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BRITISH COLUMBIA

Applications of Mathematics 12

JUNE 2004

Course Code = AMA

Student Instructions

1. Place the stickers with your Personal Education Number (PEN) in the allotted spaces above. **Under no circumstance is your name or identification, other than your Personal Education Number, to appear on this booklet.**
2. Ensure that in addition to this examination booklet, you have an **Examination Response Form**. Follow the directions on the front of the Response Form.
3. **Disqualification** from the examination will result if you bring books, paper, notes or unauthorized electronic devices into the examination room.
4. When instructed to open this booklet, **check the numbering of the pages** to ensure that they are numbered in sequence from page one to the last page, which is identified by

   END OF EXAMINATION .

5. At the end of the examination, place your Response Form inside the front cover of this booklet and return the booklet and your Response Form to the supervisor.

Question 1a:

1. . (2)

Question 1b:

2. . (1)

Question 1c:

3. . (2)

Question 2a:

4. . (1)

Question 2b:

5. . (2)

Question 2c:

6. . (2)

Question 3a:

7. . (3)

Question 3b:

8. . (2)

Question 4a:

9. . (2)

Question 4b:

10. . (3)

Question 5a:

11. . (1)

Question 5b:

12. . (2)

Question 5c:

13. . (2)

Question 6a:

14. . (3)

Question 6b:

15. . (2)

GENERAL INSTRUCTIONS

1. Aside from an approved calculator, electronic devices, including dictionaries and pagers, are **not** permitted in the examination room.

2. All multiple-choice answers must be entered on the Response Form using an **HB pencil**. Multiple-choice answers entered in this examination booklet will **not** be marked.

3. For each of the written-response questions, write your answer in the space provided in this booklet.

   You will not be provided with any additional paper since rough-work space for the written-response questions has been incorporated into the space allowed for answering each question. You may not need all of the space provided to answer each question.

4. Ensure that you use language and content appropriate to the purpose and audience of this examination. Failure to comply may result in your paper being awarded a zero.

5. This examination is designed to be completed in **two hours**. *Students may, however, take up to 30 minutes of additional time to finish*.

APPLICATIONS OF MATHEMATICS 12 PROVINCIAL EXAMINATION

1. This examination consists of **two** parts:

		Value	Suggested Time
PART A:	40 multiple-choice questions	60	75
PART B:	6 written-response questions	30	45
	Total:	**90 marks**	**120 minutes**

2. The last **four** pages inside the back cover contain **Formulae**, **The Standard Normal Distribution Table**, **Rough Work for Graphing**, and **Rough Work for Multiple-Choice**. These pages may be detached for convenient reference prior to writing this examination.

3. **A graphing calculator is essential for the Applications of Mathematics 12 Provincial Examination.** The calculator must be a hand-held device designed primarily for mathematical computations involving logarithmic and trigonometric functions, for graphing functions and for performing statistical tests. Computers, calculators with a QWERTY keyboard or symbolic manipulation abilities, such as the Computer Algebraic System (CAS) and electronic writing pads will not be allowed. Students must not bring any external devices (peripherals) to support calculators such as manuals, printed or electronic cards, printers, memory expansion chips or cards, CD-ROMs, libraries or external keyboards. Students may have more than one calculator available during the examination. Calculators may not be shared and must not have the ability to either transmit or receive electronic signals. In addition to an approved calculator, students will be allowed to use rulers, compasses, and protractors during the examination.

   Calculators must not have any information programmed into the memory which would not be acceptable in paper form. Specifically, calculators must not have any built-in notes, definitions, or libraries. There is no requirement to clear memories at the beginning of the examination but the use of calculators with built-in notes is equivalent to the use of notes in paper form. Any student deemed to have cheated on a provincial examination will receive a "0" on that examination and will be permanently disqualified from the Provincial Examination Scholarship Program.

4. If, in a justification, you refer to information produced by the calculator, this information must be presented clearly in the response. For example, if a graph is used in the solution of the problem, it is important to sketch the graph, showing its general shape and indicating the appropriate window dimensions.

5. When using the calculator, you should provide a decimal answer that is correct to **at least two decimal places** (unless otherwise indicated). Such rounding should occur **only** in the final step of the solution.

PART A: MULTIPLE CHOICE

Value: 60 marks **Suggested Time: 75 minutes**

INSTRUCTIONS: For each question, select the **best** answer and record your choice on the Response Form provided. Using an HB pencil, completely fill in the circle that has the letter corresponding to your answer.

1. Given $A = \begin{bmatrix} -2 & 1 \\ 3 & 5 \end{bmatrix}$, $B = \begin{bmatrix} -5 & 2 \\ 6 & 1 \end{bmatrix}$, and $C = \begin{bmatrix} -1 \\ 5 \end{bmatrix}$, determine which of the following matrix operations is not possible.

   A. AB
   B. AC
   C. $A + B$
   D. $A + C$

2. The matrix below shows results for three teams in a local hockey league. Teams are awarded 2 points for a win, 0 points for a loss, and 1 point for a tie. Which matrix shows the total points for each team?

$$\begin{array}{c} \\ \text{Team X} \\ \text{Team Y} \\ \text{Team Z} \end{array} \begin{array}{c} \begin{array}{ccc} \text{win} & \text{loss} & \text{tie} \end{array} \\ \begin{bmatrix} 7 & 2 & 4 \\ 5 & 2 & 5 \\ 2 & 0 & 5 \end{bmatrix} \end{array}$$

   A. $\begin{array}{c} \\ \text{X} \\ \text{Y} \\ \text{Z} \end{array} \begin{bmatrix} 18 \\ 15 \\ 9 \end{bmatrix}$

   B. $\begin{array}{c} \\ \text{X} \\ \text{Y} \\ \text{Z} \end{array} \begin{bmatrix} 18 \\ 9 \\ 15 \end{bmatrix}$

   C. $\begin{array}{c} \\ \text{X} \\ \text{Y} \\ \text{Z} \end{array} \begin{bmatrix} 14 \\ 4 \\ 14 \end{bmatrix}$

   D. $\begin{array}{c} \\ \text{X} \\ \text{Y} \\ \text{Z} \end{array} \begin{bmatrix} 13 \\ 12 \\ 7 \end{bmatrix}$

OVER

3. Given $-2\begin{bmatrix} 3 & 2 \\ -1 & 3 \end{bmatrix} + \begin{bmatrix} 1 & -5 \\ 3 & 7 \end{bmatrix} = \begin{bmatrix} a & b \\ c & x \end{bmatrix}$, determine the value of x.

