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9to1_AQA_Nov2017_GCSE_1H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	8 from 34	3 from 12	3 from 8	0 from 9	2 from 5	0 from 0
A02 and 3	13 from 46	5 from 10	0 from 14	5 from 7	0 from 8	3 from 7
Total	21 from 80	8 from 22	3 from 22	5 from 16	2 from 13	3 from 7

Your Pinpoint Topics

(1) Converting to standard form. MWatch: 83, Hegarty:

(2) Understanding Algebra. MWatch: NA, Hegarty:

(3) Surds. MWatch: 207, Hegarty:

(4) Estimation. MWatch: 91, Hegarty:

(5) Interior and Exterior Angles. MWatch: , Hegarty:

1) Converting to standard form (Non-Calc): Easier

1) Write each as an ordinary number

a) 5×10^4 5000

b) 6.2×10^6 6200000

c) 1.205×10^8 120500000

d) 9×10^{-3} 0.009

e) 7.5×10^{-4} 0.00075

f) 6.02×10^{-7} 0.000000602

(6 marks)

---

2) Write these numbers in standard form

a) 60000 6×10^4

b) 508000 5.08×10^5

c) 0.0000000089 8.9×10^{-9}

d) 0.0000000708 7.08×10^{-8}

(4 marks)

---

1) Converting to standard form (Non-Calc): Medium

3) Circle the numbers that are in standard form

0.9×10^7 7×10^{-4} 57×10^8 1.07×10^9

(1 mark)

---

4) Write each number in standard form

a) 56×10^3

5.6×10^4

.....

b) 5096×10^7

5.096×10^{10}

.....

c) 0.04×10^8

4×10^6

.....

d) 0.00904×10^{11}

9.04×10^8

e) 90×10^{-5}

9×10^{-4}

f) 840×10^{-7}

8.4×10^{-5}

g) 0.00806×10^{-5} 8.06×10^{-8}

h) 0.00001×10^{-20} 1×10^{-25}

(8 marks)

1) Converting to standard form (Non-Calc): Harder

5) Write these numbers in order of size starting with the smallest

$58, \quad 5.8 \times 10^{-1}, \quad 8.5 \times 10^{-2}, \quad 5.81 \times 10^{-1}, \quad 5 \times 10^{1}$

58, 0.58, 0.085, 0.581, 50

$8.5 \times 10^{-2}, 5.8 \times 10^{-1}, 5.81 \times 10^{-1}, 5 \times 10^{1}, 58$

(2 Marks)

6) Here are five numbers

$7 \times 10^{3} \qquad 7.2 \times 10^{4} \qquad 27000 \qquad 7.02 \times 10^{4} \qquad 2.7 \times 10^{6}$

Work out the difference between the largest and smallest numbers.

Give your answer in standard form

Largest 2.7×10^{6}

Smallest 7×10^{3}

2700000

\- 7000

2693000

……

(2 marks)

2) Understanding Algebra (Non-Calc): Easier

1) a x a is always equal to

ANSWER = C

a) a2 b) 2a c) a^2 d) 2 x a

(1 mark)

---

2) $y= x^2$.

When x = -3, what is the value of y?

$(-3)^2 = (-3) \times (-3) = 9$. (not – 9)

(1 Mark1)

---

3) (y-5)(y-3) is always equal to: (Show working and circle a, b, c or d)

$y^2 – 5y -3y + 15$

$= y^2 - 8y +15$

ANSWER = D

a) $y^2+8y+15$ b) $y^2-8y-15$ c) $2y+8y+15$ d) $y^2-8y+15$

(2 marks)

2) Understanding Algebra (Non-Calc): Medium

4) The expression

$$(x-3)^2$$

is always equal to: (Show all your working and circle a, b, c or d)

$(x-3)(x-3) = x^2 - 3x - 3x + 9 = x^2 - 6x + 9$

ANSWER = C

(a) $x^2 - 9$ (b) $x^2 + 9$ (c) $x^2 - 6x + 9$ (d) $x^2 - 6x - 9$

(2 Marks)

---

5) $(x+1)^2$ is always equal to: (Show all your working and circle a, b, c or d)

$(x+1)(x+1) = x^2 + x + x + 1 = x^2 + 2x + 1$

ANSWER = D

a) $x^2 + 1$ b) $x^2 + 2$ c) $x^2 + x + 1$ d) $x^2 + 2x + 1$

(2 Marks)

---

6) Solve $x^2 = 81$.

$x = \pm\sqrt{81}$

= 9 and -9 (or ± 9)

You will lose a mark here if you don't include -9.

x=_____

(2 Marks)

2) Understanding Algebra (Non-Calc): Harder

7) Simplify

$$\frac{(x+1)2}{(x+1)}$$

ANSWER = (x+1)

(2 Marks)

8) $y = (x+3)^2$

x can be any number.

a) What is the smallest value that y can take?

ANSWER: $y = 0$

(y can never be negative)

b) What value of x makes y equal to its minimum value?

WHEN $x = -3$

(2 Marks)

3) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

3) Surds: Medium

4. Expand and simplify $(4-2\sqrt{3})^2$ giving your answer in the $a+b\sqrt{3}$ where a and b are integers.

$$(4-2\sqrt{3})(4-2\sqrt{3})$$
$$=16-8\sqrt{3}-8\sqrt{3}+12$$
$$=30-16\sqrt{3}$$

…… **(3)**

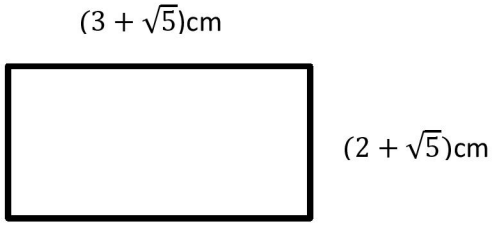
5. Expand and simplify $(\sqrt{5}-\sqrt{10})^2$ giving your answer in the $a+b\sqrt{2}$ where a and b are integers.

$$(\sqrt{5}-\sqrt{10})(\sqrt{5}-\sqrt{10})$$
$$=5-\sqrt{50}-\sqrt{50}+\sqrt{100}$$
$$=15-2\sqrt{50}$$
$$=15-2\sqrt{25\times 2}$$
$$=15-10\sqrt{2}$$

…… **(4)**

3) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.



$(3+\sqrt{5})(2+\sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

4) Estimation (Non-Calc): Easier

1. Work out an estimate for the value of

$$5.1 \times 98$$

$5 \times 100 =$

500

(2 marks)

2. Estimate the value of

$$\frac{68 \times 401}{198}$$

$\frac{70 \times 400}{200} =$

140

(2 marks)

3. Work out an estimate for the value of

$$\frac{637}{3.2 \times 9.8}$$

$\frac{600}{3 \times 10} = 20$

20

(2 marks)

4) Estimation (Non-Calc): Medium

4. Which is the best estimate for the value of

$$\frac{37.9 \times 50.2}{2.1 + 2.98}$$

$$\frac{40 \times 50}{2+3} = \frac{2000}{5} = 400$$

(3 marks)

5. Which is the best estimate for the value of

$$\frac{38.3 \times 51.7}{2.1}$$

$$\frac{40 \times 50}{2} = 1000$$

.....

(3 marks)

4) Estimation (Non-Calc): Harder

Worded Estimation

Heather runs round a circular track many times each day.

She runs 4.18km a day for 197 days.

The track is 0.2 km.

Estimate how many times heather has run round the track.

(3 marks)

$4.18\text{km} \approx 4$

$197\text{ days} \approx 200$

$4 \times 200 = 800\text{ km}$ (1)

$0.21 \approx 0.2$

$\frac{800}{0.2}$ (2) $= 800 \times 5$ (3)

$= 4000$ times

5) Interior and Exterior Angles: Easier

1. A regular decagon has 10 sides.

(a) Calculate the **sum** of its **interior** angles.

$(10 - 8) \times 180$

.....1440°.....

(b) Calculate the size of **one** of its **interior** angles.

$1440 \div 10$

.....144°.....

(2 Marks)

---

2. A regular 15 sided shape can be called a pentadecagon.

(a) Write down the **sum** of its **exterior** angles.

.....360°.....

(b) Calculate the size of **one** of its **exterior** angles.

$360 \div 15$

.....24°.....

(2 Marks)

---

3. What is the name of the regular polygon with an **exterior** angle of 72°?

$360 \div 72 = 5$

.....pentagon.....

(1 Mark)

---

4. If a regular polygon has an interior angle of 140°, how many sides does it have?

Exterior angle: $180 - 140 = 40$

Sides: $360 \div 40$

.....9.....

(2 Marks)

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5) Interior and Exterior Angles: Medium

5. A portion of a regular polygon with a reflex angle of 200° outside the shape, is shown below.

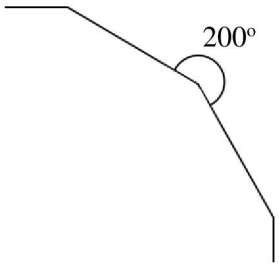

Diagram not accurately drawn

How many sides does the polygon have?

Exterior angle: $200 - 180 = 20$

Sides: $360 \div 20 = 18$

..... 18.....

(2 Marks)

---

6. A portion of a regular polygon is shown below with straight lines extending from two of its sides. These lines cross forming an angle of 144°.

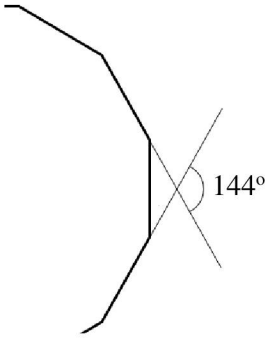

Diagram not accurately drawn

How many sides does the polygon have?

Obtuse angle in triangle: 144 (vertically opposite)

Base angle sum in isosceles triangle: $180 - 144 = 36$

Exterior angle: $36 \div 2 = 18$

Sides: $360 \div 18 = 20$

..... 20.....

(4 Marks)

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5) Interior and Exterior Angles: Harder

7. A primary school teacher gives pupils a regular black pentagon, and five regular white hexagons. She tells them to glue them onto a flat piece of paper in a football pattern, as shown below.

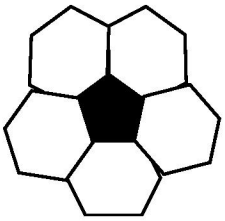

Diagram not accurately drawn

She says to be careful to make all of the edges and corners meet.

Use interior angles to show that this cannot be done.

Pentagon interior angle: $(5-2)\times 180\div 5=108°$
Hexagon interior angle: $(6-2)\times 180\div 6=120°$
Where two hexagons meet the pentagon the sum of the angles is 348°. Angles around a point add up to 360°, therefore the pattern can't be create without gaps.

(3 Marks)

---

8. The diagram below shows two regular polygons placed edge to edge, with two equilateral triangles fitting exactly in the gaps.

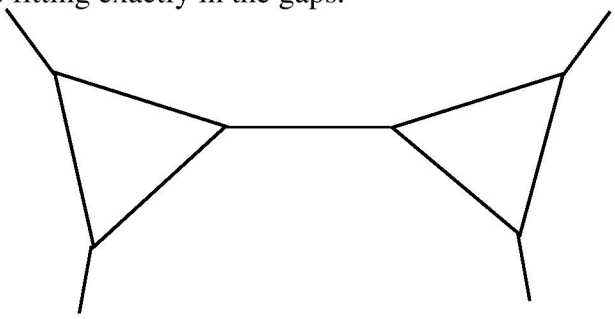

Diagram not accurately drawn

(a) If the two polygons are identical, how many sides do they have?

Angles in equilateral triangle: 60
Interior angle of each polygon: $(360-60)\div 2=150$
Exterior angle of each polygon: $180-150=30$
Polygon sides: $360\div 30=12$

……. 12…….

(b) If the one of the polygons has 24 sides, what is the name of the other polygon?

Interior angle of 24 sided polygon : $180-(360\div 24)=165$
Interior angle of other polygon : $360-165-60=135$
Sides of other polygon: $360\div(180-135)=8$

…… octagon……

(6 Marks)

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A02 and 3	10 from 46	2 from 10	3 from 14	5 from 7	0 from 8	0 from 7
Total	18 from 80	5 from 22	7 from 22	5 from 16	1 from 13	0 from 7

Your Pinpoint Topics

(1) Index Notation. MWatch: 131, Hegarty:

(2) Surds. MWatch: 207, Hegarty:

(3) Circle Problems. MWatch: , Hegarty:

(4) Estimation. MWatch: 91, Hegarty:

(5) Interior and Exterior Angles. MWatch: , Hegarty:

1) Index Notation: Easier

1. (a) Simplify $m^3 \times m^6$ $= m^{3+6}$

m^9

(1)

(b) Simplify $\frac{p^8}{p^2}$ p^{8-2}

p^6

(1)

(c) Simplify $(2n^3)^4$ $16n^{3\times4}$

$16n^{12}$

(2)

(4 marks)

---

2. (a) Simplify $m^6 \times m^7$ m^{6+7}

(1)

m^{13}

(b) Simplify x^0

(1)

1

(c) Simplify $(16y^6)^{\frac{1}{2}}$

$\sqrt{16}\, y^{\frac{6}{2}}$

(2)

$4y^3$

(4 marks)

---

3. (a) Simplify $m^5 \div m^3$ m^{5-3}

m^2

(1)

(b) Simplify $5x^4y^3 \times x^2y$ $5x^{4+2}y^{3+1}$

$5x^6y^4$

(2)

(3 marks)

---

1) Index Notation: Medium

4. (a) Simplify $a^4 \times a^5$

a^{4+5}

a^9

(1)

(b) Simplify $\frac{45e^6 f^8}{5ef^2}$

$9e^{6-1} f^{8-2}$

$9e^5 f^6$

(2)

(c) Write down the value of $9^{\frac{1}{2}}$

$\sqrt{9}$

3

(1)

(4 marks)

---

5. (a) Simplify $m^2 \times m^4$

m^{2+4}

m^6

(1)

(b) Simplify $y^7 \div y^5$

y^{7-5}

y^2

(1)

(c) Simplify $(m^3)^5$

$m^{3\times5}$

m^{15}

(2)

(4 marks)

---

6. Simplify fully

(a) $p^2 \times p^7$

p^{2+7}

p^9 **(1)**

(b) $\frac{3q^4 \times 2q^5}{q^3}$

$\frac{(3\times2)q^{4+5}}{q^3} = 6q^{9-3}$

$6q^6$ **(2)**

(c) $(2xy^3)^5$

$2^5 x^5 y^{3\times5}$

$32x^5y^{15}$ **(2)**

(4 marks)

---

1) Index Notation: Harder

20. (a) Find the value of

(i) 64°

1

(ii) $64^{\frac{1}{2}}$ $\sqrt{64}$

8

(iii) $64^{-\frac{2}{3}}$ $= \frac{1}{64^{2/3}}$ $= \left(\sqrt[3]{64}\right)^2 = \frac{1}{4^2}$

$\frac{1}{16}$ or 0.0625

(4 marks)

2) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

2) Surds: Medium

4. Expand and simplify $(4-2\sqrt{3})^2$ giving your answer in the $a+b\sqrt{3}$ where a and b are integers.

$$(4-2\sqrt{3})(4-2\sqrt{3})$$
$$=16-8\sqrt{3}-8\sqrt{3}+12$$
$$=30-16\sqrt{3}$$

…… **(3)**

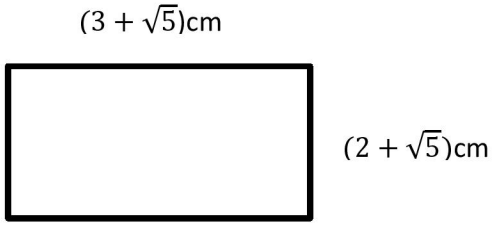
5. Expand and simplify $(\sqrt{5}-\sqrt{10})^2$ giving your answer in the $a+b\sqrt{2}$ where a and b are integers.

$$(\sqrt{5}-\sqrt{10})(\sqrt{5}-\sqrt{10})$$
$$=5-\sqrt{50}-\sqrt{50}+\sqrt{100}$$
$$=15-2\sqrt{50}$$
$$=15-2\sqrt{25\times 2}$$
$$=15-10\sqrt{2}$$

…… **(4)**

2) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.



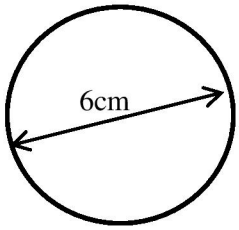
$(3+\sqrt{5})(2+\sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

3) Circle Problems: Easier

1. A circle of **diameter** 6cm is shown below



(a) Find the **circumference** of the circle, to one decimal place.

$C = \pi d = \pi \times 6 = 18.8cm$

(b) Find the **area** of the circle, to one decimal place.

$A = \pi r^2 = \pi \times 3^2 = 28.3cm^2$

(4 Marks)

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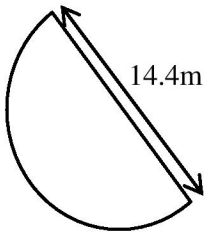
2. A semicircle of **diameter** 14.4m is shown below



(a) Find the **perimeter** of the semicircle, to 2 significant figures.

$C = \pi d = \pi \times 14.4 = 45.2m \quad 45.2 \div 2 + 14.4 = 37m$

(b) Find the **area** of the semicircle, to 2 significant figures.

