Grade 12
Essential Mathematics
Achievement Test

Marking Guide

June 2013

Manitoba

Manitoba Education Cataloguing in Publication Data

Grade 12 essential mathematics achievement test.
Marking Guide. June 2013 [electronic resource]

ISBN: 978-0-7711-5442-3

1. Educational tests and measurements—Manitoba.
2. Mathematical ability—Testing.
3. Mathematics—Examinations, questions, etc.
4. Mathematics—Study and teaching (Secondary)—Manitoba.
I. Manitoba. Manitoba Education.
510.76

Manitoba Education
School Programs Division
Winnipeg, Manitoba, Canada

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

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

After the administration of this test, print copies of this resource will be available for purchase from the Manitoba Text Book Bureau. Order online at <www.mtbb.mb.ca>.

This resource will also be available on the Manitoba Education website at <www.edu.gov.mb.ca/k12/assess/archives/index.html>.

Websites are subject to change without notice.

Disponible en français.

Available in alternate formats upon request.

Contents

Marking Guidelines.....ii

Irregularities in Provincial Tests.....ii

Presentation of the Student Samples 1

Vehicle Finance..... 2

Geometry and Trigonometry 14

Statistics..... 26

Home Finance..... 36

Precision Measurement..... 48

Probability 58

Appendix: Irregularities in Provincial Tests..... 71

Irregular Test Booklet Report..... 73

Marking Guidelines

The *Grade 12 Essential Mathematics Achievement Test: Marking Guide (June 2013)* is based on *Grades 9 to 12 Mathematics: Manitoba Curriculum Framework of Outcomes* (2009).

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.

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 scores.
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.

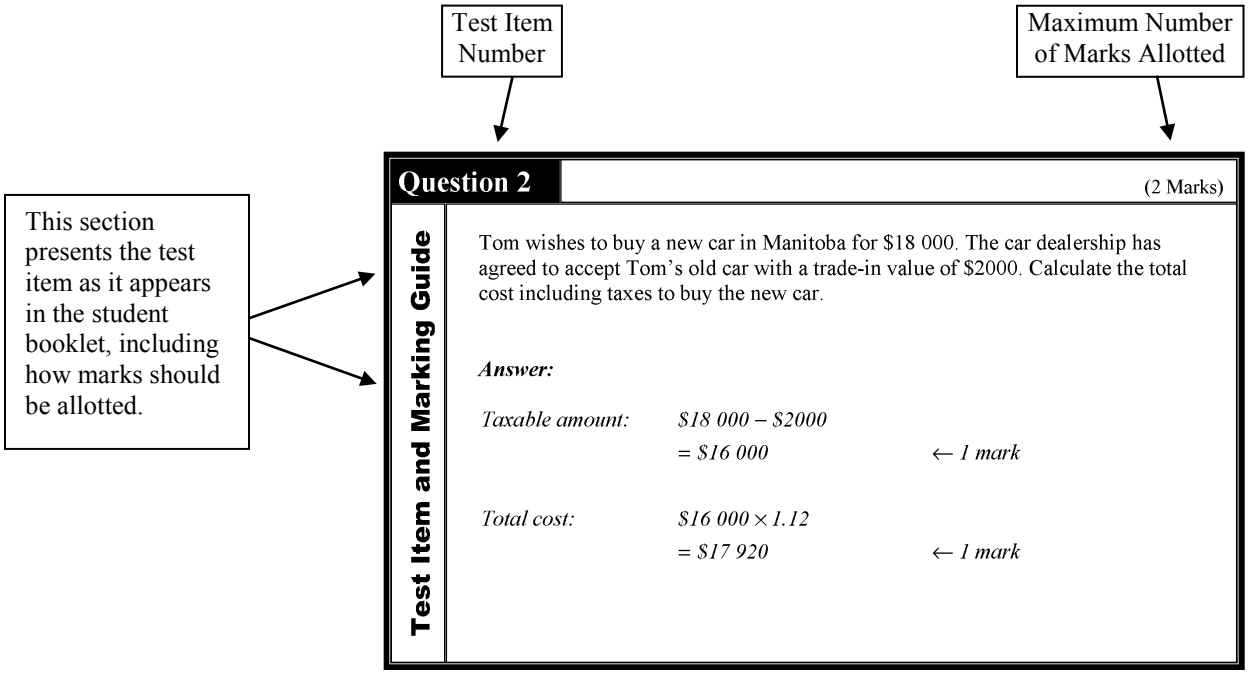
Irregularities in Provincial Tests

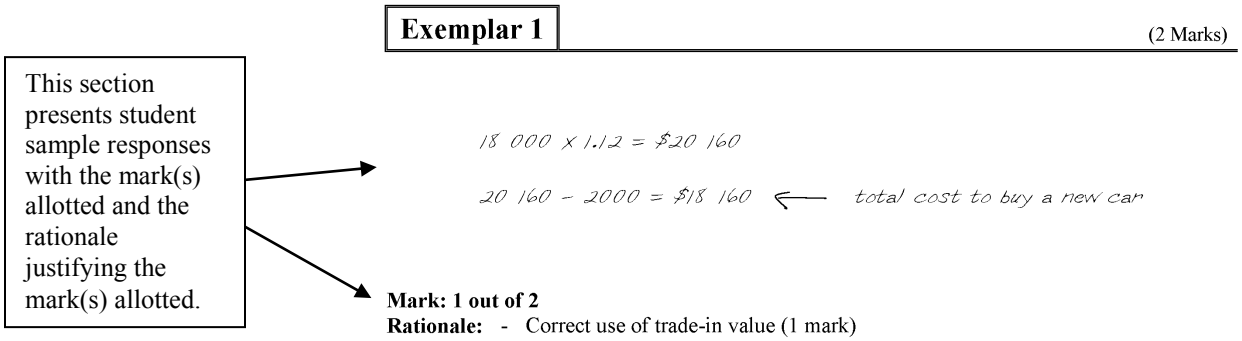
During the administration of provincial tests, supervising teachers may encounter irregularities. Markers may also encounter irregularities during local marking sessions. The appendix provides examples of such irregularities as well as procedures to follow to report irregularities.

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*.

Presentation of the Student Samples

Each constructed-response question is presented using the following sections:





Vehicle Finance

Question 1

(2 Marks)

Test Item and Marking Guide

You are purchasing a vehicle. The bank will lend you $16 500, repayable over 3 years at an interest rate of 4.25%. Calculate the monthly payment.

