Academic

Grade 9 Assessment of Mathematics

2013

RELEASED ASSESSMENT QUESTIONS

Record your answers to the multiple-choice questions on the Student Answer Sheet (2013, Academic).

Please note: The format of this booklet is different from that used for the assessment. The questions themselves remain the same.

Directions

Make sure you have the following materials:

- Student Answer Sheet

- the Formula Sheet

- a pencil and an eraser

- a ruler

- a scientific or graphing calculator

- some paper for rough work for multiple-choice questions only

The diagrams in this booklet are **not** all drawn to scale.

Answering Multiple-Choice Questions

When answering the multiple-choice questions, be sure you use the Student Answer Sheet. The circles you will be filling in are lettered a, b, c, d.

1. Try to answer all of the multiple-choice questions. Be sure to read each question and its four answer choices carefully. Do not spend too much time on any one question.

2. To indicate your answer, **use a pencil to fill in the circle completely** on the Student Answer Sheet. **Like this:** ● **Not like this:** ⊗ ✓ ◓ ◉

3. If you fill in more than one answer to a question, the question will be scored zero.

4. If you leave a question blank, the question will be scored zero.

5. Cleanly erase any answer you wish to change and fill in the circle for your new answer.

Answering Open-Response Questions

1. Do all of your work for each question (even your rough work) in the space provided for the question. Work on additional pages will **not** be scored.

2. Present a complete and well-organized solution to each question. Give as much information as you can.

3. Write your solutions so that they can be understood by someone who does not know your work.

4. Make sure you follow the directions on the Key Words page.
   For example, a question might ask you to "Show your work." Read the Key Words page. It says to record all calculations and steps. So, if you sketch a graph in the process of getting to your answer, show the sketch and label it.

5. When using a calculator, write down the numbers you use and the operations you carry out.
   For example, a question might ask you to "Find the area of a circle with a radius of 7 cm." You need to write $A = \pi(7)^2$ as well as the answer you get on your calculator.

Key Words

Throughout the assessment, key words are used to identify the type of response required from you. The key words are explained below. Refer to this sheet to make sure you are responding fully to each question.

Compare:
Tell what is the same and what is different.

Describe:
Use words to create a mental picture for the reader.

Determine:
Use mathematics to find a solution to the problem.

List:
Use point form.

Explain:
Use words and symbols to make your solution clear.

Justify:
Give reasons and evidence to show your answer is correct.

Show your work:
Record all calculations and all the steps you went through to get your answer. You may use words, numbers, graphs, diagrams, symbols and/or charts.

1 What is the value of $5x^3y^2$ when $x = 2$ and $y = 4$?

$5(2)^3(4)^2$

a   240

b   320 $= 5 \cdot 8 \cdot 16$

c   480 $= 640$

d   640

(handwritten: $5(2)^3(4)^2 = 5 \cdot 8 \cdot 16 = 640$, answer d circled)

2 What exponent goes in the box to make the following equation true?

$$\frac{x^\Box x^6}{x^2} = x^{12}$$

a   9

b   8   *(circled)*

c   4

d   3

(handwritten: $x^\Box x^{6-2} = x^{12}$, $\frac{x^\Box x^4}{x^4} = \frac{x^{12}}{x^4}$, $x^\Box = x^{12-4}$, $x^\Box = x^8$)

3 Mario is making fruit punch by mixing orange juice and pineapple juice in a ratio of 1:3.

How much pineapple juice should he use to make 3 L of fruit punch?

a   0.75 L

b   2 L

c   2.25 L   *(circled)*

d   4 L

(handwritten:)
Orange : Pineapple
1 : 3
x : 3x

$x + 3x = 3$
$\frac{4x}{4} = \frac{3}{4}$
$x = 0.75$
Pineapple $= 3x = 3(0.75) = 2.25$

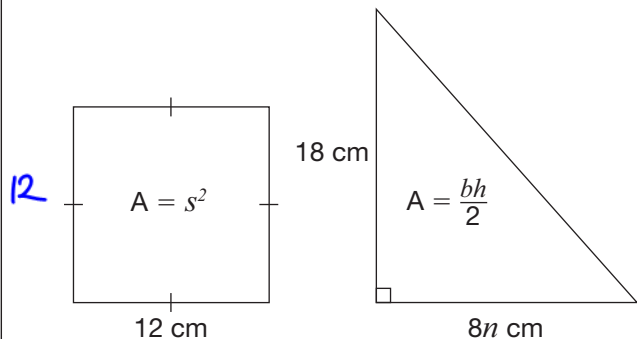**4** Which of the following is a simplified form of the expression $4(5x - 8) - 3(2x - 7)$?

a $14x - 11$ *(circled)* $= 20x - 32 - 6x + 21$

b $14x - 53$ $= 20x - 6x - 32 + 21$

c $26x - 11$ $= 14x - 11$

d $26x - 53$

5 The square and the triangle below have the same area.

12

A = s^2

18 cm

A = $\frac{bh}{2}$

12 cm

8*n* cm

What is the value of *n*?

a   1

b   2   *(circled)*

c   8

d   16

(handwritten:)
$A_{Square} = A_{Triangle}$
$12 \cdot 12 = \frac{8n(18)}{2}$
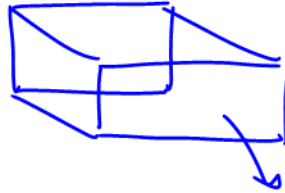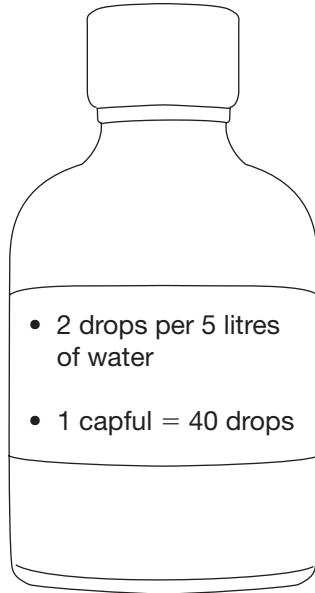$\frac{144}{72} = \frac{72n}{72}$
$2 = n$

6 Healthy Fish

James adds vitamin drops to his fish tank to keep his fish healthy.

