Stone Lodge Sixth Form Summer task

Subject: Engineering

Personal Skills:
Skills that you will need to be successful in this course are:

- **Well organised –** having the correct equipment and being on time to lessons.
- **Questioning -** be prepared to ask questions and contribute to class discussions.
- **Critical thinking** – being eager to want to know the *why* and make links across topics.
- **Studious** – to follow the recommended **reading** list to enhance your understanding.
- **Knowledgeable –** applying your knowledge and skills**.**
- **Resilient -** demanding the best from yourself even when it gets challenging.

Summer Task Details:
Complete the summer tasks below. You will be required to email your work to Mrs George prior to joining in September – cgeorge@stonelodgeschool.co.uk
You will also be required to being a hard copy of this on your first day in September.

Task 1:
Research the following materials to find out their material categories, working properties and applications. Write up your findings in a table.

- Stainless steel
- Mild steel
- Aluminium
- Brass
- Copper
- Nylon
- Polypropylene

Task 2:
Research the following manufacturing processes to find out how they work, what materials they are used with and what products are manufactured using them. Write up your findings.

- Milling
- Injection moulding
- Turning (centre lathe)
- Welding - spot welding & metal inert gas (MIG) welding
- Brazing

Task 3:
Complete the attached maths questions. Make sure you show your working. Use the link to a PDF which will show you worked examples.

Suggested reading/sources/links:

- Maths revision guide PDF: https://www.pearsonschoolsandfecolleges.co.uk/asset-library/pdf/FE-Vocational/btec-nationals-engineering/form-samples/revise-btec-national-engineering-revision-guide.pdf

- Further information on some units: http://www.kupper.org.uk/engineering/b-tec-engineering-lvl-2-3-spec-modules/

- Useful website to research processes and materials: https://www.technologystudent.com/equip1/equipex1.htm

Course Content:

Over the 2-year course, you will complete 10 units.

- Unit 1 Engineering Principles [external exam]
- Unit 2 Delivery of Engineering Processes Safely as a Team
- Unit 3 Engineering Product Design and Manufacture [external exam]
- Unit 4 Applied Commercial and Quality Principles in Engineering
- Unit 5 A Specialist Engineering Project
- Unit 7 Calculus to Solve Engineering Problems
- Unit 10 Computer Aided Design in Engineering
- Unit 44 Fabrication Manufacturing Processes
- Unit 57 Sustainable Transport
- Unit 60 Autonomous Mobile Robotics

BTEC Level 3 Engineering Principles – Summer Task

Name: ……

This work should be completed by **September 2023** to help you prepare for **Unit 1 (Engineering principles)** of the Level 3 BTEC Engineering course.

This work will be a basis for mathematical understanding that you will work to develop as the course progresses.

You need to try **all** questions on the following sheets. Show full working for all questions.

The work should take between **2 - 4** hours to complete.

You can use **these sites for further support**
Maths Genie • Learn GCSE Maths for Free
GCSE Maths Revision 2022 – Corbettmaths
(or any other GCSE revision websites)

Topic	**Time spent**	**Completed**	**Comments** (about completion and highlight any areas of difficulty)
Solving Equations			
Rearranging simple formulae			
Substitution			
Pythagoras' Theorem			
Trigonometry			
Area of Trapezium			
Area of a Circle			