Monthly Vehicle Loan Payments
per $1000 borrowed

Interest Rate (%)	Years to Repay Loan				
	1	2	3	4	5
4.00	85.15	43.42	29.52	22.58	18.42
4.25	85.26	43.54	29.64	22.69	18.53
4.50	85.38	43.65	29.75	22.80	18.64
4.75	85.49	43.76	29.86	22.92	18.76
5.00	85.61	43.87	29.97	23.03	18.87
5.25	85.72	43.98	30.08	23.14	18.99
5.50	85.84	44.10	30.20	23.26	19.10
5.75	85.95	44.21	30.31	23.37	19.22
6.00	86.07	44.32	30.42	23.49	19.33
6.25	86.18	44.43	30.54	23.60	19.45
6.50	86.30	44.55	30.65	23.71	19.57
6.75	86.41	44.66	30.76	23.83	19.68
7.00	86.53	44.77	30.88	23.95	19.80
7.25	86.64	44.89	30.99	24.06	19.92
7.50	86.76	45.00	31.11	24.18	20.04
7.75	86.87	45.11	31.22	24.30	20.16
8.00	86.99	45.23	31.34	24.41	20.28

Answer:

$$\frac{\$16\,500}{1000} \times \underbrace{29.64}_{1 \text{ mark}} = \underbrace{\$489.06}_{1 \text{ mark}} \text{ monthly payment}$$

Exemplar 1

(2 Marks)

Monthly Payment = $29.64

Mark: 1 out of 2
Rationale: - Correct table value (1 mark)

Exemplar 2

(2 Marks)

$$\frac{16\,500 \times 29.52}{1000} = \$487.08/\text{monthly}$$

Mark: 1 out of 2
Rationale: - Incorrect table value
- Correct solution (follow-through error) (1 mark)

Exemplar 3

(2 Marks)

$$\frac{29.64 \times 16\,500}{1000} = 489.06 \text{ annual}$$

$$489.06 \div 12 = 40.76 \text{ monthly}$$

Mark: 1 out of 2
Rationale: - Correct table value (1 mark)

Question 2

(2 Marks)

Test Item and Marking Guide

Tom wishes to buy a new car in Manitoba for $18 000. The car dealership has agreed to accept Tom's old car with a trade-in value of $2000. Calculate the total cost including taxes to buy the new car.

Answer:

Taxable amount: $\$18\,000 - \$2000$

$= \$16\,000$ ← *1 mark*

Total cost: $\$16\,000 \times 1.12$

$= \$17\,920$ ← *1 mark*

Exemplar 1

(2 Marks)

18 000 x 1.12 = $20 160

20 160 − 2000 = $18 160 ⟵ total cost to buy a new car

Mark: 1 out of 2
Rationale: - Correct use of trade-in value (1 mark)

Exemplar 2

(2 Marks)

$18 000 − $2000 = $16 000 × 5% = $800

$16 000 + $800 = $16 800

The total cost to buy a new car will be $16 800.

Mark: 1 out of 2
Rationale: - Correct taxable amount (1 mark)

Exemplar 3

(2 Marks)

18 000
−2000
$16 000

Mark: 1 out of 2
Rationale: - Correct taxable amount (1 mark)

Question 3

(2 Marks)

Test Item and Marking Guide

Describe one (1) advantage and one (1) disadvantage of purchasing a new car instead of leasing one.

Advantage of purchasing	Disadvantage of purchasing

Sample Answers:

Advantage of purchasing	Disadvantage of purchasing
No monthly payments, once paid off	*Higher monthly payments*
No charge for driving excessive distances	*Owner assumes repair costs once the warranty expires*
No charge for excessive wear and tear	*Stuck with the vehicle if it turns out to be unreliable*
Option to personalize/customize the vehicle	
The car becomes an asset	
Cheaper in the long run if the car is kept	

(2 × 1 mark)

Exemplar 1

(2 Marks)

Advantage of purchasing	Disadvantage of purchasing
When you finish paying for your vehicle you own the car and it is yours.	Monthly or yearly insurance payments.

Mark: 1 out of 2
Rationale: - Correct response for advantage (1 mark)

Exemplar 2

(2 Marks)

Advantage of purchasing	Disadvantage of purchasing
The buyer owns the vehicle.	If you want to sell it you have to do all the work, not just give it back to the dealer.

Mark: 1 out of 2
Rationale: - Correct response for disadvantage (1 mark)

Question 4

(5 Marks)

Test Item and Marking Guide

You are leasing a vehicle. The monthly lease payment is $299 plus taxes for 36 months. The lease requires a $4500 down payment.

A) Calculate the total amount paid over 36 months. (3 marks)

Answer:

Monthly payment:	$\$299 \times 1.12$	
	$= \$334.88$	← *1 mark*
Lease payments over 36 months:	$\$334.88 \times 36$	
	$= \$12\,055.68$	← *1 mark*
Total paid over 36 months:	$\$12\,055.68 + \$4500$	
	$= \$16\,555.68$	← *1 mark*

B) You choose to purchase the vehicle at the end of the lease for the residual value (75% of the original value). The original cost of the vehicle was $34 000 plus taxes. Calculate the total amount paid for the vehicle. (2 marks)

Answer:

Residual value:	$\$34\,000 \times 1.12 \times 0.75$	
	$= \$28\,560$	← *1 mark*
Total amount paid:	$\$16\,555.68 + \$28\,560$	
	$= \$45\,115.68$	← *1 mark*

Exemplar 1

(5 Marks)

A) $16 555.68

B) $45 115.68

Mark: 2 out of 5
Rationale: - Correct total in Part A (1 mark)
- Correct total in Part B (1 mark)

Exemplar 2

(5 Marks)

A)

(PST + GST)
299 x 12% = 35.88
299 + 35.88 = 334.88
334.88 x 36 = 12 055.68

B)

PST + GST
34 000 x (12%) = $4080
34 000 + 4080 = $38 080
38 080 x 75% = $28 560
38 080 – 28 560 = $9520

Mark: 3 out of 5
Rationale: - Correct lease payments over 36 months in Part A (2 × 1 mark)
- Correct residual value in Part B (1 mark)

Exemplar 3

(5 Marks)

A) $299 x 12% = $35.88

$299 + $35.88 = $334.88 x 36 = $12 055.68
+ $4500
$16 555.68

B) $34 000 x 75% = $25 500

$16 555.68 + $25 500 = $42 055.68

Mark: 4 out of 5
Rationale: - Correct cost of lease over 36 months in Part A (3 × 1 mark)
- Correct total amount paid (follow-through error) in Part B (1 mark)

Question 5

(3 Marks)

Test Item and Marking Guide

Phillip buys a used car for $1500. The price of a safety inspection on the car was $40. When registering the car, Phillip is told that the book value of the car is $3700. Calculate the total cost of purchasing the car.

Answer:

Safety:	$\$40 \times 1.05$	
	$= \$42$	← *1 mark*
Tax on book value:	$\$3700 \times 0.07$	
	$= \$259$	← *1 mark*
Total:	$\$1500 + \$42 + \$259$	
	$= \$1801$	← *1 mark*

Exemplar 1

(3 Marks)

Car $1500
Inspection $40

$1500 + $40 = $1540

The total cost of the vehicle is $1540.

Mark: 1 out of 3
Rationale: - Incorrect taxes
- Correct total (follow-through error) (1 mark)

Exemplar 2

(3 Marks)

40 x 1.12 = 44.80
3700 x 1.12 = 4144.00
+ 1500
$5688.80

Mark: 1 out of 3
Rationale: - Incorrect taxes
- Correct solution (follow-through error) (1 mark)

Exemplar 3

(3 Marks)

I don't entirely understand the question. Phillip purchased the car for $1500.00. He owns it. It doesn't state whether it was safetied prior to him buying it or after. I'll assume you're asking for purchase price including the safety and the taxes.

