Answer all the questions.

1 **(a)** If $p : q = 5 : 7$ and $q : r = 1\frac{2}{3} : 9$, what is the ratio of $p : q : r$?

Answer (a) _____:_____:_____ [1]

(b) The total number of students in a class is 40. The number of girls in the class is 24. How many boys should be added to the class so that the ratio of the number of boys to the number of girls becomes 13 : 12?

Answer (b) _____ boys [1]

---

2 A bag contains 8 yellow balls, 5 white balls and 2 pink balls. One ball is drawn from the bag at random. Find the probability that

(a) the ball is yellow,

Answer (a) _____ [1]

(b) the ball is non-white.

Answer (b) _____ [1]

---

3 By writing each number correct to 2 significant figures, estimate the value of

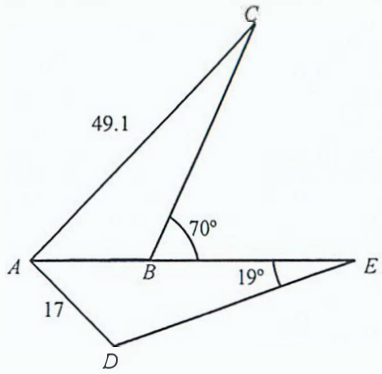
$$\frac{(12.3)^2 - \sqrt{1207}}{0.284}$$

You must show your working.

Answer _____ [2]

---

4 In the diagram, ΔABC is congruent to ΔADE.
$AC = 49.1$ cm, $AD = 17$ cm, $\angle DEB = 19°$ and $\angle EBC = 70°$.



Find

(a) the length of BE,

Answer (a) _____ cm [1]

(b) $\angle CAB$.

Answer (b) _____ [1]

---

5 The line $\frac{x}{4}+\frac{y}{6}=1$ cuts the x-axis at H and the y-axis at K. Find the length of HK.

Answer $HK =$ _____ [2]

---

6 **(a)** Given that $x=\frac{1}{2}$, $y=\frac{2}{3}$, and $z=1$, show your working to find the exact value of $\frac{x}{y}-z$.

Answer (a) _____ [2]

(b) Given that $h=\frac{3-u}{8g}$. Express u in terms of h and g.

Answer (b) _____ [2]

---

7 **(a)** Express $\frac{y-3}{4}-\frac{y-5}{3}$ as a single fraction in its lowest term.

Answer **(a)** _____ [1]

(b) Solve the equation $\frac{2}{p}=\frac{3}{p+4}$.

Answer (b) $p =$ _____ [1]

---

8 **(a)** "343 is a prime number".
State whether this statement is true or false. Give reasons for your answer.

Answer **(a)** _____

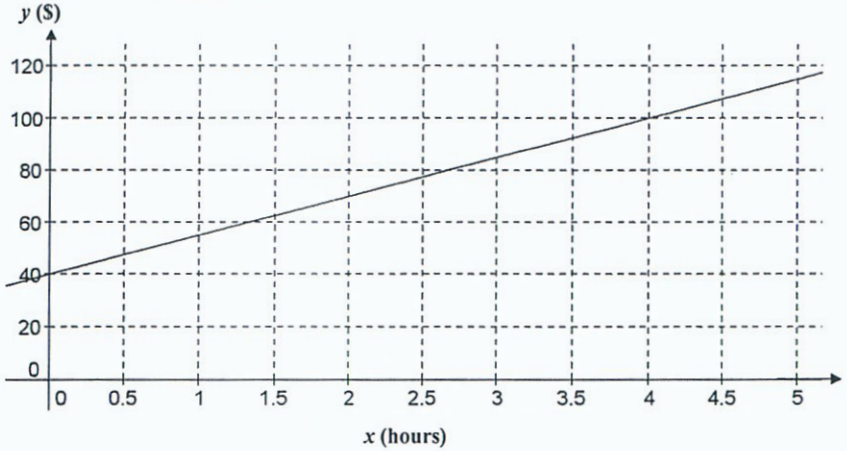
_____[1]

(b) Three school bus services set off at intervals of 15 minutes, 30 minutes and 35 minutes respectively. If all three buses set off at 07 30, what time will the three bus services next set off together again?

Answer (b) Time = _____ [2]

---

9 The graph shows the charges of company A for carrying out computer repairs. The total cost is made up of two parts. There is a fixed charge \$$h$ and a further charge of \$$k$ for each hour of work done.



(a) Find the cost of a repair work which took 4 hours.

Answer (a)\$ _____ [1]

(b) Find the value of h and k.

Answer (b) h = _____

k = _____ [2]

(c) Another company B charges \$30 per hour for carrying out repairs without a fixed charge.

(i) Draw a line on the graph to represent the total cost of hiring company B. [1]

(ii) State with reason(s), which company will you engage to do a 3-hour repair work?

