

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

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

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

1. (a) Find the number of seconds in a day, giving your answer in standard form.

Answer (a) _____ seconds [1]

- (b) From the given numbers, write down the number which has the smallest value in the space provided :

$$0.123 \times 10^{-8} \quad , \quad 1.23 \times 10^{-11} \quad , \quad \frac{123}{10^{12}}$$

Answer (b) _____ [1]

2. On a certain day, the exchange rate between the Singapore dollar (SGD) and the Malaysian Ringgit (RM) was SGD\$ 1 = RM 2.34.

- (a) How many Malaysian Ringgit can be exchanged for SGD \$ 4350 ?

Answer (a) RM _____ [1]

- (b) A Malaysian tourist exchanged RM 857 for Singapore dollars. How much Singapore dollars did he get ? Give your answer to the *nearest dollar*.

Answer (b) SGD _____ [1]

3. Last year, 6.5 kg of rice cost \$11.70. This year, 35 kg of rice cost \$80.50. What was the percentage increase in the price of rice?

Answer _____ % [2]

4. (a) Simplify $-3(2x-3)+8x$.

Answer (a) _____ [1]

- (b) Solve $3(7-x)=6$.

Answer (b) _____ [1]

5. Find the fraction exactly halfway between $\frac{3}{4}$ and $\frac{3}{5}$. Give your answer in its simplest form.

Answer _____ [1]

6. A computer shop gives a 8% discount on any item purchased.
- (a) Farhan paid \$15.18 for a set of headphones. What was the price of the headphones before the discount?

Answer (a) \$ _____ [1]

- (b) Herman had a total discount of \$ 5.40 for buying 3 identical USB cables. What was the cost of each USB cable before the discount?

Answer (b) \$ _____ [1]

7. (a) Given that $y = 3x^2$, find the value of y when $x = -2$.

Answer (a) $y =$ _____ [1]

- (b) Make x the subject of the formula $y = 2x - 7$.

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

8. Ryan and Sami each have \$5000 to invest for 3 years.

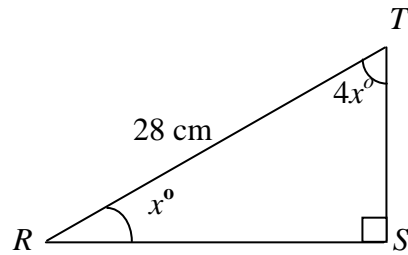
- (a) Ryan invests the amount at 5% per year compound interest. Calculate the total interest that Ryan will earn.

Answer (a) \$ _____ [2]

- (b) Sami invests the amount at 5.2 % per year simple interest. Calculate the total interest that Sami will earn.

Answer (b) \$ _____ [1]

9. In the diagram, $\angle RST = 90^\circ$, $RT = 28$ cm, $\angle TRS = x^\circ$ and $\angle RTS = 4x^\circ$.



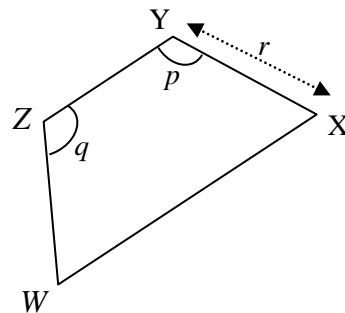
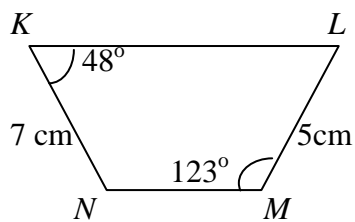
(a) Form an equation in x and solve the equation.

Answer (a) $x =$ _____ [2]

(b) Find the length of RS .

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

10. In the diagram, $KLMN$ is congruent to $WXYZ$. Given that KL is parallel to NM , write down the values of p , q and r .



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

(b) $q =$ _____ [1]

(c) $r =$ _____ cm [1]

11. The first 5 numbers of a sequence are 2, 5, 8, 11, 14,

Find

(a) the next number,

Answer (a) _____ [1]

(b) the n^{th} term,

Answer (b) _____ [1]

(c) the 20th term.

Answer (c) _____ [1]

12. The probability that Michelle will oversleep on any particular day is $\frac{1}{6}$.

Find the probability that

(a) Michelle will not oversleep on a particular day,

Answer (a) _____ [1]

(b) Michelle will oversleep on two particular consecutive days,

Answer (b) _____ [1]

(c) Michelle will oversleep on just one of two particular days.

