Answer **all** the questions.

**1** Expand and simplify $(2p+5q)(3p^2-q+5r)$.

$6p^3-2pq+10pr+15p^2q-5q^2+25qr$

B2 if all terms are correct
B1 if at least 3 terms are right

*Answer* ……. [2]

---

**2** Lee has two pieces of string.
Their lengths are in the ratio 5 : 3 and the total length of the two pieces of string is $8x$ cm.
Lee cuts 6 cm from each piece of string.
The ratio of their lengths is now 9 : 5.
Find the value of $x$. the first piece of string be $5x$ cm.

The first piece of string is $5x$ cm.
The second piece of string is $3x$ cm.

$\frac{5x-6}{3x-6}=\frac{9}{5}$ M1 for setting up the right equation

$25x-30=27x-54$ M1 for manipulation of algebraic terms

$24=2x$

$x=12$ A1

*Answer* $x=$……. [3]

---

**3** A salesperson earns a fixed weekly salary of \$1000 plus 8% commission on the total value of items he sells.

**(a)** In one week, he sold items worth \$1750.
Calculate the total amount the salesperson earned that week.

Total amount = $\$1000+\frac{8}{100}\times 1750$
= \$1140 B1

*Answer* \$……. [1]



Downloaded from SingaKids.com

**(b)** The following week, the salesperson earned a total of $1450.
Calculate the total value of items he sold that week.

Commission = $1450 − $1000
= $450
8% represents $450

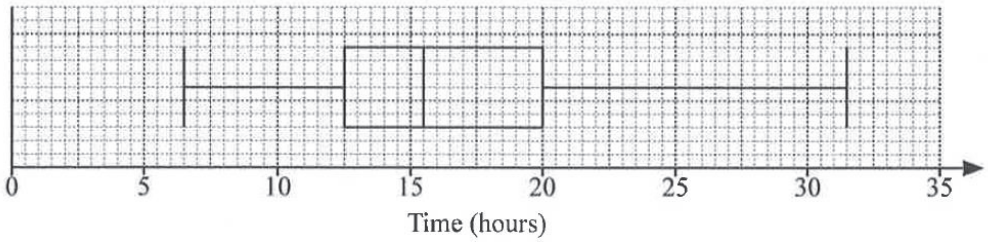
M1 for recognising that 8% rep $450

100% represents $\$\frac{450}{8}\times 100$
= $5625

A1

---

**4** The box-and-whisker-plot gives information about the time, in hours, that 120 adults spent on social media in one week.




**(a)** State the median time.

15.5 hours

B1

*Answer* ……..hours [1]

**(b)** State the range.

Range = 31.5 − 6.5
= 25

B1

*Answer* ……. hours [1]

**(c)** There was an error in the collection of data.
Every adult spent 2 hours less on social media in one week.
Describe the effect this change would have on the box-and-whisker plot.

The whole box-and-whisker plot will move to the **left** by **4 square units**.

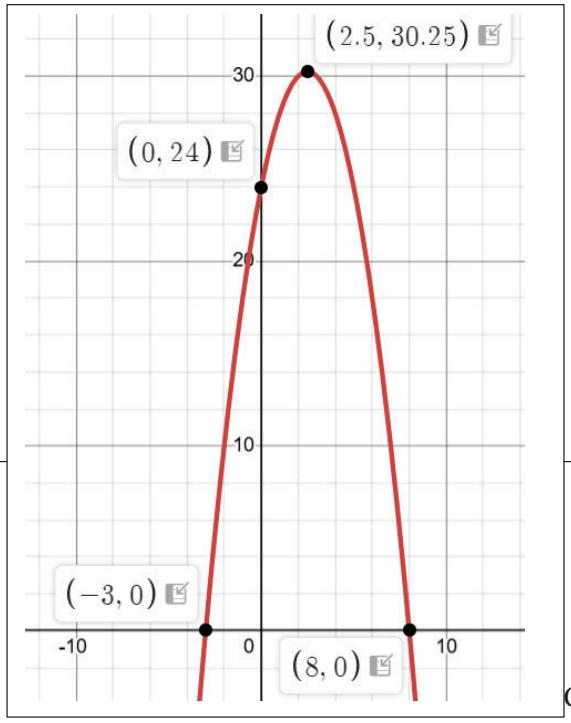
B1 all key words must be present

---



Downloaded from SingaKids.com

**5** Sketch the graph of $y = -(x+8)(x-3)$ on the axes below.
Indicate clearly the values where the graph crosses the $x$- and $y$- axes.




