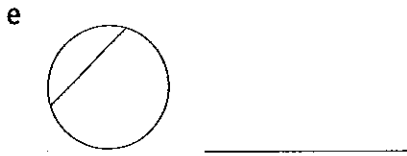
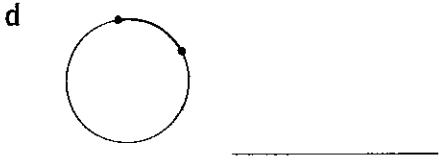
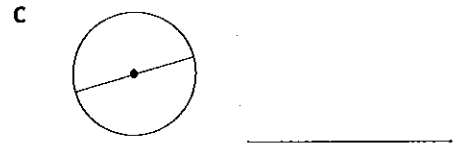
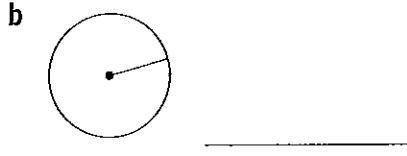
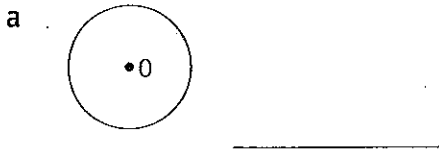


# CHAPTER 7

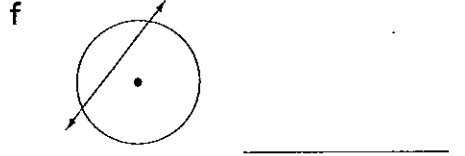
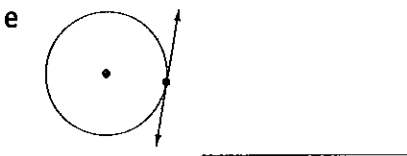
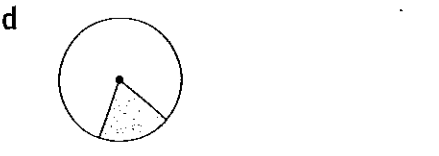
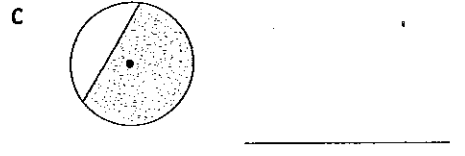
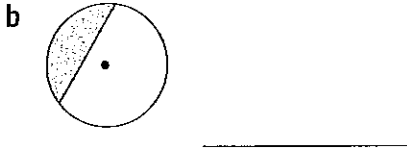
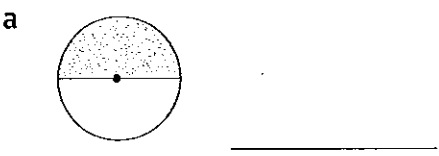
## Circles and cylinders

### Parts of a circle

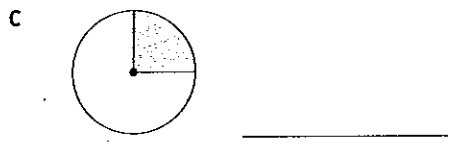
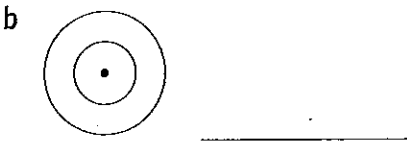
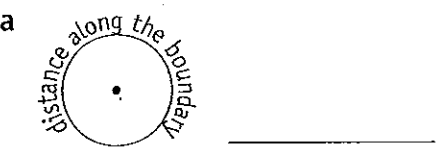
**QUESTION 1** Name each part of a circle in the following diagrams.



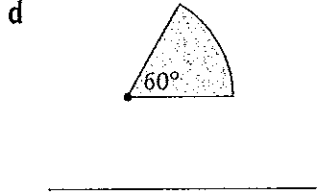
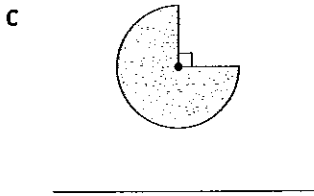
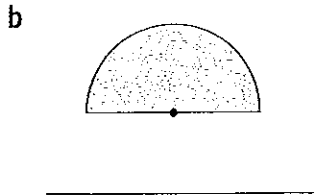
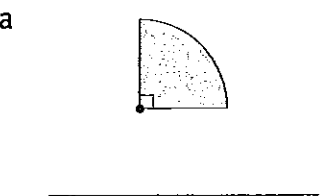
**QUESTION 2** Name the part of the circle shown below.



**QUESTION 3** Name the following.



**QUESTION 4** Find the fraction of the circle given below.



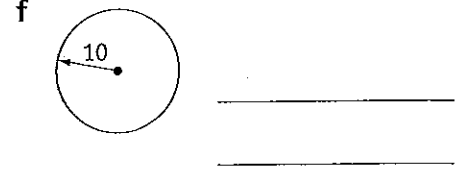
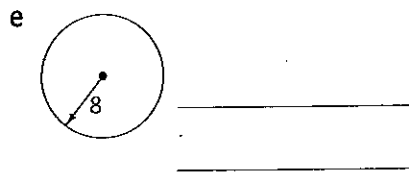
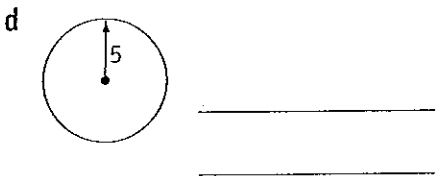
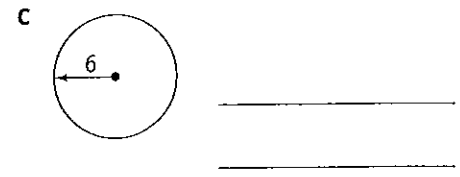
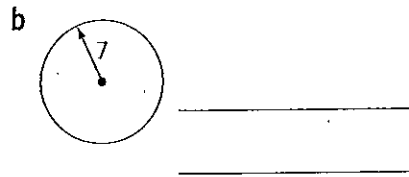
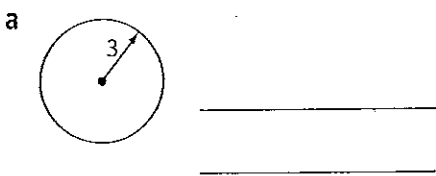
**QUESTION 5**

- a If the diameter of a circle is 16 cm, find its radius. \_\_\_\_\_
- b If the radius of a circle is 7.5 cm, find its diameter. \_\_\_\_\_
- c The formula for the circumference of a circle is \_\_\_\_\_.
- d The formula for the area of a circle is \_\_\_\_\_.
- e A circle can be divided into \_\_\_\_\_ quadrants.

