

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).**

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

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

- a 240
 - b 320
 - c 480
 - d 640**
- Handwritten work: $5(2)^3(4)^2 = 5(8)(16) = 40(16) = 640$

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

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

- a 9
 - b 8**
 - c 4
 - d 3
- Handwritten work: $\square + 6 - 2 = 12$
 $\square + 4 = 12$
 $\square = 8$

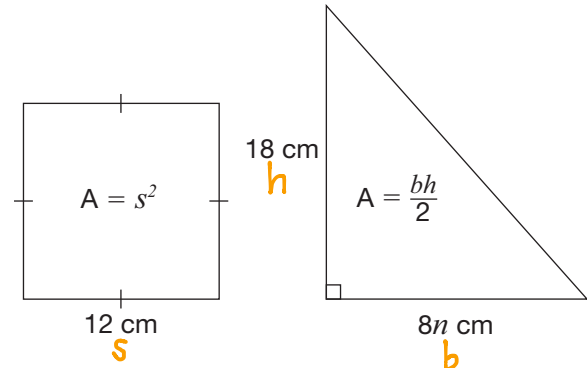
3 Mario is making fruit punch by mixing orange juice and pineapple juice in a ratio of 1:3. How much pineapple juice should he use to make 3 L of fruit punch?

- a 0.75 L
 - b 2 L
 - c 2.25 L**
 - d 4 L
- Handwritten work: 1:3 means \rightarrow 1 part orange juice and 3 parts pineapple juice \rightarrow 4 parts in total
 $\frac{x}{3} = \frac{3}{4}$ (arrow to pineapple)
 $\frac{1}{3} \left(\frac{x}{3} \right) = 3 \left(\frac{3}{4} \right)$ (arrow to total)
 $x = \frac{9}{4} = 2\frac{1}{4} = 2.25$

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

- a $14x - 11$**
 - b $14x - 53$
 - c $26x - 11$
 - d $26x - 53$
- Handwritten work: $20x - 32 - 6x + 21 = 14x - 11$

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



What is the value of n ?

- a 1
- b 2**
- c 8
- d 16

Handwritten work: $A_{\text{square}} = A_{\text{triangle}}$
 $s^2 = \frac{bh}{2}$
 $12^2 = \frac{8n(18)}{2}$
 $\frac{144}{72} = \frac{72n}{72}$
 $2 = n$

Multiple Choice Strategy

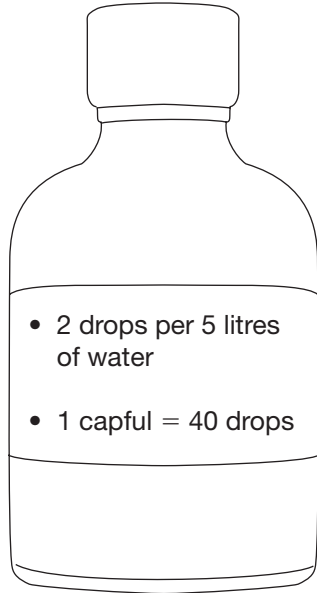
- when possible, work out the question fully using good mathematical form
- select a response only after you have completed a full solution

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.



Let x represent the number of drops required.

$$\frac{\text{no. of drops}}{\text{L of water}} : \frac{x}{350} = \frac{2}{5}$$

$$350 \left(\frac{x}{350} \right) = 350 \left(\frac{2}{5} \right)$$

$$x = 140$$

\therefore 140 drops are required.

$$\text{no. of capfuls} = \frac{140}{40}$$

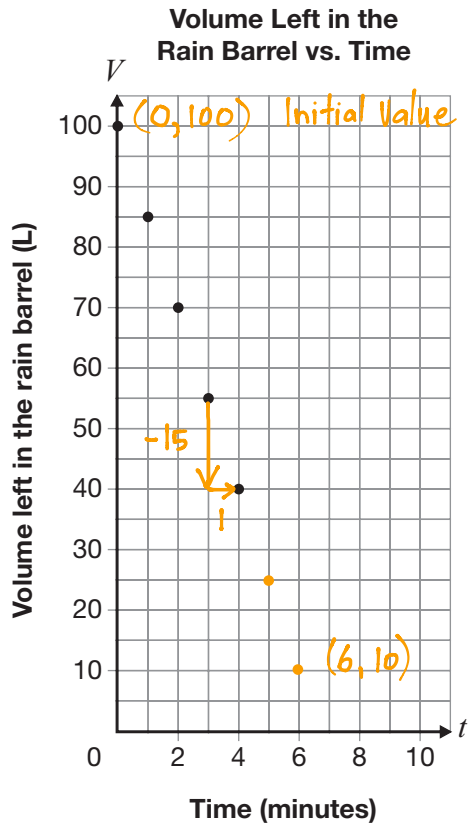
$$= 3.5$$

\therefore 3.5 capfuls are required.

Open-Response Strategy

- Use correct mathematical form. Use "Let statements" and concluding statements to answer the question.

