MATHEMATICS APPLICATIONS
Test 3 2018 ✓
~~Linear Functions~~
Section B-Resource Assumed
Marks: 35   Time Allowed: 40 minutes

ALL working must be shown for full marks.

Question 5 [1, 2, 2 = 5 marks]

For the following shape

a) Calculate the diameter of the semicircle

$$4 \times 5 = 20\text{cm}$$

19cm

4cm

b) Calculate the perimeter

$$P = \pi \times r \times 2 \times \tfrac{1}{2} + 2 \times 19 + 9 \times 4 \ (\checkmark)$$
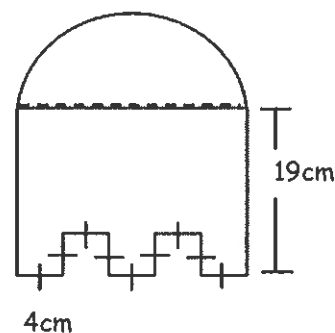$$= 105 \cdot 42 \text{cm} \qquad (\checkmark)$$

c) Calculate the area

$$A = \tfrac{1}{2} \times \pi \times r^2 + 19 \times 20 - 2 \times 16 \quad (\checkmark)$$
$$= \tfrac{1}{2} \times \pi \times 10^2 + 19 \times 20 - 2 \times 16$$
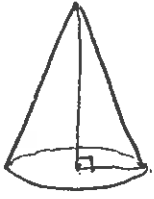$$= 505 \cdot 08 \text{cm}^2 \qquad (\checkmark)$$

Question 6

A cone has a volume of 24.74cm³ and a radius of 15mm.   —1.5cm ✓)
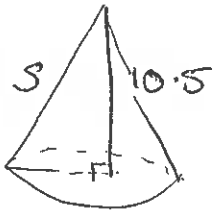
a) Calculate the height of the cone in mm.

$$V = \pi r^2 \times h \div 3$$

$$24.74 = \pi \times (1.5)^2 \times h \div 3$$

$$h = \frac{24.74 \times 3}{\pi \times (1.5)^2} \quad \checkmark$$

$$h = 10.50 \text{ cm} \quad \text{or} \quad 105.00 \text{ mm}.$$

b) Calculate the total surface area of the cone.

$$S^2 = 10.5^2 + 1.5^2$$

$$S = 10.6 \text{ cm}. \quad \checkmark$$

$$SA = \pi r^2 + \pi r S$$

$$= \pi (1.5)^2 + \pi \times 1.5 \times 10.6 \quad \checkmark$$

$$= 57.05 \text{ cm}^2. \quad \checkmark$$

Question 7

[2, 3, 5 = 10 marks]

The diagrams below show two possible plans for a garden outside a new medical center. The garden beds are shown in the diagrams as grey.
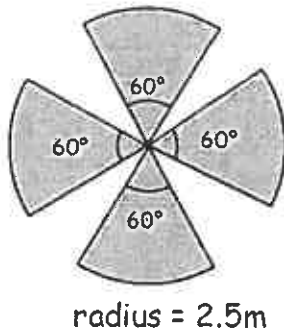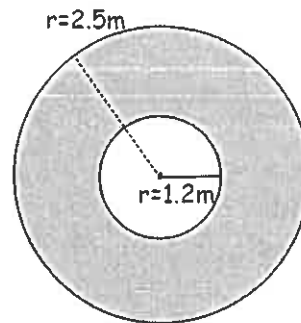
Diagram 1

60°
60°   60°
60°

radius = 2.5m

Diagram 2

r=2.5m

r=1.2m

a) Calculate the perimeter of each garden.

$4 \times \dfrac{60}{360} \times \pi \times 2.5 \times 2 + 8 \times 25$

$= 10.47 + 20$

$= \underline{30.47 \text{ m}}$.

7.

