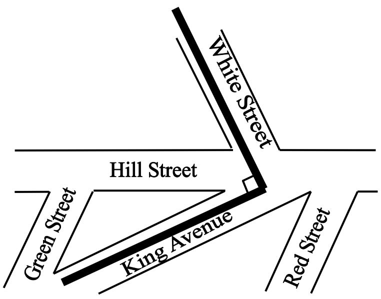
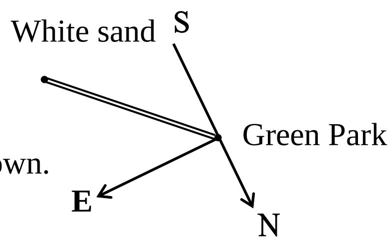
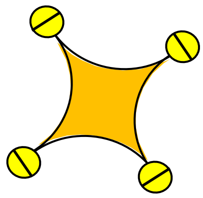
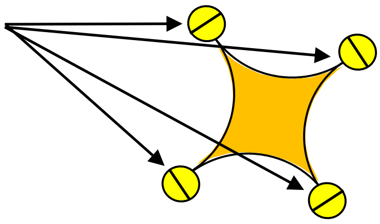
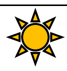
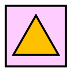
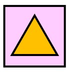
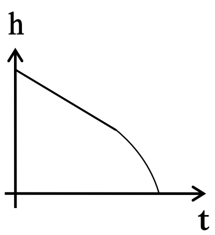
YEAR 9 – PAPER TWO
ANSWERS AND LEARNING STATEMENT

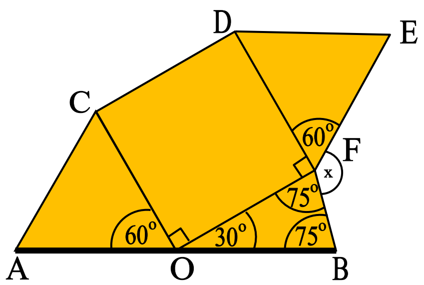
NON CALCULATOR

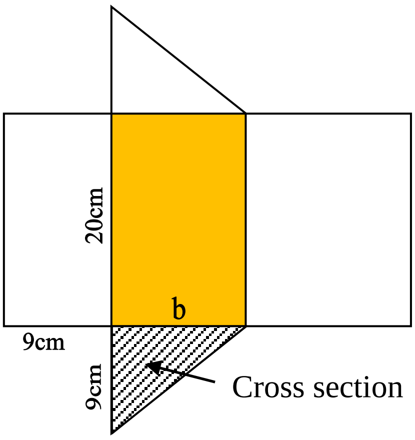
	ANSWER	WORKED SOLUTION	LEARNING STATEMENT A student can
1	81	The total number of trees for Green St and Victoria St is 11, which represents 198 trees. So each tree represents 198 ÷ 11 = 18 real trees. Hence, the number of trees in Green Street is 4.5 × 18 = 81 trees.	Construct and compare a range of data displays including stem-and-leaf plots and dot plots (ACMSP170)
2	2 hours 56 minutes	From 4:15 pm until 5pm there is 45 minutes and from 5 pm until 7:11pm there is 2 hours 11 minutes. So the total time is 2 hours11 minutes + 45 minutes = 2 hours 56 minutes Hence, the match lasted 2 hours 56 minutes.	Solve problems involving duration, including using 12- and 24-hour time within a single time zone (ACMMG199)
3	White Street	White Street is perpendicular to King Avenue as shown. 	Investigate conditions for two lines to be parallel and solve simple numerical problems using reasoning (ACMMG164)
4	South East	Peter is to drive South East from Green Park to White Sand as shown. 	Describe routes using landmarks and directional language (ACMMG113)
5	74	The first shape has 10 matchsticks. Each shape after the first shape has 8 more matchsticks than the shape before it. Hence, the 9th shape will have 10 + (9 -1) × 8 = 74 matchsticks.	Introduce the concept of variables as a way of representing numbers using letters (ACMNA175)

