PART A: MULTIPLE-CHOICE QUESTIONS
(calculator not permitted)

Value: 12 marks

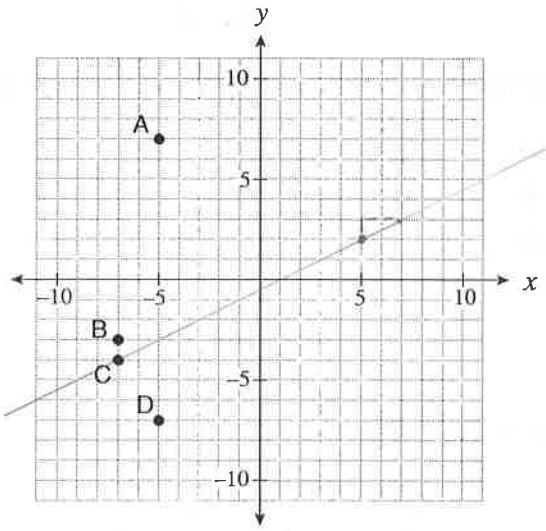
Suggested Time: 30 minutes
Allowable Time: 40 minutes

INSTRUCTIONS: **No calculator may be used for this part of the examination.** For each question, select the **best** answer and record your choice on the **blue Answer Sheet** provided. Using an HB pencil, completely fill in the bubble that has the letter corresponding to your answer. You have a **maximum of 40 minutes** to work on this section.

You have **Examination Booklet Form B**. In the box above #1 on your **Answer Sheet**, fill in the bubble as follows.

Exam Booklet Form/ Cahier d'examen	A	B	C	D	E	F	G	H
	○	●	○	○	○	○	○	○

Use the following graph to answer question 1.



1. The line $y-2=\frac{1}{2}(x-5)$ passes through which point on the graph?

A. A
B. B
C. C
D. D

The point-slope form of this line tells us it passes through $(5,2)$ and has a slope, $m = \frac{1}{2}$

Plot this point, draw in the slope, then draw the line to see which point it passes through.

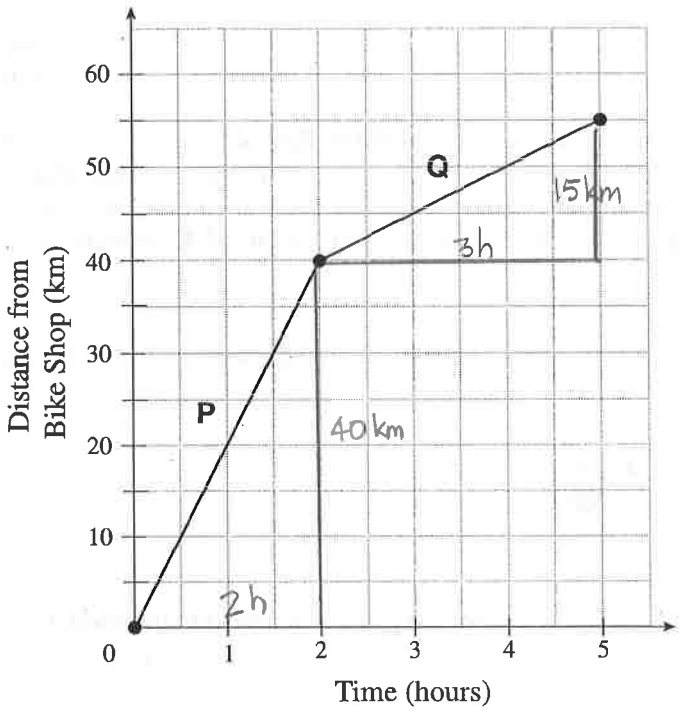
then CHECK to see if it works C(−7,−4)

$-4-2 = \frac{1}{2}(-7-5)$

$-6 = \frac{1}{2}(-12)$

$-6 = -6$ ✓

2. The graph below models a bicycle's distance from a bike shop over time.



$m_p = \frac{40\text{ km}}{2\text{ h}} = 20\text{ km/h}$

$m_q = \frac{15\text{ km}}{3\text{ h}} = 5\text{ km/h}$

∴ the change in speed is 15 km/h

Calculate the change in the speed of the bike from segment P to segment Q.

(A.) decreased by 15 km/h
B. decreased by 5 km/h
C. increased by 15 km/h
D. increased by 11 km/h

3. Solve the following system of equations:

① $4x + 2y = 8$
② $-3x + y = -1$ $\xrightarrow{\times(-2)}$ $6x - 2y = 2$

add these equations

$4x + 2y = 8$
$6x - 2y = 2$
$10x = 10$

$x = 1$

substitute $x = 1$ into ① and solve for y

$4(1) + 2y = 8$
$4 + 2y = 8$
$2y = 8 - 4$
$2y = 4$
$y = 2$

A. (–3, 10)
B. (–1, 6)
(C.) (1, 2)
D. (3, 2)

4. How many solutions does this system of equations have?

$$y = 3x + 7$$
$$y = 3x - 4$$

(A) no solution
B. one solution
C. an infinite number of solutions
D. cannot be determined without solving

These two lines are parallel but have different y-intercepts ∴ no solution

5. What is the least common multiple of 18 and 24?

A. 2×3
B. $2^2 \times 3^3$
(C) $2^3 \times 3^2$
D. $2^4 \times 3^3$

$18 = 2 \times 3 \times 3 = 2 \times 3^2$

$24 = 2 \times 2 \times 2 \times 3 = 2^3 \times 3$

L.C.M. must contain the factors of both numbers

∴ L.C.M. $= 2^3 \times 3^2$

6. What is the greatest common factor of 12, 24, 30, 72?

A. 360
B. 12
(C) 6
D. 2

$12 = 2^2 \times 3$

$24 = 2^3 \times 3$

$30 = 2 \times 3 \times 5$

$72 = 2^3 \times 3^2$

2 is a common factor of all the numbers as is 3

∴ GCF $= 2 \times 3 = 6$

7. Express $2\sqrt{5}$ as an entire radical.

A. $\sqrt{10}$
(B) $\sqrt{20}$
C. $\sqrt{50}$
D. $\sqrt{100}$

$2\sqrt{5} = \sqrt{2^2 \times 5} = \sqrt{4 \times 5}$

remember, generally

$a\sqrt[n]{b} = \sqrt[n]{a^n \times b}$

8. Order the numbers from the smallest value to the largest value.

express the mixed radicals as radicals

I.	$-3\sqrt{2}$
II.	$\sqrt{9}$
III.	$2\sqrt{3}$
IV.	$-2\sqrt{7}$

$= -\sqrt{3^2 \times 2} = -\sqrt{18}$

$\longrightarrow \sqrt{9}$

$= \sqrt{2^2 \times 3} = \sqrt{12}$ most

$= -\sqrt{2^2 \times 7} = -\sqrt{28}$ least

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

9. Simplify: $(2x^3)^3 \cdot 3x^4$ $\longrightarrow$ $2^3 x^9 \cdot 3x^4$

$= 8x^9 \cdot 3x^4$

$= 24x^{9+4}$

$= 24x^{13}$

A. $24x^{36}$
B. $24x^{13}$
C. $18x^{36}$
D. $6x^{13}$

10. A road sign says to turn right in 1000 feet. Approximately how far is this distance in kilometres?

using the conversion sheet...

$1000\,ft \times 0.3048\,m/ft = 304.8\,m$

$304.8\,m \div 1000\,m/km = 0.3048\,km$

A. 0.3 km
B. 0.6 km
C. 1 km
D. 1.5 km

11. Which of the following calculations converts 4 yards into centimetres?

A. $4 \text{ yd} \times \frac{2.54 \text{ cm}}{1 \text{ in}}$ ← the units do not multiply to cm

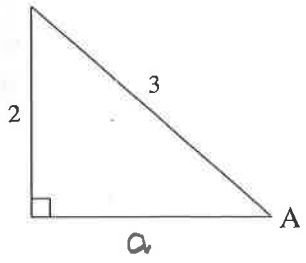
B. $4 \text{ yd} \times \frac{3 \text{ ft}}{1 \text{ yd}} \times \frac{2.54 \text{ cm}}{1 \text{ ft}}$ ← $\frac{2.54\text{cm}}{1\text{ft}}$ is incorrect, it is actually $\frac{2.54\text{cm}}{1\text{ in}}$

(C.) $4 \text{ yd} \times \frac{3 \text{ ft}}{1 \text{ yd}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{2.54 \text{ cm}}{1 \text{ in}}$

D. $4 \text{ yd} \times \frac{1 \text{ ft}}{3 \text{ yd}} \times \frac{1 \text{ in}}{12 \text{ ft}} \times \frac{1 \text{ cm}}{2.54 \text{ in}}$ ← each of the three conversions are incorrect

12. Determine the ratio of cos *A*.

cos is $\frac{\text{adjacent}}{\text{hypotenuse}}$



$\therefore \cos A = \frac{a}{3}$

* use PYTHAGOREAN THEOREM to determine a

$2^2 + a^2 = 3^2$

$a^2 = 9 - 4$

$a^2 = 5$

$a = \sqrt{5}$

$\therefore \cos A = \frac{\sqrt{5}}{3}$

A. $\cos A = \frac{2}{3}$

(B.) $\cos A = \frac{\sqrt{5}}{3}$

C. $\cos A = \frac{\sqrt{13}}{3}$

D. $\cos A = \frac{3}{\sqrt{5}}$

This is the end of Part A (calculator not permitted).

