BRITISH COLUMBIA

Principles of Mathematics 10

Sample Exam

(Updated as of January 2005)

Student Instructions

1. Ensure that in addition to this **Student Booklet**, you have a **Response Form**.
2. **Disqualification** from the examination will result if you bring books, paper, notes or unauthorized electronic devices into the examination room.
3. This examination is designed to be completed in **two hours**. *Students may, however, take up to 30 minutes of additional time to finish.*
4. At the end of the examination, return this **Student Booklet** and the **Response Form** to the supervisor.

PRINCIPLES OF MATHEMATICS 10 PROVINCIAL EXAMINATION

INSTRUCTIONS

1. All answers must be entered on the Response Form using an **HB pencil**.
   Answers entered in this examination booklet will **not** be marked.

2. A *Formulae Sheet* is provided at the back of this booklet. *Rough Work for Graphing* and *Rough Work Space* are also located at the back of the examination.

3. Use the value of π programmed in your calculator rather than the approximation of 3.14.

4. When using the calculator, rounding should occur **only in the final step** of the solution.

5. The provincial examination consists of 60 questions worth one mark each. There are **four** types of questions:

4	True-and-False Questions
8	Numerical-Response Questions
12	Matching Questions
36	Multiple-Choice Questions
60	**Total**

6. When answering **Numerical-Response** questions, please note the following:

   - Find the correct question number on the Response Form and write your answer in the spaces provided, noting proper place value. **Only one digit per box.**
   - PRINT your digits **as shown below**. Keep within the box provided.

0	1	2	3	4	5	6	7	8	9

   - Negative answers must include a shaded negative circle. If neither circle is bubbled, the answer will be read as positive.
   - Leave unused boxes blank.
   - For example, the answer **−70.6** will be written as shown.

1. In order to determine the level of student satisfaction with the cafeteria food at her high school, Mary asked six of her friends for their opinion. What sampling technique did Mary use?

   A. Random Sampling
   B. Convenience Sampling
   C. Questionnaire Sampling
   D. Stratified Random Sampling

2. You are interested in finding out what percentage of the 900 students at your high school have cell phones. Which of the following samples would give you the best estimate?

   A. You survey 30 of your friends.
   B. You survey the 38 students in your math class.
   C. You survey every tenth student as they leave the school one day.
   D. You survey every second student entering the library at lunch hour one day.

Use the following information to answer question 3.

A Western Canadian travel magazine has 100 000 readers. In an on-line survey, the readers were asked about the number of trips they took outside Canada last year. Over a three-week period, there was a total of 2250 responses.

Survey Results	
Number of Trips	**Number of Responses**
0	90
1 or 2	920
3 or 4	830
5 or more	410

3. Which of the following statements can be supported by the information given?

I.	Over 50% of respondents took at least 3 trips outside Canada last year.
II.	Less than 5% of the magazine's 100 000 readers did not leave Canada last year.
III.	Over 15% of Western Canadians will take at least 5 trips outside Canada this year.
IV.	The survey may not be reliable because of the method used.

A. I only
B. I and III only
C. I and IV only
D. I, II, III and IV

4. To which set(s) of numbers does $-\sqrt{25}$ belong?

I.	Natural
II.	Integer
III.	Rational
IV.	Irrational

A. III only
B. IV only
C. II and III only
D. I, II and III only

5. The number 4.373 773 777 377 773 ... is rational.

A. True
B. False

6. Consider the following numbers: $9,\ 5\sqrt{3},\ 4\sqrt{5},\ 2\sqrt{19},\ 6\sqrt{2}$
If the numbers are ranked from smallest to largest, what is the third largest value of the numbers?

A. 9
B. $5\sqrt{3}$
C. $4\sqrt{5}$
D. $2\sqrt{19}$

7. Cathy has a fixed-rate investment account that pays interest at an annual rate of 4.5% on the lowest balance in the year. Towards the end of each year, she deposits $500 into the account. She makes no withdrawals from this account. Data for this account is shown below.

Year	Opening Balance ($)	Interest Earned ($)	Annual Deposit ($)	Closing Balance ($)
4	3850.84	173.29	500	
5				

How much interest did Cathy earn in year 5? Answer to two decimal places.

Record your answer neatly on the Response Form.

Use the following information to answer question 8.

In A-League Soccer a win is worth 3 points, a tie is worth 1 point and a loss is worth 0 points. The team with the most points is in first place. The following table shows the standings.

Team	Wins	Losses	Ties	Points
Seattle	12	10	2	38
Portland	10	7	7	37
Vancouver	11	10	3	36
Calgary	10	9	5	35

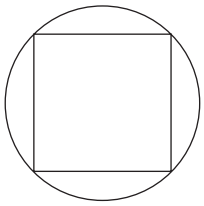
8. If a win was worth 2 points (instead of 3 points), which team would be in second place? Assume all else stays the same.

A. Seattle
B. Calgary
C. Portland
D. Vancouver

Match each Irrational Expression on the left with the correct Equivalent Form on the right. Each Expression may be used once, more than once or not at all.

Irrational Expression	Equivalent Form
9. $2\sqrt{48}$	A. $-5\sqrt{3}$
10. $\sqrt{75}-2\sqrt{12}+\sqrt{27}$	B. $3\sqrt{3}$
11. $\frac{24}{2\sqrt{3}}$	C. $4\sqrt{3}$
	D. $8\sqrt{3}$
	E. $12\sqrt{3}$
	F. $16\sqrt{3}$

12. A square is inscribed in a circle.



The area of the circle is $36\pi\,\text{cm}^2$. What is the exact perimeter of the square?