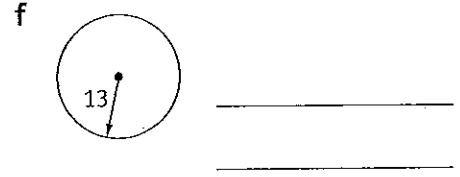
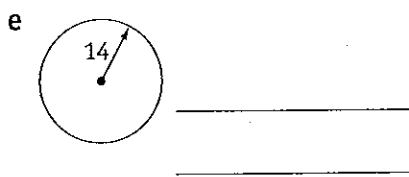
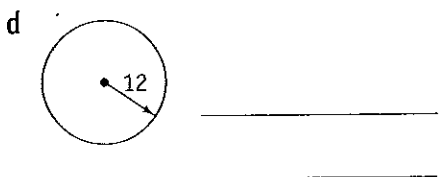
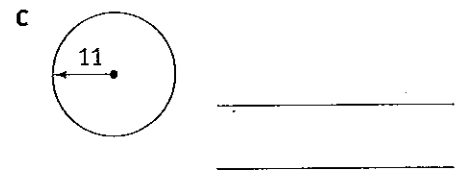
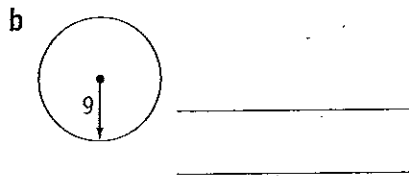
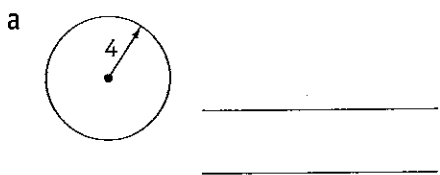


## Circumference of a circle when radius is given

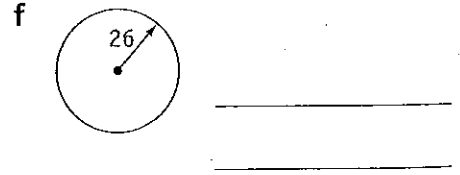
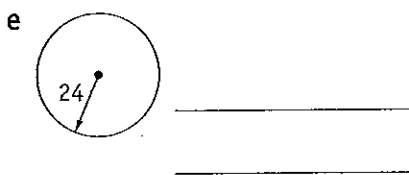
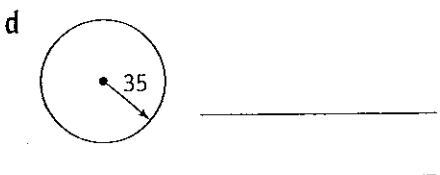
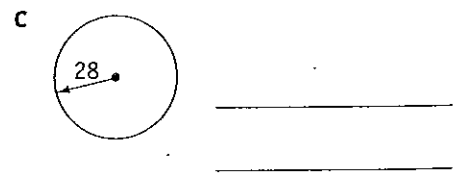
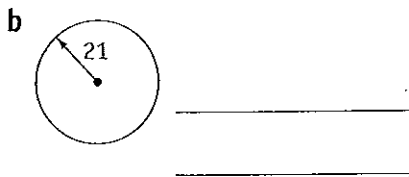
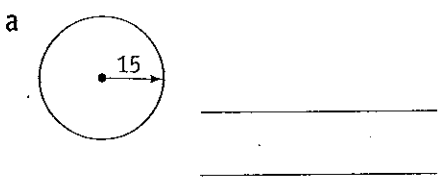
**QUESTION 1** Calculate the circumference of each circle using  $\pi = \frac{22}{7}$  (All measurements are in cm.)



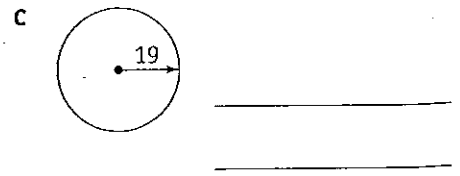
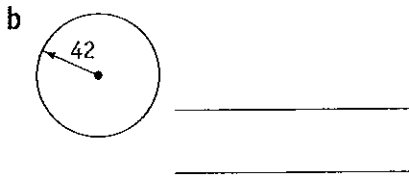
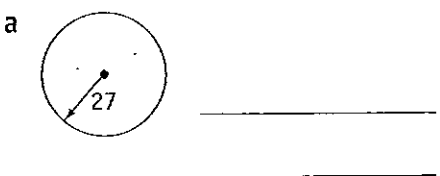
**QUESTION 2** Calculate the circumference of the following circles correct to 2 decimal places. Use the calculator for the value of  $\pi$ . (All measurements are in cm.)



**QUESTION 3** Calculate the circumference of each circle using  $\pi = 3.14$ , giving answers correct to 3 significant figures. (All measurements are in cm.)



**QUESTION 4** Calculate the perimeter of each figure correct to 2 decimal places.

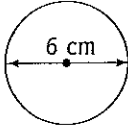
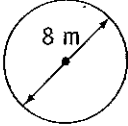
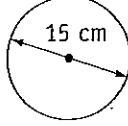
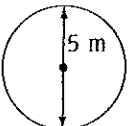
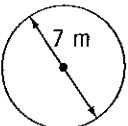
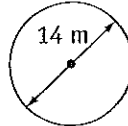


# Circles and cylinders

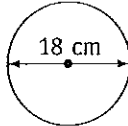
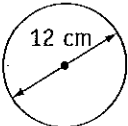
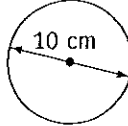
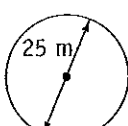
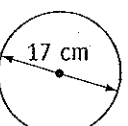
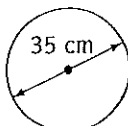


## Circumference of a circle when diameter is given

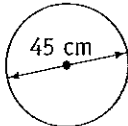
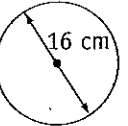
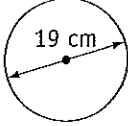
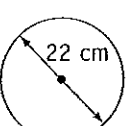
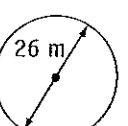
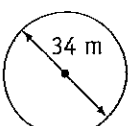
**QUESTION 1** Calculate the circumference of the following circles using  $\pi = \frac{22}{7}$

<p>a</p>  <p>_____</p> <p>_____</p>	<p>b</p>  <p>_____</p> <p>_____</p>	<p>c</p>  <p>_____</p> <p>_____</p>
<p>d</p>  <p>_____</p> <p>_____</p>	<p>e</p>  <p>_____</p> <p>_____</p>	<p>f</p>  <p>_____</p> <p>_____</p>

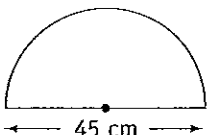
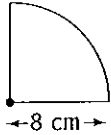
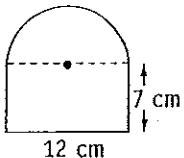
**QUESTION 2** Calculate the circumference of the following circles correct to 2 decimal places using the calculator value of  $\pi$ .

<p>a</p>  <p>_____</p> <p>_____</p>	<p>b</p>  <p>_____</p> <p>_____</p>	<p>c</p>  <p>_____</p> <p>_____</p>
<p>d</p>  <p>_____</p> <p>_____</p>	<p>e</p>  <p>_____</p> <p>_____</p>	<p>f</p>  <p>_____</p> <p>_____</p>

**QUESTION 3** Calculate the circumference of these circles using  $\pi = 3.14$ . Give your answers correct to 3 significant figures.