A. -20
B. -1
C. 1
D. 13

4. The matrix M shows the number of sales for BC Sound from three of its stores.

$$M = \begin{array}{r} \\ \text{Store J} \\ \text{Store K} \\ \text{Store L} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Discman} & \text{Boombox} & \text{Deluxe System} \end{array} \\ \begin{bmatrix} 120 & 110 & 50 \\ 150 & 120 & 20 \\ 50 & 20 & 10 \end{bmatrix} \end{array}$$

The discman sells for \$80, the boombox sells for \$100, and the deluxe system sells for \$800. Which matrix product shows the total sales for each store?

A. $M \times \begin{bmatrix} 80 \\ 100 \\ 800 \end{bmatrix}$

B. $\begin{bmatrix} 80 \\ 100 \\ 800 \end{bmatrix} \times M$

C. $M \times \begin{bmatrix} 80 & 100 & 800 \end{bmatrix}$

D. $\begin{bmatrix} 80 & 100 & 800 \end{bmatrix} \times M$

5. Solve for y:

$$\begin{bmatrix} y & 3 \\ 2 & -1 \end{bmatrix} \begin{bmatrix} 2 & -2 \\ -y & 4 \end{bmatrix} = \begin{bmatrix} a & 22 \\ -1 & c \end{bmatrix}$$

A. -10
B. -5
C. 5
D. 10

6. The following network matrix shows a delivery company's direct connections between four cities.

		To			
		Vancouver	Kamloops	Penticton	Cranbrook
From	Vancouver	1	0	1	1
	Kamloops	1	0	0	0
	Penticton	1	1	1	0
	Cranbrook	0	1	0	1

How many ways can a delivery go from Penticton to Kamloops either directly or through exactly one intermediate city?

A. 1
B. 2
C. 3
D. 4

7. If a car loan is compounded quarterly for 8 years, what is the total number of compound periods?

A. 4
B. 8
C. 16
D. 32

8. Samex shares, which track the TSE index, were purchased for $8000 when the TSE index was 4695. The shares were then sold when the TSE index was 5945. What was the approximate value of the shares when they were sold?

A. $1 682
B. $6 318
C. $9 579
D. $10 130

OVER

9. A farmer buys a truck for $50 000. If the truck depreciates in value at a rate of 10% per year, how much will it be worth after five years? (Answer to the nearest dollar.)

   A. $25 000
   B. $26 572
   C. $29 525
   D. $32 805

10. Patricia is planning a trip to Hawaii in three years time. What is the least amount of money she needs to invest now at 4% per annum, compounded quarterly, to have $5000 for her trip?

    A. $3123
    B. $4437
    C. $4808
    D. $4950

11. A financial institution offers two investment plans with an annual interest rate of 4% compounded monthly:

    Option A: invest $125 at the end of each month

    Option B: invest $1500 at the end of each year

    After two years, determine how much Option A has gained over Option B.

    A. $54.59
    B. $55.70
    C. $56.75
    D. $57.86

12. The spreadsheet below gives the beginning of the amortization schedule for a car loan of $18 400 at an interest rate of 3.5% per annum compounded monthly with 30 monthly payments.

	A	B	C	D	E	F
1	Principal:	$18400				
2	Interest:	3.5%				
3	# Pmts:	30				
4					Payment	Closing
5	Payment #	Principal	Payment	Interest	to Princ.	Balance
6						$18400.00
7	1	$18400.00				
8	2					
9	3					
10	4					
11	5					

Determine the value for cell F7.

A. $17 704.88
B. $17 758.55
C. $17 784.91
D. $17 812.22

13. The half-life of a substance is defined as

A. the mass of a substance after a half hour.
B. the mass of a substance after half of its life.
C. the time it takes for the mass of a substance to reduce by half.
D. the time it takes for the mass of a substance to reduce to one-half gram.

14. On a given day, the height of the tide at a certain seaport can be represented by the sinusoidal equation $h = 3.25\sin(0.52t - 1.31) + 6.28$, where h is the height of the tide in metres at time t hours using a 24-hour clock. What is the median height of the tide?

A. 0.52
B. 1.31
C. 3.25
D. 6.28

OVER

15. A colony contains 50 ants. Suppose the population triples every month and no ants die. How many ants are there 4 months later?

A. 600
B. 1350
C. 3200
D. 4050

16. A ball is dropped from a height of 30 m. After each bounce it rebounds to 70% of its previous height. After which bounce will the height of the rebound first be less than 1 m?

A. 8^{th}
B. 9^{th}
C. 10^{th}
D. 11^{th}

17. Determine the period of the graph of the function $h = 3.8\sin(1.8x) + 4.2$

A. 1.8
B. 3.5
C. 3.8
D. 4.2

18. A set of nested open-top boxes, with each box fitting inside the previous one, is constructed.

The largest box is a cube with side length of 50 cm. The side length of each successive cube is $\frac{4}{5}$ the length of the previous cube. Determine the volume of the third largest cube. (Answer to the nearest cm^3.)