A. $12\sqrt{2}$ cm
B. $24\sqrt{2}$ cm
C. $36\sqrt{2}$ cm
D. $48\sqrt{2}$ cm

13. Place the following exponential expressions in order from the **smallest value** to the **largest value** once the expressions have been simplified.

I.	$27^{\frac{1}{3}}$
II.	$\left(16^{\frac{1}{2}}\right)^{3}$
III.	$81^{-\frac{3}{4}}$
IV.	$\left(\frac{3}{7}\right)^{-2}$

A. I, II, III, IV
B. I, III, IV, II
C. III, I, IV, II
D. III, II, I, IV

14. Which of the following is equivalent to $\left(-a^{3}\right)^{-\frac{2}{3}}$?

A. a^{2}

B. $-\frac{1}{a^{2}}$

C. $-a^{\frac{9}{2}}$

D. $\frac{1}{a^{2}}$

15. What is the value of k if $\sqrt{x^{-\frac{1}{2}}} = x^k$?

Record your answer neatly on the Response Form.

16. The sequence $1,\ 2,\ 4,\ 7,\ 11,\ 16,\ \ldots$ is arithmetic.

A. True
B. False

Use the following information to answer question 17.

Sequence I	Sequence II
$2,\ 9,\ 16,\ 23, \ldots$	$4,\ 10,\ 16,\ 22, \ldots$

17. Which of the following statements is correct?

A. t_{17} is greater in Sequence I.
B. t_{17} is greater in Sequence II.
C. t_{17} is the same in both sequences.
D. There is not enough information given to determine t_{17}.

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18. Helen's starting salary is \$35 000 per year. If she receives a raise of \$2000 every year after that, how much will she have earned after working 11 years?

A. \$395 000
B. \$405 000
C. \$440 000
D. \$495 000

19. A cabin by a lake is purchased for $35 000. If it appreciates in value by 8.5% each year, what is its value at the beginning of the 15th year?

A. $93 159.02
B. $101 077.53
C. $109 669.13
D. $118 991.00

20. What is the sum of the following arithmetic series:

$-20+(-17)+(-14)+...52$?

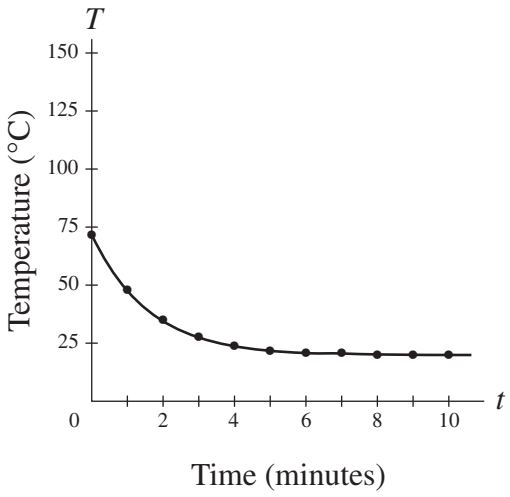
Record your answer neatly on the Response Form.

21. A cup of hot water is left to cool on the table. The temperature is recorded, to the nearest degree, at regular time intervals as shown by the following data.

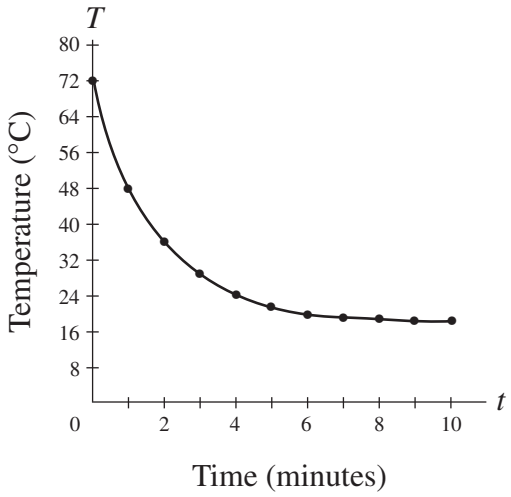
Time (minutes)	0	1	2	3	4	5	6	7	8	9	10
Temperature (°C)	72	48	35	28	24	22	21	21	20	20	20

The data was then graphed. Which graph **best** represents the cooling of the hot water over time?

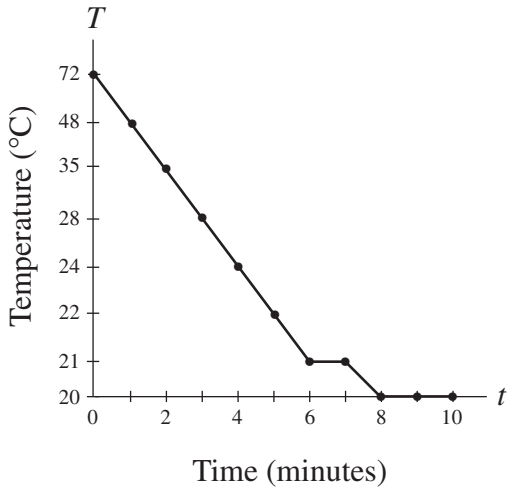
A.