6		Because of the lines drawn in each of the circles, only the 3rd shape would have rotational symmetry. 	Identify line and rotational symmetries [(ACMMG181)]()
7	5.5m	Short Tall Short Tall 9 : 11 = 4.5 : x The height of the taller giraffe is x = 4.5 ÷ 9 × 11 = 5.5m	Solve a range of problems involving rates and ratios, with and without digital technologies (ACMNA188)
8	$4.68	780 cm = 7.8 m Hence, the cost of ribbon is C = 7.8 × 0.60 = $4.68	Solve a range of problems involving rates and ratios, with and without digital technologies (ACMNA188)
9	 =  × 4 – 3	Only this rule  =  × 4 – 3 works for all 3 pairs of numbers as shown. 5 = 2 × 4 – 3 17 = 5 × 4 – 3 33 = 9 × 4 – 3	Introduce the concept of variables as a way of representing numbers using letters (ACMNA175)
10	$\frac{4}{3}$	As 24 ÷  = 18, then 24 ÷18 =  So  $= \frac{24}{18} = \frac{4}{3}$.	Carry out the four operations with rational numbers and integers, using efficient mental and written strategies (ACMNA183)
11	42	The chance of selecting a yellow bird is 2 in 9 this means $\frac{2}{9}$ of the 54 birds are yellow. As $\frac{2}{9}$ of 54 is 12, then 12 of the birds are yellow. Hence, there are 54 – 12 = 42 birds which are not yellow.	Calculate relative frequencies from given or collected data to estimate probabilities of events involving 'and' or 'or' (ACMSP226)
12	All its angles should be right angles.	As the quadrilateral has a pair of opposite sides parallel and equal then it must be a parallelogram. But its diagonals are also equal so it must be a rectangle. Hence, each of its angles must be 90°.	Establish properties of quadrilaterals using congruent triangles and angle properties, and solve related numerical problems using reasoning (ACMMG202)

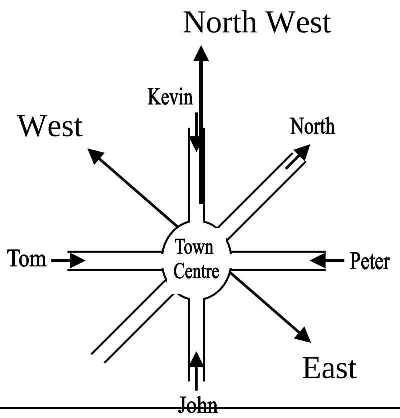
13	30	This solid has 10 vertical edges, 10 horizontal edges and 10 edges from front to back. Hence, this solid has a total of 30 edges.	Draw different views of prisms and solids formed from combinations of prisms [(ACMMG161)](ACMMG161)
14	14	$420 \div 30 = 14$ $840 \div 60 = 14$ and so on. Hence, the number of loaves of bread produced $= \boxed{14} \times$ time in minutes.	Create algebraic expressions and evaluate them by substituting a given value for each variable [(ACMNA176)](ACMNA176)
15	1 : 3	As 20 cars are black, then 80 – 20 = 60 cars are other colours. So the ratio of black to other colours is 20 : 60. This can be simplified as 1:3.	Solve a range of problems involving rates and ratios, with and without digital technologies [(ACMNA188)](ACMNA188)
16	12	Let each girl start with x. Patricia's answer is $(x + 4) \times 4 = 4x + 16$. Talia's answer is $x \times 4 + 4 = 4x + 4$. Hence, the difference between their answers is $4x + 16 - (4x + 4) = 4x + 16 - 4x - 4 = 12$.	Create algebraic expressions and evaluate them by substituting a given value for each variable [(ACMNA176)](ACMNA176)
17		The top of the tank is a cylinder which has a uniform circular cross section so the level will fall uniformly, giving a straight line graph. The circular cross section in the lower part of the tank narrows so the level will fall at an increasing rate, giving a curve which gets steeper. Hence, the 4th graph is correct.	Graph simple non-linear relations with and without the use of digital technologies and solve simple related equations [(ACMNA296)](ACMNA296)
18	8	$20\% \times 40$ $= \frac{20}{100} \times 40$ $= 8$. Hence, Anthony has 8 action games.	Find percentages of quantities and express one quantity as a percentage of another, with [(ACMNA158)](ACMNA158)
19	40	As the ratio of cars in Green St : View St is 2 : 5 then Green St has $\frac{2}{7}$ of the total number of cars. Hence, the number of cars in Green St is $\frac{2}{7} \times 140 = 40$.	Solve a range of problems involving rates and ratios, with and without digital technologies [(ACMNA188)](ACMNA188)