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.



After 6 minutes, the draining is stopped.

How much water is needed to refill the rain barrel?

- a 90 L
 - b 75 L
 - c 25 L
 - d 10 L
- $V_{full} - V_{after 6 min} = 100 - 10 = 90$

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?

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

Step 1: find m Step 2: find b

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{80 - 60}{5 - 3} = \frac{20}{2} = 10$$

$$m = 10 \quad b = ? \quad x = 3 \quad y = 60$$

$$y = mx + b$$

$$60 = 10(3) + b$$

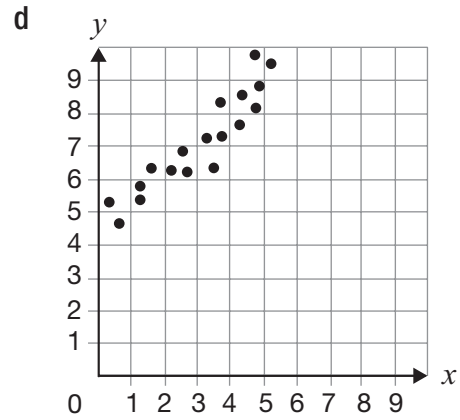
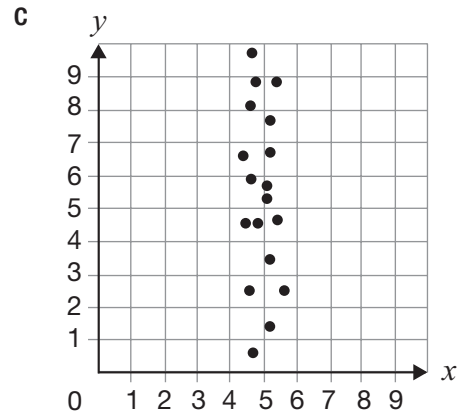
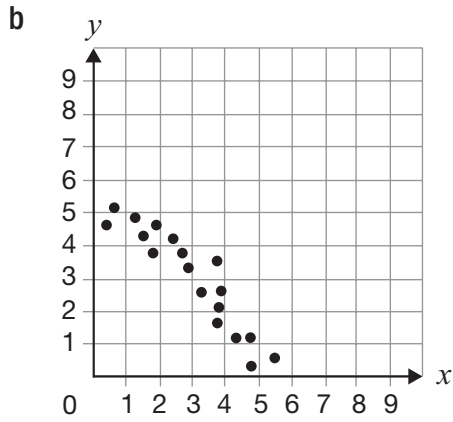
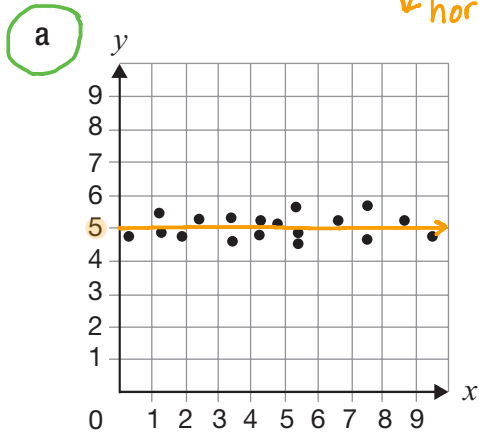
$$60 = 30 + b$$

$$30 = b$$

$\therefore y = 10x + 30.$

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

horizontal line



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

Let $D = 182$

$182 = -0.5t + 300$

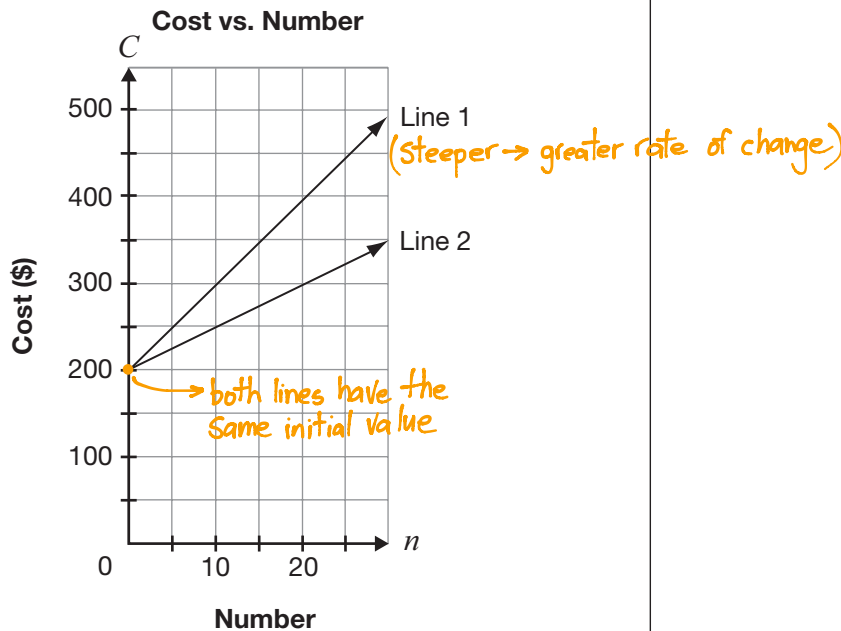
$0.5t = 300 - 182$

$\frac{0.5t}{0.5} = \frac{118}{0.5}$

$t = 236$

$118 \div 0.5$
 $= 118 \div \frac{1}{2}$
 $= 118 \times 2$
 $= 236$

12 Two lines are shown below.



Which of the following describes a difference between Line 1 and Line 2?

