2 \times 85 = 170 \times 0.05 = 8.5 + 170 = 178.50$$

$$693 + 178.50 = 871.50$$

**Mark: 2 out of 3**

**Rationale:** Correct total labour cost (1 mark)

Correct process/subtotal (1 mark)

Incorrect final answer (incorrect application of tax)



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**Question 18**

E5.V.1

3 marks

Matisse is purchasing a used car privately. The car is priced at \$5000. The book value of the car is \$5500. Matisse will need to pay \$45 for a safety inspection.

Calculate the total amount he will pay for the car, after taxes. (3 marks)

**Answer:**

$$\begin{aligned}\text{PST on car} &= 5500 \times 0.07 \\ &= \$385\end{aligned}\quad \leftarrow 1 \text{ mark}$$

$$\begin{aligned}\text{Total safety inspection cost} &= 45 \times 1.05 \\ &= \$47.25\end{aligned}\quad \leftarrow 1 \text{ mark}$$

$$\begin{aligned}\text{Total amount} &= 5000 + 385 + 47.25 \\ &= \$5432.25\end{aligned}\quad \leftarrow 1 \text{ mark}$$

**Exemplar 1**

(3 marks)

$$\begin{aligned} 5000 + 45 \\ = \$5045 \\ (5045)(0.07) \\ = 353.15 \\ (5045) + 353.15 \\ = \$5398.15 \end{aligned}$$

**Mark: 1 out of 3**

**Rationale:** Incorrect PST on car  
Incorrect safety inspection  
Correct final answer (follow-through error) (1 mark)

**Exemplar 2**

(3 marks)

$$\begin{aligned} 5000 \times 1.07 &= 5350 \\ 45 \times 1.05 &= 47.25 \\ 5350 + 47.25 + 5500 \\ &= \$10,897.25 \end{aligned}$$

**Mark: 1 out of 3**

**Rationale:** Incorrect PST on car  
Correct safety inspection (1 mark)  
Incorrect final answer

**Exemplar 3**

(3 marks)

$$\begin{aligned} 45 \times 1.05 &= 47.25 \\ 5500 \times 1.07 &= 5885 \\ &\underline{\hspace{1cm}} \\ &= \$5932.25 \end{aligned}$$

**Mark: 2 out of 3**

**Rationale:** Correct PST on car (1 mark)  
Correct safety inspection (1 mark)  
Incorrect final answer

**Question 19**

E5.V.1

2 marks

Mary wants to buy a new car for \$22 210. The dealership has agreed to accept Mary's old car with a trade-in value of \$1340.

Calculate the total cost to purchase the new car, after taxes. (2 marks)

**Answer:**

$$\begin{array}{l} \text{Total cost before taxes} = 22\,210 - 1340 \\ \qquad \qquad \qquad = \$20\,870 \end{array} \left. \vphantom{\begin{array}{l} \text{Total cost before taxes} = 22\,210 - 1340 \\ \qquad \qquad \qquad = \$20\,870 \end{array}} \right\} \leftarrow 1 \text{ mark}$$

$$\begin{array}{l} \text{Total cost} = 20\,870 \times 1.12 \\ \qquad \qquad \qquad = \$23\,374.40 \end{array} \qquad \qquad \qquad \leftarrow 1 \text{ mark}$$

**Exemplar 1**

(2 marks)

$$22210 - 1340 \times .12$$
$$= \$ 22\,049.20$$

**Mark: 1 out of 2****Rationale:** Correct subtraction of trade-in value (1 mark)  
Incorrect final answer**Exemplar 2**

(2 marks)

$$22\,210 \times 1.12 = 24875.20$$
$$- 1340$$
$$\$ 23\,535.20$$

**Mark: 1 out of 2****Rationale:** Incorrect total cost before taxes (subtracted trade-in value after tax calculation)  
Correct final answer (follow-through error) (1 mark)**Exemplar 3**

(2 marks)

$$22\,210 - 1340 = 20\,870$$
$$20\,870 \times 1.12 = 23\,374.4$$

E5

E6

**Mark: 2 out of 2****Rationale:** Correct total cost before taxes (1 mark)  
Correct final answer (1 mark)  
E5 (does not include units in final answer)  
E6 (does not express answer to appropriate number of decimal places)

**Question 20**

E5.V.1

1 mark

Choose the letter that best completes the statement below.

Carl drives his vehicle to school twice a month. His insurance agent should recommend

- A) all-purpose insurance
- B) pleasure insurance
- C) lay-up insurance
- D) no insurance

**Answer:**     B

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**Question 21**

E5.V.1

2 marks

Tia is leasing a new truck. Her monthly lease payment will be \$349, after taxes, for 4 years. Her down payment is \$2000.