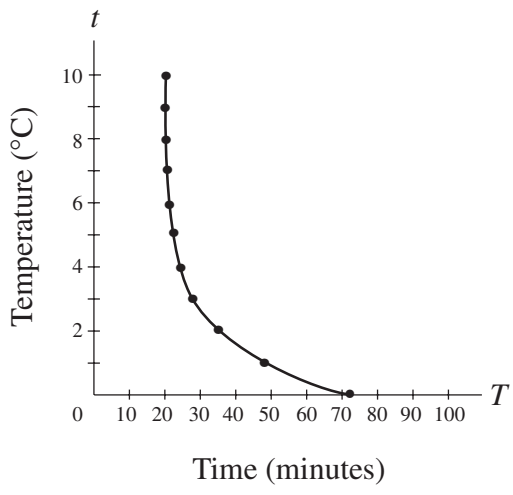
B.



C.

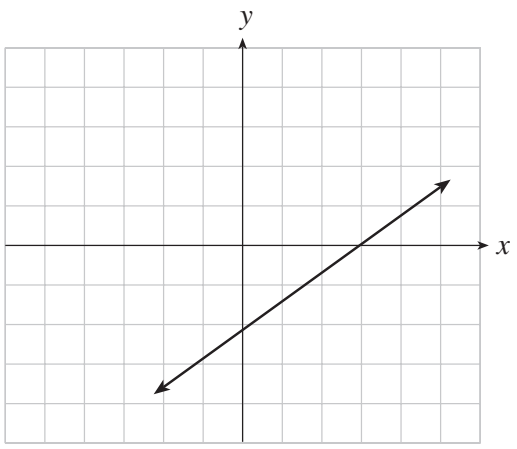


D.

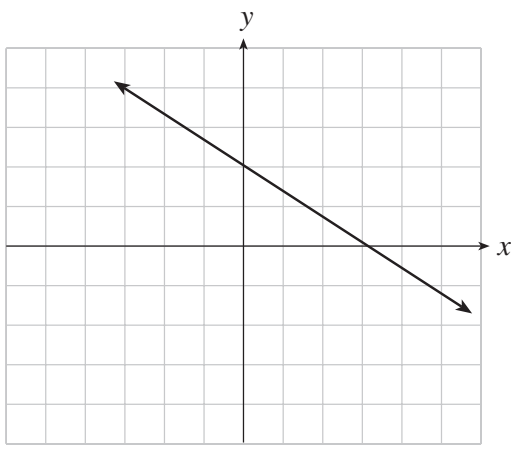


22. Given $f(x) = mx + b$, where m and b are positive real numbers, which of the following graphs best represents $f(x)$?

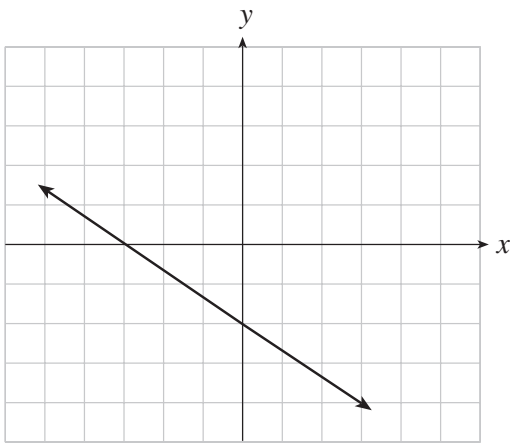
A.



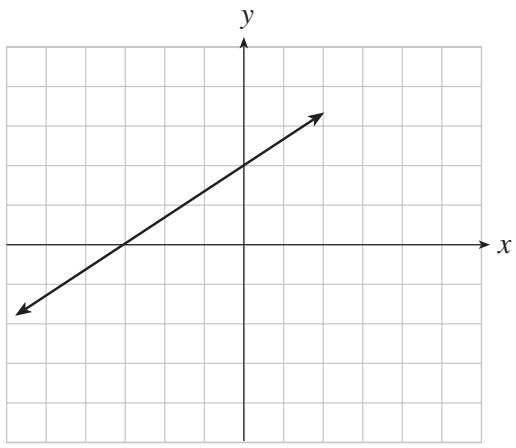
B.



C.



D.



23. If $f(x) = \frac{x}{2+x}$, find $f(3) + f\left(3^{-1}\right)$.

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

B. $\frac{5}{11}$

C. $\frac{16}{35}$

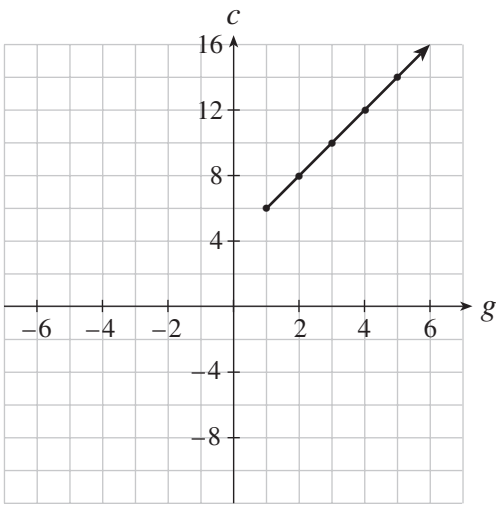
D. $\frac{26}{35}$

24. At the Euclid Laser Arcade the following rates are posted:

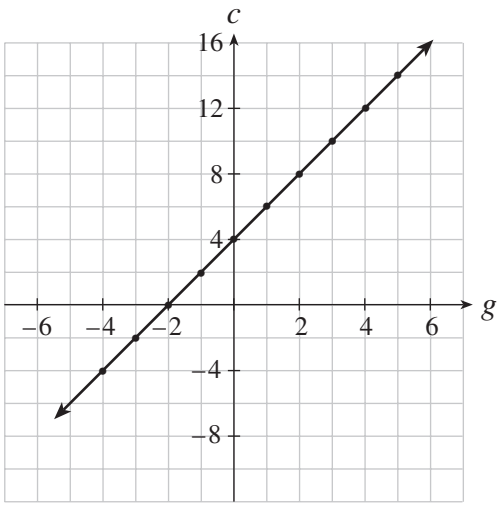
Number of games (g)	Cost (c)
1	\$6
2	\$8
3	\$10
4	\$12
⋮	⋮

Which of the following graphs best represents the rates posted?