$A = \pi r^2 = \pi \times 7.2^2 = 162.86m^2 \quad 162.86 \div 2 = 81m^2$

(4 Marks)

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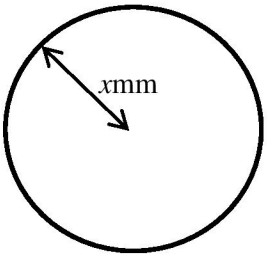
3. The circle shown below has **area** 50mm^2



(a) Find the **radius** of the circle, giving your answer to the nearest integer.

$A = \pi r^2 \rightarrow 50 = \pi \times r^2 \rightarrow r^2 = 50 \div \pi = 15.92 \rightarrow r = \sqrt{15.92} = 4mm$

(b) Find the **circumference** of the circle, giving your answer to the nearest integer.

$C = \pi d = \pi \times 8 = 25mm$

(4 Marks)

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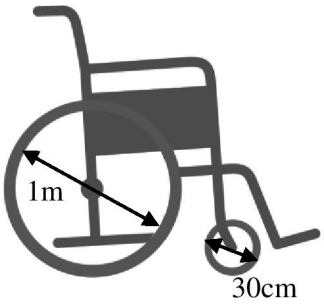
3) Circle Problems: Medium

4. A wheelchair has two different sizes of wheel. The front wheel has a **diameter** of 30cm, and the back wheel has a diameter of 1m.



When the wheelchair travels a distance of 1km, how many more rotations does the front wheel do, than the back wheel?

Give your answer to the nearest whole number.

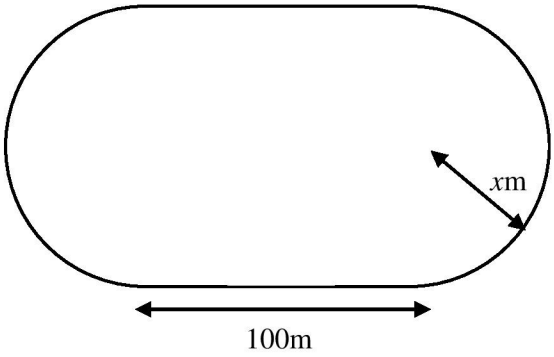
Front: $C = \pi d = \pi \times 0.3 = 0.94m$ 1000 ÷ 0.94 = 1064 rotations

Back: $C = \pi d = \pi \times 1 = 3.14m$ 1000 ÷ 3.14 = 318 rotations

1064 – 318 = 746 rotations more

(4 Marks)

5. An athletics track is being built in the shape of the diagram shown below, where each end of the track is a perfect semicircle.



The track distance needs to be 400m, with each straight section being 100m.

(a) Calculate *x*, the radius of the semi-circular section of track, so the one entire lap of the track is 400m. Give your answer to 3 significant figures.

Curved section = 400 - 100 – 100 = 200m

$C = \pi d \rightarrow 200 = \pi \times d \rightarrow d = 200 \div \pi = 63.66\text{m} \rightarrow r = 31.8m$

The area inside the track is going to be planted with grass seed. One pack of grass seed costs £17.99 and covers 60m^2.

(b) Using your answer to part (a), what will the cost of the grass seed for the track be?

$A = \pi r^2 = \pi \times 31.8^2 =$ 3176.9. Then 100 x 2x = 6366.2.

Total Area = 3176.9 + 6366.2 = 9813.1

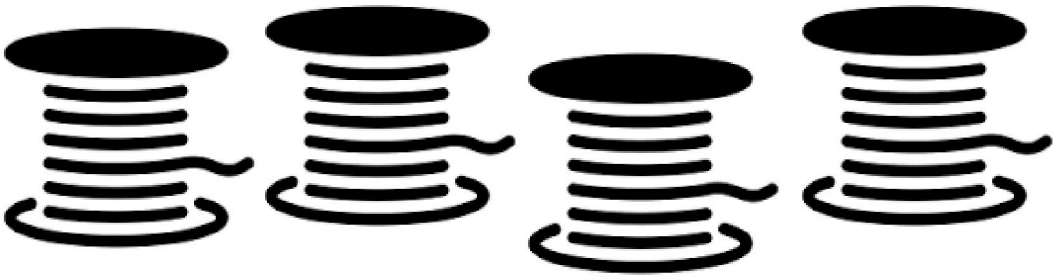
9813.1 / 60 = 163.5 packets, actually 164.

164 x £17.99 = £2950.36

(5 Marks)

3) Circle Problems: Harder

6. A sewing shop buys 100m of thread on 4 large reels.



Each large reel has a radius of 5cm.

(a) Calculate the number of times a piece of thread is wrapped round one reel.

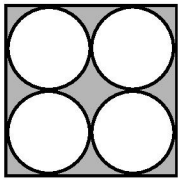
1 reel has 25m of thread

$C = \pi d = \pi \times 10 = 31.4cm = 0.314m$

$25 \div 0.314 = 79.6$

80 wraps

The large reels are stored upright in a square box 20cm, as shown below.



(b) What area of the floor space of the box, is not taken up by reels.

Reels: $A = \pi r^2 = \pi \times 5^2 = 78.5cm^2$

Box: $A = 20 \times 20 = 400cm^2$

$400 - 4 \times 78.5$

$= 86cm^2$

The thread from **one** reel is unwrapped and sold on 5 smaller reels separately.

(c) If each of the smaller reels has thread wrapped around it 50 times, what must the **diameter** of the smaller reel be?

Small reel holds 5m thread (25÷5)

The circumference of the small reel must be 10cm (5m ÷ 50 wraps)

$C = \pi d \rightarrow 10 = \pi \times d \rightarrow d = 10 \div \pi = 3.18cm$

$3.18cm$

(7 Marks)

4) Estimation: Easier

1. Work out an estimate for the value of

$$5.1 \times 98$$

$5 \times 100 =$

500

(2 marks)

2. Estimate the value of

$$\frac{68 \times 401}{198}$$

$\frac{70 \times 400}{200} =$

140

(2 marks)

3. Work out an estimate for the value of

$$\frac{637}{3.2 \times 9.8}$$

$\frac{600}{3 \times 10} = 20$

20

(2 marks)

4) Estimation: Medium

4. Which is the best estimate for the value of

$$\frac{37.9 \times 50.2}{2.1 + 2.98}$$

$$\frac{40 \times 50}{2+3} = \frac{2000}{5} = 400$$

(3 marks)

5. Which is the best estimate for the value of

$$\frac{38.3 \times 51.7}{2.1}$$

$$\frac{40 \times 50}{2} = 1000$$

.....

(3 marks)

4) Estimation: Harder

Worded Estimation

Heather runs round a circular track many times each day.

She runs 4.18km a day for 197 days.

The track is 0.2 km.

Estimate how many times heather has run round the track.

(3 marks)

$4.18\text{km} \approx 4$

$197\text{ days} \approx 200$

$4 \times 200 = 800\text{ km}$ (1)

$0.21 \approx 0.2$

$\frac{800}{0.2}$ (2) $= 800 \times 5$ (3)

$= 4000$ times

5) Interior and Exterior Angles: Easier

1. A regular decagon has 10 sides.

(a) Calculate the **sum** of its **interior** angles.

$(10 - 8) \times 180$

.....1440°.....

(b) Calculate the size of **one** of its **interior** angles.

$1440 \div 10$

.....144°.....

(2 Marks)

---

2. A regular 15 sided shape can be called a pentadecagon.

(a) Write down the **sum** of its **exterior** angles.

.....360°.....

(b) Calculate the size of **one** of its **exterior** angles.

$360 \div 15$

.....24°.....

(2 Marks)

---

3. What is the name of the regular polygon with an **exterior** angle of 72°?

$360 \div 72 = 5$

.....pentagon.....

(1 Mark)

---

4. If a regular polygon has an interior angle of 140°, how many sides does it have?

Exterior angle: $180 - 140 = 40$

Sides: $360 \div 40$

.....9.....

(2 Marks)

---

5) Interior and Exterior Angles: Medium

5. A portion of a regular polygon with a reflex angle of 200° outside the shape, is shown below.

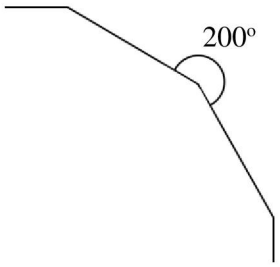


Diagram not accurately drawn

How many sides does the polygon have?

Exterior angle: $200 - 180 = 20$

Sides: $360 \div 20 = 18$

..... 18.....

(2 Marks)

---

6. A portion of a regular polygon is shown below with straight lines extending from two of its sides. These lines cross forming an angle of 144°.

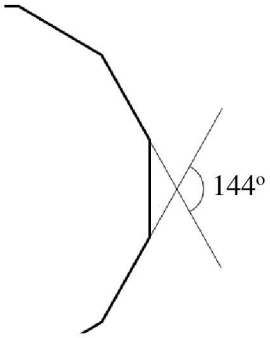


Diagram not accurately drawn

How many sides does the polygon have?

Obtuse angle in triangle: 144 (vertically opposite)

Base angle sum in isosceles triangle: $180 - 144 = 36$

Exterior angle: $36 \div 2 = 18$

Sides: $360 \div 18 = 20$

..... 20.....

(4 Marks)

---

5) Interior and Exterior Angles: Harder

7. A primary school teacher gives pupils a regular black pentagon, and five regular white hexagons. She tells them to glue them onto a flat piece of paper in a football pattern, as shown below.

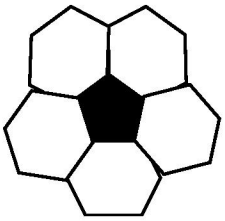


Diagram not accurately drawn

She says to be careful to make all of the edges and corners meet.

Use interior angles to show that this cannot be done.

Pentagon interior angle: $(5-2) \times 180 \div 5 = 108°$
Hexagon interior angle: $(6-2) \times 180 \div 6 = 120°$
Where two hexagons meet the pentagon the sum of the angles is 348°. Angles around a point add up to 360°, therefore the pattern can't be create without gaps.

(3 Marks)

---

8. The diagram below shows two regular polygons placed edge to edge, with two equilateral triangles fitting exactly in the gaps.

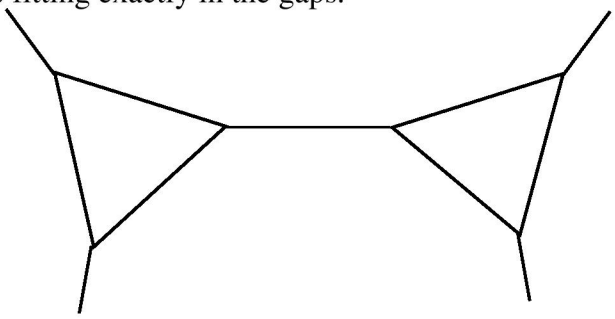


Diagram not accurately drawn

(a) If the two polygons are identical, how many sides do they have?

Angles in equilateral triangle: 60
Interior angle of each polygon: $(360-60) \div 2 = 150$
Exterior angle of each polygon: $180 - 150 = 30$
Polygon sides: $360 \div 30 = 12$ ..... 12.....

(b) If the one of the polygons has 24 sides, what is the name of the other polygon?

Interior angle of 24 sided polygon : $180 - (360 \div 24) = 165$
Interior angle of other polygon : $360 - 165 - 60 = 135$
Sides of other polygon: $360 \div (180 - 135) = 8$

..... octagon.....

(6 Marks)

GREGORY Jacob

9to1_AQA_Nov2017_GCSE_1H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	9 from 34	4 from 12	1 from 8	2 from 9	2 from 5	0 from 0
A02 and 3	16 from 46	3 from 10	5 from 14	5 from 7	0 from 8	3 from 7
Total	25 from 80	7 from 22	6 from 22	7 from 16	2 from 13	3 from 7

Your Pinpoint Topics

(1) Understanding Algebra. MWatch: NA, Hegarty:

(2) Estimation. MWatch: 91, Hegarty:

(3) Interior and Exterior Angles. MWatch: , Hegarty:

(4) Similar Shapes Volume and Area SF. MW: 200, Hgrty:

(5) Factorising Quadratics with a coefficient greater than 1. MW: , Hgrty:

1) Understanding Algebra: Easier

1) a x a is always equal to

ANSWER = C

a) a2 b) 2a c) a^2 d) 2 x a

(1 mark)

---

2) $y= x^2$.

When x = -3, what is the value of y?

$(-3)^2 = (-3) \times (-3) = 9$. (not – 9)

(1 Mark1)

---

3) (y-5)(y-3) is always equal to: (Show working and circle a, b, c or d)

$y^2 – 5y -3y + 15$

$= y^2 - 8y +15$

ANSWER = D

a) $y^2+8y+15$ b) $y^2-8y-15$ c) $2y+8y+15$ d) $y^2-8y+15$

(2 marks)

---

1) Understanding Algebra: Medium

4) The expression

$$(x-3)^2$$

is always equal to: (Show all your working and circle a, b, c or d)

$(x-3)(x-3) = x^2 - 3x - 3x + 9 = x^2 - 6x + 9$

ANSWER = C

(a) $x^2 - 9$ (b) $x^2 + 9$ (c) $x^2 - 6x + 9$ (d) $x^2 - 6x - 9$

(2 Marks)

---

5) $(x+1)^2$ is always equal to: (Show all your working and circle a, b, c or d)

$(x+1)(x+1) = x^2 + x + x + 1 = x^2 + 2x + 1$

ANSWER = D

a) $x^2 + 1$ b) $x^2 + 2$ c) $x^2 + x + 1$ d) $x^2 + 2x + 1$

(2 Marks)

---

6) Solve $x^2 = 81$.

$x = \pm\sqrt{81}$

= 9 and -9 (or ± 9)

You will lose a mark here if you don't include -9.

x=_____

(2 Marks)

1) Understanding Algebra: Harder

7) Simplify

$$\frac{(x+1)2}{(x+1)}$$

ANSWER = (x+1)

(2 Marks)

8) $y = (x+3)^2$

x can be any number.

a) What is the smallest value that y can take?

ANSWER: $y = 0$

(y can never be negative)

b) What value of x makes y equal to its minimum value?

WHEN x = -3

(2 Marks)

2) Estimation: Easier

1. Work out an estimate for the value of

$$5.1 \times 98$$

$5 \times 100 =$

500

(2 marks)

2. Estimate the value of

$$\frac{68 \times 401}{198}$$

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140

(2 marks)

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(2 Marks)

---

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.....24°.....

(2 Marks)

---

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(2 Marks)

---

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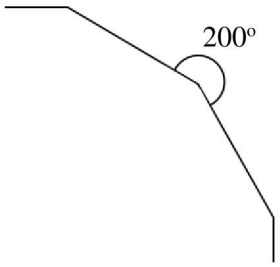

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(2 Marks)

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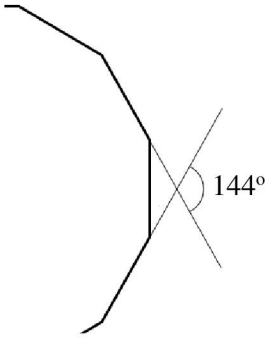

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(4 Marks)

---

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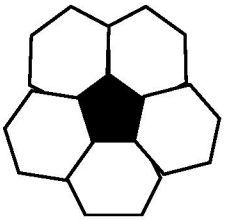

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(3 Marks)

---

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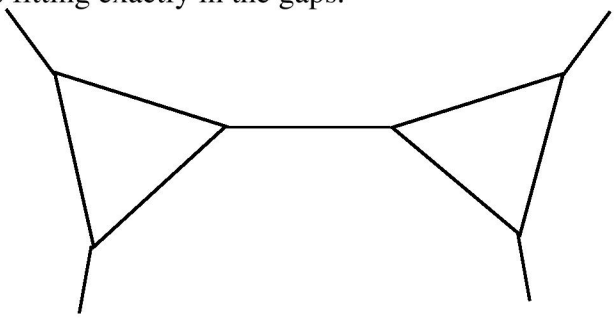

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..... octagon.....

(6 Marks)

4) Similar Shapes Volume and Area SF: Easier

Solution for Question 1:

Scale factor: $\frac{9}{3} = 3$

Area of Quadrilateral B: $24 \times 3^2 = 216\text{cm}^2$

Solution for Question 2:

Scale factor: $\frac{14}{7} = 2$

Volume of Cuboid D: $35 \times 2^3 = 280\text{m}^3$

Solution for Question 3:

$\frac{243}{75} = 3.24$

$\sqrt{3.24} = 1.8$

$\text{h} = 10\text{cm} \times 1.8$

18cm

4) Similar Shapes Volume and Area SF: Medium

Solution for Question 4:

$$\frac{343}{125} = 2.744$$

$$\sqrt[3]{2.744} = 1.4$$

$$x = 20 \times 1.4$$

$$x = 28\text{cm}$$

$$y = \frac{56}{1.4}$$

$$y = 40\text{cm}$$

Solution for Question 5:

$$\frac{200\pi}{8\pi} = 25$$

$$\sqrt{25} = 5$$

$$7\pi \times 5^3$$

$$875\pi \text{ cm}^3$$

4) Similar Shapes Volume and Area SF: Harder

Solution for Question 6:

$\frac{175}{7} = 25$

$\sqrt{25} = 5$

$5 \times 5^3 = 625$ kg

$\frac{625}{10} = 62.5$ packs

Therefore 63 packs are required.

