

Education Quality and
Accountability Office



Grade 9 Assessment of Mathematics

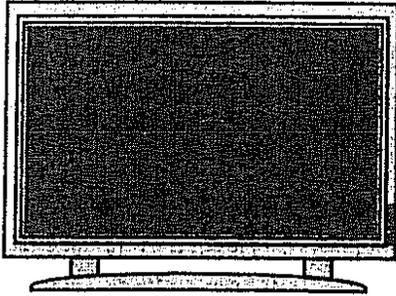
Winter 2008, Academic

**Released Item-Specific Rubrics and
Sample Student Responses with
Annotations**

Competing Sales (Winter 2008)

Code	Descriptor
B	Blank: nothing written or drawn in response to the question
I	<ul style="list-style-type: none"> - Illegible: cannot be read; completely crossed out/erased; not written in English; - Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”); - Off topic: no relationship of written work to the question.
10	<p>Application of knowledge and skills in the manipulation of an expression requiring the application of percent to determine the difference in the sale prices shows limited effectiveness due to</p> <ul style="list-style-type: none"> • misunderstanding of concepts; • incorrect selection or misuse of procedures.
20	<p>Application of knowledge and skills in the manipulation of an expression requiring the application of percent to determine the difference in the sale prices shows some effectiveness due to</p> <ul style="list-style-type: none"> • partial understanding of the concepts; • errors and/or omissions in the application of the procedures.
30	<p>Application of knowledge and skills in the manipulation of an expression requiring the application of percent to determine the difference in the sale prices shows considerable effectiveness due to</p> <ul style="list-style-type: none"> • an understanding of most of the concepts; • minor errors and/or omissions in the application of the procedures.
40	<p>Application of knowledge and skills in the manipulation of an expression requiring the application of percent to determine the difference in the sale prices shows a high degree of effectiveness due to</p> <ul style="list-style-type: none"> • a thorough understanding of the concepts; • an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding) <p>(e.g., \$150)</p>

Sam is interested in buying a TV. At Fair Deal, the TV is regularly priced at \$599.99 and is on sale for 20% off the regular price. At Big Big Discount, the same TV is regularly priced at \$899.99 and is on sale for 30% off the regular price.



What is the difference in the sale price of the TV between these two stores?

Show your work.

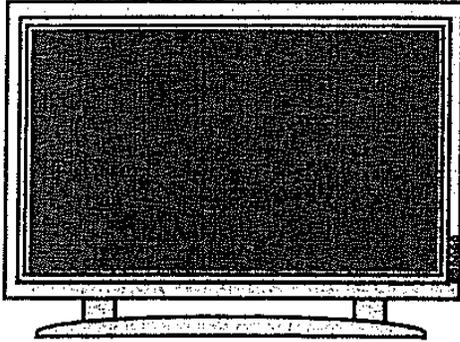
To begin with, ~~the~~ the tv at Big Big Discount is 300\$ more than the tv at Fair Deal. In the end it will probably be a 10\$ difference.

$$\begin{array}{r} \$899.99 \\ - 599.99 \\ \hline \$300 \end{array}$$

Annotation:

Student demonstrates an incorrect selection of the procedures; determines the difference between the regular prices.

Sam is interested in buying a TV. At Fair Deal, the TV is regularly priced at \$599.99 and is on sale for 20% off the regular price. At Big Big Discount, the same TV is regularly priced at \$899.99 and is on sale for 30% off the regular price.



What is the difference in the sale price of the TV between these two stores?

Show your work.