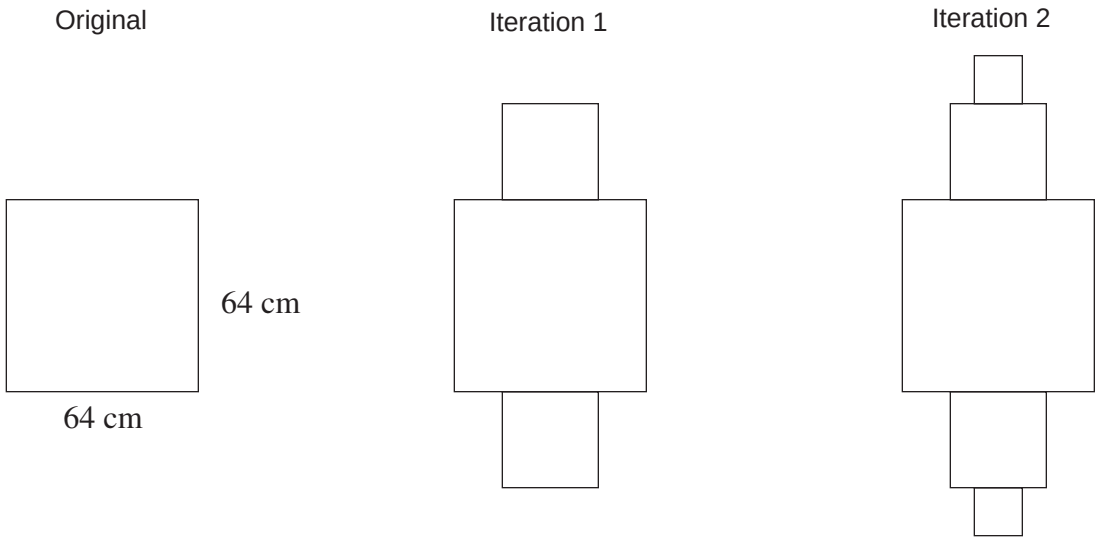
A. 16 777
B. 27 000
C. 32 768
D. 64 000

19. A lake presently has 5000 trout in it. Each year 35% of the trout either die or are taken by fishermen. The local fish and game club stocks the lake with 1200 new trout each year. If this pattern continues, determine the number of trout in 30 years (the maintenance level). Answer to the nearest 10 fish.

A. 1850
B. 3430
C. 3500
D. 3710

20. A fractal is made by starting with an original square with dimensions of x cm.

- squares, half the dimensions of the original square, are placed on the top and bottom of the original square (as shown in Iteration 1)
- squares, half the dimensions of the previously constructed squares, are again placed on the top and bottom (as shown in Iteration 2)



Determine the total area of the fractal in Iteration 4 (in cm^2).

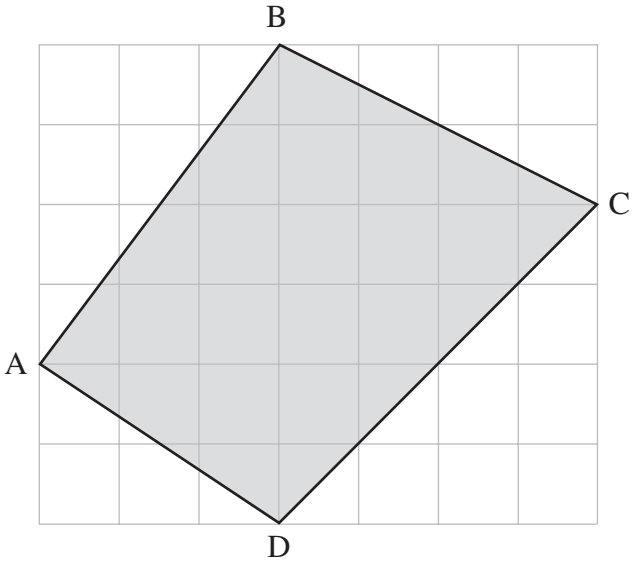
A. 5456
B. 6816
C. 6824
D. 8192

OVER

21. A Student Council has been given a budget of $100 to create a banner to welcome new students. The cost of the materials for the banner is $90.30. The remainder is to be spent on lettering at $0.35 per letter. What is the maximum number of letters that the Student Council can buy?

A. 27
B. 28
C. 29
D. 30

22. The grid below has square units. Find the exact area of quadrilateral ABCD.



A. 21 units^2
B. 22 units^2
C. 23 units^2
D. 24 units^2

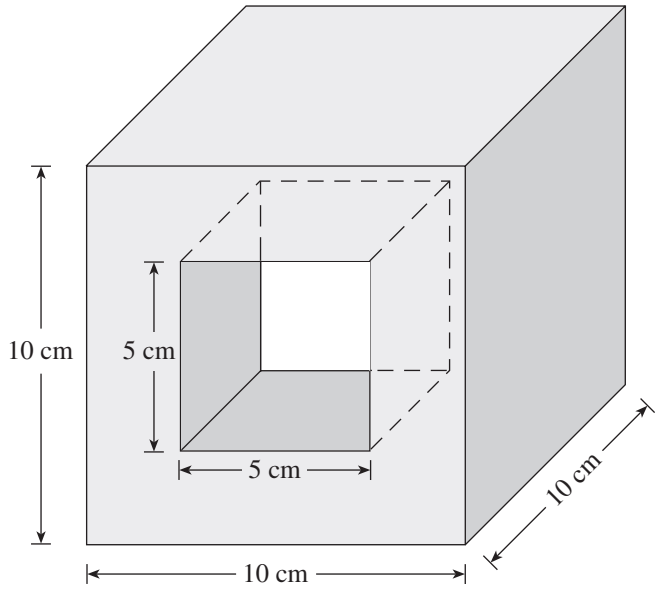
23. Determine the surface area of a cone which has a radius of 30 cm and a height of 40 cm. (Answer to the nearest cm^2.)

A. 3770
B. 4712
C. 6597
D. 7540

24. A cylindrical can has a radius of 6 cm and is 11 cm high. What is the surface area of a label if it is wrapped around the entire can but not on the top or bottom lids? (Answer to the nearest cm^2.)

A. 113
B. 207
C. 226
D. 415

25. A plastic block with a hole in the centre is shown below.

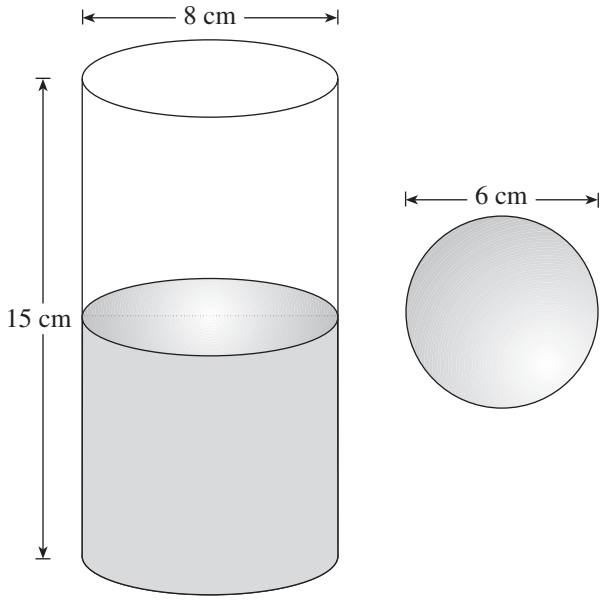


All angles involved are right angles. Each cubic centimetre of the material has a mass of 0.92 g. Determine the total mass of the block.