If there is some time left, you have two options:

i) Make sure you have answered all the questions. You will not be able to go back to this section at the end of 40 minutes.

ii) You may proceed to the rest of the examination without the use of a calculator; there are many questions that do not require a calculator. Make sure you flag any questions you skip to remember to go back to them later.

Do not access your calculator until directed by the supervisor. At the end of the 40 minutes, the supervisor will give you permission to access your calculator.

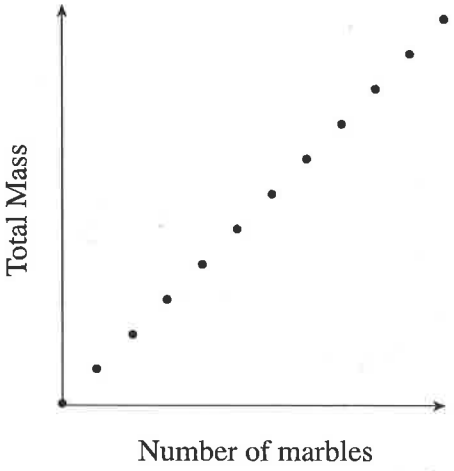
PART B: MULTIPLE-CHOICE QUESTIONS
(calculator permitted)

Value: 42 marks **Suggested Time: 75 minutes**

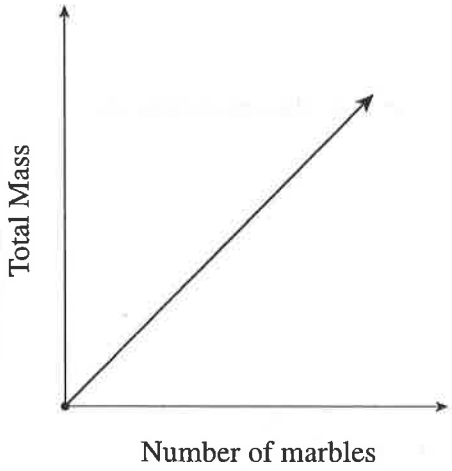
INSTRUCTIONS: For each question, select the **best** answer and record your choice on the **white Answer Sheet** provided. Using an HB pencil, completely fill in the bubble that has the letter corresponding to your answer.

13. Marbles are placed in a jar one at a time. Which graph below best represents the total mass of the jar and marbles as the marbles are added?

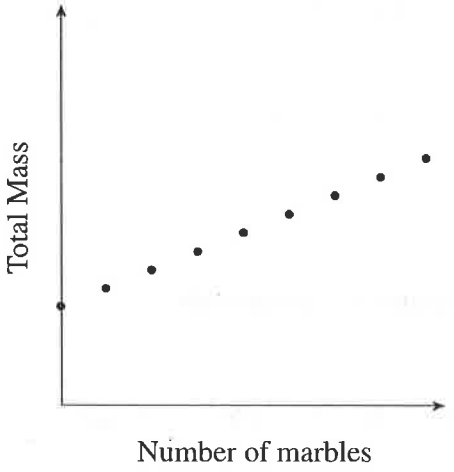
A.



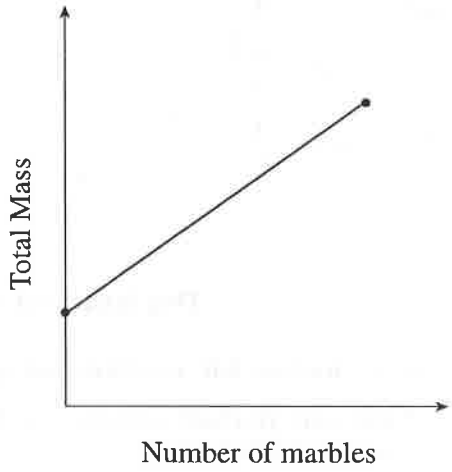
B.



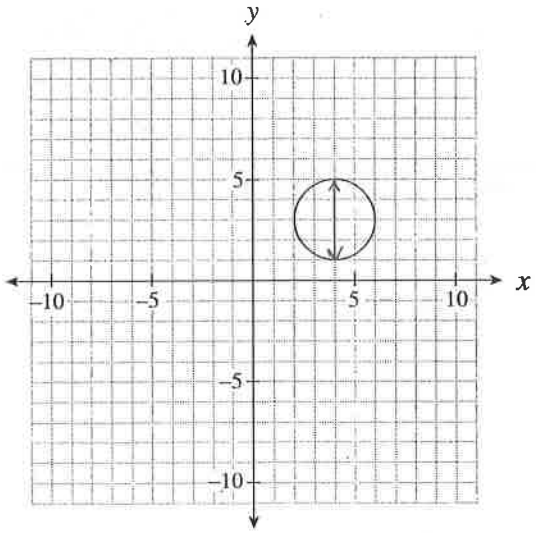
C.



D.



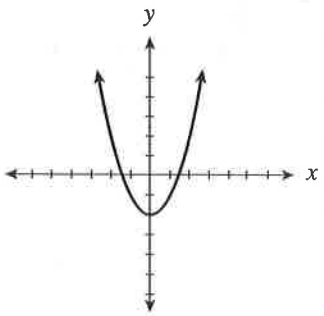
14. What is the range of the graph below?



I.	All x values between 2 and 6 inclusive. ✗
II.	$(2, 6)$ ✗
III.	$[1, 5]$ ✓
IV.	$1 \leq y \leq 5$ ✓

A. III only
B. IV only
C. I and II only
(D.) III and IV only

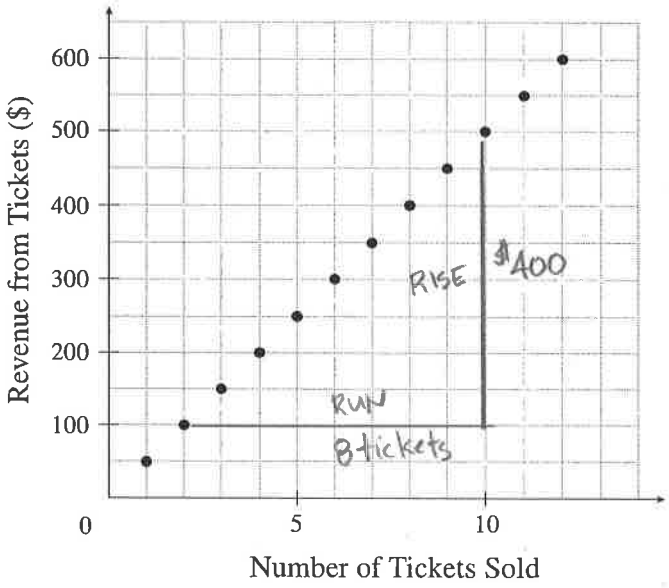
15. Which of the following relations are also functions?

I.	$\{(0, 2), (1, 4), (3, 6), (4, 5), (4, 3), (7, -8)\}$
II.	$y = 2x + 5$ ✓
III.	The output is 6 more than half the input. $y = 6 + \frac{1}{2}x$ ✓
IV.	 ✓

× because an input of 4 has more than one output

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

16. What does the slope represent in the graph below?



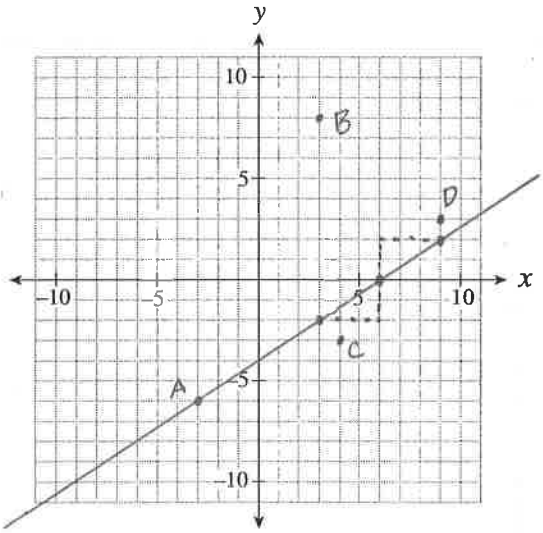
SLOPE = $\frac{\text{RISE}}{\text{RUN}}$

$= \frac{\$400}{8 \text{ tickets}}$

$= \$50/\text{ticket}$

(A.) price per ticket
B. profit from tickets
C. revenue from tickets
D. number of tickets sold

The grid below may be used for rough work to answer question 17.