- a Line 2 has a larger initial cost.
- b Line 1 has a larger initial cost.
- c Line 2 has a greater rate of change.
- d Line 1 has a greater rate of change.

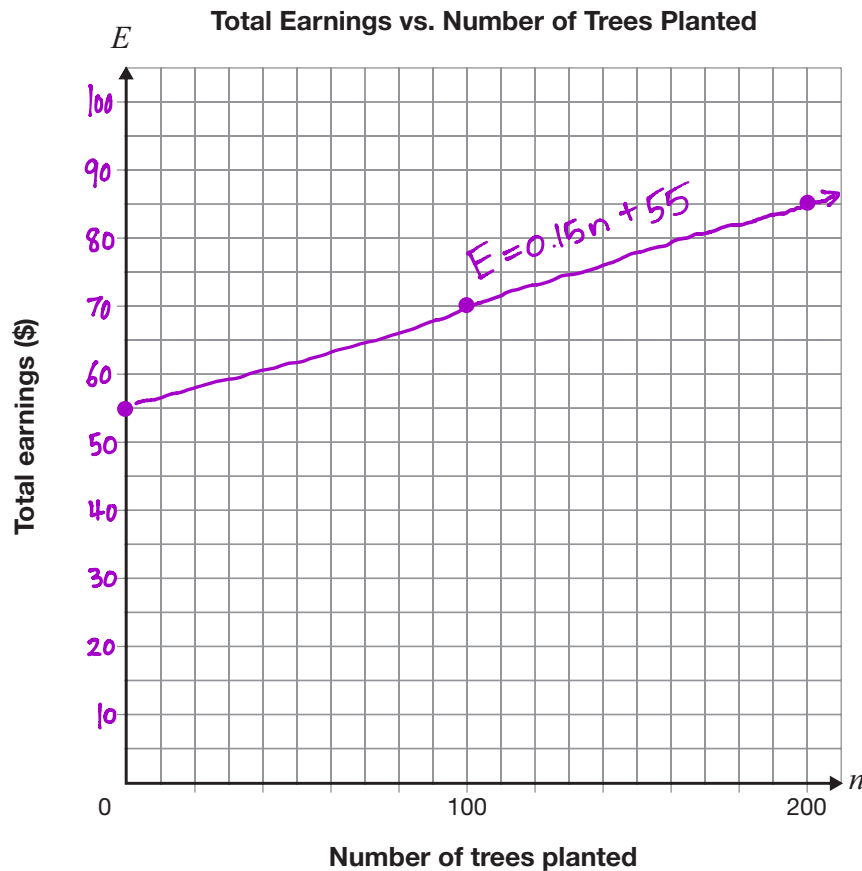
Multiple Choice Strategy
 • eliminate answers you know are not right

13 Planting More Trees

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.