<p>a</p>  <p>_____</p> <p>_____</p>	<p>b</p>  <p>_____</p> <p>_____</p>	<p>c</p>  <p>_____</p> <p>_____</p>
<p>d</p>  <p>_____</p> <p>_____</p>	<p>e</p>  <p>_____</p> <p>_____</p>	<p>f</p>  <p>_____</p> <p>_____</p>

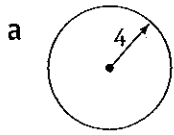
**QUESTION 4** Calculate the perimeter of these figures correct to 1 decimal place.

<p>a</p>  <p>_____</p> <p>_____</p>	<p>b</p>  <p>_____</p> <p>_____</p>	<p>c</p>  <p>_____</p> <p>_____</p>
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# Circles and cylinders

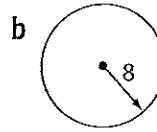
## Area of a circle when radius is given

**QUESTION 1** Calculate the area of these circles using  $\pi = \frac{22}{7}$  (All measurements are in cm.)



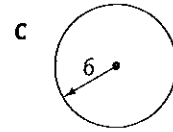
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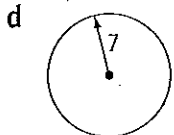
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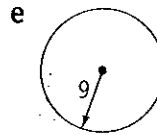
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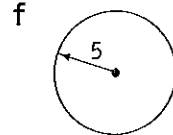
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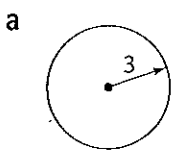
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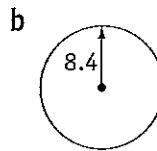
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**QUESTION 2** Calculate the area of each circles correct to 2 decimal places using the calculator value of  $\pi$ . (All measurements are in cm.)



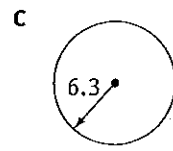
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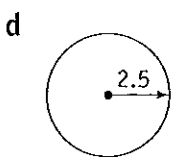
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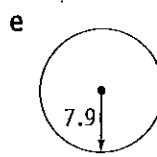
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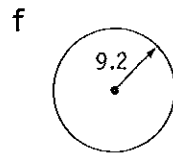
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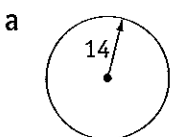
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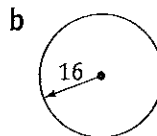
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**QUESTION 3** Calculate the area of these circles correct to 3 significant figures using  $\pi = 3.14$  (All measurements are in cm.)



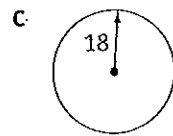
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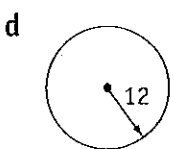
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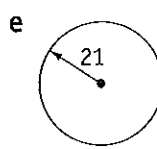
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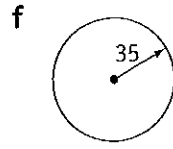
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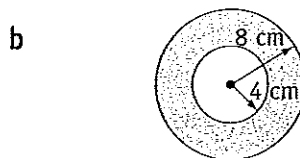
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**QUESTION 4** Calculate the shaded area correct to 1 decimal place.



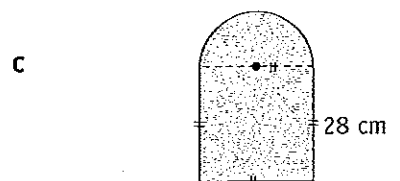
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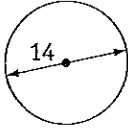
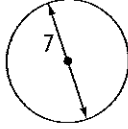
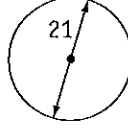
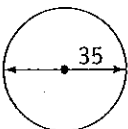
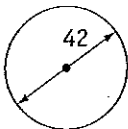
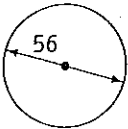
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# Circles and cylinders

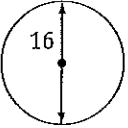
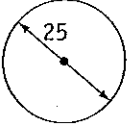
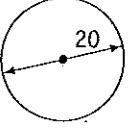
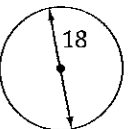
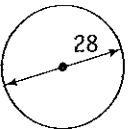
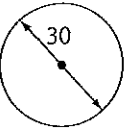


## Area of a circle when diameter is given

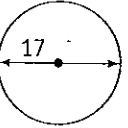
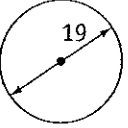
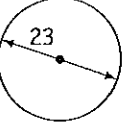
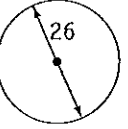
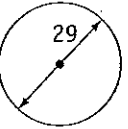
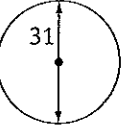
**QUESTION 1** Calculate the area of these circles using  $\pi = \frac{22}{7}$  (All measurements are in m.)

<p>a</p>  <p>_____</p> <p>_____</p>	<p>b</p>  <p>_____</p> <p>_____</p>	<p>c</p>  <p>_____</p> <p>_____</p>
<p>d</p>  <p>_____</p> <p>_____</p>	<p>e</p>  <p>_____</p> <p>_____</p>	<p>f</p>  <p>_____</p> <p>_____</p>

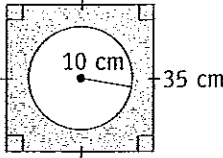
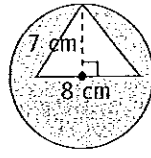
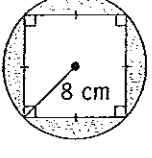
**QUESTION 2** Find the area of each circle correct to 2 decimal places using the calculator value of  $\pi$ . (All measurements are in cm.)

<p>a</p>  <p>_____</p> <p>_____</p>	<p>b</p>  <p>_____</p> <p>_____</p>	<p>c</p>  <p>_____</p> <p>_____</p>
<p>d</p>  <p>_____</p> <p>_____</p>	<p>e</p>  <p>_____</p> <p>_____</p>	<p>f</p>  <p>_____</p> <p>_____</p>

**QUESTION 3** Calculate the area of these circles correct to 3 significant figures using  $\pi = 3.14$  (All measurements are in cm.)

<p>a</p>  <p>_____</p> <p>_____</p>	<p>b</p>  <p>_____</p> <p>_____</p>	<p>c</p>  <p>_____</p> <p>_____</p>
<p>d</p>  <p>_____</p> <p>_____</p>	<p>e</p>  <p>_____</p> <p>_____</p>	<p>f</p>  <p>_____</p> <p>_____</p>

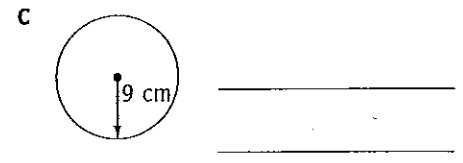
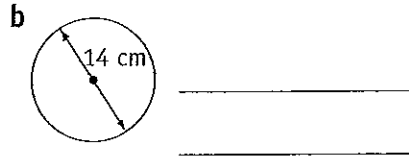
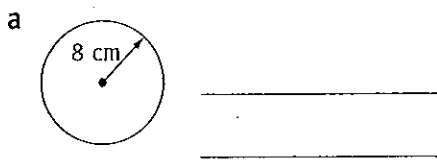
**QUESTION 4** Calculate the shaded area correct to 1 decimal place.

