Name: _____ Class: _____

St George Girls High School

Year 9

Common Test 1

May 2008

Mathematics

Time Allowed: 75minutes

Marks 74

	Marks
Section A	/20
Section B Question 1 Question 2 Question 3 Question 4	/13 ./13 /14 /14
Total	/74

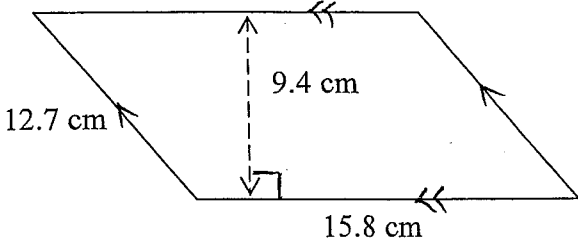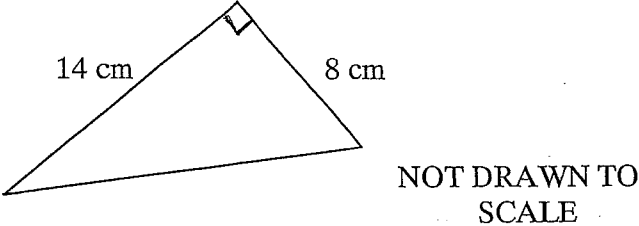**Instructions:**
- Set out work clearly
- Show all working when required.
- Calculators may be used.

SECTION A
20 questions - 1 mark each.
(Answers only in the ANSWER column).

QUESTION	ANSWER
1. Expand $5x(2x-7)$	
2. Express 3 570 000 in scientific notation	
3. Find the area of the parallelogram 12.7 cm, 9.4 cm, 15.8 cm NOT DRAWN TO SCALE	
4. This spreadsheet shows winners of a book award What is the content of cell B3? (A) 2003 (B) Jill Saunders (C) Kitten and Snake (D) Jeff Hardy	
5. Solve the equation. $\dfrac{5n+3}{6}=8$	

For question 4, the spreadsheet:

	A	B	C
1	Year	Author	Title
2	2001	Frances Clarke	A Town's Lament
3	2002	Jill Saunders	Kitten and Snake
4	2003	Jeff Hardy	The Quiet Room

QUESTION	ANSWER
6. Change $8 \cdot 104 \times 10^{-7}$ to its basic numeral	
7. Find the perimeter of the triangle (1 decimal place) 14 cm 8 cm NOT DRAWN TO SCALE	
8. Write $\sqrt[4]{y^3}$ in full index notation	
9. Solve the equation. $(y+5)^2 = 36$	
10. Estimate the result of 9.476×17.489	
11. Factorise fully $12m^3 - 9m^2$	
12. Change the subject of the equation to m. $k = mn - y$	
13. A rectangular swimming pool is 25 metres long by 8 metres wide and is surrounded by a path of width 1 metre. What is the perimeter around the outside edge of the path?	

QUESTION	ANSWER

14. The students of Jones High School need to purchase their own textbooks. This spreadsheet shows the cost of each textbook to be purchased by Felicity Howard, a year 9 student.

	A	B	C
1	Felicity Howard		
2			
3	Textbook	Price	
4	Mathematics	$42.85	
5	English	$31.45	
6	Science	$64.95	
7	History	$23.95	
8	Creative Arts	$18.00	
9			

If the formula =B4+B5+B6+B7+B8 is entered into cell B1, what value is shown in B1?

15. A rhombus has one diagonal equal to 12 cm and has an area of 78 cm^2. What is the length of the other diagonal?

16. Express 27 kg/h in g/s.

17. Simplify by expanding the brackets.

$$\left(27x^6 y^3\right)^{\frac{1}{3}}$$

Questions 18. and 19. relate to the following spreadsheet.

This spreadsheet shows the times taken for a group of students to each walk 50 metres. The speed of each student was calculated using a formula.