1500.00 1500.00
40.00 + taxes = 44.80
3700 x .07 (7% PST) = 259 $1803.80

Mark: 2 out of 3
Rationale: - Incorrect tax on safety
- Correct taxes on book value (1 mark)
- Correct total answer (follow-through error) (1 mark)

Question 6

(2 Marks)

Test Item and Marking Guide

Nancy is going on a 1300 km car trip. Her car's fuel efficiency is 8 L/100 km. The average price for fuel on her trip is estimated to be $1.20 per litre. Calculate the cost of fuel for her trip.

Answer:

Fuel used: $1300\ km \times \frac{8\ L}{100\ km}$

$= 104\ L$ ← *1 mark*

Total cost: $104\ L \times \$1.20/L$

$= \$124.80$ ← *1 mark*

OR

Fuel rate: $\frac{8\ L}{100\ km} \times \$1.20/L$

$= \$0.096/km$ ← *1 mark*

Total cost: $1300\ km \times \$0.096/km$

$= \$124.80$ ← *1 mark*

Exemplar 1

(2 Marks)

1300 x 1.20 = $1560 cost of fuel for 1300 km

Mark: 0 out of 2
Rationale: - Incorrect solution

Exemplar 2

(2 Marks)

$\frac{1300}{8}$ = 162.5 Km x 1.20 = $195 cost of trip

Mark: 0 out of 2
Rationale: - Incorrect solution

Exemplar 3

(2 Marks)

8 × 1.20 = $9.6 × 13 = $124.8
Per
1300
Km

Mark: 2 out of 2
Rationale: - Correct solution, alternate method (2 marks)

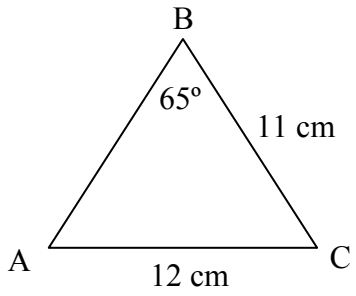
Geometry and Trigonometry

Question 7

(2 Marks)

Test Item and Marking Guide

In triangle ABC, the length of side AC is 12 cm, the length of side BC is 11 cm, and the measure of angle B is 65º. Use the Sine Law to calculate the measure of angle A in degrees.



Answer:

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

$$\frac{\sin A}{11} = \frac{\sin 65º}{12}$$ ← *1 mark for substitution*

$$\sin A = \frac{(11)(\sin 65º)}{12}$$

$$\sin A = 0.831$$

$$angle\, A = \sin^{-1}(0.831)$$

$angle\, A = 56.18º$ *or* $56.2º$ *or* $56º$ ← *1 mark*

Note to marker: *Degrees not required. Allow for various roundings.*

Exemplar 1

(2 Marks)

SAS $\longrightarrow$ cos

$c^2 = a^2 + b^2 - 2ab(\cos 65^\circ)$

$c^2 = (11\text{ cm})^2 + (12\text{ cm})^2 - 2(11\text{ cm})(12\text{ cm})(\cos 65^\circ)$

$\sqrt{c^2} = \sqrt{153.428\,7789}$

$c = 12.39\text{ cm}$

Angle A

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

$(11\text{ cm})^2 = (12\text{ cm})^2 + (12.39\text{ cm}) - 2(12\text{ cm})(12.39\text{cm})(\cos A)$

$\frac{121 - 297.5121}{-297.36} = \cos A$

$\cos^{-1} A = 0.593\,597$

$A = 53.59^\circ$

Mark: 0 out of 2
Rationale: - Incorrect formula

Exemplar 2

(2 Marks)

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

$\frac{11\text{ cm}}{\sin A} = \frac{12\text{ cm}}{\sin 65} = \frac{c}{\sin C}$

$\frac{11\text{ cm}}{\sin A} = \frac{12\text{ cm}}{\sin(65)} = 10.87$

Mark: 1 out of 2
Rationale: - Correct substitution (1 mark)

Exemplar 3

(2 Marks)

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

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

$\frac{\sin A}{11\text{cm}} = \frac{65^\circ}{12\text{cm}}$

$\downarrow$

$\frac{\sin A}{11\text{cm}} \times \frac{0.9063}{12\text{cm}}$

$\frac{9.9693}{12} = 0.830\,775$

56.2°

angle A is 56.2°

Mark: 2 out of 2
Rationale: - Correct solution (2 marks)

Question 8

(3 Marks)

Test Item and Marking Guide

The Cosine Law is often used in construction, commercial, industrial, or artistic applications.

A) Demonstrate one use of the Cosine Law in the real world by performing the following two steps: (2 marks)

- State a specific example where Cosine Law is used.
- Support your example with a written explanation, or with other information or evidence, of how Cosine Law is used.

Answer:

2 marks for example with support

B) Sketch a reasonably neat picture or diagram (not necessarily to scale) that supports your example in Part A. (1 mark)

Answer:

1 mark for sketch

Exemplar 1

(3 Marks)

A) The Cosine Law can be used when sailors would want to know the distance of something

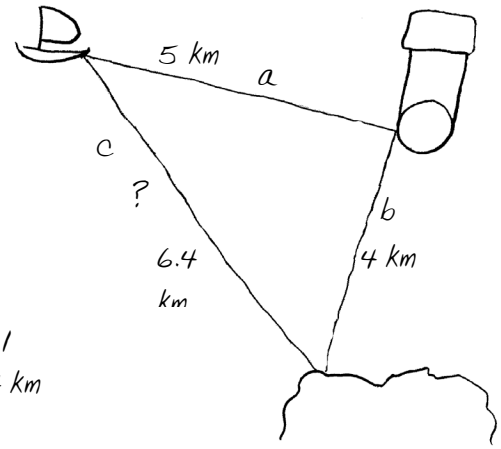
If they wanted to know how far an island was from them but only knew the distance from them to the lighthouse and from the lighthouse to the island

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

$c^2 = 5^2 + 4^2 = 41$

$c = \sqrt{41} = 6.4$ km

B)



Mark: 0 out of 3
Rationale: - Incorrect answers

Exemplar 2

(3 Marks)

A) When a construction builder is making the outline of a roof.

B)

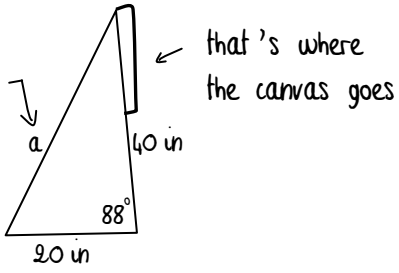
Mark: 0 out of 3
Rationale: - Incorrect answer

Exemplar 3

(3 Marks)

A) The cosine law is used when you are trying to find the missing side of a triangle. Perhaps if you were building an easel for example, and you needed to find the length of one of the pieces of wood used to create a stand.

