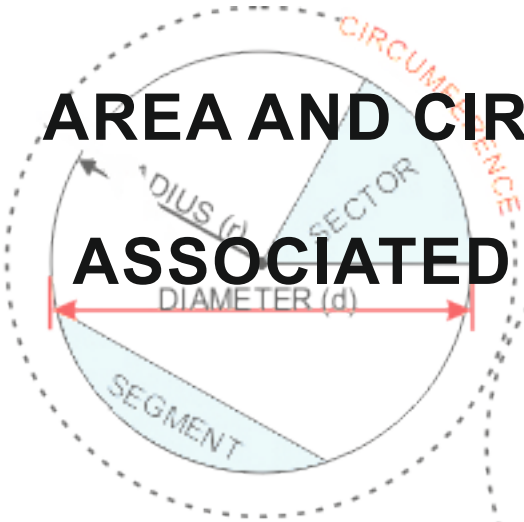
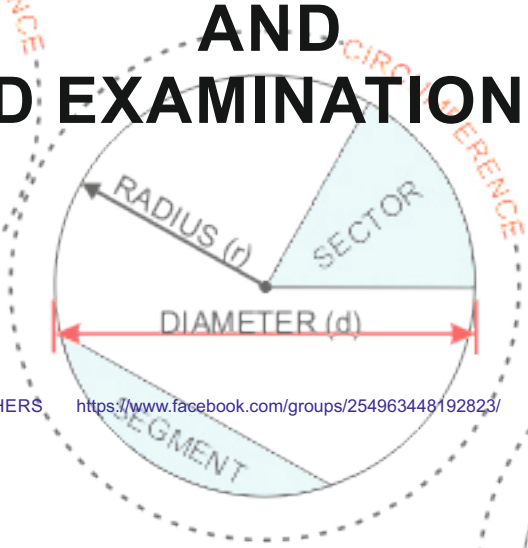
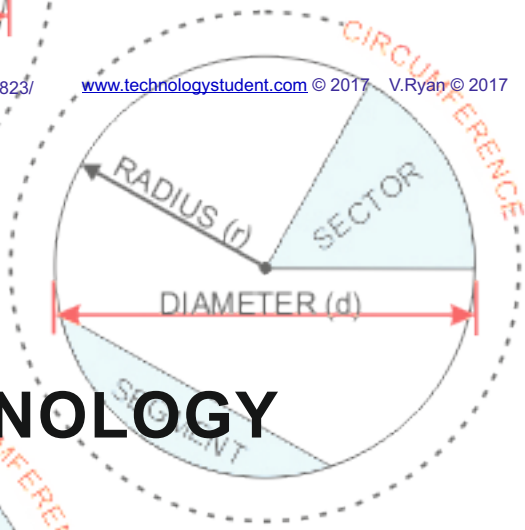
MATHEMATICAL SKILLS