Calculate the total leasing costs over 4 years. (2 marks)

**Answer:**

$$\begin{aligned}\text{Total costs} &= (349 \times 12 \times 4) + 2000 && \leftarrow 1 \text{ mark for process} \\ &= \$18\,752 && \leftarrow 1 \text{ mark}\end{aligned}$$

**OR****Answer:**

$$\begin{aligned}\text{Total lease payments} &= 349 \times 12 \times 4 \\ &= \$16\,752 && \leftarrow 1 \text{ mark} \\ \text{Total leasing costs} &= 16\,752 + 2000 \\ &= \$18\,752 && \leftarrow 1 \text{ mark}\end{aligned}$$



**Exemplar 1**

(2 marks)

$$349 \times 1.12 = 390.88 \times 48 = 18762.24 + 2000$$
$$\$20762.24$$

**Mark: 1 out of 2****Rationale:** Incorrect total lease payments

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

**Exemplar 2**

(2 marks)

$$4 \times 12 = 48$$
$$\$349 \times 48 = \$16,752$$
$$\$16,752 - 2000$$
$$= \$14,752$$
$$= 14,752 \times 1.12$$
$$= \$16,522.24$$

**Mark: 1 out of 2****Rationale:** Correct total lease payments (1 mark)

Incorrect final answer

**Exemplar 3**

(2 marks)

$$\text{Total lease payment} = 48 \times \$349$$
$$= \boxed{\$16752}$$

**Mark: 1 out of 2****Rationale:** Correct total lease payments (1 mark)

Incorrect final answer

# Geometry and Trigonometry

## Question 22

E6.G.2

2 marks

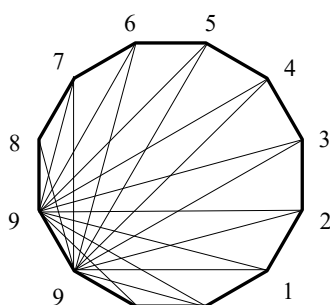
Determine the number of diagonals in a regular dodecagon (12-sided shape). (2 marks)

**Answer:**

$$\begin{aligned}
 D &= \frac{n(n-3)}{2} \\
 &= \frac{12(12-3)}{2} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \leftarrow 1 \text{ mark for substitution} \\
 &= \frac{12(9)}{2} \\
 &= 54 \text{ diagonals} \quad \leftarrow 1 \text{ mark}
 \end{aligned}$$

OR

**Answer:**



$$\begin{aligned}
 \text{Number of diagonals} &= 9 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 \\
 &= 54 \text{ diagonals}
 \end{aligned}$$

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

$\leftarrow 1 \text{ mark}$

### Exemplar 1

(2 marks)



$$n(n-3) \div 2$$

**Mark: 1 out of 2**

**Rationale:** No substitution shown  
Correct final answer (1 mark)

### Exemplar 2

(2 marks)

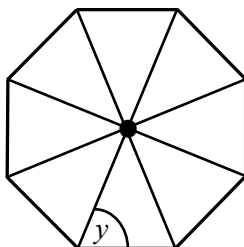
$$= \frac{12(12-3)}{2}$$

$$= 108 \text{ diagonals}$$

**Mark: 1 out of 2**

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

Given the following regular octagon:



A) Calculate the measure of one of the central angles. (1 mark)

**Answer:**

$$\begin{aligned}\text{Central angle} &= \frac{360}{8} \\ &= 45^\circ \quad \leftarrow 1 \text{ mark}\end{aligned}$$

B) Calculate the measure of  $\angle y$ . (2 marks)

**Answer:**

$$\begin{aligned}\text{Measure of one interior angle} &= \frac{180(8-2)}{8} \\ &= \frac{180(6)}{8} \\ &= 135^\circ \quad \leftarrow 1 \text{ mark}\end{aligned}$$

$$\begin{aligned}\angle y &= \frac{135}{2} \\ &= 67.5^\circ \quad \leftarrow 1 \text{ mark}\end{aligned}$$

**OR**

**Answer:**

$$\begin{aligned}\angle y &= \frac{180 - 45}{2} \quad \leftarrow 1 \text{ mark} \\ &= 67.5^\circ \quad \leftarrow 1 \text{ mark}\end{aligned}$$

**Exemplar 1**

(3 marks)

A)  $\frac{360}{8} = 72^\circ$

B)  $180 - 72 = \frac{108}{2} = 54$   
 $\rightarrow 54^\circ$

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

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

**Exemplar 2**

(3 marks)

A)  $\frac{360^\circ}{n} = \text{Central Angle}$

$$\frac{360^\circ}{8} = 45^\circ$$

B)  $S = \frac{180(n-2)}{n}$

$$S = \frac{180(8-2)}{8}$$

$$S = 135^\circ$$

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

Correct measure of one interior angle in Part B (1 mark)

**Exemplar 3**

(3 marks)

A)  $\frac{360}{8} = 45$  E5

B)  $180 - 45 = 135$

$135 \div 2 = 67.5$  E5

**Mark: 3 out of 3**

**Rationale:** Correct answer in Part A (1 mark)  
Correct answer in Part B (2 marks)  
E5 (does not include units in final answer)

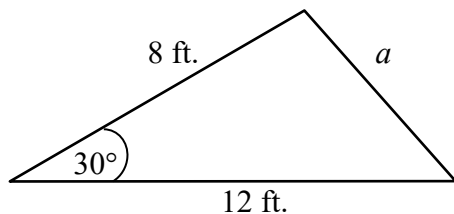
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**Question 24**