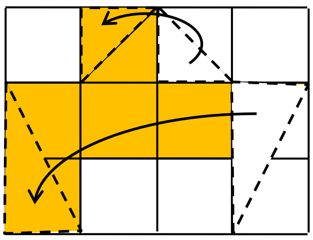
20	\$90	Before Christine bought the bag she had \$10 + \$35 = \$45. This is half of the amount she started with. Hence, she started with $2 \times \$45 = \$90$.	Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving all four operations with whole numbers (ACMNA123)
21	$\frac{1}{6}$	2.5 hours is $2 \times 60 + 30 = 150$ minutes. The fraction of the time needed to fill the tank is $\frac{25}{150} = \frac{5}{30} = \frac{1}{6}$. As 25 minutes is $\frac{1}{6}$ of the time needed, then $\frac{1}{6}$ of the volume of the tank will be filled.	Solve a range of problems involving rates and ratios, with and without digital technologies (ACMNA188)
22	$a^2 \times a^2$	$a^2 + a^2 = 2a^2$. $a + a + a + a = 4a$ $a + a + 4 = 2a + 4$ $a^2 \times a^2 = a^4$ $a^6 - a^2 = a^6 - a^2$ Hence, only $a^2 \times a^2 = a^4$	Use index notation with numbers to establish the index laws with positive integral indices and the zero index (ACMNA182)
23	$m = 5p - 340$	The average mass of the 5 players is p, so $p = \frac{340+m}{5}$ that is $5p = 340 + m$ Hence, $m = 5p - 340$	Calculate mean, median, mode and range for sets of data. Interpret these statistics in the context of data (ACMSP171)
24	3250 mL	There are 13 cans each containing 250 mL. So the total volume of soft drink is $13 \times 250 = 3250$ mL.	Connect volume and capacity and their units of measurement (ACMMG138)
25	1.08 km	Jack runs 4.32km in 4 days. As he runs the same distance each day then he must run $4.32 \div 4 = 1.08$ km per day.	Multiply and divide fractions and decimals using efficient written strategies and digital technologies (ACMNA154)
26	5080	$558.8 \div 0.11 = 55880 \div 11 = 5080$	Multiply and divide decimals using efficient written strategies (ACMNA154)

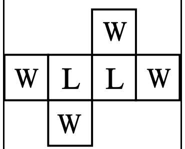
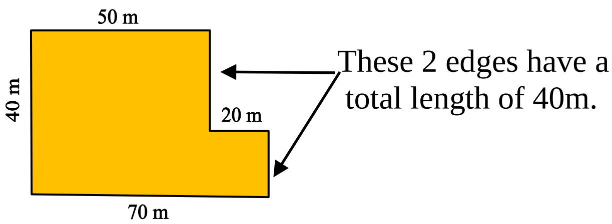
27	25	The fraction of non sport cars in all the boxes is $4 - \frac{2}{5} = 3\frac{3}{5}$. So there are 90 non sport cars in $3\frac{3}{5}$ boxes. Hence, each box would contain $90 \div 3\frac{3}{5} = 90 \div \frac{18}{5} = 90 \times \frac{5}{18} = 25$.	Multiply and divide fractions and decimals using efficient written strategies and digital technologies [(ACMNA154)](ACMNA154)
28	\$1 hours 9 minutes and 55 seconds	4 hours 8 minutes and 30 seconds = 3 hours 68 minutes and 30 seconds = 3 hours 67 minutes and 90 seconds. 3 hours 67 minutes and 90 seconds − 2 hours 58 minutes and 35 seconds 1 hour 9 minutes and 55 seconds Hence, David took 1 hour 9 minutes and 55 seconds more than John to complete the marathon.	Solve problems involving duration, including using 12- and 24-hour time within a single time zone [(ACMMG199)](ACMMG199)
29	135°	 $\angle AOC = 60°$ (angle in equilateral triangle AOC) $\angle COF = 90°$ (angle in a square COFD) $\therefore \angle FOB = 180° – (90° + 60°) = 30°$ (angle of a straight line AOB) Let $\angle OBF = \alpha$ $\therefore \angle OFB = \alpha$ (base angles of isosceles ΔOFB are equal) $\therefore \alpha + \alpha + 30° = 180°$ (angle sum of ΔOFB) so $\alpha = 75°$. Now, $\angle OFD = 90°$(angle in a square COFD) and $\angle DFE = 60°$ (angle in equilateral triangle DFE) Hence, $x = 360° - (75° + 90° + 60°) = 135°$ (angle of revolution at F)	Apply logical reasoning, including the use of congruence and similarity, to proofs and numerical exercises involving plane shapes [(ACMMG244)](ACMMG244)

