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0607/43

October/November 2015

2 hours 15 minutes

Additional Materials: Geometrical Instruments
Graphics Calculator

READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

The total number of marks for this paper is 120.

This document consists of **16** printed pages.

Formula List

For the equation $ax^2 + bx + c = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Curved surface area, A , of cylinder of radius r , height h . $A = 2\pi rh$

Curved surface area, A , of cone of radius r , sloping edge l . $A = \pi rl$

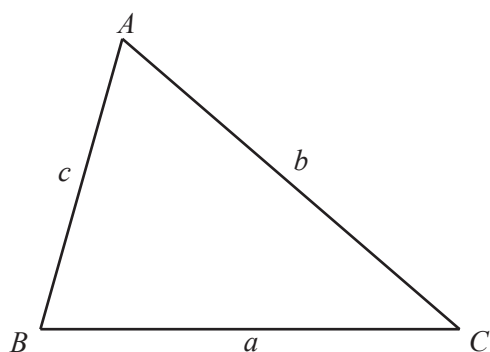
Curved surface area, A , of sphere of radius r . $A = 4\pi r^2$

Volume, V , of pyramid, base area A , height h . $V = \frac{1}{3}Ah$

Volume, V , of cylinder of radius r , height h . $V = \pi r^2 h$

Volume, V , of cone of radius r , height h . $V = \frac{1}{3}\pi r^2 h$

Volume, V , of sphere of radius r . $V = \frac{4}{3}\pi r^3$



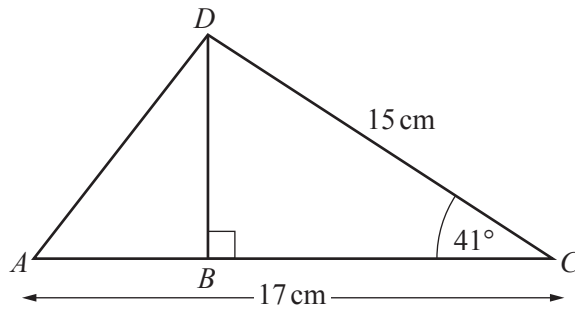
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

$$\text{Area} = \frac{1}{2}bc \sin A$$

Answer **all** the questions.

1



NOT TO
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- (a) Calculate the length of BD .

Answer(a) cm [2]

- (b) Calculate the area of triangle ACD .

Answer(b) cm^2 [2]

- (c) Use the cosine rule to find the length of AD .

Answer(c) cm [3]

- 2 (a) Jay buys a bicycle for \$220.
He later sells it for \$160.

Calculate his percentage loss.

Answer(a) % [3]

- (b) A television has a sale price of \$216 after a reduction of 10%.

Calculate the original price of the television.

Answer(b) \$ [3]

- (c) The population of a village is 2180.
The population decreases by 3% each year.

- (i) Calculate the population in 20 years time.

Answer(c)(i) [3]

- (ii) Calculate the number of whole years it takes for the population to decrease from 2180 to less than 1000.

Answer(c)(ii) [2]

- 3 (a) The speeds, v km/h, of 120 cars passing under a bridge are measured.
The table shows the results.

Speed (v km/h)	$30 < v \leq 50$	$50 < v \leq 60$	$60 < v \leq 70$	$70 < v \leq 75$	$75 < v \leq 90$
Frequency	2	25	46	41	6

- (i) Write down the interval that contains the lower quartile.

Answer(a)(i) [1]

- (ii) Calculate an estimate of the mean.

Answer(a)(ii) km/h [2]

- (iii) Complete the table of frequency densities.

Speed (v km/h)	$30 < v \leq 50$	$50 < v \leq 60$	$60 < v \leq 70$	$70 < v \leq 75$	$75 < v \leq 90$
Frequency density					

[3]

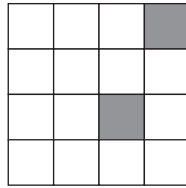
- (b) The table below shows the monthly rainfall and the average midday temperatures of a city.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (r mm)	15	20	20	35	70	90	75	70	50	30	12	8
Temperature (t °C)	35	25	22	15	10	10	15	20	27	30	38	36

Find the equation of the line of regression, giving t in terms of r .