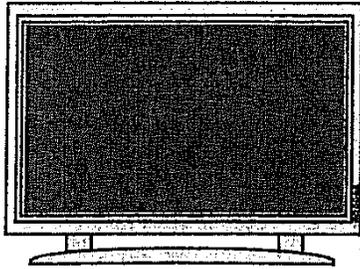
$$\begin{array}{l} \text{Fair Deal} \\ \$599.99 / 20\% \\ 599.99 \times 0.20 \\ = \$119.99 \text{ is the discount.} \end{array}$$

$$\begin{array}{l} \text{Big Big Discount} \\ \$899.99 / 30\% \\ 899.99 \times 0.30 \\ = 269.99 \text{ is the discount.} \end{array}$$

Annotation:

Student demonstrates a partial understanding of the concepts; accurately determines the discounts for each of the two TVs but does not determine the sale prices or the difference between them.

Sam is interested in buying a TV. At Fair Deal, the TV is regularly priced at \$599.99 and is on sale for 20% off the regular price. At Big Big Discount, the same TV is regularly priced at \$899.99 and is on sale for 30% off the regular price.



What is the difference in the sale price of the TV between these two stores?

Show your work.

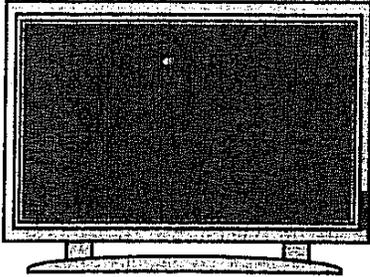
<p style="text-align: center;"><u>Fair Deal</u> (total amount of sale discount)</p> <p>20% of \$599.99</p> $= 0.20 \times 599.99$ $\equiv \$120.00$ <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: right;">\$599.99</td> <td style="text-align: left;">(total amount + sale discount)</td> </tr> <tr> <td style="text-align: right;"><u>\$120.00</u></td> <td></td> </tr> <tr> <td style="text-align: right;">\$479.99</td> <td></td> </tr> </table>	\$599.99	(total amount + sale discount)	<u>\$120.00</u>		\$479.99		<p style="text-align: center;"><u>Big Big Discount</u> (total amount of sale discount)</p> <p>30% of \$899.99</p> $= 0.30 \times 899.99$ $\equiv \$270.00$ <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: right;">\$899.99</td> <td style="text-align: left;">(total amount + sale)</td> </tr> <tr> <td style="text-align: right;"><u>\$270.00</u></td> <td></td> </tr> <tr> <td style="text-align: right;">\$629.99</td> <td></td> </tr> </table>	\$899.99	(total amount + sale)	<u>\$270.00</u>		\$629.99	
\$599.99	(total amount + sale discount)												
<u>\$120.00</u>													
\$479.99													
\$899.99	(total amount + sale)												
<u>\$270.00</u>													
\$629.99													

∴ Fair Deal is selling a TV that costs \$479.99 while Big Big Discount is selling the same TV for \$629.99. Sam decides to get the TV at Fair Deal for the better deal 20% off \$599.99 (\$479.99).

Annotation:

Student demonstrates minor errors and/or omissions in the application of the procedures; accurately calculates the amounts of the discounts and sale prices, omits determining the difference between the sale prices.

Sam is interested in buying a TV. At Fair Deal, the TV is regularly priced at \$599.99 and is on sale for 20% off the regular price. At Big Big Discount, the same TV is regularly priced at \$899.99 and is on sale for 30% off the regular price.



What is the difference in the sale price of the TV between these two stores?

Show your work.

$$\begin{aligned} \text{Fair deal} &= 599.99 - 20\% \\ 0.20(599.99) &= 120 \rightarrow \begin{array}{r} 599.99 \\ -120.00 \\ \hline 479.99 \end{array} \\ \text{cost of tv} &= \boxed{479.99\$} \end{aligned}$$

$$\begin{aligned} \text{big big discount} &= 899.99(0.30) = 270 \rightarrow \begin{array}{r} 899.99 \\ -270.00 \\ \hline 629.99 \end{array} \\ \text{cost of tv} &= \boxed{629.99\$} \end{aligned}$$

$$\begin{aligned} \text{bbd} &= 629.99 \\ \text{fd} &= -479.99 \\ \hline \text{difference} &= \boxed{150.00\$} \end{aligned}$$

\therefore Therefore if you buy your tv at fair deal you'll save 150\$.