If James follows the instructions on the bottle of vitamins, how many capfuls should he add to his 350-litre fish tank?

Show your work.

- 2 drops per 5 litres of water

- 1 capful = 40 drops

Step 1: Calculate how many drops James needs

$$\frac{2\ drops}{5L} \times \frac{x}{350L} \qquad Cross\ multiply$$

$$2(350) = 5x$$

$$\frac{700}{5} = \frac{5x}{5}$$

$$\boxed{x = 140\ drops}$$

Step 2: Calculate the amount of capfuls

$$\frac{1\ capful}{40\ drops} = \frac{x}{140\ drops} \qquad Cross\ mult.$$

$$\frac{140}{40} = \frac{40x}{40}$$

$$x = 3.5\ capfuls$$

∴ James will add 3 and half capfuls to his tank.

7 A rain barrel full of water is drained at a constant rate. Data for the first few minutes of draining is shown on the grid below.

Volume Left in the Rain Barrel vs. Time

6 min, 10 L

Time (minutes)
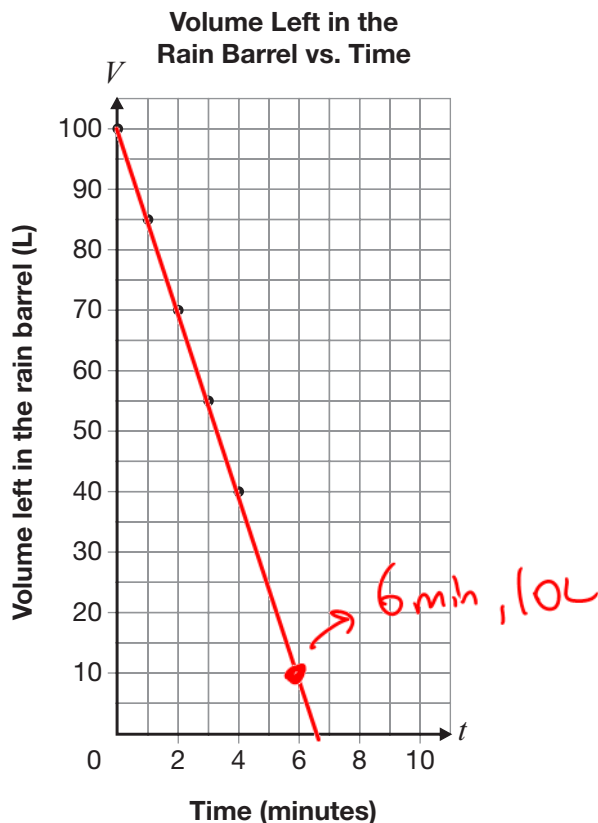
After 6 minutes, the draining is stopped.

How much water is needed to refill the rain barrel?

a 90 L   *b/c 10L remaining in the tank.*

b 75 L

c 25 L

d 10 L

8 Luisa chooses a cellphone plan that charges a flat fee of $20 per month and $0.25 for each text message sent.

Which equation best represents the cost of Luisa's cellphone plan, C, in dollars, where n is the number of text messages sent?

C = 0.25n + 20

a $C = 20.25n$

b $C = 20(0.25n)$

c $C = 20n + 0.25$

d $C = 0.25n + 20$

9 There is a linear relationship between the total cost of renting a costume and the number of hours the costume is rented.

- For 3 hours, the total cost is $60. *A(3, 60)*
- For 5 hours, the total cost is $80. *B(5, 80)*

What type of variation is this relationship, and what is its initial value?

a a partial variation with an initial value of $30

b a partial variation with an initial value of $20

c a direct variation with an initial value of $30

d a direct variation with an initial value of $20

A(3, 60)   B(5, 80)

Determine the equation given 2 points
You need : slope (m) and point

$$m = \frac{80 - 60}{5 - 3} = \frac{20}{2} = 10$$
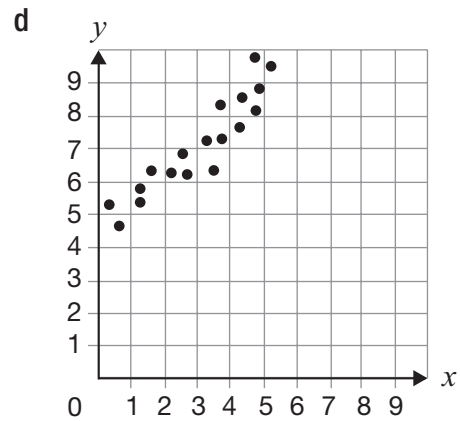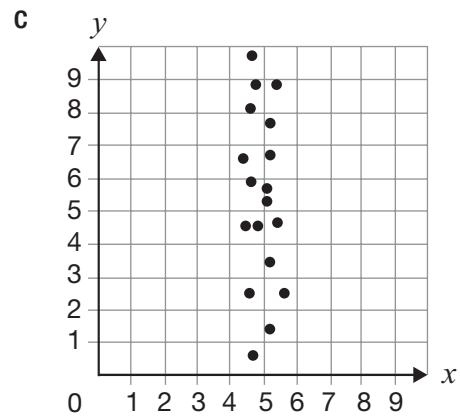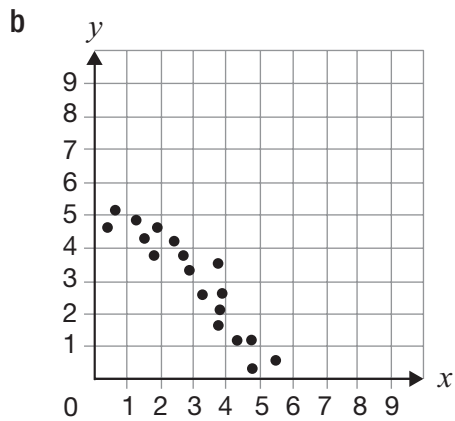
y = mx + b   m = 10   A(3, 60)

60 = 10(3) + b

60 = 30 + b   ∴ y = 10x + 30

30 = b

10 For which scatter plot could the line $y = 5$ be the line of best fit?

**a**

b

c

d

11 Alex's distance from home is represented by the equation $D = -0.5t + 300$, where D represents his distance from home, in kilometres, and t represents time, in minutes.