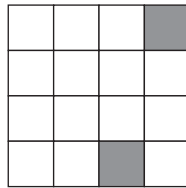
Answer(b) $t =$ [2]

- 4 (a) (i) Shade in one more square so that the diagram has one line of symmetry.



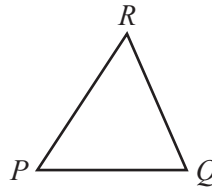
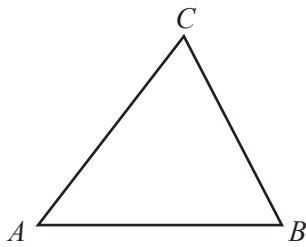
[1]

- (ii) Shade in two more squares so that the diagram has rotational symmetry of order 2 and no lines of symmetry.



[1]

(b)



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Triangle ABC and triangle PQR are mathematically similar.
 $AB : PQ = 3 : 2$.

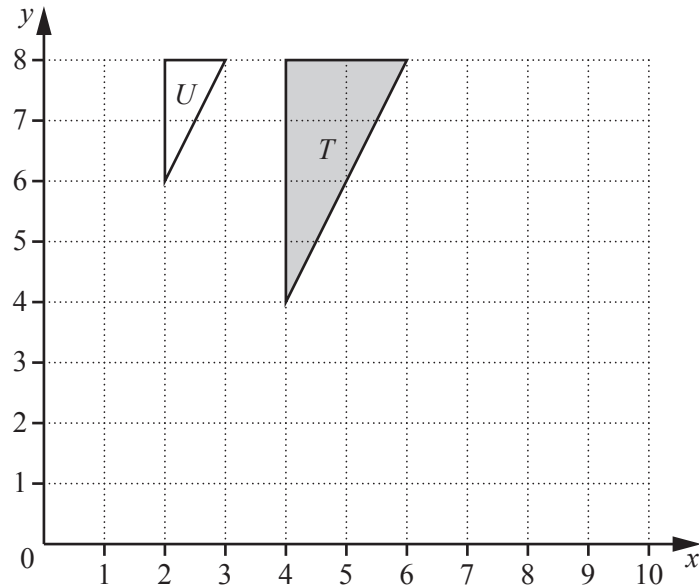
- (i) $CB = 10.5$ cm.
 Calculate the length of RQ .

Answer(b)(i) cm [2]

- (ii) The area of triangle ABC is 45 cm^2 .
 Calculate the area of triangle PQR .

Answer(b)(ii) cm^2 [2]

5



- (a) (i) Describe fully the **single** transformation that maps triangle T onto triangle U .

Answer(a)(i)
 [3]

- (ii) Describe fully the inverse of the transformation in **part(a)(i)**.

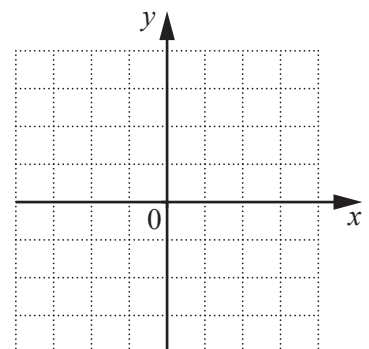
Answer(a)(ii)
 [2]

- (b) (i) Draw the image of triangle T under a reflection in the line $y = x$. [2]

- (ii) Draw the image of triangle T under a rotation of 90° anti-clockwise about the point $(6, 8)$. [2]

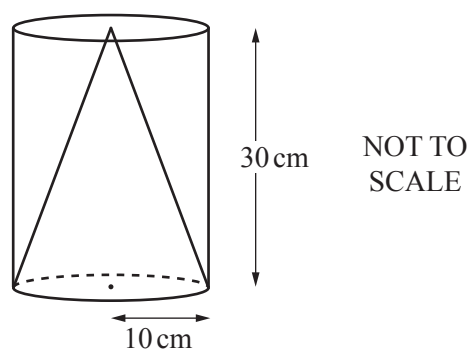
- (c) Describe fully the **single** transformation equivalent to a rotation 90° clockwise about $(0, 0)$ followed by a reflection in the line $y = -x$.

