Student's Name: ....

Teacher's Initials: ....

Barker
College

HONOR NON HONORES

ARP	DZP
RMH	GPF
TE	AYG*

YEAR 9

AM1 7th NOVEMBER

TERM 4, 2018

5.3 MATHEMATICS

TOTAL TIME: 90 minutes

160 copies

INSTRUCTIONS TO STUDENTS:

This examination consists of TWO sections.

* **Write your name and teacher's initials in the spaces indicated.**

SECTION 1 : NON-CALCULATOR (20 minutes)

* Calculators must NOT be used in this section.
* Answer ALL questions in the spaces provided.
* Show ALL necessary working.
* Marks may not be awarded for careless or badly arranged work.
* Diagrams are NOT drawn to scale.

SECTION 2 : CALCULATOR (70 minutes)

* Calculators MAY be used in this section.
* Answer ALL questions in the spaces provided.
* Show ALL necessary working.
* Marks may not be awarded for careless or badly arranged work.
* Diagrams are NOT drawn to scale.

* * * *

	Your Mark	**Marks**
SECTION 1		**32**
SECTION 2		**81**
TOTAL		**113**

SECTION 1: NON-CALCULATOR

1. Simplify $(3x^2)^0 y^2$ **1**

2. Round 0.0054823 to 3 significant figures.   **1**

3. Simplify $k^{13} \times k^6 \div k^9$ **1**

4. Factorise fully:
  (a) $x^2 + 11x + 24$ **1**

  (b) $3x^2 - 75$ **2**

5. Given that $y = \sqrt{2a - b}$, find the value of y when $a = 4$ and $b = -1$.   **2**

6. Consider the line with equation $y = 3x - 6$ **2**
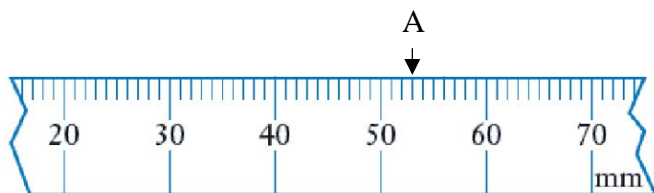
  (i)   What is the y – intercept?

  (ii)   What is the gradient?

7. A regular hexagon has 6 sides. **2**

What is the size of each exterior angle of the hexagon?

8. Evaluate $64^{-\frac{1}{2}}$ **2**

9. The diagram shows a section of Bob the builder's tape measure.

(i) What is the absolute error of measurement A? **1**

(ii) What is the range in values in which the actual measurement could lie? **1**

10. Find the interest earned if Ben borrowed $1000 at 12% per annum for 5 months. **2**

11. The following information is given about three towns Dingle (D), Glin (G) and Listowel (L): **2**

- Glin is due east of Listowel
- Glin is on a bearing of 145° from Dingle
- Dingle is on a bearing of 060° from Listowel

NOT TO SCALE
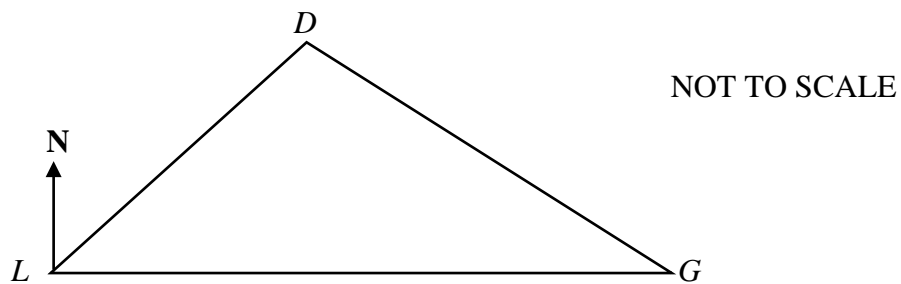
(i) Show this information on the diagram above.

(ii) Hence, find $\angle LDG$

12. The line $6x - ky = 2$ passes through the point (3, 2). **2**

Find the value of k.