Answer (bii) _____

_____ [1]

10 **(a)** Write these numbers in order of size, starting with the smallest.

$$-2,\ \frac{6}{5},\ (-2)^2 \text{ and } \left(\frac{6}{5}\right)^2$$

Answer (a) _____ (smallest), _____, _____, _____ (largest) [1]

(b) Simplify $\dfrac{a^2 \times a^4}{\sqrt{a}}$ and give your answer in the form a^n.

Answer (b) _____ [1]

(c) Given that $2^{2k} \div \dfrac{1}{8} = \sqrt[4]{64}$, find the value of k.

Answer (c) k = _____ [2]

11 The diameter of a molecule is about 0.125 picometers.

(a) Express 0.125 picometers in centimeters, giving your answer in standard form.

Answer (a) _____ cm [1]

(b) Suppose that the molecules are placed side by side to form a line segment of 2 cm. Find the number of water molecules on the line segment, expressing your answer in standard form.

Answer (b) _____ [1]

12 Solve the simultaneous equations.

$$5x - y = 11$$
$$2x - 3y = 7$$

Answer $x =$ _____

$y =$ _____ [2]

---

13 A map is drawn to a scale of 1 : 600 000.

(a) Find the actual distance, in kilometres, represented by 8 centimetres on the map.

Answer (a) _____ km [1]

(b) A city covers an area of 900 square kilometres. Find, in square centimetres, the area representing the city on the map.

Answer (b) _____ cm^2 [2]

---

14 **(a)** Factorise $9a^2 - 64$.

Answer (a) _____ [1]

(b) **(i)** Factorise $2a^2 - 17a + 21$.

Answer (b)(i) _____ [1]

(ii) Hence solve $2a^2 - 17a + 21 = 0$.

Answer (b)(ii) $a =$ _____ or _____ [1]

---

15 The ratio of an interior angle to an exterior angle of a n-sided regular polygon is 13 : 2.

(a) Find the exterior angle.

Answer (a) _____ [1]

(b) Find the value of n.

Answer (b) $n =$ _____ [2]

---

16 Trevor wishes to buy a new car which is priced in the showroom at $120 000.

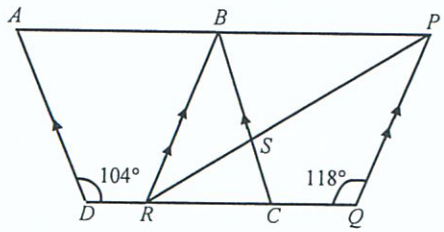
(a) If he pays cash, he will be given a discount. Calculate the percentage discount if he only needs to pay $98 400.

Answer (a) _____% [2]

(b) The value of the new car priced at $120 000, decreases by 20% after 1 year. At the end of the second year, its value decreases a further 15%.Calculate the value of the car at the end of the second year.

Answer (b) $_____ [2]

17 $ABCD$ and $BPQR$ are two rhombuses.
Given $\angle PQR = 118°$ and $\angle ADR = 104°$.



Calculate, stating your reasons clearly,

(a) $\angle QPR$,

Answer (a) $\angle QPR$ = _____ [1]

(b) $\angle QCB$,

Answer (b) $\angle QCB$ = _____ [1]

(c) $\angle RSC$.

Answer (c) $\angle RSC$ = _____ [1]

18 **(a)** The heights (in cm) of 20 pupils in class P from a secondary school are represented by the following stem-and-leaf diagram.

14	7
15	4 6 6
16	0 1 3 5 6 9
17	0 0 0 3 3 4
18	0 2 7
19	0

Key:
14|7 means 147 cm

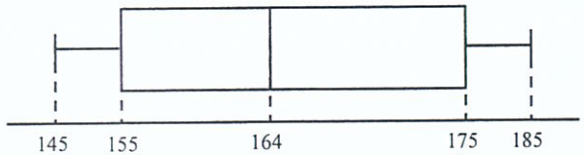
(i) Find the median height.

***Answer (a)*(i)** _____ cm [1]

(ii) Calculate the interquartile range.

***Answer (a)*(ii)** _____ cm [1]

(b) The heights (in cm) of another 20 pupils in class Q from the same secondary school are represented by the following box-and-whisker plot.



(i) Calculate the interquartile range.

***Answer (b)*(i)** _____ cm [1]

(ii) Write down two comments comparing the heights of the pupils in class P and the pupils in class Q.