[3]

Coor of turning point (2.5, 30.25)

B1 correct shape and $y$-intercept
B1 correct turning point
B1 correct $x$-intercepts

---

**6** Express as a single fraction in its simplest form $\frac{4}{3-2y} - \frac{5}{y+3}$.

$$\frac{4}{3-2y} - \frac{5}{y+3}$$
$$= \frac{4y+12-15+10y}{(3-2y)(y+3)}$$
$$= \frac{14y-3}{(3-2y)(y+3)}$$

M1 for combining to a single fraction

A1

*Answer* .....  [2]

---



Downloaded from SingaKids.com

**7** **(a)** A map has a scale of 1 : 2 500 000.

The distance between Singapore and Phuket is 1314 km.
Calculate the distance, in centimetres, between Singapore and Phuket on the map.

25 km represents 1 cm
1314km represents **52.56cm**

M1 for correctly converting from cm to km

A1, exact answer only

*Answer* .....cm [2]

**(b)** When a ball is dropped, the distance, $d$ metres, it falls is directly proportional to the square of the time, $t$ seconds, from when the ball is released.
The distance from which the ball is dropped is increased by 44%.
Calculate the percentage change in the time taken for the ball to reach the ground.

| $d$ | $t^2$ |
|---|---|
| 1.44 $d$ | $(1.2t)^2=1.44\ t^2$ |

M1 for getting $1.2^2\ t^2$ or 1.2t as t

$$\text{Percentage change} = \frac{1.2t - t}{t} \times 100\%$$
$$= 20\%$$

A1

*Answer* .....% [2]

---

**8** Simplify $\dfrac{x^2-9}{3x^2-9x}$

$$\frac{x^2-9}{3x^2-9x}$$
$$= \frac{(x-3)(x+3)}{3x(x-3)}$$
$$= \frac{x+3}{3x}$$

B2, factorising numerator and denominator correctly

A1

*Answer* ..... [3]

---



Downloaded from SingaKids.com

**9** Factorise $6x^2y^2 + xy - 3x^2y - 2xy^2$.

$6x^2y^2 + xy - 3x^2y - 2xy^2$
$= xy(6xy + 1 - 3x - 2y)$
$= xy(6xy - 3x + 1 - 2y)$
$= xy[3x(2y-1) - (2y-1)]$
$= xy(3x-1)(2y-1)$

M1 for extracting common term

M1 for factorising by grouping

A1

*Answer* ……... [3]]

---

**10** Five positive integers have a mean of 6, a median of 7 and a mode of 10.
Find the five numbers.

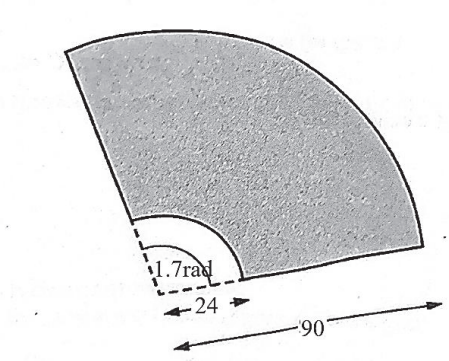
1, 2, 7, 10,10

B2 for getting all the numbers correct right
B1 if for getting 7, 10, 10

*Answer* ……., ……., ……., ……., …….[2]

---

**11**




Calculate the perimeter of the shaded area.
All lengths are in centimetres.

Perimeter of shaded area = $1.7 \times 24 + 1.7 \times 90 + 2(66)$

M1 for setting up the equation correctly

= 325.8 cm

A1, exact so do not accept 3 s.f ans

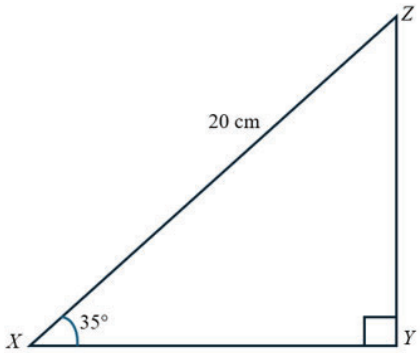
……... cm [2]

---



Downloaded from SingaKids.com

**12**




**(a)** Calculate the distance $YZ$.

$\sin 35° = \frac{YZ}{20}$

M1 for setting up the correct equation

$YZ = 20\sin 35°$

$= 11.472$ cm

$= 11.\ 5$ cm (3 s.f.)