Solution for Question 7:

(1) 0.5 x AB x BC = 7
(2) 0.5 x BD x BC = 175
(3)

(2) / (1)

Gives

$\frac{BD}{AB} = 25$

$BD = 25AB$

Therefore AD = 25AB + AB = 26AB

Scale Factor between ADF and ABC:

$\frac{AD}{AB} = \frac{26AB}{AB} = 26$

Area of CDE: 7 x 26^2 – 7 – 175 = $4550cm^2$

5) Factorising Quadratics with a coefficient greater than 1: Easier

1) Solve $(4x + 2)(x - 1) = 0$

$4x+2=0$ $\quad x-1=0$

$4x=-2$ $\quad x=1$

$x=\frac{-2}{4}=\frac{-1}{2}$

$x=-1/2$ and 1

(2 Marks)

---

2) Solve $3x^2 + 7x + 2 = 0$

A/C $\quad x \to 6$, $+ \to 7$

$3x^2+6x+x+2=0$

$3x(x+2)+1(x+2)=0$

$(3x+1)(x+2)=0$

$3x+1=0$ $\quad x+2=0$

$3x=-1$ $\quad x=-2$

$x=-1/3$

$x=-1/3$ and -2

(2 Marks)

---

3) Solve $2a^2 + 7a + 5 = 0$

$x \to 10$, $+ \to 7$

$2a^2+2a+5a+5=0$

$2a(a+1)+5(a+1)=0$

$(2a+5)(a+1)=0$

$2a+5=0$ $\quad a=-1$

$2a=-5$

$a=-5/2$

$a=-5/2$ and -1

(2 Marks)

---

4) Solve $2x^2 + 5x - 3 = 0$

$x \to -6$, $+ \to 5$

$2x^2+6x-x-3=0$

$2x(x+3)-1(x+3)=0$

$(2x-1)(x+3)=0$

$2x-1=0$ $\quad x+3=0$

$2x=1$ $\quad x=-3$

$x=1/2$

$x=1/2$ and -3

(2 Marks)

5) Factorising Quadratics with a coefficient greater than 1: Medium

5) Solve $6x^2 - x - 15 = 0$

$X - 90$, $+ \rightarrow -1$

$6x^2 + 9x - 10x - 15 = 0$

$3x(2x+3) - 5(2x+3) = 0$

$(3x-5)(2x+5) = 0$

$3x - 5 = 0$ $\quad$ $2x + 3 = 0$

$3x = 5$ $\quad$ $2x = -3$

$x = 5/3$ $\quad$ $x = -3/2$

$x = 5/3$ and $-3/2$

(2 Marks)

---

6) Solve, by factorising, the equation $8x^2 - 30x - 27 = 0$

$X \rightarrow -216$, $+ -30$

$8x^2 - 36x + 6x - 27 = 0$

$4x(2x-9) + 3(2x-9) = 0$

$(4x+3)(2x-9) = 0$

$4x + 3 = 0$ $\quad$ $2x - 9 = 0$

$4x = -3$ $\quad$ $2x = 9$

$x = -3/4$ $\quad$ $x = 9/2$

$x = -\frac{3}{4}$ and $9/2$

(2 Marks)

---

7) Simplify

$$\frac{2x^2 - 5x + 3}{2x^2 - x - 3}$$

Factorise $2x^2 - 5x + 3$

$X \rightarrow 6$, $+ \rightarrow -5$

$2x^2 - 2x - 3x + 3$

$2x(x-1) - 3(x-1)$

$(2x-3)(x-1)$

Factorise $2x^2 - x - 3$

$X \rightarrow -6$, $+ -1$

$2x^2 + 2x - 3x - 3$

$2x(x+1) - 3(x+1)$

$(2x-3)(x+1)$

$$\frac{(2x-3)(x-1)}{(2x-3)(x+1)}$$

$$\frac{x-1}{x+1}$$

(2 Marks)

5) Factorising Quadratics with a coefficient greater than 1: Harder

8) Simplify

$$\frac{5x^2 + x - 6}{5x^2 - 9x - 18}$$

Factorising $5x^2+x-6$

$x \to -30$ $+ \to +1$

$5x^2 + 5x + 6x - 6$

$5x(x-1) + 6(x-1)$

$(5x+6)(x-1)$

factorising $5x^2-9x-18$

$x \to -90$, $+ -9$

$5x^2 - 15x + 6x - 18$

$5x(x-3) + 6(x-3)$

$(5x+6)(x-3)$

$$\frac{(5x+6)(x-1)}{(5x+6)(x-3)}$$

$x-1/x-3$

(2 Marks)

9) The two rectangles have the same area

$4x - 1$		$3x - 2$	
Rectangle C	x	Rectangle D	$x + 2$

a) Write an equation showing this.

$x(4x-1) = (3x-2)(x-2)$

$4x^2 - x = 3x^2 + 6x - 2x - 4$

$4x^2 - 3x^2 - x - 6x + 2x + 4 = 0$

$x^2 - 5x + 4 = 0$

$x^2 - 5x + 4 = 0$

b) Solve the equation. These are two possible solutions for the areas of these rectangles. Find them both.

$x^2 - 5x + 4 = 0$

$(x-4)(x-1) = 0$

$x - 4 = 0$ $\quad x - 1 = 0$

$x = 4$ $\quad x = 1$

Area 1 $= (4x-1)(x)$

$(4(4)-1)(4)$

$15 \times 4 = 60$

Area 2 $= (4x-1)(x)$

$(4(1)-1)(1)$

$3 \times 1 = 3$

60 and 3.

(3 Marks)

MADDISON Lillie

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Strand	Overall	Number	Algebra	Data	Shape	Ratio
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Total	11 from 80	4 from 22	2 from 22	4 from 16	1 from 13	0 from 7

Your Pinpoint Topics

(1) Index Notation. MWatch: 131, Hegarty:

(2) Understanding Algebra. MWatch: NA, Hegarty:

(3) Surds. MWatch: 207, Hegarty:

(4) Circle Problems. MWatch: , Hegarty:

(5) Estimation. MWatch: 91, Hegarty:

1) Index Notation: Easier

1. (a) Simplify $m^3 \times m^6$ $= m^{3+6}$

m^9

(1)

(b) Simplify $\frac{p^8}{p^2}$ p^{8-2}

p^6

(1)

(c) Simplify $(2n^3)^4$ $16n^{3\times4}$

$16n^{12}$

(2)

(4 marks)

---

2. (a) Simplify $m^6 \times m^7$ m^{6+7}

(1)

m^{13}

(b) Simplify x^0

(1)

1

(c) Simplify $(16y^6)^{\frac{1}{2}}$

$\sqrt{16}\, y^{\frac{6}{2}}$

(2)

$4y^3$

(4 marks)

---

3. (a) Simplify $m^5 \div m^3$ m^{5-3}

m^2

(1)

(b) Simplify $5x^4y^3 \times x^2y$ $5x^{4+2}y^{3+1}$

$5x^6y^4$

(2)

(3 marks)

---

1) Index Notation: Medium

4. (a) Simplify $a^4 \times a^5$

a^{4+5}

a^9

(1)

(b) Simplify $\frac{45e^6 f^8}{5ef^2}$

$9e^{6-1} f^{8-2}$

$9e^5 f^6$

(2)

(c) Write down the value of $9^{\frac{1}{2}}$

$\sqrt{9}$

3

(1)

(4 marks)

---

5. (a) Simplify $m^2 \times m^4$

m^{2+4}

m^6

(1)

(b) Simplify $y^7 \div y^5$

y^{7-5}

y^2

(1)

(c) Simplify $(m^3)^5$

$m^{3\times5}$

m^{15}

(2)

(4 marks)

---

6. Simplify fully

(a) $p^2 \times p^7$

p^{2+7}

p^9 **(1)**

(b) $\frac{3q^4 \times 2q^5}{q^3}$

$\frac{(3\times2)q^{4+5}}{q^3} = 6q^{9-3}$

$6q^6$ **(2)**

(c) $(2xy^3)^5$

$2^5 x^5 y^{3\times5}$

$32x^5y^{15}$ **(2)**

(4 marks)

---

1) Index Notation: Harder

20. (a) Find the value of

(i) 64°

1

(ii) $64^{\frac{1}{2}}$ $\sqrt{64}$

8

(iii) $64^{-\frac{2}{3}}$ $= \frac{1}{64^{2/3}}$ $= \left(\sqrt[3]{64}\right)^2 = \frac{1}{4^2}$

$\frac{1}{16}$ or 0.0625

(4 marks)

2) Understanding Algebra: Easier

1) a x a is always equal to

ANSWER = C

a) a2 b) 2a c) a^2 d) 2 x a

(1 mark)

---

2) $y= x^2$.

When x = -3, what is the value of y?

$(-3)^2 = (-3) \times (-3) = 9$. (not – 9)

(1 Mark1)

---

3) (y-5)(y-3) is always equal to: (Show working and circle a, b, c or d)

$y^2 – 5y -3y + 15$

$= y^2 - 8y +15$

ANSWER = D

a) $y^2+8y+15$ b) $y^2-8y-15$ c) $2y+8y+15$ d) $y^2-8y+15$

(2 marks)

2) Understanding Algebra: Medium

4) The expression

$$(x-3)^2$$

is always equal to: (Show all your working and circle a, b, c or d)

$(x-3)(x-3) = x^2 - 3x - 3x + 9 = x^2 - 6x + 9$

ANSWER = C

(a) $x^2 - 9$ (b) $x^2 + 9$ (c) $x^2 - 6x + 9$ (d) $x^2 - 6x - 9$

(2 Marks)

---

5) $(x+1)^2$ is always equal to: (Show all your working and circle a, b, c or d)

$(x+1)(x+1) = x^2 + x + x + 1 = x^2 + 2x + 1$

ANSWER = D

a) $x^2 + 1$ b) $x^2 + 2$ c) $x^2 + x + 1$ d) $x^2 + 2x + 1$

(2 Marks)

---

6) Solve $x^2 = 81$.

$x = \pm\sqrt{81}$

= 9 and -9 (or ± 9)

You will lose a mark here if you don't include -9.

x=_____

(2 Marks)

2) Understanding Algebra: Harder

7) Simplify

$$\frac{(x+1)2}{(x+1)}$$

ANSWER = (x+1)

(2 Marks)

8) $y = (x+3)^2$

x can be any number.

a) What is the smallest value that y can take?

ANSWER: $y = 0$

(y can never be negative)

b) What value of x makes y equal to its minimum value?

WHEN x = -3

(2 Marks)

3) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

3) Surds: Medium

4. Expand and simplify $(4-2\sqrt{3})^2$ giving your answer in the $a+b\sqrt{3}$ where a and b are integers.

$$(4-2\sqrt{3})(4-2\sqrt{3})$$
$$=16-8\sqrt{3}-8\sqrt{3}+12$$
$$=30-16\sqrt{3}$$

…… **(3)**

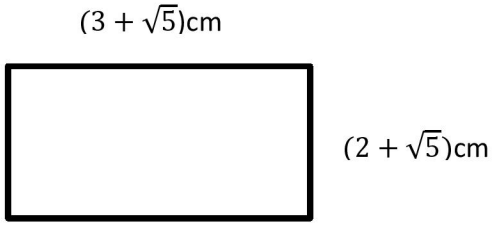
5. Expand and simplify $(\sqrt{5}-\sqrt{10})^2$ giving your answer in the $a+b\sqrt{2}$ where a and b are integers.

$$(\sqrt{5}-\sqrt{10})(\sqrt{5}-\sqrt{10})$$
$$=5-\sqrt{50}-\sqrt{50}+\sqrt{100}$$
$$=15-2\sqrt{50}$$
$$=15-2\sqrt{25\times 2}$$
$$=15-10\sqrt{2}$$

…… **(4)**

3) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.



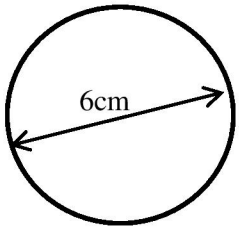
$(3+\sqrt{5})(2+\sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

4) Circle Problems: Easier

1. A circle of **diameter** 6cm is shown below



(a) Find the **circumference** of the circle, to one decimal place.

$C = \pi d = \pi \times 6 = 18.8cm$

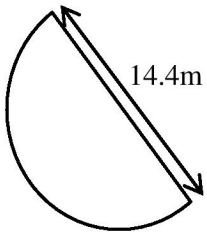
(b) Find the **area** of the circle, to one decimal place.

$A = \pi r^2 = \pi \times 3^2 = 28.3cm^2$

(4 Marks)

---

2. A semicircle of **diameter** 14.4m is shown below



(a) Find the **perimeter** of the semicircle, to 2 significant figures.

$C = \pi d = \pi \times 14.4 = 45.2m \quad 45.2 \div 2 + 14.4 = 37m$

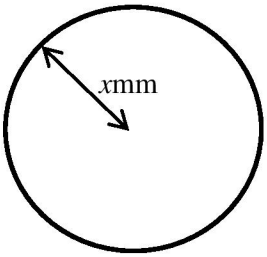
(b) Find the **area** of the semicircle, to 2 significant figures.

$A = \pi r^2 = \pi \times 7.2^2 = 162.86m^2 \quad 162.86 \div 2 = 81m^2$

(4 Marks)

---

3. The circle shown below has **area** 50mm^2



(a) Find the **radius** of the circle, giving your answer to the nearest integer.

$A = \pi r^2 \rightarrow 50 = \pi \times r^2 \rightarrow r^2 = 50 \div \pi = 15.92 \rightarrow r = \sqrt{15.92} = 4mm$

(b) Find the **circumference** of the circle, giving your answer to the nearest integer.

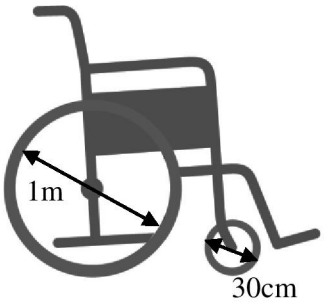
$C = \pi d = \pi \times 8 = 25mm$

(4 Marks)

---

4) Circle Problems: Medium

4. A wheelchair has two different sizes of wheel. The front wheel has a **diameter** of 30cm, and the back wheel has a diameter of 1m.



When the wheelchair travels a distance of 1km, how many more rotations does the front wheel do, than the back wheel?

Give your answer to the nearest whole number.

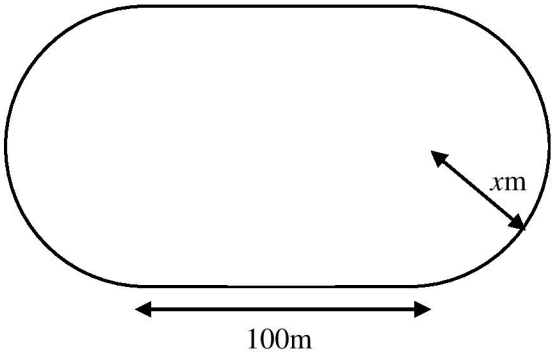
Front: $C = \pi d = \pi \times 0.3 = 0.94m$ 1000 ÷ 0.94 = 1064 rotations

Back: $C = \pi d = \pi \times 1 = 3.14m$ 1000 ÷ 3.14 = 318 rotations

1064 – 318 = 746 rotations more

(4 Marks)

5. An athletics track is being built in the shape of the diagram shown below, where each end of the track is a perfect semicircle.



The track distance needs to be 400m, with each straight section being 100m.

(a) Calculate *x*, the radius of the semi-circular section of track, so the one entire lap of the track is 400m. Give your answer to 3 significant figures.

Curved section = 400 - 100 – 100 = 200m

$C = \pi d \rightarrow 200 = \pi \times d \rightarrow d = 200 \div \pi = 63.66m \rightarrow r = 31.8m$

The area inside the track is going to be planted with grass seed. One pack of grass seed costs £17.99 and covers 60m^2.

(b) Using your answer to part (a), what will the cost of the grass seed for the track be?

$A = \pi r^2 = \pi \times 31.8^2 =$ 3176.9. Then 100 x 2x = 6366.2.

Total Area = 3176.9 + 6366.2 = 9813.1

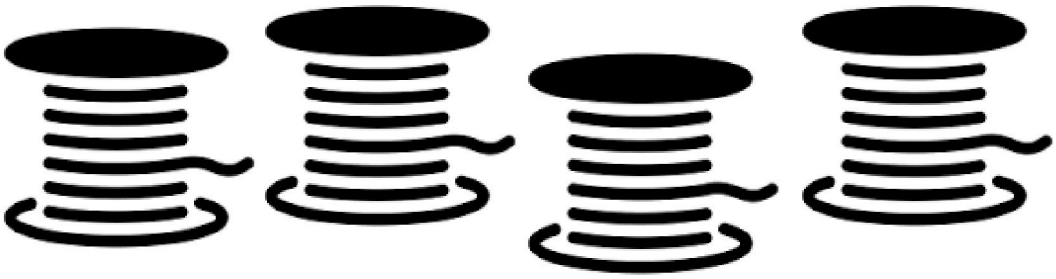
9813.1 / 60 = 163.5 packets, actually 164.