	A	B	C
1	Name	Time(s)	Speed (m/s)
2	Sarah	25	2.00
3	Ben	22	2.27
4	Alex	27	1.85
5	Cynthia	30	1.67
6	Rhys	18	2.78
7	Michael	19	2.63
8	Ellen	20	2.50
9	Maria	16	3.13

18. What formula could be entered into cell C2 to get the result shown (the formula must use a cell address)?

19. After entering the formula into cell C2, which option allowed the formula to be copied into the remaining cells?

(A)   Cut and Paste   (C)   Fill Down

(B)   Replace   (D)   Sort

20. Write the inequality that is represented by the diagram
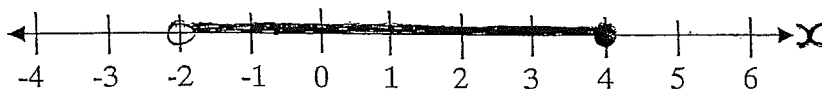
End of Section A

SECTION B
Show all necessary working in the space provided.

MARKS

Question 1 – (13 marks) Rational Numbers – Show all working

(a) Evaluate giving your answer in scientific notation correct to 3 significant figures.

    (i) $4.86 \times 10^{-3} + 5.97 \times 10^{-2}$

2

    (ii) $3.75 \times 10^{6} \div 6.28 \times 10^{10}$

2

(b) A worker in a local factory earns $12.72 per hour.

    (i)   How much does she earn in a 40 hour week?

1

    (ii)   If she receives the same amount for the week's work but only works a 38 hour week, what will be her new hourly rate to the nearest cent?

1

(c) The temperature at 2:30 pm was 11° C and fell steadily until it reached –2° C at 1:45 am. Find the average rate of decrease per hour correct to 2 decimal places.

2

Question 1 (cont'd)   MARKS

(d) 18 litres of petrol are needed for a car to travel 261 km.

        (i)   How far would the same car travel on 13 litres of petrol?

                                                                                                  1

        (ii)   How much petrol would the car use to travel 340 km?

                                                                                                  1

(e) For the calculation $\dfrac{4.76 + (5.2)^2}{3.87}$

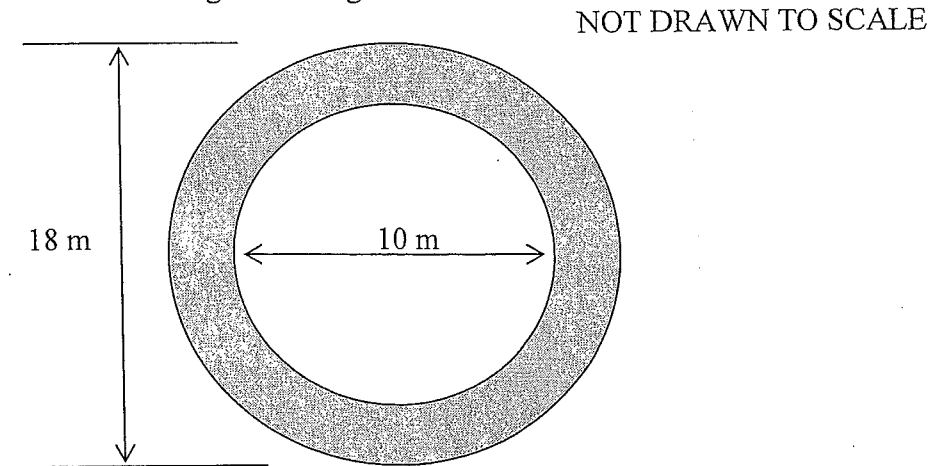   (i)   Find the upper and lower boundary estimates

                                                                                                  2

        (ii)   Calculate the answer correct to 2 decimal places.