B) so if I needed to find out how long this wood needs to be, I'd use the cosine law!



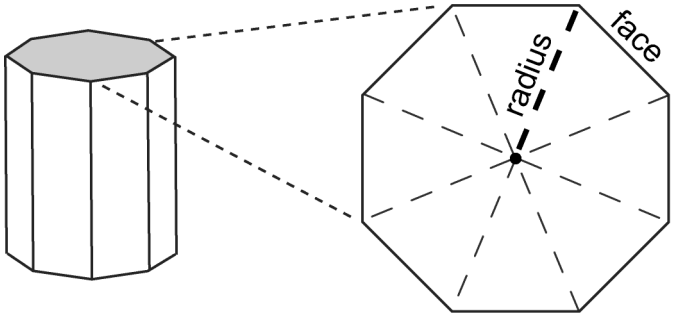
Mark: 3 out of 3
Rationale: - Correct answer in Part A (2 marks)
- Correct sketch in Part B (1 mark)

Question 9

(3 Marks)

Test Item and Marking Guide

A building foundation has 8-sided regular polygon piles. Each pile has a radius of 12 inches. Determine the width of a face of the polygon.



Answer:

Central angle: $\dfrac{360^\circ}{8}$

$= 45^\circ$ ← *1 mark*

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

$face^2 = 12^2 + 12^2 - 2(12)(12)\cos 45^\circ$ ← *1 mark for substitution*

$face^2 = 288 - 203.65$

$face^2 = 84.35$

$face = \sqrt{84.35}$

$face = 9.18$ or 9.2 or 9 (inches) ← *1 mark*

Note to marker: *Various solutions exist, including those using Sine Law, or right-angled trigonometry. Allow for various roundings.*

Exemplar 1

(3 Marks)

$$c = \frac{360}{8} = 45$$

Mark: 1 out of 3
Rationale: - Correct calculation of central angle (1 mark)

Exemplar 2

(3 Marks)

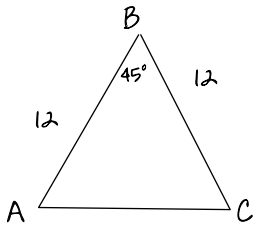
$360 \div 8 = 45°$
(degrees) (sides) (central angle)

$$\frac{\sin 45}{1} = \frac{x}{12 \text{ in}} = 8.5 \text{ in face}$$

Mark: 1 out of 3
Rationale: - Correct calculation of central angle (1 mark)

Exemplar 3

(3 Marks)



$\angle A = 67.5°$
$\angle B = 45°$
$\angle C = 67.5°$

$a = 12$ in
$b = 9$ in
$c = 12$ in

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

$$\frac{b}{\sin 45} = \frac{12}{\sin 67.5}$$

$b(\sin 67.5) = 12(\sin 45)$

$$\frac{b(0.9238)}{0.9238} = \frac{8.4852}{0.9238}$$

$b = 9.185$

$S = n-2(180)$
$S = 8-2(180)$
$S = 6(180)$
$S = 1080$

$$c = \frac{360°}{8}$$

$c = 45$

The faces are 9 inches.

Mark: 3 out of 3
Rationale: - Correct solution, alternate method (3 marks)

Question 10

(3 Marks)

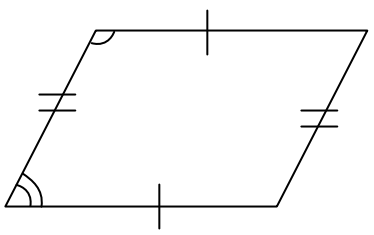
Test Item and Marking Guide

A given quadrilateral has the following properties:

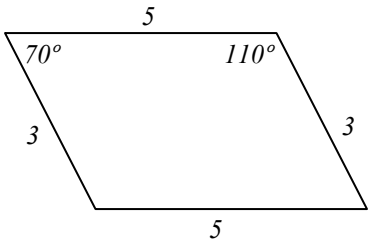
- the opposite sides have equal length
- the measures of consecutive (or adjacent) angles are not equal

A) Draw the quadrilateral with these properties. (2 marks)

Answer:



OR



For opposite sides equal ← *1 mark*

For unequal consecutive angles ← *1 mark*

B) State the name of this quadrilateral. (1 mark)

Answer: *Parallelogram*

Note to marker:
"Rhombus" is acceptable if all 4 sides are drawn equal in Part A.

Exemplar 1

(3 Marks)

A)

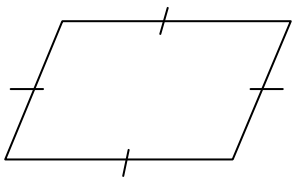
B) square

Mark: 0 out of 3

Rationale: - No indication of equal sides or angles in Part A
- Incorrect answer in Part B

Exemplar 2

(3 Marks)

A) 

B) all squares

Mark: 1 out of 3

Rationale: - Opposite sides are equal in Part A (1 mark)
- Incorrect answer in Part B

Exemplar 3

(3 Marks)

A)

B) TRAPEZOID

Mark: 2 out of 3

Rationale: - Consecutive angles not equal in Part A (1 mark)
- Correct answer in Part B (follow-through error) (1 mark)

Question 11

(1 Mark)

Test Item and Marking Guide

Choose the letter that best completes the statement below.

A given quadrilateral has four sides of equal length. The quadrilaterals with this property are

a) all parallelograms

b) all trapezoids

c) all regular pentagons

d) all trapezoids and all rhombuses

e) all rhombuses

Answer: *e)*

This page was intentionally left blank

Question 12

(3 Marks)

Test Item and Marking Guide

Polygons are often used in construction, commercial, industrial, or artistic applications.

A) Demonstrate one use of the various properties of polygons in the real world by performing the following two steps: (2 marks)

- State a specific example where the various properties of polygons are used.
- Support your example with a written explanation, or with other information or evidence, of how the various properties of polygons are used.

Answer:

2 marks for example with support

B) Sketch a reasonably neat picture or diagram (not necessarily to scale) that supports your example in Part A. (1 mark)

Answer:

1 mark for sketch

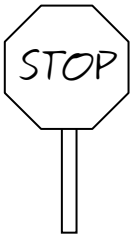
Exemplar 1

(3 Marks)

A) - used for signs

- a stop sign

B)



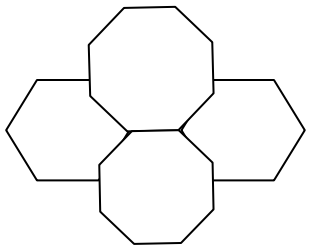
Mark: 0 out of 3
Rationale: - Incorrect answers

Exemplar 2

(3 Marks)

A) They are used in construction for their strong structure and also used in nature by honey bees in their honey combs for strength.