E6.G.1

3 marks

Calculate the length of side  $a$ , given the measurements below. (3 marks)

**Answer:**

$$a^2 = b^2 + c^2 - (2bc \cos A) \quad \leftarrow 1 \text{ mark for identification of cosine law}$$

$$a^2 = 8^2 + 12^2 - [2(8)(12) \cos 30^\circ]$$

$$a^2 = 64 + 144 - 192(0.866...)$$

$$a^2 = 208 - 166.276...$$

$$\sqrt{a^2} = \sqrt{41.7231}$$

$$a = 6.46 \text{ ft.}$$

$$\left. \begin{array}{l} a^2 = 64 + 144 - 192(0.866...) \\ a^2 = 208 - 166.276... \end{array} \right\} \leftarrow 1 \text{ mark for process/substitution}$$
$$\leftarrow 1 \text{ mark}$$



### Exemplar 1

(3 marks)

$$a^2 = 8^2 + 12^2 - 2(8)(12)\cos 30^\circ = 41.7 \text{ ft}$$

Mark: 2 out of 3

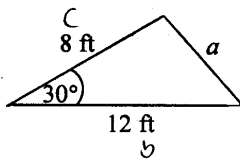
**Rationale:** Correct identification of cosine law (1 mark)

Correct substitution (1 mark)

Incorrect final answer

### Exemplar 2

(3 marks)



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

$$a^2 = 12^2 + 8^2 - 2(12)(8) \cos 30$$

$$= 208 - 192 (0.86)$$

$$= 208 - 165.12$$

E6

$$\sqrt{a^2} = \sqrt{42.88}$$

$$a = 6.55 \text{ ft}$$

Mark: 3 out of 3

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

Correct process/substitution (1 mark)

Correct final answer (1 mark)

E6 (rounds too soon)

E6 (rounds incorrectly)

## Exemplar 3

(3 marks)

$$c^2 = a^2 + b^2 - 2ab \cos(C)$$

$$8^2 + 2^2 - (2(8)(2) \cos 30)$$

$$64 + 4 - 27.71$$

$$68 - 27.71 = 40.29$$

$$\sqrt{40.29} = 6.34 \text{ ft}$$

E3 (points to formula)

E3 (points to substitution)

E6 (points to 27.71)

E6 (points to 6.34 ft)

**Mark: 3 out of 3**

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

Correct process/substitution (1 mark)

Correct final answer (1 mark)

E3 (makes a transcription error)

E6 (rounds too soon)

E6 (rounds incorrectly)

**Question 25**

E6.G.2

1 mark

Vivianne states that an equilateral triangle is also an obtuse triangle.

Choose from the list below which statement is correct.

- A) Vivianne is correct because obtuse triangles have three angles that are all less than  $60^\circ$ .
- B) Vivianne is correct because obtuse triangles have one angle greater than  $90^\circ$ .
- C) Vivianne is incorrect because equilateral triangles are also acute triangles.
- D) Vivianne is incorrect because equilateral triangles have a  $90^\circ$  angle.

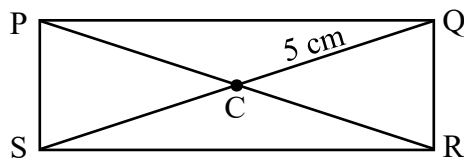
**Answer:**     C

**Question 26**

E6.G.2

1 mark

Marcello draws rectangle PQRS with centre C and line segment  $\overline{CQ}$  measuring 5 cm.



State the measure of diagonal  $\overline{PR}$ .

**Answer:**

$$\begin{aligned}\overline{PR} &= 5 + 5 \\ &= 10 \text{ cm} \quad \leftarrow 1 \text{ mark}\end{aligned}$$

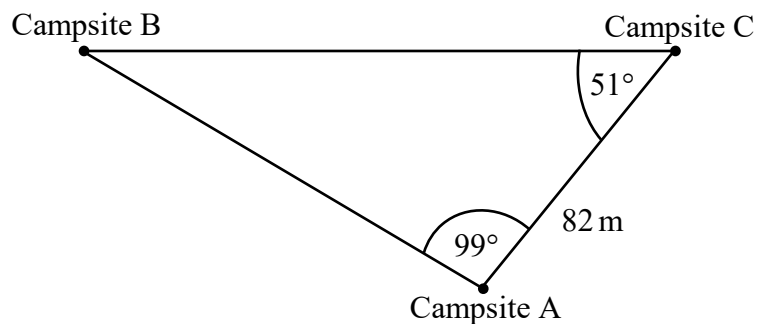
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**Question 27**

E6.G.1, E6.G.2

4 marks

Geoff is going on a canoe trip with his school. The diagram below shows the 3 campsites they will use.