                                                                                                  1

Question 2 – (13 marks) Measurement – Show all working   MARKS

(a) A circular path with diameters is shown in the diagram. Find the shaded area
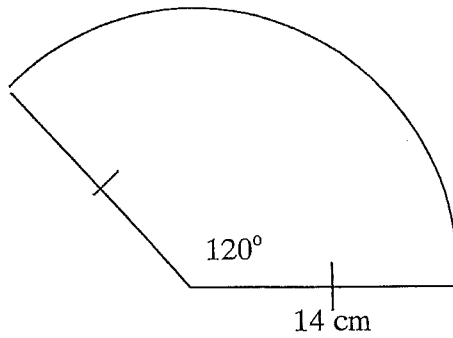   correct to 3 significant figures.

NOT DRAWN TO SCALE

18 m   10 m

(b) A rectangular sheet of metal has a semicircle cut out of one side as shown. Find the
     perimeter correct to the nearest metre.

24 m

NOT DRAWN
TO SCALE   11 m

5 m   7 m

2
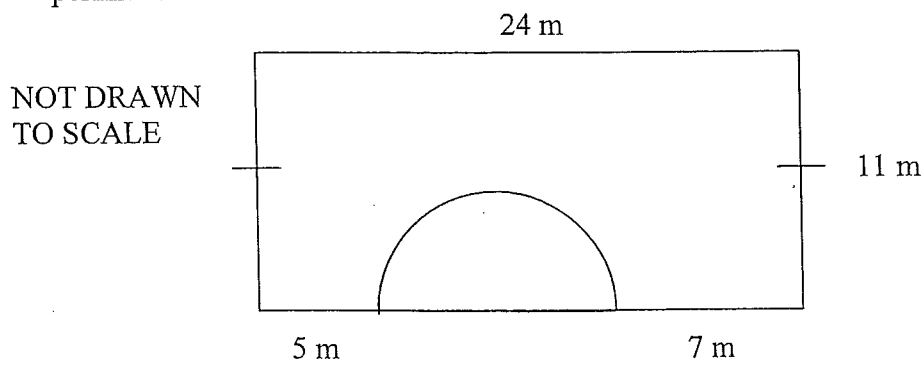
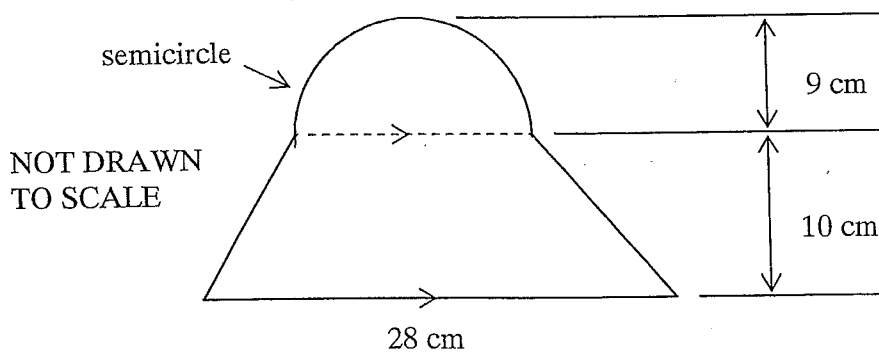Question 2 (cont'd)   MARKS

(c) Find the perimeter of the sector in centimetres correct to 2 decimal places.

NOT DRAWN TO SCALE

$120°$

14 cm

2

(d)   Find the area of the composite shape in ~~mm²~~ cm² correct to 2 decimal places.

semicircle

9 cm

NOT DRAWN
TO SCALE

10 cm

28 cm

Question 2 (cont'd)   MARKS
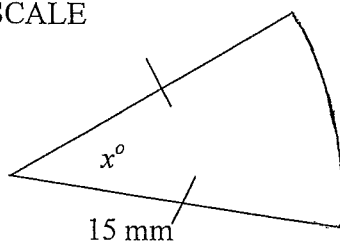
(e)   A circle and a square have the same area. If the radius of the circle is 8 cm, find the length of each side of the square in centimetres correct to 2 decimal places.