How long will it take Alex to reach a distance of 182 km from home?

a 236 minutes

b 209 minutes

c 64 minutes

d 59 minutes

Handwritten work:

$D = -0.5t + 300$

$182 = -0.5t + 300 - 300$

$\dfrac{-118}{-0.5} = \dfrac{-0.5t}{-0.5}$

$t = 236$

12 Two lines are shown below.

Cost vs. Number

$m = \dfrac{50}{5} = 10$

$\dfrac{100}{20}$ $m = 5$
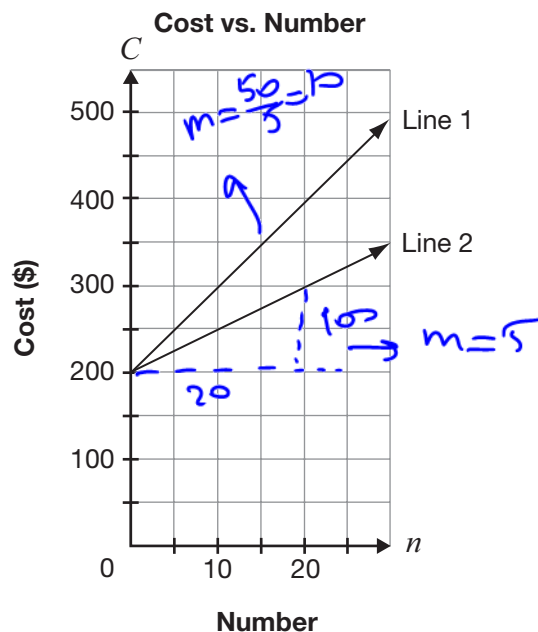
Which of the following describes a difference between Line 1 and Line 2?

a Line 2 has a larger initial cost.   SAME (200)

b Line 1 has a larger initial cost.   SAME

c Line 2 has a greater rate of change. $m = 5$

d Line 1 has a greater rate of change.   STEEPER $m = 10$

13 Planting More Trees

→ convert to $

Rachel plants trees in Northern Ontario. She is paid $55 a day plus 15¢ for each tree she plants.

On the grid provided, draw the graph of the relationship between Rachel's total earnings for a single day, *E,* in dollars, and the number of trees she plants that day, *n.*

Include a scale on the vertical axis.

Total Earnings vs. Number of Trees Planted

Number of trees planted
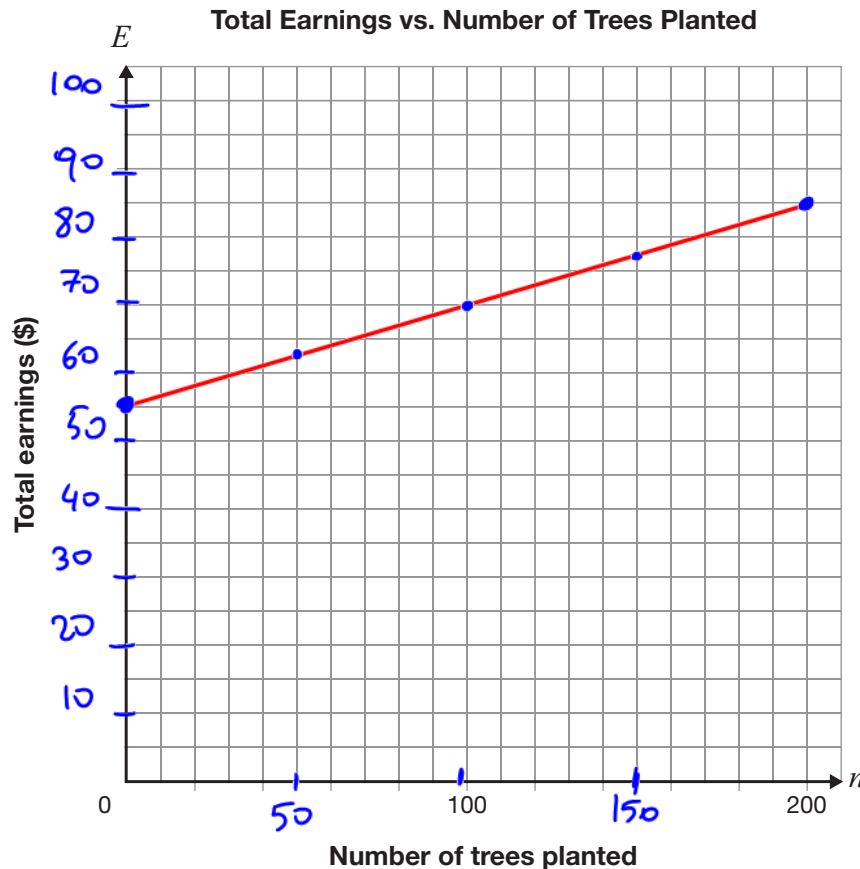
Write an equation to represent the relationship between Rachel's earnings for a single day, *E,* and the number of trees she plants, *n.*

$$E = 0.15n + 55$$

n	E
50	$0.15(50) + 55 = 62.5$
100	$0.15(100) + 55 = 70$
150	$0.15(150) + 55 = 77.5$
200	$0.15(200) + 55 = 85$

14 Water in a Pool

The graph below represents the relationship between the amount of water, A, in a pool as it drains and time, t.