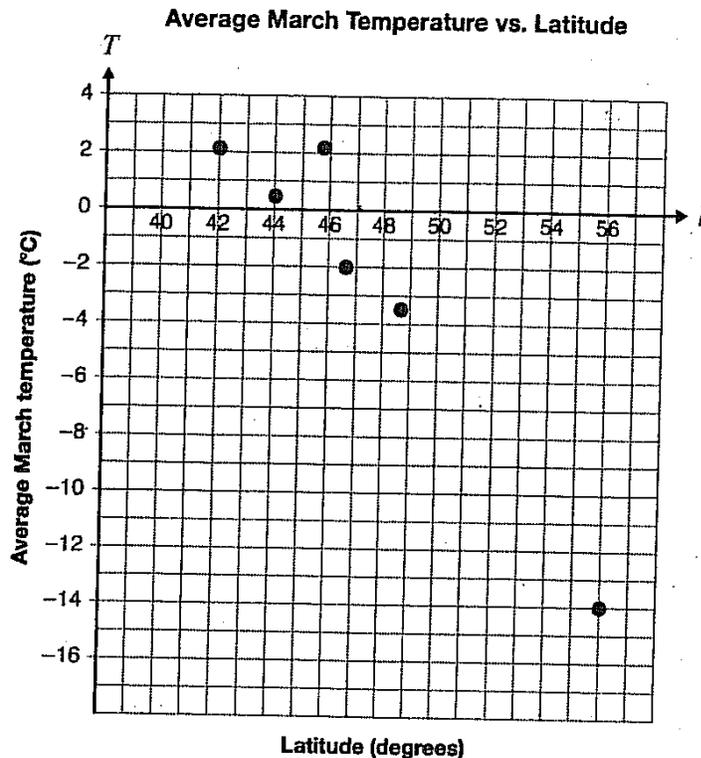
Annotation:

Student demonstrates a thorough understanding of the concepts; determines the discounts, sale prices and the difference between the sale prices accurately.

March Temperatures (Winter 2008)

Code	Descriptor
B	Blank: nothing written or drawn in response to the question
I	- Illegible: cannot be read; completely crossed out/erased; not written in English; - Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”); - Off topic: no relationship of written work to the question.
10	Application of knowledge and skills to make inferences from data shows limited effectiveness due to <ul style="list-style-type: none">• misunderstanding of concepts;• incorrect selection or misuse of procedures.
20	Application of knowledge and skills to make inferences from data shows some effectiveness due to <ul style="list-style-type: none">• partial understanding of the concepts;• errors and/or omissions in the application of the procedures.
30	Application of knowledge and skills to make inferences from data shows considerable effectiveness due to <ul style="list-style-type: none">• an understanding of most of the concepts;• minor errors and/or omissions in the application of the procedures.
40	Application of knowledge and skills to make inferences from data shows a high degree of effectiveness due to <ul style="list-style-type: none">• a thorough understanding of the concepts;• an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding)

The average March temperatures for six Ontario communities are plotted according to their latitudes on the following scatter plot.



The city of Kenora has a latitude of 50° and has an average March temperature of -6.3°C . Does the community of Kenora follow the trend of the data?

Justify your answer.