2

(f)   Find the size of the angle x^o in the sector correct to the nearest degree if its area is 84 ~~cm~~². mm^2

NOT DRAWN TO SCALE

15 mm

x^o

2

MARKS

Question 3 – (14 marks) Equations – Show all working

(a)   Solve the equations
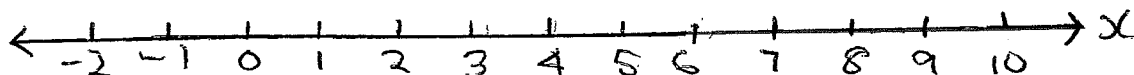
   (i) $3(5x-2)+3x = 2(7x+6)$

2

   (ii) $\dfrac{2m}{3m-4} = \dfrac{3}{5}$

2

(b)   Solve the inequation and display the solution on the number line.

   $5-3x \leq -13$

2

Question 3 (cont'd)

(c) Given that $M = \dfrac{a^2 + b^2}{12}$ find a when $M = 97.15$ and $b = 19.65$

2

(d) Solve the inequation for x when we know that x is always positive

$$13 - 3x \geq 3 + 2x$$

2

(e) Gladys has only 20 cent pieces and 50 cent pieces in her purse. The total value of
these coins is $12.30. She has two less 50 cent pieces than 20 cent pieces. Use x to
represent the number of 20 cent pieces and:

(i) Form an equation from the above information.

2

(ii) Solve the equation and state how many 20 cent pieces she has in
her purse

2

MARKS

Question 4 – (14 marks) Algebra – Show all working

(a) Expand
      (i) $(4x + 5)^2$

      (ii) $\dfrac{-3}{4}n^2(4n^2 - 8n + 5)$

(b) Expand and simplify
      (i) $2n(3n - 2) - 2(n - n^2)$
      (ii) $n^2 - (2n + 1)(2n - 1)$

4

(c) Factorise fully
      (i) $6m^2n - 12mn + 18mn^2$
      (ii) $(3x + 1)(x + 1) + 5(x + 1)$

3

Question 4 (cont'd)

MARKS

(d) Simplify

(i) $(x^{-3})^{-2}$

(ii) $m^0 \div m$

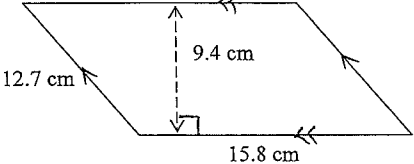(iii) $\dfrac{a^5 b^4 c^2 \times bc}{(abc^2)^3}$

3

(e) Find x

$$9^x = 27$$

2

End of Paper

SECTION A

20 questions - 1 mark each.
(Answers only in the ANSWER column).

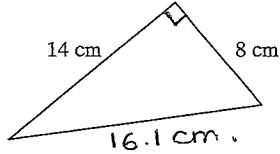| QUESTION	ANSWER
1. Expand $5x(2x-7)$ $= 10x^2 - 35x$	$10x^2 - 35x$ ✓
2. Express $3\,570\,000$ in scientific notation	3.57×10^6 ✓
3. Find the area of the parallelogram 12.7 cm 9.4 cm 15.8 cm NOT DRAWN TO SCALE	9.4×15.8 $= 148.52 \text{ cm}^2$ ✓
4. This spreadsheet shows winners of a book award <table><tr><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>1</td><td>Year</td><td>Author</td><td>Title</td></tr><tr><td>2</td><td>2001</td><td>Frances Clarke</td><td>A Town's Lament</td></tr><tr><td>3</td><td>2002</td><td>Jill Saunders</td><td>Kitten and Snake</td></tr><tr><td>4</td><td>2003</td><td>Jeff Hardy</td><td>The Quiet Room</td></tr></table> What is the content of cell B3? (A) 2003 (B) Jill Saunders (C) Kitten and Snake (D) Jeff Hardy	✓
5. Solve the equation. $\dfrac{5n+3}{6} = 8$ $5n + 3 = 48$ $5n = 45$ $n = 9$	$n = 9$ ✓