Amount of Water vs. Time

$M(0, y)$

$L(20, 45000)$

45 000

$K(70, 0)$

Amount of water (L)

0   20   70 t

Time (min)
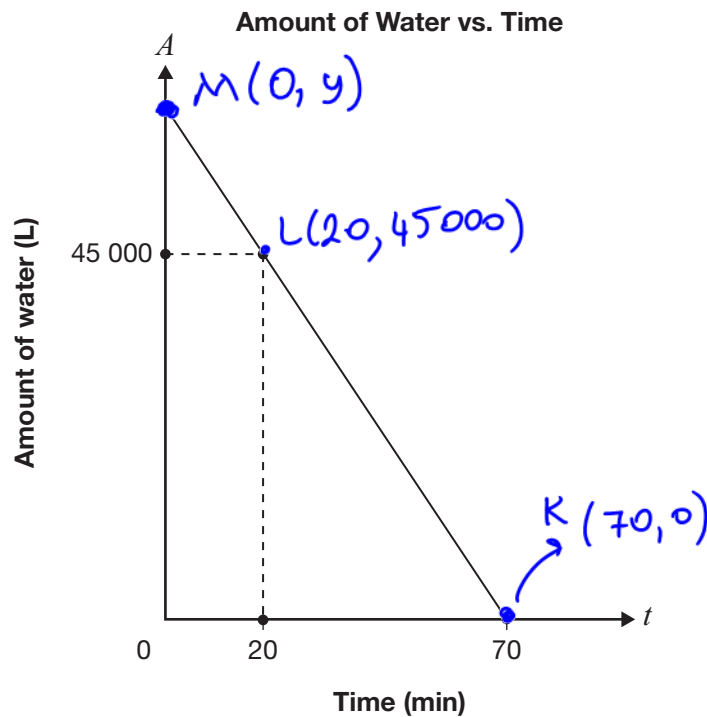
Determine the initial amount of water in the pool and the rate of change of this relation.

Show your work.

Step1 $K(70, 0)$ $L(20, 45000)$

$m = \dfrac{y_2 - y_1}{x_2 - x_1} = \dfrac{45000 - 0}{20 - 70} = \dfrac{45000}{-50} = -900$

∴ Rate of change is $-900 \text{L}/_{min}$

Finding y-int

Step2 : $m = -900$ $M(0, y)$ $K(70, 0)$

$m = \dfrac{y_2 - y_1}{x_2 - x_1}$ $\dfrac{-y}{-1} = \dfrac{-63000}{-1}$

$-900 = \dfrac{0 - y}{70 - 0}$ $y = 63,000$

cross mult. $\dfrac{-900}{1} = \dfrac{-y}{70}$ ∴ The initial value is
                                                               $\underline{63,000 L}$

15 Which of the following equations is equivalent to $3x - 5y = 45$?

a $y = \frac{3}{5}x - 9$

b $y = -\frac{3}{5}x + 9$

c $y = 3x - 45$

d $y = -3x + 45$

Handwritten work:

$3x - 5y \overset{-3x}{=} 45 - 3x$

$\frac{-5y}{-5} = \frac{-3x}{-5} + \frac{45}{-5}$

$y = \frac{3}{5}x - 9$

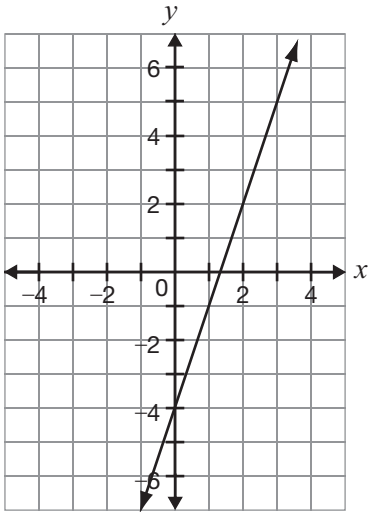**16** The point on the grid below belongs to a linear relation that has $-\frac{3}{2}$ as its rate of change.

Handwritten work:

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

(5,8)
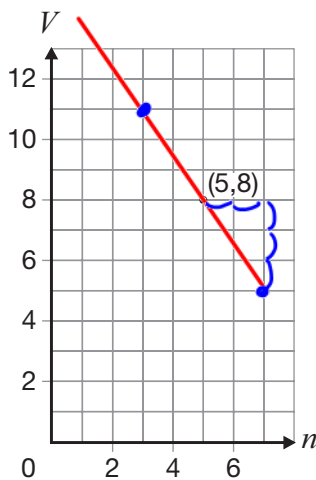
Which of the following points also belongs to this relation?

a $(2,6)$

b $(2,10)$

c $(3,11)$

d $(7,11)$

17 Which of the following lines has the same slope as the line represented by $y = -3x + 4$? *(handwritten: slope ← , → y-int)*