***Answer (b)*(ii)**

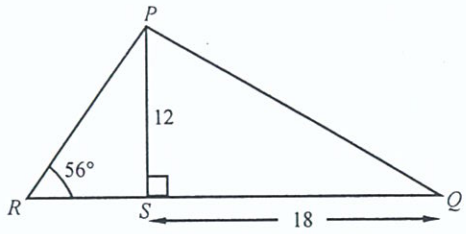
1. _____

_____

2. _____

_____ [2]

19 In triangle PQR, PS is perpendicular to RQ. Angle $PRS = 56°$, $PS = 12$ cm and $SQ = 18$ cm.



Calculate

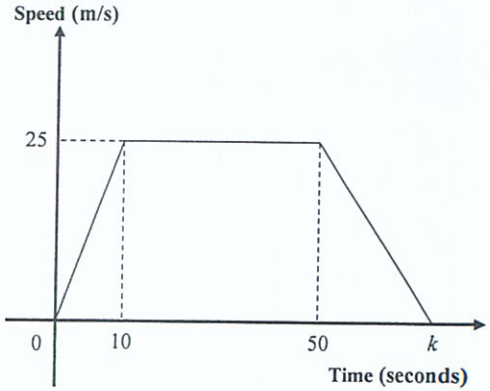
(a) $\angle PQS$,

Answer (a) $\angle PQS =$ _____ [2]

(b) PR.

Answer (b) $PR =$ _____ cm [2]

20 The diagram below shows the speed-time graph of a car. For the first 10 seconds, the car accelerates from rest until it reaches a speed of 25 m/s. It then travels at a constant speed for 40 seconds before slowing down to a stop. The car travelled a total distance of 1.5 km for the whole journey.



Calculate

(a) the acceleration of the car for the first 10 seconds,

Answer (a) _____ m/s^2 [1]

(b) the value of k,

Answer (b) $k =$ _____ [2]

(c) the average speed of the car for the whole journey, in metres per second.

Answer (c) _____ m/s [1]

21 Point A is given in the answer space below.

Answer (a)(c)(d)

(a) Draw the triangle ABC given that the base $AB = 8$ cm, $BC = 9.5$ cm and $\angle BAC = 80°$. [2]

(b) Write down the angle of $\angle BCA$.

Answer (b) $\angle BCA$ _____ [1]

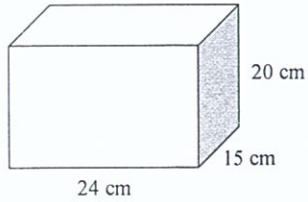
(c) Construct the perpendicular bisector of line AB. [1]

(d) Construct the angle bisector of $\angle ABC$ and produce it to cut AC. Label the intersection P. [1]

(e) Write down the length of BP.

Answer (e) _____ cm [1]

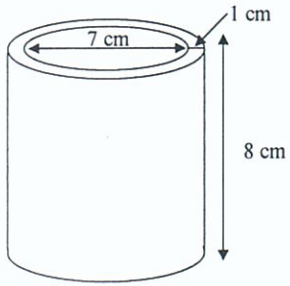
22 A rectangular block of metal having dimensions 24 cm by 20 cm by 15 cm is shown below.



(a) Find the volume of the rectangular block.

Answer (a) _____ cm^3 [1]

(b) The rectangular block is melted to form hollow cylinders, open as both ends as shown below.



The inner diameter of the container is 7 cm and the inner height is 8 cm. The container has a uniform thickness of 1 cm on the sides and the bottom.

(i) Find the volume of material used for making one such container. Take $\pi = \frac{22}{7}$.

Answer (b)(i) _____ cm^3 [2]

(ii) What is the maximum number of such containers that can be made?

Answer (b)(ii) _____ containers [1]

(iii) Find the remaining quantity of metal after all such containers are made. Give your answer correct to 1 d.p.

Answer (b)(iii) _____ cm^3 [1]

23 Given the number pattern 11, 17, 23, 29, …

(a) Find the 9^{th} term of the pattern.

Answer (a) _____ [1]

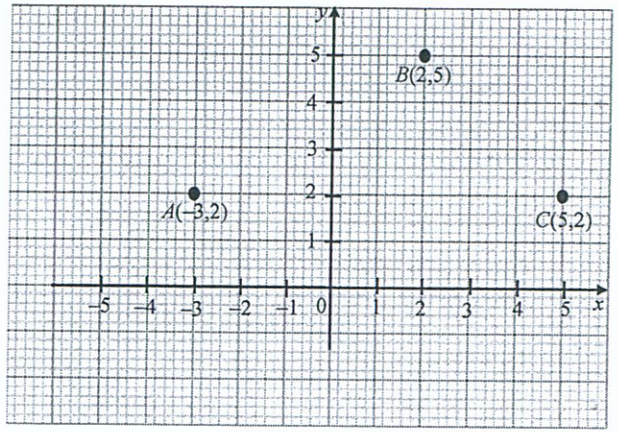
(b) Find the general term T_n.

Answer (b) _____ [2]

(c) Find the term of the pattern that gives the number 269.