A1

*Answer* $YZ =$ ……cm [2]

**(b)** Calculate the area of triangle $XYZ$.

$\cos 35° = \frac{XY}{20}$

$XY = 20\cos 35°$

$= 16.383$ cm

$= 16.\ 4$ cm (3 s.f.)

M1 for finding $XY$

Area of triangle $XYZ$ =

$= 94.0$ cm$^2$

A1

**Alternative solution**

$\angle XZY = 55°$

M1 for finding angle $XZY$

Area of triangle $= \frac{1}{2}\times(20)(11.472)\sin 55°$

$= 94.0$ cm$^2$

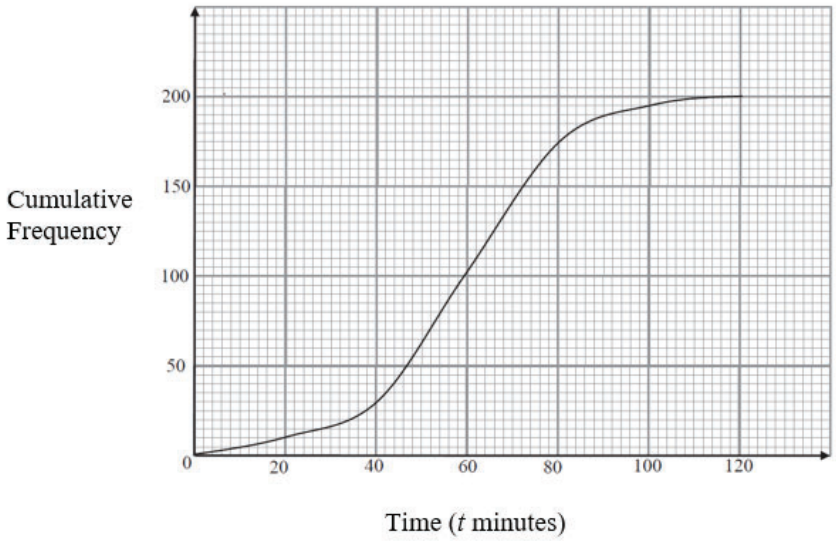
A1

*Answer* ……... cm$^2$ [2]



Downloaded from SingaKids.com

**13** A group of 200 people estimated the time, $t$ minutes, they spent at an exhibition. The cumulative frequency diagram represents their estimates.




**(a)** Use the diagram to find the estimated interquartile range of the estimated times.

Interquartile range = 72 – 47 — M1 for finding the UQ and LQ

= 25 minutes — A1

*Answer* ……minutes [2]

**(b)** One of these people is chosen at random.

The probability that the person's estimate is greater than $t$ minutes is $\frac{4}{5}$.

Find the value of $t$.

Probability of a person's estimate less than or equal to $t$ minutes is $\frac{1}{5}$.

Number of people = 40 — M1 for 40

From graph, $t$ = 44 — A1

*Answer* $t$ = ……... [2]



Downloaded from SingaKids.com

**14** $n = \dfrac{m\left(x - y^2\right)}{p}$, where $p \neq 0$.

**(a)** Find $n$ when $m = 14$, $p = 9$, $x = 2$ and $y = -3$.

$$n = \frac{14\left(2 - 9\right)}{9}$$

$$n = \frac{14\left(2 - 9\right)}{9}$$

$$= -10\frac{8}{9} \text{ or } -\frac{98}{9}$$

A1, exact value, hence do not accept answers corrected to 3 s.f

*Answer* $n =$ ..... [1]

**(b)** Rearrange the formula to make $y$ the subject.

$$n = \frac{m\left(x - y^2\right)}{p}$$

$$np = mx - my^2$$

M1 for multiplying $n$ by $p$

$$my^2 = mx - np$$

$$y^2 = \frac{mx - np}{m}$$

M1 for finding $y^2$

$$y = \pm\sqrt{\frac{mx - pn}{m}} \text{ or } \pm\sqrt{x - \frac{pn}{m}}$$

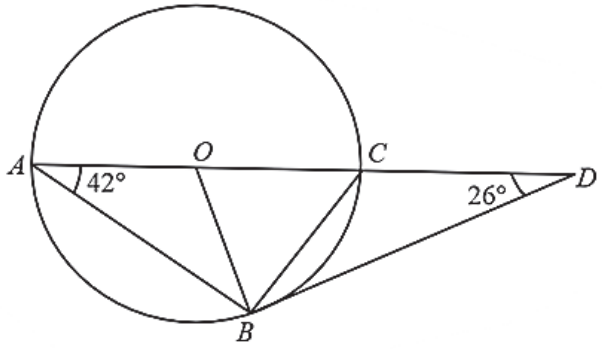
A1, no marks if $\pm$ is not seen

*Answer* $y =$ ..... [3]