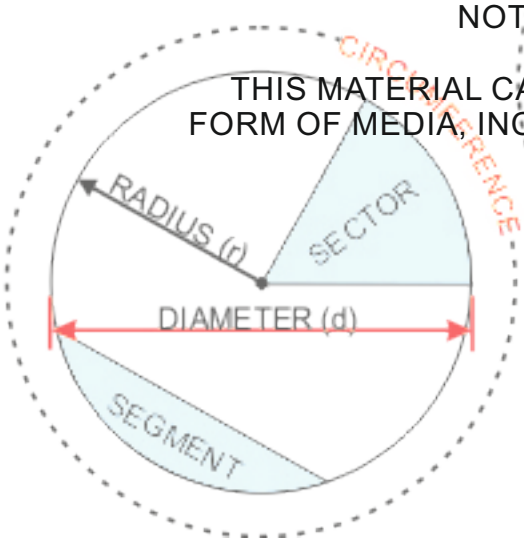
AREA AND CIRCUMFERENCE OF A CIRCLE AND ASSOCIATED EXAMINATION QUESTIONS

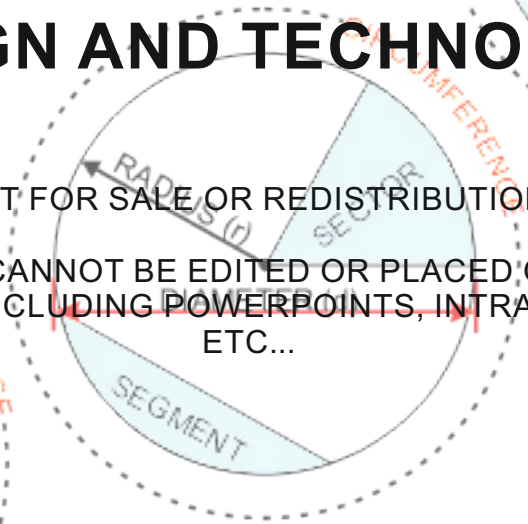






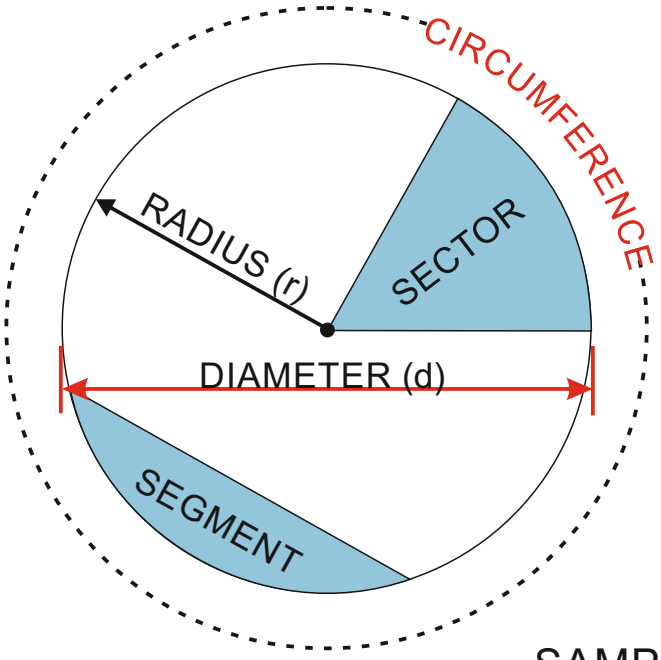
DESIGN AND TECHNOLOGY





CALCULATING THE AREA OF A CIRCLE GIVEN THE RADIUS

Definition: A precise curve around a centre. Any point on the curve is an equal distance from the centre. A circle is composed of a circumference (the precise curve) and a diameter and radius.



FORMULA

$$AREA = \pi r^2$$

$$\pi \text{ (pi)} = 3.14$$

SAMPLE QUESTIONS

A circle has a radius of 100mm. What is the area of the circle?

$AREA = \pi r^2$ π (pi) = 3.14

$AREA = 3.14 \times (100 \times 100)$

$AREA = 3.14 \times (10000)$

$AREA = 31400mm^2$

A circle has a radius of 60mm. What is the area of the circle?

$AREA = \pi r^2$ π (pi) = 3.14

$AREA = 3.14 \times (60 \times 60)$

$AREA = 3.14 \times (3600)$

$AREA = 11304mm^2$

A circle has a radius of 80mm. What is the area of the circle?

$AREA = \pi r^2$ π (pi) = 3.14

$AREA = 3.14 \times (80 \times 80)$

$AREA = 3.14 \times (6400)$

$AREA = 20096mm^2$

AREA OF A CIRCLE - SAMPLE QUESTIONS

A circle has a radius of 30mm. What is the area of the circle?

AREA = πr² π (pi) = 3.14

AREA = 3.14 x (30 x 30)

AREA = 3.14 x (900)

AREA = 2826mm²

A circle has a radius of 40mm. What is the area of the circle?

AREA = πr² π (pi) = 3.14

AREA = 3.14 x (40 x 40)

AREA = 3.14 x (1600)

AREA = 5024mm²

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A circle has a radius of 75mm. What is the area of the circle?

AREA = πr² π (pi) = 3.14

AREA = 3.14 x (75 x 75)

AREA = 3.14 x (5625)

AREA = 17662.5mm²

A circle has a radius of 45mm. What is the area of the circle?

AREA = πr² π (pi) = 3.14

AREA = 3.14 x (45 x 45)

AREA = 3.14 x (2025)

AREA = 6358.5mm²

A circle has a radius of 90mm. What is the area of the circle?