Answer (c) _____ [2]

24 A, B and C are the points (–3, 2), (2, 5) and (5, 2) respectively.



Find

(a) the area of the triangle ABC,

Answer (a) _____ [1]

(b) the equation of the line which passes through C and has the same gradient as AB,

Answer (b) _____ [2]

(c) the coordinates of D such that $ABCD$ forms a parallelogram.

Answer (c) (_____ , _____) [1]

~ End of Paper ~

Answers

Qn	Answer	Marks	Remarks / Common mistakes
1a	25 : 35 : 189	A1	
b	10	A1	
2a	$\frac{8}{15}$	A1	
b	$\frac{2}{3}$	A1	
3	$=\frac{12^2-\sqrt{1200}}{0.28}$	M1	All 3 terms must be rounded off to 2sf
	$=390$	A1	
4a	$AE = 49.1$ cm	M1	Either length derived
	$AB = 17$ cm		
	$BE = 49.1 - 17$		
	$=32.1$ cm	A1	
b	$\angle ACB = 19°$ $\angle CAB = 180° - 110° - 19°$		
	$\angle CAB = 51°$	A1	
5	$H = (4,0)$	M1	Either coordinate derived
	$K = (0,6)$		
	Length of $HK = \sqrt{4^2+6^2}$		
	$= 7.21$ units	A1	
6a	$\frac{1}{2} \div \frac{2}{3} - 1$	M1	Correct substitution without simplification
	$=-\frac{1}{4}$	A1	
6b	$h = \frac{3-u}{8g}$ $8gh = 3-u$	M1	
	$u = 3-8gh$	A1	
7a	$\frac{y-3}{4} - \frac{y-5}{3} = \frac{3(y-3)-4(y-5)}{12}$		Formation of common denominator
	$=\frac{3y-9-4y+20}{12}$		
	$=\frac{11-y}{12}$	A1	
b	$p = 8$	A1	
8a	False. 343 can be divided by more than 2 factors (e.g. 7 and 49)	A1	Both parts need to be stated to deserve credit
b	LCM = 210 min	M1	
b	Time = 11 00 hrs	A1	Units not required

9a	\$100	A1	
b	$h = 40$, $k = 15$	A1 A1	
cii	Company *A*, cheaper	A1	
10a	$-2, \frac{6}{5}, \left(\frac{6}{5}\right)^2, (-2)^2$	A1	
b	$a^{\frac{11}{2}}$ or $a^{5\frac{1}{2}}$	A1	
c	$2^{2k} \times 2^3 = \left(2^6\right)^{\frac{1}{4}}$	M1	
	$k = -\frac{3}{4}$	A1	
11a	1.25×10^{-11} cm	A1	
b	1.6×10^{11}	A1	
12	$x = 2$ and $y = -1$	A1 A1	
13a	48 km	A1	
b	900/36 or 1 cm^2 : 36 km^2	M1	Or any other acceptable working
	$= 25$ cm^2	A1	
14a	$(3a+8)(3a-8)$	A1	
bi	$(2a-3)(a-7)$	A1	
ii	$x = 1.5$ or 7	A1	
15a	$\frac{2}{2+13} \times 180°$		
	$= 24°$	A1	
b	(180° - 24°) x n = (n-2) x 180°	M1	
	$n = 15$	A1	
16a	$\frac{120000-98400}{120000} \times 100\,\%$	M1	
	$= 18\%$	A1	
b	1st year $= \frac{80}{100} \times 120000 = 96000$	M1	
	2nd year $= \frac{85}{100} \times 96000 =$ \$81600	A1	
17a	$\angle QPR = 31°$	A1	
b	$\angle QCB = 104°$	A1	
c	$\angle RSC = 73°$	A1	
18ai	169.5 cm	A1	
ii	13	A1	
bi	20	A1	
ii	The pupils in class P are taller as median height of pupils in class P is higher than pupils in class Q.	A1	

	The heights of the pupils in Class P is more consistent as the spread /inter quartile range of height of pupils in class Q is wider than that of class P as the interquartile range is bigger.	A1	
		A1	
19a	$\tan \angle PQS = \frac{12}{18}$	M1	
	$\angle PQS = 33.7°$ (1 d.p.)	A1	
b	$\sin 56° = \frac{12}{PR}$	M1	
	$PR = 14.5$ cm (3 s.f.)	A1	
20a	2.5 m/s^2	A1	
b	$0.5(25)(10) + 25(40)$ $+ 0.5(25)(k-50) = 1500$	M1	
	$k = 80$	A1	
c	18.75 m/s	A1	
21a	AB = 8 cm	A1	
	Correct dimensions	A1	
b	56°	A1	
c	Perpendicular bisector constructed	A1	Must include working lines
d	Angle bisector constructed	A1	Must include working lines. Intersection must be labelled 'P'.
e	8.1 cm	A1	
22a	7200 cm^3	A1	
bi	$[\frac{22}{7}(4.5)^2 - \frac{22}{7}(3.5)^2] \times 8$	A1	
	$= 201$ cm^3	A1	
ii	35 containers	A1	
iii	160cm^3	A1	
23a	59	A1	
b	$6n + 5$	A1	6n
	$6n + 5$	A1	5
c	$6n + 5 = 269$	M1	
	44th term	A1	
24a	Area = 12 square units	A1	
b	Gradient $= \frac{5-2}{2+3} = \frac{3}{5}$	M1	
	$y = \frac{3}{5}x - 1$	A1	
	$D(0, -1)$	A1	

Section A (46 marks)

Answer all the questions in this section.