Downloaded from SingaKids.com

**15**




$A$, $B$ and $C$ are points on a circle, centre $O$.
$ACD$ is a straight line, angle $BDC = 26°$ and angle $BAO = 42°$.

**(a)** Find angle $OBC$.
Give a reason for each step of your working.

Minus 1 mark if no mention of radii or radius of circle

$OA = OB$ (radii of a circle)
$\angle OBA = 42°$ (base angle of isosceles triangle $OAB$)
$\angle ABC = 90°$ (angle in a semicircle)
$\angle OBC = 90° - 42°$
$= 48°$ A1

M1 for finding either finding angle $OBA$ or angle $ABC$

**(b)** Explain why $BD$ is **not** a tangent to the circle.

$\angle BOC = 84°$ (ext angle of isosceles triangle $OBC$)
$\angle OBD = 180° - 84° - 26°$(sum of angles in a triangle)
$= 70°$

M1 for finding angle $OBD$

Since $\angle OBD \neq 90°$, therefore by the converse of the radius perpendicular to tangent, $BD$ is not a tangent to the circle.

A1 stating it's not 90° with (by converse) tangent ⊥ radisus

**Alternative solution**

$\angle BOC = 84°$ (angle at centre = 2 angle at circumference)
$\angle OBD = 180° - 84° - 26°$(sum of angles in a triangle)
$= 70°$

M1 for finding angle $OBD$

Since ⬭, therefore by the converse of the radius perpendicular to tangent, $BD$ is not a tangent to the circle.

A1 stating it's not 90° with (by converse) tangent ⊥ radius



Downloaded from SingaKids.com

**16** Solve these simultaneous equations.

$$3x+5y+8=0$$
$$4x+13y-2=0$$

You must show your working.

$3x+5y+8=0 \quad -(1)$
$4x+13y-2=0 \quad -(2)$
$(1)\times 4 \quad 12x+20y+32=0 \quad -(3)$
$(2)\times 3 \quad 12x+39y-6=0 -(4)$
$(4)-(3) \quad 19y-38=0$
$y=2$
Sub y = 2 into (1)
$3x+10+8=0$
$3x=-18$
$x=-6$
Ans : $x=-6$ or $y=2$

M1 for making coeff of $x$ or $y$ the same/ M1 for making $x$ or $y$ the subject of the equation

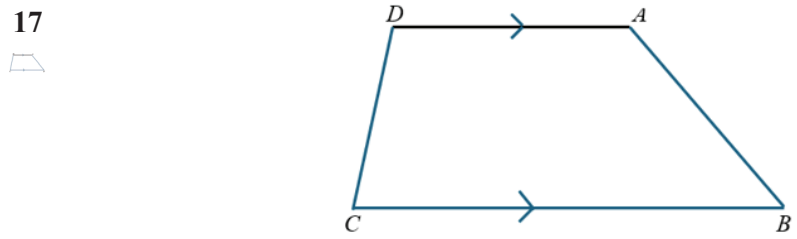
M1 for eliminating $x$ or $y$/ M1for correct substitution

A1 for getting both $x$ and $y$ correct

*Answer* $x =$ ……..
$y =$ …….. [3]

---

**17**




*ABCD* is a trapezium.
The ratio angle *CDA* : angle *DCB* : angle *CBA*= 18 : 6 : 2.
Find angle *DAB*.

24 units represent 180°

1 unit represents 7.5°
2 units represent 15°

M1 for recognising that angle *CDA* and *DCB* are int angles. It is good practice to write the angle reasoning so that markers understand your work.

$\angle DAB = 180° - 15°$ (int angles, $AB$// $BC$)
$= 165°$

M1 for either applying int angles or sum of angles in quad correctly

A1

Note: Answer mark is deducted if there is no clear indication of the unit of measure used throughout the entire working.

