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**DUNEARN SECONDARY SCHOOL
PRELIM EXAMINATION 2017
MATHEMATICS SYLLABUS A (4045/01)
PAPER 1**

Secondary 4 Normal (Academic)

Thursday

17th August 2017

08 00 – 10 00 h

2 hours

READ THESE INSTRUCTIONS FIRST

Write your name, class and register number in the spaces at the top of this page.
Write in dark blue or black pen. You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions in the spaces provided in this question paper.
If working is needed for any question it must be shown with the answer. Omission of essential working will result in loss of marks.
If the degree of accuracy is not specified in the question and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
At the end of the examination, fasten all your work securely together.

The use of an approved scientific calculator is expected, where appropriate.
For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .
You are reminded of the need for clear presentation in your answers.
The number of marks is given in brackets [] at the end of each question or part question.
The total number of marks for this paper is 80.

PARENT'S SIGNATURE

FOR EXAMINER'S USE
80

Setter: Ms Charmaine Goh

This question paper consists of 17 printed pages, including this cover page.

Mathematical Formulae

Compound interest

$$\text{Total amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3} \pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2} ab \sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$$

Answer **all** the questions.

- 1 By writing each value correct to 1 significant figure, estimate the value of $\frac{\sqrt{900.78} + 9.987}{7.1^2 + 0.995}$.
Show your working.

Answer [2]

- 2 Solve $\frac{3y-5}{4} = \frac{5y}{8}$.

Answer $y =$ [2]

- 3 8, 14, 20, 26, ...

(a) Find an algebraic expression for the n th term in the sequence.

Answer [1]

(b) Explain why all the terms in the sequence cannot be odd numbers.

Answer

.....[1]

- 4 Make s the subject of the formula $w = \sqrt{\frac{4s - 5w}{s + 2}}$.

Answer $s = \dots\dots\dots$ [2]

- 5 Simplify $(2x - 3)(7 + 3x) - 5(x - 6)$.

Answer $\dots\dots\dots$ [2]

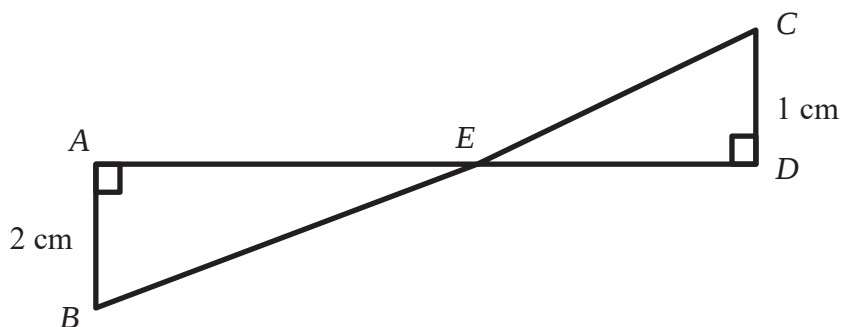
- 6 (a) Solve the inequality $-9 \leq 5 - 2w$.

Answer $\dots\dots\dots$ [1]

- (b) Hence, write down all the possible values of w , given that w is a prime number.

Answer $w = \dots\dots\dots$ [1]

- 7 In the figure, $\triangle BAE$ and $\triangle CDE$ are similar. AD and BC are straight lines and $\angle BAE = \angle CDE = 90^\circ$. $AB = 2$ cm, $CD = 1$ cm and $AD = 6$ cm.



Find the length of DE .

Answer $DE = \dots\dots\dots$ cm [2]

- 8 The price of a car at the end of 2015 was 12% lower than at the end of 2014.
The price of a car at the end of 2016 was 8% lower than at the end of 2015.
Calculate the price of the car at the end of 2016 as a percentage of the price at the end of 2014.

Answer $\dots\dots\dots$ % [2]

- 9 There are 10 blue balls, x red balls and y white balls in a bag. When one ball is drawn from the bag, the probability that a ball is red is $\frac{1}{3}$ and the probability that the ball is white is $\frac{1}{4}$. Find

(a) the probability that the ball is blue,

Answer [1]

(b) the values of x and y .

Answer $x = \dots\dots\dots y = \dots\dots\dots$ [2]

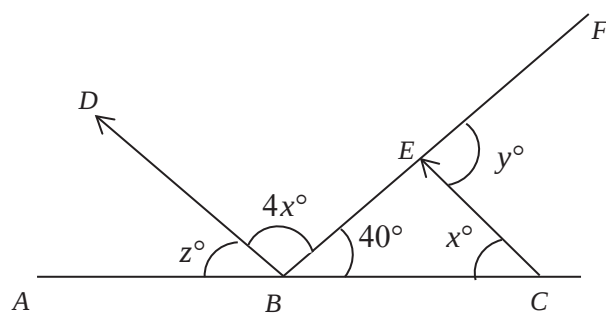
-
- 10 Solve the simultaneous equations.

$$2x - y = -19$$

$$7x + 5y = -7$$

Answer $x = \dots\dots\dots$

$y = \dots\dots\dots$ [3]



In the diagram, ABC and BEF are straight lines and BD and CE are parallel.

It is given that $\angle CBE = 40^\circ$.

Find the value of

(a) x ,

Answer $x = \dots\dots\dots$ [1]

(b) y ,

Answer $y = \dots\dots\dots$ [1]

(c) z .

Answer $z = \dots\dots\dots$ [1]

- 12** The diameter of a water molecule is about 0.275 nanometres where 1 nanometre is given by 1×10^{-9} m.

(a) Express 0.275 nanometers in centimeters, giving your answer in standard form.

Answercm [1]

(b) Suppose that water molecules are placed side by side to form a line segment of 1 cm. Find the number of water molecules on the line segment, expressing your answer in standard form, correct to 3 significant figures.

Answer [2]

-
- 13** At a school, the ratio of teachers to students is 5 : 18. The ratio of female students to male students is 7 : 2.

(a) If the ratio of the female teachers to female students is 1 : 7, find the ratio of male teachers to male students.