Answer (c) _____ [1]

13. The weights of 5 men (in kg) are given below.

57, 60, 62, 65, 71

Find

(a) the mean weight,

Answer (a) _____ kg [1]

(b) the upper quartile,

Answer (b) _____ kg [1]

(c) the standard deviation.

Answer (c) _____ kg [2]

14. The number 63, written as the product of its prime factors, is $3^2 \times 7$.

(a) Write 105 as the product of its prime factors.

Answer (a) $105 =$ _____ [1]

(b) Hence find the highest common factor of 63 and 105.

Answer (b) _____ [1]

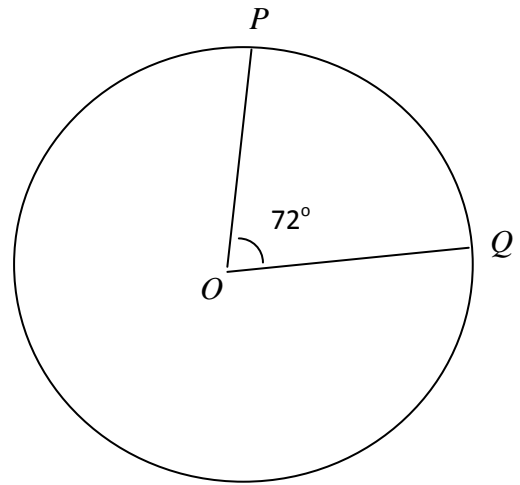
(c) Given that k is a whole number which can be divided by 63 and 105, find the smallest value of k .

Answer (c) $k =$ _____ [1]

15. The diagram shows a circle, centre O , with radius 6 cm. P and Q are points on the circumference such that $\angle POQ = 72^\circ$. (Take $\pi = 3.14$)

Find

- (a) the area of the sector POQ ,

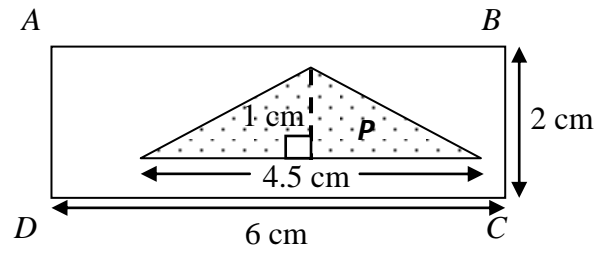


Answer (a) _____ cm^2 [1]

- (b) the perimeter of the sector POQ .

Answer (b) _____ cm [2]

16. The diagram below shows the map of a rectangular field $ABCD$, which is drawn on a scale of 1: 2500. A triangular pond labelled P is located inside the field.



- (a) Find the actual length of AB in metres, giving your answer to the *nearest metre*. Show your method of calculation clearly.

Answer (a) _____ m [1]

- (b) Express the area of the pond as a percentage of the area of the field. Estimate your answer to the *nearest percent*.

Answer (b) _____ % [2]

17. (a) Calculate the sum of the interior angles of a 7-sided polygon.

Answer (a) _____° [1]

- (b) Four of the angles of a 7-sided polygon are 120° , and the other angles are x° , $(x + 92)^\circ$ and $(2x - 20)^\circ$. Find the size of the largest angle.

Answer (b) _____° [3]

18. (a) Factorise $6x - 12y - 3$.

Answer (a) _____ [1]

- (b) (i) Given that $x^2 - 4x + 7 = (x + a)^2 + b$, find a and b .

Answer (b)(i) $a =$ _____ [1]

$b =$ _____ [1]

- (ii) Hence, or otherwise, solve $x^2 - 4x + 7 = 3$.

Answer (b)(ii) $x =$ _____ [1]

19. (a) Given that x is an integer, $-3 < x \leq 2$ and $x \neq 0$ or -1 , write down all possible values of x .

Answer (a) $x =$ _____ [2]

- (b) y is directly proportional to x^3 .
When x has a certain value, $y = 5$.
Find the value of y when x is doubled.

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

- (c) 5 shirts and 3 belts cost \$ 101. A shirt costs \$9 more than the price of a belt. If one shirt costs \$ x and one belt costs \$ y , write down two equations involving x and y and hence find the price of a shirt.