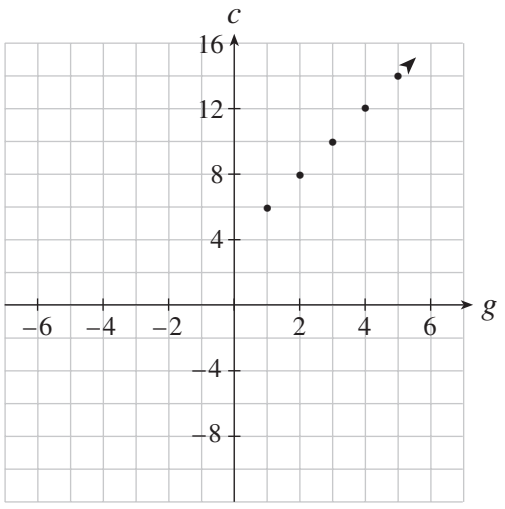
A.



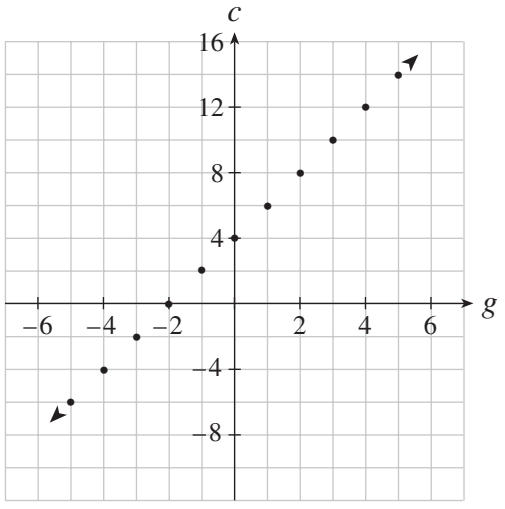
B.



C.



D.



25. Consider the following statements concerning the graph of $x + 2y - 6 = 0$.

I.	The y-intercept is 6.
II.	The x-intercept is -6.
III.	The slope is $\frac{1}{2}$.
IV.	The domain and range are all real numbers.

Which of the following is true?

A. I, II, III and IV
B. II and III only
C. I and IV only
D. IV only

26. A banquet room has been rented for a retirement dinner for math teachers. It costs $200 to rent the room and $15 for every person who attends. Which of the following statements are true?

I.	The function for total cost can be represented by an arithmetic sequence.
II.	The function representing total cost is a direct variation.
III.	The equation representing total cost is the linear function $C = 15n + 200$, where C is the total cost and n is the number of people.

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

Use the following equation to answer questions 27 to 29.

$$y = -2x + 8$$

Match each Graph Characteristic on the left with the correct Value(s) on the right. Each Value(s) may be used once, more than once or not at all.

Graph Characteristic	Value(s)
27. slope	A. -2
28. x-intercept	B. 4
29. domain	C. 8
	D. $x \geq 8$
	E. all real numbers

Use the following information to answer question 30.

There is a fixed cost of \$250 to design a full colour glossy flyer for a jewelry store. It costs 80¢ each to print the first 200 flyers, 75¢ each to print the next 500 flyers and 65¢ for each flyer after that.

30. How many flyers can be designed and printed for a total cost of \$500?

Record your answer neatly on the Response Form.

31. Which of the following has $x - 3$ as a factor?

I.	$2x^2 - 5x - 3$
II.	$2x^2 - 18$
III.	$x^2 + x - 6$
IV.	$2xa - 6a - x^2 + 3x$

A. I and II only
B. III and IV only
C. I, II and IV only
D. I, II, III and IV

32. For which integral values of k can $6x^2 + kx + 1$ be factored?

A. $5,\ 7$ only
B. $\pm 5,\ \pm 7$ only
C. $-5,\ -7$ only
D. all integers between -7 and 5, inclusive

33. What value of k will make the following trinomial a perfect square?

$$2kx^2 - 24xy + 9y^2$$

Record your answer neatly on the Response Form.

Match each Expression on the left with the correct Expanded Form on the right. Each Expanded Form may be used once, more than once or not at all.

Expression	Expanded Form
34. $(a+x)(a-x)$	A. $x^2 - a^2$
35. $(x+a)^2$	B. $x^2 + a^2$
36. $-(x+a)(x-a)$	C. $-x^2 + 2ax - a^2$
	D. $a^2 - x^2$
	E. $x^2 - 2ax - a^2$
	F. $x^2 + 2ax + a^2$
	G. $-x^2 - a^2$

Use the following information to answer question 37.

Jane and Harry are asked to determine the value for which the expression $\frac{6x-12}{x-2}$ is undefined.

$$\frac{6x-12}{x-2}$$
$$= \frac{6\cancel{(x-2)}}{\cancel{(x-2)}}$$
$$= 6$$

Here are their responses.

Jane: The expression is undefined when $x = 2$ because the original expression is undefined when $x = 2$.