<p>a</p>  <p>_____</p> <p>_____</p>	<p>b</p>  <p>_____</p> <p>_____</p>	<p>c</p>  <p>_____</p> <p>_____</p>
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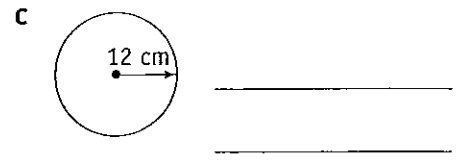
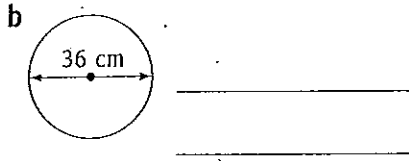
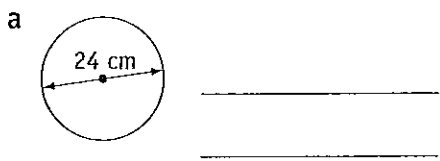


## Miscellaneous questions

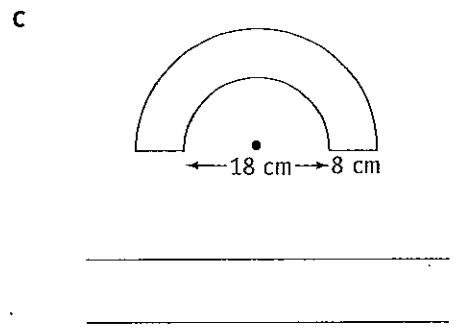
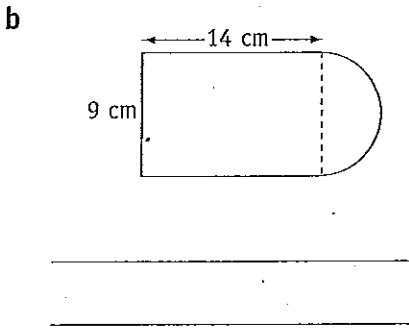
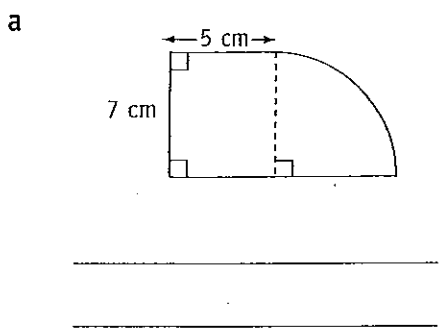
**QUESTION 1** Calculate the circumference correct to 2 decimal places.



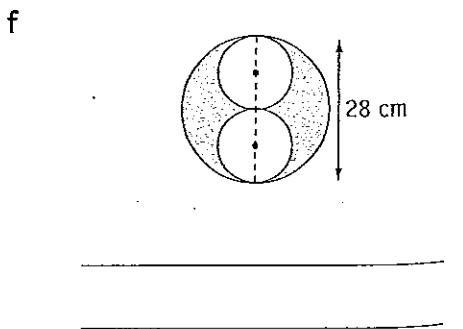
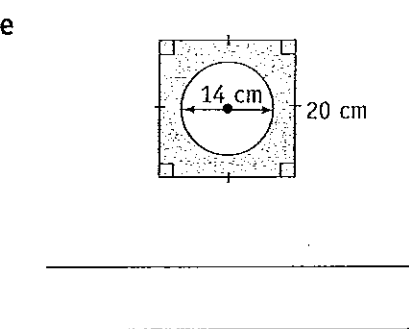
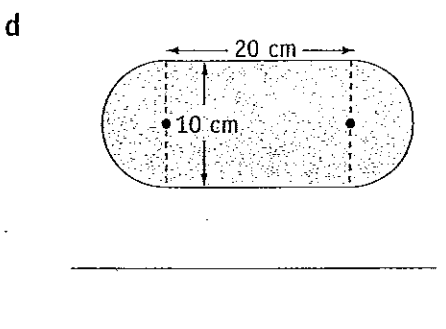
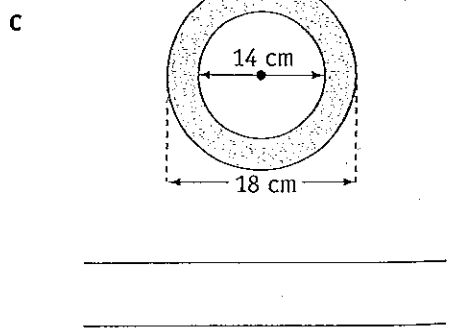
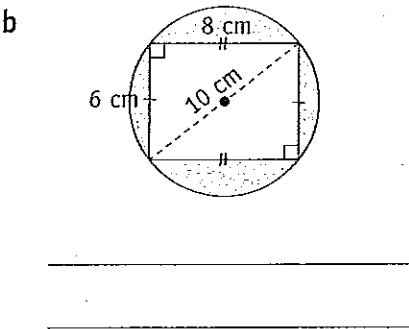
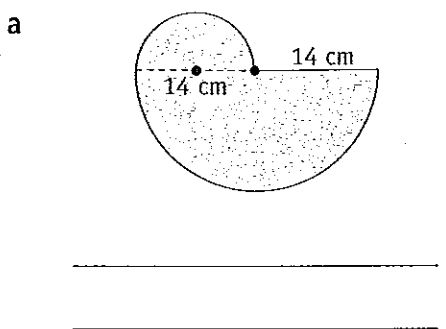
**QUESTION 2** Calculate the area correct to 1 decimal place.



**QUESTION 3** Calculate the perimeter of each shape correct to 3 significant figures.



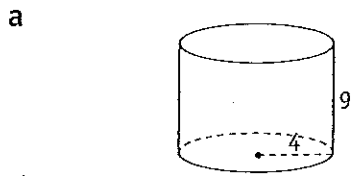
**QUESTION 4** Calculate the shaded area correct to 2 decimal places.





## Volume of a cylinder

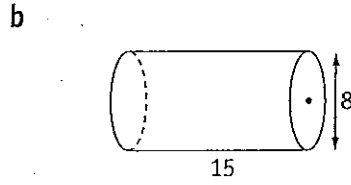
**QUESTION 1** Calculate the volume of each cylinder correct to 1 decimal place.  
(All measurements are in cm.)