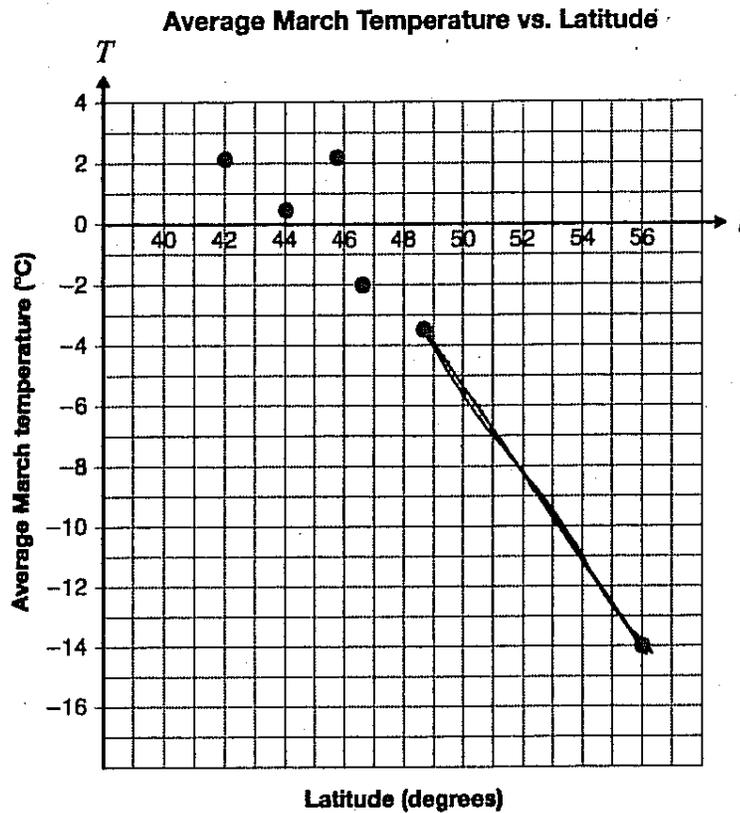
No, The temperatures of all the points equal to -14.7 degrees, then you divide by $6 = -2.45^\circ\text{C}$.

$$(-4) + (-3.5) + (-2) + (0.5) + 2.1 + 2.2 = -14.7 \div 6 = -2.45^\circ\text{C}$$

Annotation:

Student demonstrates a misunderstanding of the concepts; incorrectly applies determining the average of all the points for a specific value.

The average March temperatures for six Ontario communities are plotted according to their latitudes on the following scatter plot.



The city of Kenora has a latitude of 50° and has an average March temperature of -6.3°C . Does the community of Kenora follow the trend of the data?

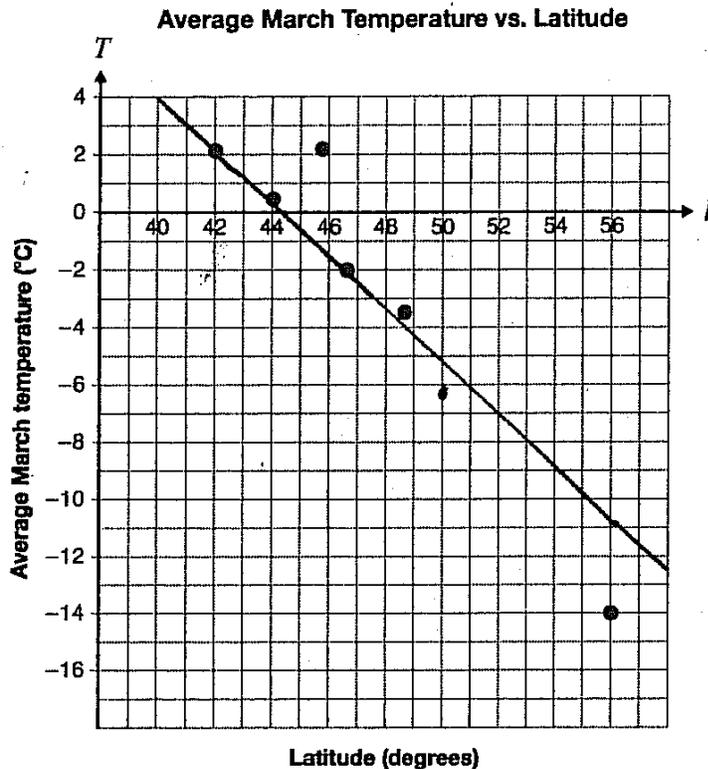
Justify your answer.

