Student Name _____

Eastern Goldfields College
Mathematics 1D 2011
Investigation 1 – Layton's Feature Circle

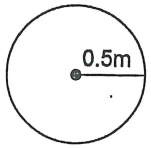
Class time allocated: 50 minutes Total Marks: 40

Layton has just moved into a new house and is looking at landscaping his backyard. He wants a circular brick-paved feature within his garden. Around the feature hw wishes to have a row of cobblestones as a border.

Layton needs some help to decide what size his brick-paved feature should be and to work out how much it is going to cost.

(Round all answers to 3dp)

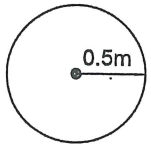
1. [2 marks]
Calculate the **circumference** of a circle with radius 0.5 m.



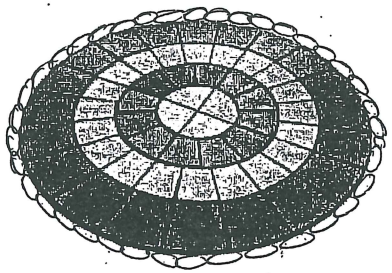
$C = 2\pi.0.5$ ✓
$= 3.142m$ ✓ ↓FT

-1 if incorrect rounding (more than once)
-1 if incorrect units used.

2. [2 marks]
Calculate the **area** of a circle with radius 0.5 m.



$C = \pi \times 0.5^2$ ✓
$= 0.785m^2$ ✓



3. [2 marks]

(a) Which measurement best describes the amount of cobblestones required? (Please circle)

CIRCUMFERENCE AREA ✓

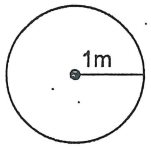
(b) Which measurement best describes the amount of bricks required? (Please circle)

CIRCUMFERENCE AREA ✓

Layton would like to investigate different possible sizes for his feature.

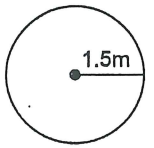
4. [1, 1, 1 = 3 marks]
Calculate the **circumference** of each circle below.

(a)



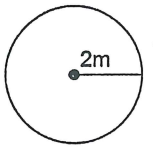
$C = 2\pi.1$ ✓
$= 6.283m$

(b)



$C = 2\pi.1.5$ ✓
$= 9.425m$

(c)



$C = 2\pi.2$
$= 12.566m$ ✓

5. [1 mark]
Use your answers from questions 1 and 4 to complete the table below.

Radius of Circle (m)	Circumference of Circle (m^2)
0.5	3.142
1	6.283
1.5	9.425
2	12.566

FT ✓

6. [2 marks]
When the radius of a circle is **doubled**, does the circumference also double? (Show evidence/calculations to support you answer.)

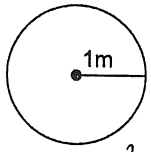
Yes ✓ $r = 1$, $C = 6.283$ ✓
$r = 2$, $C = 12.566 = 6.283 \times 2$.

7. [2 marks]
When the radius of a circle is **tripled** (three times as long), what happens to the circumference? Does it also triple? (Show evidence/calculations to support you answer.)

Yes ✓ $r = 0.5$ $C = 3.142$
$r = 1.5$ $C = 9.425 = 3.142 \times 3$. ✓

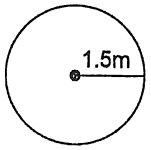
8. [1, 1, 1 = 3 marks]
Calculate the **area** of each circle below.

(a)



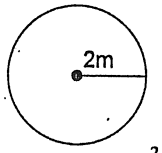
$A = \pi \cdot 1^2$
$= 3.142\ m^2$ ✓

(b)



$A = \pi \times 1.5^2$
$= 7.069 m^2$ ✓

(c)



$A = \pi \times 2^2$
$= 12.566\ m^2$ ✓

9. [1 mark]
Use your answers from questions 2 and 4 to complete the table below.