$$y^2 + 10y + 25 = 36$$
$$y^2 + 10y = 11$$

$$(y+5)(y+5)$$
$$= y(y+5) + 5(y+5)$$
$$= y^2 + 5y + 5y + 25$$
$$=$$

QUESTION	ANSWER
6. Change $8 \cdot 104 \times 10^{-7}$ to its basic numeral	0.0000008104 ✓
7. Find the perimeter of the triangle (1 decimal place) 14 cm 8 cm 16.1 cm. NOT DRAWN TO SCALE	38.1 cm ✓ (correct to 1 decimal place)
8. Write $\sqrt[4]{y^3}$ in full index notation	$y^{\frac{3}{4}}$ ✓
9. Solve the equation. $(y+5)^2 = 36$	$y^2 + 10y = 11$ −1
10. Estimate the result of 9.476×17.489	9.5×17.5 $= 166.25$ ✓
11. Factorise fully $12m^3 - 9m^2$ $3m^2(4m-3)$	$3m^2(4m-3)$ ✓
12. Change the subject of the equation to m. $k = mn - y$ $mn = k + y$ $m = \dfrac{k+y}{n}$	$m = \dfrac{k+y}{n}$ ✓
13. A rectangular swimming pool is 25 metres long by 8 metres wide and is surrounded by a path of width 1 metre. What is the perimeter around the outside edge of the path?	74 m. ✓

QUESTION	ANSWER
14. The students of Jones High School need to purchase their own textbooks. This spreadsheet shows the cost of each textbook to be purchased by Felicity Howard, a year 9 student.	$181.20

	A	B	C
1	Felicity Howard		
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3	Textbook	Price	
4	Mathematics	$42.85	
5	English	$31.45	
6	Science	$64.95	
7	History	$23.95	
8	Creative Arts	$18.00	
9			

If the formula =B4+B5+B6+B7+B8 is entered into cell B1, what value is shown in B1?

✓

15. A rhombus has one diagonal equal to 12 cm and has an area of 78 cm^2. What is the length of the other diagonal?

$\frac{12 \times x}{2} = 78$ $12 \times x = 156$ $x = 13$

length of the other diagonal is 13 cm ✓

16. Express 27 kg/h in g/s.

27000 g/h
450 g/min
7.5 g/sec

7.5 g/s. ✓

17. Simplify by expanding the brackets.

$\left(27x^6 y^3\right)^{1/3}$

$3x^2 y$

$3x^2 y$ ✓

Questions 18. and 19. relate to the following spreadsheet.

This spreadsheet shows the times taken for a group of students to each walk 50 metres. The speed of each student was calculated using a formula.

	A	B	C
1	Name	Time(s)	Speed (m/s)
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3	Ben	22	2.27
4	Alex	27	1.85
5	Cynthia	30	1.67
6	Rhys	18	2.78
7	Michael	19	2.63
8	Ellen	20	2.50
9	Maria	16	3.13

18. What formula could be entered into cell C2 to get the result shown (the formula must use a cell address)?

50 ÷ B2

50 ÷ B2 ✓

19. After entering the formula into cell C2, which option allowed the formula to be copied into the remaining cells?

(A) Cut and Paste   (C) Fill Down

(B) Replace   (D) Sort

C ✓

20. Write the inequality that is represented by the diagram

$-2 < x \le 4$ ✓

End of Section A

SECTION B
Show all necessary working in the space provided.

MARKS

Question 1 – (13 marks) Rational Numbers – Show all working

(a) Evaluate giving your answer in scientific notation correct to 3 significant figures.

    (i) $4.86 \times 10^{-3} + 5.97 \times 10^{-2}$

        6.46×10^{-2} ✓

2

    (ii) $3.75 \times 10^{6} \div 6.28 \times 10^{10}$

        5.97×10^{-5} ✓

2

(b) A worker in a local factory earns $12.72 per hour.

    (i) How much does she earn in a 40 hour week?