Answer [2]

(b) Find the number of male teachers in the school if the total number of teachers and students are 345.

Answer male teachers [1]

- 14** **(a)** The ratio of an exterior angle to an interior angle of a regular polygon is 2 : 7. Find the number of sides of the polygon.

Answer [2]

- (b)** Calculate the value of one interior angle of a regular nonagon.

Answer° [1]

-
- 15** A train started a journey of 247 km at 10.47am and travelled 3 hours 15 minutes.

Calculate

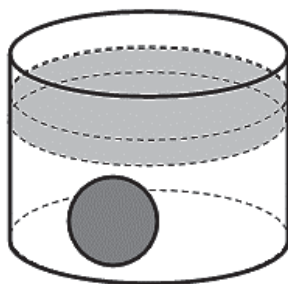
- (a)** the time at which the train reached its destination,

Answer pm [1]

- (b)** the average speed of the train, giving your answer in km/h.

Answer km/h [2]

- 16 A metal sphere of radius 3 cm is submerged into the water contained in a cylinder of radius 7 cm. Find



- (a) the volume of the metal sphere in terms of π ,

Answercm³ [1]

- (b) the increase in the surface area of the cylinder that is in contact with the water when the water level rises.

Answercm² [2]

-
- 17 It is given that X^2 is inversely proportional to $Y + 3$. The table below shows the corresponding values of X and Y .

X	2	3	8
Y	3	$-\frac{1}{3}$	a

- (a) Express Y in terms of X .

Answer [2]

- (b) Find the value of a .

Answer [1]

18 (a) Simplify $\frac{2(p-3q)}{10r} \div \frac{(3q-p)^2}{r}$.

Answer [2]

(b) Write as a single fraction in its simplest form $\frac{5x+2}{x-2} + \frac{7}{2x-4}$.

Answer [2]

19 A map is drawn to a scale of 1 : 20000.

(a) A park has an area of 100 km². Find the area of the park on the map, giving your answer in cm².

Answer cm² [2]

(b) Given that the park is shaped as a square, find the perimeter of the park on the map, giving your answer in m.

Answer m [2]

- 20 The currency tables from two money changers are shown below.

Determined Money Changer

Singapore dollar to one unit of foreign currency	Currency	Buying	Selling
	Sterling Pound (£)	1.78	1.797
	Euro Dollar (€)	1.565	1.578

Disciplined Money Changer

Singapore dollar to one unit of foreign currency	Currency	Buying	Selling
	Sterling Pound (£)	1.786	1.802
	Euro Dollar (€)	1.566	1.575

Amy is planning a trip to Europe. She has £2000 left from her previous year's trip. Amy wants to sell the £2000, buy €2000 from the same shop and keep the rest of the money in Singapore dollars. Which shop should she go to? Explain your answer with the necessary calculation.

Hint: Amy can sell 1£ for S\$1.786 and buy 1£ for S\$1.802 at Disciplined Money Changer.

Answer Money Changer, because
 [4]

- 21** The following are the scores of 10 students in a mathematics test.
1, 5, 3, 10, 19, 20, 11, 7, 8, 5.

(a) State the mode.

Answer marks [1]

(b) Calculate the mean score of the test.

Answer marks [1]

(c) Find the median score.

Answer marks [1]

(d) When a number x is added to the above set, the new median is 8 and the mode remains unchanged. Given that all scores are integers, state the smallest possible value of x .

Answer [1]

22 Construct $\triangle ABC$ in the space provided below, where $AB = 10$ cm, $BC = 8$ cm and $\angle BAC = 50^\circ$.

(a) Label two possible positions of C , where $\triangle ABC$ are of different sizes. [2]

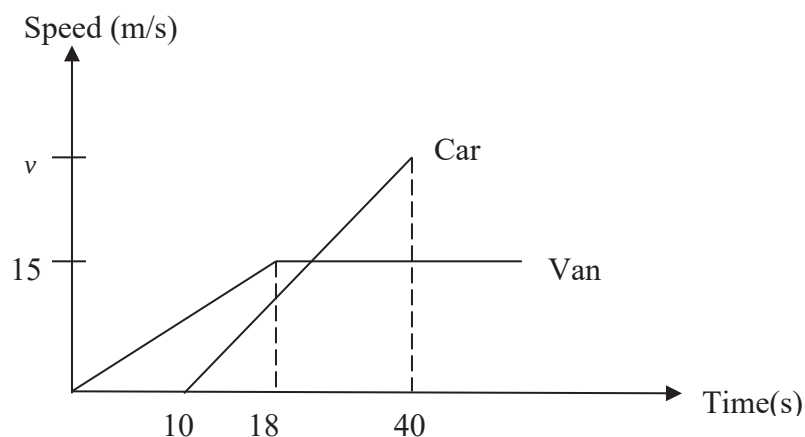
(b) Construct

(i) the perpendicular bisector of AB , [1]

(ii) the angle bisector of $\angle BAC$. [1]

(c) X is the point that is equidistant from the points A and B , and equidistant from the lines AC and AB . Measure the length of BX . [1]

- 23** The diagram shows the speed-time graphs of a van and a car. The van, starting from rest, accelerates uniformly for 18 seconds until it reaches a speed of 15m/s. It then continues to travel at this constant speed.



- (a)** What is the acceleration of the van in the first 18 seconds?

Answer m/s^2 [1]

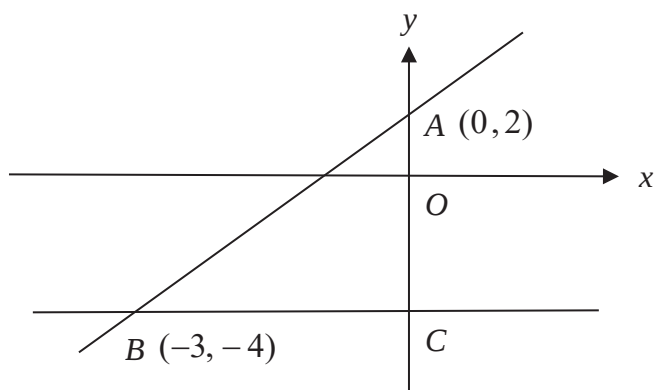
- (b)** Find the total distance travelled by the van in 40 seconds.