Harry: No, since we cancel the $(x-2)$'s, there are no restrictions.

37. Jane is correct.

A. True
B. False

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38. For what values of x is the following expression undefined?

$$\frac{4x^2-25}{4x^2-10x-50}$$

A. $x = 5$

B. $x = \frac{5}{2},\ 5$

C. $x = -\frac{5}{2},\ 5$

D. $x = 0,\ -\frac{5}{2},\ 5$

39. Simplify:

$$\frac{8x^2 - 12x + 16}{-4}$$

A. $-2x^2 + 3x - 4$

B. $-2x^2 - 3x + 4$

C. $-2x^2 - 3x - 4$

D. $-2x^2 + 3x + 4$

40. Simplify:

$\frac{2x^2 - 8x + 6}{x - 3}$; for all permissible values of x.

A. $x - 1$

B. $x + 1$

C. $2x - 2$

D. $2x + 2$

41. A number is multiplied by 3 and then 2 is subtracted. 50 is divided by this result. The same number is multiplied by 4 and then 4 is added. 100 is divided by this result. If both quotients are the same, what is the number?

Record your answer neatly on the Response Form.

42. Simplify:

$$\frac{1}{x}+\frac{3}{x},\ x\neq 0$$

A. $\frac{4}{x}$

B. $\frac{4}{2x}$

C. $\frac{3}{2x}$

D. $\frac{3}{x^2}$

43. Simplify:

$$\frac{a^2+7a+10}{a^2-2a-35}\div\frac{a^2+a-2}{a^2-10a+21}$$; for all permissible values of a.

A. $\frac{a-1}{a-3}$

B. $\frac{a-3}{a-1}$

C. $\frac{a+1}{a-3}$

D. $\frac{a+3}{a-1}$

44. Solve:

$$\frac{3x+1}{2x} = \frac{6x-5}{4x-3} \text{ ; where } x \neq 0, \frac{3}{4}$$

A. $3, 5$

B. $\frac{3}{5}$

C. $\frac{5}{3}$

D. -5

45. When $6y^3 + 2y^2 - 5$ is divided by $3y+1$, the quotient is $2y^2$ and the remainder is -5. Which of the following represents these results?

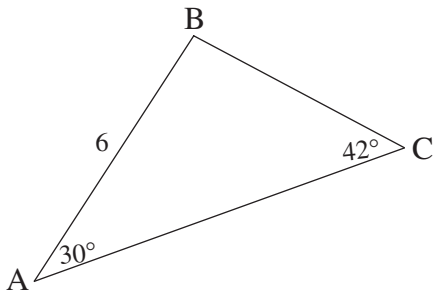
A. $\frac{6y^3 + 2y^2 - 5}{2y^2} = 3y + 1 + 5$

B. $\frac{6y^3 + 2y^2 - 5}{3y+1} = (3y+1)(2y^2) - 5$

C. $6y^3 + 2y^2 - 5 = 2y^2 - \frac{5}{3y+1}$

D. $6y^3 + 2y^2 - 5 = (3y+1)(2y^2) - 5$

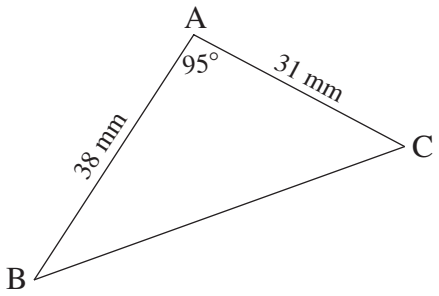
Use the following diagram to answer question 46.



46. Which of the following is used to find the length of side BC?

A. sine law
B. cosine law
C. distance formula
D. pythagorean theorem

Use the following diagram to answer questions 47 and 48.



47. What is the length of $\overline{BC}$?

A. 37 mm
B. 38 mm
C. 51 mm
D. 58 mm

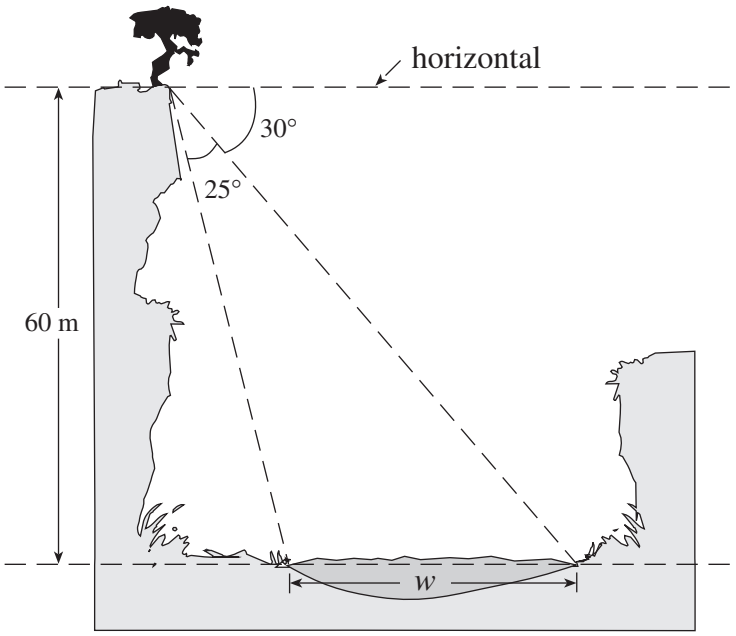
48. What is the measure of $\angle B$?