$\pi \times 1.2 \times 2 + \pi \times 2.5 \times 2$

$= \underline{23.25 \text{m}}$ (✓)

— $20 for Garden 2

b) A low garden fence around each section of the garden will cost $15 per meter. Calculate the cost of fencing the two gardens and decide the most cost effective design. **use your answers from (a) to** ✓

① 15×30.47 **Is ok if they used 30.47** ✓

$= \$457.08 (5)$ (✓)

② 20×23.25

$= \$465$ (✓)

Garden one is best. ✓

c) If fertilizer costs $5.50 per square meter calculate the cost of keeping each garden healthy and state which garden will be cheapest to keep healthy?

① $A = 4 \times \dfrac{60}{360} \times \pi \times 2.5^2$ ✓

$A = 13.09$.

Cost $= \$71.99$ (✓)

② $A = \pi \times 2.5^2 - \pi \times 1.2^2$ (✓)

$A = 15.11$

Cost $= \$83.11$ (✓)

Garden 1 is best. (✓)

Question 8 [1, 2, 2, 2 = 8 marks]
For the rectangular prism below

A
B
D
C
E
F
x cm
y cm
H 3cm G
Original

A'
B'
D'
C'
E'
F'
a cm
b cm
H' 15 cm G'
Image
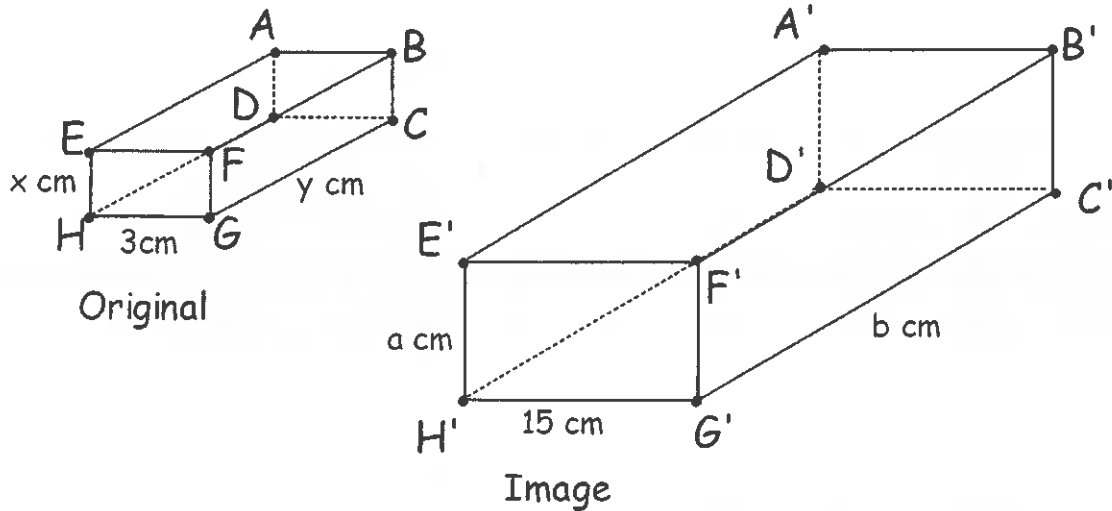
a) Calculate the scale factor that has been used to produce the image.

$$SF = 5 \quad (\checkmark)$$

b) If the volume of the original prism is 24cm³ and each side is an integer (a whole number)

i) give the possible values for x, y

$2 \times 3 \times 4$ $\quad x = 2$ $\quad 1 \times 3 \times 8$ $\quad x = 1.$ $\left(\frac{1}{2} \text{ each}\right)$
$\quad y = 4$ $\quad\quad\quad y = 8.$

ii) from your values for x, y above, calculate a and b.

if $x = 2$ then $a = 10cm$ $\quad$ if $y = 4$, $b = 20cm$ $\left(\frac{1}{2}\text{ each}\right)$
$\quad x = 1$ $\quad a = 5cm$ $\quad\quad y = 8$, $b = 40cm$

c) If the volume of the original prism is 30cm³ calculate the volume and capacity for the image.