Answer m [2]

- (c)** The car starts moving from the same position as the van 10 seconds later. It accelerates uniformly until it overtakes the van. Given that the car overtook the van at $t = 40$ seconds, calculate the speed of the car, v m/s at this instant.

Answer m/s [2]

- 24** In the diagram, A is the point $(0, 2)$ and B is the point $(-3, -4)$. The line AB meets the horizontal line C at B .



- (a)** Write down the coordinates of the point C .

Answer [1]

- (b)** Find the length of AB .

Answer units [1]

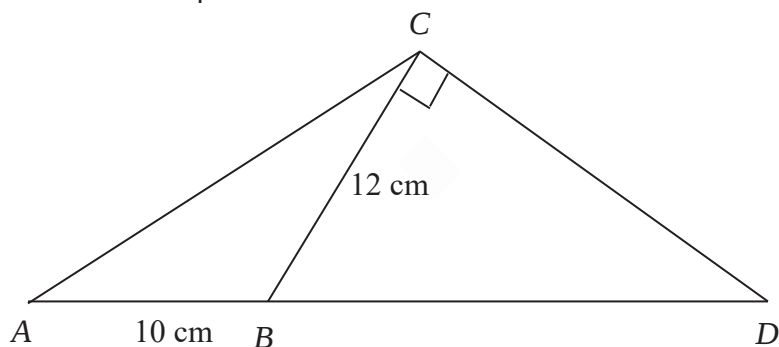
- (c)** Find the equation of the line AB .

Answer [2]

- (d)** Find the area of triangle ABC .

Answer units² [1]

- 25** In the diagram, ABD is a straight line, $AB = 10$ cm, $BC = 12$ cm and $\angle BCD$ is a right angle. It is given that $\tan \angle CBD = \frac{3}{4}$.



Without finding the value of any angle, calculate

- (a) BD ,

Answer cm [2]

- (b) $\sin \angle ABC$,

Answer [1]

- (c) the area of triangle ABC ,

Answer cm^2 [2]

- (d) the perpendicular height of triangle ABC .

Answer cm [1]

End of Paper

Section A

Answer **all** the questions in this section.

- 1 Lewis took a 4 year loan for \$10 000 from a finance company that charges compound interest at 3% per annum. Find the total interest that Lewis has to pay for the loan taken. Give your answer correct to the nearest dollar. [2]

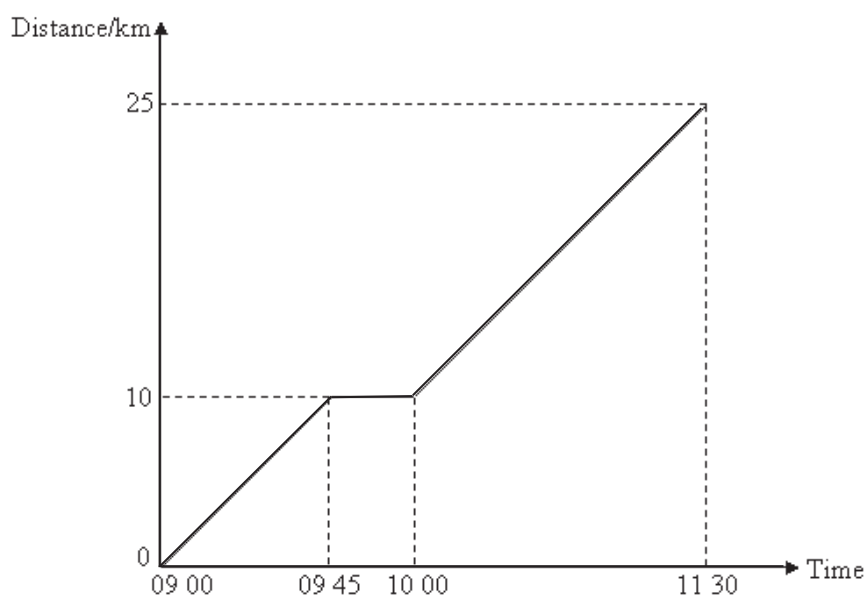
- 2 (a) Simplify $\left(\frac{1}{4}a^3b^{-2}\right)^2$, leaving your answers in a positive index form. [1]

- (b) Solve the equation $36^{2x-1} \times 6^x = 1$. [2]

- 3 (a) By completing the square, $x^2 - 6x + 5$ can be expressed in the form $(x + p)^2 + q$. Find the values of p and of q . [2]

- (b) Hence, solve $x^2 - 6x + 5 = 0$. [2]

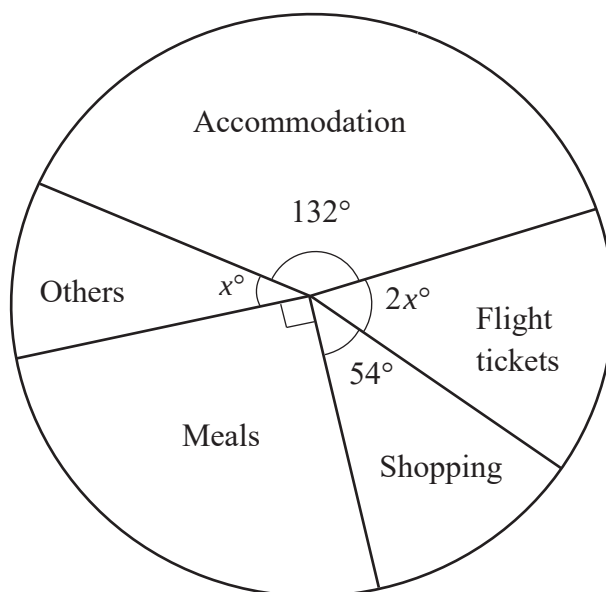
- 4 The diagram is the distance-time graph for a cyclist who begins his journey of 25 km away from origin at 09 00 and completes it at 11 30.