Calculate the distance between Campsite B and Campsite C. (4 marks)

**Answer:**

$$\angle B = 180 - 99 - 51$$

$$= 30^\circ$$

← 1 mark for calculation of angle B

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

← 1 mark for identification of sine law

$$\frac{\overline{BC}}{\sin 99^\circ} = \frac{82}{\sin 30^\circ}$$

$$\left. \begin{aligned} \overline{BC} &= \frac{(\sin 99^\circ)(82)}{\sin 30^\circ} \end{aligned} \right\} \leftarrow 1 \text{ mark for process/substitution}$$

$$\overline{BC} = 161.98 \text{ m}$$

← 1 mark

## Exemplar 1

(4 marks)

$$180 - 51 - 99 = 30^\circ$$

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

$$\frac{a}{\sin 99} = \frac{82}{\sin 30} \quad \text{E3}$$

$$82 (\sin 99) = a (\sin 30)$$

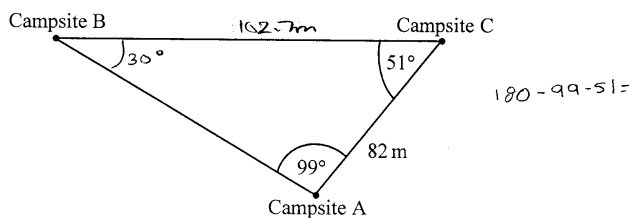
$$160\text{m} = a$$

Mark: 3 out of 4

**Rationale:** Correct calculation of angle B (1 mark)  
 Correct identification of sine law (1 mark)  
 Correct substitution (1 mark)  
 Incorrect final answer  
 E3 (makes a transcription error)

## Exemplar 2

(4 marks)



$$180 - 99 - 51 = 30^\circ$$

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

$$\frac{a}{\sin 99} = \frac{52}{\sin 30} \cdot \sin 99 = 102.7 \quad \begin{matrix} \text{E3} \\ \text{E5} \\ \text{E6} \end{matrix}$$

Mark: 4 out of 4

**Rationale:** Correct calculation of angle B (1 mark)  
 Correct identification of sine law (1 mark)  
 Correct process/substitution (1 mark)  
 Correct final answer (follow-through error) (1 mark)  
 E3 (makes a transcription error)  
 E5 (does not include units in final answer)  
 E6 (does not express the answer to the appropriate number of decimal places)

### Exemplar 3

(4 marks)

$$\frac{\overset{A}{\sin 99}}{?} = \frac{\overset{B}{\sin 30}}{82} = \frac{\overset{C}{\sin 51}}{?}$$

$51 + 99 = 150$   
 $180 - 150 = 30$

$$\frac{82 \sin 99}{\sin 30} = 16 \text{ m}$$

E6

**Mark: 4 out of 4**

**Rationale:** Correct calculation of angle B (1 mark)

Correct identification of sine law (1 mark)

Correct process/substitution (1 mark)

Correct final answer (1 mark)

E6 (does not express the answer to the appropriate number of decimal places)

E6 (rounds incorrectly)



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# Precision Measurement

**Note: Do not round answers in this unit.**

## Question 28

E5.P.1

1 mark

When cooking chicken, the internal temperature must reach a minimum of 165°F.

Explain why you need to use an accurate meat thermometer.

### Answer:

The temperature indicated on the thermometer needs to be close to the true value of 165°F otherwise the chicken will be over or under cooked.

### Exemplar 1

(1 mark)

So you know what the temperature is exactly at.

**Mark: 0 out of 1**

**Rationale:** Insufficient response

### Exemplar 2

(1 mark)

so you can be precise to 165°F

**Mark: 0 out of 1**

**Rationale:** Insufficient response

### Exemplar 3

(1 mark)

So you won't get sick and die.

**Mark: 0.5 out of 1**

**Rationale:** Correct response (1 mark)

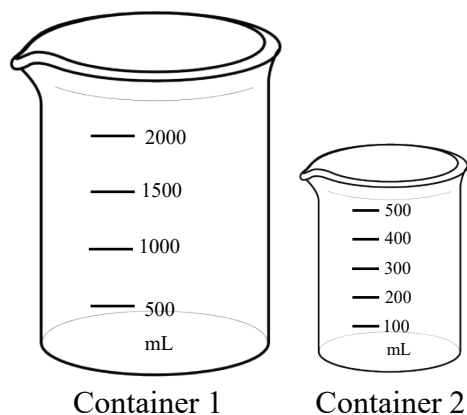
Lack of clarity (no reference to the internal temperature of the chicken)  
(0.5 mark deduction)

**Question 29**

E5.P.1

2 marks

Ellen is preparing chain saw fuel by mixing oil with gas. She needs 600 mL of gas for the mixture.



A) Justify which container is more precise. (1 mark)

**Sample Answers:**

- Container 2 is more precise due to its smaller increments.
- Container 2 is more precise because it goes up by 100 mL, whereas Container 1 goes up by 500 mL.

B) Ellen uses the container you chose in Part A to measure the 600 mL of gas.

Calculate the total uncertainty of the measurement. (1 mark)

**Answer:**

Uncertainty =  $\pm 50$

$\pm 50$

$\pm 100 \text{ mL}$

← 1 mark ( $\pm$  not required)

**Note to marker:** Award one mark for an answer of  $\pm 250 \text{ mL}$  in Part B if student answered “Container 1” in Part A.