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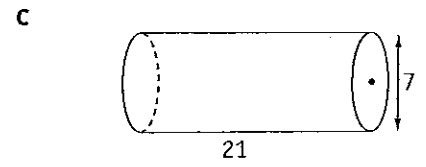
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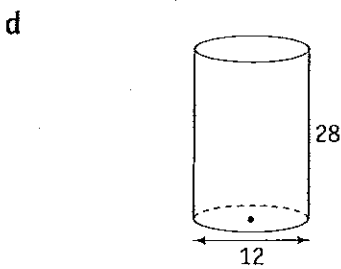
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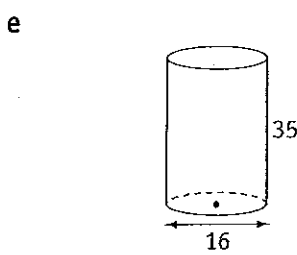
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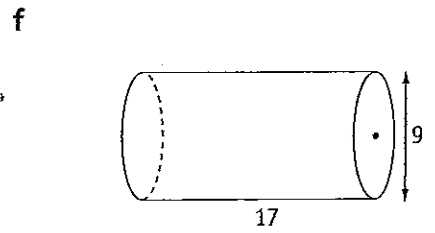
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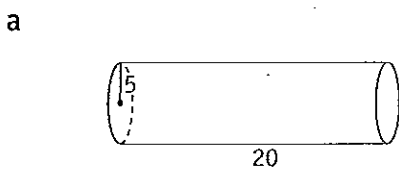



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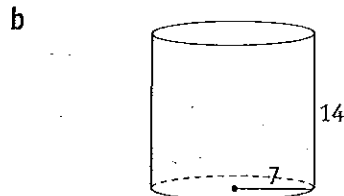
**QUESTION 2** Calculate the volume of each cylinder correct to 2 decimal places.  
(All measurements are in cm.)




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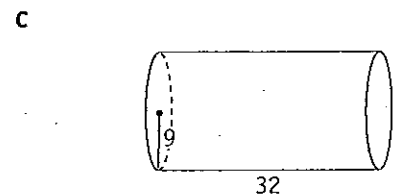
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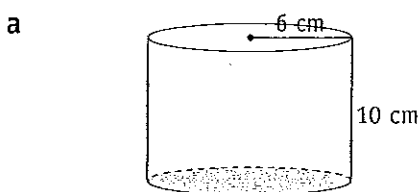



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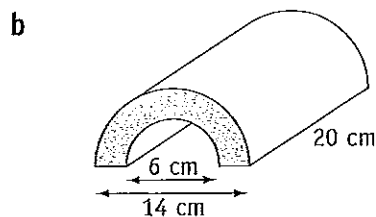
**QUESTION 3** Calculate the volume of each solid, giving your answer to the nearest  $\text{cm}^3$ .




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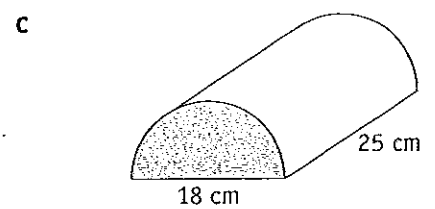
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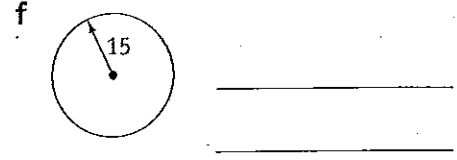
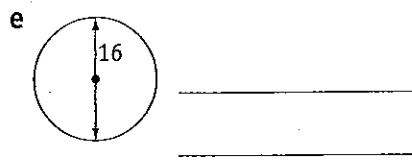
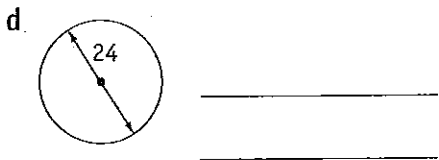
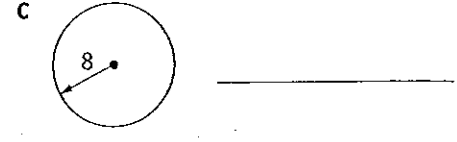
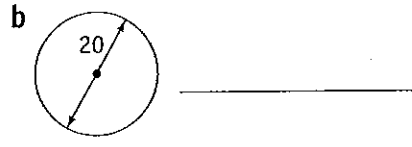
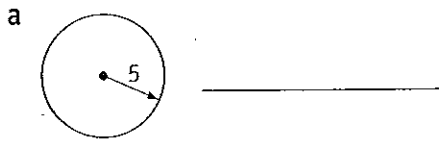


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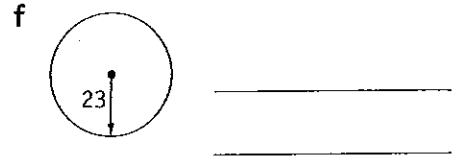
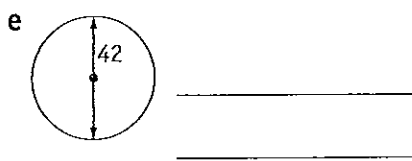
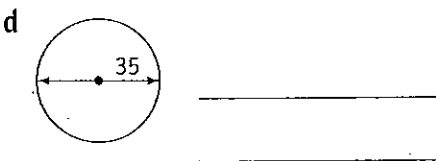
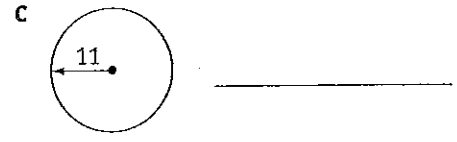
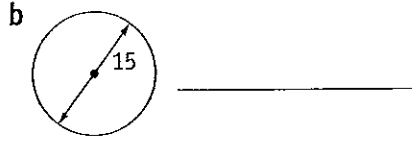
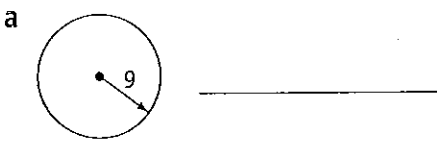


## Mixed questions

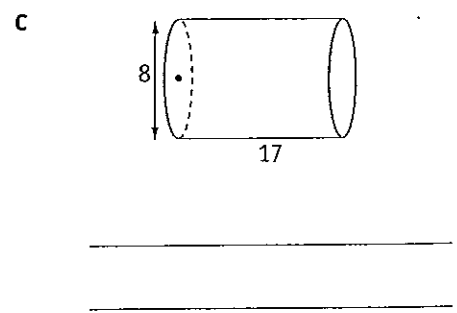
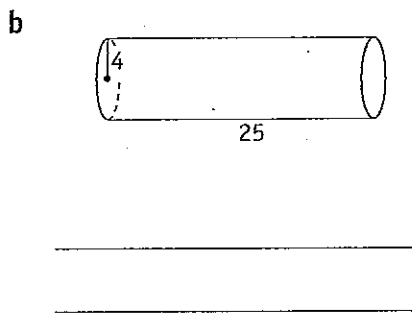
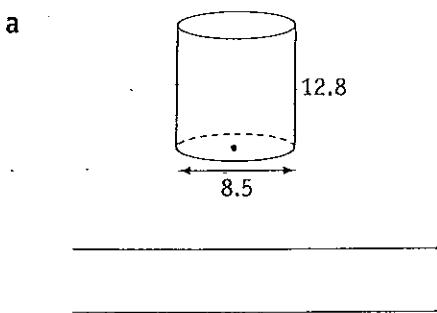
**QUESTION 1** Find the circumference of these circles correct to 2 decimal places.  
(All measurements are in cm.)