AREA = πr² π (pi) = 3.14

AREA = 3.14 x (90 x 90)

AREA = 3.14 x (8100)

AREA = 25434mm²

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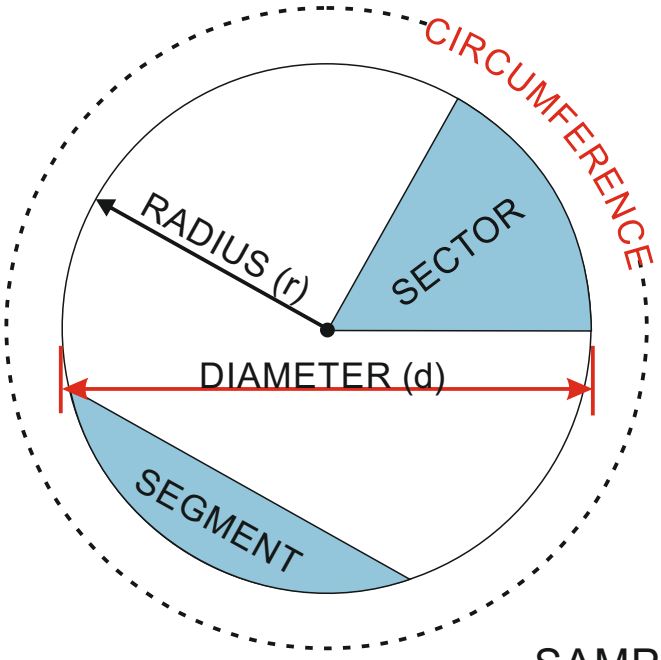
CALCULATING THE AREA OF A CIRCLE GIVEN THE RADIUS

Definition: A precise curve around a centre. Any point on the curve is an equal distance from the centre. A circle is composed of a circumference (the precise curve) and a diameter and radius.



FORMULA

$$AREA = \pi r^2$$

$$\pi \text{ (pi)} = 3.14$$

SAMPLE QUESTIONS

A circle has a radius of 100mm. What is the area of the circle?

$AREA = \pi r^2$ π (pi) = 3.14

A circle has a radius of 60mm. What is the area of the circle?

$AREA = \pi r^2$ π (pi) = 3.14

A circle has a radius of 80mm. What is the area of the circle?

$AREA = \pi r^2$ π (pi) = 3.14

AREA OF A CIRCLE - SAMPLE QUESTIONS

A circle has a radius of 30mm. What is the area of the circle?

$AREA = \pi r^2$ π (pi) = 3.14

A circle has a radius of 40mm. What is the area of the circle?

$AREA = \pi r^2$ π (pi) = 3.14

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A circle has a radius of 75mm. What is the area of the circle?

$AREA = \pi r^2$ π (pi) = 3.14

A circle has a radius of 45mm. What is the area of the circle?

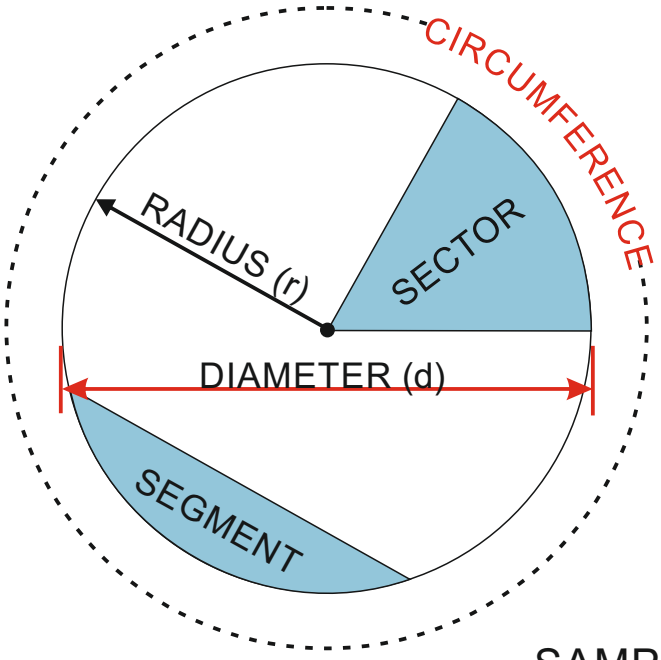
$AREA = \pi r^2$ π (pi) = 3.14

A circle has a radius of 90mm. What is the area of the circle?

$AREA = \pi r^2$ π (pi) = 3.14

CALCULATING THE CIRCUMFERENCE OF A CIRCLE GIVEN THE RADIUS

Definition: The circumference of a circle is the measurement of the boundary, all the way round, 360 degrees.