You may use the grid to help you.



Answer(c)
 [3]

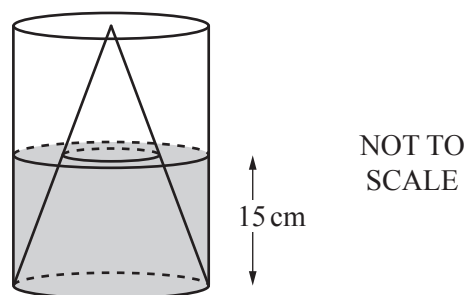
- 6 The diagram shows a solid cone inside a cylinder.
The base radius of the cone and the radius of the cylinder are both 10 cm.
The height of both the cone and the cylinder is 30 cm.



- (a) Find the volume of the cylinder **not** occupied by the cone.

Answer(a)cm³ [3]

- (b) Water is poured into the cylinder until it reaches a depth of 15 cm.



- (i) Calculate the volume of the part of the cone that is below the water level and show that it rounds to 2749 cm³, correct to the nearest cubic centimetre.

[4]

- (ii) Calculate the amount of water that has been poured into the cylinder.
Give your answer in litres.

Answer(b)(ii) litres [3]

- 7 (a) Kim walks 10 km at 4 km/h and then a further 6 km at 3 km/h.

Calculate Kim's average speed.

Answer(a) km/h [3]

- (b) Chung runs at x km/h for 45 minutes and then at $(x - 2)$ km/h for 30 minutes.

Find an expression, in terms of x , for Chung's average speed in km/h.

Give your answer in its simplest form.

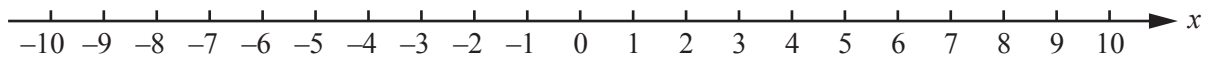
Answer(b) km/h [4]

- 8 (a) (i) Solve the inequality.

$$2(x - 3) < 5(x + 3)$$

Answer(a)(i) [3]

- (ii) Show your answer to **part(a)(i)** on the number line.



[1]

- (b) Solve the equation.

$$(x + 3)^2 + (x + 1)^2 = 25$$

Give your answers correct to 2 decimal places.

Answer(b) $x =$ or $x =$ [6]

(c) Solve the equations.

(i) $\log x = 5 - x$

Answer(c)(i) $x = \dots\dots\dots$ [3]

(ii) $\log x = |5 - x|$

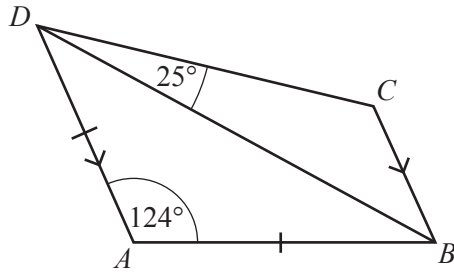
Answer(c)(ii) $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [2]

(d) Simplify, giving your answer as a single fraction.

$$\frac{x}{x-1} - \frac{2}{x+1}$$

Answer(d) $\dots\dots\dots$ [3]

9 (a)

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In the quadrilateral $ABCD$, $DA = AB$ and DA is parallel to CB .
Angle $DAB = 124^\circ$ and angle $BDC = 25^\circ$.

Calculate angle BCD .

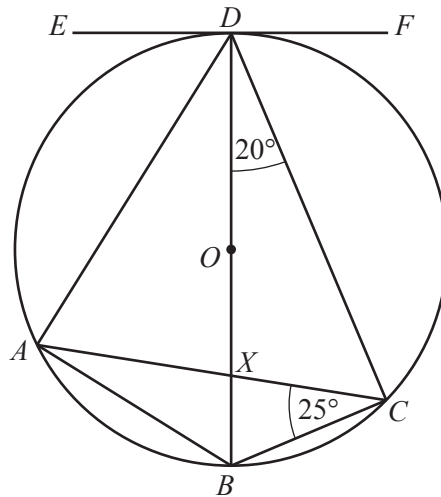
Answer(a) [3]

(b) Nine of the angles of a 10-sided polygon are each 142° .

