M1.

The perimeter of *R* is the same as the perimeter of *L*

B1

[1]

M2.

(a) $\pi \times 0.7$
or $2 \times \pi \times 0.35$
or 2.19

M1

[2.198, 2.2]

Accept 0.7 π

A1

(b)   Consistent units seen or implied
  e.g. 1600 or [0.002 198, 0.002 2] seen

B1

their 1600 ÷ their [2.198, 2.2]
  oe
  Units need not be consistent

M1

727.(…)

A1

727
  Strand (i) Rounding down their answer

Q1ft

Additional Guidance
160 ÷ 0.7π = 72.8   so 72

B0M1A0Q1ft

[6]

M3.

(Diameter or side of square =) $\sqrt{36}$ or 6 or (radius =) 3

6 × 6 (= 36)

M1

$\pi \times 6$

or $2 \times \pi \times 3$

M1dep

[18.8, 18.9] or 6 π

Accept 19 with working shown

A1

Additional Guidance
Accept [3.14, 3.142] for π
Ignore further working after 6 π, that is if they incorrectly work 6 π out award full marks
Do not accept π6 for the A mark
6 or 3 may be on diagram but must be correct, e.g. radius must be 3, not 6

[3]

M4.

Alternative method 1
2 × π × 40

or [251.2, 251.5]

or 251

or 250

M1

(2 × π × 40 + 200)

or [251.2, 251.5] + 200

or 251 + 200

or 250 + 200

M1dep

Distance ÷ 18   or   Distance ÷ 30

M1

25.(…) and yes

or 15.(…) and yes

Strand (iii) decision to match their answers

ft provided M1M0M1

Q1ft

Alternative method 2

$2 \times \pi \times 40$

or [251.2, 251.5]

or 251

or 250

M1

$(2 \times \pi \times 40 + 200)$

or [251.2, 251.5] + 200

or 251 + 200

or 250 + 200

M1dep

18×30 or 540

M1

[450, 451.5] and 540 and yes

   Strand (iii) decision to match their answers

   ft provided M1M0M1

Q1ft

Additional Guidance

$100 + 100 + 40 + 40 = 280$, $280 \div 18 = 15.(\ldots)$

M0M0M1Q0

$\pi \times 80 = 251.3$, $251.3 \div 2 = 125.65$

M0

Distance means any number using addition of lengths given in the question

e.g. $(100 + 40)$, 250, 200, 100

[4]

M5. $12 \div 2$ or 6

M1

12 ÷ 4

or 6 ÷ 2

or 3

M1dep

π × 3 × 3

oe

M1dep

9π or [28.2, 28.3] or 28

SC2 for 36π or [113, 113.2]

A1

[4]

M6.

2 × π × 9.15 or 57.4 or 57.5(0)

oe

M1

18.3π; or [57.46, 57.5]

Accept 57 if correct method seen

A1

[2]

M7.(a)   Valid reason

Strand (ii)
eg 14 ÷ 4 is not a whole number
14 is not a multiple of 4
Because you need half centimetres
Half the perimeter has to be even
14 ÷ 4 = 3.5
4 × 3 = 12 and 4 × 4 = 16

Q1

Additional Guidance

Because it wouldn't have the sides as a whole number

Q1

14 doesn't divide into a whole number

Q0

Not possible because all the sides must be equal

Q0

Nothing divides into 14 4 times (not true)

Q0

Not possible to make 14 using the same number 4 times

Q0

14 ÷ 4 without an answer or correct comment

Q0

The grid is not big enough

Q0

The square would not have equal sides

Q0

(b)   Valid reason
          Strand (ii)
          eg 12 is not a square number
          $\sqrt{12}$ *is not a whole number*
          3 × 3 = 9 and 4 × 4 = 16
          $\sqrt{12}$ *= 3.4... or 3.5*

Q1

Additional Guidance

No number multiplied by itself equals 12

Q1

No whole number multiplied by itself equals 12

Q1

If it was a square it would have to be an area of 16 (not true)

Q0

The length and width would not match each other

Q0
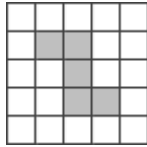
It wouldn't have equal sides

Q0

The base can't be timesed by the height to give 12 because the sides need to be equal

Q0

Because 12 as an area would mean sides would be different lengths which would make the shape a rectangle not a square

Q0

(c)   Correct shape drawn

Shape shown may be reflected or rotated

> *B1 for a Pentomino with no lines of symmetry and no rotational symmetry*
>
> *B1 for any polyomino with no lines of symmetry and rotational symmetry of order 2*

B2

Additional Guidance

CANDIDATES MUST USE A DIFFERENT SHAPE TO THOSE GIVEN TO SCORE ANY MARKS

Accept any rotation or reflection of shape shown in mark scheme

If candidates do more than one, mark all and award the lowest mark

[4]

M8.(a) $3a + 5b + 3a + 5b$
                    oe

M1

$6a + 10b$ or $2(3a + 5b)$
                    oe do not ignore fw for final mark

A1

Additional Guidance

$3a + 5b \times 2 = 6a + 10b$ (recovered)

M1A1

$3a + 5b \times 2$

M1A0

$(3a + 5b)2$

M1A0

$6a10b$

M1A0

$3a \times 2 + 5b \times 2$

M1A0

$3a \times 2\ 5b \times 2$

M0A0

(b) $15ab$

B1 for 3a × 5b
B1 for partially simplified answer
B1 for 15 × ab

B2

Additional Guidance

Penalise further working, e.g. $3a \times 5b = 15ab = 3(5ab)$ gets B1

$15ba$

B2

A = $15ab$

B2

A($15ab$)