*Answer* Angle *DAB* = …….. [3]

---



Downloaded from SingaKids.com

**18** Alice borrowed a sum of money from the bank which charges a compound interest of 3.5% per annum, compounded quarterly.
Given that Alice had to pay \$67.30 in interest at the end of the first year, find the original sum of money borrowed, giving your answer correct to the nearest dollar.

Let the original sum of money Alice borrowed be \$$P$.

$P + 67.30 = P\left(1+\frac{0.875}{100}\right)^4$ M1 for setting up the correct equation

$67.30 = P\left(1+\frac{0.875}{100}\right)^4 - P$

$67.30 = P\left[\left(1+\frac{0.875}{100}\right)^4 - 1\right]$ M1 for factorising, only awarded if original set up has total = principal + interest.

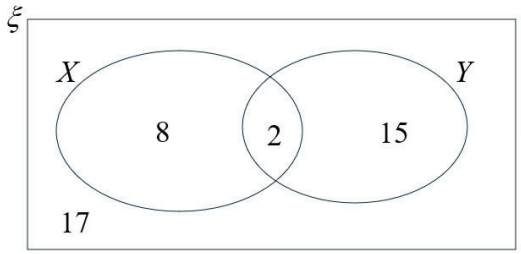
$P = \frac{67.30}{\left[\left(1+\frac{0.875}{100}\right)^4 - 1\right]}$

$P$ = \$1898 (nearest dollar) A1

*Answer* \$ ..... [3]

---

**19** The Venn diagram shows the universal set and the number of elements in each of its subsets.




Find the value of

**(a)** $n\left(X' \cap Y\right)'$,

$= 17 + 8 + 2 = 27$ B1

*Answer* ..... [1]

**(b)** $n\left(\left(X' \cup Y\right) \cap \left(X \cup Y\right)'\right)$.

$= 17$ B1

*Answer* ..... [1]

---



Downloaded from SingaKids.com

**20** **(a)** Write 0.0000000357 in standard form.

$3.57\times10^{-8}$ B1

*Answer* ..... [1]

**(b)** **(i)** Write $5.7\times10^{97}$ in the form $A\times10^{98}$.

$= 0.57\times10^{98}$ B1

*Answer* ..... [1]

**(ii)** **Hence** work out $\left(\left(100.2\times10^{98}\right)-\left(5.7\times10^{97}\right)\right.$.
Give your answer in standard form.

$\left(100.2\times10^{98}\right)-(0.57\times10^{98})$
$= 99.63\times10^{98}$
$=9.963\times10^{99}$ B1

*Answer* ..... [1]

---

**21** $x$ is a number between 200 and 300.
The highest common factor of $x$ and 126 is 21.
Find the smallest possible value of $x$.

$126 = 2\times3^2\times7$ M1 for writing 126 in terms of its prime factors

HCF $= 3\times7$

$x = 3\times7\times11$
$= 231$ A1

*Answer* $x$ = ..... [2]

---

**22**

$$\sin\left(\frac{1}{2}x°\right)=0.961$$

Find two possible values of $x$ in the range $0\le x\le360$.

$$\sin\left(\frac{1}{2}x°\right)=0.961$$

$$\frac{1}{2}x° = 73.946°, 180°-73.946°$$

$x° = 147.9°$ or $212.1°$ B1, B1

Note: 1 mark is deducted if both answers are left to 3 significant figures. Students are to follow instructions on cover page.

---



Downloaded from SingaKids.com

**23** 12 24 8 21 28 17 $2p$ $4p^2$

The list shows information about the number of text messages Mei received each day for 8 days.
The total number of text messages is 140.

**(a)** Show that $p = 2.5$.

*Answer*

$12 + 24 + 8 + 21 + 28 + 17 + 2p + 4p^2 = 0$

M1 for showing the correct set up of equation

$4p^2 + 2p + 110 = 140$

$2p^2 + p - 15 = 0$

M1 for correct factorisation or correct application of quadratic formula

$(p + 3)(2p - 5) = 0$

$p + 3 = 0$ or $2p - 5 = 0$

$p = -3$ (rej bec $p > 0$) or $p = 2.5$ (shown)

M1 for applying zero product rule and sound rejection reason.