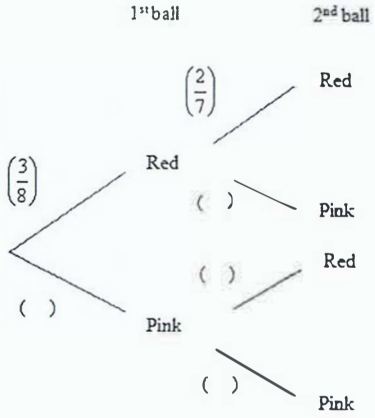
1 Calculate

(a) $2.7 \div (-3) + 1.3 \times 3$. [1]

(b) $\dfrac{4.71 + 2.24}{6.08 \times 0.35}$ [1]

2 A pouch contains 3 red balls and 5 pink balls. Hambali draws 2 balls at random from the pouch, without replacement.

(a) Copy and complete the probability tree diagram below. [2]



(b) Hence or otherwise, find the probability

(i) that both balls drawn are pink, [1]

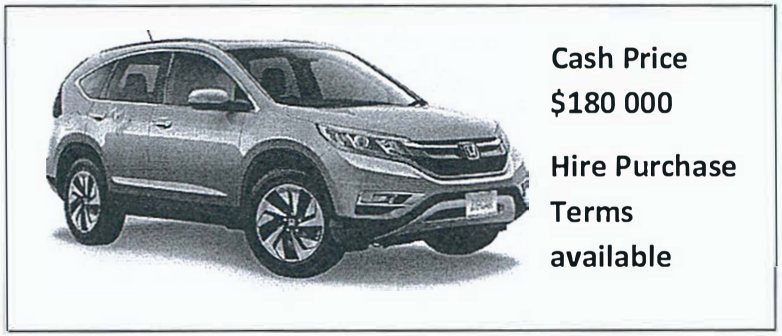
(ii) that he draws one ball of each colour. [1]

3 A sum of money is divided into three parts and shared among three girls Alicia, Bonnie and Clara. The ratio of Alicia's share to Bonnie's share is 3:5. The ratio of Bonnie's share to Clara's share is 3:7.

(a) Find the ratio of Alicia's share to Clara's share. [2]

(b) If the difference between Alicia's and Clara's shares is \$5 200, calculate the sum of money before it was divided. [2]

4 Samuel bought the car as shown in the advertisement, on hire purchase.



He paid a deposit of 60% of the cash price and then agreed to pay the balance in instalments at a simple interest rate of 5% per annum for 3 years.

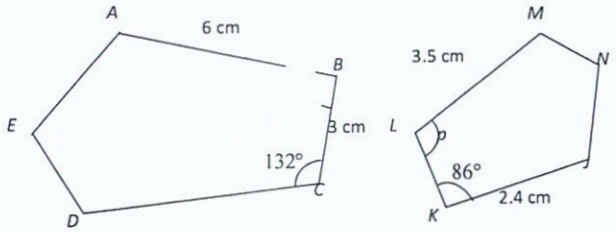
Calculate

(a) the total amount of interest payable, [2]

(b) the monthly instalment he had to pay, [2]

(c) the interest he paid as a percentage of the cash price. [1]

5 Given that *ABCDE* is similar to *JKLMN*.



(a) Find the value of p. [1]

(b) Find the scale factor if figure *ABCDE* is enlarged from figure *JKLMN*. [1]

(c) Find the length of *CD*. [1]

(d) Find the area of triangle *JKL*. [2]

6 If V is inversely proportional to the cube root of P and P is 216 when $V = 30$, find

(a) an equation connecting V and P, [2]

(b) V when $P = 512$, [1]

(c) P when $V = 40$. [1]

7 In a family of 4 children, the sum of the ages of a pair of twins and their eldest sister will be 45 in 5 years' time. The present age of the eldest sister is 6 years less than the sum of the present ages of the twins. Using x to represent the age of one twin,

(a) Write down algebraic expressions, in terms of x, for

(i) the present age of the eldest sister. [1]

(ii) the sum of ages of the twins and the eldest sister now. [2]

(b) Hence, calculate how old the twins are now. [2]