A. 230 g
B. 460 g
C. 690 g
D. 805 g

OVER

26. A sphere with diameter 6 cm is placed into a cylinder with diameter 8 cm and height 15 cm. If the cylinder is half full of water, how far does the water level rise when the sphere is completely submerged?



A. 0.75 cm
B. 2.25 cm
C. 6.00 cm
D. 18.00 cm

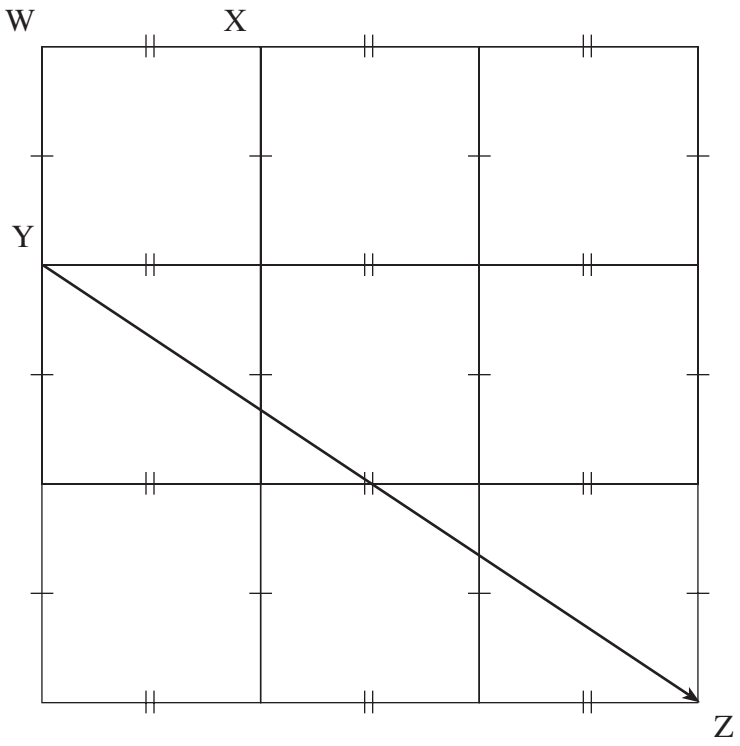
27. Which of the following is a vector quantity?

A. time
B. speed
C. distance
D. displacement

28. If vector $\vec{v} = 10$ km/h northeast, then vector $-2\vec{v}$ would be

A. 8 km/h southwest.
B. 20 km/h southeast.
C. 20 km/h northwest.
D. 20 km/h southwest.

29. In the diagram below, which of the following is equivalent to vector $\overrightarrow{YZ}$?



A. $2\overrightarrow{WY} + 3\overrightarrow{WX}$

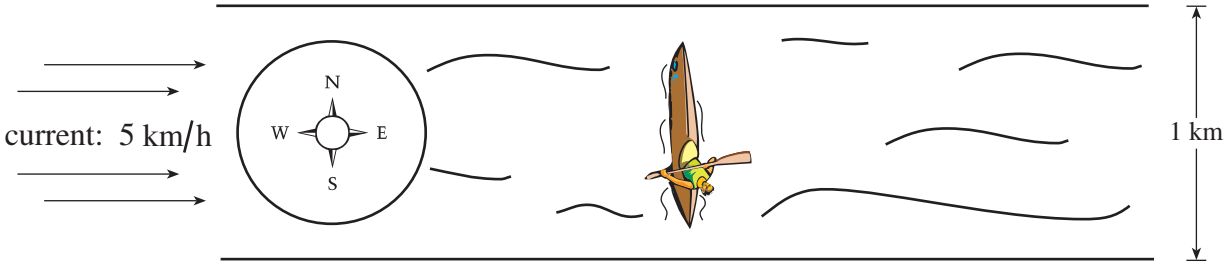
B. $3\overrightarrow{WY} + 2\overrightarrow{WX}$

C. $2\overrightarrow{YW} + 3\overrightarrow{XW}$

D. $3\overrightarrow{YW} + 2\overrightarrow{XW}$

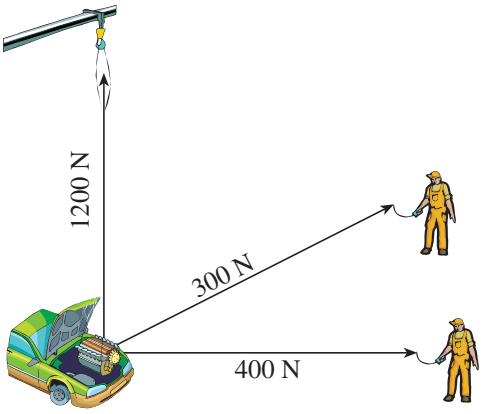
OVER

30. A river runs from west to east with a current speed of 5 km/h. A kayaker who paddles his kayak at a speed of 5 km/h heads due north to cross the river. If the river is 1 km wide, how long does it take the kayaker to cross the river?



A. 0.17 h
B. 0.20 h
C. 0.25 h
D. 0.33 h

31. Two mechanics are preparing to remove a car engine using a winch. The winch lifts vertically with a force of 1200 N. One mechanic pulls horizontally due north with a force of 300 N and the other mechanic pulls horizontally due east with a force of 400 N.



What is the magnitude of the resultant vector and its direction measured to the horizontal? (Angle correct to the nearest degree.)

A. magnitude 1300 N at an angle of 67° to the horizontal
B. magnitude 1300 N at an angle of 76° to the horizontal
C. magnitude 1700 N at an angle of 67° to the horizontal
D. magnitude 1700 N at an angle of 76° to the horizontal

32. If one item can be selected in m different ways and a second item can be selected in n different ways, how many ways can the two items be selected?