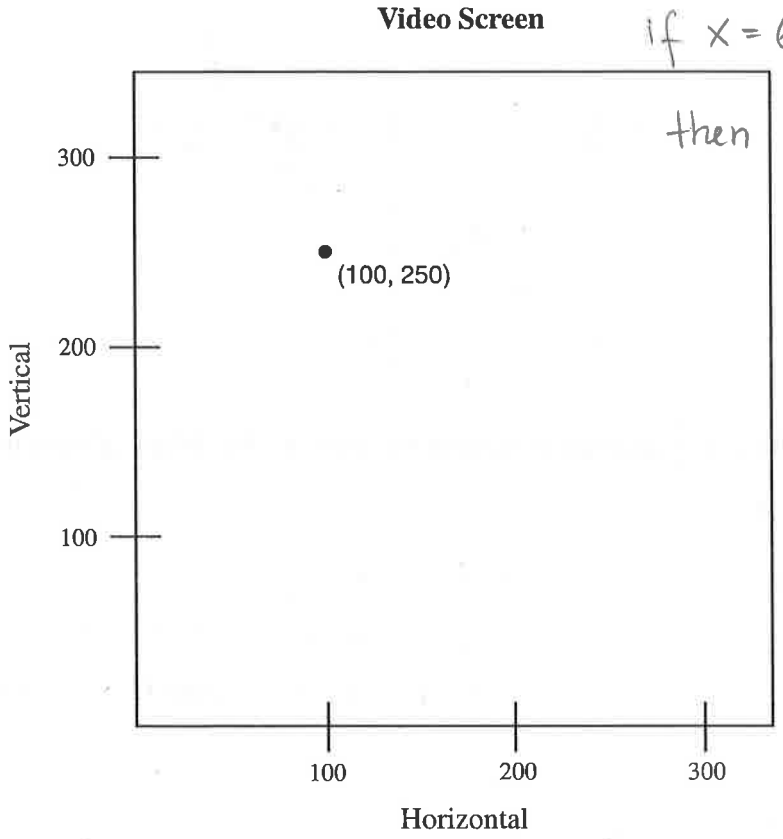
17. A line has a slope of $\frac{2}{3}$ and passes through the point $(6, 0)$. Which of the following points must also be on the line?

(A.) $(-3, -6)$
B. $(3, 8)$
C. $(4, -3)$
D. $(9, 3)$

PLOT EACH OF THESE POINTS ON THE GRAPH, THEN DRAW THE LINE TO SEE WHICH POINT IS ON THE LINE.

18. A video game programmer needs to simulate a shot on a gaming screen. The shot needs to have a slope of $\frac{6}{5}$ to a target at $(100,\ 250)$. If the shooter has a horizontal position of 65, what would be the shooter's position on the screen?

$y - 250 = \frac{6}{5}(x - 100)$



if $x = 65$

then

$y - 250 = \frac{6}{5}(65 - 100)$

$y - 250 = \frac{6}{5}(-35)$

$y - 250 = 6(-7)$

$y - 250 = -42$

$y = -42 + 250$

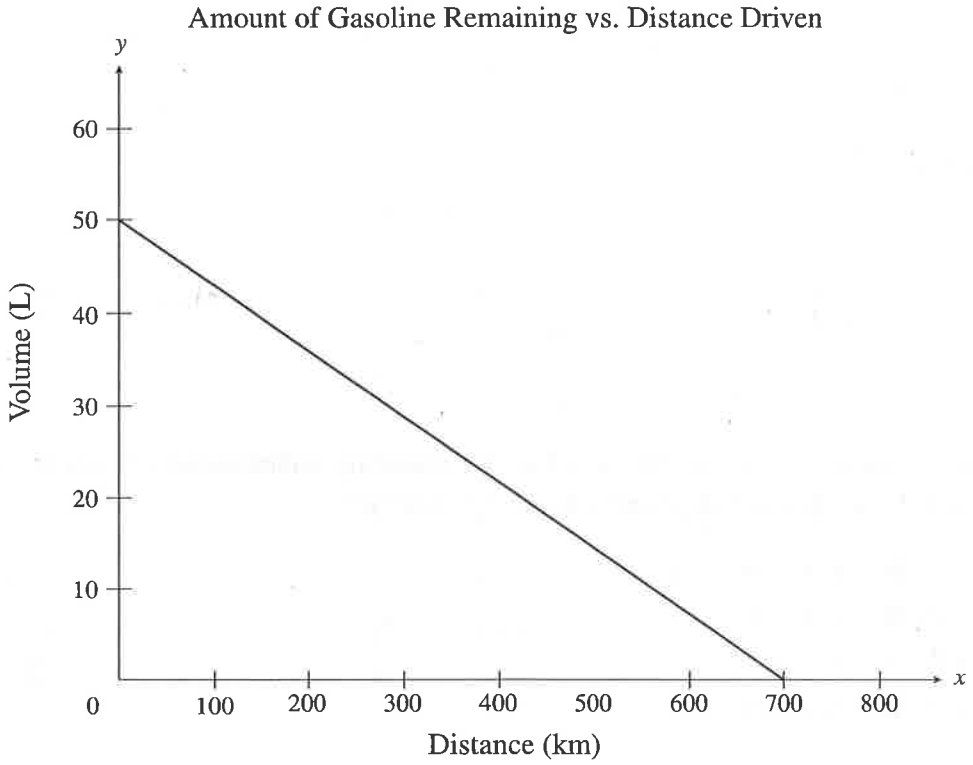
$y = 208$

A. $(65,\ 78)$
B. $(65,\ 125)$
C. $(65,\ 208)$
D. $(65,\ 220.8)$

19. Which of the following scenarios is **not** linear?

A. the height of a football thrown over time
B. the total weight of a jar of pennies as more pennies are added
C. the distance travelled by a car moving at a constant speed over time
D. the pay of a truck driver who earns \$2500 a month, plus \$0.50 for every kilometre he drives

Use the following graph to answer question 20.



20. The graph above shows the relationship between the amount of gasoline remaining in a 50 L tank and the distance driven for a certain car.

What does the x-intercept represent in this situation?

A. fuel capacity of the gasoline tank
B. total distance travelled during a long trip
C. total distance driven until the car is out of gas
D. number of kilometres driven per litre of gasoline

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21. Damien has a list of 37 potential customers for his house-painting business. In order to get a business grant, he must graph his income versus the number of customers. Determine the domain of the graph.

A. $\{0, 1, 2, 3, \ldots\}$
B. $\{0, 1, 2, 3, \ldots 37\}$
C. all real numbers
D. all real numbers between 0 and 37

22. Rewrite $y = \frac{x}{5} - 6$ in general form.

multiply each term by 5

$5y = 5\left(\frac{x}{5}\right) - 5(6)$

$5y = x - 30$

$-x + 5y + 30 = 0$ coefficient of x must be positive
* multiply both sides by -1

$\therefore \quad x - 5y - 30 = 0$

A. $\frac{x}{5} - y - 6 = 0$

B. $x + 5y - 6 = 0$

(C.) $x - 5y - 30 = 0$

D. $5x - 5y - 30 = 0$

23. Given the equation $Ax + By + C = 0$, which of the following conditions must be true for the graph of the line to have a positive slope and a positive y-intercept?