Calculate

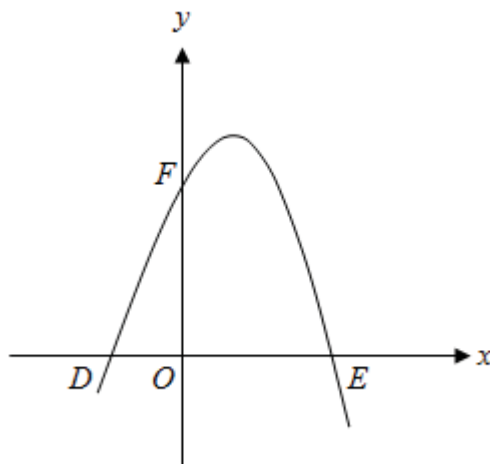
- (a) the acceleration of the cyclist for the first 45 minutes in km/h^2 , [1]
- (b) the speed of the cyclist at 11 00, [1]
- (c) the distance of the cyclist from origin at 10 15. [2]

- 5 The pie chart shows Clara's total expenses in a month.



- (a) Find the value of x . [2]
- (b) Clara spent \$270 on shopping. How much more did she spend on accommodation than on meals in a month? [2]

- 6 The graph of $y = k(x + 4)(x - 6)$ intersects the x -axis at points D and E and the y -axis at point F .



- (a) State the largest possible integer value of k . [1]
- (b) Find the y -coordinates of the point F in terms of k . [1]
- (c) State the coordinates of the points D and E . [2]
- (d) Write down the equation of the line of symmetry. [1]

- 7 Meiying spent her Monday morning collecting data of the waiting times of the patients at a community hospital. The waiting time, in minutes, for 50 patients at the hospital is given as follows.

Waiting time (minutes)	$20 < t \leq 24$	$24 < t \leq 28$	$28 < t \leq 32$	$32 < t \leq 36$	$36 < t \leq 40$
Number of patients	4	23	14	6	3

- (a) State
- (i) the modal class of this distribution, [1]
 - (ii) the class in which the median of the distribution lies. [1]
- (b) Calculate the **lowest** possible mean waiting time of the 50 patients. [2]
- (c) Meiying wants to represent the data that she collected in a statistical diagram.
- State one form of a statistical diagram that she can use and explain the advantage of the use of it. [2]
-

- 8 A light aircraft flew from Maseru to Nata and returned to Maseru.

- (a) The distance from Maseru to Nata is 1080 km.
- (i) On the outward flight, the average speed of the aircraft was x km/h. Write down an expression, in terms of x , for the time taken in hours. [1]
 - (ii) On the return flight, the average speed was 30 km/h greater than the average speed on the outward flight. Write down an expression, in terms of x , for the time taken in hours, on the return flight. [1]
- (b) The time taken on the return flight was half an hour less than the time taken on the outward flight. Form an equation in x and show that it reduces to $x^2 + 30x - 64800 = 0$. [3]
- (c) Solve the equation $x^2 + 30x - 64800 = 0$. [3]
- (d) Calculate the average speed for the whole flight from Maseru to Nata and back to Maseru. [2]
-

9 Answer the whole of this question on a sheet of graph paper.

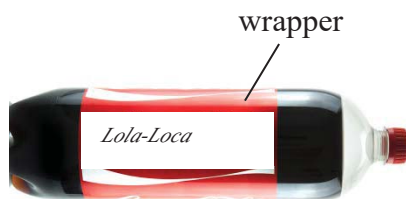
Temperatures were recorded over a nine hour period.

The table below shows the temperature, y °C, at various times.

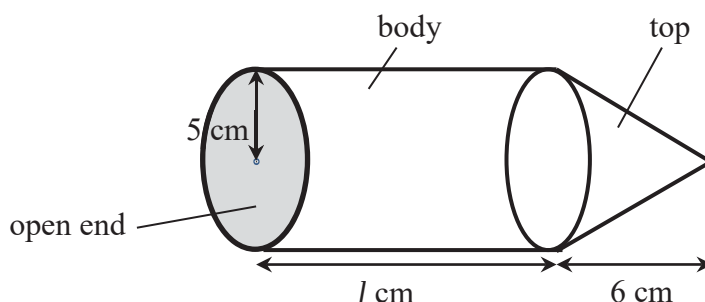
Time (x hours)	0	1	2	3	4	5	6	7	8	9
Temperature (y °C)	2	-1	-2	-1.4	0	2	3.5	3.4	2.4	0.6

- (a) Using a scale of 1 cm to represent 1 hour, draw a horizontal x -axis for $0 \leq x \leq 9$.
 Using a scale of 2 cm to represent 1 °C, draw a vertical y -axis for $-2 \leq y \leq 4$.
 On your axes, plot the points given in the table and join them with a **smooth curve**. [3]
- (b) Use your graph to find an estimate for
- (i) the temperature when $x = 5.5$, [1]
 - (ii) how long, in hours and minutes, the temperature was above 2°C. [1]
- (c) (i) By drawing a tangent, find the gradient of the curve at the point where $x = 8$. [2]
- (ii) State briefly what this gradient represents. [1]
-

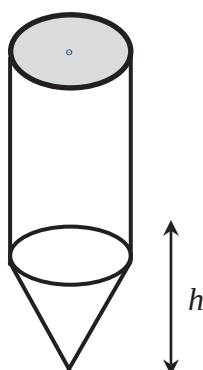
- 10 The middle section of a 1.5 litre polyethylene terephthalate (PET) bottle, where it is covered by the wrapper, is cut out and used to build the body of a PET rocket for Science lesson.



The diagram below shows the model of the PET rocket with a cylindrical body of radius 5 cm and length l cm. The conical top made of plastic film has a vertical height of 6 cm.