Yes it does follow the trend, because if you look at the graph above and make a line between the last dot and the 2nd dot and you that around 50° the temperature is about 5.5 so it is fairly close but not dead on but it is close enough to follow the trend

Annotation:

Student demonstrates partial understanding of the concepts; compares given point to the two neighbouring points only with no reference to the overall trend of the data.

The average March temperatures for six Ontario communities are plotted according to their latitudes on the following scatter plot.



The city of Kenora has a latitude of 50° and has an average March temperature of -6.3°C . Does the community of Kenora follow the trend of the data?

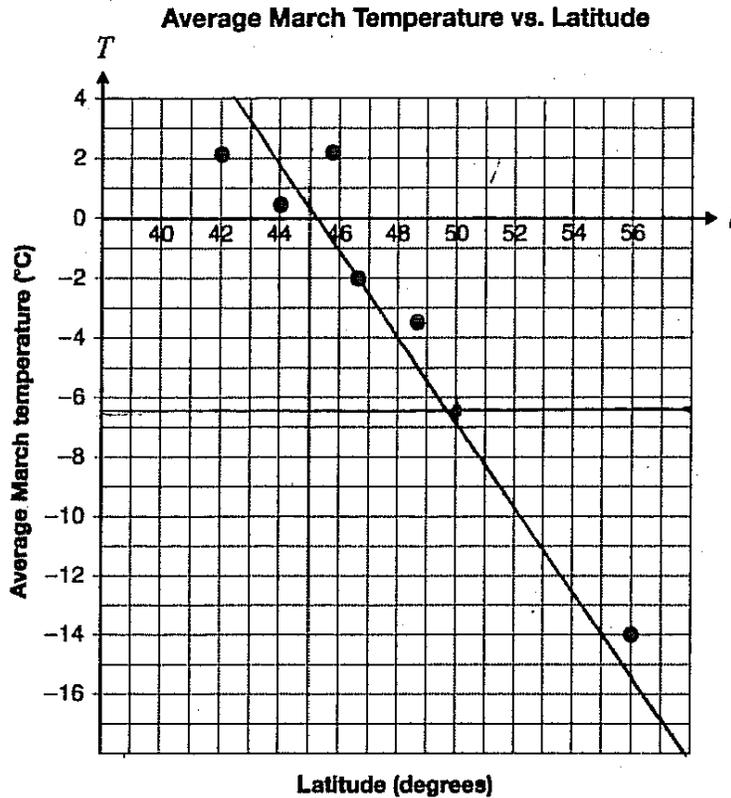
Justify your answer.

Kenora doesn't follow the trend because it isn't on the line of best fit. It is colder than it should be.

Annotation:

Student demonstrates minor errors and/or omissions in the application of the procedures; plots point representing Kenora and line of best fit is drawn (line should be a little steeper to represent the trend accurately), no discussion on how the point is close to the line of best fit, like the other points represented on the scatter plot.

The average March temperatures for six Ontario communities are plotted according to their latitudes on the following scatter plot.



The city of Kenora has a latitude of 50° and has an average March temperature of -6.3°C . Does the community of Kenora follow the trend of the data?

Justify your answer.

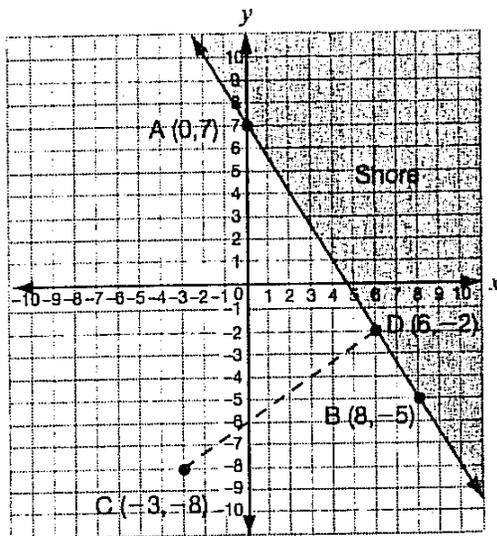
Yes, It does because it is close to the line of best fit so it is very close to the average temperature drop per latitude raise.