A. $A > 0,\ B > 0,\ C > 0$ ⟶ slope $= \frac{-A}{B}$ y-int $= \frac{-C}{B}$

(B.) $A > 0,\ B < 0,\ C > 0$ ⟶ slope $= \frac{-A}{-B}$ y-int $= \frac{-C}{-B}$

C. $A > 0,\ B > 0,\ C < 0$

D. $A > 0,\ B < 0,\ C < 0$

24. Which of the following lines have a negative slope?

I.	$y + 3 = 0$
II.	$2x + y = 6$
III.	$(y + 2) = -4(x - 5)$

$y = -3$ horizontal line, $m = 0$

$y = -2x + 6$ $m = -2$

$m = -4$

A. II only
B. III only
C. I and III only
(D.) II and III only

25. Which of the following statements are true for $2x + 3y = 6$?

I.	The y-intercept is -2.	×
II.	The line is parallel to $y = 2x$.	×
III.	The slope-intercept form of the line is $y = \frac{2}{3}x + 2$.	×
IV.	The range is all real numbers.	✓

(A.) IV only
B. I and II only
C. I and IV only
D. III and IV only

$2x + 3y = 6$

$3y = -2x + 6$

$y = \frac{-2x + 6}{3}$

$y = -\frac{2}{3}x + \frac{6}{3}$

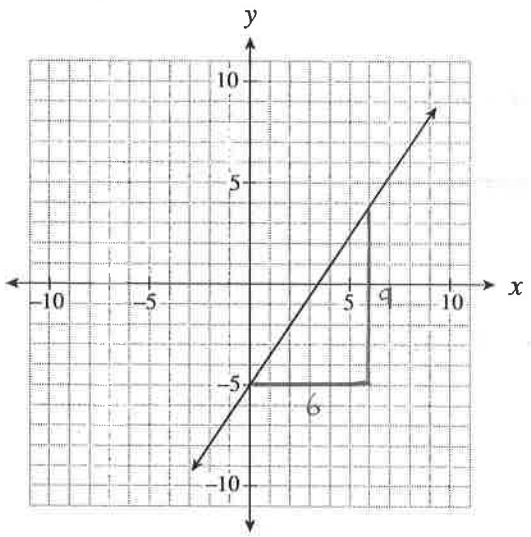
$y = -\frac{2}{3}x + 2$

$m = -\frac{2}{3}$

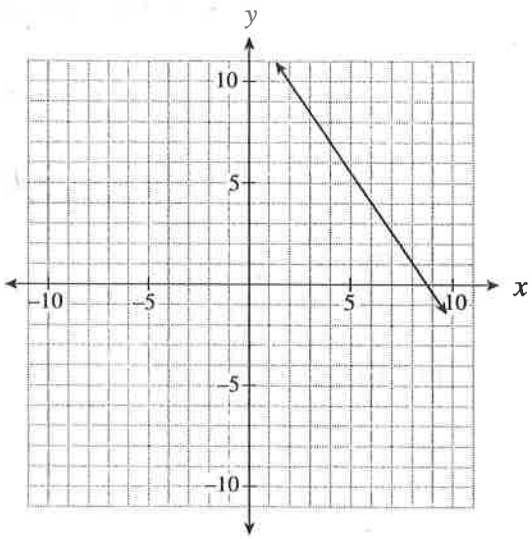
$y\text{-int} = 2$

26. Which of the following graphs represents a line that passes through $(6, 4)$ and is perpendicular to $y = -\frac{2}{3}x$? $\therefore$ slope $= \frac{3}{2}$ eliminate B and C

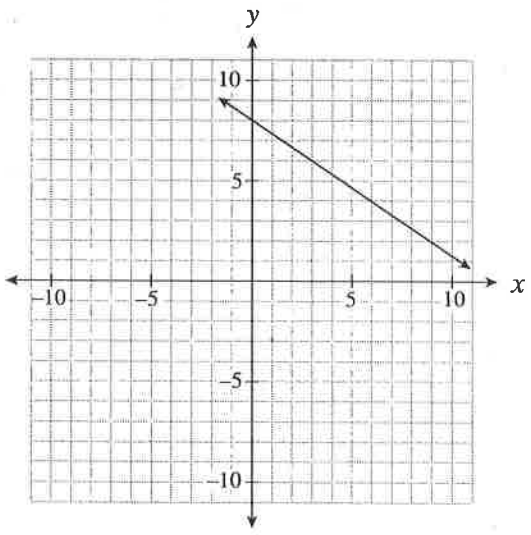
(A.)



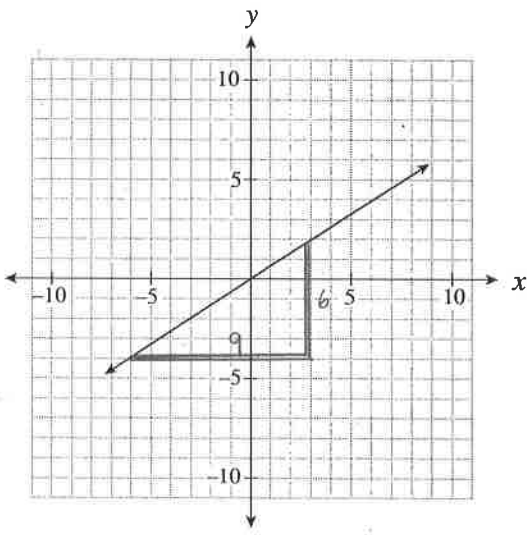
B.



C.



D.



27. Determine the slope-intercept form of the line that passes through the point $(-4, 3)$ and is parallel to the line segment that joins $A(\underset{x_1}{-1}, \underset{y_1}{-5})$ and $B(\underset{x_2}{-3}, \underset{y_2}{1})$.

(A.) $y=-3x-9$
B. $y=-3x+5$
C. $y=-3x+15$
D. $y=3x+15$

$m_{AB} = \frac{1-(-5)}{-3-(-1)} = \frac{1+5}{-3+1} = \frac{6}{-2} = -3$

now use $y-y_1 = m(x-x_1)$ where $m=-3$ and $(\underset{x_1}{-4}, \underset{y_1}{3})$

$\therefore\ y-3 = (-3)(x-(-4))$

$y-3 = -3(x+4) \longrightarrow y-3 = -3x-12 \longrightarrow y=-3x-9$

28. A hot-dog stand owner makes a profit of $100 when he sells 90 hot dogs a day. He has a loss of $30 when he sells 25 hot dogs a day. Which linear relation represents his profit?

A. $y=0.5x+55$
B. $y=1.08x+3.08$
C. $y=1.11x$
(D.) $y=2x-80$

calculate m, using $(\underset{x_1}{90}, \underset{y_1}{100})$ $(\underset{x_2}{25}, \underset{y_2}{-30})$

$m = \frac{-30-100}{25-90} = \frac{-130}{-65} = 2$ $\therefore$ answer is D

29. Which ordered pair represents $f(3)=-5$?

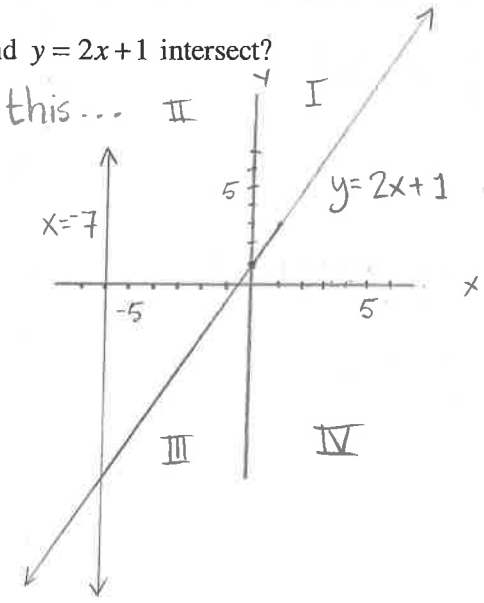
A. $(-5, 3)$
B. $(-3, 5)$
(C.) $(3, -5)$
D. $(5, -3)$

input, x output, y $\therefore$ $(3,-5)$

30. In which quadrant do the graphs of $x=-7$ and $y=2x+1$ intersect?

A. Quadrant I
B. Quadrant II
(C.) Quadrant III
D. Quadrant IV

graph this...



31. Joey bought 8 books. Some books cost $12 each the rest cost $18 each. He spent a total of $108. Which of the following systems of linear equations could represent the given situation?

(A) $x+y=8$
$12x+18y=108$

B. $x+y=108$
$12x+18y=8$

C. $x+12y=8$
$x+18y=108$

D. $12x+y=8$
$x+18y=108$

let the number of $12 books be x
$18 books be y
∴ the total number of books = 8 ∴ x+y=8

the cost of $12 books is $12x
$18 books is $18y
TOTAL COST $108

∴ 12x + 18y = 108

32. Kim invested a total of $1500 between two bonds. One bond earned 8% per annum and the other bond earned 10% per annum. In one year, Kim earned $132 on her investments. How much did she invest in the bond that earned 10%?