Calculate the other angle.

Answer(b) [3]

(c)

NOT TO
SCALE

A, B, C and D lie on the circle, centre O .
 BD is a diameter and EDF is a tangent at D .
 AC and BD intersect at X .

Angle $BCA = 25^\circ$ and angle $BDC = 20^\circ$.

Calculate

(i) angle ADE ,

Answer(c)(i) [2]

(ii) angle DAC ,

Answer(c)(ii) [2]

(iii) angle AXD .

Answer(c)(iii) [1]

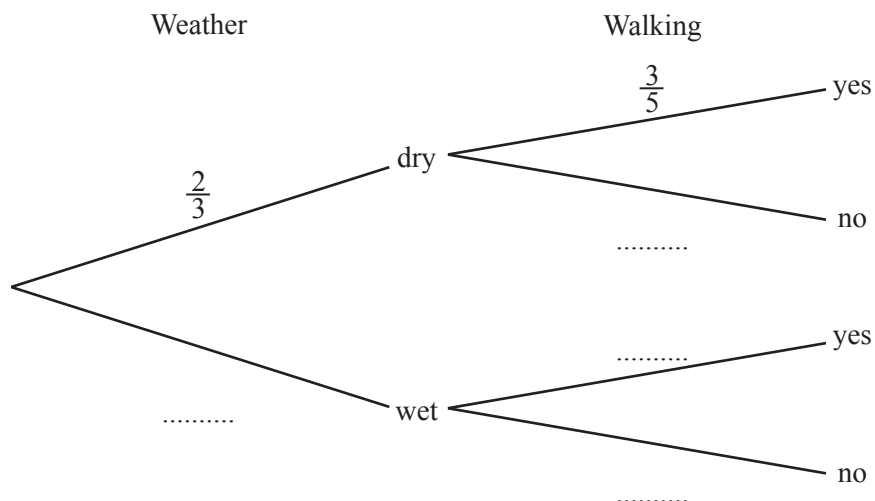
- 10 In this question, the weather is only considered to be either wet or dry.

When the weather is dry the probability that Sara will go walking is $\frac{3}{5}$.

When the weather is wet the probability that Sara will go walking is $\frac{1}{10}$.

The probability of a dry day is $\frac{2}{3}$.

- (a) Complete the tree diagram.



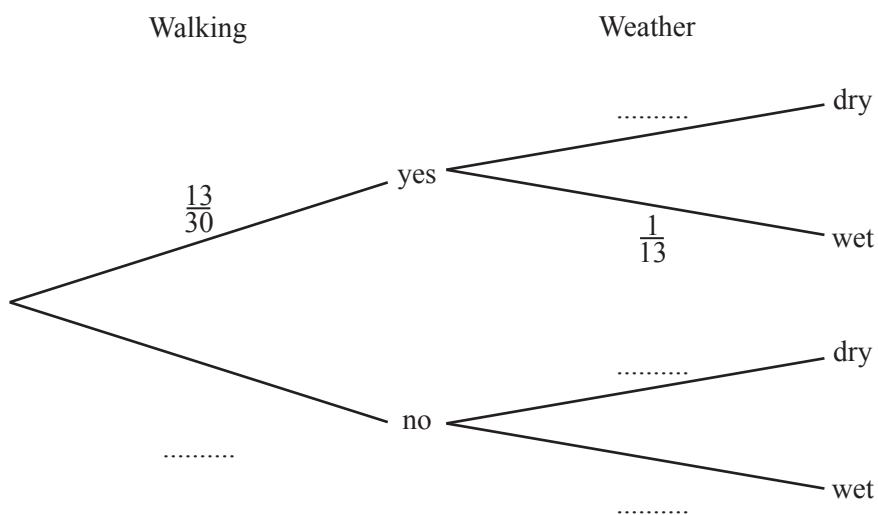
[3]

- (b) Show that the probability that Sara goes walking is $\frac{13}{30}$.