a

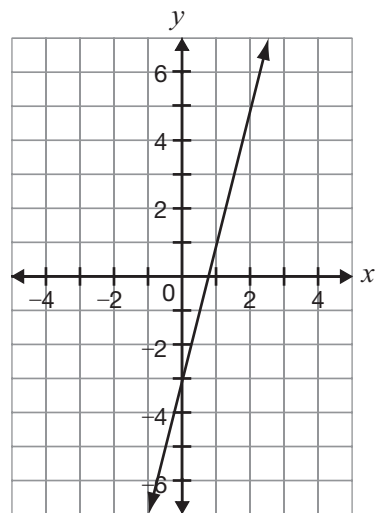**b** *(handwritten: circled, y-int ←, circle around 4)*
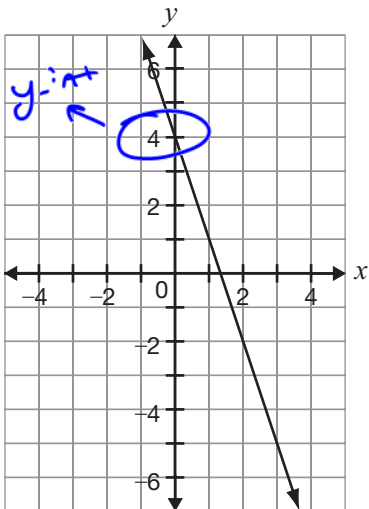
c
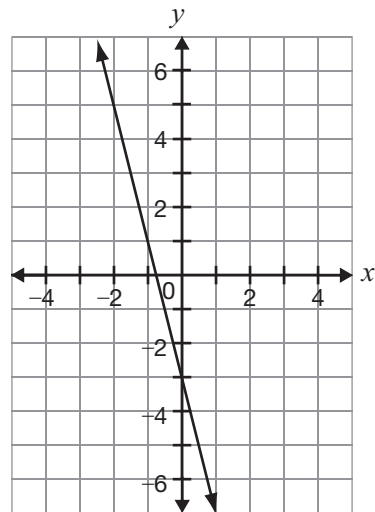
d

18 Which equation below represents a line that is perpendicular to the line represented by $y = 3x - 5$? *(handwritten: $m_1 = 3$ $m_2 = \frac{-1}{3}$)*
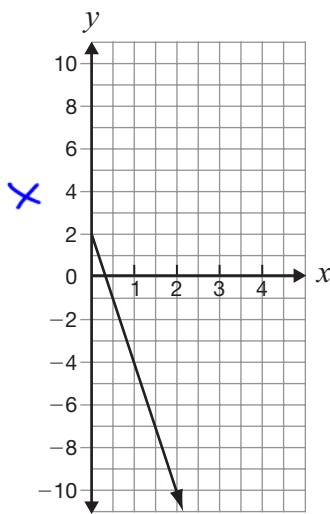
   a $y = 3x + \frac{1}{5}$

   b $y = -3x - \frac{1}{5}$

   c *(circled)* $y = -\frac{1}{3}x + 7$

   d $y = \frac{1}{3}x - 7$

19 Which of the following is the graph of the equation $y = -2x + 6$?
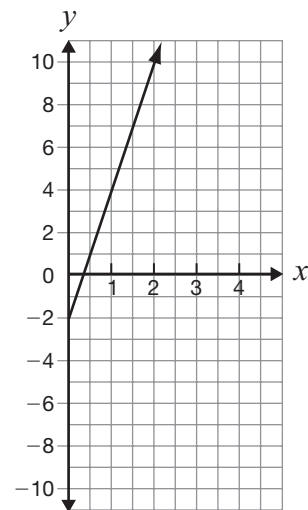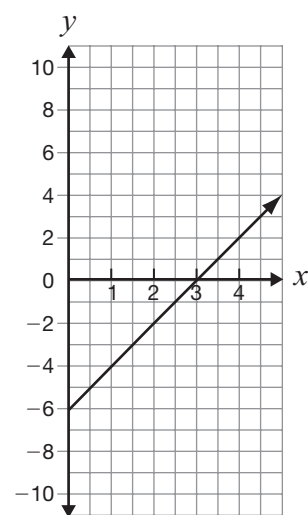
a

b

y-int
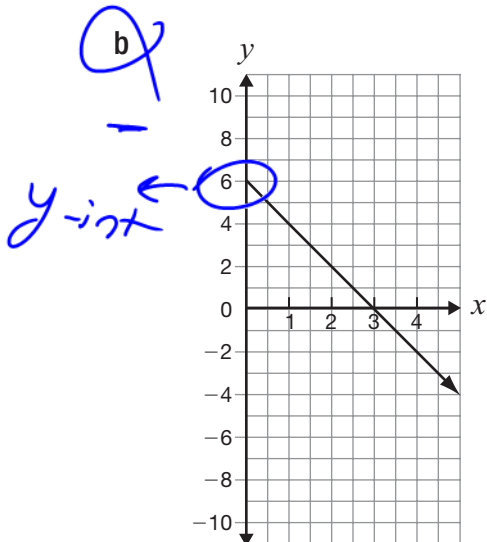
c

d

20 The equations below represent the relationship between the total cost, C, in dollars, to repair a computer and the amount of time, t, in hours, at two computer repair stores.

Compu-Fix: $C = 10 + 15t$

Data Repair: $C = 30 + 12t$

It will take between 1 and 5 hours to repair Maria's computer.

What are the smallest and largest possible amounts Maria could pay?

   a $10, $85

   b $10, $90

   c $25, $85

   d $25, $90

Time:	Compu-Fix	Data Repair
1	$10+15(1) = 25	$30+12(1) = 42
5	$10+15(5) = 85	$30+12(5) = 90

21 Tony and Mike decide to keep track of their reading. The graph below represents the relationship between the number of pages of a novel each has read and the time spent reading since they started tracking.