13. Convert the recurring decimal $0.\dot{4}\dot{5}$ to a fully simplified fraction. **2**

14. Simplify:

(a) $\dfrac{5^3}{\sqrt{5^5}}$ **3**

(b) $\dfrac{(2x^3)^3 y^2}{4y^3}$ **3**

15. Express $2^4 + 2^4 + 2^4 + 2^4$ in the form 2^n. **2**

End of Section 1: Non-Calculator

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YEAR 9

5.3 MATHEMATICS

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SECTION 2: CALCULATOR

Time: 70 minutes

INSTRUCTIONS TO STUDENTS:

- **Attempt ALL questions.**
- **Show ALL working.**
- **Approved calculators MAY be used.**
- **Write your answers in the spaces provided on the paper.**
- **Marks may not be awarded for careless or badly arranged work.**
- **Diagrams are NOT drawn to scale.**

SECTION 2: There are EIGHT parts in this section.

Part	Topic	Your Mark	Marks
A	**Algebra, Products & Factors**		**11**
B	**Trigonometry**		**7**
C	**Earning Money**		**11**
D	**Equations**		**10**
E	**Geometry, Congruence & Similarity**		**11**
F	**Co-ordinate Geometry & Simultaneous Equations**		**13**
G	**Surface Area and Volume**		**8**
H	**Mixed Questions**		**10**
	Total		**81**

Part A: Algebra, Products & Factors (11 marks)

Question 1

Expand and simplify:

    (a) $(5x - 2)(3x - 4)$ **2**

    (b) $(7a - b)^2$ **2**

Question 2

Factorise completely:

    (a) $10x^2 - x - 2$ **2**

    (b) $15ac - 12ad - 10bc + 8bd$ **2**

Question 3

Simplify and then fully factorise: **3**

$(7x - 2)(7x + 2) - (5y - 2)(5y + 2)$

Part B: Trigonometry (7 marks)

Question 4

Find x correct to 2 decimal places. **2**
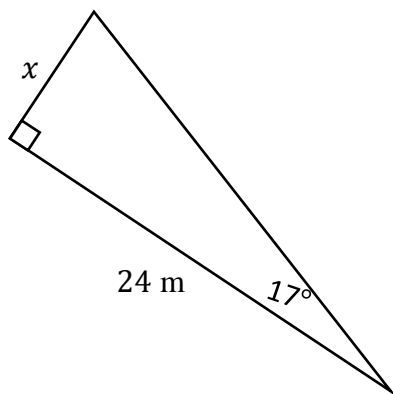
Question 5

Find θ to the nearest degree. **2**
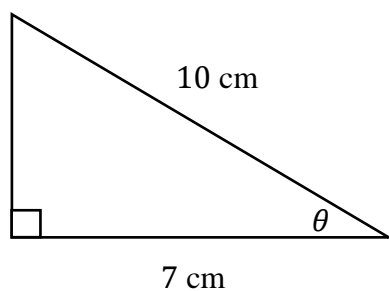
Question 6
If $\tan \theta = \frac{1}{2}$

    (i)   Represent this information on a right angled triangle. **1**

    (ii)   Find $\cos \theta$ exactly. **2**

Part C: Earning Money (11 marks)

Question 7

Sarah sells jewellery. She is paid a retainer of $200 per week plus 6% on the first $2000 of her sales, **2**
3.5% on the next $1000, and 2% thereafter. What is Sarah's gross income for a week when
her total sales are $5670?

Question 8

John is a plumber. The table below shows part of his weekly payslip. **3**

Description	Hours Worked	Pay Rate	Amount
Basic Hourly	20.4	$36	$734.40
Overtime: Double Time	8.2	$72	$590.40
Overtime: Time and a half	9.9	*A*	*B*
Total Gross Income			*C*

Fill in this missing amounts from the payslip labelled *A, B* and *C* below.

   A = … … … …

   B = ...

   C = ...

Question 9

Simon bought a car on terms. He paid a 20% deposit and monthly repayments

of $338.52 for 4 years. The price of the car was $15 000.

