



Government of **Western Australia**  
School Curriculum and Standards Authority



# MATHEMATICS ESSENTIAL

## GENERAL COURSE

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Marking key for the Externally set task  
Sample 2016

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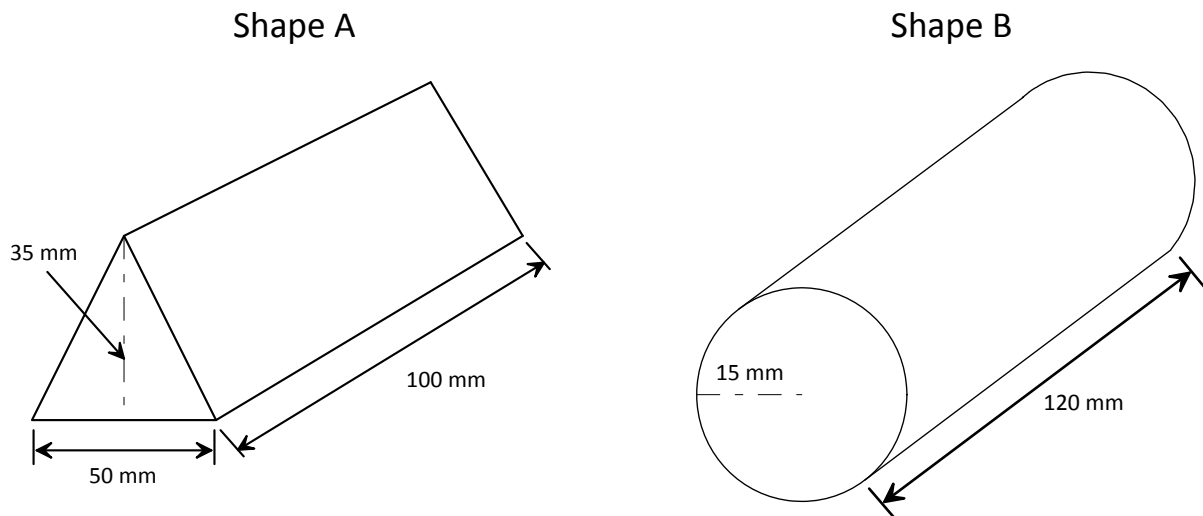
# Mathematics Essential

## Externally set task – marking key

When developing a new product for the retail market, a number of decisions need to be made.

These include how a product is packaged, how the product is stacked for cost effective transportation, the placement of the product on the shelf, and whether the product is priced competitively.

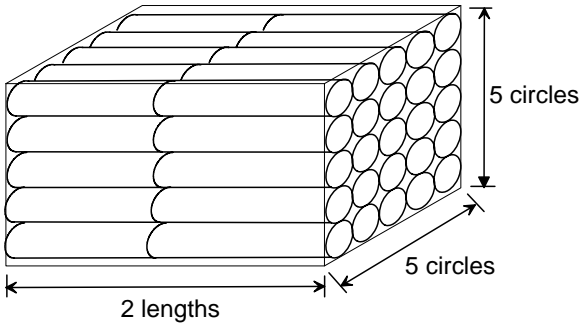
The Delice Chocolate Company has developed a new range of chocolate and is investigating two possible designs for the packaging.



1. For the cylindrical shape package, determine:
  - (a) the area of the circular base
  - (b) the volume of the Shape B
  - (c) the amount of chocolate to the nearest millilitre (mL), that would be required to fill the shape.

Solution	
(a) Area of circle = $\pi \times 15^2$ = 706.86 mm <sup>2</sup> i.e 707 mm <sup>2</sup>	or (a) Area of circle = $\pi \times 1.5^2$ = 7.07 cm <sup>2</sup> i.e 7 cm <sup>2</sup>
(b) Volume of cylinder = 707mm <sup>2</sup> × 120 mm = 84840 mm <sup>3</sup>	(b) Volume of cylinder = 7.07 cm <sup>2</sup> × 12.0 cm = 84 cm <sup>3</sup>
(c) 1 cm <sup>3</sup> = 1 mL, so ≈ 85 mL of chocolate is required to fill the shape (accept 84 mL)	
Specific behaviours	Marks
Calculates area of circular base	1
Correctly calculates the volume in mm <sup>3</sup> or cm <sup>3</sup>	1
Communicates appropriate units for either area or volume calculation	1
Communicates appropriate units for area and volume calculations	1
Correctly expresses amount of chocolate to the nearest ml	1
<b>Total</b>	<b>5</b>

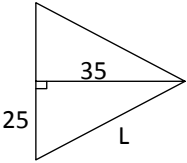
2. Determine the maximum number of product Shape B that could fit in this carton. Clearly show your workings to justify your answer.