Annotation:

Student demonstrates a thorough understanding of the concepts; line of best fit accurately graphed, plots point representing Kenora and conclusion is justified (close to line of best fit).

Washed Up on the Shore (Winter 2008)

Code	Descriptor
B	Blank: nothing written or drawn in response to the question
I	<ul style="list-style-type: none">- Illegible: cannot be read; completely crossed out/erased; not written in English;- Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”);- Off topic: no relationship of written work to the question.
10	<p>Application of knowledge and skills of determining properties of the slopes of lines and line segments shows limited effectiveness due to</p> <ul style="list-style-type: none">• misunderstanding of concepts;• incorrect selection or misuse of procedures.
20	<p>Application of knowledge and skills of determining properties of the slopes of lines and line segments shows some effectiveness due to</p> <ul style="list-style-type: none">• partial understanding of the concepts;• errors and/or omissions in the application of the procedures.
30	<p>Application of knowledge and skills of determining properties of the slopes of lines and line segments shows considerable effectiveness due to</p> <ul style="list-style-type: none">• an understanding of most of the concepts;• minor errors and/or omissions in the application of the procedures.
40	<p>Application of knowledge and skills of determining properties of the slopes of lines and line segments shows a high degree of effectiveness due to</p> <ul style="list-style-type: none">• a thorough understanding of the concepts;• an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding)



Determine whether the path from C to D is perpendicular to the shoreline.

Justify your answer.

$$C(-3, -8) \quad B(8, -5)$$

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

$$m = \frac{-5 + 8}{8 + 3}$$

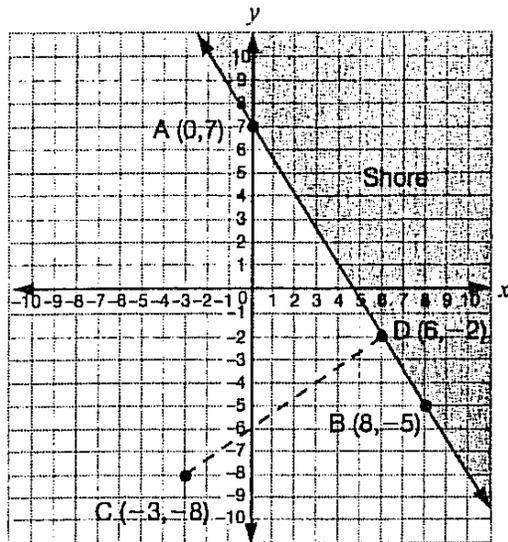
$$m = \frac{3}{11}$$

Yes, C, D is perpendicular to shore line.

Annotation:

Student demonstrates a misunderstanding of the concepts; calculates a slope, but does not compare it to any other slope or reflect on the relationship between the slopes of perpendicular lines.

A boat is travelling from Point C toward Point D, which is on the shoreline.
The shoreline is represented by the line through points A and B.



Determine whether the path from C to D is perpendicular to the shoreline.

Justify your answer.