164 x £17.99 = £2950.36

(5 Marks)

4) Circle Problems: Harder

6. A sewing shop buys 100m of thread on 4 large reels.



Each large reel has a radius of 5cm.

(a) Calculate the number of times a piece of thread is wrapped round one reel.

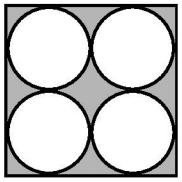
1 reel has 25m of thread

$C = \pi d = \pi \times 10 = 31.4cm = 0.314m$

$25 \div 0.314 = 79.6$

80 wraps

The large reels are stored upright in a square box 20cm, as shown below.



(b) What area of the floor space of the box, is not taken up by reels.

Reels: $A = \pi r^2 = \pi \times 5^2 = 78.5cm^2$

Box: $A = 20 \times 20 = 400cm^2$

$400 - 4 \times 78.5$

$= 86cm^2$

The thread from **one** reel is unwrapped and sold on 5 smaller reels separately.

(c) If each of the smaller reels has thread wrapped around it 50 times, what must the **diameter** of the smaller reel be?

Small reel holds 5m thread (25÷5)

The circumference of the small reel must be 10cm (5m ÷ 50 wraps)

$C = \pi d \rightarrow 10 = \pi \times d \rightarrow d = 10 \div \pi = 3.18cm$

$3.18cm$

(7 Marks)

5) Estimation: Easier

1. Work out an estimate for the value of

$$5.1 \times 98$$

$5 \times 100 =$

500

(2 marks)

2. Estimate the value of

$$\frac{68 \times 401}{198}$$

$\frac{70 \times 400}{200} =$

140

(2 marks)

3. Work out an estimate for the value of

$$\frac{637}{3.2 \times 9.8}$$

$\frac{600}{3 \times 10} = 20$

20

(2 marks)

5) Estimation: Medium

4. Which is the best estimate for the value of

$$\frac{37.9 \times 50.2}{2.1 + 2.98}$$

$$\frac{40 \times 50}{2+3} = \frac{2000}{5} = 400$$

(3 marks)

5. Which is the best estimate for the value of

$$\frac{38.3 \times 51.7}{2.1}$$

$$\frac{40 \times 50}{2} = 1000$$

.....

(3 marks)

5) Estimation: Harder

Worded Estimation

Heather runs round a circular track many times each day.

She runs 4.18km a day for 197 days.

The track is 0.2 km.

Estimate how many times heather has run round the track.

(3 marks)

$4.18\text{km} \approx 4$

$197\text{ days} \approx 200$

$4 \times 200 = 800\text{ km}$ (1)

$0.21 \approx 0.2$

$\frac{800}{0.2}$ (2) $= 800 \times 5$ (3)

$= 4000$ times

9to1_AQA_Nov2017_GCSE_1H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	6 from 34	1 from 12	0 from 8	4 from 9	1 from 5	0 from 0
A02 and 3	11 from 46	4 from 10	2 from 14	0 from 7	0 from 8	5 from 7
Total	17 from 80	5 from 22	2 from 22	4 from 16	1 from 13	5 from 7

Your Pinpoint Topics

(1) Index Notation. MWatch: 131, Hegarty:

(2) Understanding Algebra. MWatch: NA, Hegarty:

(3) Surds. MWatch: 207, Hegarty:

(4) Circle Problems. MWatch: , Hegarty:

(5) Estimation. MWatch: 91, Hegarty:

1) Index Notation: Easier

1. (a) Simplify $m^3 \times m^6$ $= m^{3+6}$

m^9

(1)

(b) Simplify $\frac{p^8}{p^2}$ p^{8-2}

p^6

(1)

(c) Simplify $(2n^3)^4$ $16n^{3\times4}$

$16n^{12}$

(2)

(4 marks)

---

2. (a) Simplify $m^6 \times m^7$ m^{6+7}

(1)

m^{13}

(b) Simplify x^0

(1)

1

(c) Simplify $(16y^6)^{\frac{1}{2}}$

$\sqrt{16}\, y^{\frac{6}{2}}$

(2)

$4y^3$

(4 marks)

---

3. (a) Simplify $m^5 \div m^3$ m^{5-3}

m^2

(1)

(b) Simplify $5x^4y^3 \times x^2y$ $5x^{4+2}y^{3+1}$

$5x^6y^4$

(2)

(3 marks)

---

1) Index Notation: Medium

4. (a) Simplify $a^4 \times a^5$

a^{4+5}

a^9

(1)

(b) Simplify $\frac{45e^6 f^8}{5ef^2}$

$9e^{6-1} f^{8-2}$

$9e^5 f^6$

(2)

(c) Write down the value of $9^{\frac{1}{2}}$

$\sqrt{9}$

3

(1)

(4 marks)

---

5. (a) Simplify $m^2 \times m^4$

m^{2+4}

m^6

(1)

(b) Simplify $y^7 \div y^5$

y^{7-5}

y^2

(1)

(c) Simplify $(m^3)^5$

$m^{3\times5}$

m^{15}

(2)

(4 marks)

---

6. Simplify fully

(a) $p^2 \times p^7$

p^{2+7}

p^9 **(1)**

(b) $\frac{3q^4 \times 2q^5}{q^3}$

$\frac{(3\times2)q^{4+5}}{q^3} = 6q^{9-3}$

$6q^6$ **(2)**

(c) $(2xy^3)^5$

$2^5 x^5 y^{3\times5}$

$32x^5y^{15}$ **(2)**

(4 marks)

---

1) Index Notation: Harder

20. (a) Find the value of

(i) 64°

1

(ii) $64^{\frac{1}{2}}$ $\sqrt{64}$

8

(iii) $64^{-\frac{2}{3}}$ $= \frac{1}{64^{2/3}}$ $= \left(\sqrt[3]{64}\right)^2 = \frac{1}{4^2}$

$\frac{1}{16}$ or 0.0625

(4 marks)

2) Understanding Algebra: Easier

1) a x a is always equal to

ANSWER = C

a) a2 b) 2a c) a^2 d) 2 x a

(1 mark)

---

2) $y= x^2$.

When x = -3, what is the value of y?

$(-3)^2 = (-3) \times (-3) = 9$. (not – 9)

(1 Mark1)

---

3) (y-5)(y-3) is always equal to: (Show working and circle a, b, c or d)

$y^2 – 5y -3y + 15$

$= y^2 - 8y +15$

ANSWER = D

a) $y^2+8y+15$ b) $y^2-8y-15$ c) $2y+8y+15$ d) $y^2-8y+15$

(2 marks)

---

2) Understanding Algebra: Medium

4) The expression

$$(x-3)^2$$

is always equal to: (Show all your working and circle a, b, c or d)

$(x-3)(x-3) = x^2 - 3x - 3x + 9 = x^2 - 6x + 9$

ANSWER = C

(a) $x^2 - 9$ (b) $x^2 + 9$ (c) $x^2 - 6x + 9$ (d) $x^2 - 6x - 9$

(2 Marks)

---

5) $(x+1)^2$ is always equal to: (Show all your working and circle a, b, c or d)

$(x+1)(x+1) = x^2 + x + x + 1 = x^2 + 2x + 1$

ANSWER = D

a) $x^2 + 1$ b) $x^2 + 2$ c) $x^2 + x + 1$ d) $x^2 + 2x + 1$

(2 Marks)

---

6) Solve $x^2 = 81$.

$x = \pm\sqrt{81}$

= 9 and -9 (or ± 9)

You will lose a mark here if you don't include -9.

x=_____

(2 Marks)

2) Understanding Algebra: Harder

7) Simplify

$$\frac{(x+1)2}{(x+1)}$$

ANSWER = (x+1)

_____

(2 Marks)

---

8) $y = (x+3)^2$

x can be any number.

a) What is the smallest value that y can take?

ANSWER: $y = 0$

(y can never be negative)

_____

b) What value of x makes y equal to its minimum value?

WHEN x = -3

_____

(2 Marks)

3) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

3) Surds: Medium

4. Expand and simplify $(4-2\sqrt{3})^2$ giving your answer in the $a+b\sqrt{3}$ where a and b are integers.

$$(4-2\sqrt{3})(4-2\sqrt{3})$$
$$=16-8\sqrt{3}-8\sqrt{3}+12$$
$$=30-16\sqrt{3}$$

…… **(3)**

5. Expand and simplify $(\sqrt{5}-\sqrt{10})^2$ giving your answer in the $a+b\sqrt{2}$ where a and b are integers.

$$(\sqrt{5}-\sqrt{10})(\sqrt{5}-\sqrt{10})$$
$$=5-\sqrt{50}-\sqrt{50}+\sqrt{100}$$
$$=15-2\sqrt{50}$$
$$=15-2\sqrt{25\times 2}$$
$$=15-10\sqrt{2}$$

…… **(4)**

3) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.

$(3 + \sqrt{5})$cm

$(2 + \sqrt{5})$cm

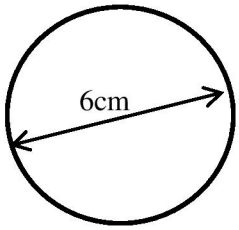
$(3 + \sqrt{5})\,(2 + \sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

4) Circle Problems: Easier

1. A circle of **diameter** 6cm is shown below



(a) Find the **circumference** of the circle, to one decimal place.

$C = \pi d = \pi \times 6 = 18.8cm$

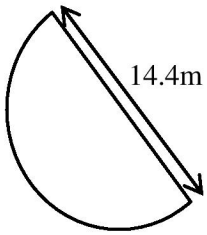
(b) Find the **area** of the circle, to one decimal place.

$A = \pi r^2 = \pi \times 3^2 = 28.3cm^2$

(4 Marks)

---

2. A semicircle of **diameter** 14.4m is shown below



(a) Find the **perimeter** of the semicircle, to 2 significant figures.

$C = \pi d = \pi \times 14.4 = 45.2m \quad 45.2 \div 2 + 14.4 = 37m$

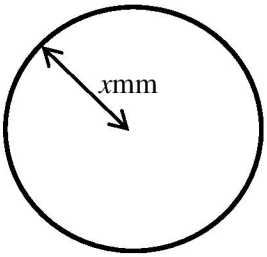
(b) Find the **area** of the semicircle, to 2 significant figures.

$A = \pi r^2 = \pi \times 7.2^2 = 162.86m^2 \quad 162.86 \div 2 = 81m^2$

(4 Marks)

---

3. The circle shown below has **area** 50mm^2



(a) Find the **radius** of the circle, giving your answer to the nearest integer.

$A = \pi r^2 \rightarrow 50 = \pi \times r^2 \rightarrow r^2 = 50 \div \pi = 15.92 \rightarrow r = \sqrt{15.92} = 4mm$

(b) Find the **circumference** of the circle, giving your answer to the nearest integer.

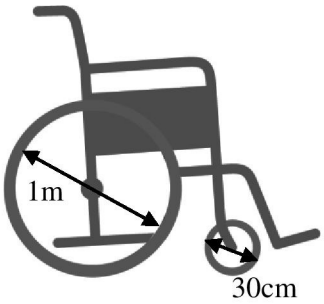
$C = \pi d = \pi \times 8 = 25mm$

(4 Marks)

---

4) Circle Problems: Medium

4. A wheelchair has two different sizes of wheel. The front wheel has a **diameter** of 30cm, and the back wheel has a diameter of 1m.



When the wheelchair travels a distance of 1km, how many more rotations does the front wheel do, than the back wheel?

Give your answer to the nearest whole number.

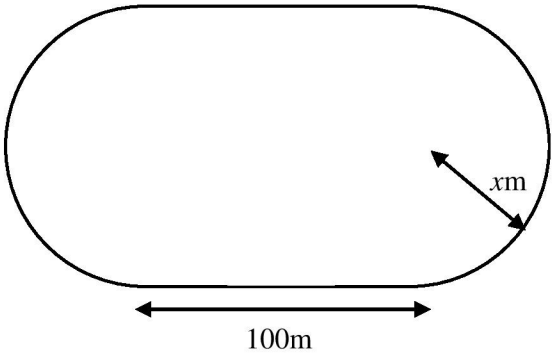
Front: $C = \pi d = \pi \times 0.3 = 0.94m$ 1000 ÷ 0.94 = 1064 rotations

Back: $C = \pi d = \pi \times 1 = 3.14m$ 1000 ÷ 3.14 = 318 rotations

1064 – 318 = 746 rotations more

(4 Marks)

5. An athletics track is being built in the shape of the diagram shown below, where each end of the track is a perfect semicircle.



The track distance needs to be 400m, with each straight section being 100m.

(a) Calculate *x*, the radius of the semi-circular section of track, so the one entire lap of the track is 400m. Give your answer to 3 significant figures.

Curved section = 400 - 100 – 100 = 200m

$C = \pi d \rightarrow 200 = \pi \times d \rightarrow d = 200 \div \pi = 63.66\text{m} \rightarrow r = 31.8m$

The area inside the track is going to be planted with grass seed. One pack of grass seed costs £17.99 and covers 60m^2.

(b) Using your answer to part (a), what will the cost of the grass seed for the track be?

$A = \pi r^2 = \pi \times 31.8^2 =$ 3176.9. Then 100 x 2x = 6366.2.

Total Area = 3176.9 + 6366.2 = 9813.1

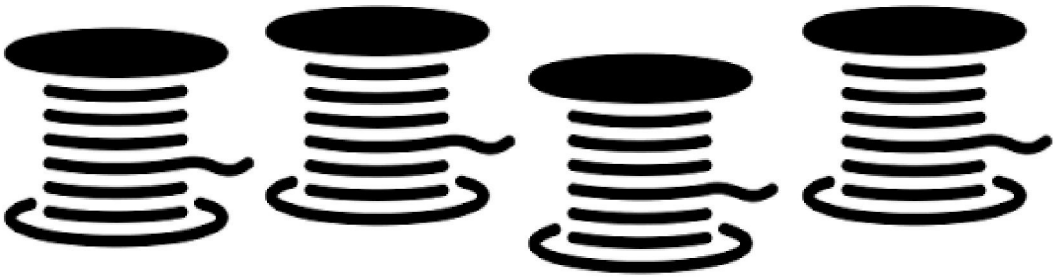
9813.1 / 60 = 163.5 packets, actually 164.

164 x £17.99 = £2950.36

(5 Marks)

4) Circle Problems: Harder

6. A sewing shop buys 100m of thread on 4 large reels.



Each large reel has a radius of 5cm.

(a) Calculate the number of times a piece of thread is wrapped round one reel.

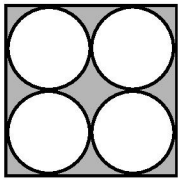
1 reel has 25m of thread

$C = \pi d = \pi \times 10 = 31.4cm = 0.314m$

$25 \div 0.314 = 79.6$

80 wraps

The large reels are stored upright in a square box 20cm, as shown below.



(b) What area of the floor space of the box, is not taken up by reels.

Reels: $A = \pi r^2 = \pi \times 5^2 = 78.5cm^2$

Box: $A = 20 \times 20 = 400cm^2$

$400 - 4 \times 78.5$

$= 86cm^2$

The thread from **one** reel is unwrapped and sold on 5 smaller reels separately.

(c) If each of the smaller reels has thread wrapped around it 50 times, what must the **diameter** of the smaller reel be?

Small reel holds 5m thread (25÷5)

The circumference of the small reel must be 10cm (5m ÷ 50 wraps)

$C = \pi d \rightarrow 10 = \pi \times d \rightarrow d = 10 \div \pi = 3.18cm$

$3.18cm$

(7 Marks)

5) Estimation: Easier

1. Work out an estimate for the value of

$$5.1 \times 98$$

$5 \times 100 =$

500

(2 marks)

2. Estimate the value of

$$\frac{68 \times 401}{198}$$

$\frac{70 \times 400}{200} =$

140

(2 marks)

3. Work out an estimate for the value of

$$\frac{637}{3.2 \times 9.8}$$

$\frac{600}{3 \times 10} = 20$

20

(2 marks)

5) Estimation: Medium

4. Which is the best estimate for the value of

$$\frac{37.9 \times 50.2}{2.1 + 2.98}$$

$$\frac{40 \times 50}{2+3} = \frac{2000}{5} = 400$$

(3 marks)

5. Which is the best estimate for the value of

$$\frac{38.3 \times 51.7}{2.1}$$

$$\frac{40 \times 50}{2} = 1000$$

.....

(3 marks)

5) Estimation: Harder

Worded Estimation

Heather runs round a circular track many times each day.

She runs 4.18km a day for 197 days.

The track is 0.2 km.

Estimate how many times heather has run round the track.