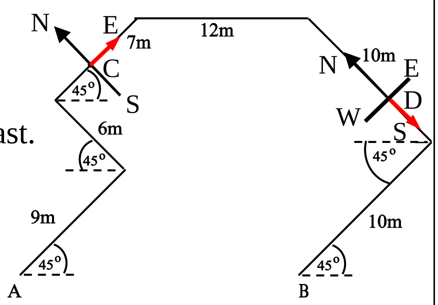
30	16	The only way to form a square prism with height 8 cm is to have 2 layers of triangular prism each of height 4cm. Now, in order to form the square base of the prism using the dimensions 3 cm and 7 cm each edge of the square should divisible by both 3 and 7 so they must each be 21cm. This means Grace will need $7 \times 3 = 21$ triangular prisms to form the bottom layer but to complete this layer, and have no gaps, she needs to position another 21 triangular prisms upside down, against these initial triangular prisms to form 21 rectangular prisms, a total of 42 triangular prisms are needed for the lower layer. She will need another 42 for the second layer. Hence, she needs a total of 84 blocks and this means she will have 16 left.	Solve problems involving the surface area and volume of right prisms (ACMMG218)
31	96cm	The 6 identical squares have a total area of 384 cm². So each square has an area of $384 \div 6 = 64$cm². Therefore, the side length of any of these squares is 8cm. Also, the side length of each equilateral triangle must also be 8cm. Hence, the perimeter will be $12 \times 8 = 96$cm.	Find perimeters and areas of parallelograms, trapeziums, rhombuses and kites (ACMMG196)
32	240 cm²	 Volume = Cross section area × perpendicular height So1080 = Cross section area × 20 Therefore, the cross section area is $1080 \div 20 = 54$ cm² Now, the area of the triangular cross section is $54 = \frac{1}{2} \times 9 \times b$ then $9b = 108$ So $b = 12$cm Hence, the shaded area = $20 \times b$ $= 20 \times 12$ $= 240$ cm²	Solve problems involving the surface area and volume of right prisms (ACMMG218)

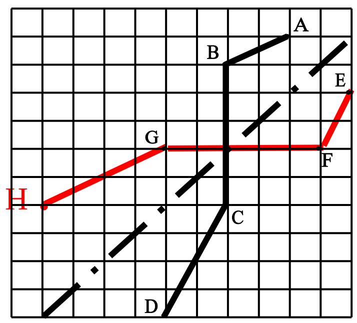
YEAR 9 – PAPER TWO – CALCULATOR ALLOWED

	ANSWER	WORKED SOLUTION	LEARNING STATEMENT A student can
1	$ 440 000	The cost of one shop is $ 3 080 000 ÷ 7 = $ 440 000	Carry out the four operations with rational numbers and integers, using efficient mental and written strategies and appropriate digital technologies (ACMNA183)
2	a cone inside a hemisphere	The outer shape is a hemisphere. The inner shape is a cone. Hence, the diagram shows a cone inside a hemisphere.	Draw different views of prisms and solids formed from combinations of prisms (ACMMG161)
3	John	 Only John is travelling North West.	Describe routes using landmarks and directional language (ACMMG113)
4	Black	This Divided Bar Graph contains 18 equal sections. Each section represents 54 ÷ 18 = 3 students. So the colour that 15 students chose must have 15 ÷ 3 = 5 sections. Hence, these students chose Black as it is the only colour represented by 5 sections.	Construct and compare a range of data displays including stem-and-leaf plots and dot plots (ACMSP170)
5	12	Ethan needs 8 × 7 = 56 hinges. So he need to buy 56 ÷ 5 = 11.2 bags Hence, Ethan must buy 12 bags as 11bags will not have enough hinges.	Carry out the four operations with rational numbers and integers, using efficient mental and written strategies and appropriate digital technologies (ACMNA183)