\overline{CD}

$$\begin{aligned} & \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-8 + 5}{-3 - 8} \\ &= \frac{-3}{-11} \\ &= \frac{3}{11} \end{aligned}$$

\overline{AB}

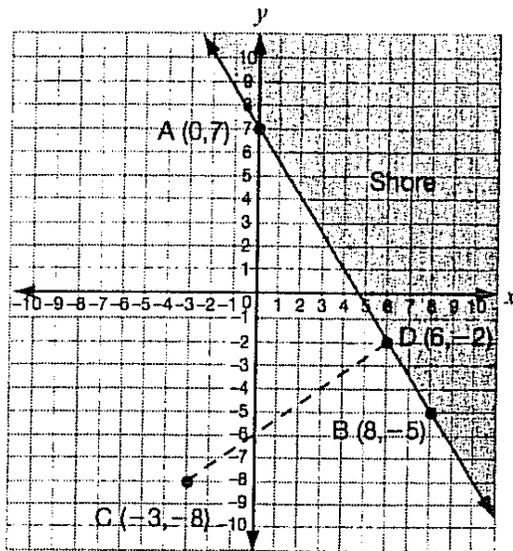
$$\begin{aligned} & \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{7 + 5}{0 - 8} \\ &= \frac{12}{-8} \\ &= -\frac{12}{8} \\ &= -\frac{3}{2} \end{aligned}$$

\therefore The two lines aren't perpendicular because their slopes are not opposites.

Annotation:

Student demonstrates errors in the application of the procedures; one correct slope calculation of AB, error as slope of CB calculated instead of CD and weak justification as opposites unclear with correct conclusion.

A boat is travelling from Point C toward Point D, which is on the shoreline. The shoreline is represented by the line through points A and B.



Determine whether the path from C to D is perpendicular to the shoreline.

Justify your answer.

$$\begin{aligned}
 \text{Boat} \\
 m &= \frac{y_2 - y_1}{x_2 - x_1} \\
 &= \frac{-2 - (-8)}{6 - (-3)} \\
 &= \frac{6}{9} \\
 &= \frac{2}{3}
 \end{aligned}$$

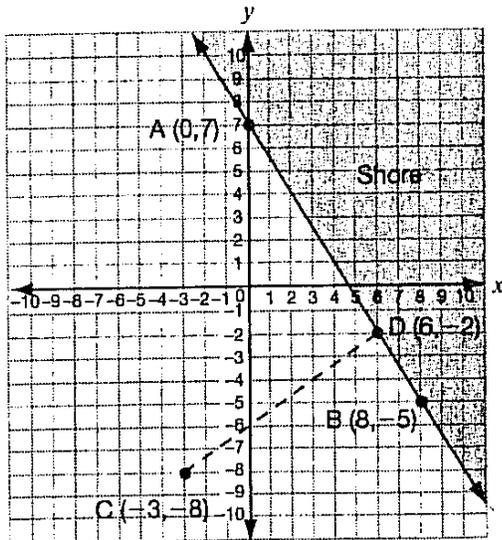
$$\begin{aligned}
 \text{Shore} \\
 m &= \frac{y_2 - y_1}{x_2 - x_1} \\
 &= \frac{-5 - 7}{8 - 0} \\
 &= \frac{-12}{8} \\
 &= -\frac{3}{2}
 \end{aligned}$$

It is perpendicular, because the slopes are opposite, (perpendicular)

Annotation:

Student demonstrates a minor error in the application of the procedures; correct slopes calculated for both lines and conclusion correct, but justification is unclear (opposite).

A boat is travelling from Point C toward Point D, which is on the shoreline.
The shoreline is represented by the line through points A and B.



Determine whether the path from C to D is perpendicular to the shoreline.

Justify your answer.

It is perpendicular.

slope of CD = $(-3, -8)$ $(6, -2)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - (-8)}{6 - (-3)} = \frac{-2 + 8}{6 + 3} = \frac{6}{9} = \frac{2}{3}$$

Slope of AB = $(0, 7)$ $(8, -5)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5 - 7}{8 - 0} = \frac{-12}{8} = \frac{-3}{2}$$

Slope of perpendicular lines are negative reciprocals.

\therefore It is perpendicular

Annotation:

Student demonstrates a thorough understanding of the concepts; understanding of slopes demonstrated as calculations included and perpendicular conclusion is correct and well justified as states negative reciprocals.