$$E = 0.15n + 55$$

or, use a Table of Values

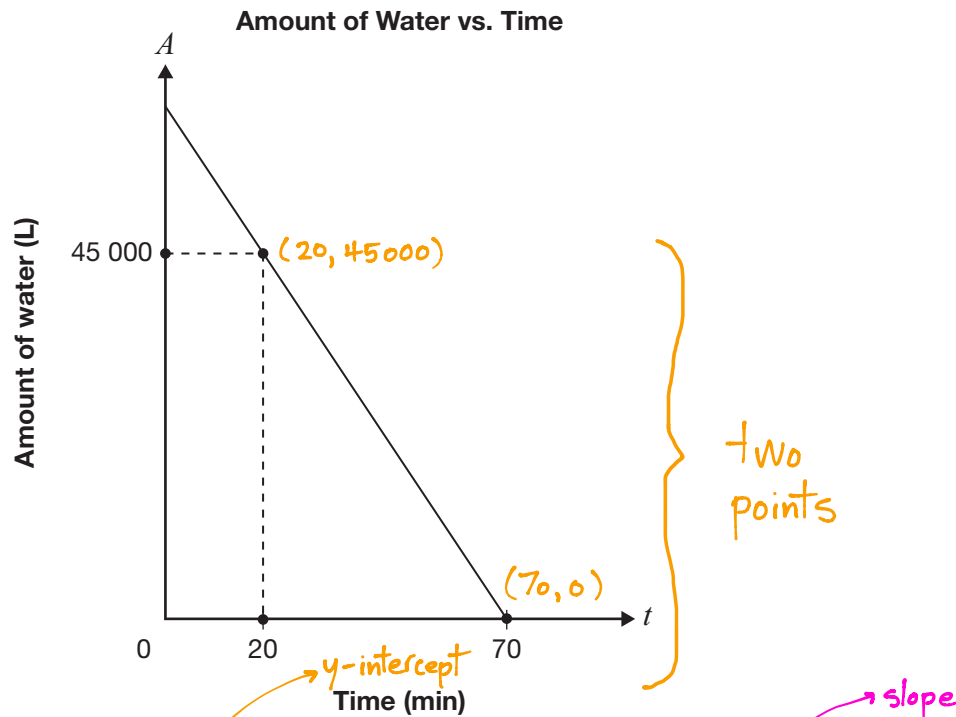
n	E
0	55
100	70
200	85

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

$$E = 0.15n + 55$$

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 .



Determine the **initial amount** of water in the pool and the **rate of change** of this relation.

Show your work.

Step 1: find m

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

$$= \frac{0 - 45000}{70 - 20}$$

$$= \frac{-45000}{50} = -900$$

\therefore the water is draining at a rate of 900 L/min.

Step 2: find b

$$m = -900 \quad b = ? \quad x = 70 \quad y = 0$$

$$y = mx + b$$

$$0 = -900(70) + b$$

$$0 = -63000 + b$$

$$63000 = b$$

\therefore the initial amount of water is 63 000 L.

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

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

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

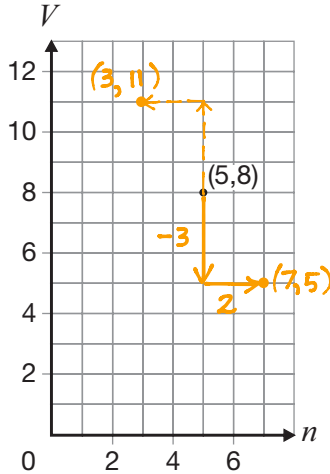
c $y = 3x - 45$

d $y = -3x + 45$

$$3x - 5y = 45$$

$$\begin{array}{r} -5y = -3x + 45 \\ \hline -5 \quad \quad -5 \\ y = \frac{3}{5}x - 9 \end{array}$$

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



Which of the following points also belongs to this relation?

a (2,6)

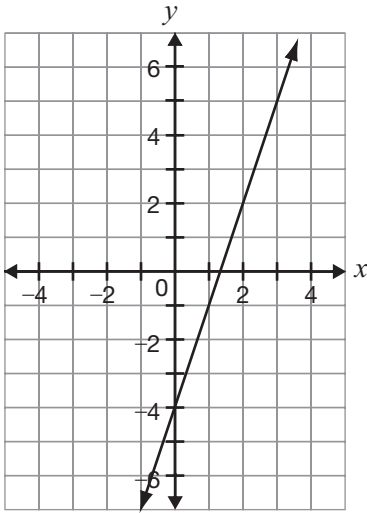
b (2,10)

c (3,11)

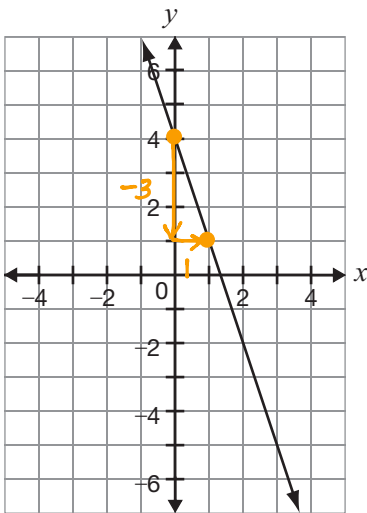
d (7,11)

17 Which of the following lines has the same slope as the line represented by $y = -3x + 4$? $m = -3 \rightarrow$ rise \rightarrow run