Number of Pages Read vs. Amount of Time Spent Reading
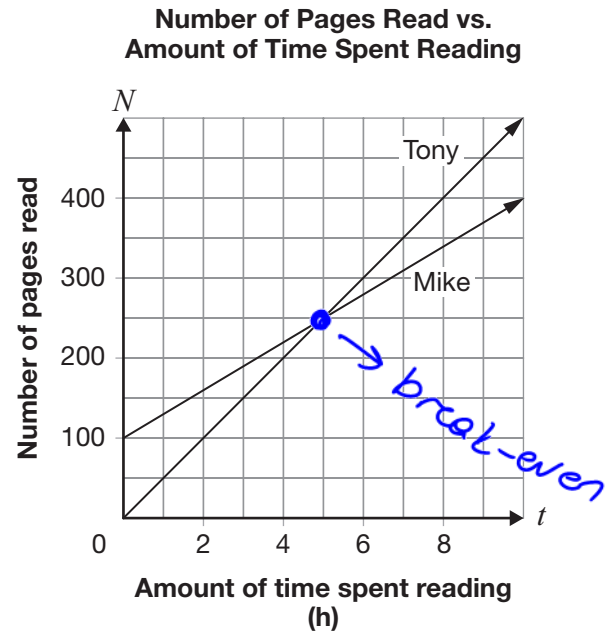
Which of the following statements is true?

   a At 5 hours, Mike has read 100 pages more than Tony.

   b Before 5 hours, Tony has read fewer pages than Mike.

   c At 250 minutes, Mike has read the same number of pages as Tony. $\frac{250}{60} = 4.2$

   d It takes 250 minutes for Tony to catch up to the number of pages that Mike has read.
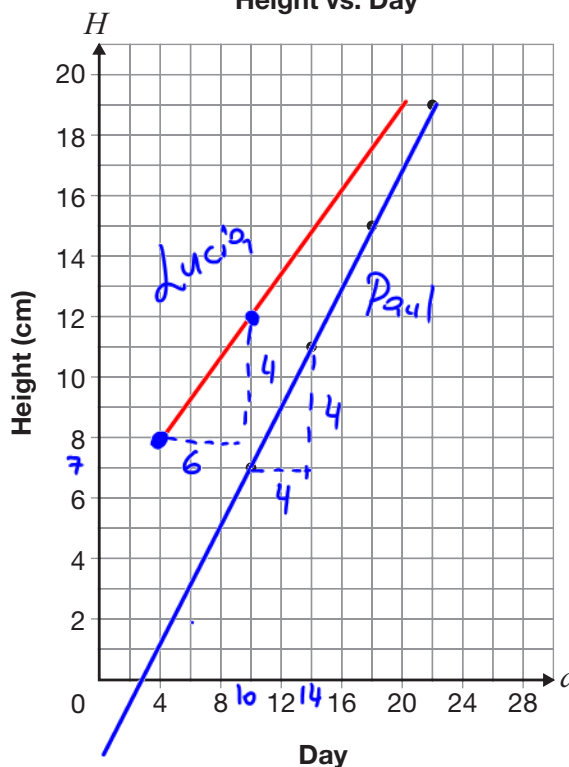
22 Growing Rates

Lucia and Paul each have a plant. Both plants grow at a constant rate.

Lucia records information about the height of her plant in a table, and Paul graphs his results as shown below.

Lucia's Plant

Day	Height (cm)
4	8
7	10
10	12
13	14

Paul's Plant
Height vs. Day

Whose plant is growing faster?

Circle one:　　　Lucia's　　~~Paul's~~ (circled)

Justify your answer.

Rate of change shows me how fast plants grow

$$\text{Lucia} \quad | \quad \text{Paul}$$

$$m = \frac{rise}{run} = \frac{4}{6} = \frac{2}{3} \quad \bigg| \quad m = \frac{rise}{run} = \frac{4}{4} = 1$$

Rate of change for Paul's plant is greater than that of Lucia; therefore, Paul's plant grows faster.

㉓ Lovely Lines

Line 1 is shown on the grid below.
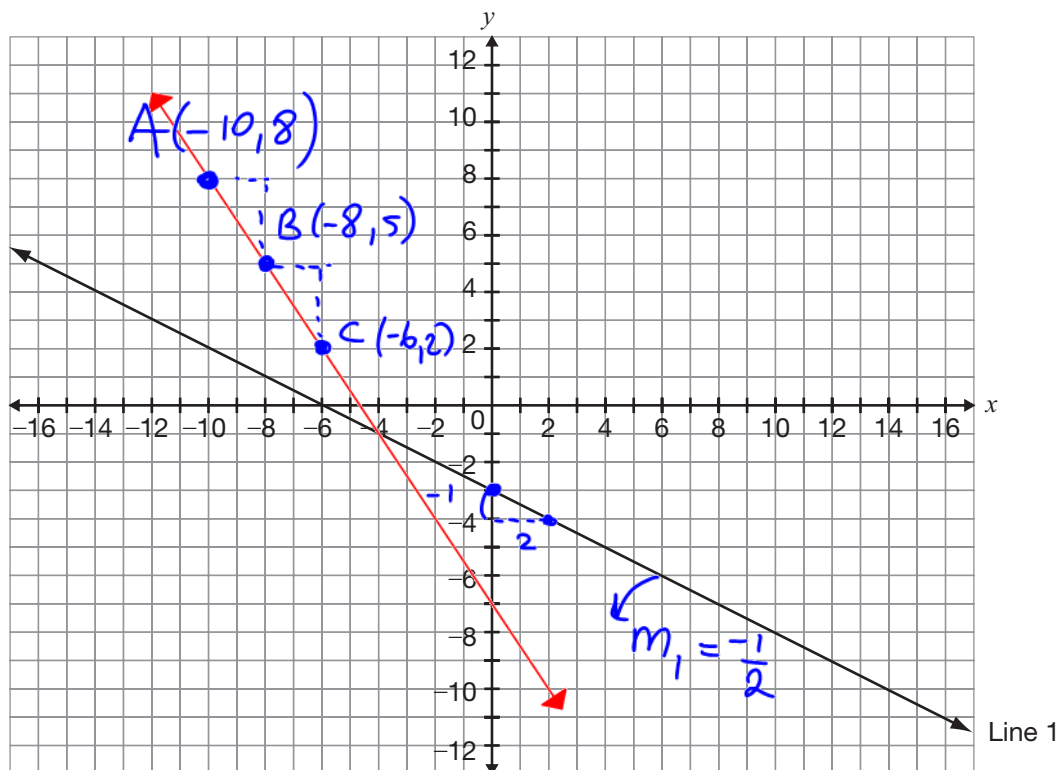
Graph Line 2 on the same grid so that it passes through A(-10, 8) and has a slope that is three times the slope of Line 1.