(A) $600
B. $750
C. $900
D. $1000

① let the amount invested at 10% = x
" " " " " 8% = 1500 − x

② Kim earned $(1500-x)(.08) + x(.1) = 132$
$120 - .08x + .1x = 132$
$.02x = 132 - 120$

③ $.02x = 12$
$x = 12/.02$
$x = 600$

33. Which one of the following sets of numbers contains only rational numbers?

(A) $\left\{-\frac{3}{4}, 7.1, \sqrt{16}\right\}$

B. $\left\{\frac{1}{2}, -6, \frac{\sqrt{5}}{2}\right\}$ → $\sqrt{5}$ is irrational

C. $\{-3, 4.\overline{23}, 4.121314\ldots\}$ → 4.121314... is irrational

D. $\{\sqrt{10}, 3\sqrt{9}, \pi\}$ → $\sqrt{10}$ and π are both irrational

34. Simplify: $\sqrt[3]{1080}$

A. $2\sqrt[3]{135}$

B. $3\sqrt[3]{40}$

C. $6\sqrt[3]{5}$

D. $6\sqrt[3]{30}$

$2 \mid 1080$
$2 \mid 540$
$2 \mid 270$
$3 \mid 135$
$3 \mid 45$
$3 \mid 15$
5

$\therefore \sqrt[3]{1080} = \sqrt[3]{2^3 \cdot 3^3 \cdot 5}$

$= 2 \cdot 3\sqrt[3]{5}$

$= 6\sqrt[3]{5}$

35. Simplify: $(3a^2)^3(4a^3)^0$ $= (3^3a^6)(1)$ because $x^0 = 1$

A. $9a^6$

B. $27a^6$

C. $36a^8$

D. $108a^9$

$= 27a^6$

36. Which expression is equivalent to $(-c^2)^{-\frac{1}{3}}$?

A. $\frac{1}{\sqrt[3]{-c^2}}$ $= \frac{1}{(-c^2)^{1/3}}$ because $x^{-n} = \frac{1}{x^n}$

B. $\frac{1}{\sqrt[3]{c^2}}$

C. $\frac{1}{\sqrt{-c^3}}$ $= \frac{1}{\sqrt[3]{-c^2}}$ because $x^{1/n} = \sqrt[n]{x}$

D. $\sqrt[3]{c^2}$

37. Simplify: $\sqrt{x^3} \div \sqrt[3]{x^4}$

$= x^{3/2} \div x^{4/3}$ because $\sqrt[n]{x^m} = x^{m/n}$

$= x^{3/2 - 4/3} = x^{3/2(3/3) - 4/3(2/2)}$

$= x^{9/6 - 8/6} = x^{1/6} = \sqrt[6]{x}$

(A.) $\sqrt[6]{x}$

B. $\sqrt[8]{x^9}$

C. $\sqrt[9]{x^8}$

D. $\sqrt[12]{x}$

38. Expand and simplify: $(4x-3)^2$ $= (4x-3)(4x-3)$

$= 16x^2 - 12x - 12x + 9$

$= 16x^2 - 24x + 9$

A. $16x^2 + 9$

B. $16x^2 - 12x + 9$

C. $16x^2 - 24x - 9$

(D.) $16x^2 - 24x + 9$

39. Pam expanded and simplified $(x-3)(x^2+2x-4)$, as shown below.

Steps	
I.	$x(x^2+2x-4)-3(x^2+2x-4)$
II.	$x^3+2x^2-4x-3x^2+6x-12$
III.	$x^3-x^2+2x-12$

should be $-6x+12$

In which step is Pam's first error?

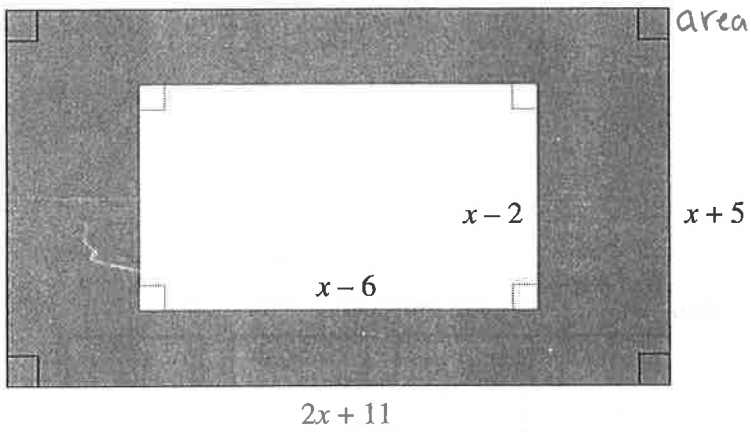
A. Step I

(B.) Step II

C. Step III

D. There is no mistake.

40. Determine an expression to represent the shaded area below. → area of large rectangle − area of small rectangle



A. x^2+43

B. $x^2+13x+67$

C. $x^2+29x+43$

D. $3x^2+13x+67$

$(2x+11)(x+5)-(x-6)(x-2)$

$= 2x^2+10x+11x+55-(x^2-2x-6x+12)$

$= 2x^2+21x+55-(x^2-8x+12)$

$= 2x^2+21x+55-x^2+8x-12$

$= x^2+29x+43$

41. Determine the greatest common factor of $12x^5y$, $4x^3y^2$ and $6x^2y^4$.

A. $2xy$

B. $2x^2y$

C. $4x^3y^2$

D. $12x^5y^4$

42. Which of the following expressions is a factor of $x^2-8x-20$?

A. $x-2$

B. $x-4$

C. $x-5$

D. $x-10$

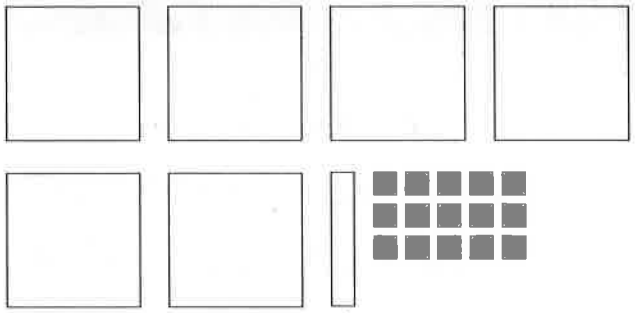
$= (x-10)(x+2)$

43. When completely factored, how many factors does $2x^4 - 24x^2 - 128$ have?

A. 2
B. 3
(C.) 4
D. 5

• since this is a 4th degree polynomial it would have 4 factors

44. Joe was asked to factor $6x^2 + x - 15$ and represent it with math tiles.



What additional tiles would he need to represent the total area of the two factors?