(3 marks)

$4.18\text{km} \approx 4$

$197\text{ days} \approx 200$

$4 \times 200 = 800\text{ km}$ (1)

$0.21 \approx 0.2$

$\frac{800}{0.2}$ (2) $= 800 \times 5$ (3)

$= 4000$ times

SAKELLARIOU Adonis

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	10 from 34	3 from 12	2 from 8	3 from 9	2 from 5	0 from 0
A02 and 3	10 from 46	3 from 10	2 from 14	5 from 7	0 from 8	0 from 7
Total	20 from 80	6 from 22	4 from 22	8 from 16	2 from 13	0 from 7

Your Pinpoint Topics

(1) Surds. MWatch: 207, Hegarty:

(2) Estimation. MWatch: 91, Hegarty:

(3) Interior and Exterior Angles. MWatch: , Hegarty:

(4) Similar Shapes Volume and Area SF. MW: 200, Hgrty:

(5) Factorising Quadratics with a coefficient greater than 1. MW: , Hgrty:

1) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

1) Surds: Medium

4. Expand and simplify $(4-2\sqrt{3})^2$ giving your answer in the $a+b\sqrt{3}$ where a and b are integers.

$$(4-2\sqrt{3})(4-2\sqrt{3})$$
$$=16-8\sqrt{3}-8\sqrt{3}+12$$
$$=30-16\sqrt{3}$$

…… **(3)**

5. Expand and simplify $(\sqrt{5}-\sqrt{10})^2$ giving your answer in the $a+b\sqrt{2}$ where a and b are integers.

$$(\sqrt{5}-\sqrt{10})(\sqrt{5}-\sqrt{10})$$
$$=5-\sqrt{50}-\sqrt{50}+\sqrt{100}$$
$$=15-2\sqrt{50}$$
$$=15-2\sqrt{25\times 2}$$
$$=15-10\sqrt{2}$$

…… **(4)**

1) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.

$(3 + \sqrt{5})$cm

$(2 + \sqrt{5})$cm

$(3 + \sqrt{5})\,(2 + \sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

2) Estimation: Easier

1. Work out an estimate for the value of

$$5.1 \times 98$$

$5 \times 100 =$

500

(2 marks)

2. Estimate the value of

$$\frac{68 \times 401}{198}$$

$\frac{70 \times 400}{200} =$

140

(2 marks)

3. Work out an estimate for the value of

$$\frac{637}{3.2 \times 9.8}$$

$\frac{600}{3 \times 10} = 20$

20

(2 marks)

2) Estimation: Medium

4. Which is the best estimate for the value of

$$\frac{37.9 \times 50.2}{2.1 + 2.98}$$

$$\frac{40 \times 50}{2+3} = \frac{2000}{5} = 400$$

(3 marks)

5. Which is the best estimate for the value of

$$\frac{38.3 \times 51.7}{2.1}$$

$$\frac{40 \times 50}{2} = 1000$$

..... (3 marks)

2) Estimation: Harder

Worded Estimation

Heather runs round a circular track many times each day.

She runs 4.18km a day for 197 days.

The track is 0.2 km.

Estimate how many times heather has run round the track.

(3 marks)

$4.18\text{km} \approx 4$

$197\text{ days} \approx 200$

$4 \times 200 = 800\text{ km}$ (1)

$0.21 \approx 0.2$

$\frac{800}{0.2}$ (2) $= 800 \times 5$ (3)

$= 4000$ times

3) Interior and Exterior Angles: Easier

1. A regular decagon has 10 sides.

(a) Calculate the **sum** of its **interior** angles.

$(10 - 8) \times 180$

.....1440°.....

(b) Calculate the size of **one** of its **interior** angles.

$1440 \div 10$

.....144°.....

(2 Marks)

---

2. A regular 15 sided shape can be called a pentadecagon.

(a) Write down the **sum** of its **exterior** angles.

.....360°.....

(b) Calculate the size of **one** of its **exterior** angles.

$360 \div 15$

.....24°.....

(2 Marks)

---

3. What is the name of the regular polygon with an **exterior** angle of 72°?

$360 \div 72 = 5$

.....pentagon.....

(1 Mark)

---

4. If a regular polygon has an interior angle of 140°, how many sides does it have?

Exterior angle: $180 - 140 = 40$

Sides: $360 \div 40$

.....9.....

(2 Marks)

---

3) Interior and Exterior Angles: Medium

5. A portion of a regular polygon with a reflex angle of 200° outside the shape, is shown below.

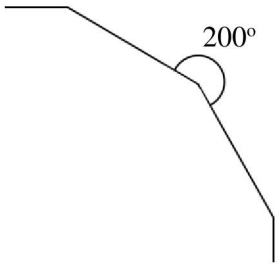

Diagram not accurately drawn

How many sides does the polygon have?

Exterior angle: $200 - 180 = 20$

Sides: $360 \div 20 = 18$

..... 18.....

(2 Marks)

---

6. A portion of a regular polygon is shown below with straight lines extending from two of its sides. These lines cross forming an angle of 144°.

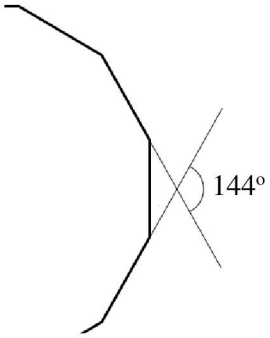

Diagram not accurately drawn

How many sides does the polygon have?

Obtuse angle in triangle: 144 (vertically opposite)

Base angle sum in isosceles triangle: $180 - 144 = 36$

Exterior angle: $36 \div 2 = 18$

Sides: $360 \div 18 = 20$

..... 20.....

(4 Marks)

---

3) Interior and Exterior Angles: Harder

7. A primary school teacher gives pupils a regular black pentagon, and five regular white hexagons. She tells them to glue them onto a flat piece of paper in a football pattern, as shown below.

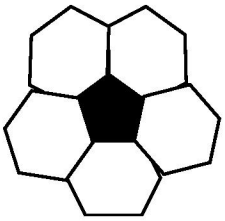

Diagram not accurately drawn

She says to be careful to make all of the edges and corners meet.

Use interior angles to show that this cannot be done.

Pentagon interior angle: $(5-2)\times 180\div 5=108°$
Hexagon interior angle: $(6-2)\times 180\div 6=120°$
Where two hexagons meet the pentagon the sum of the angles is 348°. Angles around a point add up to 360°, therefore the pattern can't be create without gaps.

(3 Marks)

---

8. The diagram below shows two regular polygons placed edge to edge, with two equilateral triangles fitting exactly in the gaps.

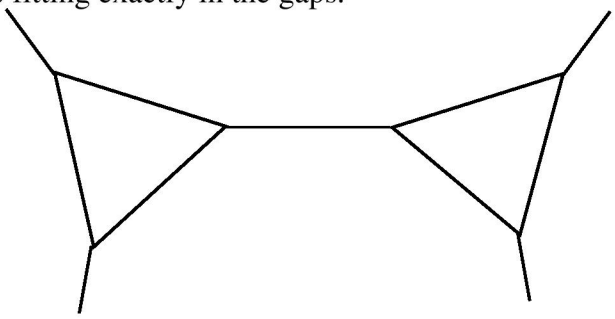

Diagram not accurately drawn

(a) If the two polygons are identical, how many sides do they have?

Angles in equilateral triangle: 60
Interior angle of each polygon: $(360-60)\div 2=150$
Exterior angle of each polygon: $180-150=30$
Polygon sides: $360\div 30=12$

……. 12…….

(b) If the one of the polygons has 24 sides, what is the name of the other polygon?

Interior angle of 24 sided polygon : $180-(360\div 24)=165$
Interior angle of other polygon : $360-165-60=135$
Sides of other polygon: $360\div(180-135)=8$

…… octagon……

(6 Marks)

4) Similar Shapes Volume and Area SF: Easier

Solution for Question 1:

Scale factor: $\frac{9}{3} = 3$

Area of Quadrilateral B: $24 \times 3^2 = 216\text{cm}^2$

Solution for Question 2:

Scale factor: $\frac{14}{7} = 2$

Volume of Cuboid D: $35 \times 2^3 = 280\text{m}^3$

Solution for Question 3:

$\frac{243}{75} = 3.24$

$\sqrt{3.24} = 1.8$

$\text{h} = 10\text{cm} \times 1.8$

18cm

4) Similar Shapes Volume and Area SF: Medium

Solution for Question 4:

$$\frac{343}{125} = 2.744$$

$$\sqrt[3]{2.744} = 1.4$$

$$x = 20 \times 1.4$$

$$x = 28\text{cm}$$

$$y = \frac{56}{1.4}$$

$$y = 40\text{cm}$$

Solution for Question 5:

$$\frac{200\pi}{8\pi} = 25$$

$$\sqrt{25} = 5$$

$$7\pi \times 5^3$$

$$875\pi\ \text{cm}^3$$

4) Similar Shapes Volume and Area SF: Harder

Solution for Question 6:

$\frac{175}{7} = 25$

$\sqrt{25} = 5$

$5 \times 5^3 = 625$ kg

$\frac{625}{10} = 62.5$ packs

Therefore 63 packs are required.

Solution for Question 7:

(1) 0.5 x AB x BC = 7
(2) 0.5 x BD x BC = 175
(3)

(2) / (1)

Gives

$\frac{BD}{AB} = 25$

$BD = 25AB$

Therefore AD = 25AB + AB = 26AB

Scale Factor between ADF and ABC:

$\frac{AD}{AB} = \frac{26AB}{AB} = 26$

Area of CDE: 7 x 26^2 – 7 – 175 = $4550cm^2$

5) Factorising Quadratics with a coefficient greater than 1: Easier

1) Solve $(4x + 2)(x - 1) = 0$

$4x+2=0$ $\quad x-1=0$

$4x=-2$ $\quad x=1$

$x=\frac{-2}{4}=\frac{-1}{2}$

$x=-1/2$ and 1

(2 Marks)

---

2) Solve $3x^2 + 7x + 2 = 0$

A/C $\quad x \to 6$, $+ \to 7$

$3x^2+6x+x+2=0$

$3x(x+2)+1(x+2)=0$

$(3x+1)(x+2)=0$

$3x+1=0$ $\quad x+2=0$

$3x=-1$ $\quad x=-2$

$x=-1/3$

$x=-1/3$ and -2

(2 Marks)

---

3) Solve $2a^2 + 7a + 5 = 0$

$x \cdot 10$, $+ \to 7$

$2a^2+2a+5a+5=0$

$2a(a+1)+5(a+1)=0$

$(2a+5)(a+1)=0$

$2a+5=0$ $\quad a=-1$

$2a=-5$

$a=-5/2$

$a=-5/2$ and -1

(2 Marks)

---

4) Solve $2x^2 + 5x - 3 = 0$

$x \to -6$, $+ \to 5$

$2x^2+6x-x-3=0$

$2x(x+3)-1(x+3)=0$

$(2x-1)(x+3)=0$

$2x-1=0$ $\quad x+3=0$

$2x=1$ $\quad x=-3$

$x=1/2$

$x=1/2$ and -3

(2 Marks)

5) Factorising Quadratics with a coefficient greater than 1: Medium

5) Solve $6x^2 - x - 15 = 0$

$X \to -90$, $+ \to -1$

$6x^2 + 9x - 10x - 15 = 0$

$3x(2x+3) - 5(2x+3) = 0$

$(3x-5)(2x+5) = 0$

$3x - 5 = 0$ $\quad$ $2x + 3 = 0$

$3x = 5$ $\quad$ $2x = -3$

$x = 5/3$ $\quad$ $x = -3/2$

$x = 5/3$ and $-3/2$

(2 Marks)

---

6) Solve, by factorising, the equation $8x^2 - 30x - 27 = 0$

$X \to -216$, $+ \to -30$

$8x^2 - 36x + 6x - 27 = 0$

$4x(2x-9) + 3(2x-9) = 0$

$(4x+3)(2x-9) = 0$

$4x + 3 = 0$ $\quad$ $2x - 9 = 0$

$4x = -3$ $\quad$ $2x = 9$

$x = -3/4$ $\quad$ $x = 9/2$

$x = -\frac{3}{4}$ and $9/2$

(2 Marks)

---

7) Simplify

$$\frac{2x^2 - 5x + 3}{2x^2 - x - 3}$$

Factorise $2x^2 - 5x + 3$

$X \to 6$, $+ \to -5$

$2x^2 - 2x - 3x + 3$

$2x(x-1) - 3(x-1)$

$(2x-3)(x-1)$

Factorise $2x^2 - x - 3$

$X \to -6$, $+ \to -1$

$2x^2 + 2x - 3x - 3$

$2x(x+1) - 3(x+1)$

$(2x-3)(x+1)$

$$\frac{(2x-3)(x-1)}{(2x-3)(x+1)}$$

$$\frac{x-1}{x+1}$$

(2 Marks)

5) Factorising Quadratics with a coefficient greater than 1: Harder

8) Simplify

$$\frac{5x^2 + x - 6}{5x^2 - 9x - 18}$$

Factorising $5x^2+x-6$

$x \to -30$ $+ \to +1$

$5x^2 + 5x + 6x - 6$

$5x(x-1) + 6(x-1)$

$(5x+6)(x-1)$

factorising $5x^2-9x-18$

$x \to -90$, $+ -9$

$5x^2 - 15x + 6x - 18$

$5x(x-3) + 6(x-3)$

$(5x+6)(x-3)$

$$\frac{(5x+6)(x-1)}{(5x+6)(x-3)}$$

$x-1/x-3$

(2 Marks)

9) The two rectangles have the same area

$4x - 1$		$3x - 2$	
Rectangle C	x	Rectangle D	$x + 2$

a) Write an equation showing this.

$x(4x-1) = (3x-2)(x-2)$

$4x^2 - x = 3x^2 + 6x - 2x - 4$

$4x^2 - 3x^2 - x - 6x + 2x + 4 = 0$

$x^2 - 5x + 4 = 0$

$x^2 - 5x + 4 = 0$

b) Solve the equation. These are two possible solutions for the areas of these rectangles. Find them both.

$x^2 - 5x + 4 = 0$

$(x-4)(x-1) = 0$

$x - 4 = 0$ $\quad x - 1 = 0$

$x = 4$ $\quad x = 1$

Area 1 $= (4x-1)(x)$

$(4(4)-1)(4)$

$15 \times 4 = 60$

Area 2 $= (4x-1)(x)$

$(4(1)-1)(1)$

$3 \times 1 = 3$

60 and 3.

(3 Marks)

TRAVERS Emma

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
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A02 and 3	12 from 46	1 from 10	1 from 14	5 from 7	1 from 8	4 from 7
Total	20 from 80	3 from 22	2 from 22	7 from 16	4 from 13	4 from 7

Your Pinpoint Topics

(1) Converting to standard form. MWatch: 83, Hegarty:

(2) Index Notation. MWatch: 131, Hegarty:

(3) Surds. MWatch: 207, Hegarty:

(4) Estimation. MWatch: 91, Hegarty:

(5) Interior and Exterior Angles. MWatch: , Hegarty:

1) Converting to standard form: Easier

1) Write each as an ordinary number

a) 5×10^4 5000

b) 6.2×10^6 6200000

c) 1.205×10^8 120500000

d) 9×10^{-3} 0.009

e) 7.5×10^{-4} 0.00075

f) 6.02×10^{-7} 0.000000602

(6 marks)

---

2) Write these numbers in standard form

a) 60000 6×10^4

b) 508000 5.08×10^5

c) 0.0000000089 8.9×10^{-9}

d) 0.0000000708 7.08×10^{-8}

(4 marks)

---

1) Converting to standard form: Medium

3) Circle the numbers that are in standard form

0.9×10^7 7×10^{-4} 57×10^8 1.07×10^9

(1 mark)

---

4) Write each number in standard form

a) 56×10^3

5.6×10^4

.....

b) 5096×10^7

5.096×10^{10}

.....

c) 0.04×10^8

4×10^6

.....

d) 0.00904×10^{11}

9.04×10^8

e) 90×10^{-5}

9×10^{-4}

f) 840×10^{-7}

8.4×10^{-5}

g) 0.00806×10^{-5} 8.06×10^{-8}

h) 0.00001×10^{-20} 1×10^{-25}

(8 marks)

1) Converting to standard form: Harder

5) Write these numbers in order of size starting with the smallest

$58, \quad 5.8 \times 10^{-1}, \quad 8.5 \times 10^{-2}, \quad 5.81 \times 10^{-1}, \quad 5 \times 10^{1}$

58, 0.58, 0.085, 0.581, 50

$8.5 \times 10^{-2}, 5.8 \times 10^{-1}, 5.81 \times 10^{-1}, 5 \times 10^{1}, 58$

(2 Marks)

6) Here are five numbers

$7 \times 10^{3} \qquad 7.2 \times 10^{4} \qquad 27000 \qquad 7.02 \times 10^{4} \qquad 2.7 \times 10^{6}$

Work out the difference between the largest and smallest numbers.