(c) The fourth child in this family is half the age of the eldest sister now. What is the current age of this child? [1]

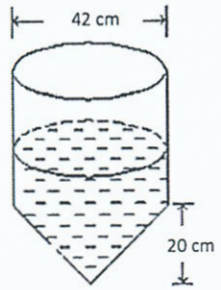
8 **(a)** Factorise *completely* $64 - 4y^4$ [3]

(b) Simplify

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

(ii) $\frac{4p^2}{3} \div \frac{5p^4}{12}$ [2]

9 The diagram shows a container in the form of a hollow cone joined to a cylinder.



25 000 cm^3 of water is poured into it. Calculate

(a) the depth of water in the container, [4]

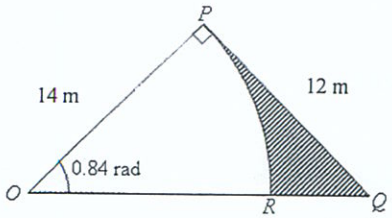
(b) the slant height of the cone, [1]

(c) the surface area of the container that is in contact with the water, giving your answer to the *nearest whole number*. [3]

Section B (14 marks)

Answer any **two** questions in this section. Each question carries 7 marks.

10 **(a)**

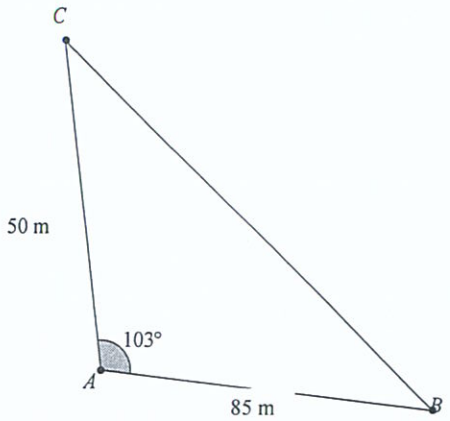


The diagram above shows a right-angled triangle OPQ. An arc of a circle with centre O and radius 14 m, cuts OQ at R. Given that angle $POQ = 0.84$ radian, $OP = 14$ m and $PQ = 12$ m, calculate

(i) angle OQP in *radians*, [1]

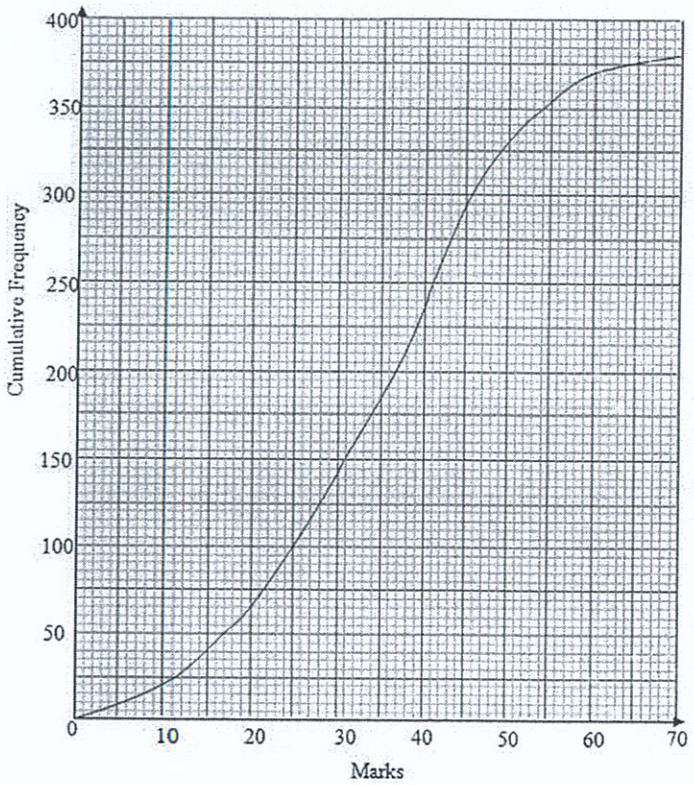
(ii) the perimeter of the shaded region. [3]

(b)



In the diagram, $AB = 85$ m, $AC = 50$ m and $\angle BAC = 103°$.
Calculate the length BC. [3]

11 The cumulative frequency curve below shows the distribution of the marks of 380 students in a Mathematics exam.



(a) Use the graph to determine

(i) the median mark, [1]

(ii) the interquartile range, [2]

(iii) the number of students who passed this Mathematics exam if the passing mark is 50 marks. [1]

(b) The data below shows the marks obtained by the same group of 380 students in a Mathematics exam as well as a Science exam.