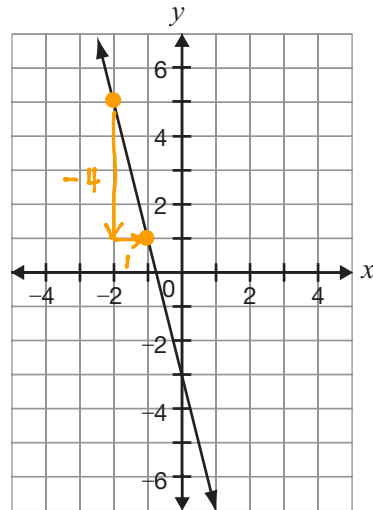
~~a~~
positive slope



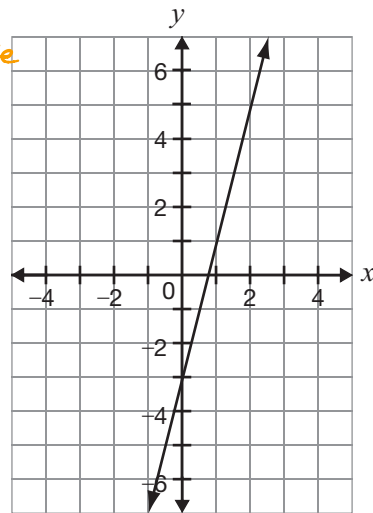
b



~~c~~



~~d~~
positive slope



18 Which equation below represents a line that is perpendicular to the line represented by $y = 3x - 5$?

a $y = 3x + \frac{1}{5}$

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

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

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

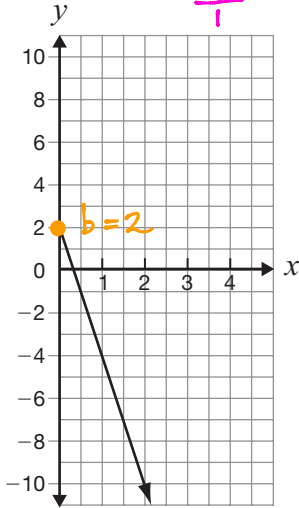
slope will be the negative reciprocal

$m = \frac{3}{1}$

$\therefore m_{\perp} = -\frac{1}{3}$

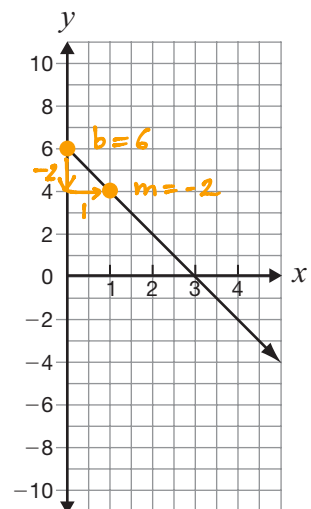
19 Which of the following is the graph of the equation $y = -2x + 6$?

~~a~~

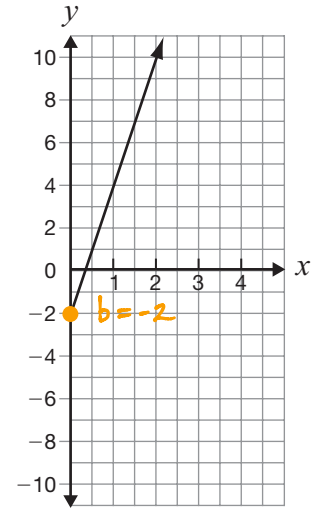


$m = -\frac{2}{1}$ → $b = 6$
 $[(0, 6)]$

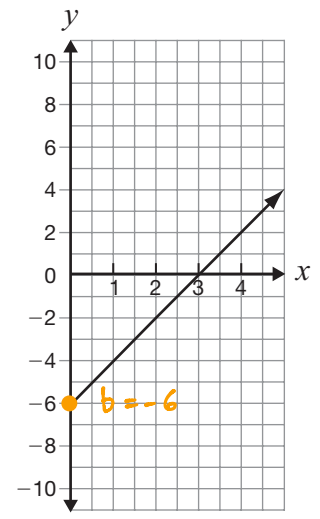
b



~~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: $C = 10 + 15t$ ①

Data Repair: $C = 30 + 12t$ ②

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

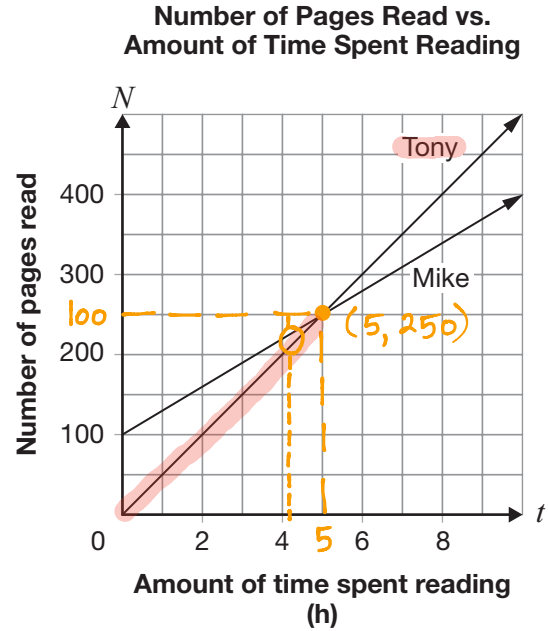
Smallest Amount
Let $t = 1$

① $C = 10 + 15(1)$ ② $C = 30 + 12(1)$
 $= 10 + 15$ $= 30 + 12$
 $= 25$ $= 42$

Largest Amount
Let $t = 5$

① $C = 10 + 15(5)$ ② $C = 30 + 12(5)$
 $= 10 + 75$ $= 30 + 60$
 $= 85$ $= 90$

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.



Which of the following statements is true?

- a At 5 hours, Mike has read 100 pages more than Tony. (same amount)
- 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.
- d It takes 250 minutes for Tony to catch up to the number of pages that Mike has read.