A. 8 each of ▭ and ■
(B.) 9 each of ▭ and ■
C. 10 each of ▭ and ■
D. 11 each of ▭ and ■

(1) $6x^2 + x - 15$

$x^2 + x - 90$

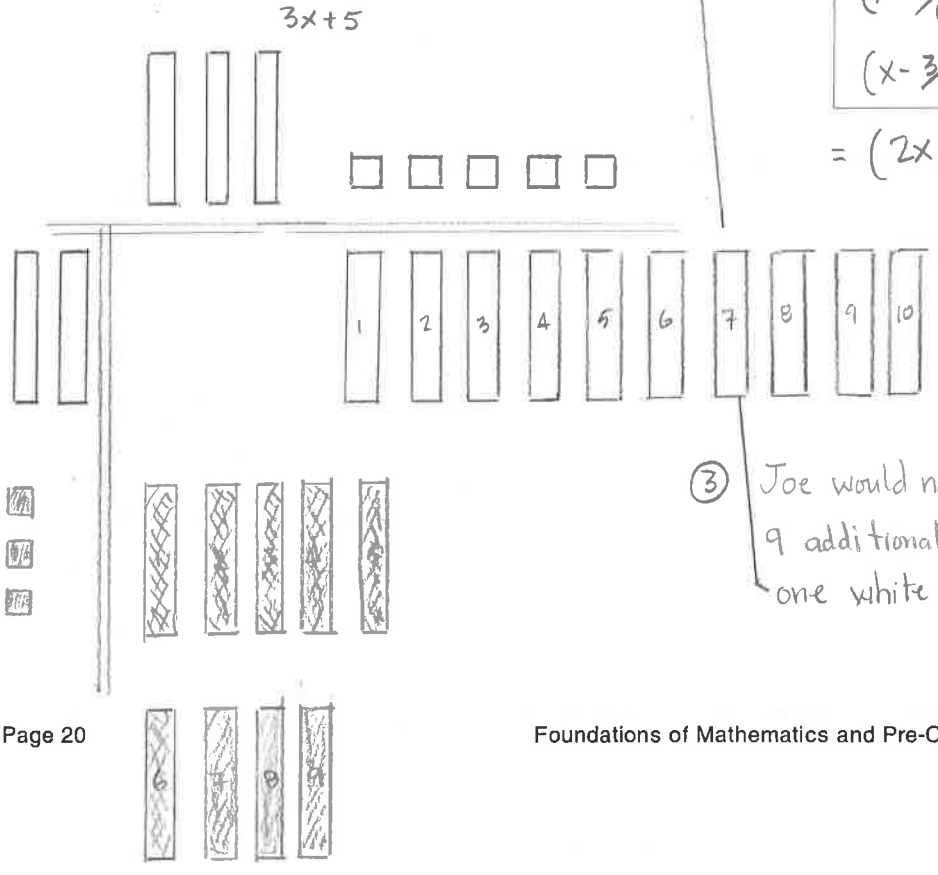
$(x-9)(x+10)$

$(x-\frac{9}{6})(x+\frac{10}{6})$

$(x-\frac{3}{2})(x+\frac{5}{3})$

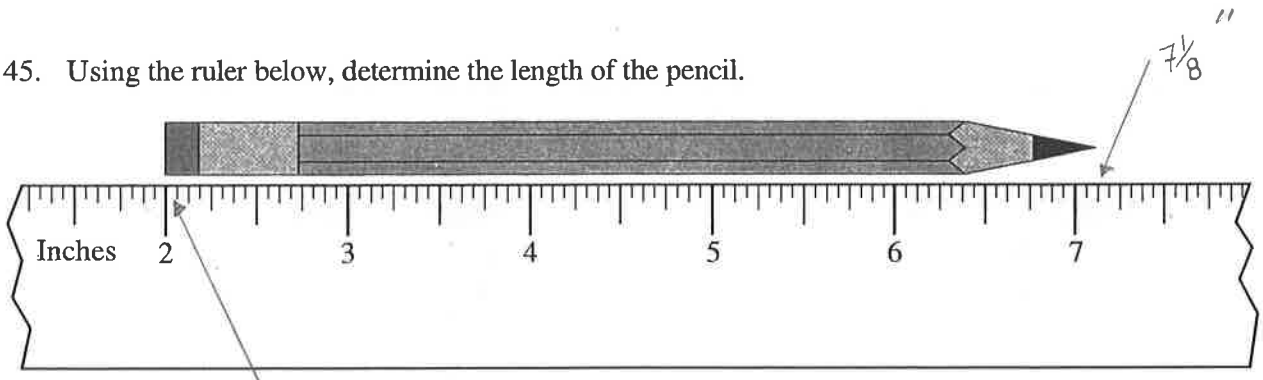
$= (2x-3)(3x+5)$

(2)



(3) Joe would need 9 additional white and 9 additional shaded tiles given he has one white tile already.

45. Using the ruler below, determine the length of the pencil.



$7\frac{1}{8}" - 2" = 5\frac{1}{8}"$

(A.) $5\frac{1}{8}"$

B. 5.2"

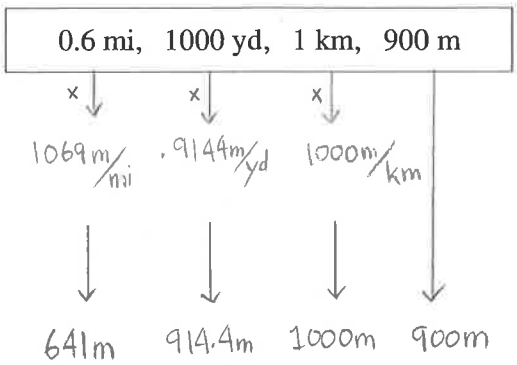
C. $5\frac{1}{4}"$

D. $7\frac{1}{8}"$

46. Jung was told to plant trees two steps apart. Which of the following estimates is closest to "two steps apart"?

(A.) 6 ft
B. 3 m
C. 60 cm
D. 30 in

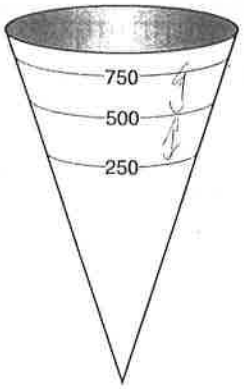
47. Which distance below is the longest? convert all to m



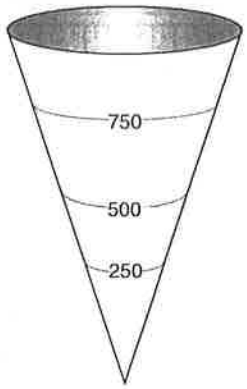
A. 0.6 mi
B. 1000 yd
(C.) 1 km
D. 900 m

48. A cone-shaped water tank has a volume of 1000 litres. Which diagram best represents the 250 L, 500 L and 750 L marks outside of the water tank?

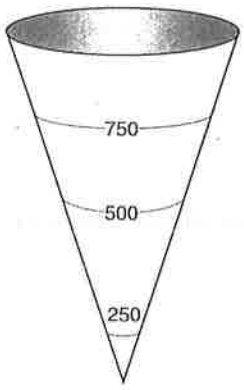
A.



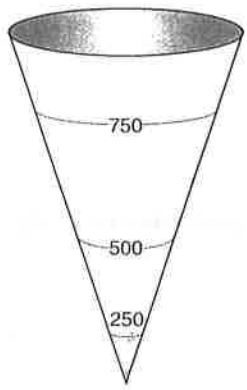
B.



C.



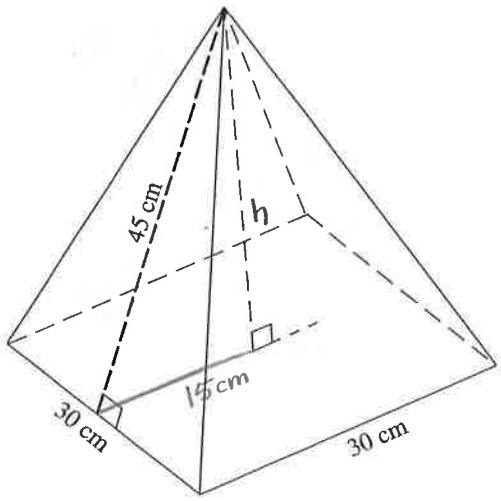
D.



The increments should get closer together from bottom to top.
This occurs because the diameter increases from bottom to top

49. The slant height of the pyramid below is 45 cm. Calculate its volume.

$V = \frac{1}{3}$(area of base) × h



height of pyramid is determined by

$h^2 + 15^2 = 45^2$

$h^2 = 45^2 - 15^2$

$h^2 = 2025 - 225$

$h^2 = 1800$

$h = \sqrt{1800}$ cm

A. 10 062 cm^3

(B.) 12 728 cm^3

C. 13 500 cm^3

D. 40 500 cm^3

$V = \frac{1}{3}(30cm \times 30cm) \times \sqrt{1800}\ cm$

$= 12\,728\ cm^3$

50. A cylinder with a diameter of 10 cm and a height of 12 cm is half full of water. A sphere with a diameter of 5 cm is dropped into the cylinder. How far will the water level rise once the sphere is completely under the water?

A. 0.57 cm

(B.) 0.83 cm

C. 5 cm

D. 6 cm

① Volume of water in cylinder:

$V_c = \pi r^2 h = \pi (5cm)^2 (12cm) = 942.48\ cm^3$

② Volume of sphere:

$V_s = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi (2.5cm)^3 = 65.45\ cm^3$