- (a) Given that the surface area of the wrapper is $100\pi \text{ cm}^2$ and $1 \text{ litre} = 1000 \text{ cm}^3$,
- show that $l = 10$, [1]
 - calculate the percentage volume of the PET bottle that is used to build the body of the rocket. [2]
- (b) Explain why the answer to (a)(ii) is only an estimate. [1]
- (c) John wanted to fill one-third of the volume of rocket with water. He held the rocket with the open end facing upwards and poured water into the rocket.

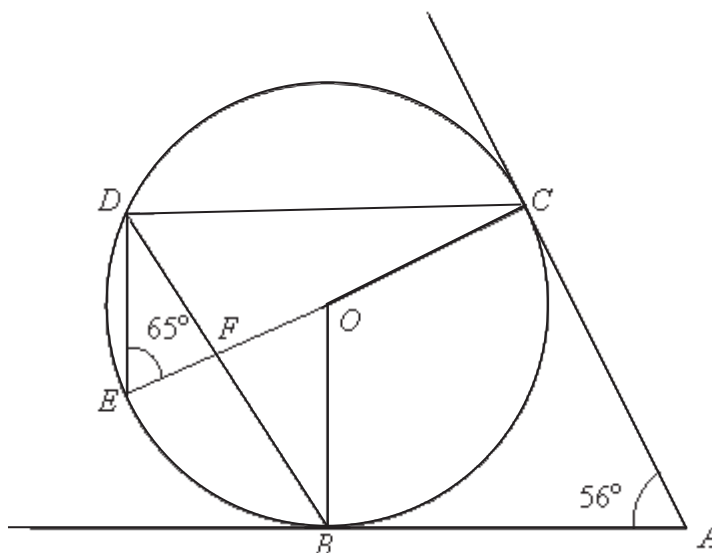


State whether the height h will be equal to, more than or less than one-third of the total length of the rocket body and top. Give a reason for your answer. [2]

Section B

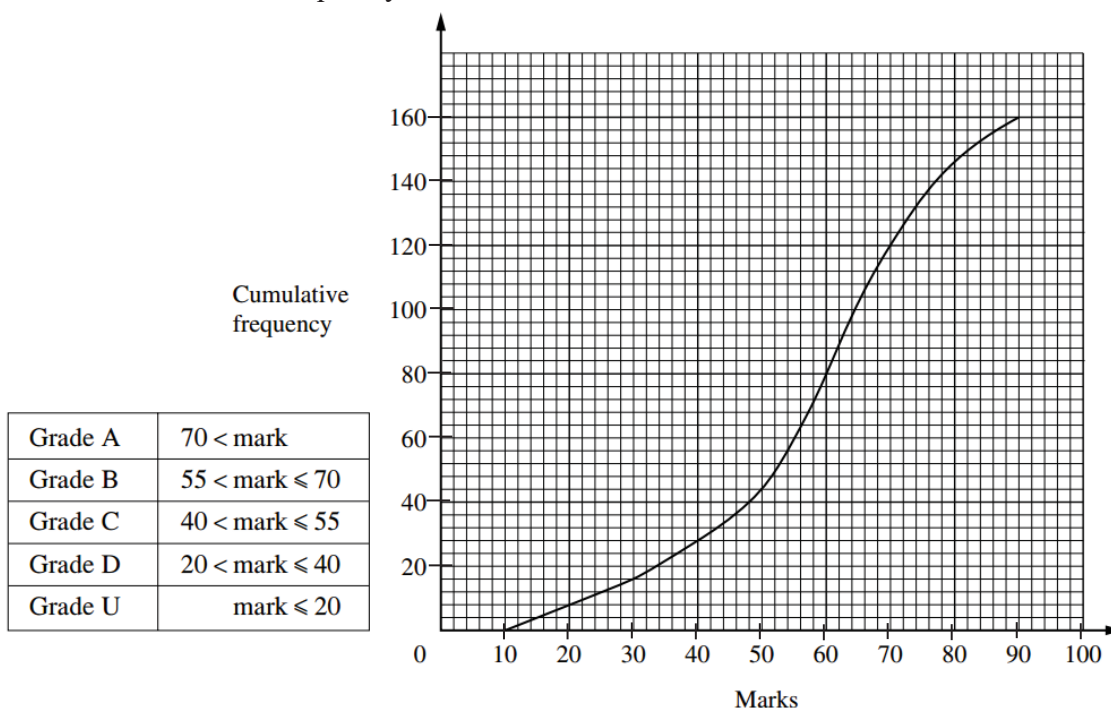
Answer any **one** question from this section. Each question carries 8 marks.

- 11** In the diagram, O is the centre of the circle $BCDE$. AB and AC are tangents to the circle and $COFE$ is a straight line.

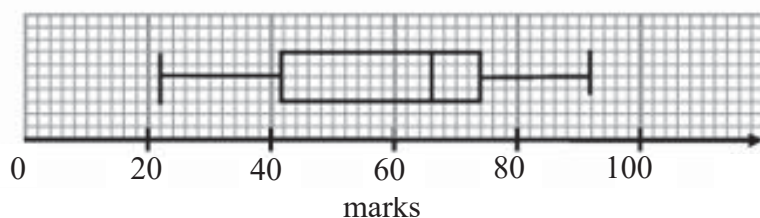


- (a) Give a reason why $\angle EDC$ is a right angle. [1]
- (b) Given that $\angle CED = 65^\circ$ and $\angle CAB = 56^\circ$, giving your reasons clearly, calculate
- (i) $\angle BOC$, [2]
- (ii) $\angle BDC$, [1]
- (iii) $\angle DFC$. [2]
- (c) Given that $CE = 13$ cm, calculate the area of minor sector BOE . [2]

- 12 160 students took an English examination. The table shows the marks needed for each grade. The cumulative frequency curve shows the distribution of their marks.



- (a) Use your graph to find
- (i) the median, [1]
 - (ii) the interquartile range, [2]
 - (iii) the number of students who were awarded a Grade C. [2]
- (b) Two students were picked at random. Find the probability that both students were awarded Grade C. [1]
- (c) The same group of students took a Mathematics examination. The box and whisker diagram below illustrates the marks obtained.