Solution	
	
Maximum number of product Shape B that could fit in the carton is 50	
Specific behaviours	Marks
Links length of box to dimensions of product	1
Links width and height of box to dimensions of the circular base	2
Determines maximum number of product (69 if volume of carton ÷ volume of product)	1
Provides evidence of method to determine number	1
<b>Total</b>	<b>5</b>

3. Place correct dimensions (mm) of the radius, length of rectangle and the width of rectangle for the net of the cylinder.

Solution	
Radius of circle 15 mm	
width is = $\pi \times 30 = 94.25$ mm	
length of rectangle is 120 mm	
Specific behaviours	Marks
Correctly labels radius	1
Correctly calculates width	2
Correctly labels length and width	1
<b>Total</b>	<b>4</b>

4(a) Verify that the width of the shaded rectangle is 43 mm as shown.

Solution	
(a) 	$L^2 = 25^2 + 35^2$ $L^2 = 1850$ $L = 43$ The length of the shaded side is 43 mm. or draws a scale diagram
Specific behaviours	Marks
Chooses an appropriate technique to verify value	1
Carries through mathematical thinking to verify value	1
<b>Total</b>	<b>2</b>

(b) Determine the surface area of Shape A.

Solution	
(b) Surface area = $50 \times 100 + 2 \times 43 \times 100 + 2 \times \frac{1}{2} \times 35 \times 50$ $= 15350 \text{ mm}^2$	
Specific behaviours	Marks
Calculates area of triangle	1
Correctly calculates area of rectangular sides	1
Correctly calculates area of rectangular base	1
States total surface area based on previous calculations	1
<b>Total</b>	<b>4</b>

- 5(a) Use a labelled sketch to show that five templates for Shape A can fit on one sheet of card. Justify your sketch with appropriate calculations.

<b>Solution</b>	
(a) $2 \times 35 + 100 = 170$ and $2 \times 43 + 50 = 136$	
Not to scale	
Specific behaviours	Marks
Shows placement of all five templates within boundaries of card	1
Shows appropriate calculations involving length and width of the template	1
Labels sketch with correct length of the circumscribed template	1
Labels sketch with correct width of the circumscribed template	1
<b>Total</b>	<b>4</b>

- (b) Graphic designers have reported that a maximum of four templates only can be cut from each sheet of card. How best could the designers explain the reduced number?

<b>Solution</b>	
Templates would require tabs for construction. The five templates currently take up the entire 680 mm dimension. The inclusion of tabs would account for the reduction in number. Space for printing/cutting between templates could also impact on the number of templates.	
Specific behaviours	Marks
Gives valid reason for reduced number of templates; for example, reference to extra space taken up by tabs	1
<b>Total</b>	<b>1</b>

6(a) Describe the 'population' referred to in this situation.

Solution	
(a) The 'population' are those people who may buy chocolate or other confectionary.	
Specific behaviours	Marks
Gives an appropriate description of the population	1
<b>Total</b>	<b>1</b>

(b) State a possible advantage and disadvantage in using each of the following methods of survey to carry out the market research.

- A: Customers in a local supermarket were approached to complete a questionnaire about the product.
- B: A sample of each shape was delivered to a number of residences in the local area and they were asked to phone their responses to the company given the sample size is large enough; for example, greater than 30.
- C: An email survey of randomly chosen students from the local secondary school was conducted.

Solution		
	Advantage	Disadvantage
A	<ul style="list-style-type: none"> <li>There is a better chance the survey will be completed.</li> <li>The size of the sample can be controlled.</li> <li>The potential customers can see a sample of the product.</li> </ul>	<ul style="list-style-type: none"> <li>The customers in the local supermarket may not be indicative of people who may purchase the Delice Company's chocolate product.</li> <li>The survey may not include questions about the shape of the product.</li> </ul>
B	<ul style="list-style-type: none"> <li>The potential customers can see and feel a sample of the product.</li> </ul>	<ul style="list-style-type: none"> <li>Sample size may end up being too small because of an insufficient number of people who take the time to phone and give feedback.</li> </ul>
C	<ul style="list-style-type: none"> <li>The participants are randomly chosen.</li> </ul>	<ul style="list-style-type: none"> <li>The results could be biased to the opinion of secondary students and therefore not representative of the population.</li> <li>Sample size may end up being too small due to lack of response.</li> <li>The students do not get to see and feel a sample of the product.</li> </ul>
Specific behaviours		Marks
Makes appropriate references to four of the following concepts: sample size, bias, reliability, random choice of sample, first-hand experience of product		4
<b>Total</b>		<b>4</b>