B)



Mark: 3 out of 3
Rationale: - Correct answer in Part A (2 marks)
- Correct sketch in Part B (1 mark)

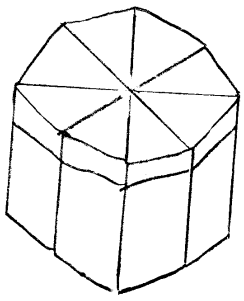
Exemplar 3

(3 Marks)

A) – industrial art could be one

– if a person making a structure or even a container with a polygon structure with maybe 8 sides. Calculations will have to be done with triangles, rectangles and octagons to make this and make sides evenly so they fit.

B)



Mark: 3 out of 3
Rationale: - Correct answer in Part A (2 marks)
- Correct sketch in Part B (1 mark)

Statistics

Question 13

(1 Mark)

Test Item and Marking Guide

Choose the letter that best completes the statement below.

Outliers are removed from a data set before calculating the measure of central tendency. This measure is called the

a) mean

b) median

c) mode

d) trimmed mean

e) weighted mean

Answer: *d)*

This page was intentionally left blank

Question 14

(2 Marks)

Test Item and Marking Guide

You are given the following set of data:

10	3	10	4	5
2	9	9	2	7
7	3	8	8	3

A) Express the mode. (1 mark)

Answer: *3*

B) Express the median. (1 mark)

Answer: *7*

Exemplar 1

(2 Marks)

A) Answer: 7,7

2, 2, 3, 3, 3, 4, 5, 7, 7, 8, 8, 9, 9, 10, 10

B) Answer: 90

10 + 3 + 10 + 4 + 5 + 2 + 9 + 9 + 2 + 7 + 7 + 3 + 8 + 8 + 3 = 90

Mark: 0 out of 2

Rationale: - Incorrect response in Part A
- Incorrect response in Part B

Exemplar 2

(2 Marks)

2, 2, 3, 3, 3, 4, 5, 7, 8, 8, 9, 9, 10, 10 $\left(\frac{83}{14} = 6 \text{ arithmetic mean}\right)$

A) Answer: 3

B) Answer: 5 and 7

Mark: 1 out of 2

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

Exemplar 3

(2 Marks)

A) Answer: 3

B) Answer: 9

$$\frac{10+9+8+7+2}{4} = \frac{36}{4} = 9$$

Mark: 1 out of 2

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

Question 15

(2 Marks)

Test Item and Marking Guide

A research company conducted a survey on the music preferences of two groups of people. People in Group A enjoyed 1 out of the 5 songs. People in Group B enjoyed 3 out of the 5 songs.

Explain why the research company may use a weighted mean to determine the overall enjoyment of the music.

Sample answers:

– *There may be more people in one of the groups.*

– *The opinions of one group may be more valuable to the company (e.g., due to age range).*

Exemplar 1

(2 Marks)

Group A — 1 out of 5 songs

Group B — 4 out of 5 songs

	Percent	Weight	Overall
Group A	$\frac{1}{5} = 20\%$	5	1
Group A	$\frac{3}{5} = 60\%$	5	3

Mark: 0 out of 2
Rationale: - Incorrect response

Exemplar 2

(2 Marks)

A — 1/5

B — 3/5

$$\bar{X} = \frac{\Sigma x}{n} = \frac{1+3}{10} = \frac{4}{10} = 40\%$$

to get an accurate percentage

Mark: 0 out of 2
Rationale: - Incorrect response

Exemplar 3

(2 Marks)

A $\frac{1}{5}$ B $\frac{3}{5}$

In A people like it less but maybe that is who the company is targeting.

Mark: 2 out of 2
Rationale: - Correct response (2 marks)

Question 16

(2 Marks)

Test Item and Marking Guide

A class of 20 students had a mean of 8 out of 10 on a recent quiz. The teacher added up all of the marks and got 160 out of 200 marks for the class. The teacher decides to use a trimmed mean, and drops two marks: a "2" and a "10". Calculate the trimmed mean for the class.

Answer:

Old total: $20 \times 8 = 160$

New total: $160 - (2 + 10)$

$= 148$ ← *1 mark*

Trimmed mean: $\dfrac{148}{(20 - 2)}$

$= \dfrac{148}{18}$

$= 8.2$ ← *1 mark*

Exemplar 1

(2 Marks)

Trimmed mean:

$$\%\ \text{trim} = \frac{2}{10} = 20\%$$

$$\text{Trimmed } \bar{X} = (20\%) = \frac{8}{10} = 80$$

Mark: 0 out of 2
Rationale: - Incorrect solution

Exemplar 2

(2 Marks)

The mean would go up a little bit because the two is bringing the average down more than the ten is bringing it up so I would say it would be a mean of 9 out of 10.

Mark: 0 out of 2
Rationale: - Incorrect solution

Exemplar 3

(2 Marks)

8/10 mean

2, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 8, 10

= 156 ÷ 18 = 8.6 = 9/10 trimmed mean

Mark: 1 out of 2
Rationale: - Incorrect new total
- Correct solution (follow-through error) (1 mark)

Question 17

(3 Marks)

Test Item and Marking Guide

On a recent math test, Hannah received a better mark than 16 other students in the class. There are 25 students in the class.

A) Calculate Hannah's percentile rank. (2 marks)

Answer:

$$P = \frac{B}{n} \times 100$$

$$= \frac{16}{25} \times 100 \qquad \leftarrow \textit{1 mark for substitution}$$

$$= 64$$

$$\therefore 64 \quad or \quad 64th \quad or \quad P_{64} \qquad \leftarrow \textit{1 mark}$$

Note to marker: *accept* $\frac{16.5}{25} = 66$

B) Explain whether Hannah passed the test. (1 mark)

Answer:

We do not know Hannah's score on the test, so we do not know if she passed or not.

Exemplar 1

(3 Marks)

A) $\frac{16}{25} \times 100$

$= 0.0064$

B)

Mark: 1 out of 3
Rationale: - Correct substitution in Part A (1 mark)

Exemplar 2

(3 Marks)

A) $PR = \frac{16}{25} = 64\%$

B) It's hard to tell by a percentile ranking whether she passed or not. Percentile ranking compare how you did compared to everyone else but don't necessarily reflect your mark.

Mark: 2 out of 3
Rationale: - Correct substitution in Part A (1 mark)
- Correct response in Part B (1 mark)

Exemplar 3

(3 Marks)

A) $PR = \left(\frac{B + 0.5e}{n}\right) \times 100$ $\quad PR = \frac{16 + 0.5(0)}{25} \times 100$

$= 64$

B) We don't know because we don't know what the other marks were.

Mark: 3 out of 3
Rationale: - Correct answer in Part A (2 × 1 mark)
- Correct response in Part B (1 mark)

Home Finance

Question 18

(2 Marks)

Test Item and Marking Guide

State two (2) reasons why a homeowner would spend money on preventative maintenance.

Sample Answers:

- *Money is spent now to avoid problems in the future.*
- *Small repairs now may be cheaper than larger repairs later on.*
- *It is a form of budgeting, to avoid having to pay for large repairs all at once.*
- *It helps maintain/increase the value of the house.*

(2 × 1 mark)

Exemplar 1

(2 Marks)

1) To be reimbursed in case of burglary

2) To be reimbursed in case of fire or flood

Mark: 0 out of 2
Rationale: - Incorrect responses (conceptual error)

Exemplar 2

(2 Marks)

Fix small problems before they become big ones.
Make improvements for better economy.