Answer (c) shirt costs \$ _____ [4]

20. Complete the table of values for $y = 3 - 2x$.

Answer (a)

x	-2	-1	0	1	2
y	7		3	1	

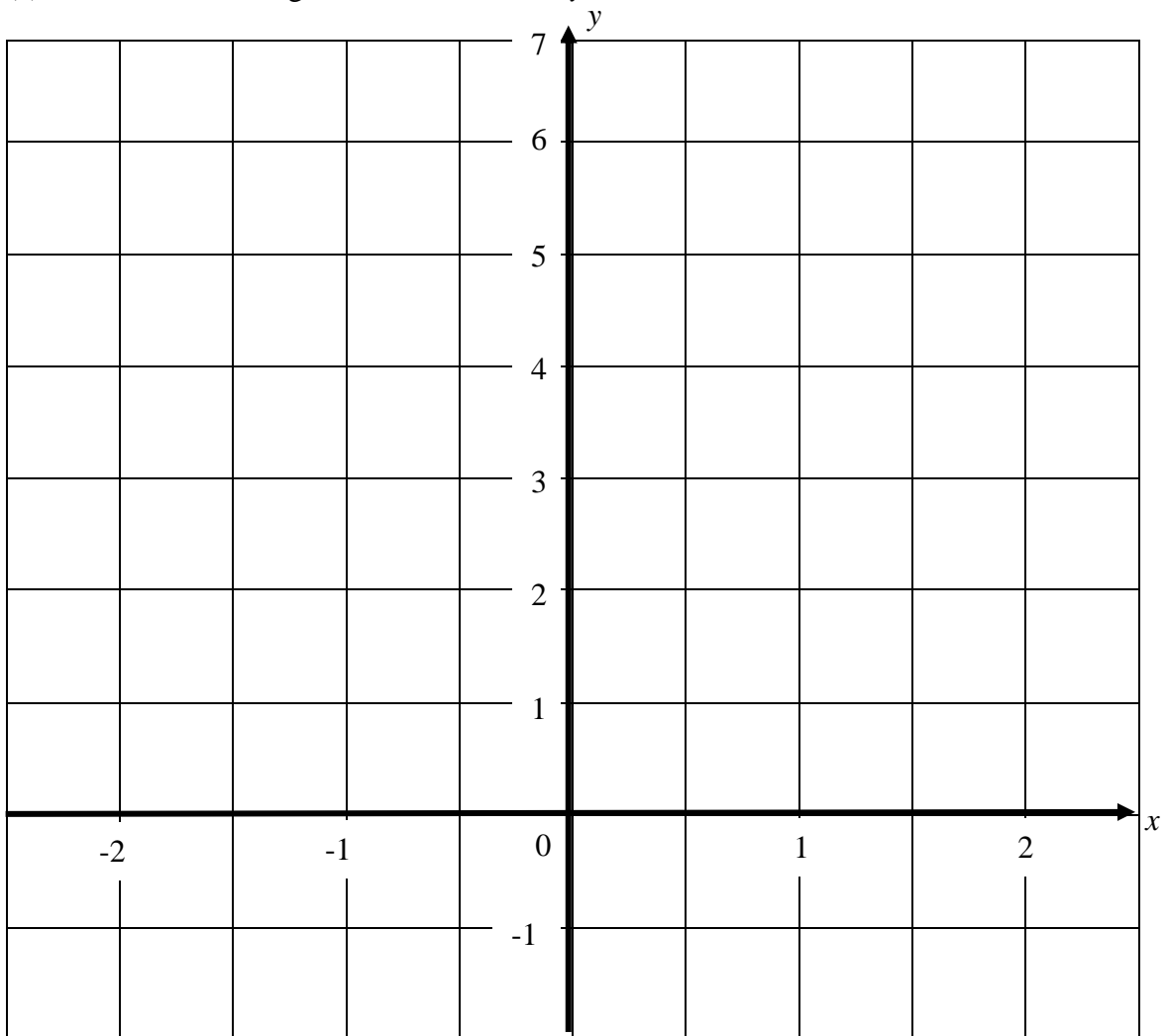
[2]

(b) On the grid, draw the line of $y = 3 - 2x$.

[2]

(c) On the same grid, draw the line of $y=5$.