Justify your answer.

A(-10, 8)   and slope is $3 \times m_1 = 3\left(\frac{-1}{2}\right) = \frac{-3}{2}$ ✓

$$m = \frac{\text{rise}}{\text{run}} = \frac{-3}{2}$$

Step 1 · Plot A(-10, 8)

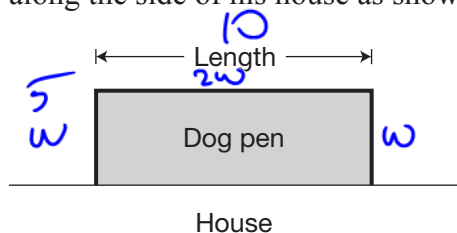Step 2: Go 2 units right, then 3 units down, plot your point

Step 3: Draw a line goes through these two points.

Check (JUSTIFYING)

Slope $= \frac{y_2 - y_1}{x_2 - x_1}$ B(-8, 5)   C(-6, 2)

$$= \frac{2 - (5)}{-6 - (-8)} = \frac{-3}{2} \checkmark$$

24 Marcus is building a rectangular dog pen along the side of his house as shown below.

10

5
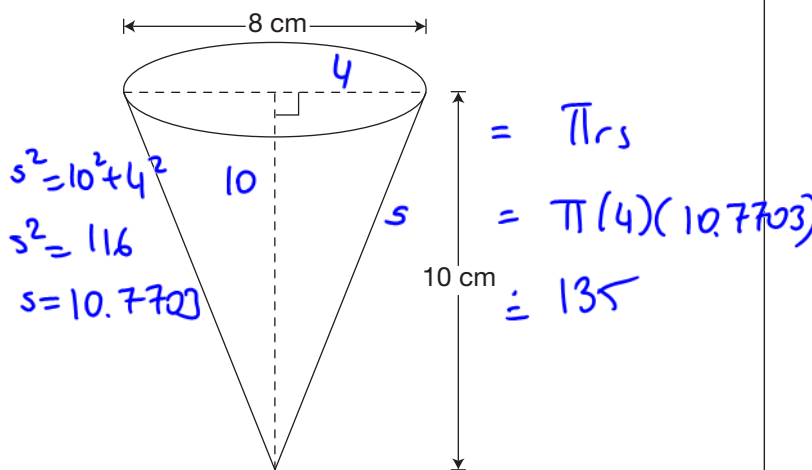w
$2w$

Length

Dog pen

w

House

Marcus has 20 m of fencing for the 3 sides of the dog pen.

What is the length of the dog pen with the maximum area?

$4w = 20$
$w = 5$

a   4 m

b   5 m

c   10 m

d   12 m

25 An open-topped paper drinking cup in the shape of a cone is pictured below.

8 cm

4

10

s

10 cm

$s^2 = 10^2 + 4^2$
$s^2 = 116$
$s = 10.7703$

$= \pi r s$
$= \pi(4)(10.7703)$
$\doteq 135$

Which is closest to the amount of paper required to make the cup?

a   185 cm^2

b   167 cm^2

c   135 cm^2

d   126 cm^2

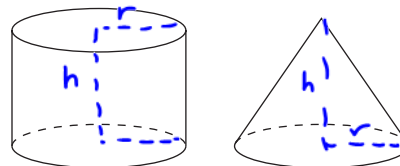**26** The diagram below is made of a trapezoid and a semicircle.

14 cm

3
5 cm 3 3 5 cm

6 cm
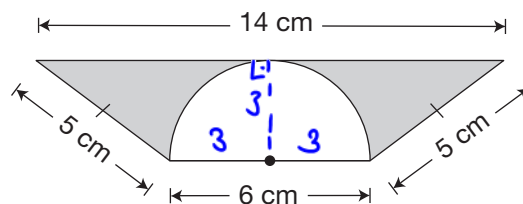
Which is closest to the area of the shaded part of the diagram?

$A_{Shaded} = A_{Total} - A_{Semicircle}$

a   2 cm^2

b   16 cm^2 $= \frac{(6+14)3}{2} - \frac{\pi(3)^2}{2}$

c   21 cm^2 $= 30 - 14.1372$

d   36 cm^2 $= 15.86$
$\doteq 16$

27 The cylinder and the cone shown below have the same height and radius.

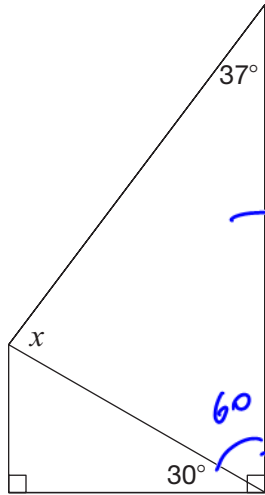r

h

h
r

| Volume of cylinder $= ? \times$ Volume of cone |

What number completes this equation?

a   3

b   2

c $\frac{1}{2}$

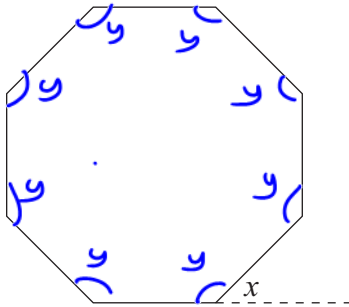d $\frac{1}{3}$

28 Consider the diagram below.

37°

x

60

30°

→ SATT   x+37+60=180
                x+97=180

                x = 83

→ CAT

What is the value of *x* in the diagram?