↓ $\frac{250 \text{ minutes}}{60 \text{ minutes/h}}$
 $= 4\frac{10}{60} \text{ h}$
 $= 4\text{h } 10\text{min}$

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.

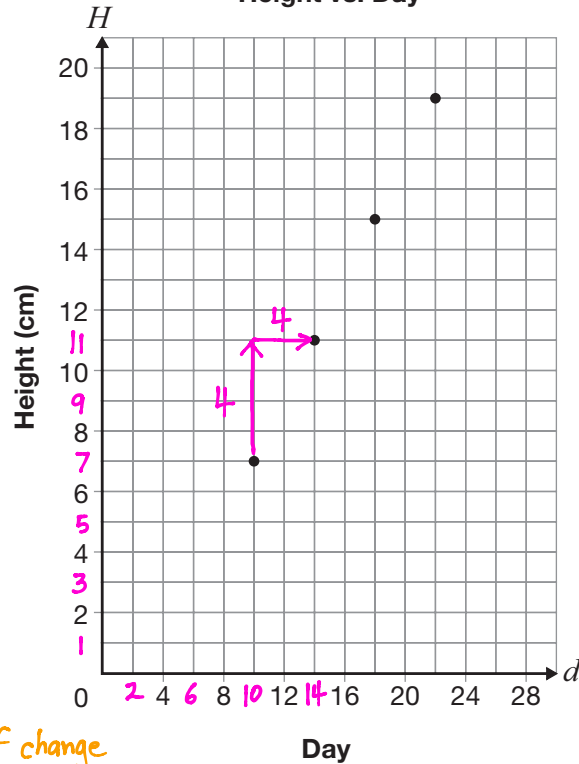
Lucia's Plant

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

} two points

Paul's Plant

Height vs. Day



Whose plant is growing faster?

greater rate of change
→ larger slope

Circle one: Lucia's

Paul's

Justify your answer.

$$\begin{aligned} \text{Lucia: } m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{10 - 8}{7 - 4} \\ &= \frac{2}{3} \end{aligned}$$

∴ Lucia's plant grows at a rate of $\frac{2}{3}$ cm/day.

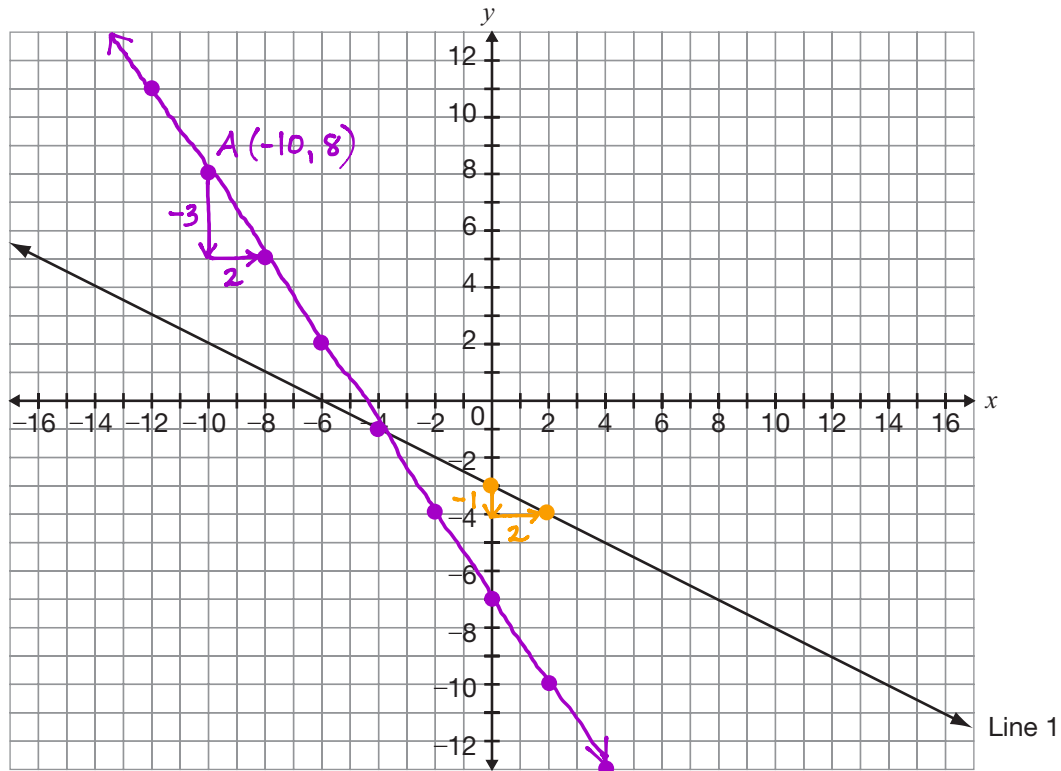
$$\begin{aligned} \text{Paul: } m &= \frac{\text{rise}}{\text{run}} \\ &= \frac{4}{4} \\ &= 1 \end{aligned}$$

∴ Paul's plant grows at a rate of 1 cm/day.