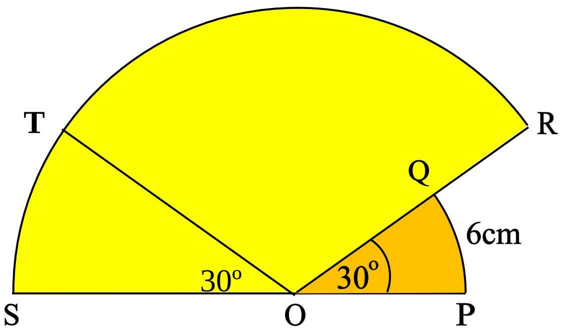
6	10:36 am	10 km at 100km per hour would take 10 ÷ 100 = 0.1 hours = 0.1 × 60 =6 minutes. The remaining 30 km at 60km per hour would take 30 ÷ 60 = 0.5 hours = 30 minutes. Therefore, Anthony needs 6 + 30 = 36 minutes to travel from the farm to the beach. Hence, he will arrive at 10:36 am.	Solve a range of problems involving rates and ratios, with and without digital technologies (ACMNA188)
7	$\frac{7}{23}$	We need to find the difference between each of these fractions and 0.3 and the smallest difference regardless of its sign, gives us the closest fraction to 0.3. $0.3-\frac{5}{12}=-0.11666\ldots$, $0.3-\frac{3}{11}=0.0272\ldots$ $0.3-\frac{4}{13}=-0.00769\ldots$, $0.3-\frac{5}{17}=0.0058\ldots$ $0.3-\frac{7}{23}=-0.0043\ldots$ As the smallest difference is $0.0043\ldots$ then $\frac{7}{23}$ is the closest to 0.3.	Investigate terminating and recurring decimals (ACMNA184)
8	81	The length of the lane is 36 × 900 = 32400cm The number of cars that can fit in front of this traffic light is 32400 ÷ 400 = 81 cars.	Solve problems involving the comparison of lengths and areas using appropriate units (ACMMG137)
9	$\frac{5}{12}$	By moving the shaded triangles to corresponding unshaded triangles as shown in the diagram, we can see that there are 5 squares shaded.  Hence, the shaded fraction of this logo is $\frac{5}{12}$.	Find perimeters and areas of parallelograms, trapeziums, rhombuses and kites (ACMMG196)
10	27 and 37	$\sqrt[3]{30\,000}$ = 31.072325..., which is between 27 and 37.	Investigate the concept of irrational numbers, including π (ACMNA186)

11	11h	Each day John swims from 5:15 pm until 7:05 pm this means he swims 1hour 50 minutes. Therefore from Monday to Friday he swims $5 \times$ 1hour 50minutes = 5hours 250 minutes = 9 hours 10minutes. On Saturday he swims from 11:25am until 1:15pm this means he swims for 1hour 50minutes. Hence, in total John swims 9 hours 10minutes + 1hour 50minutes =11hours.	Solve problems involving duration, including using 12- and 24-hour time within a single time zone (ACMMG199)
12	a pentagonal prism	Triangular prism has 9 edges &5 faces. Triangular pyramid has 6 edges & 4 faces. Pentagonal prism has 15 edges & 7 faces. Pentagonal pyramid has 10 edges & 6 faces. Only in a pentagonal prism the sum of the number of the faces and edges is 22.	Draw different views of prisms and solids formed from combinations of prisms (ACMMG161)
13		Let the probability of lose L be x. As the probability of win W is twice the probability of lose L then it is 2x. Therefore, the probability of win W is $\frac{2x}{3x} = \frac{2}{3}$. The required net should have $\frac{2}{3} \times 6 = 4$ faces of win W and 2 faces of lose L. Hence, the net of the second die gives the required probability.	List all outcomes for two-step chance experiments, both with and without replacement using tree diagrams or arrays. Assign probabilities to outcomes and determine probabilities for events (ACMSP225)
14	220 m	 Hence, the perimeter of the Garden is $2 \times 40 + 50 + 20 + 70 = 220$m.	Find perimeters and areas of parallelograms, trapeziums, rhombuses and kites (ACMMG196)
15	1600 and 9600	Grace tripled her points and ended with 4800 so she scored $4800 \div 3 = 1600$ in level 1. Jessica lost half of her points and ended with 4800 so she scored $4800 \times 2 = 9600$ in level 1.	Carry out the four operations with rational numbers and integers, using efficient mental and written strategies and appropriate digital technologies (ACMNA183)