        $508.80 ✓

1

    (ii) If she receives the same amount for the week's work but only works a 38 hour week, what will be her new hourly rate to the nearest cent?

1

        $13.40 ^{39} is her new hourly rate

        $\dfrac{\$508.80}{38} = 13.39$ ✓

(c) The temperature at 2:30 pm was 11° C and fell steadily until it reached –2° C at 1:45 am. Find the average rate of decrease per hour correct to 2 decimal places.

2

2:30
3:30
4:30
5:30
6:30
7:30
8:30
9:30

11:30
12:30
1:30

fell 13°C

1.18° of decrease per hour.

$13 \div 11.25$

12 hrs.
+15 min

−1

Question 1 (cont'd)

MARKS

(d) 18 litres of petrol are needed for a car to travel 261 km.

    (i) How far would the same car travel on 13 litres of petrol?

    14.5 km / per litre

    188.5 km ✓

1

    (ii) How much petrol would the car use to travel 340 km?

    23 litres
    (rounded to whole number) ✓

1

(e) For the calculation $\dfrac{4.76 + (5.2)^2}{3.87}$

    (i) Find the upper and lower boundary estimates

    $\dfrac{8.5}{7.5} \sim \dfrac{9.8}{8.5}$

    $5 + 27 = \dfrac{32}{4} = 8$ ✗

    $-1\frac{1}{2}$

2

    (ii) Calculate the answer correct to 2 decimal places.
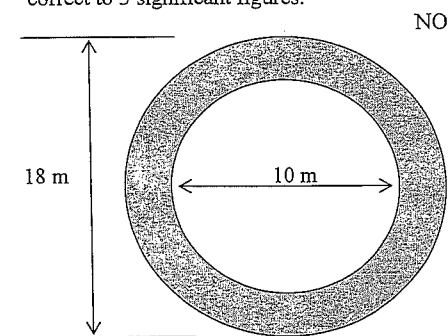
    8.22 ✓

1

**Question 2 – (13 marks) Measurement – Show all working**   MARKS

(a) A circular path with diameters is shown in the diagram. Find the shaded area
     correct to 3 significant figures.

NOT DRAWN TO SCALE

18 m

10 m

$$165\,m^2$$

$$254\,m^2 - 194\pi^2 = 79\,m^2$$

$$= 175\,m^2 \times$$

$$A = \pi R^2 - \pi r^2$$

$$= \pi \times 9^2 - \pi \times 5^2$$

$$= 175.929\cdots \quad \boxed{-1}$$

$$\approx 176\,m^2$$

(b) A rectangular sheet of metal has a semicircle cut out of one side as shown. Find the
     perimeter correct to the nearest metre.

24 m

NOT DRAWN
TO SCALE

11 m

19

2

5 m   7 m
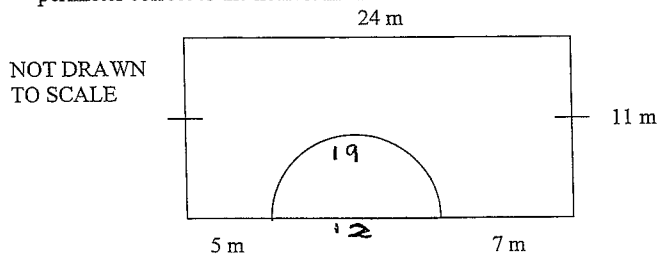
$$11 + 24 + 11 + 7 + 19 + 5 = 77\,m$$

∴ the perimeter is 77m. ✓

2

Question 2 (cont'd)   MARKS

(c) Find the perimeter of the sector in centimetres correct to 2 decimal places.