[3]

**(b)** The standard deviation for Mei's data is 7.89.

For the same 8 days, Mei's brother also received some text messages.
For his data, the mean is 19 and the standard deviation 8.51.

Make two comparisons between the distributions for the number of text messages received by Mei and her brother.

1. Mei's brother received **more text messages** on average because the **mean is higher** at 19 compared to Mei's mean which is 17.5.

B1

2. The **number of text messages** Mei's brother received **is less consistent** since the **standard deviation is higher** at 8.51 compared to Mei's which is 7.89.

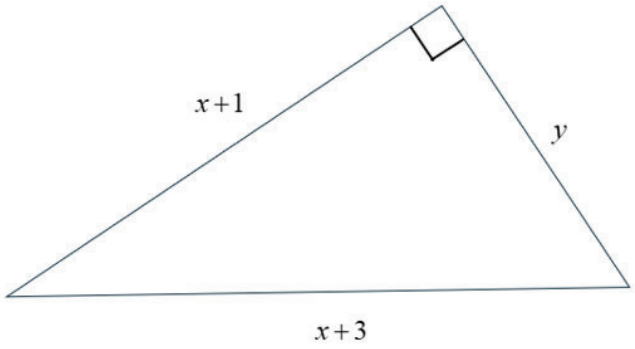
B1

[2]



Downloaded from SingaKids.com

**24**




The right-angled triangle has sides $(x+1)$, $(x+3)$ and $y$ where $x$ and $y$ are integers.

**(a)** Show that $y$ is an even number.
*Answer*

$y^2 = (x+3)^2 - (x+1)^2$
$= x^2 + 6x + 9 - (x^2 + 2x + 1)$
$= 4x + 8$
$= 4(x+2)$

M1 for setting up the correct equation

M1 for correct expansion/applying difference of squares to reach $4x+8$

Since 4 **is even**, multiplying it by $(x+2)$, an integer, will make $y^2$ even.
Taking square root of an even number gives an even number.
Therefore $y$ even. (shown)

M1 for convincingly establishing $y^2$ is even.
A1 for stating that the square root of an even number must be even and concluding for y.

OR

$y^2 = 4(x+2)$
$y = 2\sqrt{x+2}$

Since $y$ is an integer, $\sqrt{x+2}$ must be an integer.
As such, 2 is a factor of $y$, therefore $y$ is even.

M1 correct $y$.
A1 for stating that $\sqrt{x+2}$ is an integer and therefore 2 is a factor. Proper conclusion for $y$.

[4]

**(b)** Find a possible value of $y$ and the corresponding value of $x$.

Let $y^2 = 16^2$
$\therefore y = 4$
Hence $4x + 8 = 16$
$x = 2$

B1: accept any logical $y$, where $y^2$ is a multiple of 4

B1

*Answer* $x =$..... $y =$..... [2]



Downloaded from SingaKids.com

**25** Solve the equation $a^2 + 17a - 30 = 0$ by completing the square.
Give your solutions correct to 2 decimal places.

$a^2 + 17a - 30 = 0$

$\left(a + \frac{17}{2}\right)^2 - \left(\frac{17}{2}\right)^2 - 30 = 0$ M1 for completing the square correctly

$\left(a + \frac{17}{2}\right)^2 = \left(\frac{17}{2}\right)^2 + 30$

$\left(a + \frac{17}{2}\right)^2 = 102.25$

$a + \frac{17}{2} = \pm\sqrt{102.25}$ M1 for taking square root

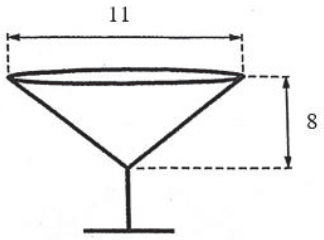
$a = 1.61$ or $-18.61$ (2 d.p) A1 for both correct answers

*Answer* $a$ = ..... or $a$ = ..... [3]



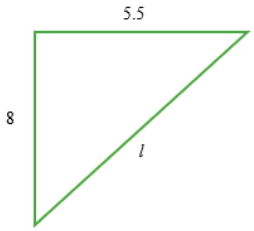
Downloaded from SingaKids.com

**26**




A glass is in the shape of a cone on a stem is filled to the brim with water.
The diameter of the top of the glass is 11 cm.
The height of the cone is 8 cm.
The thickness of the glass is negligible.