   (i)   Find the balance owing on the car after the deposit has been paid. **1**

   (ii)   How much did he pay in repayments? **1**

   (iii)   How much interest was charged? **1**

Question 10

Richard in an architect who earned $118 600 one financial year. He also earned $652 in interest from his shares. Richard has $2 340 in allowable tax deductions.

Income tax rates for 2018/2019 financial year

Income	Marginal tax rate	Tax payable*
$0-$18,200	0%	Nil
$18,201- $37,000	19%	19 cents for each $1 over $18,200
$37,001-$90,000	32.5%	$3,572 plus 32.5 cents for each dollar over $37,000
$90,001-$180,000	37%	$20,797 plus 37 cents for each dollar over $90,000
$180,001 and above	45%	$54,097 plus 45 cents for each dollar over $180,000

Source: Adapted from information on the ATO website (www.ato.gov.au).

    (i)   Show that Richard's taxable income is $116 912   **1**

    (ii)   Find the amount of income tax payable.   **2**

Part D: Equations (10 marks)

Question 11

Solve:

$$\frac{3-2m}{5} + 4 = 3$$

2

Question 12

Solve the following inequality and show the solution on the number line.

$-5 < 3x + 10$

3
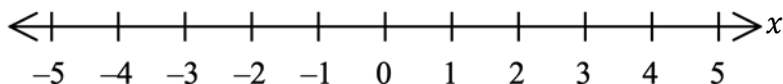
Question 13

The volume of a shape is given by the following formula:

2

$$V = \frac{1}{3}\pi h(R^2 + Rr + r^2)$$

Find the volume of the shape if $h = 4.5$ cm, $R = 2$ cm, $r = 1$ cm and $\pi \approx \frac{22}{7}$.
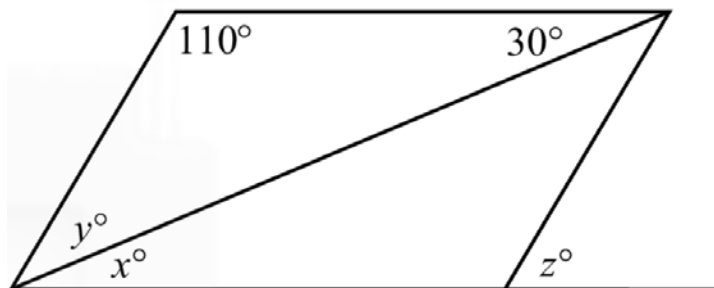
Question 14

Make p the subject of the equation. **3**

$$a = \frac{p}{p+b}$$

Part E: Geometry, Congruence & Similarity (11 marks)

Question 15

The diagram below shows a parallelogram with one side extended.   **3**
Solve for the pronumerals. **Do not give** reasons for your answers.

x = … … … …...

y = … … … … …

z = … … … … …

Question 16

PQRS is a trapezium with *PQ* || *SR*. Diagonals *PR* and *SQ* intersect at *T*.
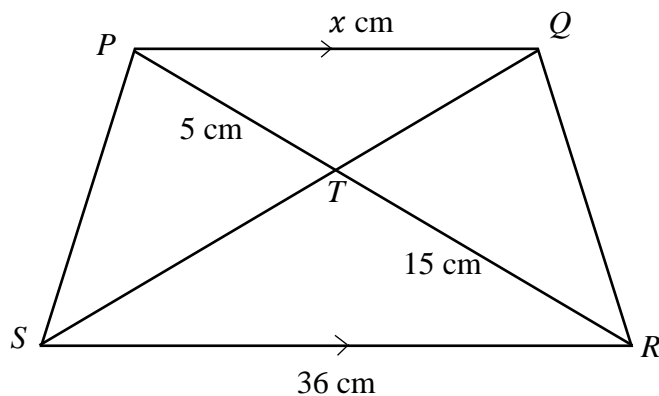
(i)   Prove that Δ*PQT* is similar to Δ*RST*. Give reasons.   **3**