A. 27°
B. 37°
C. 48°
D. 58°

49. A ship leaves port and travels due north for 300 km. It then changes course and travels N70°E (bearing 70°) for 500 km. How far is the ship (in kilometres) from its starting point? Answer to one decimal place.

Record your answer neatly on the Response Form.

50. From the top of a cliff 60 m above a river, angles are measured as shown in the diagram below.



Calculate the width, w, of the river.

A. 28 m
B. 62 m
C. 73 m
D. 104 m

Use the following information to answer question 51.

Line Segment UV	Line Segment XY
$U(2,\ 5),\ V(6,\ 8)$	$X(-3,\ 4),\ Y(-7,\ 1)$

51. Which of the following statements is correct?

    A. The length of line segment UV is greater.
    B. The length of line segment XY is greater.
    C. The lengths of the two line segments are the same.
    D. There is not enough information given to determine the lengths of the line segments.

52. The midpoint of line segment AB is $M(5,\ -3)$. If the coordinates of B are $(-1,\ -7)$ and the coordinates of A are $(x,\ y)$, what is y?

    A. -5
    B. 1
    C. 2
    D. 11

53. When the radius of a sphere is doubled, its volume is also doubled.

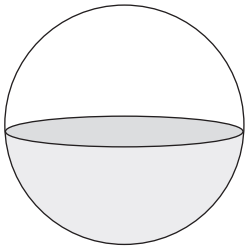
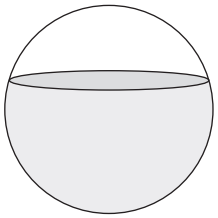
    A. True
    B. False

54. The rounded value 0.6820 is a trigonometric ratio for an angle $A\left(0° \le A \le 180°\right)$. Which of the following has the given value?

I.	$\cos 133°$
II.	$\sin 43°$
III.	$\sin 137°$
IV.	$\cos 47°$

A. I and IV only
B. II and IV only
C. I, II and III only
D. II, III and IV only

Use the following information to answer question 55.

Sphere 1	**Sphere 2**
	
$\frac{1}{2}$ full of water	$\frac{3}{4}$ full of water

55. What must the radius be, in centimetres, of Sphere 1 in order for there to be an equal volume of water in each sphere? Answer to two decimal places.

Record your answer neatly on the Response Form.

56. Determine the value of x if the slope of a line is $\frac{1}{2}$ and the line passes through the points $(-6,\ 2)$ and $(x,\ 10)$.

A. -2
B. 6
C. 10
D. 22

Match each Description on the left with its Equation on the right.
Each Equation may be used once, more than once or not at all.

Description	Equation
57. line through $(3,\ -1)$ and $(-3,\ 3)$	A. $3x - 2y + 4 = 0$
58. line with slope $m = -\frac{2}{3}$ through $(6,\ -2)$	B. $2x - 3y + 3 = 0$
59. line with a y-intercept of 1 passing through $(3,\ 3)$	C. $2x - 3y + 6 = 0$
	D. $2x + 3y - 6 = 0$
	E. $2x + 3y + 3 = 0$
	F. $3x + 2y - 2 = 0$
	G. $3x - 2y + 2 = 0$
	H. $2x + 3y - 3 = 0$

60. Line ℓ contains points $\mathrm{P}(3,\ -9)$ and $\mathrm{Q}(-3,\ -5)$. Choose the equations of the lines that are parallel and perpendicular to line ℓ.

	Parallel to line ℓ	**Perpendicular to line ℓ**
A.	$y = -\frac{2}{3}x - 10$	$y = \frac{3}{2}x + 12$
B.	$y = -\frac{2}{3}x - 8$	$y = -\frac{3}{2}x - 12$
C.	$y = -\frac{3}{2}x + 10$	$y = \frac{3}{2}x - 4$
D.	$y = \frac{3}{2}x - 9$	$y = -\frac{2}{3}x + 17$

END OF EXAMINATION

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Formulae Sheet

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$t_n = a + (n-1)d$$

$$t_n = ar^{n-1}$$

$$S_n = \frac{n}{2}(a + t_n)$$

$$S_n = \frac{n}{2}[2a + (n-1)d]$$

Volume of pyramid: $= \frac{1}{3}(\text{Base Area})(h)$

Volume of prism: $= (\text{Base Area})(h)$

Volume of a cylinder: $= \pi r^2 h$

Surface area of a cylinder: $= 2\pi r^2 + 2\pi rh$

Volume of a cone: $= \frac{1}{3}\pi r^2 h$

Surface area of a cone: $= \pi r^2 + \pi rs$

Volume of a sphere: $= \frac{4}{3}\pi r^3$

Surface area of a sphere: $= 4\pi r^2$

NOTE: Use the value of π programmed in your calculator rather than the approximation of 3.14.