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Grade 4 questions	

Solving Equations

1) Solve $2x - 3 = 17$

2) Solve $3x + 2 = 14$

3) Solve $5x - 7 = 33$

4) Solve $4x + 7 = 19$

5) Solve $x + x + x + x = 20$

6) Solve $x + 3x = 24$

7) Solve $2(x + 3) = 8$

8) Solve $2(3x - 4) = 22$

9) Solve $5(t - 1) = 20$

10) Solve $3(2x + 5) = 36$

11) Solve $2x + 7 = x + 11$

12) Solve $5y - 2 = 3y + 10$

13) Solve $2x + 1 = 5x - 20$

14) Solve $p - 3 = 3p - 11$

15) Solve $2d + 5 = 20 - 3d$

16) Solve $4 - e = 2e - 8$

17) Solve $2(x + 3) = x + 9$

18) Solve $x - 7 = 3(2x - 4)$

19) Solve $5(x + 3) = 2(x + 6)$

20) Solve $4(2y + 1) = 2(12 - y)$

21) Solve $7 - 3x = 2(x + 1)$

22) Solve $\frac{x}{2} = 5$

23) Solve $\frac{x}{5} = 6$

24) Solve $\frac{2x}{3} = 4$

25) Solve $\frac{5x}{2} = 15$

26) Solve $\frac{x - 2}{3} = 1$

27) Solve $\frac{x + 5}{2} = 7$

28) Solve $\frac{2x + 1}{4} = 2$

29) Solve $\frac{5x - 3}{3} = 4$

30) Solve $\frac{x + 2}{3} = x + 4$

31) Solve $\frac{3x - 1}{4} = 2x - 3$

32) Solve $\frac{4x + 3}{5} = \frac{2x - 1}{2}$

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Grade 4 questions	

Rearranging Simple Formulae

1) Make c the subject of the formula.

$a = b + cd$

2) Make t the subject of the formula.

$u = v + 2t$

3) Make n the subject of the formula.

$M = 3n + 5$

4) Make z the subject of the formula.

$x = 3y + z$

5) $r = 5s + 3t$

a) Make t the subject of the formula.

b) Make s the subject of the formula.

6) Rearrange $y = 3x + 1$ to make x the subject.

7) Rearrange $y = \frac{1}{2}x + 2$ to make x the subject.

8) Rearrange $y = \frac{1}{3}x + 1$ to make x the subject.

Substitution

1) $y = 5x$

a) Work out the value of y when $x = 3$

b) Work out the value of y when $x = -2$

2) $y = 2x + 7$

a) Work out the value of y when $x = 4$

b) Work out the value of y when $x = -3$

3) $y = 2x + 4t$

$x = 6$

$t = 1$

Work out the value of y.

4) $y = 2a - 3b$

$a = 4$

$b = -2$

Work out the value of y.

5) $v = 3a + 5b$

$a = 6$

$b = -3$

Work out the value of v.

6) $y = x^2$

a) Work out the value of y when $x = 6$

b) Work out the value of y when $x = -4$

7) $y = 2x^2$

a) Work out the value of y when $x = 5$

b) Work out the value of y when $x = -3$

8) $y = 3x^2 + 2x$

a) Work out the value of y when $x = 2$

b) Work out the value of y when $x = -4$

9) $v = u^2 + 5as$

$u = 6$
$a = 2.5$
$s = 9$

Work out the value of v.

10) $y = p - 2qx^2$

$p = -10$

$q = 2$

$x = -5$

Work out the value of y.

11) $v^2 = u^2 + 2as$

$u = 6$
$a = 2.5$
$s = 9$

Work out the value of v.

12) $v^2 = u^2 + 2as$

$u = 3$
$a = 9.8$
$s = 12$

Work out the value of v.
Give your answer correct to 1 decimal place

13) $s = ut + 0.5at^2$

$a = 9.8$
$t = 5$
$u = 7$

Work out the value of s.

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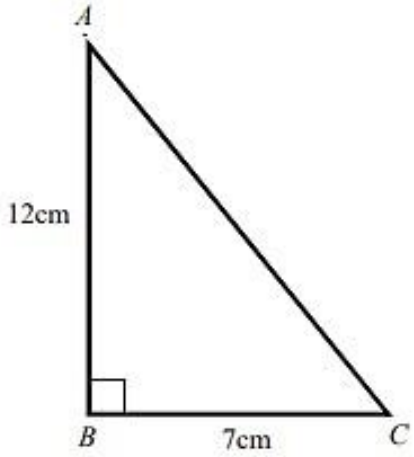
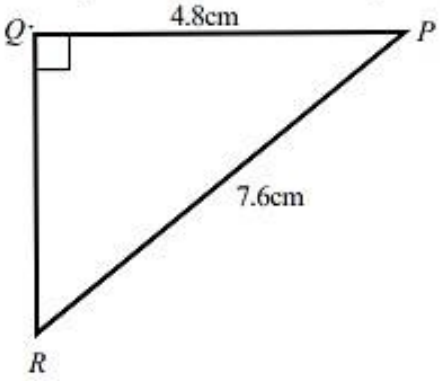
Grade 4 questions	

Pythagoras' Theorem

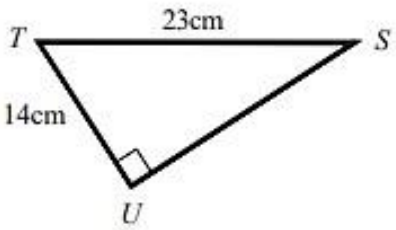
1) Find the length of side AC.
Give your answer to 1 decimal place.