B2

$15ab$ cm^2

B2

A($3a \times 5b$)

B1

$(3a)(5b)$

B1

$3a5b$

B1

$15(ab)$

B1

$3(5ab)$

B1

$ab15$

B1

$(15ab)^2$

B0

$15ab^2$

B0

$(3a \times 5b)^2$

B0

$3a \times 5b^2$

B0

(c)   315 ÷ 15 or 21 seen

M1

7 and 3 in any order
> *SC1 for 15 and 21*
> *or 9 and 35*

A1

Additional Guidance

1 and 21 on the answer line

M1A0
[6]

M9. $\pi \times 6 \times 6 \div 2$

> *oe accept a numerical value for* π

M1

18 π or a numerical value

[55.8, 56.57]

> *Accept* $\pi \times 18$ *or* $\pi 18$

A1
[2]

M10. $x + x + 3 + x + x + 3$ (=37)   *oe*

> *(2x + 3) × 2 condone missing brackets*
> *37 − 6*

M1

$4x + 6 = 37$

or $4x = 37 − 6$

> *oe*

$$\frac{37-6}{4}$$

M1dep

(x =) 7.75 *oe*

A1

[3]

M11.

(a) $\frac{1}{2}$ × (40 + 24) × 16

oe

M1

512

A1

(b) π × 4 × 4

oe

M1

[50.2, 50.3] **or** 16π

A1

(c) $\frac{\text{their } [50.2, 50.3\,]}{\text{their } 512}$

(= [0.098, 0.0982422])

M1

[9.8, 9.82422]

ft their 512 and their [50.2, 50.3]
Allow 10 with correct method seen
SC1 [90.18, 90.2]

A1ft

[6]

M12.3x or 2x seen for missing sides

)

May be on diagram or in working

B1

$4x + 4x + 2x + 3x + 2x + x$ (= 56) *oe*

        16x implies B1M1

M1

their $16x = 56$

M1

3.5 or $\dfrac{7}{2}$ or $3\dfrac{1}{2}$

       SC2 for $\dfrac{56}{11}$ *or 5.09… or 5.1*

       SC2 for $\dfrac{56}{13}$ *or 4.3…*

       SC2 for 4

       SC applies if method marks not awarded.

A1ft

[4]

M13. $2 \times \pi \times 4.2$ or $2 \times 3.14(…) \times 4.2$

M1

[26.3, 26.4]

A1

26.4

       ft their 2 d.p. or more answer

       SC1 for 55.4

B1ft

[3]

1

M14. $\pi \times 3.5 \times 3.5$ or $3.14 \ldots \times 3.5 \times 3.5$ *oe*

or $\pi \times 3.5^2$ or $3.14 \ldots \times 3.5^2$

M1

38.4(8 …) or 38.4(6…)

$\dfrac{49}{4} \pi$ *or 12.25π or 12.3π*

A1

38.5

ft their answer of 2 d.p. or more

B1 ft

[3]

M15. Any side chosen for square and squared, eg $10^2 = 100$

> *M2 is for both square and circle areas attempted with correct numerical values (eg if 10 chosen for side of square, then 5 must be used as radius of circle, or if 4 chosen as radius then 8 used as side of square)*
>
> *M1 if both square and circle area attempted with one incorrect numerical value (eg if 10 chosen for side of square, then 10 used as radius of circle, or if 4 chosen as radius then 4 used as side of square)*

Half the side squared and multiplied by π, eg $\pi \times 25$

π must be [3.1, 3.142] or $\dfrac{22}{7}$

> *M2 is for both square and circle areas attempted with correct numerical values (eg if 10 chosen for side of square, then 5 must be used as radius of circle, or if 4 chosen as radius then 8 used as side of square)*
>
> *M1 if both square and circle area attempted with one incorrect numerical value (eg if 10 chosen for side of square, then 10 used as radius of circle, or if 4 chosen as radius then 4 used as side of square)*

M2

Work out 75% of their square and a correct calculation of the circle area, **or** works out what percentage the circle area is of the square area

This can be awarded even if only M1 awarded.

Allow π used if a clear comparison, eg $\pi \times 25 > 3 \times 25$

A1

A method mark gained and correct conclusion based on 75% of their square with their circle

Strand (ii).

Do not award if their circle area > square area, eg 78.5 > 25

Q1

Alternative Method

$2r$ length of side of square giving $4r^2$ as area

M2 is for both square and circle area attempted with correct numerical values (eg if r chosen for side of square, then $\dfrac{r}{2}$ must

be used as radius of circle, or if r chosen as radius then $2r$ used as side of square)

M1 if both square and circle area attempted with one incorrect numerical value (eg if x chosen for side of square, then x used as radius of circle, or if x chosen as radius then x used as side of square)

r as radius of circle giving πr^2 as area of circle

M2 is for both square and circle area attempted with correct numerical values (eg if r chosen for side of square, then $\dfrac{r}{2}$ must

be used as radius of circle, or if r chosen as radius then $2r$ used as side of square)

M1 if both square and circle area attempted with one incorrect numerical value (eg if x chosen for side of square, then x used as radius of circle, or if x chosen as radius then x used as side of square)

M2

75% of their square ($= 3r^2$) and correct expression for area of circle with their chosen radius

A1

A method mark gained and correct conclusion based on 75% of their square with

their circle. eg $\pi > 3$

Strand (ii). Do not award if their circle area >square area, eg
$\pi r^2 > r^2$

Q1
[4]

Strand (ii). Do not award if their circle area >square area, eg
$\pi r^2 > r^2$