$$30 \times 5^3 \checkmark$$

$$= 3750 cm^3 \quad (\checkmark)$$

d) If the surface area of the image is 1050cm², calculate the surface area for the original prism.
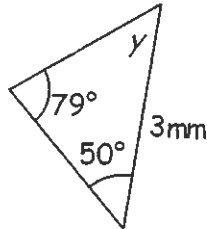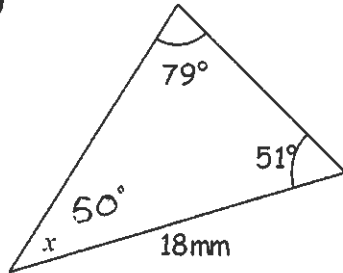
$$1050 \div 5^2 \quad \checkmark$$

$$= 42. cm^2 \quad . \checkmark$$
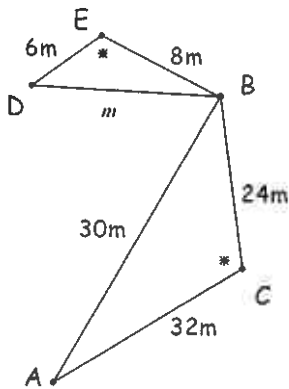
Question 4 [7 marks]

a) Identify which pairs of triangles are Similar and identify the similarity test that applies.
b) Calculate the Scale Factor where the similar triangles occur.
c) Give the value for the missing letters where the similar triangles occur.

i)

a) A A A (✓)

b) $Sf = \frac{3}{18} = \frac{1}{6}$ (✓)

c) $y = 51°$ $x = 50°$
   (✓)   (✓)

ii)

a) SAS. (✓)

b) $Sf = \frac{32}{8} = 4$ (✓)

c) $m = 30 \div 4$
   $= 7.5m$ (✓)

MATHEMATICS APPLICATIONS
Test 3 2018
Area, Surface Area, Volume and Similarity
Section A-Resource Free
Marks: 17   Time Allowed: 20 minutes

Name: _____

ALL working must be shown for full marks.

Round to 2dp where necesarry. ✓

Question 1   **[4 marks]**

If a = 4 and b = -2

a) $2a + 3b =$ $\underline{2 \times 4 + 3 \times -2}$

$= \underline{8 - 6 = 2}$ ✓

c) $5(a - b) =$ $\underline{5 \times (4 - (-2))}$

$= 5 \times 6$

$= 30$ ✓

b) $30 + ab =$ $\underline{30 + (-8)} = 22$ ✓

d) $a^2 + b^2 =$ $\underline{4^2 + (-2)^2}$ ✓

$= 16 + 4$

$= 20$

Question 2   **[4 marks]**

Convert the following units of measurement.