Mathematics marks	
Mean	34.5
$\sum fx^2$	529500

Science marks	
Mean	35.5
Standard Deviation	12.1

(i) Calculate the standard deviation of the Mathematics marks scored by the 380 students, giving your answer correct to 1 decimal place. [1]

(ii) Which subject, Mathematics or Science, did the students perform better in? Explain your answer. [2]

12 Answer the whole of this question on a graph paper.

The table of values below is for $y = x^2 - 5x + 4$.

x	-1	0	1	2	3	4	5	6
y	10	4	0	-2	-2	0	4	10

(a) Using a scale of 2 cm to represent 1 unit, draw a horizontal x-axis for $-1 \le x \le 6$.

Using a scale of 1 cm to represent 1 unit, draw a vertical y-axis for $-2 \le y \le 10$.

Plot the graph of $y = x^2 - 5x + 4$ for $-1 \le x \le 6$. [2]

(b) Use your graph to find

(i) the minimum value of y, [1]

(ii) the values of x when $y = 4$. [1]

(c) Write down the equation of the line of symmetry of the graph. [1]

(d) By drawing a tangent, find the gradient of the curve $y = x^2 - 5x + 4$ when $x = 5$. [2]

End of Paper

Marking Scheme for Sec 4N Maths Prelim 2 P2 2015

Section A (46 marks)

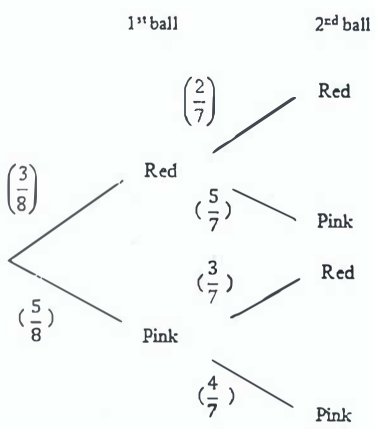
1(a)

$2.7 \div (-3) + 1.3 \times 3 = (-0.9) + 3.9$

$= 3$ [1]

(b) 3.27 (3 s.f.) [1]

2(a) [2]



(b)(i) P(both balls are pink) $= \frac{5}{8} \times \frac{4}{7}$ [1]

$= \frac{5}{14}$ [1]

(ii) P(red ball and pink ball or pink ball and red ball) $= \frac{3}{8} \times \frac{5}{7} + \frac{5}{8} \times \frac{3}{7}$ [1]

$= \frac{15}{28}$ [1]

3(a)

Alicia		Bonnie		Clara
3	:	5		
		3	:	7
9	:	15	:	35

[1]

Ratio = 9 : 35 [1]

(b) $35 - 9 = 26$

26 units – 5 200

Sum of money = 9 + 15 + 35 = 59 units

$= \frac{5200}{26} \times 59$ [1]

= \$11 800 [1]

4

(a) I = PRT/100

$= \frac{(0.4 \times 180000 \times 5 \times 3)}{100}$ [1]

= \$10 800 [1]

(b) Monthly instalment $= \frac{(0.4 \times 180000 + 10800)}{3 \times 12}$ [1]

= \$ 2300 [1]

(c) Percentage $= \frac{10800}{180000} \times 100\%$

= 6% [1]

5

(a) $p = 132°$ [1]

(b) Scale factor $= \frac{6}{2.4}$

$= 2.5$ [1]

(c) $\frac{CD}{3.5} = 2.5$

$CD = 2.5 \times 3.5$

= 8.75 cm [1]

(d) Area of triangle JKL $= \frac{1}{2} \times KL \times 2.4 sin 86°$

$= \frac{1}{2} \times (3 \times 2.5) \times 2.4 sin 86°$

= 8.9781

= 8.98 cm² [1]

6 (a) $V = \frac{k}{\sqrt[3]{P}}$

$30 = \frac{k}{\sqrt[3]{216}}$

$k = 30 \times 6$

$k = 180$ [1]

Eqn: $V = \frac{180}{\sqrt[3]{P}}$ [1]

(b) $V = \frac{180}{\sqrt[3]{P}}$

$= \frac{180}{\sqrt[3]{512}}$

= 22.5 cm³ [1]

(c) $V = \frac{180}{\sqrt[3]{P}}$

$40 = \frac{180}{\sqrt[3]{P}}$

$\sqrt[3]{P} = 4.5$

$p = 4.5^3$

= 91.125 Pa [1]

7

(a)(i) let their sister's age be y.