**(a)** Calculate the curved surface area of the inside of the glass.




$l^2 = 5.5^2 + 8^2$

$= 94.25$

$l = \sqrt{94.25}$

M1 for finding the slant height of the cone

Curved surface area of the inside of the glass $= \pi(5.5)\left(\sqrt{94.25}\right)$

$= 168 \text{ cm}^2$ (3s.f.)

A1

*Answer* ……..…….. $\text{cm}^2$ [2]



Downloaded from SingaKids.com

**(b)** Ethan pours 40% of the water in this glass into a second glass.
The second glass is in the shape of a cylinder.
The depth of water in the cylindrical glass is 2.5 cm.
Calculate the diameter of the cylindrical glass.

Volume of water in the glass $= \frac{1}{3} \times \pi \times 5.5^2 \times 8$

$= 80\frac{2}{3}\pi \text{cm}^3$

M1 for finding the vol of water in the glass

$\pi r^2 (2.5) = 80\frac{2}{3}\pi \times 0.4$

M1 for correct formula of volume of cylinder and taking 40% of their volume of cone.

$r^2 = \frac{80\frac{2}{3} \times 0.4}{2.5}$

$r = \sqrt{\frac{80\frac{2}{3} \times 0.4}{2.5}}$

M1 for correct $r$

diameter $= 2r$

$= 2 \times \sqrt{\frac{80\frac{2}{3} \times 0.4}{2.5}}$

= 7.19 cm (3 s.f)

A1

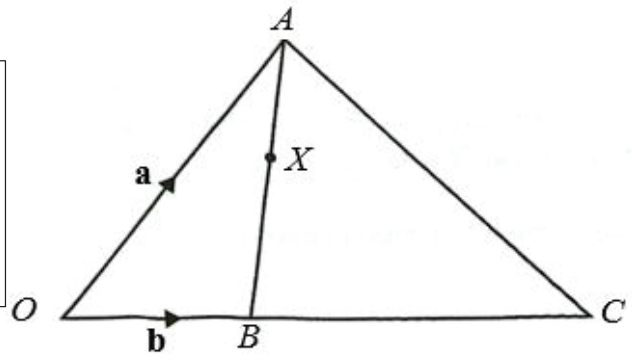
*Answer* ……..…….…….. cm [4]



Downloaded from SingaKids.com

**27**

Note: 1 mark is deducted from overall of this question if students did not use proper vector notations.




$OAC$ is a triangle and $B$ is a point on $OC$.
$\overrightarrow{OA} = \mathbf{a}$, $\overrightarrow{OB} = \mathbf{b}$ and $OB : BC = 2 : 3$.
$X$ is the point on $AB$ such that $AX : XB = 1 : 2$.

**(a)** Express $\overrightarrow{AC}$ in terms of **a** and **b**, as simply as possible.

$\overrightarrow{OC} = 2.5\mathbf{b}$
$\overrightarrow{AC} = 2.5\mathbf{b} - \mathbf{a}$

M1 for correct $\overrightarrow{OC}$ in terms of **b**

A1

*Answer* $\overrightarrow{AC}$ = ..... [2]

**(b)** Express $\overrightarrow{XB}$ in terms of **a** and **b**, as simply as possible.

$\overrightarrow{AB} = \mathbf{b} - \mathbf{a}$
$\overrightarrow{XB} = \frac{2}{3}(\mathbf{b} - \mathbf{a})$

M1 for correct $\overrightarrow{AB}$ in terms of **a** and **b**

A1

*Answer* $\overrightarrow{XB}$ = ..... [2]

**(c)** $Y$ is the point on $OC$ such that $AXYC$ is a trapezium.
Find, in terms of **a** and **b**, $\overrightarrow{XY}$.

For $AXYC$ to be a trapezium, triangle $BXY$ is similar to triangle $BAC$.

$\frac{XY}{AC} = \frac{BX}{BA} = \frac{2}{3}$

M1 for identifying triangle $BXY$ to be similar to triangle $BAC$

$\overrightarrow{XY} = \frac{2}{3}\overrightarrow{AC}$
$= \frac{2}{3}\left(\frac{5}{2}\mathbf{b} - \mathbf{a}\right)$
$= \frac{5}{3}\mathbf{b} - \frac{2}{3}\mathbf{a}$

A1

$\overrightarrow{XY}$ = ..... [2]

**END OF PAPER**
**Setter: Low SG**



Downloaded from SingaKids.com