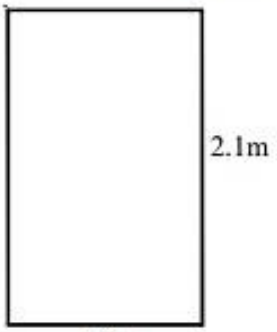
2) Find the length of side QR
Give your answer to 1 decimal place.



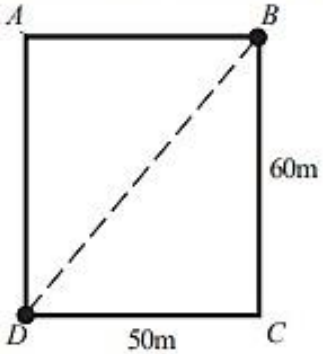
3) Find the length of side SU
Give your answer to 1 decimal place.



4) Below is a picture of a doorway.
Find the size of the diagonal of the doorway.
Give your answer to 1 decimal place.

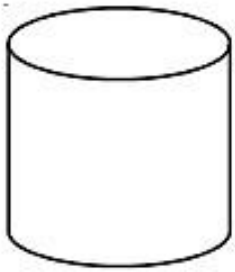


5) In the sketch of the rectangular field, below, James wants to walk from B to D.



Which of the following routes is shorter and by how much?
From B to C to D or straight across the field from B to D.
Give your answer to the nearest metre.

6) Fiona keeps her pencils in a cylindrical beaker as shown below.
The beaker has a diameter of 8cm and a height of 17cm.
Will a pencil of length 19cm fit in the beaker without poking out of the top?
All workings must be shown.



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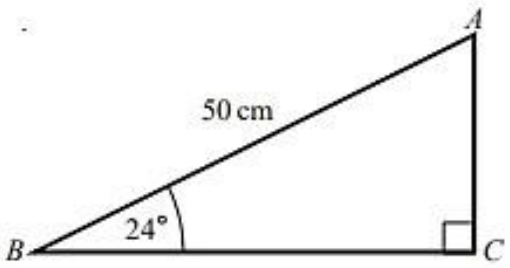
Grade 5 questions	

Trigonometry

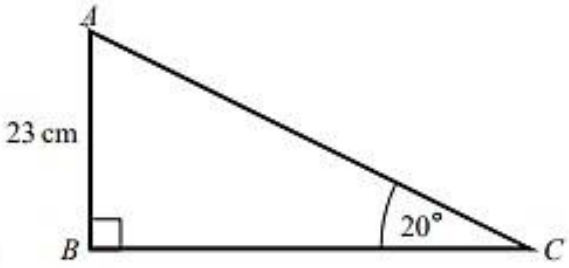
1) *ABC* is a right-angled triangle.
AB = 50 cm.
Angle *ABC* = 24°

Work out the length of *BC*.
Give your answer correct to 1 decimal place.



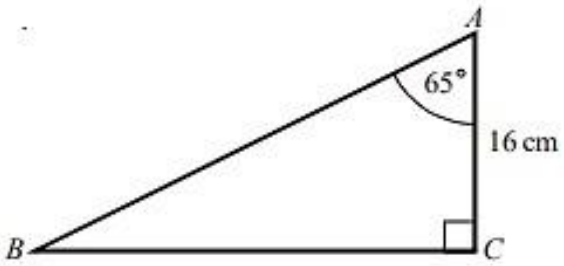
2) *ABC* is a right-angled triangle.
AB = 23 cm.
Angle *BCA* = 20°

Work out the length of *AC*.
Give your answer correct to 1 decimal place.



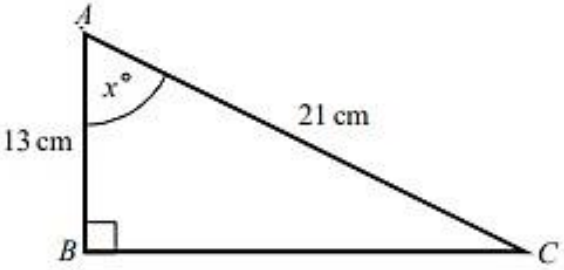
3) *ABC* is a right-angled triangle.
AC = 16 cm.
Angle *CAB* = 65°

Work out the length of *BC*.
Give your answer correct to 1 decimal place.