$y = 2x - 6$ [1]

(ii) sum $= 2(x+5) + (2x-6+5) - 15$ [1]

$= 2x + 10 + 2x - 1 - 15$

$= 4x + 9 - 15$ [1]

$= 4x - 6$

(b) $4x + 9 = 45$ [1]

$4x = 36$ [1]

$x = 9$ [1]

(c) Eldest sister is $y = 2(9) - 6 = 12$ years old now.
Hence age of fourth child = ½ × 12 = 6 years old

8

(a) $64 - 4y^4$

$= 4(16 - y^4)$ [1]

$= 4[(4)^2 - (y^2)^2]$

$= 4(4 + y^2)(4 - y^2)$ [1]

$= 4(4 + y^2)(2 + y)(2 - y)$ [1]

(b)(i)

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

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

$= \frac{x-2}{x(x+1)}$ [1]

(ii) $\frac{4p^2}{3} \div \frac{5p^4}{12} = \frac{4p^2}{3} \times \frac{12}{5p^4}$ [1]

$= \frac{16}{5p^2}$ [1]

9

(a)

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

$= \frac{1}{3} \times \pi \times 21^2 \times 20$

$= 9236.282402\ \text{cm}^3$ [1]

Volume of water in cylinder $= 25000 - 9236.282402$

$= 15763.7176\ \text{cm}^3$ [1]

Volume of cylinder $= \pi r^2 h$

$15763.7176 = \pi \times 21^2 \times h$

$h = \frac{15763.7176}{\pi \times 21^2}$

$h = 11.37811146$

$= 11.4$ cm [1]

Depth of water in container $= 11.4 + 20$

$= 31.4$ cm [1]

(b)

$l^2 = 21^2 + 20^2$

$l^2 = 841$

$l = 29$ cm [1]

(c)

Surface Area $= \pi rl + 2\pi rh$

$= \pi \times 21 \times 29 + 2 \times \pi \times 21 \times 11.37811146$ [1]

$= 3414.536364$ [1]

$\approx 3415\ \text{cm}^2$ [1]

Section B (16 marks)

10 (a)(i) angle $OQP = \pi - 0.84 - \frac{\pi}{2}$

$= 0.731$ rad [1]

(ii) $OQ = \sqrt{14^2 + 12^2}$

$= \sqrt{340}$

$= 18.4$ m (3 s.f.) [1]

Arc PR $= r\theta$

$= 14(0.84)$

$= 11.76$ m [1]

Perimeter of shaded region $= 12 + (\sqrt{340} - 14) + 11.76$

$= 12 + 4.439 + 11.76$

$= 28.2$ m (3 s.f.) [1]

(b)

$BC^2 = AB^2 + AC^2 - 2(AB)(AC)\cos\angle BAC$ [1]

$BC^2 = (50)^2 + (85)^2 - 2(50)(85)\cos\angle 103°$ [1]

$BC = 107.8753167$ [1]

≈ 108 m (3 s.f.)

11 (a)(i) 36 marks [1]

(ii) Upper quartile = ¾ × 380 = 285th student's mark = 44 marks

Lower quartile = ¼ × 380 = 95th student's mark = 24 marks

Interquartile range = 44 -24 [1]

= 20 marks [1]

(iii) 330 students scored below 50 marks, so number of students who passed = 380 – 330

= 50 [1]

(b)(i) standard deviation $= \sqrt{\frac{529500}{380} - 34.5^2}$

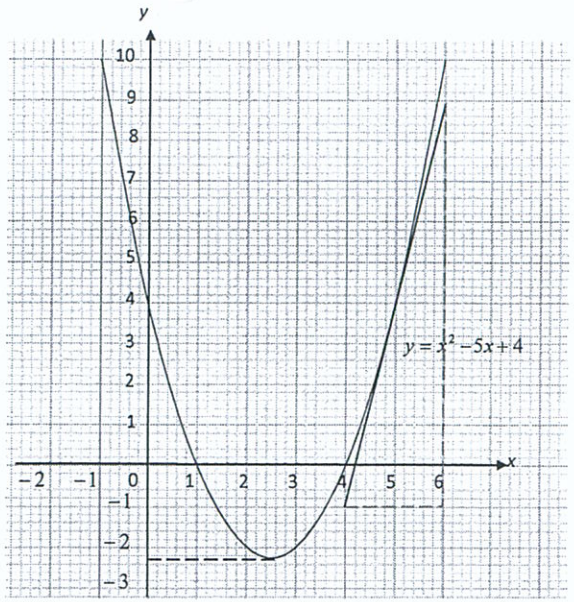
= 14.254

≈ 14.3 marks (3 s.f.) [1]

(ii) Science [1]

The mean Science marks was higher than that of Mathematics. The standard deviation of the Science marks was also lower than that of Mathematics which shows a more consistent performance in the Science exam by the students. [1]

12 (a)



(a) Correct labelled axes drawn according to scale [1] [2]

Smooth curve passing through 8 correctly plotted data points with equation written beside it. [1] [1]

(d) tangent drawn correctly [1] [1]

(b)(i) min. $y = -2.3$ [1]

(ii) When $y = 0$, $x = 0$ or 5 [1]

(c) Line of symmetry: $x = \frac{1+4}{2}$

$x = 2.5$ [1]

(d) Gradient $= \frac{9.9}{2}$

$= 4.95$ (±0.5) [1]