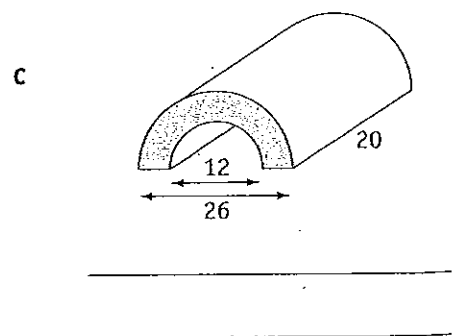
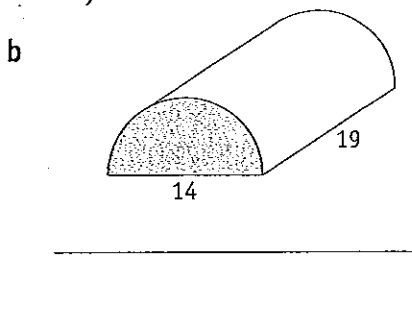
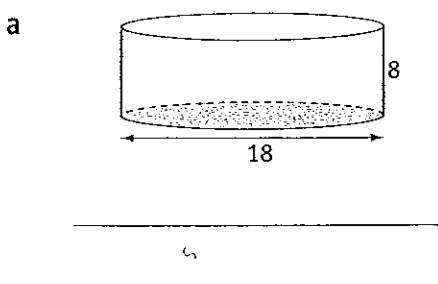
**QUESTION 2** Calculate the area of each circle correct to 1 decimal place. (All measurements are in cm.)



**QUESTION 3** Calculate the volume of each cylinder correct to 1 decimal place.  
(All measurements are in cm.)



**QUESTION 4** Find the volume of each solid, giving your answer to the nearest  $\text{cm}^3$ .  
(All measurements are in cm.)





# Circles and cylinders

## Problem solving with circles and cylinders



- 1 Calculate the circumference of a circle with radius 63 cm. (Use  $\pi = \frac{22}{7}$ )  
\_\_\_\_\_
- 2 Calculate the diameter of a circle with a circumference 572 cm. (Use  $\pi = \frac{22}{7}$ )  
\_\_\_\_\_
- 3 A circular track has radius 42 m. Calculate the distance around the track. (Use  $\pi = \frac{22}{7}$ )  
\_\_\_\_\_
- 4 Calculate the area of the circle formed by the track in Question 3. (Use  $\pi = \frac{22}{7}$ )  
\_\_\_\_\_
- 5 Find the volume of a can with diameter 27 cm and height 20 cm.  
\_\_\_\_\_
- 6 The circumference of a circle is 308 cm. Find the area of the circle. (Use  $\pi = \frac{22}{7}$ )  
\_\_\_\_\_
- 7 Find the area of a round tablecloth if its diameter is 5 metres. (Use  $\pi = 3.14$ )  
\_\_\_\_\_
- 8 A circular ring has a radius of 2.8 metres. What is the perimeter of the ring?  
\_\_\_\_\_
- 9 What is the cooking area of a circular barbeque grill having radius 14 cm?  
\_\_\_\_\_
- 10 What distance do you ride in one turn of a merry-go-round when you sit 8.5 metres from the centre?  
\_\_\_\_\_
- 11 Find the circumference of a circle with diameter 64 cm.  
\_\_\_\_\_
- 12 Find the area of a circle of radius 9 cm.  
\_\_\_\_\_

# Circles and cylinders

## TOPIC TEST


## PART A

- Instructions**
- This part consists of 15 multiple choice questions
  - Fill in only ONE CIRCLE for each question
  - Each question is worth 1 mark
  - Calculators may be used

**Time allowed: 15 minutes**

**Total marks = 15**

	Marks
<p><b>1</b> The diameter and radius of a circle are related as</p> <p>(A) <math>r = 2d</math>      (B) <math>rd = 2</math>      (C) <math>d = 2r</math>      (D) none of these</p>	1
<p><b>2</b> The exact value of <math>\pi</math> is</p> <p>(A) 3.14      (B) 3.142      (C) <math>\frac{22}{7}</math>      (D) none of these</p>	1
<p><b>3</b> The circumference of a circle is given by the formula</p> <p>(A) <math>\frac{2\pi}{r}</math>      (B) <math>\frac{2\pi}{d}</math>      (C) <math>2\pi r</math>      (D) <math>2\pi d</math></p>	1
<p><b>4</b> The area of a circle is given by the formula</p> <p>(A) <math>\pi r^2</math>      (B) <math>\pi d^2</math>      (C) <math>\frac{\pi}{r^2}</math>      (D) <math>\frac{\pi}{d^2}</math></p>	1
<p><b>5</b> The volume of a cylinder with radius <math>r</math> and height <math>h</math> equals</p> <p>(A) <math>\pi r^2 h</math>      (B) <math>\pi r h^2</math>      (C) <math>\pi^2 r h</math>      (D) <math>\pi r h</math></p>	1
<p><b>6</b> A semi-circle equals</p> <p>(A) a full circle      (B) half a circle (C) a quarter of a circle      (D) a third of a circle</p>	1
<p><b>7</b> A chord cuts the circle at</p> <p>(A) 1 point      (B) 2 points      (C) 3 points      (D) no point</p>	1
<p><b>8</b> A tangent cuts the circle at</p> <p>(A) 1 point      (B) 2 points      (C) 3 points      (D) no point</p>	1
<p><b>9</b> A quadrant is</p> <p>(A) <math>\frac{3}{4}</math> of a circle      (B) <math>\frac{1}{2}</math> of a circle      (C) <math>\frac{1}{4}</math> of a circle      (D) none of these</p>	1

				Marks		
<b>10</b>	The circumference of a circle with diameter 14 cm equals	(A) 46 cm	(B) 48 cm	(C) 44 cm	(D) 42 cm	1
<b>11</b>	The area of a circle with radius 14 cm equals	(A) 610 cm <sup>2</sup>	(B) 616 cm <sup>2</sup>	(C) 622 cm <sup>2</sup>	(D) none of these	1
<b>12</b>	The diameter of a circle is 24 cm. Its radius is	(A) 6 cm	(B) 8 cm	(C) 12 cm	(D) 16 cm	1
<b>13</b>	The area of a circle of radius 3 cm is approximately equal to	(A) 27 cm <sup>2</sup>	(B) 28 cm <sup>2</sup>	(C) 29 cm <sup>2</sup>	(D) none of these	1
<b>14</b>	$\frac{3}{4}$ of a circle is called a	(A) semi-circle	(B) quadrant	(C) sector	(D) segment	1
<b>15</b>	 The shaded area in the figure is called a	(A) semi-circle	(B) segment	(C) chord	(D) sector	1

**Total marks achieved for PART A**

15
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# Circles and cylinders

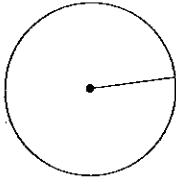
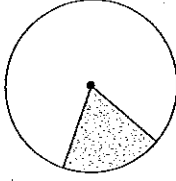
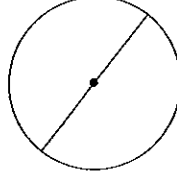
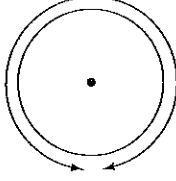
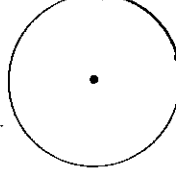
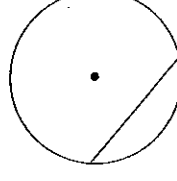
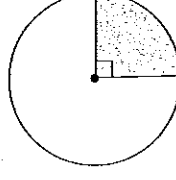
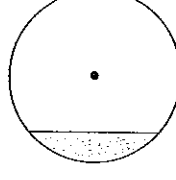
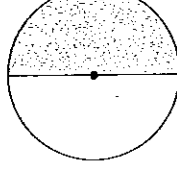
## TOPIC TEST