A. mn
B. $m+n$
C. $m(n-1)$
D. $m(n+1)$

33. In a normal distribution, approximately what percentage of the data lies within 1 standard deviation of the mean?

A. 34%
B. 50%
C. 68%
D. 95%

34. Determine the standard deviation for the following data set.

Value	Frequency
28	4
30	5
32	7
34	6
36	1

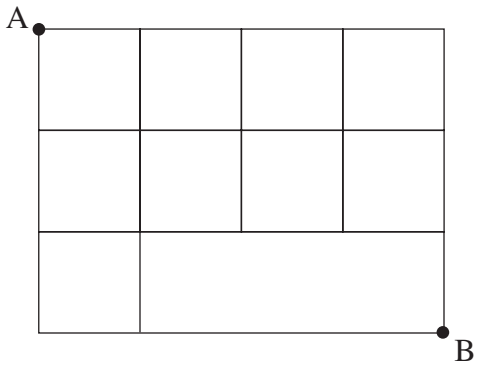
A. 2.28
B. 2.33
C. 2.83
D. 3.16

35. There are 250 students in a graduating class. Of these, 120 take History, 160 take Mathematics, and 70 take both History and Mathematics. How many students take neither History nor Mathematics?

A. 40
B. 140
C. 210
D. The situation described above is not possible.

OVER

36. How many different paths are there from A to B on the grid shown below if only moves to the right and down are allowed?



A. 16
B. 19
C. 35
D. 70

37. The probability that the Vancouver Canucks will win a game that goes into overtime is $\frac{7}{12}$. Determine the probability that they will win exactly 3 out of their next 4 games that go into overtime.

A. 0.08
B. 0.15
C. 0.33
D. 0.88

38. A card is drawn from a standard deck of playing cards. The card is returned to the deck and a second card is randomly drawn. Determine the probability that both cards are red or both cards are face cards.

A. 0.284
B. 0.290
C. 0.300
D. 0.303

39. A six-sided die and a four-sided die are rolled. Determine the probability that doubles are **not** rolled.

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

B. $\frac{1}{4}$

C. $\frac{3}{4}$

D. $\frac{5}{6}$

40. The scores on the Applications of Mathematics exam are normally distributed with a mean of 68 and a standard deviation of 14.6. If 92% of the students writing this exam pass, determine the pass mark for this exam.

A. 45
B. 47
C. 50
D. 53

This is the end of the multiple-choice section.
Answer the remaining questions directly in this examination booklet.

OVER

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PART B: WRITTEN RESPONSE

Value: 30 marks **Suggested Time: 45 minutes**

INSTRUCTIONS: Rough-work space has been incorporated into the space allowed for answering each question. You may not need all the space provided to answer each question. Where required, place the final answer for each question in the space provided.

If, in a justification, you refer to information produced by the calculator, this information must be presented clearly in the response. For example, if a graph is used in the solution of the problem, it is important to sketch the graph, showing its general shape and indicating the appropriate window dimensions.

When using the calculator, you should provide a decimal answer that is correct to **at least two decimal places** (unless otherwise indicated). Such rounding should occur **only** in the final step of the solution.

Full marks will NOT be given for the final answer only.

OVER

1. A couple plans to purchase a townhouse that will cost $120 000 after all fees and taxes are applied. They plan to provide a down payment of $25 000. A financial institution is offering a mortgage rate of 4.25% per annum compounded semi-annually.

   a) What will the monthly payments be if they choose a 20-year amortization period for the mortgage? **(2 marks)**

ANSWER:

b) What will the monthly payments be if they choose a 10-year amortization period for the mortgage? **(1 mark)**

ANSWER:

c) How much would they save if the mortgage is paid off in 10 years instead of 20 years? **(2 marks)**

ANSWER:

OVER

2. The weights of males between the ages of 18 and 35 years in a certain city is normally distributed with a mean of 75.8 kg and a standard deviation of 3.8 kg.

a) What is the z-score for a weight of 85 kg? **(1 mark)**

ANSWER:

b) What percent of this age group of males weighs more than 80 kg? **(2 marks)**

ANSWER:

c) What percentage of this group weighs between 60 and 70 kg? **(2 marks)**

ANSWER:

OVER

3. Businesses in a certain community use either the postal service or a private courier to send their parcels. At present, 60% use the postal service and 40% use private couriers. A survey shows that 82% of those that use the postal service will continue to do so next year, and that 91% of those that use private couriers will continue using this method.

   a) If this trend continues, what percentage of businesses will be using private couriers after 2 years? (Clearly show the initial state matrix and transition matrix used.) **(3 marks)**

ANSWER:

b) Given that this trend continues for the long term, what percent of businesses will eventually be using the postal service? **(2 marks)**

ANSWER:

OVER

4. On a certain day, the angle of elevation of the sun at the equator is measured at specific times on a 24-hour clock. Data for these measurements is as follows.

Time (h)	**Elevation (°)**
06:00	0.1
08:00	26.9
10:00	52.3
12:00	66.6
14:00	53.0
16:00	27.8
18:00	0.9

a) Determine the sine regression equation for this data. **(2 marks)**

ANSWER:

b) On this day, how long was the angle of elevation of the sun greater than 45°? **(3 marks)**

If providing a graphical solution, state the function(s) used, sketch the graph, indicate appropriate window dimensions and clearly explain how your solution is derived from the graph.

$Y_1 =$

$Y_2 =$

$Y_3 =$

$Y_4 =$

[,] [,]