## Exemplar 1

(2 marks)

A) Container 2 is more precise since it measures to the nearest 100 mL.

B) Uncertainty =  $\pm 50 \text{ mL}$

Mark: 0.5 out of 2

Rationale: Correct response in Part A (1 mark)

Lack of clarity (no comparison to Container 1) (0.5 mark deduction)

Incorrect answer in Part B

## Exemplar 2

(2 marks)

A) Container 2 is more accurate because it increases in more precise increments

B)  $600 \pm 100 \text{ mL}$

E1

Mark: 1 out of 2

Rationale: Incorrect response in Part A

Correct answer in Part B (1 mark)

E1 (too much information is presented in the answer and the information is numerically and conceptually correct)

### Exemplar 3

(2 marks)

A) Container 2  
bc it is going  
up in mL by  
a smaller number

B) 100 mL

50 mL

**Mark: 1 out of 2**

**Rationale:** Correct response in Part A (1 mark)  
Incorrect answer in Part B

**Note to marker:** Not an E1 error since answer is clearly indicated.

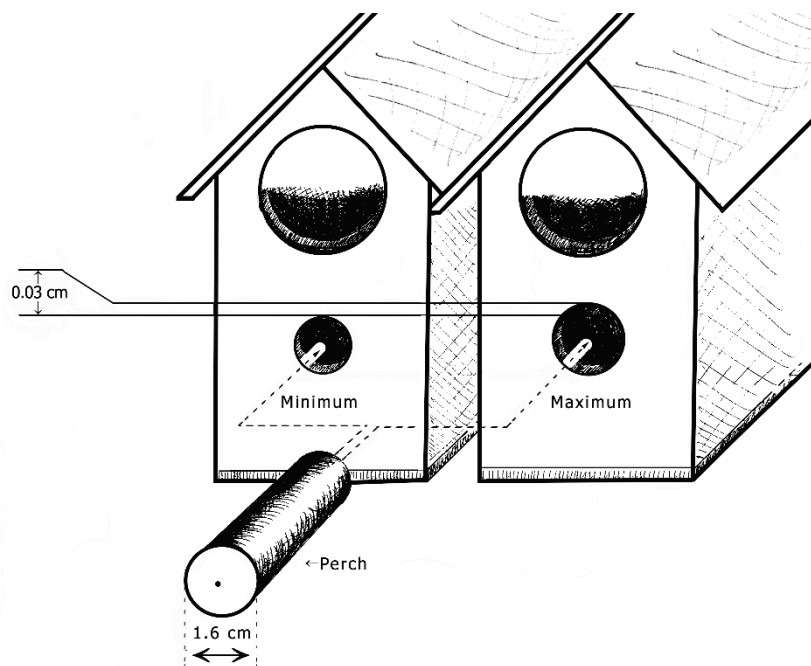
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**Question 30**

E5.P.1

2 marks

Robert is building a bird house. The perch has a diameter of 1.6 cm which is the midpoint of the tolerance range. The tolerance is 0.03 cm.



State the range of acceptable measurements for the perch diameter in the form:  $\frac{\text{maximum value}}{\text{minimum value}}$  (2 marks)

**Answer:**

$$\begin{aligned}\text{Half tolerance} &= 0.03 \div 2 \\ &= 0.015 \text{ cm} \quad \leftarrow 1 \text{ mark}\end{aligned}$$

$$\begin{aligned}\text{Maximum} &= 1.6 + 0.015 \\ &= 1.615 \text{ cm}\end{aligned}$$

$$\begin{aligned}\text{Minimum} &= 1.6 - 0.015 \\ &= 1.585 \text{ cm}\end{aligned}$$

$$\text{Tolerance of diameter} = \left. \begin{array}{l} 1.615 \text{ cm} \\ 1.585 \text{ cm} \end{array} \right\} \quad \leftarrow 1 \text{ mark}$$

**OR****Answer:**

$$\text{Tolerance of diameter} = \begin{array}{ll} 1.615 \text{ cm} & \leftarrow 1 \text{ mark} \\ 1.585 \text{ cm} & \leftarrow 1 \text{ mark} \end{array}$$



### Exemplar 1

(2 marks)

minimum value = 1.6  
maximum value = 1.63

Mark: 0 out of 2

Rationale: Incorrect maximum value  
Incorrect minimum value

### Exemplar 2

(2 marks)

1.615  
1.545

E5

Mark: 1 out of 2

Rationale: Correct maximum value (1 mark)  
Incorrect minimum value  
E5 (does not include units in final answer)

### Exemplar 3

(2 marks)

1.63 cm  
1.57 cm

Mark: 1 out of 2

Rationale: Incorrect half tolerance  
Correct tolerance of diameter (follow-through error) (1 mark)

### Exemplar 4

(2 marks)

Min: 1.585 cm  
max: 1.615 cm

E2

Mark: 2 out of 2

Rationale: Correct maximum value (1 mark)  
Correct minimum value (1 mark)  
E2 (answer expressed in an alternative form than requested)

**Question 31**

E5.P.1

1 mark

Last week, Phoenix collected 13.7 kg of berries.