## PART B

- Instructions**
- This part consists of 15 questions
  - Each question is worth 1 mark
  - Write answers in the 'Answers only' column

Time allowed: 15 minutes

Total marks = 15

Questions			Answers only	Marks
Name the parts of the circle below.				
<b>1</b>		<b>2</b>		<input type="text" value="1"/>
		<b>3</b>		<input type="text" value="1"/>
				<input type="text" value="1"/>
<b>4</b>		<b>5</b>		<input type="text" value="1"/>
		<b>6</b>		<input type="text" value="1"/>
				<input type="text" value="1"/>
<b>7</b>		<b>8</b>		<input type="text" value="1"/>
		<b>9</b>		<input type="text" value="1"/>
				<input type="text" value="1"/>
<b>10</b>	Write the formula for the area of a circle.			<input type="text" value="1"/>
<b>11</b>	Write the formula for the circumference of a circle.			<input type="text" value="1"/>
<b>12</b>	Write the value of $\pi$ correct to 3 decimal places.			<input type="text" value="1"/>
<b>13</b>	Find the diameter of a circle of circumference 35 cm correct to 2 decimal places.			<input type="text" value="1"/>
<b>14</b>	Calculate the volume of a cylinder of radius 4 cm and height 5 cm.			<input type="text" value="1"/>
<b>15</b>	Calculate the volume (to the nearest $\text{cm}^3$ ) of a cylinder of radius 7 cm and height 9 cm.			<input type="text" value="1"/>

Total marks achieved for PART B

# Circles and cylinders

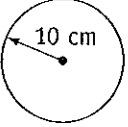
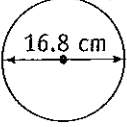
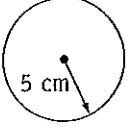
## TOPIC TEST

## PART C

- Instructions**
- This part consists of 4 questions
  - Each question is worth 5 marks
  - Show all necessary working

**Time allowed: 20 minutes**

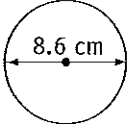
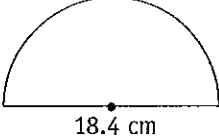
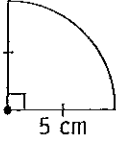
**Total marks = 20**

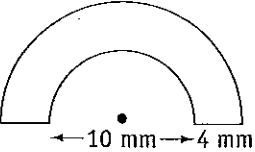
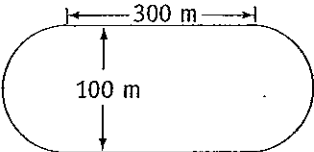
- 1**
- a  circumference = \_\_\_\_\_  
area = \_\_\_\_\_
- b  circumference = \_\_\_\_\_  
area = \_\_\_\_\_
- c  perimeter = \_\_\_\_\_

Marks

5

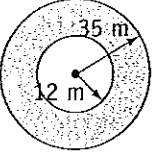
- 2** Calculate the perimeter of each shape.

- a  \_\_\_\_\_
- b  \_\_\_\_\_
- c  \_\_\_\_\_

- d  \_\_\_\_\_  
\_\_\_\_\_
- e  \_\_\_\_\_  
\_\_\_\_\_

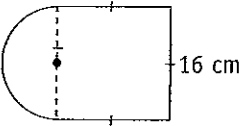
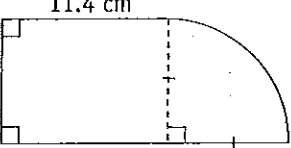
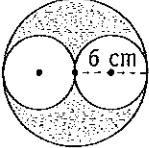
5

- 3**
- a Find the area of a circle with radius 16 cm. \_\_\_\_\_
- b Find the volume of a cylinder with radius 12 cm and height 8 cm.  
\_\_\_\_\_

- c Find the shaded area in the figure.  \_\_\_\_\_

5

- 4** Find the (shaded) area of each figure correct to 2 decimal places.