x_{min} x_{max} y_{min} y_{max}

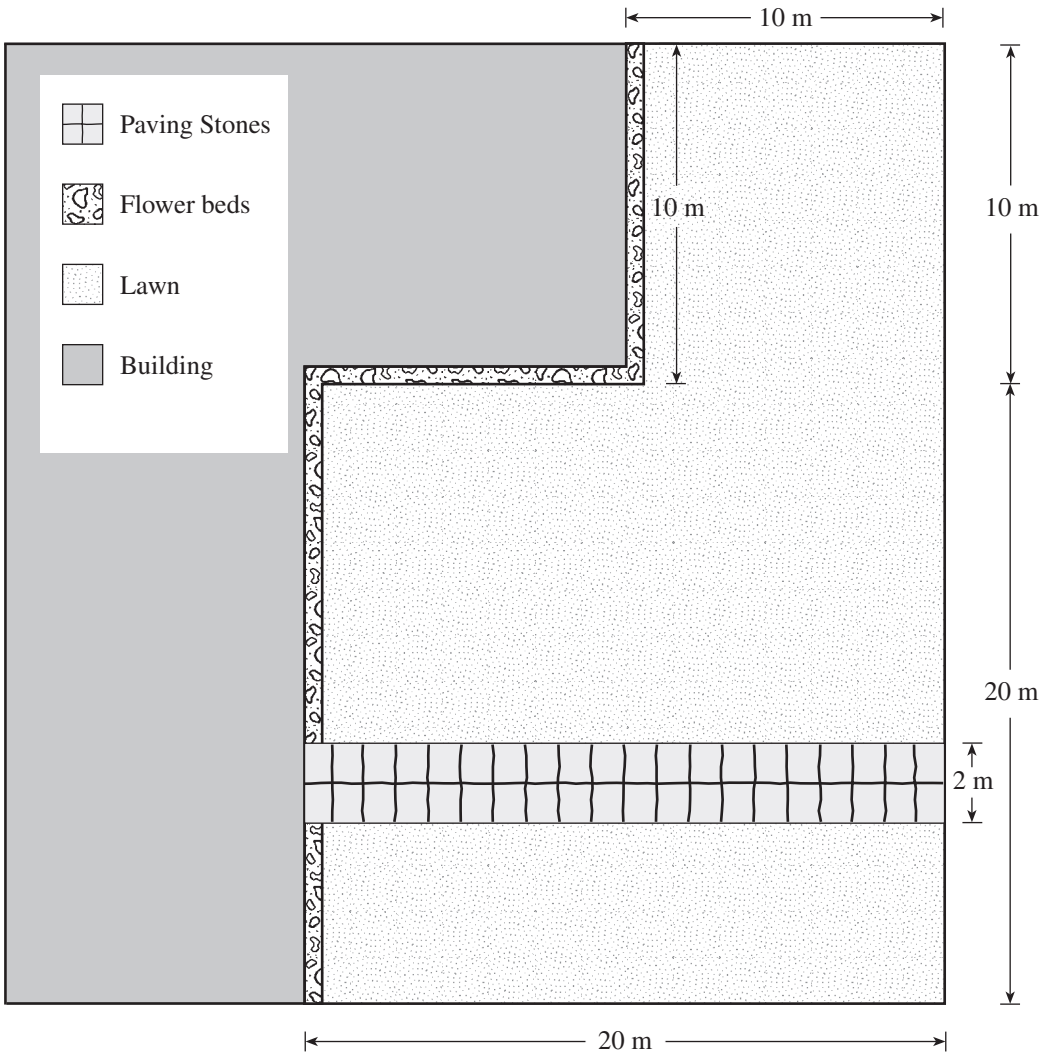
ANSWER:

OVER

Use the following table and diagram to answer all parts of question 5.

5. Some landscaping needs to be done to the front of an office building with dimensions as shown in the diagram. The cost of each item to be used is listed in the following table.

Item	Price
Paving Stones (1 m by 1 m)	\$7.50 each
Top Soil	$\$20/\text{m}^3$
Lawn Seed	$\$15/100\ \text{m}^2$



a) Determine the cost of the paving stones. **(1 mark)**

ANSWER:

b) Determine the cost of the flower beds if the top soil is 40 cm deep and the flower beds are 50 cm wide. **(2 marks)**

ANSWER:

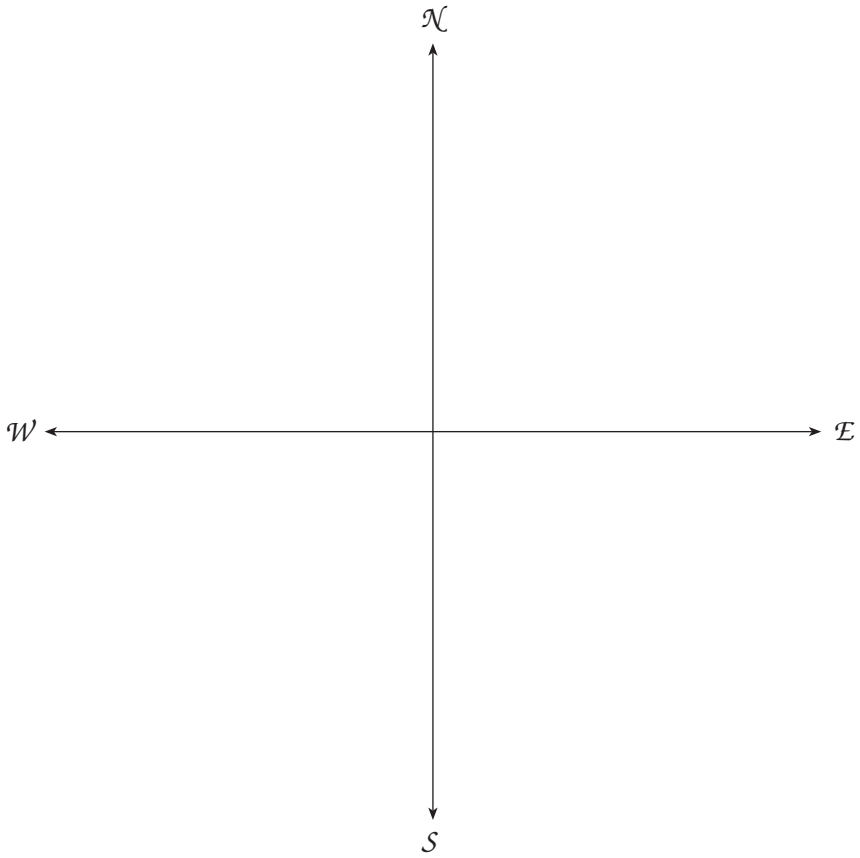
c) Determine the cost of preparing the lawn if it requires 10 cm of topsoil plus the seeding. **(2 marks)**

ANSWER:

OVER

6. An aircraft is cruising at 180 km/h at $[315°]$. The wind is blowing towards $[070°]$ at a speed of 50 km/h.

a) Use the axes provided to sketch the vectors and solve for the magnitude of the resultant velocity vector. (Answer to the nearest km/h.) **(3 marks)**



b) Determine the direction of the resultant vector. (Answer to the nearest degree.) **(2 marks)**

ANSWER:

END OF EXAMINATION

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FORMULAE

Geometry:

Triangle: $\text{Area} = \frac{1}{2}bh$

$= \frac{1}{2}ab\sin C$

Trapezoid: $A = \frac{1}{2}(b_1 + b_2)\cdot h$

Circle: $A = \pi r^2,\ C = 2\pi r = \pi d$

Sphere: $A = 4\pi r^2,\ V = \frac{4}{3}\pi r^3$

Cylinder: $A = 2\pi r^2 + 2\pi rh,\ V = \pi r^2 h$

Cone: $A = \pi rs + \pi r^2,\ V = \frac{1}{3}\pi r^2 h$

Volume of pyramid: $V = \frac{1}{3}A_b h$

Volume of prism: $V = A_b h$

Interest:

$$A = P\left(1 + \frac{r}{n}\right)^{nt}$$

$$I = Prt$$

Miscellaneous:

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

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

Probability and Statistics:

$$\mu = \frac{1}{n}\Sigma(f_i)(x_i)$$

$$\sigma = \sqrt{\frac{1}{n}\Sigma(x_i - \mu)^2}$$

$$\mu = np$$

$$\sigma = \sqrt{np(1-p)}$$

$$z = \frac{x - \mu}{\sigma}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

Note: Graphing calculators will contain many of these formulae as pre-programmed functions.

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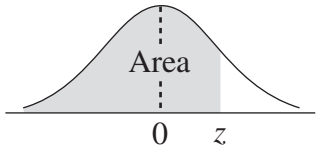
THE STANDARD NORMAL DISTRIBUTION TABLE



$$F_z(z) = P[Z < z]$$

z	**0.00**	**0.01**	**0.02**	**0.03**	**0.04**	**0.05**	**0.06**	**0.07**	**0.08**	**0.09**
–3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
–3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
–3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
–3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
–3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
–2.9	0.0019	0.0018	0.0017	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
–2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
–2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
–2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
–2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
–2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
–2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
–2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
–2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
–2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
–1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
–1.8	0.0359	0.0352	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
–1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
–1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
–1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
–1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0722	0.0708	0.0694	0.0681
–1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
–1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
–1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
–1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
–0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
–0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
–0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
–0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
–0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
–0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
–0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
–0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
–0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
–0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

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$$F_z(z) = P[Z < z]$$

z	**0.00**	**0.01**	**0.02**	**0.03**	**0.04**	**0.05**	**0.06**	**0.07**	**0.08**	**0.09**
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9278	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

ROUGH WORK FOR GRAPHING

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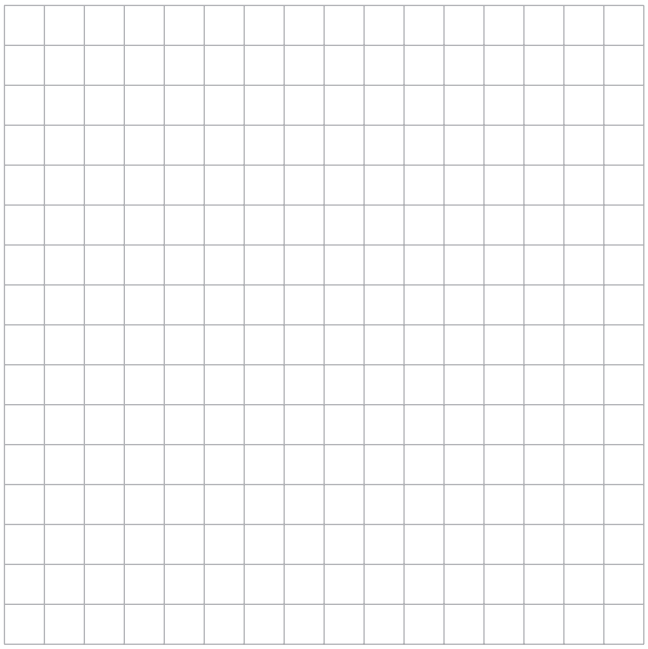