Radius of Circle (m)	Area of Circle (m^2)
0.5	0.785
1	3.142
1.5	7.069
2	12.566

✓

10. [3 marks]
When the radius of a circle is **doubled**, does the area also double? (Show evidence/calculations to support you answer.) If not what is happening?

✓ No $r = 0.5$, $A = 0.785$ ✓
$r = 1$ $A = 3.142 \neq 0.785 \times 2$

$\frac{3.142}{0.785} \approx 4$
∴ x by 4 ✓

11. [3 marks]
When the radius of a circle is **tripled** (three times as long), what happens to the area? Does it also triple? (Show evidence/calculations to support you answer.) If not what is happening?

✓ No $r = 0.5$ $A = 0.785$ ✓
$r = 1.5$ $A = 7.069 \neq 3 \times 0.785$

$\frac{7.069}{0.785} \approx 9$
x by 9 ✓

referring

Price List

Brick Pavers (feature)	\$65 per m^2
Cobblestones (border)	\$9.50 per 1m of border

12. [3 marks]
Layton decides to make a circular feature with a radius of 1m. Using the price list above, how much will Layton's feature cost **in total**?

$C \times 9.50 = 6.283 \times 9.50 = \$59.69$ ✓ $7 \times 9.5 = 66.5$
$A \times 65 = 3.142 \times 65 = \$204.23$ ✓ $4 \times 65 = 260$
263.92 ✓ \$326.5

$3.14 \times 65 = 204.10$
$6.28 \times 9.5 = 59.66$
\$263.76

13. [2 marks]
Layton then realises that he could afford to build a bigger feature. He decides to double the radius. **Without doing calculations**, do you think that the new cost will be

(i) less than double the original cost?

(ii) exactly double the original cost?

(iii) More than double the original cost? ✓

[Circle correct answer]

Explain your choice.

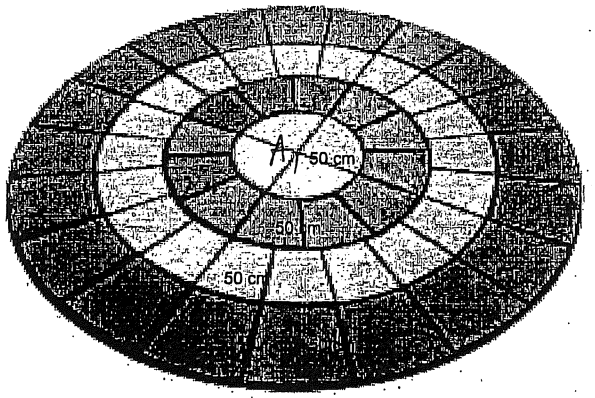
As Area more than doubles ✓

14. [3 marks]
Calculate the total cost of the new feature (with the doubled radius).

$12.566 \times 9.50 = 119.38$ ✓ $13 \times 9.5 = 123.50$
$12.566 \times 65 = 816.79$ ✓ $13 \times 65 = 845$
\$936.17 ✓ \$968.50

15. [2 marks]
Is the new cost less than, more than or exactly double the original cost? (Show evidence/calculations to support your answer).

$\frac{936.17}{263.92} = 3.5$ ✓
✓ more than double



16. [4 marks]

For the design above calculate the area to be paved by the light coloured pavers.

$A_1 = \pi \cdot 50^2$ ✓
$= 7853.98 cm^2$

$A_2 = \pi \times 150^2 - \pi \times 100^2$ ✓✓
$= 39269.91 cm^2$

$70685.83471 - 31415.92654$

7853.98
-39269.91

$\therefore 47123.89 cm^2$ ✓

$(4.71 m^2)$

17. [2 marks]

What percentage of the design will be covered by the light pavers?

$\pi \times 200^2 = 125663.71$ ✓

$\frac{47123.89}{125663.71} \times 100 = 37.5\%$ ✓