16	$1075	The cost of the excursion was C = 400 + 4.5 × 150 C = $1075	Create algebraic expressions and evaluate them by substituting a given value for each [variable](#) [(ACMNA176)](#)
17	5	The group of the first five cards in pattern has a total of 1 + 2 + 4 + 5 + 7 = 19. As the numbers on this group continually repeat themselves in this pattern we divide 200 by 19 we get 10.5263 which means when we can repeat this group of five cards 10 times until we reach a sum of 190. After that we still need to add between 10 and 15, which is a sum of a part of this group, to reach a sum between 200 and 205. As 1+2+4+5 = 12, then the last number will be 5.	Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving all four operations with whole numbers [(ACMNA123)](#)
18	p + 1	Multiplying any integer by 2, 4 or 6 will produce an even number. Adding 1 to an even number will produce an odd number, so the first 3 expressions will always produce an odd number. The 4th expression "p + 1" will produce an even number when p is odd.	Create algebraic expressions and evaluate them by substituting a given value for each [variable](#) [(ACMNA176)](#)
19	6000	$1600 = \frac{p}{5} + 400$ so $1200 = \frac{p}{5}$ Hence, p = 6000	Solve linear equations using algebraic and graphical techniques. [(ACMNA194)](#)
20	$\frac{11}{35}$	The fraction of the first two stages of the course is $\frac{2}{5} + \frac{2}{7} = \frac{24}{35}$. Hence, the fraction of the last stage of the course is $1 - \frac{24}{35} = \frac{11}{35}$	Solve problems involving addition and subtraction of fractions, including those with unrelated denominators [(ACMNA153)](#)
21	South	Total distance is 9 + 6 + 7 + 12+ 10 +10 = 54m. As $\frac{1}{3}$ of 54m is 18m, then when Vanessa reached C she was walking East. As $\frac{7}{9} \times 54$= 42m. then Vanessa was heading South when she reached D.  	Multiply and divide fractions and decimals using efficient written strategies and digital technologies [(ACMNA154)](#)

22	\$52.50	Let the cost of the helmet be H. Hence the cost of the bike is 3H. So H + 3H = \$210 4H = \$210 H = \$52.50 Hence, the helmet cost \$52.50.	Solve linear equations using algebraic and graphical techniques. Verify solutions by substitution (ACMNA194)
23	one right angle and one obtuse angle	As the quadrilateral has one obtuse and one right angle then it cannot have another one obtuse and one right angle as 2 right angles and 2 obtuse angles make angle sum greater than 360º.	Establish properties of quadrilaterals, angle properties, and solve related numerical problems using reasoning (ACMMG202)
24	234 cm	The heights of the tree in the next three years are as shown. $h_1 = \frac{1.2}{1-0.2} = 1.5\text{m}$, $h_2 = \frac{1.5}{1-0.2} = 1.875\text{m}$ $h_3 = \frac{1.875}{1-0.2} = 2.34375\text{m}$ Hence, the height after three years will be approximately 234cm.	Create algebraic expressions and evaluate them by substituting a given value for each variable (ACMNA176)
25	\$56	Robyn bought 72kg = 72000g of nuts. The number of bags made was 72000 ÷ 900 = 80 bags. The selling price of these bags was 80 × \$3.20 = \$ 256 Hence, Robyn's profit was \$256 − \$200 = \$56	Solve problems involving profit and loss, with and without digital technologies (ACMNA189)
26	5.22 km	From B to C there is 5 units on the grid. So 5units represents a distance of 4.35 km that is 1unit represents a distance of 0.87 km. From C to H there is 6 units on the grid. Hence, the distance between C and H is 6 × 0.87 km = 5.22 km. 	Solve a range of problems involving rates and ratios, with and without digital technologies (ACMNA188)