Give your answer in standard form

Largest 2.7×10^{6}

Smallest 7×10^{3}

2700000

\- 7000

2693000

……

(2 marks)

2) Index Notation: Easier

1. (a) Simplify $m^3 \times m^6$ $= m^{3+6}$

m^9

(1)

(b) Simplify $\frac{p^8}{p^2}$ p^{8-2}

p^6

(1)

(c) Simplify $(2n^3)^4$ $16n^{3\times4}$

$16n^{12}$

(2)

(4 marks)

---

2. (a) Simplify $m^6 \times m^7$ m^{6+7}

(1)

m^{13}

(b) Simplify x^0

(1)

1

(c) Simplify $(16y^6)^{\frac{1}{2}}$

$\sqrt{16}\, y^{\frac{6}{2}}$

(2)

$4y^3$

(4 marks)

---

3. (a) Simplify $m^5 \div m^3$ m^{5-3}

m^2

(1)

(b) Simplify $5x^4y^3 \times x^2y$ $5x^{4+2}y^{3+1}$

$5x^6y^4$

(2)

(3 marks)

---

2) Index Notation: Medium

4. (a) Simplify $a^4 \times a^5$

a^{4+5}

a^9

(1)

(b) Simplify $\frac{45e^6 f^8}{5ef^2}$

$9e^{6-1} f^{8-2}$

$9e^5 f^6$

(2)

(c) Write down the value of $9^{\frac{1}{2}}$

$\sqrt{9}$

3

(1)

(4 marks)

---

5. (a) Simplify $m^2 \times m^4$

m^{2+4}

m^6

(1)

(b) Simplify $y^7 \div y^5$

y^{7-5}

y^2

(1)

(c) Simplify $(m^3)^5$

$m^{3\times5}$

m^{15}

(2)

(4 marks)

---

6. Simplify fully

(a) $p^2 \times p^7$

p^{2+7}

p^9 **(1)**

(b) $\frac{3q^4 \times 2q^5}{q^3}$

$\frac{(3\times2)q^{4+5}}{q^3} = 6q^{9-3}$

$6q^6$ **(2)**

(c) $(2xy^3)^5$

$2^5 x^5 y^{3\times5}$

$32x^5y^{15}$ **(2)**

(4 marks)

---

2) Index Notation: Harder

20. (a) Find the value of

(i) 64°

1

(ii) $64^{\frac{1}{2}}$ $\sqrt{64}$

8

(iii) $64^{-\frac{2}{3}}$ $= \frac{1}{64^{2/3}}$ $= \left(\sqrt[3]{64}\right)^2 = \frac{1}{4^2}$

$\frac{1}{16}$ or 0.0625

(4 marks)

3) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

3) Surds: Medium

4. Expand and simplify $(4-2\sqrt{3})^2$ giving your answer in the $a+b\sqrt{3}$ where a and b are integers.

$$(4-2\sqrt{3})(4-2\sqrt{3})$$
$$=16-8\sqrt{3}-8\sqrt{3}+12$$
$$=30-16\sqrt{3}$$

…… **(3)**

5. Expand and simplify $(\sqrt{5}-\sqrt{10})^2$ giving your answer in the $a+b\sqrt{2}$ where a and b are integers.

$$(\sqrt{5}-\sqrt{10})(\sqrt{5}-\sqrt{10})$$
$$=5-\sqrt{50}-\sqrt{50}+\sqrt{100}$$
$$=15-2\sqrt{50}$$
$$=15-2\sqrt{25\times 2}$$
$$=15-10\sqrt{2}$$

…… **(4)**

3) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.

$(3 + \sqrt{5})$cm

$(2 + \sqrt{5})$cm

$(3 + \sqrt{5})\,(2 + \sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

4) Estimation: Easier

1. Work out an estimate for the value of

$$5.1 \times 98$$

$5 \times 100 =$

500

(2 marks)

2. Estimate the value of

$$\frac{68 \times 401}{198}$$

$\frac{70 \times 400}{200} =$

140

(2 marks)

3. Work out an estimate for the value of

$$\frac{637}{3.2 \times 9.8}$$

$\frac{600}{3 \times 10} = 20$

20

(2 marks)

4) Estimation: Medium

4. Which is the best estimate for the value of

$$\frac{37.9 \times 50.2}{2.1 + 2.98}$$

$$\frac{40 \times 50}{2+3} = \frac{2000}{5} = 400$$

(3 marks)

5. Which is the best estimate for the value of

$$\frac{38.3 \times 51.7}{2.1}$$

$$\frac{40 \times 50}{2} = 1000$$

..... (3 marks)

4) Estimation: Harder

Worded Estimation

Heather runs round a circular track many times each day.

She runs 4.18km a day for 197 days.

The track is 0.2 km.

Estimate how many times heather has run round the track.

(3 marks)

$4.18\text{km} \approx 4$

$197\text{ days} \approx 200$

$4 \times 200 = 800\text{ km}$ (1)

$0.21 \approx 0.2$

$\frac{800}{0.2}$ (2) $= 800 \times 5$ (3)

$= 4000$ times

5) Interior and Exterior Angles: Easier

1. A regular decagon has 10 sides.

(a) Calculate the **sum** of its **interior** angles.

$(10 - 8) \times 180$

.....1440°.....

(b) Calculate the size of **one** of its **interior** angles.

$1440 \div 10$

.....144°.....

(2 Marks)

---

2. A regular 15 sided shape can be called a pentadecagon.

(a) Write down the **sum** of its **exterior** angles.

.....360°.....

(b) Calculate the size of **one** of its **exterior** angles.

$360 \div 15$

.....24°.....

(2 Marks)

---

3. What is the name of the regular polygon with an **exterior** angle of 72°?

$360 \div 72 = 5$

.....pentagon.....

(1 Mark)

---

4. If a regular polygon has an interior angle of 140°, how many sides does it have?

Exterior angle: $180 - 140 = 40$

Sides: $360 \div 40$

.....9.....

(2 Marks)

---

5) Interior and Exterior Angles: Medium

5. A portion of a regular polygon with a reflex angle of 200° outside the shape, is shown below.

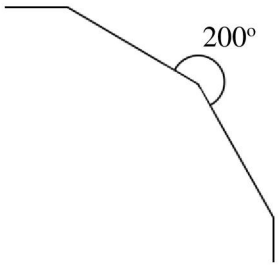

Diagram not accurately drawn

How many sides does the polygon have?

Exterior angle: $200 - 180 = 20$

Sides: $360 \div 20 = 18$

..... 18.....

(2 Marks)

---

6. A portion of a regular polygon is shown below with straight lines extending from two of its sides. These lines cross forming an angle of 144°.

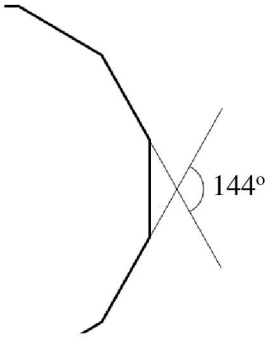

Diagram not accurately drawn

How many sides does the polygon have?

Obtuse angle in triangle: 144 (vertically opposite)

Base angle sum in isosceles triangle: $180 - 144 = 36$

Exterior angle: $36 \div 2 = 18$

Sides: $360 \div 18 = 20$

..... 20.....

(4 Marks)

---

5) Interior and Exterior Angles: Harder

7. A primary school teacher gives pupils a regular black pentagon, and five regular white hexagons. She tells them to glue them onto a flat piece of paper in a football pattern, as shown below.

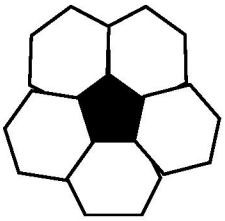

Diagram not accurately drawn

She says to be careful to make all of the edges and corners meet.

Use interior angles to show that this cannot be done.

Pentagon interior angle: $(5-2)\times 180\div 5=108°$
Hexagon interior angle: $(6-2)\times 180\div 6=120°$
Where two hexagons meet the pentagon the sum of the angles is 348°. Angles around a point add up to 360°, therefore the pattern can't be create without gaps.

(3 Marks)

---

8. The diagram below shows two regular polygons placed edge to edge, with two equilateral triangles fitting exactly in the gaps.

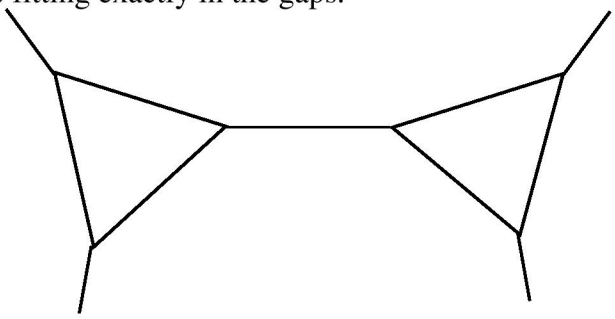

Diagram not accurately drawn

(a) If the two polygons are identical, how many sides do they have?

Angles in equilateral triangle: 60
Interior angle of each polygon: $(360-60)\div 2=150$
Exterior angle of each polygon: $180-150=30$
Polygon sides: $360\div 30=12$

..... 12.....

(b) If the one of the polygons has 24 sides, what is the name of the other polygon?

Interior angle of 24 sided polygon : $180-(360\div 24)=165$
Interior angle of other polygon : $360-165-60=135$
Sides of other polygon: $360\div(180-135)=8$

..... octagon.....

(6 Marks)

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	5 from 34	1 from 12	0 from 8	3 from 9	1 from 5	0 from 0
A02 and 3	10 from 46	3 from 10	2 from 14	4 from 7	0 from 8	1 from 7
Total	15 from 80	4 from 22	2 from 22	7 from 16	1 from 13	1 from 7

Your Pinpoint Topics

(1) Index Notation. MWatch: 131, Hegarty:

(2) Understanding Algebra. MWatch: NA, Hegarty:

(3) Surds. MWatch: 207, Hegarty:

(4) Circle Problems. MWatch: , Hegarty:

(5) Estimation. MWatch: 91, Hegarty:

1) Index Notation: Easier

1. (a) Simplify $m^3 \times m^6$ $= m^{3+6}$

m^9

(1)

(b) Simplify $\frac{p^8}{p^2}$ p^{8-2}

p^6

(1)

(c) Simplify $(2n^3)^4$ $16n^{3\times4}$

$16n^{12}$

(2)

(4 marks)

---

2. (a) Simplify $m^6 \times m^7$ m^{6+7}

(1)

m^{13}

(b) Simplify x^0

(1)

1

(c) Simplify $(16y^6)^{\frac{1}{2}}$

$\sqrt{16}\, y^{\frac{6}{2}}$

(2)

$4y^3$

(4 marks)

---

3. (a) Simplify $m^5 \div m^3$ m^{5-3}

m^2

(1)

(b) Simplify $5x^4y^3 \times x^2y$ $5x^{4+2}y^{3+1}$

$5x^6y^4$

(2)

(3 marks)

---

1) Index Notation: Medium

4. (a) Simplify $a^4 \times a^5$

a^{4+5}

a^9

(1)

(b) Simplify $\frac{45e^6 f^8}{5ef^2}$

$9e^{6-1} f^{8-2}$

$9e^5 f^6$

(2)

(c) Write down the value of $9^{\frac{1}{2}}$

$\sqrt{9}$

3

(1)

(4 marks)

---

5. (a) Simplify $m^2 \times m^4$

m^{2+4}

m^6

(1)

(b) Simplify $y^7 \div y^5$

y^{7-5}

y^2

(1)

(c) Simplify $(m^3)^5$

$m^{3\times5}$

m^{15}

(2)

(4 marks)

---

6. Simplify fully

(a) $p^2 \times p^7$

p^{2+7}

p^9 **(1)**

(b) $\frac{3q^4 \times 2q^5}{q^3}$

$\frac{(3\times2)q^{4+5}}{q^3} = 6q^{9-3}$

$6q^6$ **(2)**

(c) $(2xy^3)^5$

$2^5 x^5 y^{3\times5}$

$32x^5y^{15}$ **(2)**

(4 marks)

---

1) Index Notation: Harder

20. (a) Find the value of

(i) 64°

1

(ii) $64^{\frac{1}{2}}$ $\sqrt{64}$

8

(iii) $64^{-\frac{2}{3}}$ $= \frac{1}{64^{2/3}}$ $= \left(\sqrt[3]{64}\right)^2 = \frac{1}{4^2}$

$\frac{1}{16}$ or 0.0625

(4 marks)

2) Understanding Algebra: Easier

1) a x a is always equal to

ANSWER = C

a) a2 b) 2a c) a^2 d) 2 x a

(1 mark)

---

2) $y= x^2$.

When x = -3, what is the value of y?

$(-3)^2 = (-3) \times (-3) = 9$. (not – 9)

(1 Mark1)

---

3) (y-5)(y-3) is always equal to: (Show working and circle a, b, c or d)

$y^2 – 5y -3y + 15$

$= y^2 - 8y +15$

ANSWER = D

a) $y^2+8y+15$ b) $y^2-8y-15$ c) $2y+8y+15$ d) $y^2-8y+15$

(2 marks)

---

2) Understanding Algebra: Medium

4) The expression

$$(x-3)^2$$

is always equal to: (Show all your working and circle a, b, c or d)

$(x-3)(x-3) = x^2 - 3x - 3x + 9 = x^2 - 6x + 9$

ANSWER = C

(a) $x^2 - 9$ (b) $x^2 + 9$ (c) $x^2 - 6x + 9$ (d) $x^2 - 6x - 9$

(2 Marks)

---

5) $(x+1)^2$ is always equal to: (Show all your working and circle a, b, c or d)

$(x+1)(x+1) = x^2 + x + x + 1 = x^2 + 2x + 1$

ANSWER = D

a) $x^2 + 1$ b) $x^2 + 2$ c) $x^2 + x + 1$ d) $x^2 + 2x + 1$

(2 Marks)

---

6) Solve $x^2 = 81$.

$x = \pm\sqrt{81}$

= 9 and -9 (or ± 9)

You will lose a mark here if you don't include -9.

x=_____

(2 Marks)

2) Understanding Algebra: Harder

7) Simplify

$$\frac{(x+1)2}{(x+1)}$$

ANSWER = (x+1)

_____

(2 Marks)

---

8) $y = (x+3)^2$

x can be any number.

a) What is the smallest value that y can take?

ANSWER: $y = 0$

(y can never be negative)

_____

b) What value of x makes y equal to its minimum value?

WHEN x = -3

_____

(2 Marks)

3) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

3) Surds: Medium

4. Expand and simplify $(4-2\sqrt{3})^2$ giving your answer in the $a+b\sqrt{3}$ where a and b are integers.

$$(4-2\sqrt{3})(4-2\sqrt{3})$$
$$=16-8\sqrt{3}-8\sqrt{3}+12$$
$$=30-16\sqrt{3}$$

…… **(3)**

5. Expand and simplify $(\sqrt{5}-\sqrt{10})^2$ giving your answer in the $a+b\sqrt{2}$ where a and b are integers.

$$(\sqrt{5}-\sqrt{10})(\sqrt{5}-\sqrt{10})$$
$$=5-\sqrt{50}-\sqrt{50}+\sqrt{100}$$
$$=15-2\sqrt{50}$$
$$=15-2\sqrt{25\times 2}$$
$$=15-10\sqrt{2}$$

…… **(4)**

3) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.

$(3 + \sqrt{5})$cm

$(2 + \sqrt{5})$cm

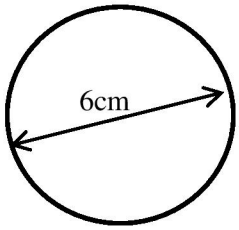
$(3 + \sqrt{5})\ (2 + \sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

4) Circle Problems: Easier

1. A circle of **diameter** 6cm is shown below



(a) Find the **circumference** of the circle, to one decimal place.

$C = \pi d = \pi \times 6 = 18.8cm$

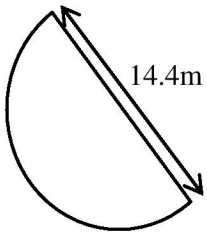
(b) Find the **area** of the circle, to one decimal place.

$A = \pi r^2 = \pi \times 3^2 = 28.3cm^2$

(4 Marks)

---

2. A semicircle of **diameter** 14.4m is shown below



(a) Find the **perimeter** of the semicircle, to 2 significant figures.

$C = \pi d = \pi \times 14.4 = 45.2m \quad 45.2 \div 2 + 14.4 = 37m$

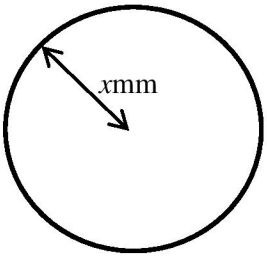
(b) Find the **area** of the semicircle, to 2 significant figures.

$A = \pi r^2 = \pi \times 7.2^2 = 162.86m^2 \quad 162.86 \div 2 = 81m^2$

(4 Marks)

---

3. The circle shown below has **area** 50mm^2



(a) Find the **radius** of the circle, giving your answer to the nearest integer.

$A = \pi r^2 \rightarrow 50 = \pi \times r^2 \rightarrow r^2 = 50 \div \pi = 15.92 \rightarrow r = \sqrt{15.92} = 4mm$

(b) Find the **circumference** of the circle, giving your answer to the nearest integer.

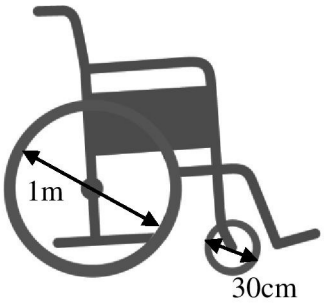
$C = \pi d = \pi \times 8 = 25mm$

(4 Marks)

---

4) Circle Problems: Medium

4. A wheelchair has two different sizes of wheel. The front wheel has a **diameter** of 30cm, and the back wheel has a diameter of 1m.



When the wheelchair travels a distance of 1km, how many more rotations does the front wheel do, than the back wheel?

Give your answer to the nearest whole number.