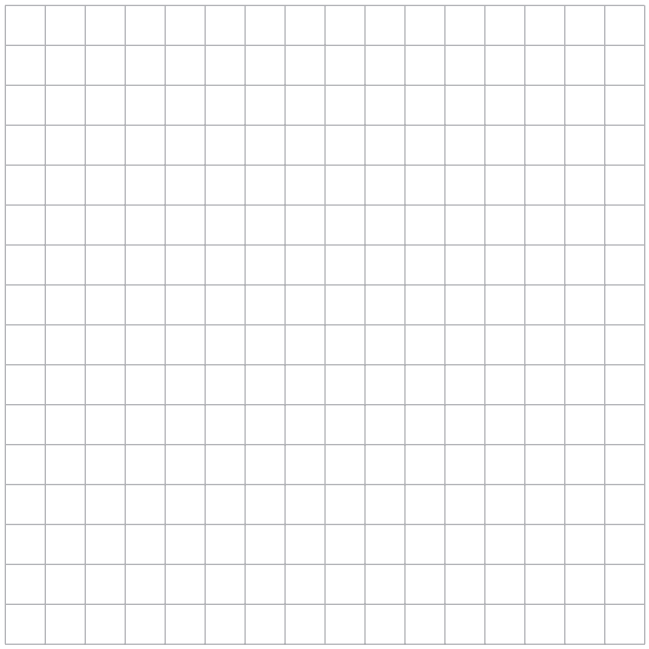

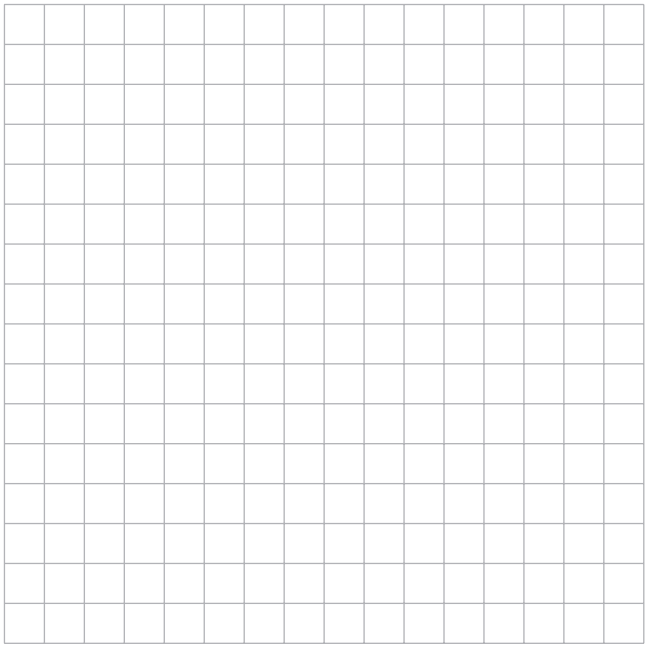

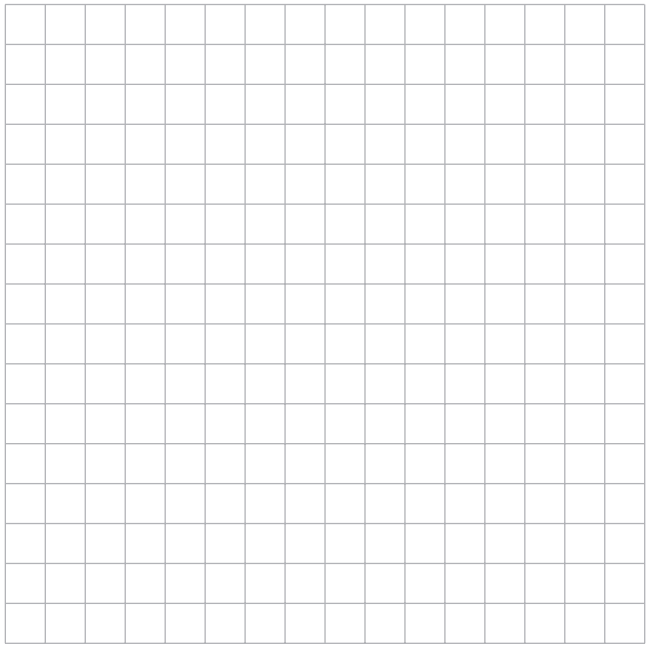

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ROUGH WORK FOR GRAPHING

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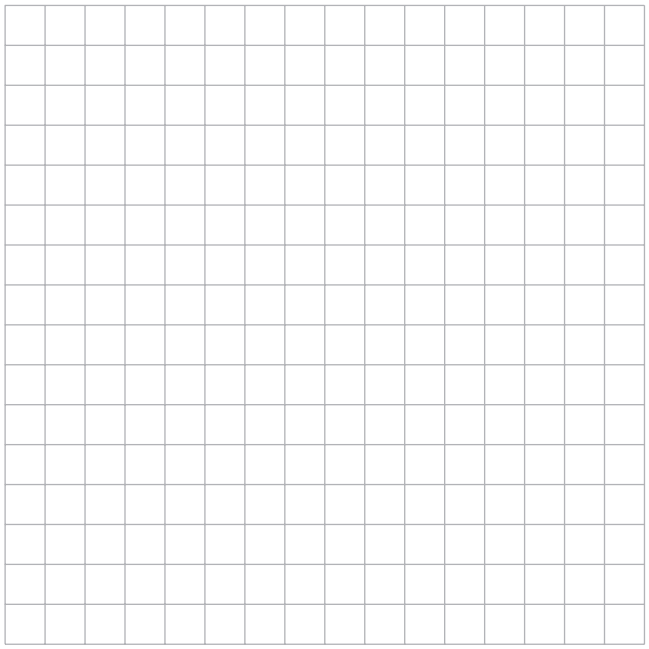

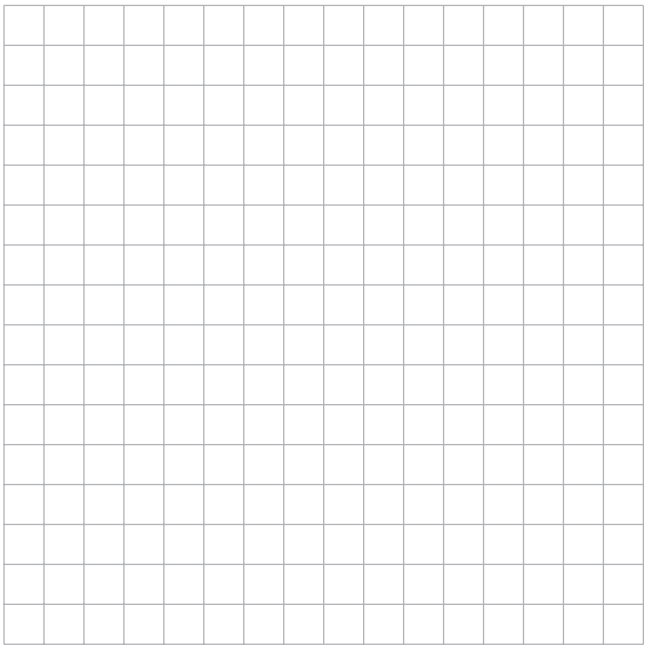

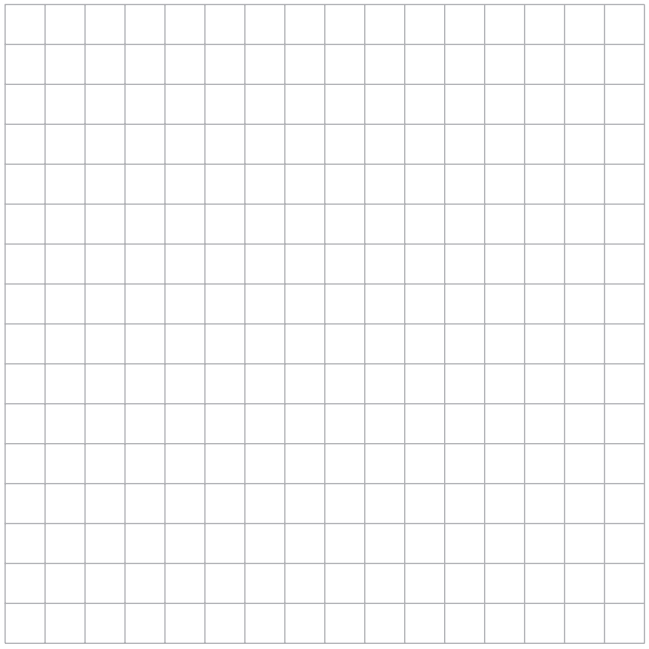

ROUGH WORK FOR MULTIPLE-CHOICE

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ROUGH WORK FOR MULTIPLE-CHOICE