27	14	Let the number of messages Susan sent be S. Hence, Melissa sent $\frac{2}{5}$ S and Jane sent S + 8. $S + \frac{2}{5}S + S + 8 = 92$ $2S + \frac{2}{5}S = 84$ $10S + 2S = 420$ $12S = 420$ So $S = \frac{420}{12} = 35$ Hence, Melissa sent $\frac{2}{5} \times 35 = 14$ messages.	Create algebraic expressions and evaluate them by substituting a given value for each variable (ACMNA176)
28	$\frac{1}{13}$	Let the number of Yellow hats be Y. The number of green hats is $\frac{Y}{3}$ and the number of purple hats is 3Y. So the total number of hats in the bag is $Y + \frac{Y}{3} + 3Y$ $= 4Y + \frac{Y}{3} = \frac{12Y+Y}{3} = \frac{13Y}{3}$ Hence, the chance Vanessa will choose a green hat is $P = \frac{\frac{Y}{3}}{\frac{13Y}{3}} = \frac{1}{13}$.	Create algebraic expressions and evaluate them by substituting a given value for each variable (ACMNA176)
29	15	We need to find n such that $5n(n + 9) = 1800$ By trial and error we substitute different values for n as shown. For n = 10 we get $S = 5 \times 10 \times (10 + 9) = \$950$ As it gives a smaller amount than $1800, we try n = 12 we get $S = 5 \times 12 \times (12 + 9) = \$1260$ again this amount still small, we try n = 15 we get $S = 5 \times 15 \times (15 + 9) = \$1800$ Hence, Anthony will save $1800 after 15 weeks.	Create algebraic expressions and evaluate them by substituting a given value for each variable (ACMNA176)
30	2603	As the number of white circles is always multiple of 7 then the shape that has 9107 white circles is $9107 \div 7 = 1301$. Now the number of black circles in any shape is always is 1 more than twice the shape's position. So the number of black circles in the required 1301^{st} shape is $2 \times 1301 + 1 = 2603$.	Carry out the four operations with rational numbers and integers, using efficient mental and written strategies and appropriate digital technologies (ACMNA183)

31	50 cm	 Place T on the arc SR, such that ∠ TOS = 30º. As OP is $\frac{3}{5}$ of OS, then OS is $\frac{5}{3}$ of OP, hence the length of arc ST is $\frac{5}{3}$ of the length arc PQ. So the length of arc ST = $\frac{5}{3} \times 6 = 10$cm. Now ∠ SOR = 180º − 30º = 150º As ∠SOR = 5 × ∠ SOT then the length of arc SR = 5 × the length of arc ST Hence, the length of Arc SR = 5 × 10 = 50 cm. ***An alternative method.*** Let the radius OS of the larger sector be x then the radius OP of the smaller sector is $\frac{3}{5}x$. The length of an arc is $L = \frac{\theta}{360} \times 2\pi r$ So $6 = \frac{30}{360} \times 2\pi \times \frac{3}{5}x$ $6 = \frac{1}{12} \times 2 \times \pi \times \frac{3}{5}x$ $6 = \frac{1}{10}\pi x$ Therefore $x = \frac{60}{\pi}$ Hence, the length of arc RS is $L = \frac{150}{360} \times 2\pi \times \frac{60}{\pi} = 50$ cm.	Create algebraic expressions and evaluate them by substituting a given value for each variable (ACMNA176)
32	3 cm	The height of the water rises by 8.2 – 8 = 0.2cm. So the volume of the water increases by 0.2 × 15 × 9 = 27cm³. This increase in the volume of water is equal to the volume of the cube. Now, the volume of a cube is s³ where s is the length of one edge of the cube. So, s³ = 27, hence s = 3cm.	Calculate volumes of rectangular prisms (ACMMG160)