a) 259000mm = $\underline{259}$ m

b) 0.042km^2 = $\underline{42000}$ m^2

c) 6.5m^3 = $\underline{6500}$ L

d) 3500ha = $\underline{35}$ km^2

Question 3   **[2 marks]**

The triangular prism below has a volume of is 66cm^3. Calculate the volume of a triangular pyramid that has the same base area and height as the prism below.
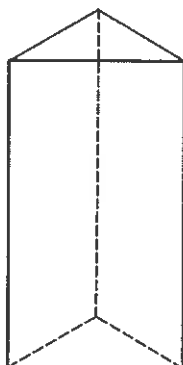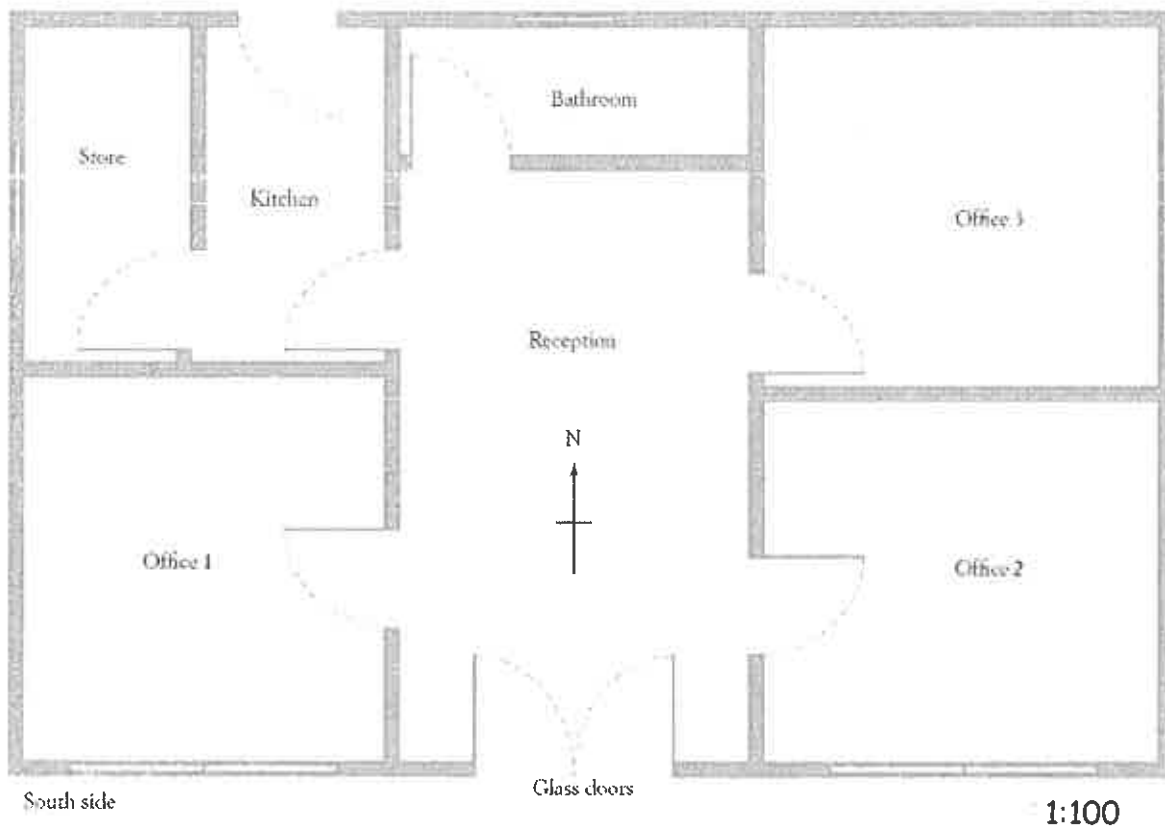
$66 \div 3$ ✓ $= 22cm^3$ ✓

~~b) If the height is~~

Question 9

The building plan for a doctor's office is shown scale diagram below, answer the following questions relating to this plan.

Store

Kitchen

Bathroom

Office 3

Reception

N

Office 1

Office 2

South side

Glass doors

1:100

a) Calculate the length and width for the office building.

Length: $15 - 15.4$ cm $\qquad = \quad 15m - 15.4m \quad (\checkmark)$ Anywhere

Width: $9.7 - 10.1$ cm. $\qquad = \quad 9.7m - 10.1m. \quad (\checkmark)$ in this range.

The concrete for the floor of the building needs to be 150mm thick.

b) Find the volume of concrete needed to build the floor.

Min Volume $= L \times W \times H$

$\quad = 15 \times 9.7 \times 0.15$

$\quad = 21.83 \text{ m}^3$

Between. →

Max Volume $= L \times W \times H$

$\quad = 15.4 \times 10.1 \times 0.15 \ (\checkmark)$

$\quad = 23.33 \text{ m}^3 \ (\checkmark)$

c) If concrete costs $75 per cubic metre, calculate the cost of the concrete slab.

$\$1636.88$

Between →

$\$1749.83$

$(\checkmark)$

d) Dr South would like his surgery in Office 1, he has selected the cheerful yellow carpet at a cost of $27.50 per square metre. Calculate the cost of carpeting Dr South's office.

Min Area $= 5m \times 4.7m$

$\quad = 23.5 m^2$

Max Area $= 5.2m \times 5.5m$

$\quad = 28.6 m^3 \ (\checkmark)$

Cost $= 27.5 \times 23.5$

$\quad = \$646.25$

Cost $= 28.6 \times 27.5$

$\quad = \$786.50 \ (\checkmark)$

27th feb.

Lilly & Serena.