(ii)   Hence, find the length of *PQ.* Show working clearly.   **2**

Question 17

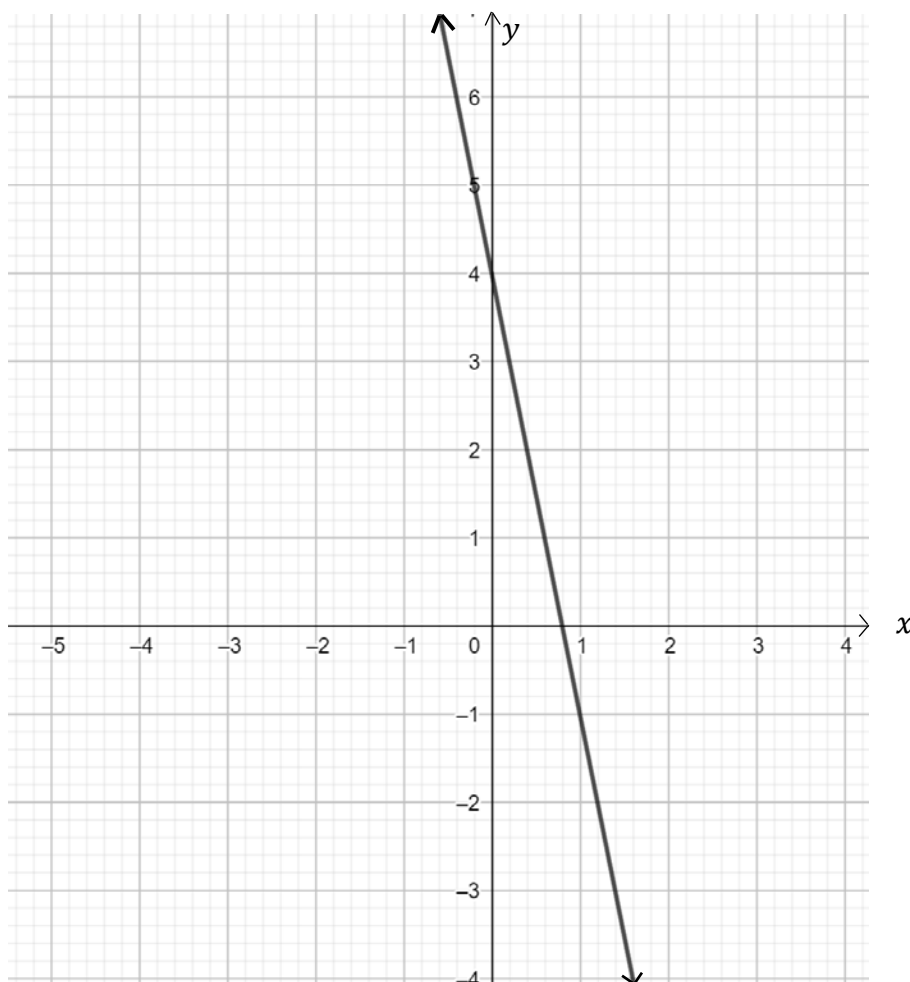*AOC* and *BOD* are diameters of the circle and *AB* ∥ *DC*. The circle has centre *O*.

Prove that ΔABD ≡ ΔDCA. Write a formal proof with full reasons. **3**
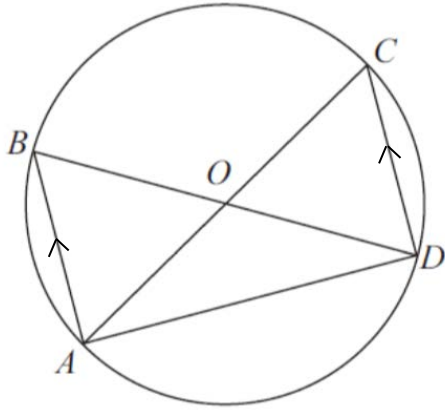
Part F: Co-ordinate Geometry & Simultaneous Equations (13 marks)

Question 18

The graph of a linear function is shown.

(i) What is the gradient of the line? **1**

(ii) Sketch any line parallel to the one shown on the graph above. **2**
Clearly label the co-ordinates of two points on your line.