Mark: 1 out of 2
Rationale: - One correct response ("fix small problems") (1 mark)

Exemplar 3

(2 Marks)

- So there won't be long term problems
- So it won't cost a lot later down the road

Mark: 2 out of 2
Rationale: - Two correct responses (2 × 1 mark)

Question 19

(2 Marks)

Test Item and Marking Guide

Homeowners must pay a Land Transfer Tax when purchasing a property. This tax is calculated as follows:

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

Calculate the Land Transfer Tax due on a property valued at $80 000.

Sample Answers:

First $30 000:	*no tax*	*← 1 mark*
Next $50 000:	*$50 000 × 0.005*	
	= $250	*← 1 mark*

OR

Taxable portion:	*$80 000 – $30 000*	
	= $50 000	*← 1 mark*
Tax:	*$50 000 × 0.005*	
	= $250	*← 1 mark*

Exemplar 1

(2 Marks)

80 000 x 0.005

= 400

$80 400

Mark: 0 out of 2
Rationale: - Incorrect taxable portion
- Incorrect answer

Exemplar 2

(2 Marks)

$80 000 x .005 = $400

Mark: 1 out of 2
Rationale: - Incorrect taxable portion
- Correct solution (follow-through error) (1 mark)

Exemplar 3

(2 Marks)

$80 000
- 30 000
50 000 x 0.5 = $25 000

Mark: 1 out of 2
Rationale: - Correct taxable portion (1 mark)

Question 20

(4 Marks)

Test Item and Marking Guide

State four (4) ongoing or daily expenses of maintaining a house. Choose from the list of expenses below.

Lawyer's fees	Down payment	Mortgage payment
Utilities	Yard care	Interest adjustment
Property tax	Movers	Insurance

1. _____

2. _____

3. _____

4. _____

Sample Answers:

- *mortgage payment*
- *yard care*
- *property tax*
- *utilities*
- *insurance*

1 mark for each correct response (4 × 1 mark)

This page was intentionally left blank

Question 21

(2 Marks)

Test Item and Marking Guide

A couple owns an older house and they would like to reduce their expenses. State two (2) things they could do to reduce their monthly heating costs.

Sample Answers:

- *install a programmable thermostat*
- *add insulation to exterior walls and/or attic*
- *install new windows*
- *install new doors*
- *improve the seal around existing windows and doors*
- *decrease the thermostat temperature*

1 mark for each correct response (2 × 1 mark)

Exemplar 1

(2 Marks)

Keep doors and windows closed in the winter and turn heat off at night.

Mark: 1 out of 2
Rationale: - One correct response ("turn heat off") (1 mark)

Exemplar 2

(2 Marks)

1. *Put a fire stove in the old house.*
2. *Get a better home, and better job.*

Mark: 1 out of 2
Rationale: - One correct response ("fire stove") (1 mark)

Exemplar 3

(2 Marks)

(1) *They could use space heaters in the winter so then it gets warm in one room (the one you are in) and not the rest of the house.*

(2) *They could also just make the heat down and try and keep the house at a constant temperature so the heat won't kick in when they don't need it.*

Mark: 2 out of 2
Rationale: - Correct responses (2 × 1 mark)

Question 22

(2 Marks)

Test Item and Marking Guide

Calculate the monthly payment for a mortgage of $120 000, amortized over 15 years at a rate of 4% interest per year.

Amortization Period of Mortgage Loan When Paid Monthly

Amortization Period of Mortgage Loan
(Blended payment of principal and interest per $1000 of loan)

Interest Rate	5 years	10 years	15 years	20 years	25 years
4.00%	$18.40	$10.11	$7.38	$6.04	$5.26
4.25%	18.51	10.23	7.50	6.17	5.40
4.50%	18.62	10.34	7.63	6.30	5.53
4.75%	18.74	10.46	7.75	6.44	5.67
5.00%	18.85	10.58	7.88	6.57	5.82
5.25%	18.96	10.70	8.01	6.71	5.96
5.50%	19.07	10.82	8.14	6.84	6.10
5.75%	19.19	10.94	8.27	6.98	6.25
6.00%	19.30	11.07	8.40	7.12	6.40
6.25%	19.41	11.19	8.53	7.26	6.55
6.50%	19.53	11.31	8.66	7.41	6.70
6.75%	19.64	11.43	8.80	7.55	6.85
7.00%	19.75	11.56	8.93	7.70	7.00
7.25%	19.87	11.68	9.07	7.84	7.16
7.50%	19.98	11.81	9.21	7.99	7.32
7.75%	20.10	11.94	9.34	8.13	7.47
8.00%	20.21	12.06	9.48	8.28	7.63

Answer:

$$\frac{\$120\,000}{1000} \times \underbrace{\$7.38}_{1\ mark} = \underbrace{\$885.60}_{1\ mark}$$

Exemplar 1

(2 Marks)

$(7.38)(120\,000) = 885\,600$

Mark: 1 out of 2
Rationale: - Correct table value (1 mark)

Exemplar 2

(2 Marks)

$$\left(\frac{120\,000 \times 7.38}{1000}\right) = \frac{885\,600}{1000} = 8856 \times 12 = \$106\,272$$

Mark: 1 out of 2
Rationale: - Correct table value (1 mark)

Exemplar 3

(2 Marks)

$$\text{Mon Pymt} \quad \frac{\$120\,000}{\$1000} \times \frac{\$7.38}{\text{Mon}} = \$885.60$$

$$I = Prt = I = \$885.60\,(0.04)\left(\frac{1}{2}\right) = 52\,952$$

Mark: 2 out of 2
Rationale: - Correct solution (2 × 1 mark)
- Extra information not related to answer

Question 23

(2 Marks)

Test Item and Marking Guide

A portion of Joe's monthly mortgage payment goes towards interest. Joe wonders how much interest he will pay over the life of the mortgage.

Explain how Joe can calculate this amount.

Answer:

First calculate the total amount paid to the bank ← *1 mark*

Subtract the amount borrowed/mortgaged ← *1 mark*

OR

Total paid = monthly payment × number of payments ← *1 mark*

Interest = total paid − amount mortgaged ← *1 mark*

Exemplar 1

(2 Marks)

With an amortization table.

Mark: 0 out of 2
Rationale: - Incorrect answer

Exemplar 2

(2 Marks)

He can make up an amortization chart including his monthly payment and interest payment for each month. Do the chart for the whole period, total at the bottom.

Mark: 2 out of 2
Rationale: - Correct answer (2 × 1 mark)

Exemplar 3

(2 Marks)

It started $120 000 mortgage amortized 15 years at 4% →

885.60	monthly payment
× 12	Months
$10 627.20	/yr
× 15	years
159 408.00	total paid
- 120 000.00	minus the mortgage
$39 408	Interest paid

Mark: 2 out of 2
Rationale: - Correct answer (2 × 1 mark)

Precision Measurement

Question 24

(2 Marks)

Test Item and Marking Guide

A metre stick is divided into 100 centimetres. Express the precision and uncertainty for the metre stick.