FORMULA

CIRCUMFERENCE = 2 x π x r

π (pi) = 3.14

SAMPLE QUESTIONS

A circle has a radius of 100mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

C = 2 x π x r

C = 2 x 3.14 x 100

C = 628mm

A circle has a radius of 60mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

C = 2 x π x r

C = 2 x 3.14 x 60

C = 376.8mm

A circle has a radius of 80mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

C = 2 x π x r

C = 2 x 3.14 x 80

C = 502.4mm

CIRCUMFERENCE - SAMPLE QUESTIONS

A circle has a radius of 30mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

C = 2 x π x r

C = 2 x 3.14 x 30

C = 188.4mm

A circle has a radius of 40mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

C = 2 x π x r

C = 2 x 3.14 x 40

C = 251.2mm

A circle has a radius of 75mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

C = 2 x π x r

C = 2 x 3.14 x 75

C = 471mm

A circle has a radius of 45mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

C = 2 x π x r

C = 2 x 3.14 x 45

C = 282.6mm

A circle has a radius of 90mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

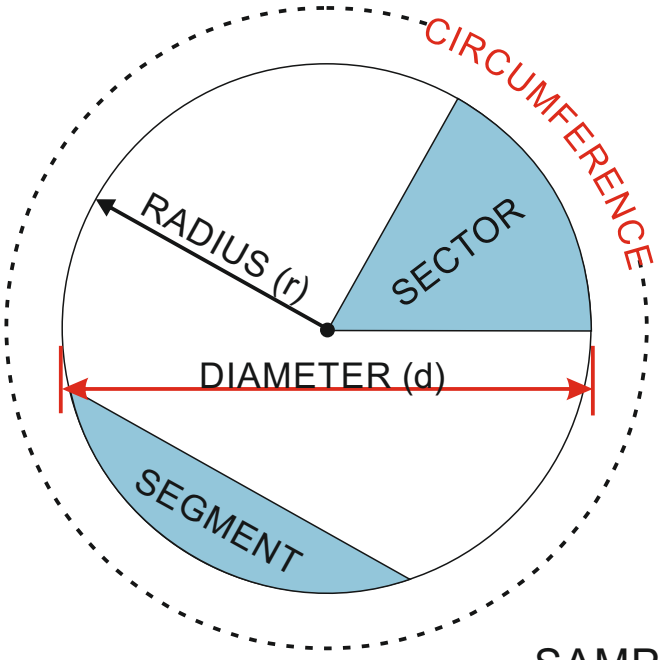
C = 2 x π x r

C = 2 x 3.14 x 90

C = 565.2mm

CALCULATING THE CIRCUMFERENCE OF A CIRCLE GIVEN THE RADIUS

Definition: The circumference of a circle is the measurement of the boundary, all the way round, 360 degrees.



FORMULA

CIRCUMFERENCE = 2 x π x r

π (pi) = 3.14

SAMPLE QUESTIONS

A circle has a radius of 100mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

A circle has a radius of 60mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

A circle has a radius of 80mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

CIRCUMFERENCE - SAMPLE QUESTIONS

A circle has a radius of 30mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

A circle has a radius of 40mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

A circle has a radius of 75mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

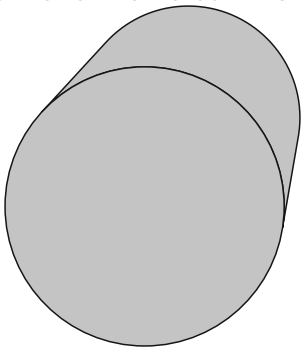
A circle has a radius of 45mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

A circle has a radius of 90mm. What is the circumference?

CIRCUMFERENCE = 2 x π x r

CIRCLE AREA AND CIRCUMFERENCE EXAMINATION QUESTIONS



The round section mild steel bar seen opposite, has a radius of 65mm.

What is the area of the 'circle' at one end?

What is the circumference of the round section bar?

FORMULA

$$AREA = \pi r^2$$

$$\pi \text{ (pi)} = 3.14$$

$$AREA = 3.14 \times (65 \times 65)$$

$$AREA = 3.14 \times (4225)$$

$$AREA = 13266.5mm^2$$

FORMULA

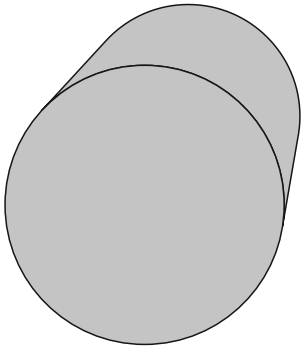
$$CIRCUMFERENCE = 2 \times \pi \times r$$

$$\pi \text{ (pi)} = 3.14$$

$$C = 2 \times \pi \times r$$

$$C = 2 \times 3.14 \times 65$$

$$C = 408.2mm$$



The round section mild steel bar seen opposite, has a radius of 110mm.