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

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

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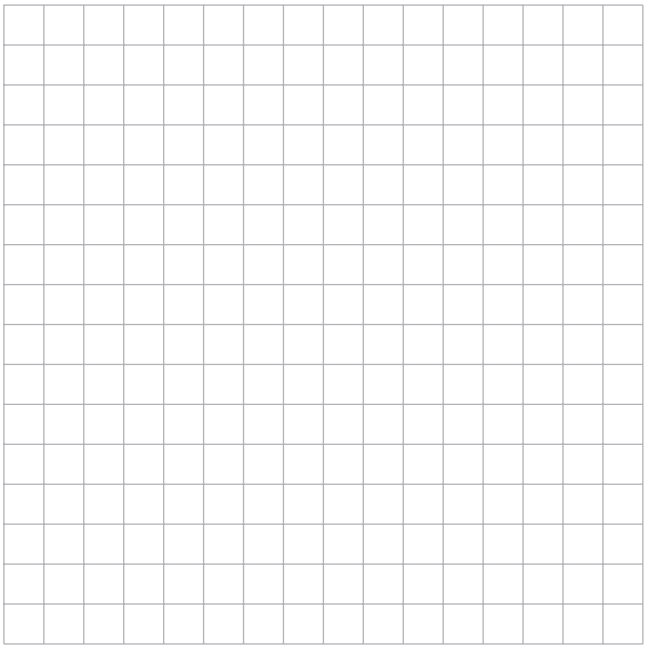
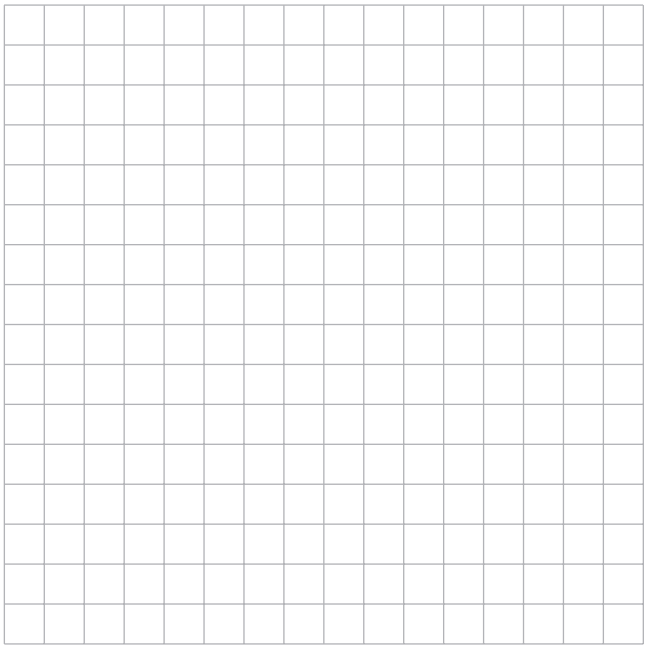
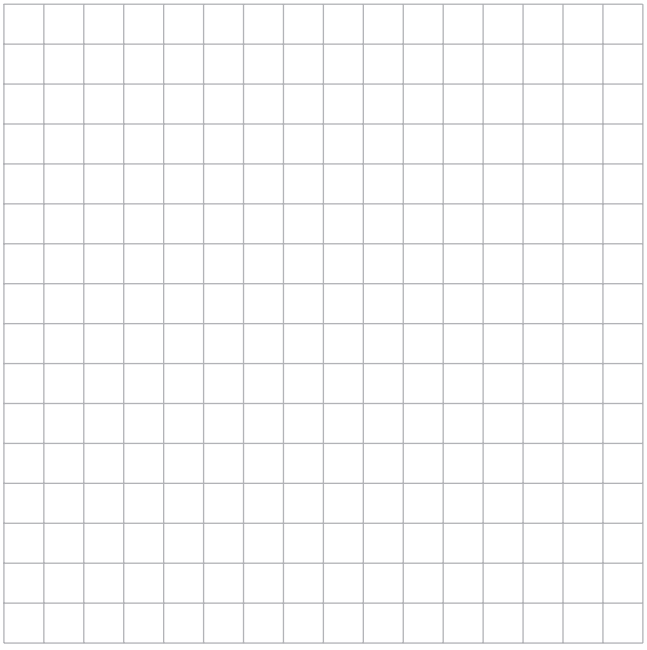
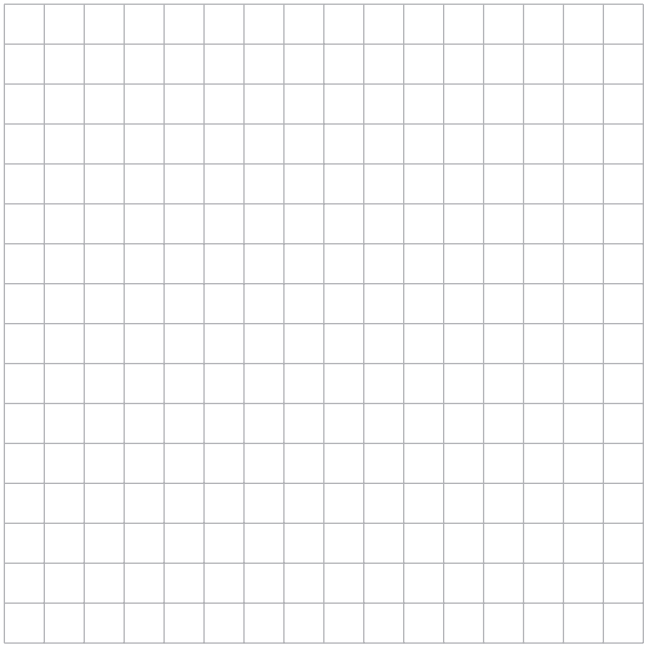
ROUGH WORK FOR GRAPHING

(No marks will be given for work done on this page.)