- (i) Which examination had the more consistent marks? Give a reason for your answer. [1]
- (ii) Which examination did the students fare better? Give a reason for your answer. [1]

End of Paper 2

Dunearn Secondary School

Marking Scheme for Sec 4 Normal Academic Prelims Mathematics P1 (80 marks)

*Deduct 1 m from overall for incorrect sf or dp

1	$\frac{\sqrt{900.78} + 9.987}{7.1^2 + 0.995}$ $= \frac{\sqrt{900} + 10}{7^2 + 1}$ $= \frac{4}{5} \quad \text{or} \quad 0.8$	M1 – all to 1 s.f. A1	Many students did not round each value to 1sf before evaluating the answers. Some mistaken the square root on the numerator to be on both the terms in the numerator.
2	$\frac{3y - 5}{4} = \frac{5y}{8}$ $24y - 40 = 20y$ $4y = 40$ $y = 10$	M1 – ability to cross multiply A1	ok
3a	$6n + 2$	B1	ok
3b	$6n + 2 = 2(3n + 1)$ hence there will not be any odd numbers in the sequence. Since T_n c always be divided by 2, all terms are even and	B1 for factorising 2 and explaining reason	Most cannot explain. Some mention that adding 6 (which is even) gives even terms.

4	$w = \sqrt{\frac{4s-5w}{s+2}}$ $w^2 = \frac{4s-5w}{s+2}$ $sw^2 + 2w^2 = 4s - 5w$ $sw^2 - 4s = -5w - 2w^2$ $s = \frac{-5w - 2w^2}{w^2 - 4} \text{ or } \frac{w(-5-2w)}{(w+2)(w-2)} \text{ or } \frac{5w+2w^2}{4-w^2}$	M1 A1 (accept all answers)	Badly done. Most of the students are stuck after squaring both sides of the equation. Algebraic manipulation skills are lacking.
2 marks			
5	$(2x-3)(7+3x) - 5(x-6)$ $= 14x + 6x^2 - 21 - 9x - 5x + 30$ $= 6x^2 + 9 \text{ or } 3(2x^2 + 3)$	M1 A1	ok
2 marks			
6a	$-9 \leq 5-2w$ $2w \leq 14$ $w \leq 7$	B1	badly done Changing the inequality sign when dividing by a negative number proves to be tough for most students.
6b	2, 3, 5, 7	B1	Most students forgot what prime numbers are.
2 marks			
7	$\frac{DE}{6-DE} = \frac{1}{2}$ $6-DE = 2DE$ $3DE = 6$ $DE = 2cm$	M1 A1	There are a handful of students who cannot tell that AE:ED is 1:3.
2 marks			
8	Price of car in 2015 = 88% Price of car in 2016 = $\frac{92}{100} \times 88\% = 80.96\%$ (answer is	M1, A1	none of the students got this question correct.

		3 marks	
11a	$5x + 40 = 180$ $x = 28$	B1	Some students have difficulties finding values of unknowns when there are algebras.
11b	$4x + y = 180$ $y = 68$	B1	
11c	$z = 28$	B1	
		3 marks	
12a	2.75×10^{-8}	B1	Badly done. Students have problem converting m to cm
12b	$\frac{1}{2.75 \times 10^{-8}}$ $= 3.6363 \times 10^7$ $\approx 3.64 \times 10^7$	M1*(ECF) A1	Badly done. Most cannot tell what they are supposed to do.
		3 marks	
13a	Teachers: students 5 : 18 Female students: male students 7 : 2 14 : 4 female teachers: female students 1 : 7 2 : 14 male teachers : male students 3 : 4	 M1 A1	Badly done. Most students are confused by the question.
13b	23 units $\rightarrow$ 345 3 units $\rightarrow$ 45	B1	
		3 marks	

14a	value of one exterior angle = $\frac{2}{9} \times 180 = 40^\circ$ number of sides = $\frac{360}{40} = 9$ sides $\frac{(9-2) \times 180}{9} = 140^\circ$	M1 A1	Some students wrote 9 units represents 360. This is a conceptual error.
14b	$\frac{(9-2) \times 180}{9} = 140^\circ$	B1	Students who got this wrong does not know what is a nonagan.
3 marks			
15a	10.47am + 3 hours 15 minutes = 2.02pm	B1	
15b	3 h 15 min = $3\frac{1}{4}$ hr $\frac{247\text{km}}{3\frac{1}{4}} = 76\text{km/h}$	M1 A1	Some students still have problem converting hr and min into hrs. a few wrote 3hr 15min as 3.15hr
3 marks			
16a	Volume of sphere = $\frac{4}{3}\pi(3)^3$ = $36\pi\text{ cm}^3$	B1	ok
16b	$\pi(7)^2 h = 36\pi$ $h = 0.73469\text{cm}$ Surface area = $2\pi(7)(0.73469)$ = $32.3135 \approx 32\frac{1}{3}\text{ cm}^2$	M1 (e.c.f. accepted) A1	None of the students got this correct. Students cannot relate rise in height to the volume of sphere.
3 marks			