29.32

NOT DRAWN TO SCALE

120°

14 cm

$$\frac{2}{28}$$

$$29.32 + 14 + 14$$

$$= 57.32\,cm$$ ✓

2
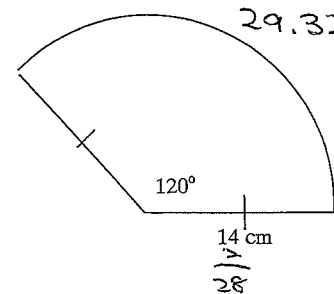
(d) Find the area of the composite shape in cm^2 correct to 2 decimal places.

semicircle

9 cm

NOT DRAWN
TO SCALE

x

10 cm

28 cm y
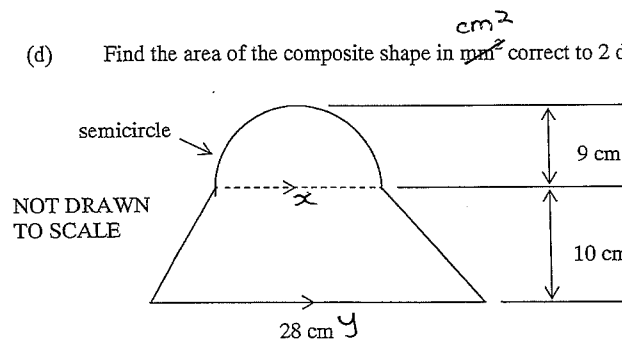
$$trapezium = \frac{(x+y)h}{2} = \frac{(18+28)10}{2} = 230\,cm^2$$

$$circle = \frac{1}{2} \times \pi \times 9^2 = 127.23\,cm^2$$

∴ total area is $357.23\,cm^2$ ✓

Question 2 (cont'd)   MARKS

(e) A circle and a square have the same area. If the radius of the circle is 8 cm, find the length of each side of the square in centimetres correct to 2 decimal places.

$\pi r^2 = 201.1 \text{ cm}^2$ 2

∴ length of each side of the square is 14.18 cm² (correct to 2 d p) ✓

(f) Find the size of the angle $x°$ in the sector correct to the nearest degree if its area is 84 cm². mm²
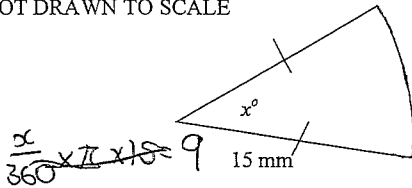
NOT DRAWN TO SCALE

$x°$
15 mm

$\frac{x}{360} \times \pi \times 15 = 9$

$\frac{x}{360} \times \pi \times 15 = 84 \quad \frac{x}{360} \times$ 2

$\frac{x}{360} \times \pi \times x$

$84 \div 707 = 0.12 \times 360$
$= 43.2$

$43°$.

∴ the size of the angle $x° = 43°$

✓

                                                       MARKS

Question 3 – (14 marks) Equations – Show all working

(a) Solve the equations
   (i) $3(5x - 2) + 3x = 2(7x + 6)$ 2

   $15x - 6 + 3x = 14x + 12$
   $18x - 6 = 14x + 12$
   $4x - 6 = 12$
   $4x = 18$
   $x = 4\frac{1}{2}$ ✓

   (ii) $\frac{2m}{3m - 4} = \frac{3}{5}$ 2

   $2m \times 5 = 3(3m - 4)$
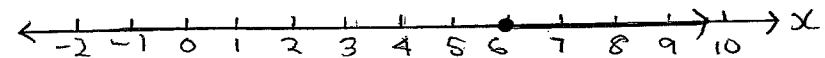 $10m = 9m - 12$
   $m = -12$ ✓

(b) Solve the inequation and display the solution on the number line.