What is the area of the 'circle' at one end?

What is the circumference of the round section bar?

FORMULA

$$AREA = \pi r^2$$

$$\pi \text{ (pi)} = 3.14$$

$$AREA = 3.14 \times (110 \times 110)$$

$$AREA = 3.14 \times (12100)$$

$$AREA = 37994mm^2$$

FORMULA

$$CIRCUMFERENCE = 2 \times \pi \times r$$

$$\pi \text{ (pi)} = 3.14$$

$$C = 2 \times \pi \times r$$

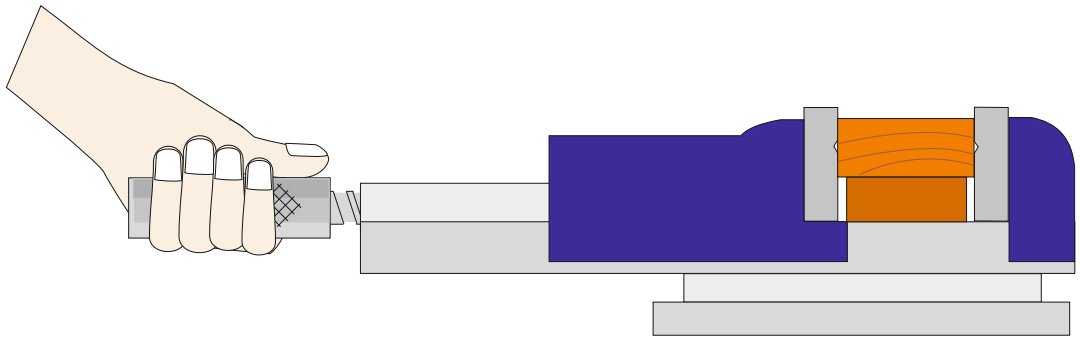
$$C = 2 \times 3.14 \times 110$$

$$C = 690.8mm$$

CIRCLE AREA AND CIRCUMFERENCE EXAMINATION QUESTIONS

A student is trying to work the ergonomic dimensions (measurements) for the 'round' handle of a machine vice, that he intends to manufacture. The student measures the radius of the handle of an existing handle and finds it to be 25mm.

What is the circumference of the handle?
What is the area of the 'round' end of the handle?



FORMULA

$$AREA = \pi r^2$$

$$\pi \text{ (pi)} = 3.14$$

$$AREA = 3.14 \times (25 \times 25)$$

$$AREA = 3.14 \times (625)$$

$$AREA = 1962.5mm^2$$

FORMULA

$$CIRCUMFERENCE = 2 \times \pi \times r$$

$$\pi \text{ (pi)} = 3.14$$

$$C = 2 \times \pi \times r$$

$$C = 2 \times 3.14 \times 25$$

$$C = 157mm$$

	RADIUS
HANDLE 1	20
HANDLE 2	25
HANDLE 3	24
HANDLE 4	30
HANDLE 5	28
TOTAL	*127*
AVERAGE	*25.4mm*

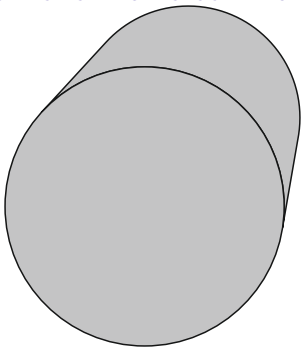
The student collects the radius measurements of five machine vices and enters the data into a table of results, seen opposite.

Calculate the average radius and enter your result in the table

Why could this measurement be useful when designing a new machine vice, based on the design above?

The measurement could be applied to the new design of the machine vice handle. Using the average radius measurement should mean that the handle is a good ergonomic 'fit' for the majority of users.

CIRCLE AREA AND CIRCUMFERENCE EXAMINATION QUESTIONS



The round section mild steel bar seen opposite, has a radius of 65mm.

What is the area of the 'circle' at one end?

What is the circumference of the round section bar?