∴ Paul's plant is growing faster.

23 Lovely Lines

Line 1 is shown on the grid below.



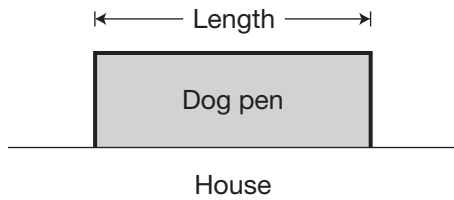
Graph Line 2 on the same grid so that it passes through $A(-10, 8)$ and has a slope that is three times the slope of Line 1.

Justify your answer.

$$\begin{aligned} \text{Line 1: } m_1 &= \frac{\text{rise}}{\text{run}} \\ &= -\frac{1}{2} \end{aligned}$$

$$\begin{aligned} \text{Line 2: } m_2 &= 3m_1 \\ &= 3\left(-\frac{1}{2}\right) \\ &= -\frac{3}{2} \end{aligned}$$

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

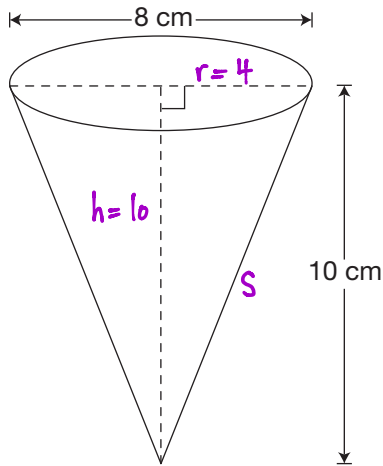


Marcus has 20 m of fencing for the 3 sides of the dog pen.

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

- a 4 m $l = 4 \therefore w = 8 \therefore A = 32$
 b 5 m $l = 5 \therefore w = 7.5 \therefore A = 37.5$
 c 10 m $l = 10 \therefore w = 5 \therefore A = 50$
 d 12 m $l = 12 \therefore w = 4 \therefore A = 48$

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



$$S^2 = 4^2 + 10^2$$

$$= 16 + 100$$

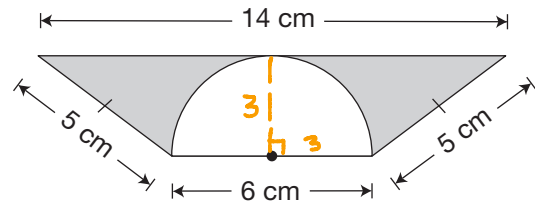
$$= 116$$

$$S = \sqrt{116}$$

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

- a 185 cm²
 b 167 cm²
 c 135 cm²
 d 126 cm²
- SA = $\pi r s$
 $= \pi (4)(\sqrt{116})$
 ≈ 135.3

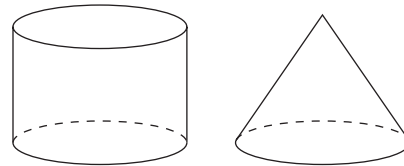
- 26 The diagram below is made of a trapezoid and a semicircle.



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

- a 2 cm²
 b 16 cm²
 c 21 cm²
 d 36 cm²
- $A_{\text{shaded}} = A_{\text{trapezoid}} - A_{\text{semicircle}}$
 $= \frac{(a+b)h}{2} - \frac{\pi r^2}{2}$
 $= \frac{(6+14)(3)}{2} - \frac{\pi(3)^2}{2}$
 ≈ 15.9

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

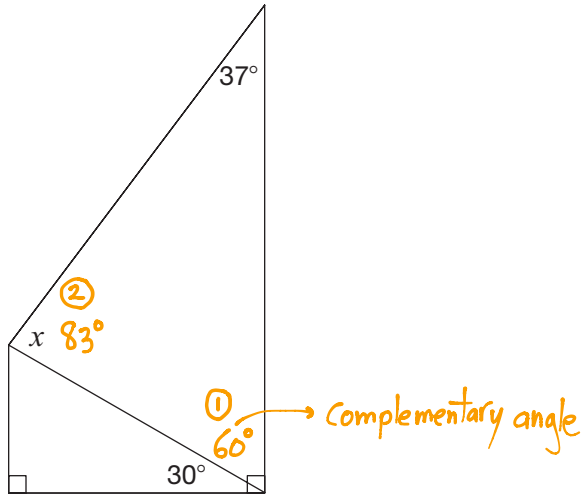


Volume of cylinder = ? × Volume of cone

What number completes this equation?