③ Total volume of water and sphere $= 942.48 + 65.45$

$= 1007.93\ cm^3$

④ Height of water in cylinder $V_c = \pi r^2 h$

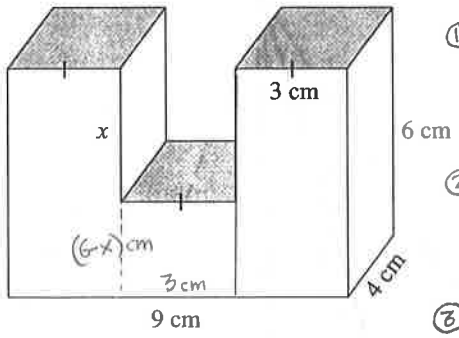
$1007.93\ cm^3 = \pi (5cm)^2 h$

$\frac{1007.93\ cm^3}{\pi (5cm)^2} = h \longrightarrow h = 12.83cm$

⑤ Change in height of water $= 12.83 - 12$

$= 0.83\ cm$

51. The volume of the object below is 186 cm^3. Calculate the length of x.



① Volume of rectangular prism

$V_L = 4 \times 6 \times 3 = 72 \text{ cm}^3$

② Volume of two rectangular prisms

$72 \text{ cm}^3 \times 2 = 144 \text{ cm}^3$

③ Volume of small rectangular prism

$V_S = 186 - 144 = 42 \text{ cm}^3$

$V_S = (6-x)(3)(4)$

A. 3.1 cm
(B.) 2.5 cm
C. 1.75 cm
D. 1.25 cm

④ $(6-x)(3)(4) = 42$

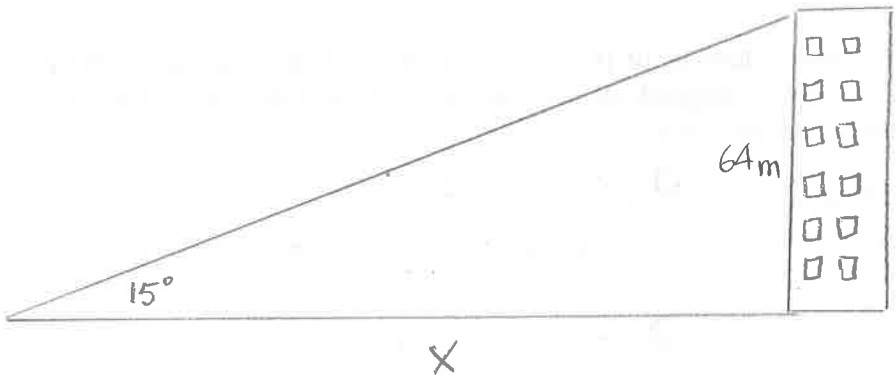
$(6-x)(12) = 42$

$6 - x = \frac{42}{12}$

$6 - x = 3.5 \longrightarrow 6 - 3.5 = x \longrightarrow x = 2.5$

52. The angle of elevation of the sun is 15°. How long is the shadow of a 64 m tall building?

A. 17 m
B. 66 m
(C.) 239 m
D. 247 m



$\tan 15° = \frac{64\text{m}}{x}$

$x \tan 15° = 64\text{m}$

$x = \frac{64\text{m}}{\tan 15°}$ $\quad x = 238.85\text{m}$

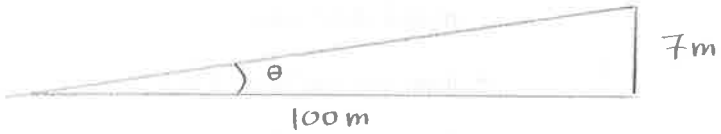
53. As Tracey is driving, she sees a sign telling her the road has a 7% grade (i.e., a rise of 7 metres for a horizontal change of 100 m). Which of the following expressions will calculate the angle between the road and the horizontal?

A. $\tan\left(\frac{7}{100}\right)$

B. $\sin\left(\frac{7}{100}\right)$

C. $\tan^{-1}\left(\frac{7}{100}\right)$

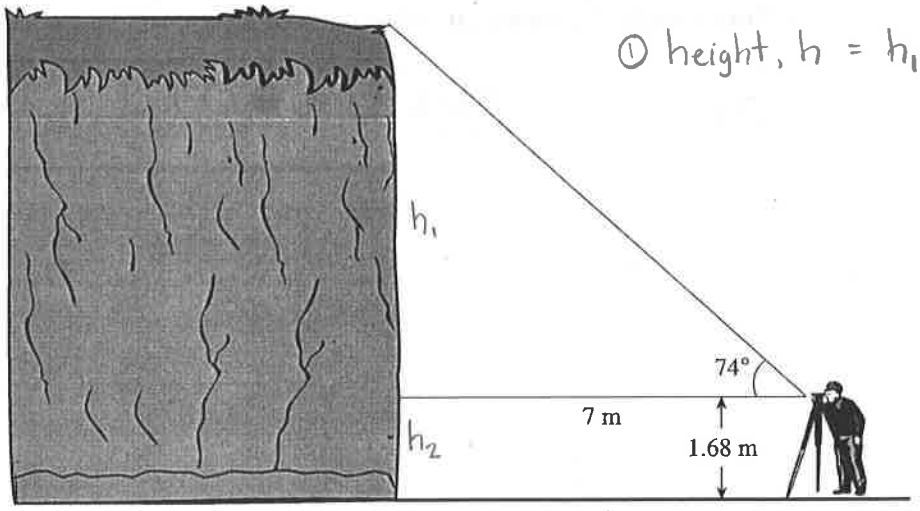
D. $\sin^{-1}\left(\frac{7}{100}\right)$



$\tan\theta = \frac{7}{100}$

$\theta = \tan^{-1}\left(\frac{7}{100}\right)$

54. Mission's outdoor club collected the following data to determine the height of a cliff.



① height, $h = h_1 + h_2$

Calculate the height of the cliff.

② $\tan 74° = \frac{h_1}{7m}$

$7m \tan 74° = h_1$

$h_1 = 24.41m$

③ $h = 24.41 + 1.68$

$= 26.09\,m$

A. 3.7 m
B. 8.4 m
C. 24.4 m
D. 26.1 m

PART C: NUMERICAL-RESPONSE QUESTIONS
(calculator permitted)

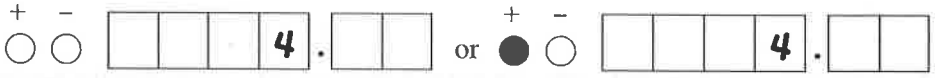
Value: 6 marks **Suggested Time: 15 minutes**

INSTRUCTIONS: When answering **numerical-response questions** on your Answer Sheet:

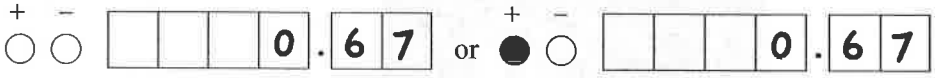
- print digits as illustrated:

- shade the bubble with the negative symbol if the answer is negative; shade or leave blank the bubble with the positive symbol if the answer is positive.
- write your answer in the spaces provided using one digit per box, noting proper place value.
- leave unused boxes blank.
- For example, –70.2 will be written as:

- For example, 4 will be written as:

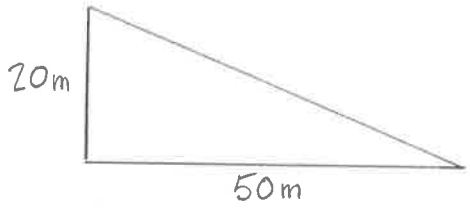


- For example, $\frac{2}{3}$, answered to two decimal places, will be written as:



55. A waterslide descends 20 m over a horizontal distance of 50 m. What is the slope of the waterslide? Answer, with a positive value, to the nearest tenth.

Record your answer neatly on the Answer Sheet.



$\text{Slope} = \frac{\text{RISE}}{\text{RUN}} = \frac{20\text{m}}{50\text{m}} = \boxed{0.4}$

56. The slope of AB is $-\frac{2}{3}$. The slope of CD is $\frac{w}{24}$. Given AB || CD, determine the value of w. Answer as an integer.

Record your answer neatly on the Answer Sheet.

since the lines are parallel, $m_{AB} = m_{CD}$

$\frac{-2}{3} = \frac{w}{24} \longrightarrow 24(-2) = 3w$

$-48 = 3w \longrightarrow \frac{-48}{3} = w$

$\boxed{w = -16}$

57. The cost C, in dollars, to rent a car is determined by the formula $C(k) = 0.15k + 22$, where k is the number of kilometres driven. Calculate the value of k if $C(k) = 166$. Answer to the nearest kilometre.

Record your answer neatly on the Answer Sheet.

if $C(k) = 0.15k + 22$ and $C(k) = 166$

then $166 = 0.15k + 22$

$166 - 22 = 0.15k$

$144 = 0.15k$

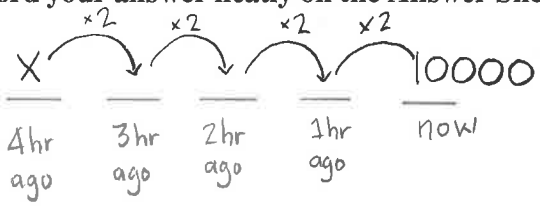
$\frac{144}{0.15} = k$

$\boxed{k = 960}$

58. A bacteria culture doubles every hour. If there are 10 000 bacteria now, how many bacteria were there 4 hours ago? Answer to the nearest bacterium.

Record your answer neatly on the Answer Sheet.

① let x represent the number of bacteria 4 hours ago

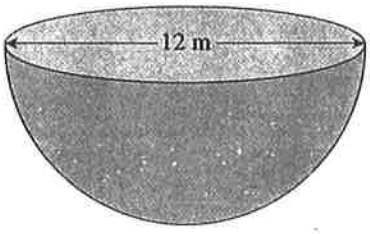
② 

③ $x \cdot 2^4 = 10000$

$16x = 10000$

④ $x = \frac{10000}{16} \longrightarrow \boxed{x = 625}$

59. Calculate the surface area of the solid hemisphere below. Answer to the nearest square metre.



Record your answer neatly on the Answer Sheet.