FORMULA

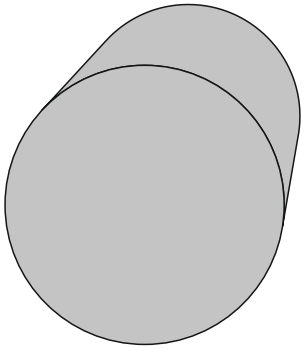
AREA = πr^2

π (pi) = 3.14

FORMULA

CIRCUMFERENCE = 2 x π x r

π (pi) = 3.14



The round section mild steel bar seen opposite, has a radius of 110mm.

What is the area of the 'circle' at one end?

What is the circumference of the round section bar?

FORMULA

AREA = πr^2

π (pi) = 3.14

FORMULA

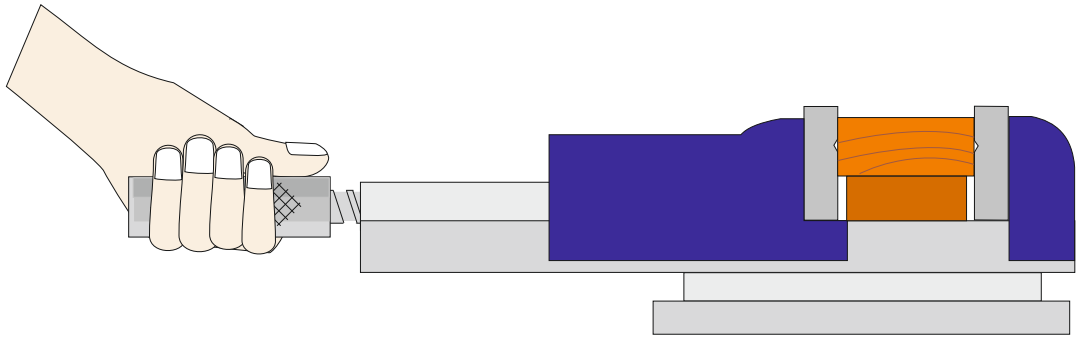
CIRCUMFERENCE = 2 x π x r

π (pi) = 3.14

CIRCLE AREA AND CIRCUMFERENCE EXAMINATION QUESTIONS

A student is trying to work the ergonomic dimensions (measurements) for the 'round' handle of a machine vice, that he intends to manufacture. The student measures the radius of the handle of an existing handle and finds it to be 25mm.

What is the circumference of the handle?
What is the area of the 'round' end of the handle?



FORMULA

AREA = πr^2

π (pi) = 3.14

FORMULA

CIRCUMFERENCE = 2 x π x r

π (pi) = 3.14

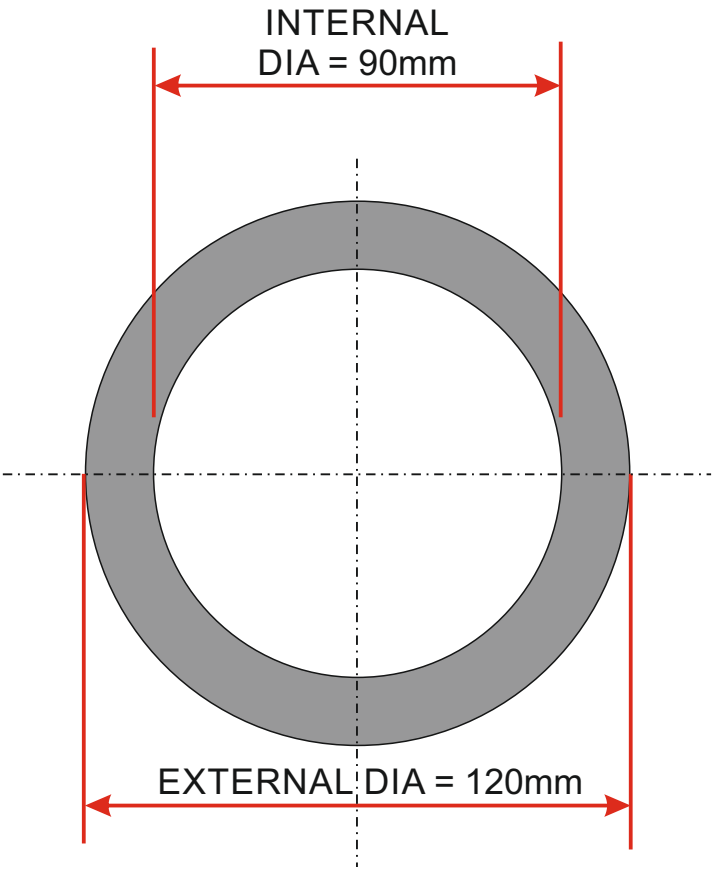
	RADIUS
HANDLE 1	20
HANDLE 2	25
HANDLE 3	24
HANDLE 4	30
HANDLE 5	28
TOTAL	*127*
AVERAGE	*25.4mm*

The student collects the radius measurements of five machine vices and enters the data into a table of results, seen opposite.