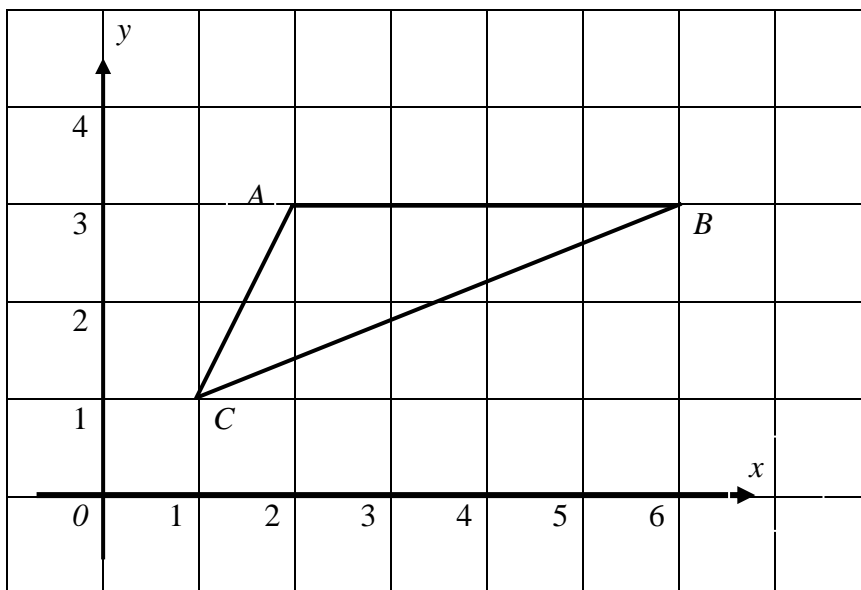
[1]



(d) Write down the coordinates of the point where the lines $y = 3 - 2x$ and $y = 5$ meet.

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

21. In the diagram, $A(2,3)$, $B(6,1)$ and $C(1,1)$ are vertices of $\triangle ABC$.



(a) Find the gradient of AC .

Answer (a) _____ [1]

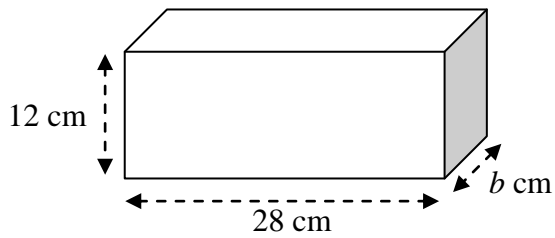
(b) Find the equation of AC .

Answer (b) _____ [2]

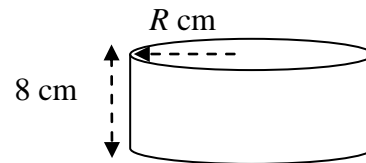
(c) Given that $BC = \sqrt{d}$ units, find the value of d .

Answer (c) $d =$ _____ [2]

22. In the diagram, Solid A is a cuboid measuring 28 cm by 12 cm by b cm. Solid B is a cylinder which has a height of 8 cm and radius R cm. (Take $\pi = 3.14$)



Solid A



Solid B

- (a) Given that the volume of solid A is 2016 cm^3 , find the value of b .

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

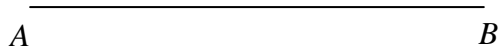
- (b) Find the total surface area of solid A.

Answer (b) _____ cm^2 [2]

- (c) Given that the volume of solid B is half the volume of solid A, find the value of R .

Answer (c) $R =$ _____ cm [2]

23. The triangle ABC has $AB = 6\text{cm}$, $AC = 10\text{ cm}$ and $\angle BAC = 35^\circ$. AB is drawn as shown below.



- (a) Using the dimensions given, construct triangle ABC accurately. [1]
- (b) The line through C , perpendicular to AC , meets AB produced at D . Construct the line CD . [1]
- (c) Measure and record $\angle ABC$ in the answer space provided.

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

- (d) Measure and record the length of AD in the space provided.

Answer (d) $AD =$ _____ [1]

----- End of paper -----

Setter : Ms Chong NT

ANSWERS

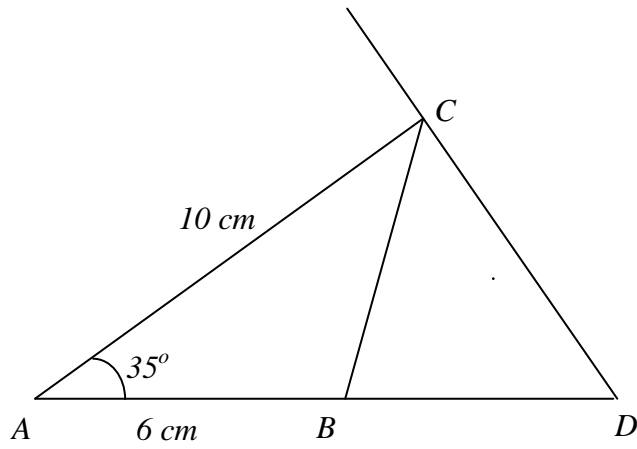
1a	8.64×10^4
b	1.23×10^{-11}
2a	RM 10179
b	SGD 366
3	<p>Cost of rice last year $= \\$ \frac{11.70}{6.5} = \\$1.80/\text{kg}$</p> <p>Cost of price this year $= \\$ \frac{80.50}{35} = \\2.30</p> <p>Percentage increase $= \frac{2.30 - 1.80}{1.80} \times 100\%$ (M1)</p> <p>$= 27.8\%$ (A1)</p>
4a	$2x + 9$
b	$x = 5$
5	$\frac{27}{40}$
6a	\$16.50
b	\$22.50
7a	12
b	$x = \frac{y+7}{2}$
8a	\$ 788.13 (2d.p.)
b	\$ 780
9a	18
b	26. 6 cm
10a	123°
b	132°
c	5 cm