State the precision of the scale he used.

**Answer:**

0.1 kg    or    one tenth of a kilogram

**Exemplar 1**

(1 mark)

$$13.7 \div 2 = 6.85 \text{ kg}$$

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

(1 mark)

$$0.01 \text{ kg}$$

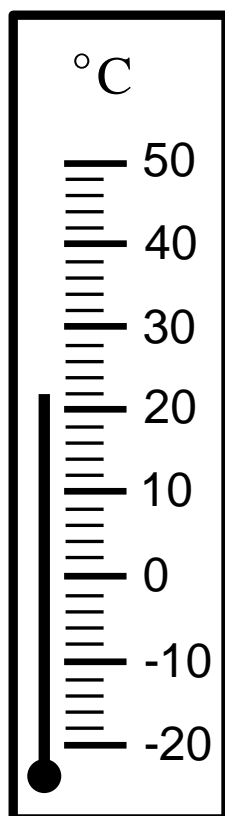
**Mark: 0 out of 1****Rationale:** Incorrect answer

**Question 32**

E5.P.1

2 marks

State the temperature shown on the thermometer below in the form: measurement  $\pm$  uncertainty.  
(2 marks)

**Answer:**

$22^{\circ}\text{C} \pm 1^{\circ}\text{C}$   
1 mark 1 mark

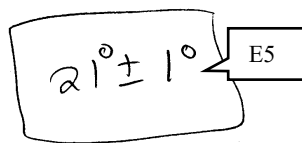
**Exemplar 1**

(2 marks)

$$20 \pm 0.5$$

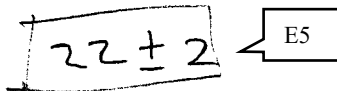
**Mark: 0 out of 2****Rationale:** Incorrect measurement  
Incorrect uncertainty**Exemplar 2**

(2 marks)


$$21^\circ \pm 1^\circ$$

**Mark: 1 out of 2****Rationale:** Incorrect measurement  
Correct uncertainty (1 mark)  
E5 (uses incorrect units of measure)**Exemplar 3**

(2 marks)


$$22 \pm 2$$

**Mark: 1 out of 2****Rationale:** Correct measurement (1 mark)  
Incorrect uncertainty  
E5 (does not include units in final answer)**Exemplar 4**

(2 marks)

$$21^\circ \pm 0.5^\circ$$

**Mark: 1 out of 2****Rationale:** Incorrect measurement  
Correct uncertainty (follow-through error) (1 mark)

**Question 33**

E5.P.1

1 mark

A drink contains  $0.504 \text{ mg} \pm 0.002 \text{ mg}$  of caffeine.

State the minimum quantity of caffeine in this drink.

**Answer:**

$$\begin{aligned}\text{Minimum quantity} &= 0.504 - 0.002 \\ &= 0.502 \text{ mg} \quad \leftarrow 1 \text{ mark}\end{aligned}$$

**Exemplar 1**

(1 mark)

$$\begin{array}{r} (0.504 + 0.002) - (0.504 - 0.002) \\ 0.506 \quad - \quad 0.502 \\ 000.4 \text{ mg} \end{array}$$

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

(1 mark)

$$\begin{array}{l} 0.504 \pm 0.002 \\ = 0.506 \\ = 0.502 \end{array}$$

E5

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

E5 (does not include units in final answer)

**Exemplar 3**

(1 mark)

E3

$$0.502 - 0.002 = 0.500 \text{ mg}$$

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

E3 (makes a transcription error)

# Statistics

## Question 34

E5.S.2

1 mark

Jorge is a soccer goalie. This year, he saved 92% of shots on net. This puts him in the 10th percentile of goalies in the league.

Justify, referring to percentile rank, whether Jorge was one of the best goalies in the league this year.

**Answer:**

No, he is only in the 10th percentile which means 90% of goalies were better than him this year.



**Exemplar 1**

(1 mark)

He did good in the shots on net,  
But he is not the best goalies this year.

**Mark: 0 out of 1****Rationale:** Insufficient response**Exemplar 2**

(1 mark)

No.  
If he was best he'd be in  
the 90th %ile.

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

**Question 35**

E5.S.1

2 marks

A train has 60 cars.