17a	$X^2 = \frac{k}{Y+3}$ $2^2 = \frac{k}{3+3}$ $k = 24$ $X^2 = \frac{24}{Y+3}$ $Y = \frac{24}{X^2} - 3$		M1 A1	Half the cohort knows they have to substitute the value of x and y to find constant k. However, many are very careless as a handful of them wrote $3+3=9$. Those who managed to obtain k did not realise question asked to express Y in terms of X. Many just left their answer as $X^2 = \frac{24}{Y+3}$.
17b	$Y = \frac{24}{8^2} - 3$ $= -\frac{21}{8} \text{ or } -2\frac{5}{8}$		B1	Those who managed to get 17a correct can get this.
3 marks				
18a	$\frac{2(p-3q)}{10r} \div \frac{(3q-p)^2}{r}$ $= \frac{-2(3q-p)}{10r} \times \frac{r}{(3q-p)^2}$ $= -\frac{1}{5(3q-p)} \text{ or } \frac{1}{5(p-3q)}$		M1 A1	Badly done. Not many students realised they can change the signs of the terms in the bracket and reduce it with the numerator. Most of them end up expanding the denominator and end up with a quadratic equation. Many misconceptions among students. Some of them think that when 10r is cancelled with r, they get 9. Not well done
18b	$\frac{5x+2}{x-2} + \frac{7}{2x-4}$ $= \frac{2(5x+2)+7}{2(5x+2)+7} = \frac{2x-4}{10x+11}$ $= \frac{2x-4}{2x-4}$		M1 A1	Half the cohort did not realise that the second denominator is 2 times of the first. They end up multiplying both denominators to get a complication expression. Common misconception among students:

			$\frac{10x + 11}{2x - 4} = \frac{5x + 11}{x - 4}$	
			4 marks	
19a	$1 : 20000$ $= 1\text{cm} : 0.2\text{km}$ $= 1\text{cm}^2 : 0.04\text{km}^2$ $100\text{km}^2 = \frac{100}{0.04}$ $= 2500\text{cm}^2$		M1 – for squaring the scale A1	ok
19b	$\sqrt{2500} = 50\text{cm}$ $50 \times 4 = 200\text{cm} = 2\text{m}$		M1 (e.c.f accepted) A1	Badly done. Not many realised the need to square-root to obtain length of square.
			4 marks	
20	Determined Money Changer $(2000 \times 1.78) = \\$3560$ Difference = $3560 - (2000 \times 1.578)$ $= \\$404$ Disciplined Money Changer $(2000 \times 1.786) = \\$3572$ Difference = $3572 - (2000 \times 1.575)$ $= \\$422$ Disciplined Money Changer because Amy can get back $\\$422$ instead of $\\$404$ at Determined Money Changer.		M1 M1 A1 A1	Badly done. Students cannot identify the correct values to use in the table despite the hint given.
			4 marks	
21a	5		B1	ok

21b	8.9	B1	ok	
21c	7.5	B1	many wrote 19.5	
21d	9	B1	Badly done. Concept of median not good.	
22		4 marks	Badly done Many students do not show construction arcs. The concept of 2C is very bad.	
			D2 for each C shown D1 for perpendicular bisector D1 for angular bisector	
22c	$BX = 5.5 \text{ cm } (\pm 0.1)$	B1		
23a	$a = \frac{15}{18} = \frac{5}{6} \text{ m/s}^2 \text{ or } 0.833 \text{ m/s}^2$	B1	ok	
23b	distance = $\frac{1}{2}(18 \times 15) + (40 - 18)(15)$ = 465m	M1 A1	Not well done. Many did not realise the first part is a triangle, they simply take $(18 \times 15) + (40 - 18)(15) = 600$	

23c	$\frac{1}{2} \times (40 - 10)(v) = 465$ $v = 31$	M1 (e.c.f accepted) A1	Only 1 student got this right. Students did not realise that overtaking means the 2 person travelled the same distance.
		5 marks	
24a	$(0, -4)$	B1	ok
24b	$AB = \sqrt{(-3 - 0)^2 + (-4 - 2)^2}$ $= 6.7082$ ≈ 6.71 units	B1	Some students got the formula wrong by writing $\sqrt{(-3 - 0)^2 - (-4 - 2)^2}$
24c	gradient $= \frac{-4 - 2}{-3 - 0}$ $= 2$ $y = 2x + 2$	M1 A1	ok
24d	$\frac{1}{2} \times 6 \times 3 = 9 \text{ units}^2$	B1	ok
		5 marks	
25a	$\tan \angle CBD = \frac{3}{4}$ $\frac{CD}{12} = \frac{3}{4}$ $CD = 9\text{cm}$ $BD = \sqrt{12^2 + 9^2}$ $= 15\text{cm}$	M1 A1	This is a HOT question. Badly done. (a) is the best attempted question. Many students are able to obtain CD from the ratio and then proceed to find BD. For the rest of the parts, many resort to finding angles and then using angles to solve the question when the question specify at the start that no angles should be found.

25b	$\sin \angle ABC = \frac{9}{15} = \frac{3}{5}$	B1	
25c	$\frac{1}{2}(10 \times 12)(\frac{3}{5})$ $= 36 \text{ cm}^2$	M1 – allow ecf A1	
25d	$\frac{1}{2}(10)h = 36$ $h = 7.2 \text{ cm}$	B1	
		6 marks	

Section A (52 marks)

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	answer may be correct. The $(x - 3)^2$ is often written as $(x + 3)^2$. Some students missed out writing the values for p and q. b) Some solved by factorization if they could not do part a.	
4a	Acceleration = 0 km/h ²	B1
4b	$\frac{25 - 10}{1.5} = 10 \text{ km/h}$	B1
4c	1 hour = 10 km 0.25 hour = 2.5 km 10 + 2.5 = 12.5 km Or $\frac{25 - 10}{1.5} = \frac{d - 10}{15/60}$ $d = 12.5$	M1 – ecf allowed A1 M1 – gradient method
	Question 4	4 marks
	Comment a) None of the students got this correct and many ended up with 10 km/h which is the answer for part b. b) Mostly incorrect. c) Mostly incorrect.	
5a	$360 - 132 - 54 - 90 = 84$ $3x = 84$ $x = 28$	M1 A1
5b	$54^\circ = \\$270$ $132 - 90 \Rightarrow 42^\circ$ $42^\circ \neq \\$210$	M1 A1
	Question 5	4 marks
	Comment a) Manageable question for most students. b) Many found the answer for 132° instead of 42°	
6a	-1	B1
6b	When $x = 0, y = k(4)(-6)$ $= -24k$	B1
6c	$D(-4,0)$ $E(6,0)$	B1 B1
6d	$x = 1$	B1
	Question 6	5 marks
	Comment a) None of the students got this correct. b) Most, if not all of the students got this incorrect. c) Some forgot to leave in coordinates form. Many still cannot do this question. d) Mostly incorrect.	
7ai	$24 < t \leq 28$	B1
7aii	$24 < t \leq 28$	B1