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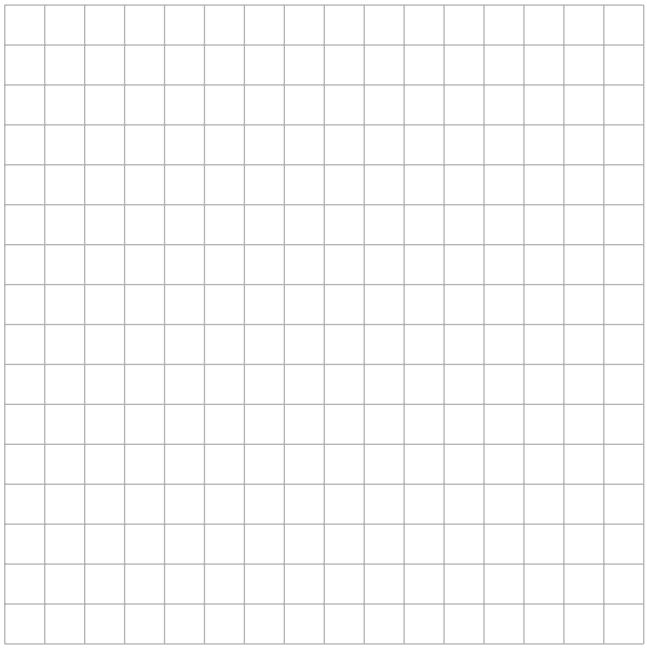

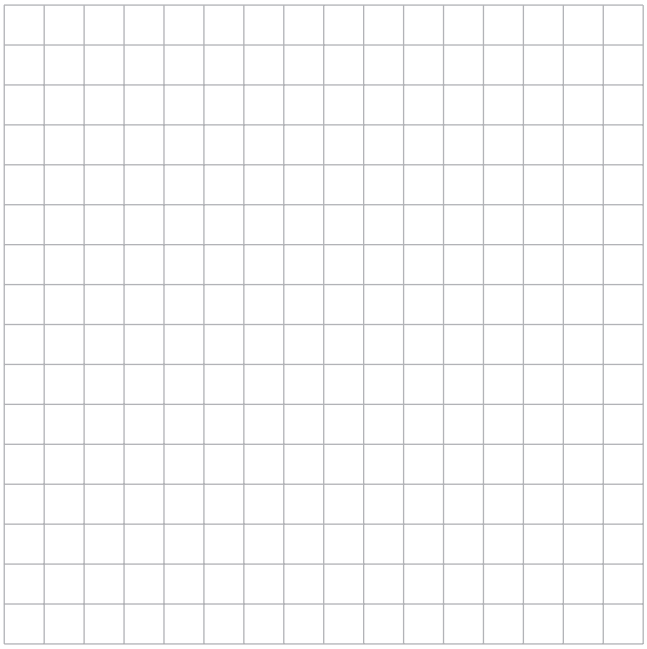

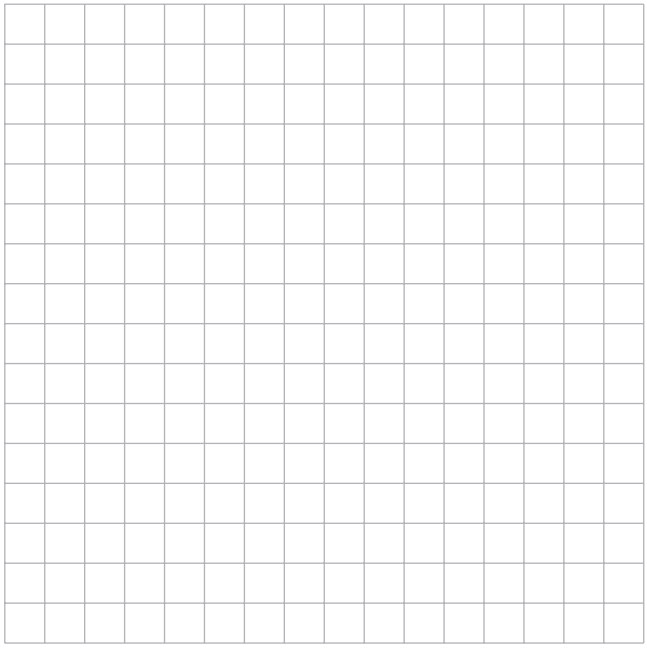

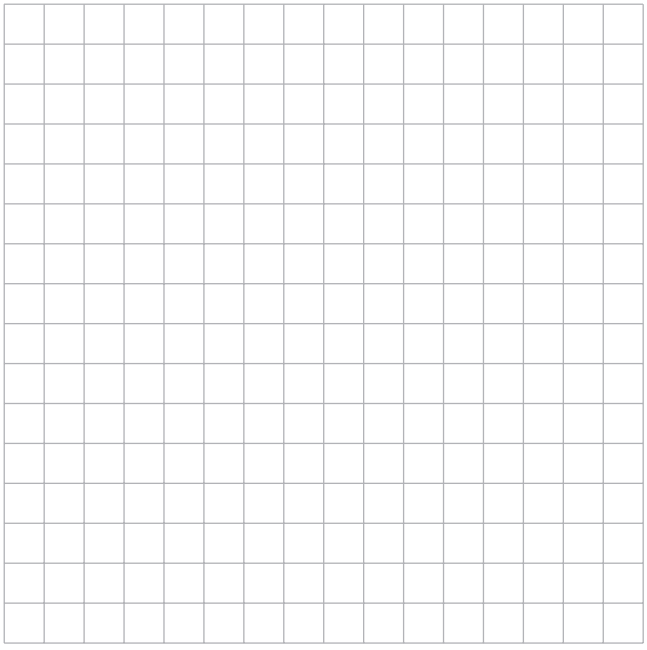

ROUGH WORK SPACE

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