Question 19

For the points $P(2, -3)$ and $Q(-2, 1)$

    (i)   Find the exact length of PQ.   **2**
               Leave your answer as a surd.

    (ii)   Find the gradient of PQ.   **2**

    (iii)   What is the equation of the line with gradient $\frac{1}{3}$ passing through the midpoint of PQ?   **3**
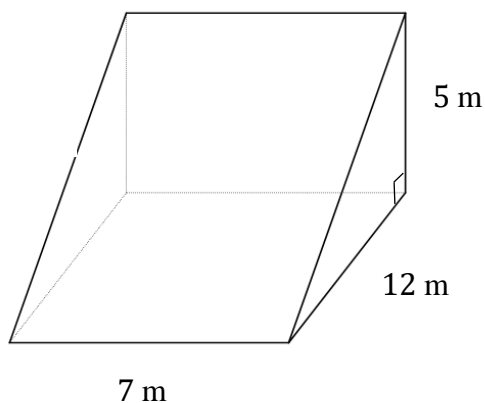
Question 20

Solve the following equations simultaneously to find x and y.   **3**

$2x - 2y = 5$
$3x + 2y = 15$

Part G: Surface Area & Volume (8 marks)

Question 21

Find the surface area of the closed prism below.   **3**


5 m

12 m

7 m

Question 22

The shape below is an octahedron with total surface area 1002 m². An octahedron is two square based pyramids joined together. It has 8 faces with all faces the same and all faces isosceles triangles.

The height of each triangular face is 15.7 metres and the base of each triangle is x metres.

The perpendicular height of the pyramid is h metres.

(i)   Find x, the base of the triangle, to 2 decimal places.   **2**

h

15.7 m

x
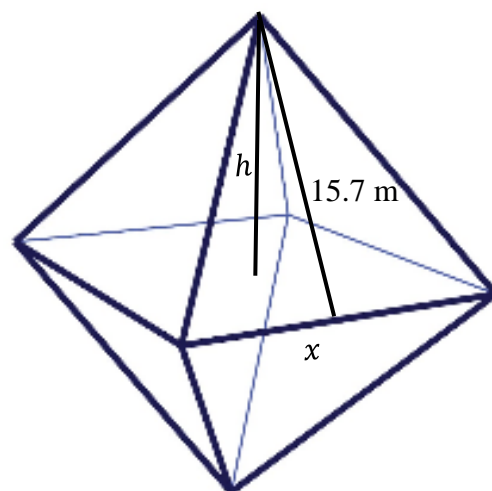
(ii)   Hence find h, the perpendicular height of the pyramid,   **3**
         to the nearest whole number.

Part H: Mixed Questions (10 marks)

Question 23

Fully simplify: **4**
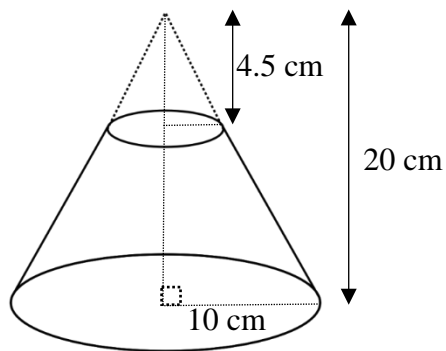
$$\frac{2x}{x+3} + \frac{3x}{x-3} - \frac{5x^2+9}{x^2-9}$$

Question 24

A solid cone has a height of 20cm and a radius of 10cm. A small cone of height 4.5cm is   **3**
cut off the top.