- a  \_\_\_\_\_
- b  \_\_\_\_\_
- c  \_\_\_\_\_

5

**Total marks achieved for PART C**

20

# Answers

- PAGE 80** All answers are in  $\text{cm}^2$ . 1 a  $50\frac{2}{7}$  b  $201\frac{1}{7}$  c  $113\frac{1}{7}$  d 154 e  $254\frac{4}{7}$  f  $78\frac{4}{7}$  2 a 28.27 b 221.67 c 124.69 d 19.63 e 196.07 f 265.90 3 a 615 b 804 c 1020 d 452 e 1380 f 3850 4 a 115.5 b 150.8 c 1091.9
- PAGE 81** 1 a  $154 \text{ m}^2$  b  $38\frac{1}{2} \text{ m}^2$  c  $346\frac{1}{2} \text{ m}^2$  d  $962\frac{1}{2} \text{ m}^2$  e  $1386 \text{ m}^2$  f  $2464 \text{ m}^2$  2 a  $201.06 \text{ cm}^2$  b  $490.87 \text{ cm}^2$  c  $314.16 \text{ cm}^2$  d  $254.47 \text{ cm}^2$  e  $615.75 \text{ cm}^2$  f  $706.86 \text{ cm}^2$  3 a  $227 \text{ cm}^2$  b  $283 \text{ cm}^2$  c  $415 \text{ cm}^2$  d  $531 \text{ cm}^2$  e  $660 \text{ cm}^2$  f  $754 \text{ cm}^2$  4 a  $910.8 \text{ cm}^2$  b  $125.9 \text{ cm}^2$  c  $73.1 \text{ cm}^2$
- PAGE 82** 1 a 50.27 cm b 43.98 cm c 56.55 cm 2 a  $452.4 \text{ cm}^2$  b  $1017.9 \text{ cm}^2$  c  $452.4 \text{ cm}^2$  3 a 35.0 cm b 51.1 cm c 97.7 cm 4 a  $384.85 \text{ cm}^2$  b  $30.54 \text{ cm}^2$  c  $100.53 \text{ cm}^2$  d  $278.54 \text{ cm}^2$  e  $246.06 \text{ cm}^2$  f  $307.88 \text{ cm}^2$
- PAGE 83** 1 a  $452.4 \text{ cm}^3$  b  $754.0 \text{ cm}^3$  c  $808.2 \text{ cm}^3$  d  $3166.7 \text{ cm}^3$  e  $7037.2 \text{ cm}^3$  f  $1081.5 \text{ cm}^3$  2 a  $392.70 \text{ cm}^3$  b  $538.78 \text{ cm}^3$  c  $2035.75 \text{ cm}^3$  3 a  $1131 \text{ cm}^3$  b  $1257 \text{ cm}^3$  c  $3181 \text{ cm}^3$
- PAGE 84** 1 a 31.42 cm b 62.83 cm c 50.27 cm d 75.40 cm e 50.27 cm f 94.25 cm 2 a  $254.5 \text{ cm}^2$  b  $176.7 \text{ cm}^2$  c  $380.1 \text{ cm}^2$  d  $962.1 \text{ cm}^2$  e  $1385.4 \text{ cm}^2$  f  $1661.9 \text{ cm}^2$  3 a  $726.3 \text{ cm}^3$  b  $1256.6 \text{ cm}^3$  c  $854.5 \text{ cm}^3$  4 a  $2036 \text{ cm}^3$  b  $1462 \text{ cm}^3$  c  $4178 \text{ cm}^3$
- PAGE 85** 1 396 cm 2 182 cm 3 264 m 4  $5544 \text{ m}^2$  5  $11451.1 \text{ cm}^3$  6  $7546 \text{ cm}^2$  7  $19.625 \text{ m}^2$  8  $17.59 \text{ cm}^2$  9  $615.75 \text{ cm}^2$  10 53.41 m 11  $201.06 \text{ cm}$  12  $254.47 \text{ cm}^2$
- PAGES 86 & 87** 1 C 2 D 3 C 4 A 5 A 6 B 7 B 8 A 9 C 10 C 11 B 12 C 13 B 14 C 15 B
- PAGE 88** 1 radius 2 sector 3 diameter 4 circumference 5 arc 6 chord 7 quadrant 8 minor segment 9 semi-circle 10  $A = \pi r^2$  11  $C = 2\pi r$  12 3.142 13 11.14 cm 14  $251.33 \text{ cm}^3$  15  $1385 \text{ cm}^3$
- PAGE 89** 1 a 62.83 cm;  $314.16 \text{ cm}^2$  b 52.78 cm;  $221.67 \text{ cm}^2$  c 31.42 cm 2 a 27.02 cm b 47.3 cm c 17.85 cm d 51.98 mm e 914.16 m 3 a  $804.25 \text{ cm}^2$  b  $3619.11 \text{ cm}^3$  c  $3396.06 \text{ cm}^2$  4 a  $457.06 \text{ cm}^2$  b  $69.06 \text{ cm}^2$  c  $56.55 \text{ cm}^2$
- PAGE 90** 1 a three b two c no d three e one f one 2 a equal b equal c  $180^\circ$  d  $60^\circ$  e opposite interior f  $360^\circ$  3 a four-sided b many sides c parallel d parallel e equal f right angle 4 a equal,  $90^\circ$  b equal, parallel c  $360^\circ$  d equal e  $90^\circ$  5 a equal b equal c equal d  $180^\circ$
- PAGE 91** 1 a 36 b 75 c 143 d  $x = 120, y = 60$  e 44 f 35. 2 a  $x = 75, y = 20$  (vertically opp. angles, straight angle) b 122 (straight angle) c 50 (straight angle) d 30 (straight angle) e 50 (vert. opp. angles) f 178 (angles at a point) 3 a  $x = 54$  (vert. opp. angles) b  $x = 20$  (straight angle) c  $m = 112$  (straight angle)
- PAGE 92** 1 a  $x = 110$  b  $x = 35$  c  $x = 65$  d  $x = 65$  e  $x = 120$  f  $x = 89$  2 a  $x = 110$  (sum of angles) b  $x = 54$  (complementary angles) c  $m = 60$  (complementary angles, vert. opp. angles) 3 a  $a = 70$  (straight angle) b  $x = 25$  (straight angle) c  $p = 35$  (complementary angles) d  $x = 55$  (straight angle) e  $x = 35$  (straight angle) f  $x = 55$  (sum of angles)
- PAGE 93** 1 a  $p = 115$  b  $x = 70$  c  $x = 115$  d  $x = 69^\circ$  e  $y = 82$  f  $m = 70, n = 70$  2 a  $x = 93$  (co-interior angles) b  $x = 66$  (alternate angles) c  $m = 40$  (co-interior angles) 3 a  $y = 143$  (straight angle, corresponding angles) b  $t = 35$  (straight angle, corresponding angles) c  $x = 130$  (corresponding angles) d  $x = 110$  (co-interior angles) e  $x = 30$  (alternate angles) f  $x = 115, y = 65$  (straight angle, corresponding angles, alternate angles)
- PAGE 94** 1 a  $x = 70$  b  $x = 70$  c  $y = 110$  d  $y = 50$  e  $x = 30$  f  $x = 40$  2 a  $a = 20$  b  $x = 30$  c  $a = 20$  d  $a = 18$  e  $x = 40$  f  $x = 48$  3 a  $y = 40$  b  $a = 20$  c  $x = 40$  d  $m = 60$  e  $x = 50$  f  $x = 20$
- PAGE 95** 1 a  $x = 167$  b  $x = 58$  c  $x = 86$  d  $x = 255$  e  $y = 65$  f  $x = 67$  2 a  $y = 130$  b  $y = 42$  c  $a = 110, b = 58$  3 a  $x = 35$  b  $x = 26$  c  $x = 120$  d  $x = 70, y = 20$  e  $x = 55$  f  $x = 55$
- PAGE 96** 1 a  $x = 75, y = 65$  b  $x = 70, y = 90$  c  $x = 88, y = 88$  d  $x = 40, y = 140$  e  $y = 50$  f  $x = 80$  2 a  $x = 52$  b  $a = 55, b = 60, c = 60$  c  $x = 50, y = 100$  3 a  $x = 72.5$  b  $x = 120$  c  $x = 30$  d  $x = 102$  e  $y = 75$  f  $x = 125$
- PAGE 97** 1 teacher 2 teacher 3 teacher 4 teacher
- PAGE 98** 1  $80^\circ$  2  $80^\circ$  3  $36^\circ$  4  $49^\circ$  5  $60^\circ$  6  $45^\circ$  7  $40^\circ$  8  $60^\circ, 120^\circ, 60^\circ$  9  $30^\circ, 60^\circ, 90^\circ$  10  $65^\circ, 115^\circ, 115^\circ$  11  $18^\circ, 72^\circ, 90^\circ$  12  $30^\circ$
- PAGES 99 & 100** 1 C 2 B 3 A 4 B 5 D 6 C 7 A 8 A 9 B 10 A 11 A 12 C 13 B 14 C 15 D
- PAGE 101** 1 revolution 2 straight angle 3 obtuse angle 4  $x = 32$  5  $x = 65$  6  $x = 178$  7  $x = 52$  8  $x = 62$  9  $x = 135$  10  $a = 65$  11  $m = 110$  12  $p = 48$  13  $x = 70$  14  $x = 143, y = 75$  15  $x = 134$
- PAGE 102** 1 a equal b  $60^\circ$  c  $90^\circ$  d four e parallel 2 a  $a = 60^\circ$  b  $x = 30$  c  $x = 70$  d  $a = 20$  e  $x = 190$  3 a  $x = 300$  (angles at a point) b  $x = 60, y = 120$  (supplementary angles) c  $x = 60, y = 30$  (straight angle, vert. opp. angles) 4 a  $a = 77$  (angles in a quadrilateral) b  $x = 100, y = 70$  (supplementary angles, alternate angles) c  $x = 140, y = 30$  (straight angle, angles in a quadrilateral)