① Surface area of circle with diameter = 12m $\longrightarrow$ r = 6m

$S.A. = \pi(6\,m)^2 = 113.1\,m^2$

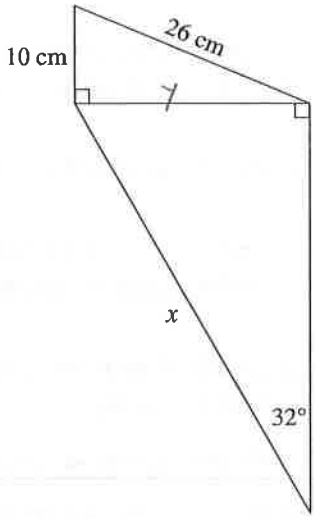
② Surface area of a sphere = $4\pi r^2$

Surface area of $\frac{1}{2}$ a sphere = $\frac{4\pi r^2}{2}$

$S.A. = \frac{4\pi(6m)^2}{2} = 226.2\,m^2$

$226.2\,m^2 + 113.1\,m^2 = 339.3\,m^2$ $\boxed{339\,m^2}$

60. Calculate the length of side x on the diagram below. Answer to the nearest centimetre.



Record your answer neatly on the Answer Sheet.

① label the common side of both triangles y

② Use the Pythagorean Theorem to calculate y.

$$10^2 + y^2 = 26^2$$
$$y^2 = 26^2 - 10^2$$
$$y^2 = 576$$
$$y = \sqrt{576} = 24$$

③ Use the sine ratio to calculate x

$$\sin 32° = \frac{24}{x}$$

$$x \sin 32° = 24 \longrightarrow x = \frac{24}{\sin 32°} = 45.2 \text{ cm} \longrightarrow \boxed{x = 45 \text{ cm}}$$

You have **Examination Booklet Form B**. In the box above #1 on your **Answer Sheet**, ensure you filled in the bubble as follows.

Exam Booklet Form/ Cahier d'examen	A	B	C	D	E	F	G	H
	○	●	○	○	○	○	○	○

Examination Rules

1. The time allotted for this examination is two hours.
   You may, however, take up to 60 minutes of additional time to finish.

2. Answers entered in the Examination Booklet will not be marked.

3. Cheating on an examination will result in a mark of zero. The Ministry of Education considers cheating to have occurred if students break any of the following rules:

   - Students must not be in possession of or have used any secure examination materials prior to the examination session.
   - Students must not communicate with other students during the examination.
   - Students must not give or receive assistance of any kind in answering an examination question during an examination, including allowing their papers to be viewed by others or copying answers from another student's paper.
   - Students must not possess any book, paper or item that might assist in writing an examination, including a dictionary or piece of electronic equipment, that is not specifically authorized for the examination by ministry policy.
   - Students must not copy, plagiarize or present as their own, work done by any other person.
   - Students must immediately follow the invigilator's order to stop writing at the end of the examination time and must not alter an Examination Booklet, Response Booklet or Answer Sheet after the invigilator has asked students to hand in examination papers.
   - Students must not remove any piece of the examination materials from the examination room, including work pages.

4. The use of inappropriate language or content may result in a mark of zero being awarded.

5. Upon completion of the examination, return all examination materials to the supervising invigilator.

UNIT CONVERSION

	Common Imperial	Imperial and Metric	Metric
Length	1 mile = 1760 yards 1 mile = 5280 feet 1 yard = 3 feet 1 yard = 36 inches 1 foot = 12 inches	1 mile ≈ 1.609 km 1 yard ≈ 0.9144 m 1 foot ≈ 0.3048 m 1 inch ≈ 2.54 cm	1 km = 1000 m 1 m = 100 cm 1 cm = 10 mm
Mass (Weight)	1 ton = 2000 pounds 1 pound = 16 ounces	1 pound ≈ 0.454 kg 1 ounce ≈ 28.35 g	1 t = 1000 kg 1 kg = 1000 g
Common Abbreviations	mile = mi yard = yd ton = ton feet = ' or ft inch = " or in pound = lb ounce = oz		kilometre = km metre = m centimetre = cm millimetre = mm tonne (metric ton) = t gram = g

FORMULAE

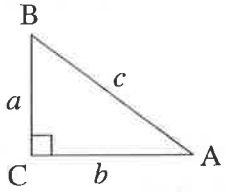
(Put your calculator in Degree Mode)

- Right triangles

$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan A = \frac{\text{opposite}}{\text{adjacent}}$$



Pythagorean Theorem

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

distance = speed × time

- The equation of a line:

$$y = mx + b$$

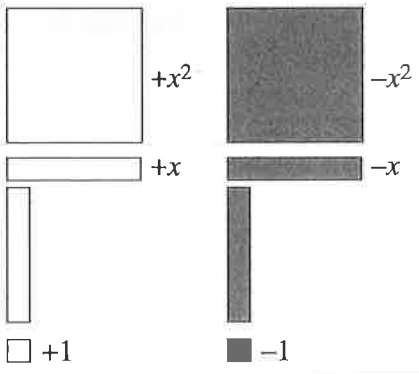
$$Ax + By + C = 0$$

$$y - y_1 = m(x - x_1)$$

- The slope of a line:

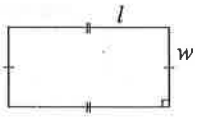
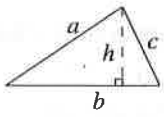
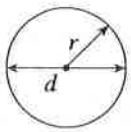
$$m = \frac{\text{rise}}{\text{run}} = \frac{\triangle y}{\triangle x} = \frac{y_2 - y_1}{x_2 - x_1}$$

Math Tiles Legend

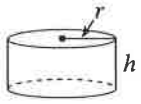
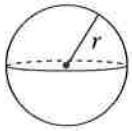
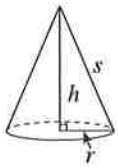
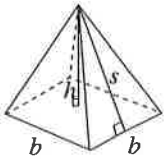
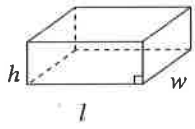


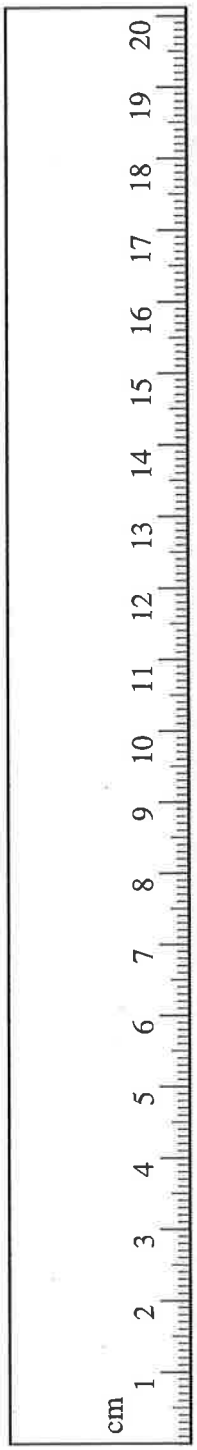
GEOMETRIC FORMULAE

Key Legend	
l = length	P = perimeter
w = width	C = circumference
b = base	A = area
h = height	SA = surface area
s = slant height	V = volume
r = radius	
d = diameter	

Geometric Figure	Perimeter	Area
Rectangle 	$P = 2l + 2w$ **or** $P = 2(l + w)$	$A = lw$
Triangle 	$P = a + b + c$	$A = \frac{bh}{2}$
Circle 	$C = \pi d$ **or** $C = 2\pi r$	$A = \pi r^2$

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

Geometric Figure	Surface Area	Volume
Cylinder 	$A_{top} = \pi r^2$ $A_{base} = \pi r^2$ $A_{side} = 2\pi rh$ $SA = 2\pi r^2 + 2\pi rh$	$V = (\text{area of base}) \times h$
Sphere 	$SA = 4\pi r^2$ **or** $SA = \pi d^2$	$V = \frac{4}{3}\pi r^3$
Cone 	$A_{side} = \pi rs$ $A_{base} = \pi r^2$ $SA = \pi r^2 + \pi rs$	$V = \frac{1}{3} \times (\text{area of base}) \times h$
Square-Based Pyramid 	$A_{triangle} = \frac{1}{2}bs$ (for each triangle) $A_{base} = b^2$ $SA = 2bs + b^2$	$V = \frac{1}{3} \times (\text{area of base}) \times h$
Rectangular Prism 	$SA = wh + wh + lw + lw + lh + lh$ **or** $SA = 2(wh + lw + lh)$	$V = (\text{area of base}) \times h$
General Right Prism	$SA =$ the sum of the areas of all the faces	$V = (\text{area of base}) \times h$
General Pyramid	$SA =$ the sum of the areas of all the faces	$V = \frac{1}{3} \times (\text{area of base}) \times h$



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

ROUGH WORK SPACE

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