Calculate the average load of one train car using a weighted mean, based on the information in the table below. (2 marks)

Type of Car	Number of Cars on Train	Load Per Car (Tons)
Cargo	50	100
Grain	10	80

**Answer:**

$$\left( \frac{50}{60} \times 100 \right) + \left( \frac{10}{60} \times 80 \right) \left. \vphantom{\frac{50}{60} \times 100} \right\} \leftarrow 1 \text{ mark for process}$$
$$= 83.\bar{3} + 13.\bar{3}$$
$$= 96.67 \text{ tons} \quad \leftarrow 1 \text{ mark}$$

**OR****Answer:**

$$\frac{(50 \times 100) + (10 \times 80)}{60} \left. \vphantom{\frac{(50 \times 100) + (10 \times 80)}{60}} \right\} \leftarrow 1 \text{ mark for process}$$
$$= \frac{5000 + 800}{60}$$
$$= 96.67 \text{ tons} \quad \leftarrow 1 \text{ mark}$$

<b>Exemplar 1</b>	(2 marks)
-------------------	-----------

mark

weight  
(%)

$$\begin{array}{r|l}
 50 & 100 = 50 \\
 10 & 80 = 8 \\
 \hline
 & 58
 \end{array}$$

E5

**Mark: 1 out of 2**

**Rationale:** Incorrect process (divided by 100 instead of 60)  
 Correct final answer (follow-through error) (1 mark)  
 E5 (does not include units in final answer)

<b>Exemplar 2</b>	(2 marks)
-------------------	-----------

Type of Car	Number of Cars on Train	Load Per Car (Tons)
Cargo	50	100
Grain	10	80

$$\begin{aligned}
 &= 5000 + \\
 &= 800 +
 \end{aligned}$$

5800 tons

**Mark: 1 out of 2**

**Rationale:** Correct process (correctly calculated total load) (1 mark)  
 Incorrect final answer

<b>Exemplar 3</b>	(2 marks)
-------------------	-----------

$$100(0.83) + 80(0.167) = 96.36 \text{ tons}$$

E6

E6

**Mark: 2 out of 2**

**Rationale:** Correct process (1 mark)  
 Correct final answer (1 mark)  
 E6 (rounds too soon)

**Question 36**

E5.S.1

1 mark

Choose the letter that best completes the statement below.

Trimming the highest and lowest values of a large data set will cause the median to:

- A) increase
- B) decrease
- C) stay the same
- D) change, but it is impossible to tell by how much

**Answer:**     C

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**Question 37**

E5.S.1

3 marks

Given the following information:

$$\text{Median} = 3$$

$$\text{Mean} = 4$$

$$\text{Mode} = 2$$

State 5 whole numbers that meet the criteria above, using the numbers 1 through 9. (3 marks)

\_\_\_\_\_

**Answer:**

$$\underbrace{\begin{array}{c} 2 \\ 2 \end{array}}_{\substack{\text{1 mark} \\ \text{for a} \\ \text{mode} \\ \text{of 2}}} \quad \underbrace{\begin{array}{c} 3 \\ 3 \end{array}}_{\substack{\text{1 mark} \\ \text{for a} \\ \text{median} \\ \text{of 3}}} \quad \begin{array}{c} 4 \\ 4 \end{array} \quad \begin{array}{c} 9 \\ 9 \end{array}$$

$$\frac{2 + 2 + 3 + 4 + 9}{5} = \frac{20}{5} = 4 \quad \leftarrow \text{1 mark for a mean of 4}$$

**OR****Answer:**

$$\underbrace{\begin{array}{c} 2 \\ 2 \end{array}}_{\substack{\text{1 mark} \\ \text{for a} \\ \text{mode} \\ \text{of 2}}} \quad \underbrace{\begin{array}{c} 3 \\ 3 \end{array}}_{\substack{\text{1 mark} \\ \text{for a} \\ \text{median} \\ \text{of 3}}} \quad \begin{array}{c} 5 \\ 5 \end{array} \quad \begin{array}{c} 8 \\ 8 \end{array}$$

$$\frac{2 + 2 + 3 + 5 + 8}{5} = \frac{20}{5} = 4 \quad \leftarrow \text{1 mark for a mean of 4}$$

**OR****Answer:**

$$\underbrace{\begin{array}{c} 2 \\ 2 \end{array}}_{\substack{\text{1 mark} \\ \text{for a} \\ \text{mode} \\ \text{of 2}}} \quad \underbrace{\begin{array}{c} 3 \\ 3 \end{array}}_{\substack{\text{1 mark} \\ \text{for a} \\ \text{median} \\ \text{of 3}}} \quad \begin{array}{c} 6 \\ 6 \end{array} \quad \begin{array}{c} 7 \\ 7 \end{array}$$

$$\frac{2 + 2 + 3 + 6 + 7}{5} = \frac{20}{5} = 4 \quad \leftarrow \text{1 mark for a mean of 4}$$

**Note to marker:** Students do not need to calculate the mean in order to receive a mark.

**Exemplar 1**

(3 marks)

     2     3     2     

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

Incorrect median

Incorrect mean

**Exemplar 2**

(3 marks)

  1     2     3     4     5  

**Mark: 1 out of 3****Rationale:** Incorrect mode

Correct median (1 mark)

Incorrect mean

**Exemplar 3**

(3 marks)

  2     2     3     4     4  

**Mark: 1 out of 3****Rationale:** Incorrect mode

Correct median (1 mark)

Incorrect mean

<b>Exemplar 4</b>
-------------------

(3 marks)

2   2   3   -1   -2

**Mark: 1 out of 3**

**Rationale:** Correct mode (1 mark)

Incorrect median

Incorrect mean

<b>Exemplar 5</b>
-------------------

(3 marks)

2   2   5   5   6

**Mark: 1 out of 3**

**Rationale:** Incorrect mode

Incorrect median

Correct mean (1 mark)



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**Question 38**

E5.S.1

1 mark

The following data set represents the number of kids that visited Maggie's house on Halloween over the past seven years.