   $5 - 3x \leq -13$ 2

   $-3x \leq -18$
   $x \geq 6$ ✓

MARKS

Question 3 (cont'd)

(c) Given that $M = \dfrac{a^2 + b^2}{12}$ find a when $M = 97.15$ and $b = 19.65$

2

$$97.15 = \frac{a^2 + 19.65}{12} \checkmark$$

$$1165.8 = a^2 + 19.65^2$$

$$1146.15 = a^2$$

$$\pm 33.85 = a \quad (\text{correct to 2 dp})$$

(–1)

(d) Solve the inequation for x when we know that x is always positive

2

$$13 - 3x \geq 3 + 2x$$

$$13 \geq 3 + 5x$$

$$10 \geq 5x$$

$$2 \geq x$$

$$x \leq 2, \text{ but } x > 0$$

$$\therefore 0 < x \leq 2$$

(–1)

(e) Gladys has only 20 cent pieces and 50 cent pieces in her purse. The total value of these coins is \$12.30. She has two less 50 cent pieces than 20 cent pieces. Use x to represent the number of 20 cent pieces and:
   (i) Form an equation from the above information.

2

$$20x + 50(x - 2)$$
$$20x + 50x - 100 = \$1230$$
$$20x + 50x = 1330$$
$$70x = 1330$$
$$x = 19$$

$$20x + 50y - 2x$$
$$18x + 50y = \$12.30$$

$$20x + 50(x - 2) = 1230$$

   (ii) Solve the equation and state how many 20 cent pieces she has in her purse

2

$$20x + 50(x - 2)$$
$$= 20x + 50x - 100 = 1230¢ \checkmark$$
$$= 20x + 50x = 1330¢$$
$$= 70x = 1330¢$$
$$= x = 19$$

$$\therefore \text{ She has } \underline{19} \text{ 20 cent pieces} \checkmark$$

MARKS

Question 4 – (14 marks) Algebra – Show all working

(a) Expand
   (i) $(4x + 5)^2$

$$(4x + 5)(4x + 5)$$
$$= 4x(4x + 5) + 5(4x + 5)$$
$$= 16x^2 + 20x + 20x + 25$$
$$= 16x^2 + 40x + 25 \checkmark$$

   (ii) $\dfrac{-3}{4}n^2(4n^2 - 8n + 5)$

$$= -3n^4 + 6n^3 - \frac{15}{4}n^2$$
$$\therefore -3n^4 + 6n^3 - \frac{15}{4}n^2 \checkmark$$

(b) Expand and simplify
   (i) $2n(3n - 2) - 2(n - n^2)$

$$6n^2 - 4n - 2n + 2n^2$$
$$= 8n^2 - 6n \checkmark$$

   (ii) $n^2 - (2n + 1)(2n - 1)$

4

$$n^2 - 2n + 1$$
$$2n(2n - 1) + 1(2n - 1)$$
$$= 4n^2 - 2n + 2n - 1$$
$$= 4n^2 - 1$$
$$n^2 - (4n^2 - 1)$$
$$= -3n^2 + 1$$

$\left(-\dfrac{1}{2}\right)$

(c) Factorise fully
   (i) $6m^2n - 12mn + 18mn^2$

$$6mn(m - 2 + 3n) \checkmark$$

   (ii) $(3x + 1)(x + 1) + 5(x + 1)$

3

$$3x(x + 1) + 1(x + 1)$$
$$= 3x^2 + 3x + x + 1$$
$$= 3x^2 + 4x + 1 + 5x + 5$$
$$= 3x^2 + 9x + 6$$
$$= 3(x^2 + 3x + 2) = 3(x + 1)(x + 2)$$

(–1)

$\therefore$ You do need to expand first when factorising here

Question 4 (cont'd)

MARKS

(d) Simplify

(i) $(x^{-3})^{-2}$

$\frac{x^4}{x^{-3}} \quad x^6$ ✓

(ii) $m^0 \div m$

$1 \div m$

$\frac{1}{m}$ ✓

(iii) $\dfrac{a^5b^4c^2 \times bc}{(abc^2)^3}$

3

$\dfrac{a^8 b^5 c^3}{a^3 b^3 c^6}$

$\dfrac{a^2 b^2}{c^3}$ ✓

(e) Find x

$9^x = 27$

$3^{2x} = 3^3$

$2x = 3$

$x = 1$

$x = 1\frac{1}{2} \quad \tfrac{3}{2} \text{ or } 1\frac{1}{2}$ ✓

2

End of Paper