Precision: _____

Uncertainty: _____

Answer:

Precision: *1 (cm)* ← *1 mark*

Uncertainty: *0.5 (cm) or ± 0.5 (cm)* ← *1 mark*

Note to marker: *"cm" not required*

Exemplar 1

(2 Marks)

Precision: 1

Uncertainty: 0.05

Mark: 1 out of 2
Rationale: - correct answer for Precision (1 mark)

Exemplar 2

(2 Marks)

Precision: cms

Uncertainty: 0.5 cm

Mark: 2 out of 2
Rationale: - Correct answers (2 × 1 mark)

Exemplar 3

(2 Marks)

Precision: 1 centimetre

Uncertainty: ± 0.5 cm

Mark: 2 out of 2
Rationale: - Correct answers (2 × 1 mark)

Question 25

(2 Marks)

Test Item and Marking Guide

Gold is trading at $1 300 per ounce. Explain why a jeweller would want to be very accurate when weighing gold to make a ring.

Sample answers:

– *The jeweller does not want to give the customer more gold than they pay for; the jeweller would lose money.*

– *The advertised amount of gold in the ring (the jeweller's claim) should be as close as possible to the true amount of gold in it, so that the jeweller can maintain her reputation.*

Exemplar 1

(2 Marks)

Because Gold is expensive.

Mark: 0 out of 2
Rationale: - Incorrect response

Exemplar 2

(2 Marks)

If they were to put too much or too little it would set the cost off and other jewellers would notice it when they were to weigh it.

Mark: 2 out of 2
Rationale: - Correct response (2 marks)

Exemplar 3

(2 Marks)

Because if she goes a little over they lose money, if she's shy a bit then they are ripping the buyers off.

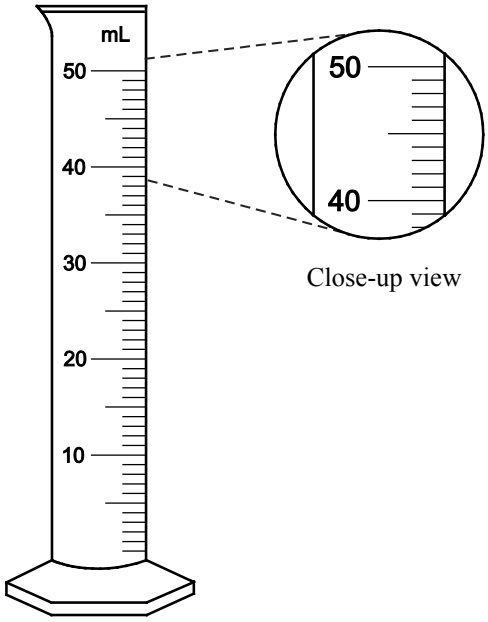
Mark: 2 out of 2
Rationale: - Correct response (2 marks)

Question 26

(2 Marks)

Test Item and Marking Guide

A graduated cylinder is a measuring device used for liquids. Express the precision and uncertainty for the given graduated cylinder.



Close-up view

Graduated cylinder

Precision: _____

Uncertainty: _____

Answer:

Precision: *1 (mL)* ← *1 mark*

Uncertainty: *0.5 (mL) or ± 0.5 (mL)* ← *1 mark*

Note to marker: *"mL" not required*

Exemplar 1

(2 Marks)

Precision: 44 mm

Uncertainty: 44.5 mm

Close enough look

Mark: 0 out of 2
Rationale: - Incorrect answers

Exemplar 2

(2 Marks)

Precision: 43 mL ± 0.5

Uncertainty: 42.5 ⟷ 43.5

Mark: 0 out of 2
Rationale: - Incorrect answers

Exemplar 3

(2 Marks)

Precision: 43 mL precise to 1 mL

Uncertainty: .5 mL

Mark: 2 out of 2
Rationale: - Correct answers (2 × 1 mark)

Question 27

(2 Marks)

Test Item and Marking Guide

A steel manufacturer creates an item that must be 5 cm across with a tolerance of 0.2 cm (± 0.1 cm). The manufacturer writes the measurements of the item in the form:

$$a^{0}_{b}$$

Express the values of a and b.

a: _____

b: _____

Answer:

a: *5.1* ← *1 mark*

b: *−0.2* ← *1 mark*

Exemplar 1

(2 Marks)

a: 5 cm ± 0.1 cm

b: 4.9 cm ± 0.1 cm

Mark: 0 out of 2
Rationale: - Incorrect responses

Exemplar 2

(2 Marks)

a: 5.1

b: 0.2

Mark: 1 out of 2
Rationale: - Correct answer for "a" (1 mark)
- Incorrect answer for "b"

Question 28

(2 Marks)

Test Item and Marking Guide

Tolerance is often used in construction, commercial, industrial, or artistic applications.

Demonstrate one use of tolerance in the real world by performing the following two steps:

- State a specific example where tolerance is used.
- Support your example with a written explanation, or with other information or evidence, of how tolerance is used.

Answer:

2 marks for example with support

Exemplar 1

(2 Marks)

A specific situation where it is used would be in a scientific lab, measuring important liquids

The scientist will not exactly be able to measure precisely the measure of liquid so there must be tolerance allowed.

Mark: 0 out of 2
Rationale: - Incorrect response

Exemplar 2

(2 Marks)

Installing a window on a house.

Mark: 0 out of 2
Rationale: - Incorrect response

Exemplar 3

(2 Marks)

- cutting a hole for a plug in drywall
- you cannot cut it too big or too small (but you can be off a little) otherwise it won't fit.

Mark: 2 out of 2
Rationale: - Correct response (2 marks)

Probability

Question 29

(2 Marks)

Test Item and Marking Guide

A fair coin is tossed four (4) times and the results are: heads, heads, heads, tails.

A) Express the probability of the coin landing on "heads" the next time it is tossed. (1 mark)

Answer:

$\frac{1}{2}$ *or* *0.5* *or* *50%* *or* *1 out of 2* *or* *1:2* ← *1 mark*

B) Explain your answer in Part A. (1 mark)

Sample answers:

- *Past results do not affect the next toss of the coin.*
- *There are two possible outcomes: heads is one of them.*
- *There is an equal chance of heads or tails, if it is a fair coin.*

Exemplar 1

(2 Marks)

A) ١:٥

B)

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

Exemplar 2

(2 Marks)

A) 1:1 or 50%

B) no matter how many times you toss the coin and what direction is face up you still only have a 50/50 chance regardless

(though I have heard that if you toss a coin with the head face up you technically have a 51% chance to get heads again...)

Mark: 1 out of 2
Rationale: - Incorrect answer in Part A (odds)
- Correct answer in Part B (1 mark)

Exemplar 3

(2 Marks)

A) 1 out of 2

B) There's only 2 sides so there's a 50% chance.