Year	Number of kids
2013	13
2014	11
2015	8
2016	19
2017	87
2018	21
2019	10

Explain why it would be better for Maggie to use the median rather than the mean to predict the number of kids next Halloween.

**Sample answers:**

- The median is the best measure of central tendency because there is an outlier.
- The mean would be affected by the high outlier of 87.

**Exemplar 1**

(1 mark)

because it would give you the middle value

**Mark: 0 out of 1****Rationale:** Insufficient response**Exemplar 2**

(1 mark)

The numbers will be better because there is a large number (87) in a lot of small numbers.

**Mark: 0.5 out of 1****Rationale:** Correct response (1 mark)

Lack of clarity (which numbers?) (0.5 mark deduction)

**Exemplar 3**

(1 mark)

Year	Number of kids
2013	13 / 4
2014	11 / 3
2015	8 / 1
2016	19 / 5
2017	87 / 7
2018	21 / 6
2019	10 / 2

$$\text{mean} = 24.14$$

$$\text{median} = 13$$

Because the median is the data point that resembles the others the most. So, it will make more sense to use a data point that resembles the others.

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

<b>Exemplar 4</b>
-------------------

(1 mark)

Because 2017 was just an irregular year and the median is a better average.

**Mark: 1 out of 1**

**Rationale:** Correct response (1 mark)

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**Question 39**

E5.S.2

2 marks

The Winnipeg Flyers hockey team keeps statistics on the number of goals scored by each player.

Player	Goals Scored
Buff, D.	13
Flowry, A.	15
Large, B.	21
Legica, J.	10
Lines, P.	36
Shuffler, M.	32
Steelers, N.	26
Wheely, B.	25

Calculate Steelers' percentile rank. (2 marks)

**Answer:**

$$PR = \frac{b}{n} \times 100$$

$$= \frac{5}{8} \times 100$$

← 1 mark for correct substitutions

$$= 62.5$$

$$\therefore 62 \text{ or } 62\text{nd} \text{ or } PR_{62}$$

← 1 mark

or

$$63 \text{ or } 63\text{rd} \text{ or } PR_{63}$$

**Note to marker:** Award one mark for a follow-through error only if “*b*” or “*n*” is substituted correctly.

### Exemplar 1

(2 marks)

$$\frac{26}{178} = 15^{\text{th}} \text{ percentile rank}$$

**Mark: 0 out of 2**

**Rationale:** Incorrect substitutions  
Incorrect final answer

### Exemplar 2

(2 marks)

$$\frac{1}{8} \times 100 = 12.5$$

E4

**Mark: 1 out of 2**

**Rationale:** Incorrect substitutions  
Correct final answer (follow-through error) (1 mark)  
E4 (does not use whole units in contextual questions involving discrete data)

### Exemplar 3

(2 marks)

$$PR = \frac{6}{n} (100)$$

$$PR = \frac{5}{8} (100)$$

$$PR = 62.5\%$$

**Mark: 1 out of 2**

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







# **Appendices**



## Appendix A:

### Table of Questions by Unit and Learning Outcome

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

Geometry and Trigonometry		
Question	Learning Outcome	Mark
22	E6.G.2	2
23 a)	E6.G.2	1
23 b)	E6.G.2	2
24	E6.G.1	3
25	E6.G.2	1
26	E6.G.2	1
27	E6.G.1, E6.G.2	4
		<b>Total = 14</b>
Precision Measurement		
Question	Learning Outcome	Mark
28	E5.P.1	1
29 a)	E5.P.1	1
29 b)	E5.P.1	1
30	E5.P.1	2
31	E5.P.1	1
32	E5.P.1	2
33	E5.P.1	1
		<b>Total = 9</b>
Statistics		
Question	Learning Outcome	Mark
34	E5.S.2	1
35	E5.S.1	2
36	E5.S.1	1
37	E5.S.1	3
38	E5.S.1	1
39	E5.S.2	2
		<b>Total = 10</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 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:** \_\_\_\_\_

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

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

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

**For Department Use Only—After Marking Complete**

**Consultant:** \_\_\_\_\_

**Date:** \_\_\_\_\_



# Appendix C:

## Marking Guidelines

A 0.5 mark deduction will apply each time there is a 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 clearly indicated (e.g., 3/4 and 3:1 presented, but final answer not indicated)
- answer is presented in another part of the question
- too much information is presented in the answer and the information is numerically and conceptually correct (If contradictory information is provided, no mark is awarded.)

#### E2 (Notation)

- dimensions written in an alternative form than requested (e.g., write the tolerance in the form nominal value  $\pm$  half tolerance and student gives maximum  $\begin{matrix} + 0 \\ - \text{tolerance} \end{matrix}$ )
- answer expressed in an alternative form than requested (e.g., express probability as a percentage and student gives a decimal form)

#### 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 paint, percentile rank)

#### 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 decimal places)