- a 3
 b 2
 c $\frac{1}{2}$
 d $\frac{1}{3}$
- $V_{\text{cylinder}} = \pi r^2 h$ $V_{\text{cone}} = \frac{1}{3} \pi r^2 h$
 $3(V_{\text{cone}}) = 3 \left(\frac{1}{3} \pi r^2 h \right)$
 $3V_{\text{cone}} = \pi r^2 h$
 $= V_{\text{cylinder}}$
 $\therefore V_{\text{cylinder}} = 3V_{\text{cone}}$

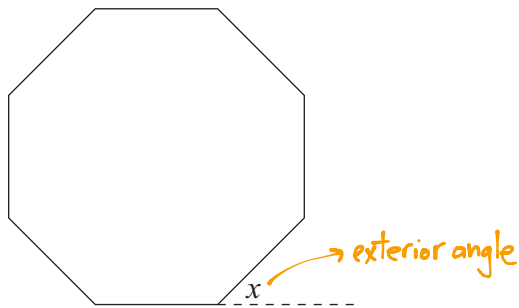
28 Consider the diagram below.



What is the value of x in the diagram?

- a 30° ① $90^\circ - 30^\circ$
- b 53° $= 60^\circ$
- c 60° ② $180^\circ - 60^\circ - 37^\circ$
- d 83° $= 83^\circ$

29 Consider the regular octagon below.

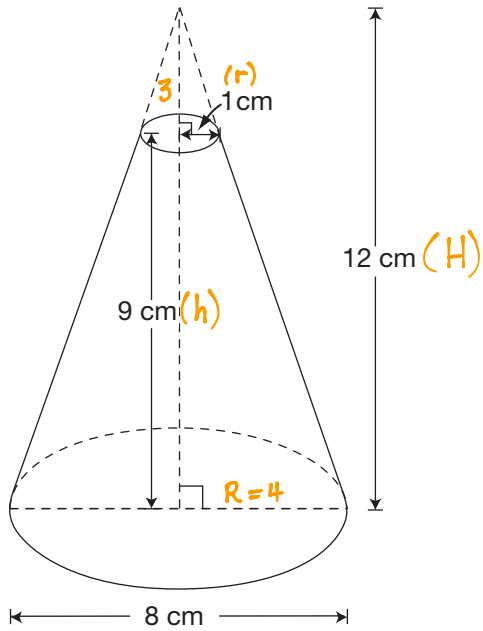


What is the value of x ?

- a 15° $x = \frac{360}{8}$
- b 30° $= 45$
- c 45°
- d 60°

30 Cutting Cones

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



Determine the volume of this figure.

Show your work.

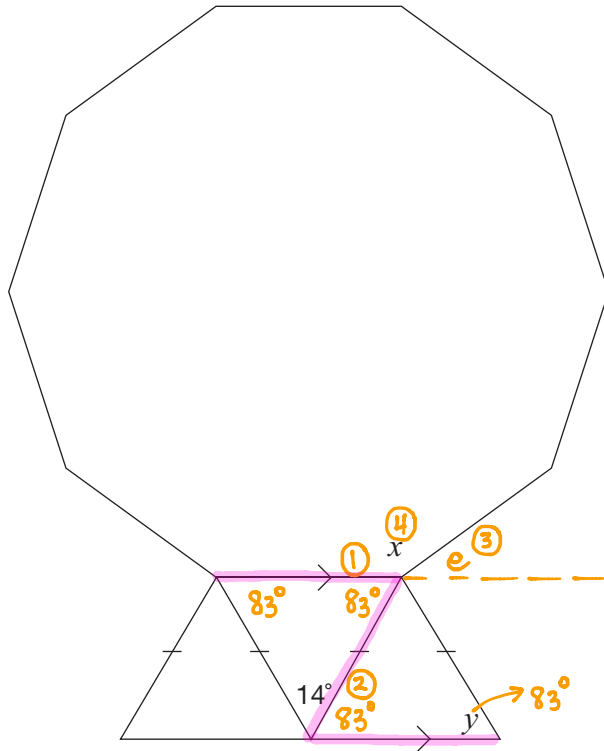
$$\begin{aligned}
 V_{\text{figure}} &= V_{\text{large cone}} - V_{\text{small cone}} \\
 &= \frac{\pi R^2 H}{3} - \frac{\pi r^2 h}{3} \\
 &= \frac{\pi (4)^2 (12)}{3} - \frac{\pi (1)^2 (3)}{3} \\
 &= \pi (16)(4) - \pi (1) \\
 &= 64\pi - \pi \\
 &= 63\pi \\
 &\approx 197.9
 \end{aligned}$$

\therefore the volume of the figure is approximately 197.9 cm^3 .

31 Diamond Cut

→ 10 sides

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



① $\frac{180^\circ - 14^\circ}{2}$
 $= 83^\circ$

② $y = 83^\circ$

③ $e = \frac{360^\circ}{10}$
 $= 36^\circ$

④ $x = 180^\circ - 36^\circ$
 $= 144^\circ$

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

Value	Justification using geometric properties
$x = \underline{144^\circ}$	<ul style="list-style-type: none"> • exterior angle of a polygon • supplementary angles
$y = \underline{83^\circ}$	<ul style="list-style-type: none"> • isosceles triangle theorem • alternate angles ("Z" pattern)

**Education Quality and
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