Calculate the average radius and enter your result in the table

Why could this measurement be useful when designing a new machine vice, based on the design above?

CIRCLE AREA AND CIRCUMFERENCE EXAMINATION QUESTIONS



A piece of steel tube can be seen opposite. The external and internal diameters can be read from the diagram.

What is the area of the surface at one end of the steel?

FORMULA

$$AREA = \pi r^2$$

$$\pi \text{ (pi)} = 3.14$$

Treat the surface at the end of the tube as two circles and find the area of each one:

EXTERNAL DIAMETER

$$AREA = \pi r^2$$

$$AREA = 3.14 \times (60 \times 60)$$

$$AREA = 3.14 \times (3600)$$

$$AREA = 11304mm^2$$

INTERNAL DIAMETER

$$AREA = \pi r^2$$

$$AREA = 3.14 \times (45 \times 45)$$

$$AREA = 3.14 \times (2025)$$

$$AREA = 6358.5mm^2$$

Then, subtract the area of the internal circle from the area of the external circle, to find the total surface area of the tube.

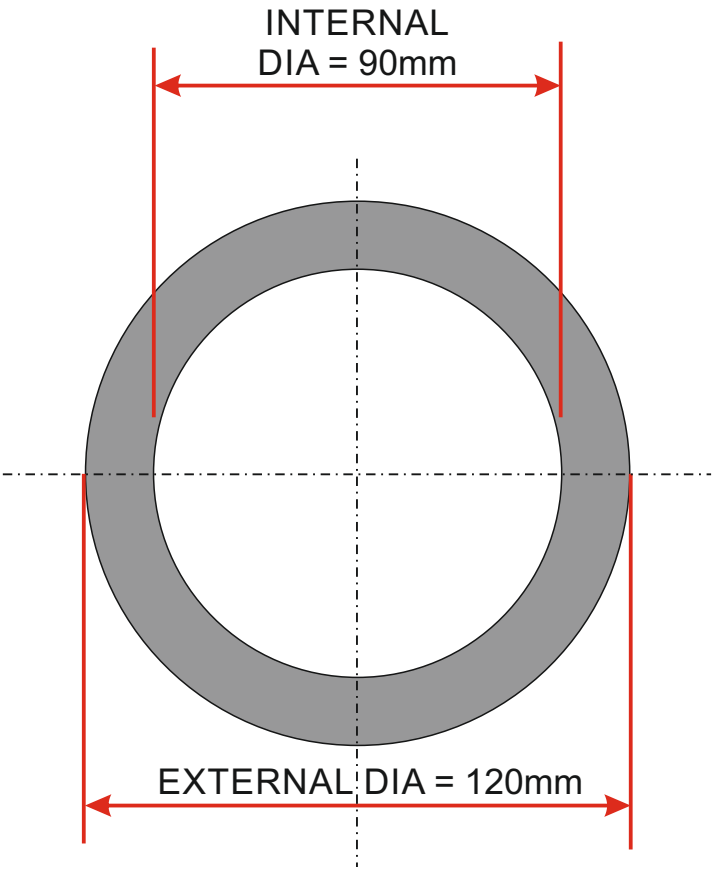
EXTERNAL CIRCLE
$11304mm^2$

INTERNAL CIRCLE
$6358.5mm^2$

$$11304 - 6358.5 = 4945.5mm^2$$

The total surface area of one end of the tube is $4945.5mm^2$

CIRCLE AREA AND CIRCUMFERENCE EXAMINATION QUESTIONS



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What is the area of the surface at one end of the steel?

FORMULA

$$AREA = \pi r^2$$

$$\pi \text{ (pi)} = 3.14$$

Treat the surface at the end of the tube as two circles and find the area of each one:

EXTERNAL DIAMETER	INTERNAL DIAMETER

Then, subtract the area of the internal circle from the area of the external circle, to find the total surface area of the tube.

The total surface area of one end of the tube is _____