Calculate the volume, in litres, to two decimal places, of the remaining solid.
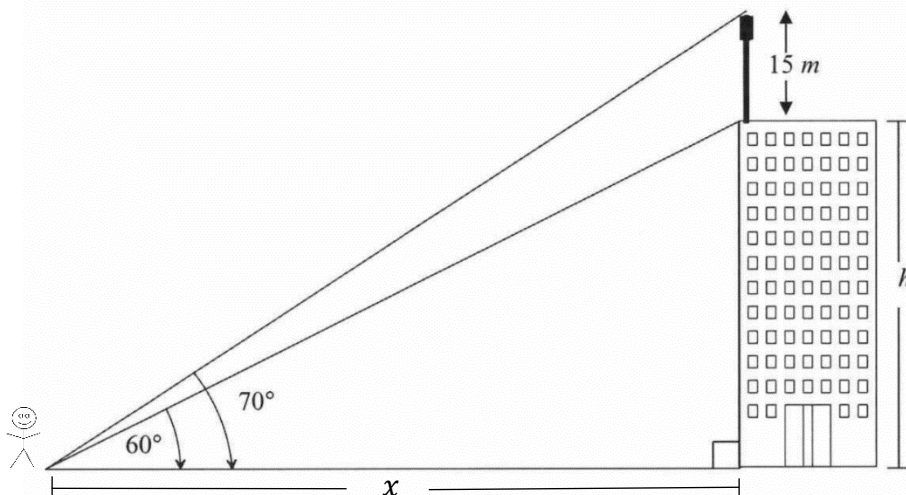
Question 25

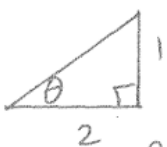A 15 m high telegraph pole stands on top of a building. **3**
An observer, standing on the ground some metres away from the building, measures the angle
of elevation to the top of the telegraph pole as 70°. She then measures the angle of elevation
to the top of the building as 60°.

Find the height, h, of the building.

End of Paper

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Year 9 5.3 Yearly Exam. Student Solutions

Non Calculator

- y^2

1. 0.00548

3. k^{10}

4a) $(x+8)(x+3)$

1) $3(x^2-25)$
   $= 3(x+5)(x-5)$

5. 3

6(i) -6

(ii) 3

7. 60

8. $\frac{1}{8}$, 0.125

9.(i) 0.5mm

(ii) 53 ± 0.5mm
   $52.5 \to 53.5$mm

10. $\$50$

11.(ii) $95°$

12. $k=8$

13. $x = \frac{45}{99}$

14. a) $\sqrt{5}$ b) $\dfrac{8x^9 y^2}{4y^3}$
   $= \dfrac{2x^9}{y}$

15. $4 \times 2^4 = 2^6$

Calculator

1. a) $15x^2 - 26x + 8$

   b) $49a^2 - 14ab + b^2$

2. a) $(5x+2)(2x-1)$

   b) $3a(5c-4d) - 2b(5c-4d)$
   $= (3a-2b)(5c-4d)$

3. $49x^2 - 25y^2$
   $= (7x+5y)(7x-5y)$

4. $\tan 17 = \dfrac{x}{24}$
   $x = 7.34$m

5. $\cos\theta = \dfrac{7}{10}$
   $\theta = 46°$

6.(i)

(ii) $\cos\theta = \dfrac{2}{\sqrt{5}}$

7. $\$408.40$

8. $A = \$54$
   $B = \$534.60$
   $C = \$1859.40$

9.(i) $\$12000$
   (ii) $\$16248.96$
   (iii) $\$4248.96$

10.(i) $\$116912$
   (ii) Tax $= \$30754.44$

11. $m = 4$

12. $x > -5$

13. $V = 33$cm^3

14. $p - ap = ab$
   $p = \dfrac{ab}{1-a}$

15. $x = 30$, $y = 40$, $z = 7l$

16.(i) $\triangle PQT \parallel\mid \triangle STR$ equiangular

(ii) $x = 12$cm

17. AO is common
   $BD = AC$ diameters
   $\angle DAO \equiv \angle OOA$
   $\triangle ABO \equiv \triangle DCA$ (SAS)

18.(i) -5
   (ii) $(1,4)$; $(2,-1)$ + othe

19.(i) $\sqrt{32} = 4\sqrt{2}$
   (ii) -1
   (iii) $y = \frac{1}{3}x - 1$

20. $x = 4$, $y = \frac{3}{2}$

21. 270m^2

22.(i) $x = 15.96$m
   (ii) $h = 13.5$m (14m)

23. $\dfrac{3}{x+3}$

24. $V = 2094.4 - 7.95$
   $= 2086.45$cm^3

25. $h = 25.6$m