[2]

- (c) The probability that Sara does not go walking when the weather is wet is $\frac{9}{30}$.

Complete this tree diagram.



[3]

11 $f(x) = x^2 - 16$ $g(x) = \frac{2}{x+1}, x \neq -1$ $h(x) = 2^x$

(a) Find $h(3)$.

Answer(a) [1]

(b) Find the range of $g(x)$ for the domain $\{0, 1\}$.

Answer(b) [1]

(c) $f(x - 2)$ can be written as $(x + a)(x + b)$.
Find the value of a and the value of b .

Answer(c) $a =$

$b =$ [4]

(d) Find the inverse of

(i) $g(x)$,

Answer(d)(i) [3]

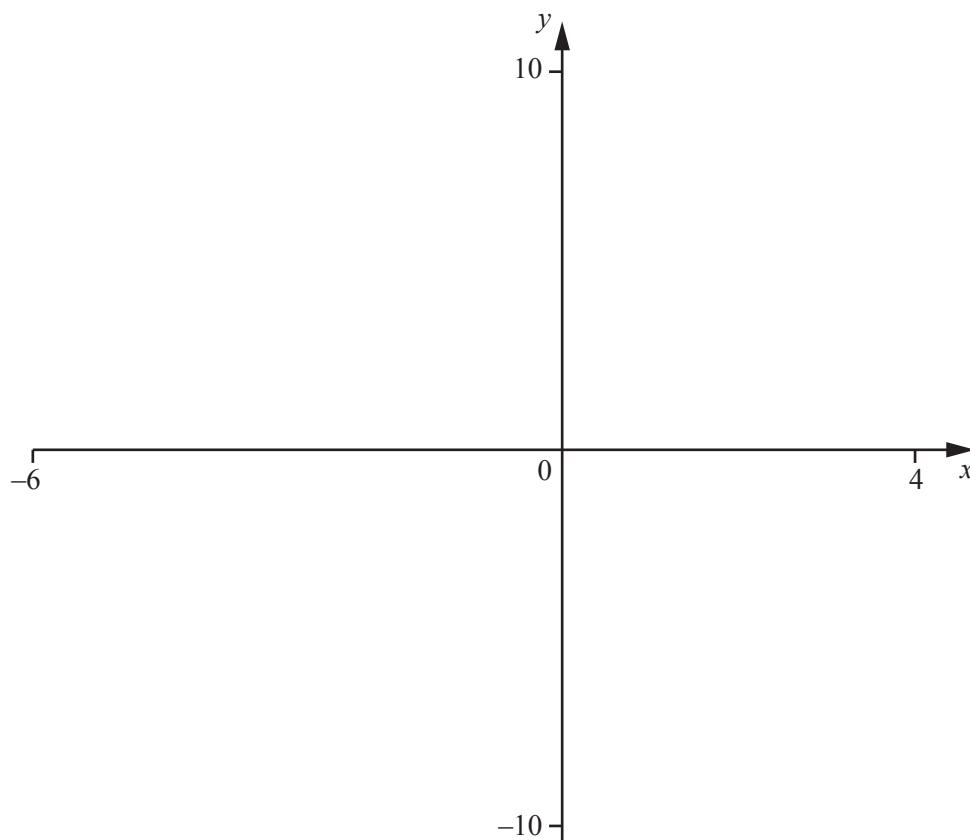
(ii) $h(x)$.

Answer(d)(ii) [2]

(e) Describe fully the **single** transformation that maps the graph of $y = f(x)$ onto the graph of $y = 2x^2 - 32$.

.....
..... [2]

Question 12 is printed on the next page



- (a) On the diagram, sketch the graphs of $y = \frac{12}{(x+2)}$ and $y = 2^x - 5$ for values of x between $x = -6$ and $x = 4$. [4]

- (b) Write down the equation of each asymptote of the graph of

(i) $y = \frac{12}{x+2}$,

Answer(b)(i)

..... [2]

(ii) $y = 2^x - 5$.

Answer(b)(ii) [1]

- (c) Solve the inequality.

$$2^x - 5 > \frac{12}{x+2} \text{ for } x > 0.$$

Answer(c) [2]

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