11a	17
b	$3n-1$
c	59
12a	$\frac{5}{6}$
b	$\frac{1}{6} \times \frac{1}{6} = \frac{1}{36}$
c	$\frac{5}{18}$
13a	63
b	68
c	≈ 4.77
14a	$3 \times 7 \times 5$
b	21
c	<p>Since $63 = 3^2 \times 7$ and $105 = 3 \times 7 \times 5$,</p> $k = 3^2 \times 7 \times 5$ $= 315$
15a	22.6 cm^2
b	<p>Length of arc PQ $= \frac{2 \times \pi \times 6 \times 72}{360}$</p> $= 7.539 \text{ cm} \quad (\text{M1})$ <p>Perimeter $= 7.539 + 6 + 6$</p> $= 19.5 \text{ cm} \quad (\text{A1})$
16a	<p>Length of AB on map $= 6 \text{ cm} \quad (\text{M1})$</p> <p>Actual length $= 6 \times 25 \text{ m}$</p> $= 125 \text{ m} \quad (\pm 10 \text{ m}) \quad (\text{A1})$
b	Area (rect) $= 150 \times 50$

	$= 7500 \text{ m}^2$ <p>Area (triangle) $= \frac{1}{2} \times 30m \times 112.5m$</p> $= 1687.5 \text{ m}^2 \quad \text{(M1)}$ <p>Estimated percentage $= \frac{1687.5}{7500} \times 100\%$</p> $= 22.5\% (\pm 5\%) \quad \text{(B1)}$
17a	900°
b	207°
18a	$3(2x - 4y - 1)$
bi	$\{x^2 - 4x + (\frac{4}{2})^2\} - (\frac{4}{2})^2 + 7$ $= [x - 2]^2 - 4 + 7$ $= [x + (-2)]^2 + 3$ $a = -2, b = 3$
bii	$[x + (-2)]^2 + 3 = 3$ $(x - 2)^2 = 0$ $x = 2$
19a	-2, 1 and 2
b	40
c	<p>Let cost of a shirt = \$$x$ and cost of a belt = \$$y$</p> $5x + 3y = 101 \dots\dots\dots\text{(i)} \quad \text{(M1)}$ $x - y = 9 \dots\dots\dots\text{(ii)}$ <p>Solve by elimination/ substitution (M1)</p> $x = 16$ <p>Price of shirt = \$16 (A1)</p>

20a	5; -1
c	(1.5, 0)
21a	2
b	<p>Let equation of AC be written as : $y = 2x + c$</p> <p>At C(1,1),</p> $1 = 2(1) + c$ $c = 1 - 2$ $= -1 \quad \text{(M1)}$ <p>Hence, equation of AC is $y = 2x - 1$ (A1)</p>
c	$BC = \sqrt{(6-1)^2 + (3-1)^2} \quad \text{(M1)}$ $= \sqrt{29}$ $\sqrt{w} = \sqrt{29}$ $w = 29 \quad \text{(A1)}$
22a	$b = \frac{2016}{12 \times 28} \quad \text{(M1)}$ $= 6. \quad \text{(A1)}$
b	<p>Total surface area = $28(12+12+ 6+6) + 2(12 \times 6)$ (M1)</p> $= 1152 \text{ cm}^2 \quad \text{(A1)}$
c	<p>Volume of cylinder = 1008 cm^3</p> $R = \sqrt{\frac{1008}{\pi \times 8}} \quad \text{(M1)}$ $= 6.33 \text{ cm.} \quad \text{(A1)}$

23a-b



c $\angle ABC = 111^\circ$

d $AD = 12.2\text{ cm}$