7b	$\frac{20 \times 4 + 24 \times 23 + 28 \times 14 + 32 \times 6 + 36 \times 3}{50}$ $= \frac{1324}{50}$ $= 26.48 \text{ mins}$	M1 A1
7c	Bar graphs / Pictograms / line graphs / Dot diagrams / Histograms The height of the graphs will give a clear representation of the number of patients in each class/interval.	B1 B1
	Question 7	6 marks
	Comment ai) Invalid answers were given by some students. aii) Many students had $28 < t < 32$ as their incorrect answer. b) Many students found the mean instead of the lowest mean. c) Some students got the right answer as bar graph but could not put into right words to explain. Most did not know how to do.	
8ai	$\frac{1080}{x}h$	B1
8aii	$\frac{1080}{x+30}h$	B1
8b	$\frac{1080}{x} - \frac{1}{2} = \frac{1080}{x+30}$ $\frac{1080}{x+30} = \frac{2160-x}{2x}$ $2160x = (2160-x)(x+30)$ $2160x = 2160x - x^2 + 64800 - 30x$ $x^2 + 30x - 64800 = 0$	M1 – ecf allowed M1 – without fraction A1
8c	$x = \frac{-30 \pm \sqrt{30^2 - 4(1)(-64800)}}{2(1)}$ $= 240 \text{ or } -270$	B1 B1, B1
8d	$\frac{1080}{240} = 4.5$ $\frac{1080}{270} = 4$ $\frac{1080 \times 2}{8.5} = 254 \text{ km/h}$	M1 – for obtaining either time taken, ecf allowed A1
	Question 8	10 marks
	Comment a) Only few students managed to get these two parts right. b) Most of them could not or did not attempt this part. c) Many students still do not know how to solve	

	quadratic. Some solved it using the completed square or factorization method and both were accepted. d) Mostly incorrect or unattempted.	
9a		
9bi	2.9°C (±0.1)	B1 – answer must be obtained from graph
9bii	3h 12 min (accept 3h 6 min or 3h 18 min)	B1 – answer must be obtained from graph
9ci	Gradient = $\frac{5 - (-2)}{6 - 11} = -\frac{7}{5}$ or -1.4 (0.5)	M1 – tangent and coordinates labelled and formula correctly used A1
9cii	The change in temperature per hour at the 8 th hour. Or The rate of change of temperature at the 8 th hour.	B1
	Question 9	8 marks
	Comment a) Most graphs are well drawn, except for a few with errors in the scale, and the turning point (too sharp and maximum point drawn at the plotted point (6,3.5), resulting in a flat turning point) bi) Most with graphs could manage this part, but if no working was shown on the graph paper, no mark was given. bii) Many incorrect answers. ci) Tangents drawn were mostly short, students should be encouraged to draw a longer tangent. Mistakes in	

	calculation of gradient often result in the incorrect formula used. cii) None could do this part.	
10ai	$2\pi(5)l = 100\pi$ $l = 10 \text{ cm}$	B1
10aii	$\pi(5^2)(10) = 785.398$ $1.5l = 1500 \text{ cm}^3$ $\frac{785.398}{1500} \times 100\% = 52.359$ $= 52.4\%$	M1 – for obtaining either 1500 cm^3 or vol of cylinder A1
10b	The body of the bottle used for the rocket may not have a constant radius of 5 cm throughout. OR The bottle may not be exactly 1500 cm^3 in volume.	B1
10c	The height h will be more than $1/3$ of the total length of the rocket's body and top. The volume of the rocket's top is smaller than its body and hence the water will take up more space in the cylinder.	B1 B1
	Question 10	6 marks
	Comment This question was mostly left blank. Students did not understand most part of the questions. The only part they attempted was (aii), however, many of them still got it incorrect as they calculate the volume of the cone which was irrelevant in this part.	

Section B (8 marks)

11a	Angle in a semicircle	B1
11bi	$360 - 90 - 90 - 56 = 124^\circ$ Tangent perpendicular to radius & Sum of angles in a quadrilateral	B1 – for answer B1 – both reasons
11bii	$124 \div 2 = 62^\circ$ Angle at centre = 2x angle at circumference	B1 – for both answer and reason
11biii	$\angle DCE = 180 - 65 - 90 = 25^\circ$ $\angle DFC = 180 - 25 - 62 = 93^\circ$ Sum of angles in a triangle OR $\angle BDE = 90 - 62 = 28^\circ$ $\angle DFC = 28 + 65 = 93^\circ$ Interior angles of triangle	B1 – for answer B1 – for one reason
11c	$\angle BOE = 180 - 124 = 56^\circ$ $\frac{56}{360} \times \pi(6.5^2) = 20.6 \text{ cm}^2$	M1 – ecf allowed A1
	Question 11	8 marks
	Comment Few students attempted this question. Very badly done, as most answers were incorrect.	
12ai	60 marks	B1
12aii	$70 - 48$ $= 22$ marks	M1 A1
12aiii	$60 - 28$ $= 32$ students	M1 A1
12b	$\frac{32}{160} \times \frac{31}{159} = \frac{31}{795}$	B1 – allow ecf from 12aiii
12ci	$74 - 42 = 32$ marks The IQR of Math examination is 32 marks which is greater than the IQR of English examination which is 22 marks. Hence the students were more consistent in the English examination.	B1 – reason with values
12cii	The median for Math examination is 66 marks. The median for English examination is 60 marks. Since the median for Math is higher, students fared better in the Math examination than English examination.	B1 – reason with values
	Question 12	8 marks
	Comment Most students attempted this question but was badly done. ai) Okay aii) Okay aiii) Many could not do this part. b) Mostly incorrect. They cannot do this at all. c) Mostly incorrect as they have forgotten that they should be using median and IQR to answer these parts.	