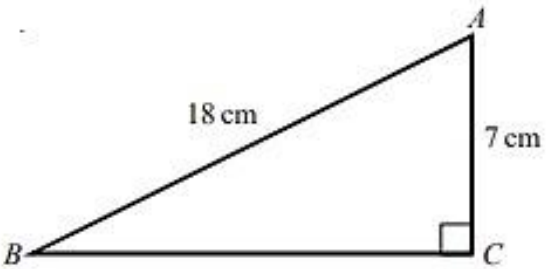
4) *ABC* is a right-angled triangle.
AB = 13 cm.
AC = 21 cm.

Work out the size of angle *x*.
Give your answer correct to 1 decimal place.



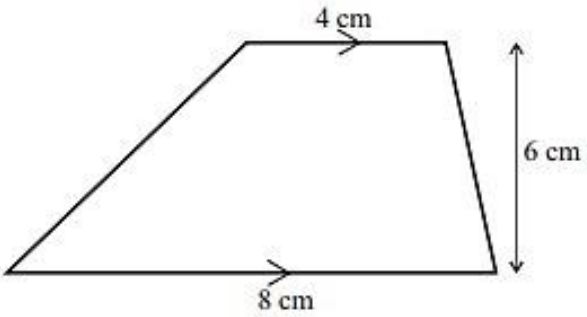
5) *ABC* is a right-angled triangle.
AB = 18 cm.
AC = 7 cm.

Work out the size of angle *ABC*.
Give your answer correct to 1 decimal place.

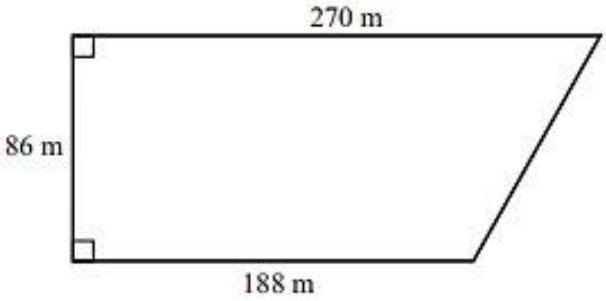


Area of a Trapezium

1) Find the area of this trapezium.

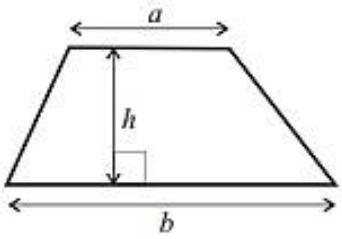


2) The diagram shows a field.



Work out the area of the field.

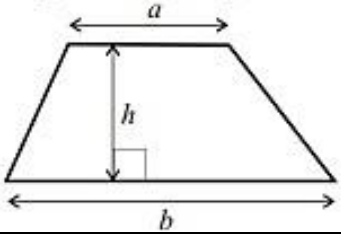
3) In the trapezium, $a = 6.6$ cm, $b = 8.4$ cm and $h = 3.6$ cm.



Work out the area of the trapezium.

4) In the trapezium below, the area is 45 cm^2.
$a = 5$ cm and $b = 10$ cm.

Calculate the height, h, of the trapezium.



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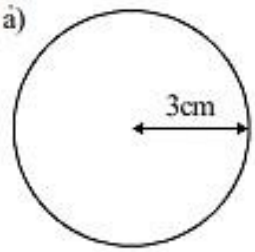
Grade 3 questions

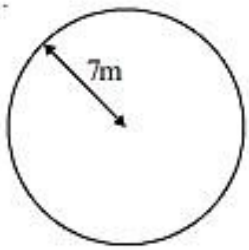
Area of a Circle

1) Find the areas of the following shapes.

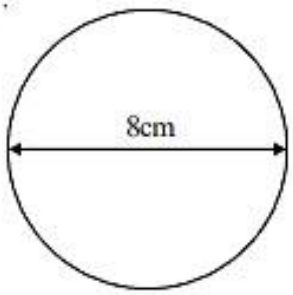
a)



b)



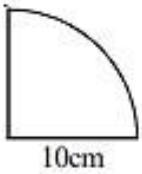
c)



2) Work out the areas of the following shapes.

a)

b)



3) The **radius** of the top of a circular table is 60 cm.
The table also has a circular base with **diameter** 30 cm.

a) Work out the area of the top of the table.

b) Work out the area of the base of the table.

4) The diagram shows a shape, made from a semi-circle and a rectangle.
The diameter of the semi-circle is 13 cm.
The length of the rectangle is 17 cm.

Calculate the area of the shape.
Give your answer correct to
3 significant figures.