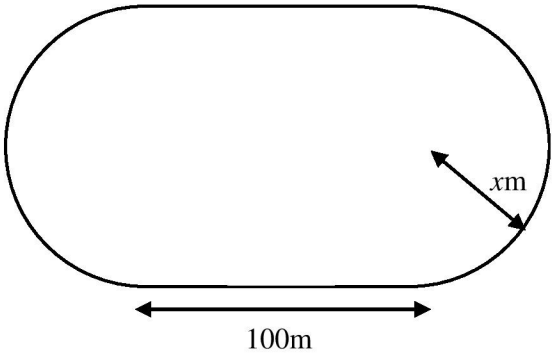
Front: $C = \pi d = \pi \times 0.3 = 0.94m$ 1000 ÷ 0.94 = 1064 rotations

Back: $C = \pi d = \pi \times 1 = 3.14m$ 1000 ÷ 3.14 = 318 rotations

1064 – 318 = 746 rotations more

(4 Marks)

5. An athletics track is being built in the shape of the diagram shown below, where each end of the track is a perfect semicircle.



The track distance needs to be 400m, with each straight section being 100m.

(a) Calculate *x*, the radius of the semi-circular section of track, so the one entire lap of the track is 400m. Give your answer to 3 significant figures.

Curved section = 400 - 100 – 100 = 200m

$C = \pi d \rightarrow 200 = \pi \times d \rightarrow d = 200 \div \pi = 63.66m \rightarrow r = 31.8m$

The area inside the track is going to be planted with grass seed. One pack of grass seed costs £17.99 and covers 60m^2.

(b) Using your answer to part (a), what will the cost of the grass seed for the track be?

$A = \pi r^2 = \pi \times 31.8^2 =$ 3176.9. Then 100 x 2x = 6366.2.

Total Area = 3176.9 + 6366.2 = 9813.1

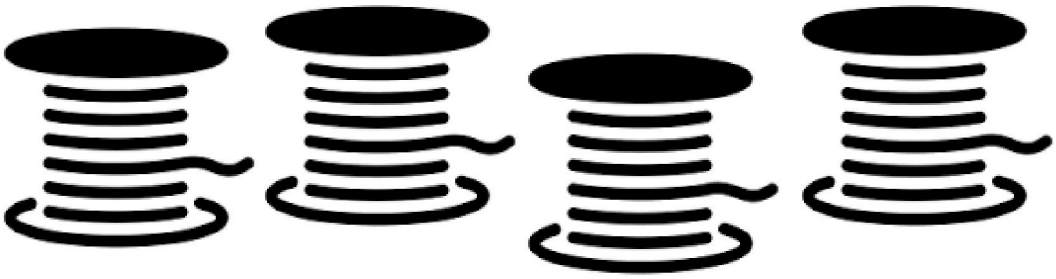
9813.1 / 60 = 163.5 packets, actually 164.

164 x £17.99 = £2950.36

(5 Marks)

4) Circle Problems: Harder

6. A sewing shop buys 100m of thread on 4 large reels.



Each large reel has a radius of 5cm.

(a) Calculate the number of times a piece of thread is wrapped round one reel.

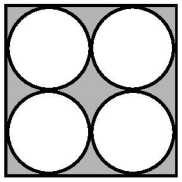
1 reel has 25m of thread

$C = \pi d = \pi \times 10 = 31.4cm = 0.314m$

$25 \div 0.314 = 79.6$

80 wraps

The large reels are stored upright in a square box 20cm, as shown below.



(b) What area of the floor space of the box, is not taken up by reels.

Reels: $A = \pi r^2 = \pi \times 5^2 = 78.5cm^2$

Box: $A = 20 \times 20 = 400cm^2$

$400 - 4 \times 78.5$

$= 86cm^2$

The thread from **one** reel is unwrapped and sold on 5 smaller reels separately.

(c) If each of the smaller reels has thread wrapped around it 50 times, what must the **diameter** of the smaller reel be?

Small reel holds 5m thread (25÷5)

The circumference of the small reel must be 10cm (5m ÷ 50 wraps)

$C = \pi d \rightarrow 10 = \pi \times d \rightarrow d = 10 \div \pi = 3.18cm$

$3.18cm$

(7 Marks)

5) Estimation: Easier

1. Work out an estimate for the value of

$$5.1 \times 98$$

$5 \times 100 =$

500

(2 marks)

2. Estimate the value of

$$\frac{68 \times 401}{198}$$

$\frac{70 \times 400}{200} =$

140

(2 marks)

3. Work out an estimate for the value of

$$\frac{637}{3.2 \times 9.8}$$

$\frac{600}{3 \times 10} = 20$

20

(2 marks)

5) Estimation: Medium

4. Which is the best estimate for the value of

$$\frac{37.9 \times 50.2}{2.1 + 2.98}$$

$$\frac{40 \times 50}{2+3} = \frac{2000}{5} = 400$$

(3 marks)

5. Which is the best estimate for the value of

$$\frac{38.3 \times 51.7}{2.1}$$

$$\frac{40 \times 50}{2} = 1000$$

.....

(3 marks)

5) Estimation: Harder

Worded Estimation

Heather runs round a circular track many times each day.

She runs 4.18km a day for 197 days.

The track is 0.2 km.

Estimate how many times heather has run round the track.

(3 marks)

$4.18\text{km} \approx 4$

$197\text{ days} \approx 200$

$4 \times 200 = 800\text{ km}$ (1)

$0.21 \approx 0.2$

$\frac{800}{0.2}$ (2) $= 800 \times 5$ (3)

$= 4000$ times

WARD Bronte

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
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Your Pinpoint Topics

(1) Index Notation. MWatch: 131, Hegarty:

(2) Understanding Algebra. MWatch: NA, Hegarty:

(3) Surds. MWatch: 207, Hegarty:

(4) Estimation. MWatch: 91, Hegarty:

(5) Interior and Exterior Angles. MWatch: , Hegarty:

1) Index Notation: Easier

1. (a) Simplify $m^3 \times m^6$ $= m^{3+6}$

m^9

(1)

(b) Simplify $\frac{p^8}{p^2}$ p^{8-2}

p^6

(1)

(c) Simplify $(2n^3)^4$ $16n^{3\times4}$

$16n^{12}$

(2)

(4 marks)

---

2. (a) Simplify $m^6 \times m^7$ m^{6+7}

(1)

m^{13}

(b) Simplify x^0

(1)

1

(c) Simplify $(16y^6)^{\frac{1}{2}}$

$\sqrt{16}\, y^{\frac{6}{2}}$

(2)

$4y^3$

(4 marks)

---

3. (a) Simplify $m^5 \div m^3$ m^{5-3}

m^2

(1)

(b) Simplify $5x^4y^3 \times x^2y$ $5x^{4+2}y^{3+1}$

$5x^6y^4$

(2)

(3 marks)

---

1) Index Notation: Medium

4. (a) Simplify $a^4 \times a^5$

a^{4+5}

a^9

(1)

(b) Simplify $\frac{45e^6 f^8}{5ef^2}$

$9e^{6-1} f^{8-2}$

$9e^5 f^6$

(2)

(c) Write down the value of $9^{\frac{1}{2}}$

$\sqrt{9}$

3

(1)

(4 marks)

---

5. (a) Simplify $m^2 \times m^4$

m^{2+4}

m^6

(1)

(b) Simplify $y^7 \div y^5$

y^{7-5}

y^2

(1)

(c) Simplify $(m^3)^5$

$m^{3\times5}$

m^{15}

(2)

(4 marks)

---

6. Simplify fully

(a) $p^2 \times p^7$

p^{2+7}

p^9 **(1)**

(b) $\frac{3q^4 \times 2q^5}{q^3}$

$\frac{(3\times2)q^{4+5}}{q^3} = 6q^{9-3}$

$6q^6$ **(2)**

(c) $(2xy^3)^5$

$2^5 x^5 y^{3\times5}$

$32x^5y^{15}$ **(2)**

(4 marks)

---

1) Index Notation: Harder

20. (a) Find the value of

(i) 64°

1

(ii) $64^{\frac{1}{2}}$ $\sqrt{64}$

8

(iii) $64^{-\frac{2}{3}}$ $= \frac{1}{64^{2/3}}$ $= \left(\sqrt[3]{64}\right)^2 = \frac{1}{4^2}$

$\frac{1}{16}$ or 0.0625

(4 marks)

2) Understanding Algebra: Easier

1) a x a is always equal to

ANSWER = C

a) a2 b) 2a c) a^2 d) 2 x a

(1 mark)

---

2) $y= x^2$.

When x = -3, what is the value of y?

$(-3)^2 = (-3) \times (-3) = 9$. (not – 9)

(1 Mark1)

---

3) (y-5)(y-3) is always equal to: (Show working and circle a, b, c or d)

$y^2 – 5y -3y + 15$

$= y^2 - 8y +15$

ANSWER = D

a) $y^2+8y+15$ b) $y^2-8y-15$ c) $2y+8y+15$ d) $y^2-8y+15$

(2 marks)

---

2) Understanding Algebra: Medium

4) The expression

$$(x-3)^2$$

is always equal to: (Show all your working and circle a, b, c or d)

$(x-3)(x-3) = x^2 - 3x - 3x + 9 = x^2 - 6x + 9$

ANSWER = C

(a) $x^2 - 9$ (b) $x^2 + 9$ (c) $x^2 - 6x + 9$ (d) $x^2 - 6x - 9$

(2 Marks)

---

5) $(x+1)^2$ is always equal to: (Show all your working and circle a, b, c or d)

$(x+1)(x+1) = x^2 + x + x + 1 = x^2 + 2x + 1$

ANSWER = D

a) $x^2 + 1$ b) $x^2 + 2$ c) $x^2 + x + 1$ d) $x^2 + 2x + 1$

(2 Marks)

---

6) Solve $x^2 = 81$.

$x = \pm\sqrt{81}$

= 9 and -9 (or ± 9)

You will lose a mark here if you don't include -9.

x=_____

(2 Marks)

2) Understanding Algebra: Harder

7) Simplify

$$\frac{(x+1)2}{(x+1)}$$

ANSWER = (x+1)

(2 Marks)

8) $y = (x+3)^2$

x can be any number.

a) What is the smallest value that y can take?

ANSWER: y = 0

(y can never be negative)

b) What value of x makes y equal to its minimum value?

WHEN x = -3

(2 Marks)

3) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

3) Surds: Medium

4. Expand and simplify $(4-2\sqrt{3})^2$ giving your answer in the $a+b\sqrt{3}$ where a and b are integers.

$$(4-2\sqrt{3})(4-2\sqrt{3})$$
$$=16-8\sqrt{3}-8\sqrt{3}+12$$
$$=30-16\sqrt{3}$$

…… **(3)**

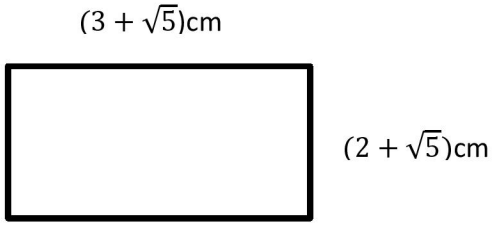
5. Expand and simplify $(\sqrt{5}-\sqrt{10})^2$ giving your answer in the $a+b\sqrt{2}$ where a and b are integers.

$$(\sqrt{5}-\sqrt{10})(\sqrt{5}-\sqrt{10})$$
$$=5-\sqrt{50}-\sqrt{50}+\sqrt{100}$$
$$=15-2\sqrt{50}$$
$$=15-2\sqrt{25\times 2}$$
$$=15-10\sqrt{2}$$

…… **(4)**

3) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.



$(3+\sqrt{5})\,(2+\sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

4) Estimation: Easier

1. Work out an estimate for the value of

$$5.1 \times 98$$

$5 \times 100 =$

500

(2 marks)

2. Estimate the value of

$$\frac{68 \times 401}{198}$$

$\frac{70 \times 400}{200} =$

140

(2 marks)

3. Work out an estimate for the value of

$$\frac{637}{3.2 \times 9.8}$$

$\frac{600}{3 \times 10} = 20$

20

(2 marks)

4) Estimation: Medium

4. Which is the best estimate for the value of

$$\frac{37.9 \times 50.2}{2.1 + 2.98}$$

$$\frac{40 \times 50}{2+3} = \frac{2000}{5} = 400$$

(3 marks)

5. Which is the best estimate for the value of

$$\frac{38.3 \times 51.7}{2.1}$$

$$\frac{40 \times 50}{2} = 1000$$

..... (3 marks)

4) Estimation: Harder

Worded Estimation

Heather runs round a circular track many times each day.

She runs 4.18km a day for 197 days.

The track is 0.2 km.

Estimate how many times heather has run round the track.

(3 marks)

$4.18\text{km} \approx 4$

$197\text{ days} \approx 200$

$4 \times 200 = 800\text{ km}$ (1)

$0.21 \approx 0.2$

$\frac{800}{0.2}$ (2) $= 800 \times 5$ (3)

$= 4000$ times

5) Interior and Exterior Angles: Easier

1. A regular decagon has 10 sides.

(a) Calculate the **sum** of its **interior** angles.

$(10 - 8) \times 180$

.....1440°.....

(b) Calculate the size of **one** of its **interior** angles.

$1440 \div 10$

.....144°.....

(2 Marks)

---

2. A regular 15 sided shape can be called a pentadecagon.

(a) Write down the **sum** of its **exterior** angles.

.....360°.....

(b) Calculate the size of **one** of its **exterior** angles.

$360 \div 15$

.....24°.....

(2 Marks)

---

3. What is the name of the regular polygon with an **exterior** angle of 72°?

$360 \div 72 = 5$

.....pentagon.....

(1 Mark)

---

4. If a regular polygon has an interior angle of 140°, how many sides does it have?

Exterior angle: $180 - 140 = 40$

Sides: $360 \div 40$

.....9.....

(2 Marks)

---

5) Interior and Exterior Angles: Medium

5. A portion of a regular polygon with a reflex angle of 200° outside the shape, is shown below.

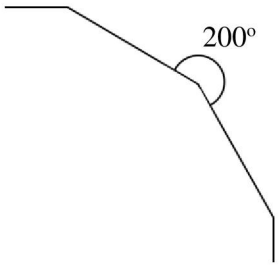


Diagram not accurately drawn

How many sides does the polygon have?

Exterior angle: $200 - 180 = 20$

Sides: $360 \div 20 = 18$

..... 18.....

(2 Marks)

---

6. A portion of a regular polygon is shown below with straight lines extending from two of its sides. These lines cross forming an angle of 144°.

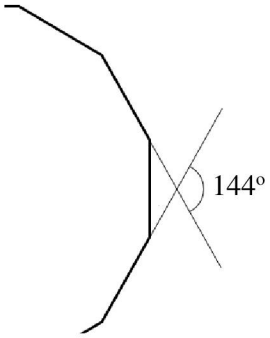


Diagram not accurately drawn

How many sides does the polygon have?

Obtuse angle in triangle: 144 (vertically opposite)

Base angle sum in isosceles triangle: $180 - 144 = 36$

Exterior angle: $36 \div 2 = 18$

Sides: $360 \div 18 = 20$

..... 20.....

(4 Marks)

---

5) Interior and Exterior Angles: Harder

7. A primary school teacher gives pupils a regular black pentagon, and five regular white hexagons. She tells them to glue them onto a flat piece of paper in a football pattern, as shown below.

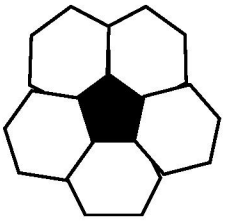


Diagram not accurately drawn

She says to be careful to make all of the edges and corners meet.

Use interior angles to show that this cannot be done.

Pentagon interior angle: $(5-2)\times 180\div 5=108°$
Hexagon interior angle: $(6-2)\times 180\div 6=120°$
Where two hexagons meet the pentagon the sum of the angles is 348°. Angles around a point add up to 360°, therefore the pattern can't be create without gaps.

(3 Marks)

---

8. The diagram below shows two regular polygons placed edge to edge, with two equilateral triangles fitting exactly in the gaps.

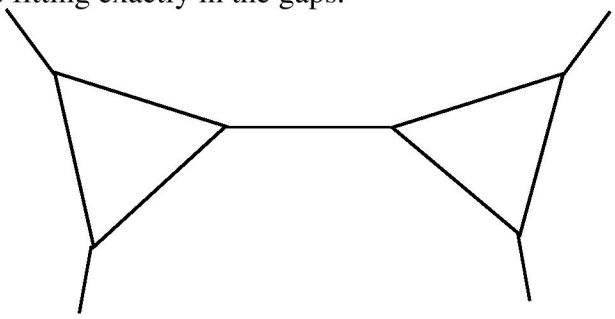


Diagram not accurately drawn

(a) If the two polygons are identical, how many sides do they have?

Angles in equilateral triangle: 60
Interior angle of each polygon: $(360-60)\div 2=150$
Exterior angle of each polygon: $180-150=30$
Polygon sides: $360\div 30=12$

……. 12…….

(b) If the one of the polygons has 24 sides, what is the name of the other polygon?