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

Question 30

(3 Marks)

Test Item and Marking Guide

In a book, 17 out of 68 pages contain an image. Express the probability, in the form of a fraction, a decimal, and a percent, that a randomly selected page will contain an image.

Fraction: _____

Decimal: _____

Percent: _____

Answer:

Fraction: $\frac{17}{68}$ *or* $\frac{1}{4}$ ← *1 mark*

Decimal: *0.25* ← *1 mark*

Percent: *25 or 25%* ← *1 mark*

Exemplar 1

(3 Marks)

Fraction: $\frac{17}{68}$

Decimal: 17.68

Percent: 17.68%

Mark: 1 out of 3
Rationale: - One correct answer (fraction) (1 mark)

Exemplar 2

(3 Marks)

Fraction: $\frac{8}{39}$

Decimal: 0.205

Percent: 20.5%

Mark: 2 out of 3
Rationale: - Incorrect fraction
- Two correct answers (decimal and percent) (follow-through error) (2 × 1 mark)

Question 31

(3 Marks)

Test Item and Marking Guide

Sandy pays $5 to play a game. The probability of winning is 60%. She will receive $10 if she wins.

A) Determine the expected value for this game. (2 marks)

Answer:

$$EV = P(win) \times \$gain - P(lose) \times \$loss$$
$$= (0.60) \times (\$5) - (0.40) \times (\$5) \quad \leftarrow \textit{1 mark for substitution}$$
$$= \$3 - \$2$$
$$= \$1 \quad \leftarrow \textit{1 mark}$$

OR

$0.60 \times \$10 = \$6$ *average earnings* ← *1 mark*

$\$6 - \$5 = \$1$ *expected value* ← *1 mark*

B) Explain whether Sandy should play this game, based on your answer in Part A. (1 mark)

Answer:

Yes, Sandy should play this game because the expected value is positive.

Exemplar 1

(3 Marks)

A) $60 \times 5 - 40 \times 5 = 100$

B) Yes, Sandy should play the game because the probability of her winning, is high.

Mark: 1 out of 3

Rationale:
- Incorrect substitution in Part A
- Correct solution in Part A (follow-through error) (1 mark)
- Incorrect answer in Part B

Exemplar 2

(3 Marks)

A) $EV = (0.60)(10) - (0.40)(5)$
$= 6 - 2$
$EV = 4$

B) Yes, she will gain 4 dollars.

Mark: 2 out of 3

Rationale:
- Incorrect substitution in Part A
- Correct solution in Part A (follow-through error) (1 mark)
- Correct answer in Part B (follow-through error) (1 mark)

Exemplar 3

(3 Marks)

A)

				Winnings
win:	60%	3/5	$5	$3/5 \times 5 = 3$
lose:	40%	2/5	-$5	$2/5 \times -5 = -2$

$-2 + 3 = 1$

B) Sandy has a chance of winning, she is not in the negative however 1 is close to negative so she has a chance of losing. Sandy should take the chance of winning because it is in the positive.

Mark: 3 out of 3

Rationale:
- Correct answers in Part A (2 × 1 mark)
- Correct answer in Part B (1 mark)

Question 32

(1 Mark)

Test Item and Marking Guide

Describe a situation that would have favourable odds of 5 : 2.

Sample answers may vary, however:

- *7 total outcomes*
- *5 favourable outcomes*
- *2 unfavourable outcomes*

For example:

- *randomly choosing a day of the week and having it be a week day*
- *having 5 blue marbles and 2 red marbles in a bag, and choosing a blue marble*

Exemplar 1

(1 Mark)

In a standard basketball game and I were to bring 5 players on the court against 2 guys, it would be in favor for most likely us to win the game.

Mark: 0 out of 1
Rationale: - Incorrect answer

Exemplar 2

(1 Mark)

7 blue marbles

2 red marbles

You have a better chance at picking a blue marble.

Mark: 0 out of 1
Rationale: - Incorrect answer

Exemplar 3

(1 Mark)

I have 5 red shirts and 2 green. What is the odds in favor for picking out a red?

5:2

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

Question 33

(3 Marks)

Test Item and Marking Guide

John has a six-sided cube and each face is labelled with a different number: 1, 2, 3, 4, 5, and 6.

He tosses the cube and sees the following results: 6, 4, 6, 6, 1, 6.

A) Assume that the cube is fair. Express the theoretical probability of tossing the cube and it showing a 6. (1 mark)

Answer:

$\frac{1}{6}$ *or* *0.17* *or* *17%* *or* *1:6* *or* *one out of six*

B) Express the experimental probability of tossing the cube and it showing a 6. (1 mark)

Answer:

$\frac{4}{6}$ *or* *0.67* *or* *67%* *or* *4:6* *or* *four out of six*

C) Explain whether you think this is a "fair cube". (1 mark)

Sample Answers:

- *This may not be a fair cube because a 6 should only show up one out of six times, but it came up 4 times.*
- *This may be a fair cube, and tossing the cube many more times will provide evidence.*

Exemplar 1

(3 Marks)

A) 1/6

B) 4/6

C) YES BECAUSE EACH SIDE HAS A DIFFERENT NUMBER.

Mark: 2 out of 3

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

Exemplar 2

(3 Marks)

A) 1:6

B) 4:6

C) Well as the data shows, the cube frequently lands on a 6 which shows a irregularity when compared to the theoretical probability; with that data in mind, I don't think this is a "fair cube".

Mark: 3 out of 3

Rationale:
- Correct answer in Part A (1 mark)
- Correct answer in Part B (1 mark)
- Correct explanation in Part C (1 mark)

Exemplar 3

(3 Marks)

A) $\frac{1}{6}$

B) $\frac{2}{3}$

C) No, because you shouldn't be able to get 6 that consistently.

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)

Question 34

(1 Mark)

Test Item and Marking Guide

Express the probability of there being an October snowstorm somewhere in Manitoba if the odds for this occurrence are 3 to 1.

Answer:

$\frac{3}{4}$ *or* *75%* *or* *0.75* *or* *3:4* *or* *3 out of 4*

Exemplar 1

(1 Mark)

$\frac{3}{1}$

Mark: 0 out of 1
Rationale: - Incorrect answer

Exemplar 2

(1 Mark)

The probability would be 33.3% chance of a snowstorm in MB if odds were 3:1.

Mark: 0 out of 1
Rationale: - Incorrect answer

Exemplar 3

(1 Mark)

THE PROBABILITY IS 3:4.

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

Appendix:

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.: _____

Problem(s) noted: _____

_____

_____

_____

_____

_____

Question(s) affected: _____

_____

_____

Action taken or rationale for assigning marks: _____

_____

_____

_____

_____

_____

_____

Follow-up: _____

_____

_____

_____

_____

_____

Decision: _____

_____

_____

_____

_____

_____

_____

Marker's Signature: _____

Principal's Signature: _____

For Department Use Only—After Marking Complete

Consultant: _____

Date: _____