Cone Zone (Winter 2008)

Code	Descriptor
B	Blank: nothing written or drawn in response to the question
I	- Illegible: cannot be read; completely crossed out/erased; not written in English; - Irrelevant content: does not attempt assigned question (e.g., comment on the task, drawings, “?”, “!”, “I don’t know”); - Off topic: no relationship of written work to the question.
10	Application of knowledge and skills involving the Pythagorean theorem to determine the volume of water in the cup shows limited effectiveness due to <ul style="list-style-type: none">• misunderstanding of concepts;• incorrect selection or misuse of procedures.
20	Application of knowledge and skills involving the Pythagorean theorem to determine the volume of water in the cup shows some effectiveness due to <ul style="list-style-type: none">• partial understanding of the concepts;• errors and/or omissions in the application of the procedures.
30	Application of knowledge and skills involving the Pythagorean theorem to determine the volume of water in the cup shows considerable effectiveness due to <ul style="list-style-type: none">• an understanding of most of the concepts;• minor errors and/or omissions in the application of the procedures.
40	Application of knowledge and skills involving the Pythagorean theorem to determine the volume of water in the cup shows a high degree of effectiveness due to <ul style="list-style-type: none">• a thorough understanding of the concepts;• an accurate application of the procedures (any minor errors and/or omissions do not detract from the demonstration of a thorough understanding)

Determine the volume of water in the cup if Zach fills it to the top.

Show your work.

$$V = \frac{(\text{area of base}) \times (\text{height})}{3}$$

$$V = \frac{120 \times 10}{3}$$

$$V = 4000\text{cm}^3$$

Annotation:

Student demonstrates a misuse of procedures; selects the correct formula, but does not calculate the area of the base correctly.

Determine the volume of water in the cup if Zach fills it to the top.

Show your work.

$$V = \frac{1}{3} \pi r^2 h$$

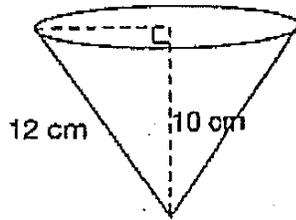
$$V = \frac{1}{3} \times \pi \times 5^2 \times 10$$

$$V = 261.7$$

The volume would
be 261.7 cm³

Annotation:

Student demonstrates omissions in the application of the procedures; does not use Pythagorean Theorem to calculate the radius, correctly uses volume formula with a value of 5 for radius, shows partial understanding.


 s

Determine the volume of water in the cup if Zach fills it to the top.

Show your work.

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

$$V = \frac{3.14 \times (15.62)^2 \times 10}{3}$$

$$= \boxed{7664.1 \text{ cm}^3}$$

$$s^2 = r^2 + h^2$$

$$s^2 = (12)^2 + (10)^2$$

$$s^2 = 144 + 100$$

$$s = \sqrt{244}$$

$$\therefore \boxed{s = 15.62}$$

\therefore volume of water in the cup is 7664.1 cm^3

Annotation:

Student demonstrates a minor error in the application of the procedures; minor error in the application of the Pythagorean Theorem, hypotenuse is not substituted properly, correctly applies the volume formula.

Determine the volume of water in the cup if Zach fills it to the top.

Show your work.

$$V = \frac{\pi \cdot r^2 \cdot h}{3}$$

$$V = 3.14 \times 6.6^2 \times 10$$

$$V = 3.14 \times 43.56 \times 10$$

$$V = \frac{1367.7}{3}$$

$$V = 455.9 \text{ cm}^3$$

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

$$10^2 + b^2 = 12^2$$

$$100 + b^2 = 144$$

$$144 - 100 = \cancel{44} 44$$

$$b^2 = \sqrt{44}$$

$$b = 6.6$$

Annotation:

Student demonstrates a thorough understanding of the concepts; rounding error and incorrect units do not detract from demonstration of a thorough understanding.