Interior angle of 24 sided polygon : $180-(360\div 24)=165$
Interior angle of other polygon : $360-165-60=135$
Sides of other polygon: $360\div(180-135)=8$

…… octagon……

(6 Marks)

WREN Francesca

9to1_AQA_Nov2017_GCSE_1H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	8 from 34	4 from 12	2 from 8	2 from 9	0 from 5	0 from 0
A02 and 3	7 from 46	1 from 10	2 from 14	1 from 7	0 from 8	3 from 7
Total	15 from 80	5 from 22	4 from 22	3 from 16	0 from 13	3 from 7

Your Pinpoint Topics

(1) Index Notation. MWatch: 131, Hegarty:

(2) Circle Problems. MWatch: , Hegarty:

(3) Estimation. MWatch: 91, Hegarty:

(4) Interior and Exterior Angles. MWatch: , Hegarty:

(5) Counting Methods. MWatch: NA, Hegarty:

1) Index Notation: Easier

1. (a) Simplify $m^3 \times m^6$ $= m^{3+6}$

m^9

(1)

(b) Simplify $\frac{p^8}{p^2}$ p^{8-2}

p^6

(1)

(c) Simplify $(2n^3)^4$ $16n^{3\times4}$

$16n^{12}$

(2)

(4 marks)

---

2. (a) Simplify $m^6 \times m^7$ m^{6+7}

(1)

m^{13}

(b) Simplify x^0

(1)

1

(c) Simplify $(16y^6)^{\frac{1}{2}}$

$\sqrt{16}\, y^{\frac{6}{2}}$

(2)

$4y^3$

(4 marks)

---

3. (a) Simplify $m^5 \div m^3$ m^{5-3}

m^2

(1)

(b) Simplify $5x^4y^3 \times x^2y$ $5x^{4+2}y^{3+1}$

$5x^6y^4$

(2)

(3 marks)

1) Index Notation: Medium

4. (a) Simplify $a^4 \times a^5$

a^{4+5}

a^9

(1)

(b) Simplify $\frac{45e^6 f^8}{5ef^2}$

$9e^{6-1} f^{8-2}$

$9e^5 f^6$

(2)

(c) Write down the value of $9^{\frac{1}{2}}$

$\sqrt{9}$

3

(1)

(4 marks)

---

5. (a) Simplify $m^2 \times m^4$

m^{2+4}

m^6

(1)

(b) Simplify $y^7 \div y^5$

y^{7-5}

y^2

(1)

(c) Simplify $(m^3)^5$

$m^{3\times5}$

m^{15}

(2)

(4 marks)

---

6. Simplify fully

(a) $p^2 \times p^7$

p^{2+7}

p^9 **(1)**

(b) $\frac{3q^4 \times 2q^5}{q^3}$

$\frac{(3\times2)q^{4+5}}{q^3} = 6q^{9-3}$

$6q^6$ **(2)**

(c) $(2xy^3)^5$

$2^5 x^5 y^{3\times5}$

$32x^5y^{15}$ **(2)**

(4 marks)

---

1) Index Notation: Harder

20. (a) Find the value of

(i) 64°

1

(ii) $64^{\frac{1}{2}}$ $\sqrt{64}$

8

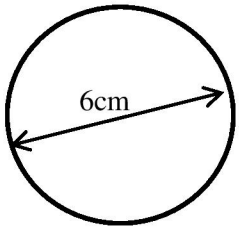
(iii) $64^{-\frac{2}{3}}$ $= \frac{1}{64^{2/3}}$ $= \left(\sqrt[3]{64}\right)^2 = \frac{1}{4^2}$

$\frac{1}{16}$ or 0.0625

(4 marks)

2) Circle Problems: Easier

1. A circle of **diameter** 6cm is shown below



(a) Find the **circumference** of the circle, to one decimal place.

$C = \pi d = \pi \times 6 = 18.8cm$

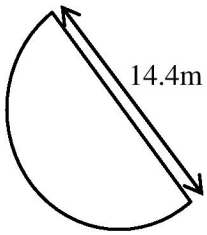
(b) Find the **area** of the circle, to one decimal place.

$A = \pi r^2 = \pi \times 3^2 = 28.3cm^2$

(4 Marks)

---

2. A semicircle of **diameter** 14.4m is shown below



(a) Find the **perimeter** of the semicircle, to 2 significant figures.

$C = \pi d = \pi \times 14.4 = 45.2m \quad 45.2 \div 2 + 14.4 = 37m$

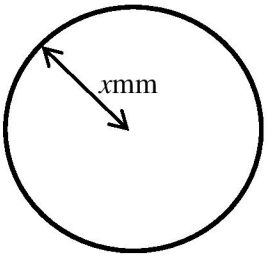
(b) Find the **area** of the semicircle, to 2 significant figures.

$A = \pi r^2 = \pi \times 7.2^2 = 162.86m^2 \quad 162.86 \div 2 = 81m^2$

(4 Marks)

---

3. The circle shown below has **area** 50mm^2



(a) Find the **radius** of the circle, giving your answer to the nearest integer.

$A = \pi r^2 \rightarrow 50 = \pi \times r^2 \rightarrow r^2 = 50 \div \pi = 15.92 \rightarrow r = \sqrt{15.92} = 4mm$

(b) Find the **circumference** of the circle, giving your answer to the nearest integer.

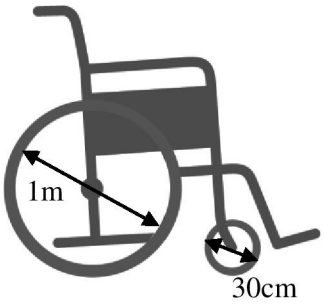
$C = \pi d = \pi \times 8 = 25mm$

(4 Marks)

---

2) Circle Problems: Medium

4. A wheelchair has two different sizes of wheel. The front wheel has a **diameter** of 30cm, and the back wheel has a diameter of 1m.



When the wheelchair travels a distance of 1km, how many more rotations does the front wheel do, than the back wheel?

Give your answer to the nearest whole number.

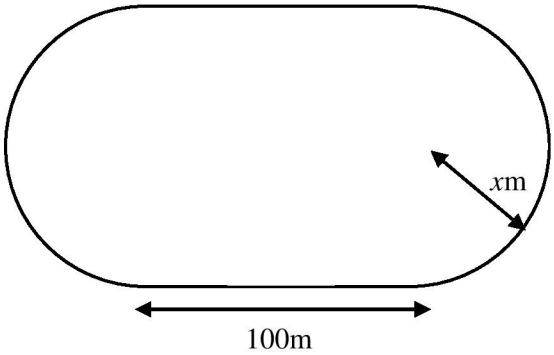
Front: $C = \pi d = \pi \times 0.3 = 0.94m$ 1000 ÷ 0.94 = 1064 rotations

Back: $C = \pi d = \pi \times 1 = 3.14m$ 1000 ÷ 3.14 = 318 rotations

1064 – 318 = 746 rotations more

(4 Marks)

5. An athletics track is being built in the shape of the diagram shown below, where each end of the track is a perfect semicircle.



The track distance needs to be 400m, with each straight section being 100m.

(a) Calculate *x*, the radius of the semi-circular section of track, so the one entire lap of the track is 400m. Give your answer to 3 significant figures.

Curved section = 400 - 100 – 100 = 200m

$C = \pi d \rightarrow 200 = \pi \times d \rightarrow d = 200 \div \pi = 63.66\text{m} \rightarrow r = 31.8m$

The area inside the track is going to be planted with grass seed. One pack of grass seed costs £17.99 and covers 60m^2.

(b) Using your answer to part (a), what will the cost of the grass seed for the track be?

$A = \pi r^2 = \pi \times 31.8^2 =$ 3176.9. Then 100 x 2x = 6366.2.

Total Area = 3176.9 + 6366.2 = 9813.1

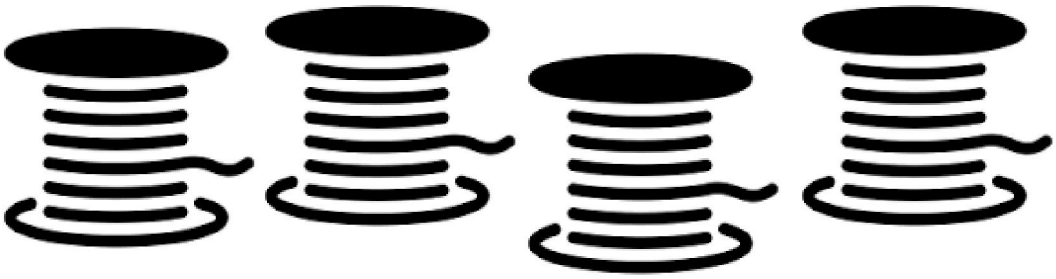
9813.1 / 60 = 163.5 packets, actually 164.

164 x £17.99 = £2950.36

(5 Marks)

2) Circle Problems: Harder

6. A sewing shop buys 100m of thread on 4 large reels.



Each large reel has a radius of 5cm.

(a) Calculate the number of times a piece of thread is wrapped round one reel.

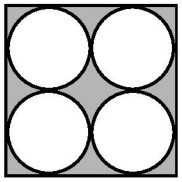
1 reel has 25m of thread

$C = \pi d = \pi \times 10 = 31.4cm = 0.314m$

$25 \div 0.314 = 79.6$

80 wraps

The large reels are stored upright in a square box 20cm, as shown below.



(b) What area of the floor space of the box, is not taken up by reels.

Reels: $A = \pi r^2 = \pi \times 5^2 = 78.5cm^2$

Box: $A = 20 \times 20 = 400cm^2$

$400 - 4 \times 78.5$

$= 86cm^2$

The thread from **one** reel is unwrapped and sold on 5 smaller reels separately.

(c) If each of the smaller reels has thread wrapped around it 50 times, what must the **diameter** of the smaller reel be?

Small reel holds 5m thread (25÷5)

The circumference of the small reel must be 10cm (5m ÷ 50 wraps)

$C = \pi d \rightarrow 10 = \pi \times d \rightarrow d = 10 \div \pi = 3.18cm$

$3.18cm$

(7 Marks)

3) Estimation: Easier

1. Work out an estimate for the value of

$$5.1 \times 98$$

$5 \times 100 =$

500

(2 marks)

2. Estimate the value of

$$\frac{68 \times 401}{198}$$

$\frac{70 \times 400}{200} =$

140

(2 marks)

3. Work out an estimate for the value of

$$\frac{637}{3.2 \times 9.8}$$

$\frac{600}{3 \times 10} = 20$

20

(2 marks)

3) Estimation: Medium

4. Which is the best estimate for the value of

$$\frac{37.9 \times 50.2}{2.1 + 2.98}$$

$$\frac{40 \times 50}{2+3} = \frac{2000}{5} = 400$$

(3 marks)

5. Which is the best estimate for the value of

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(3 marks)

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(3 marks)

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$197\text{ days} \approx 200$

$4 \times 200 = 800\text{ km}$ (1)

$0.21 \approx 0.2$

$\frac{800}{0.2}$ (2) $= 800 \times 5$ (3)

$= 4000$ times

4) Interior and Exterior Angles: Easier

1. A regular decagon has 10 sides.

(a) Calculate the **sum** of its **interior** angles.

$(10 - 8) \times 180$

……1440°……

(b) Calculate the size of **one** of its **interior** angles.

$1440 \div 10$

……144°……

(2 Marks)

---

2. A regular 15 sided shape can be called a pentadecagon.

(a) Write down the **sum** of its **exterior** angles.

……360°……

(b) Calculate the size of **one** of its **exterior** angles.

$360 \div 15$

……24°……

(2 Marks)

---

3. What is the name of the regular polygon with an **exterior** angle of 72°?

$360 \div 72 = 5$

……pentagon……

(1 Mark)

---

4. If a regular polygon has an interior angle of 140°, how many sides does it have?

Exterior angle: $180 - 140 = 40$

Sides: $360 \div 40$

……9……

(2 Marks)

---

4) Interior and Exterior Angles: Medium

5. A portion of a regular polygon with a reflex angle of 200° outside the shape, is shown below.

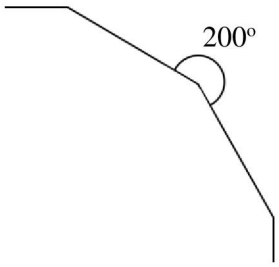

Diagram not accurately drawn

How many sides does the polygon have?

Exterior angle: $200 - 180 = 20$

Sides: $360 \div 20 = 18$

..... 18.....

(2 Marks)

---

6. A portion of a regular polygon is shown below with straight lines extending from two of its sides. These lines cross forming an angle of 144°.

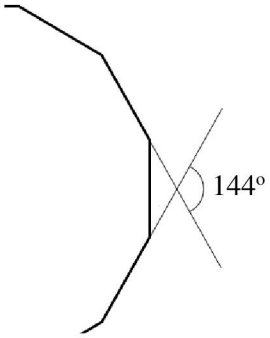

Diagram not accurately drawn

How many sides does the polygon have?

Obtuse angle in triangle: 144 (vertically opposite)

Base angle sum in isosceles triangle: $180 - 144 = 36$

Exterior angle: $36 \div 2 = 18$

Sides: $360 \div 18 = 20$

..... 20.....

(4 Marks)

---

4) Interior and Exterior Angles: Harder

7. A primary school teacher gives pupils a regular black pentagon, and five regular white hexagons. She tells them to glue them onto a flat piece of paper in a football pattern, as shown below.

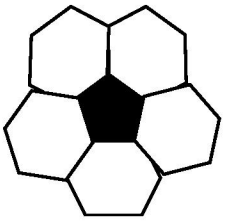

Diagram not accurately drawn

She says to be careful to make all of the edges and corners meet.

Use interior angles to show that this cannot be done.

Pentagon interior angle: $(5-2)\times 180\div 5=108°$
Hexagon interior angle: $(6-2)\times 180\div 6=120°$
Where two hexagons meet the pentagon the sum of the angles is 348°. Angles around a point add up to 360°, therefore the pattern can't be create without gaps.

(3 Marks)

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8. The diagram below shows two regular polygons placed edge to edge, with two equilateral triangles fitting exactly in the gaps.

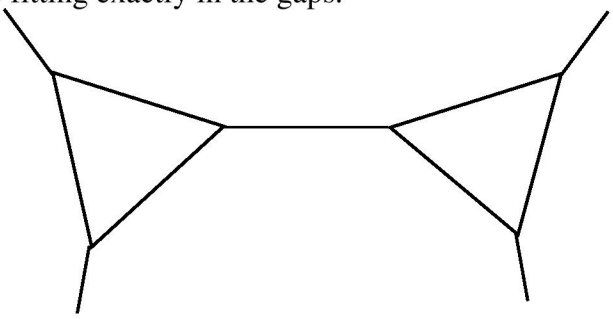

Diagram not accurately drawn

(a) If the two polygons are identical, how many sides do they have?

Angles in equilateral triangle: 60
Interior angle of each polygon: $(360-60)\div 2=150$
Exterior angle of each polygon: $180-150=30$
Polygon sides: $360\div 30=12$

..... 12.....

(b) If the one of the polygons has 24 sides, what is the name of the other polygon?

Interior angle of 24 sided polygon : $180-(360\div 24)=165$
Interior angle of other polygon : $360-165-60=135$
Sides of other polygon: $360\div(180-135)=8$

..... octagon.....

(6 Marks)

5) Counting Methods: Easier

1) Ryan has four shorts of different colours, blue, red, green and yellow.
He has three different T-shirts of different colours, black, white and orange.

Blue shorts and a black T-Shirt would be one possible outfit.
How many different outfits of Shorts and T-Shirts can Ryan wear?

4 shorts × 3 T-shirts = 12 possible outfits

(2 Marks)

2) There are 13 boys and 10 girls in a class.
Work out the total number of ways that 1 boy and 1 girl can be chosen from the class.

13 × 10 = 130 ways

(2 Marks)

3) There are 7 boys and 10 girls in a class.
Work out the total number of ways that 1 boys and 2 girls can be chosen from the class.

7 × 10 × 9 = 630 ways

(2 Marks)

5) Counting Methods: Medium

4) Mason's bank secret pin code is a four digit number and each digit can be the numbers 0, 1, 2, 3, 4, 5, 6 , 7, 8, or 9. For example one possible pin number could be 9021.

a) Mason's bank card is stolen. What is the probability with one guess only that someone correctly guesses Mason's pin number? Leave your answer as a fraction.

$$10 \times 10 \times 10 \times 10 = 10000 \text{ possibilities.}$$

$$\text{Probability of guessing first time} = \frac{1}{10000}$$

(2 Marks)

Ishmael's bank does not allow any digit to be repeated in his secret pin number. For example 7762 would not be allowed, nor would 5075.

b) Ishmael's bank card is stolen. What is the probability with one guess only that someone correctly guesses Ishmael's pin number? Leave your answer as a fraction.

$$10 \times 9 \times 8 \times 7 = 5040 \text{ possibilities.}$$

$$\text{Probability of guessing first time} = \frac{1}{5040}$$

(3 Marks)

5) Counting Methods: Harder

5) A restaurant menu has 6 starters, 10 mains and 6 desserts.
A customer can choose from the following meals

- a starter and a main,
- a main and a dessert,
- a starter, a main and a dessert.

Show that there are 480 different ways of choosing a meal at this restaurant.

$$(6 \times 10) + (10 \times 6) + (6 \times 10 \times 6)$$

$$= 60 + 60 + 360$$

$$= 480 \text{ ways}$$

(3 Marks)

6) A simple computer password only allows you to use two letters a and b.
"abaab" would be an example of one password which consists of 5 letters.
How many letters must your password contain such that the probability of someone randomly guessing it first time is less than 1 in a 1000?

Use Trial and Improvement:

2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 x 2 = 1024 ways with 10 letters.

Therefore a password of <u>10 letters</u> is needed as

$$\frac{1}{1024} < \frac{1}{1000}$$

(3 Marks)