a   30°

b   53°

c   60°

d   83°

29 Consider the regular octagon below.

y *y* *y* *y* *y* *y* *y* *x*

What is the value of *x*?
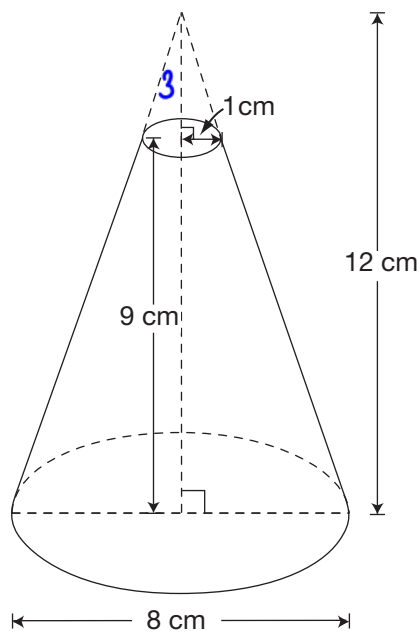
a   15°

b   30°

c   45°

d   60°

$(8-2)180 = 8y$

$\dfrac{1080}{8} = \dfrac{8y}{8}$

$135° = y$

$x + 135 = 180$ SAT

$x = 180 - 135$

$x = 45°$

30 Cutting Cones

The figure pictured below is a cone with its top portion removed.

Determine the volume of this figure.

Show your work.

$$A_{shape} = A_{Total} - A_{Tip}$$

Step 1: Finding the total area

$$A_{Total} = \frac{\pi r^2 h}{3}$$

$$= \frac{\pi (4)^2 12}{3}$$

$$\doteq 201.0619$$

Step 2: Finding the area of the tip (top)

$$A_{Tip} = \frac{\pi (1)^2 3}{3}$$

$$\doteq 3.1416$$

Step 3: Putting them altogether

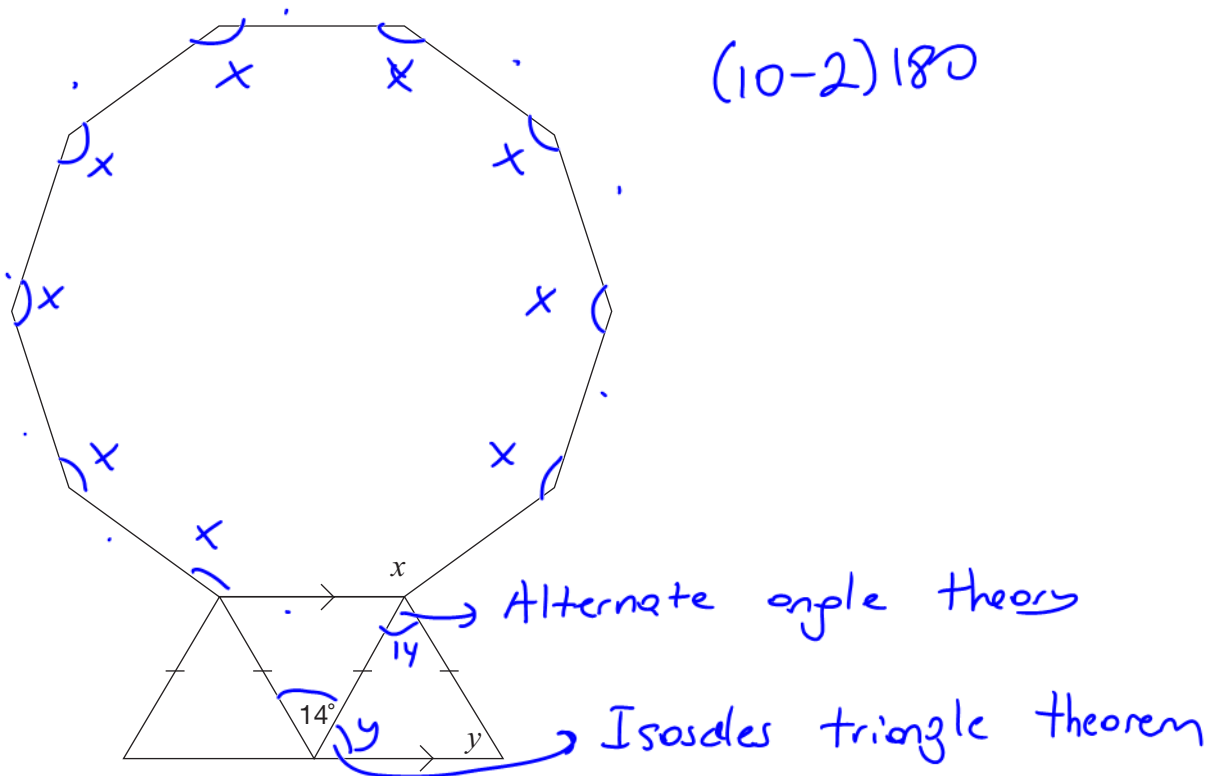$$A_{shape} = 201.0619 - 3.1416$$
$$\doteq 197.9$$

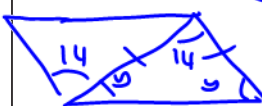∴ The area of the shape is $197.9 \, cm^3$

31 Diamond Cut

The diagram below shows a regular decagon and three isosceles triangles.

$(10-2)180$

→ Alternate angle theory

14

14°

→ Isosceles triangle theorem

Determine the values of x and y. Justify your answers using geometric properties.

Value	Justification using geometric properties
$x = $ __144__	$(10-2)180 = 10x$ $\dfrac{1440}{10} = \dfrac{10x}{10}$ $\boxed{X = 144}$ Interior angle in a polygon $\dfrac{(n-2)180}{n}$
$y = $ __83°__	$2y + 14 = 180^{-14}$ $\dfrac{2y}{2} = \dfrac{166}{2}$ $\boxed{y = 83°}$ Sum of all angles in a triangle theorem