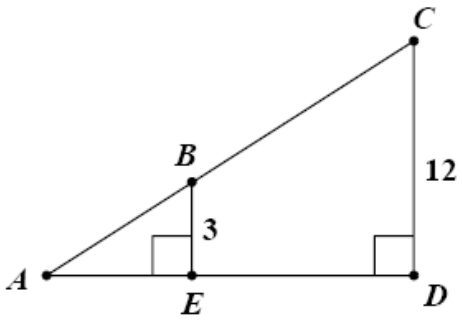
Grade 9 Mathematics Worksheet

Theorem of Pythagoras

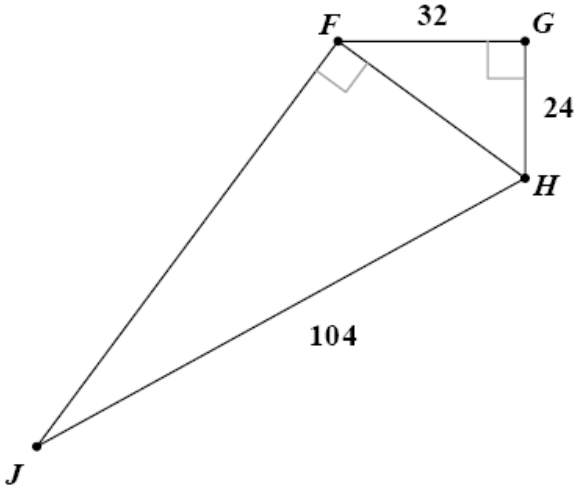
Questions:

1. i) Find the area in square units of trapezoid *BCDE* if the length of *AC* is 20 units, the length of *DC* is 12 units, and the length of *BE* is 3 units.



ii) The diagonals of a rhombus are 6 cm and 8 cm. what is the perimeter, in inches, of the rhombus?

iii) What is the area in square units of the quadrilateral *FGHJ*?



iv) Find the area of the isosceles trapezoid DEFG in square metres. Express your answer in the simplest form.

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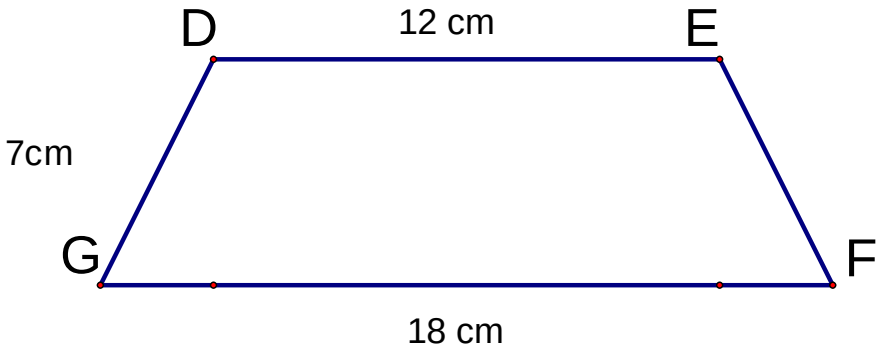
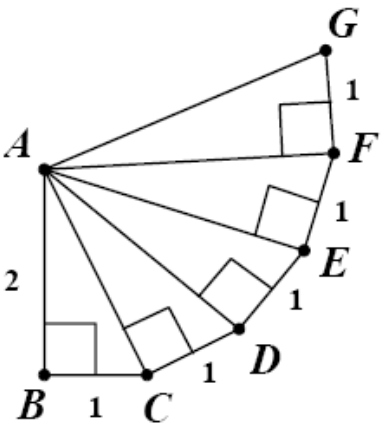


v) What is the length of *AG*?



vi) A traveller drove 18 km north, then 11 km west, then 6 km south, and then 6 km east. In km, how far "as the crow flies" was the traveller from his original starting point?

vii) On your paper, sketch an equilateral triangle, ΔABC. Draw the altitude BD from vertex B to side AC. On your sketch, mark congruent sides and show the measures of all angles in ΔABD and ΔCBD.

viii) What is the relationship between AB and AD? Will this relationship always exist in a 30°-60°-90° triangle? Explain.

ix) Sketch a 30°-60°-90° triangle. Choose any integer for the length of the shorter leg. Use the relationship from 6 together with the Pythagorean Theorem to find the length of the other leg. Simplify the square root.

x) Write a generalisation relating the sides of any 30°-60°-90° triangle.

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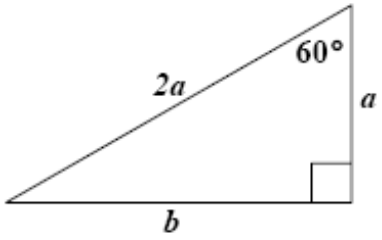
xi) Use algebra to verify the relationship for any 30°-60°-90° triangle by using the triangle to the



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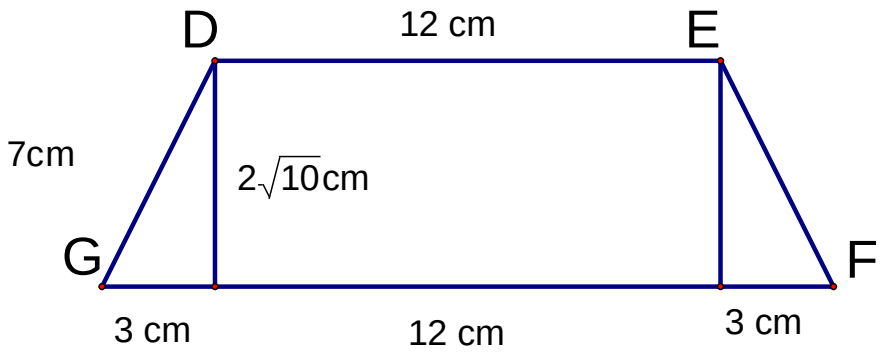
Solution

1. i) Applying the Pythagorean Theorem on ΔACD
AD = 16 units
$\Delta ABE - \Delta ACD$. BE is one-fourth of CD; therefore
AE is one-fourth of AD. AE = 4 units.
DE = AD – AE = 12 units.
Area of trapezoid BCDE = (3 + 12) × (12/2)
= 90 square units

ii) Applying the Pythagorean Theorem, the length of each side of the rhombus is 5 cm. The perimeter is 20 cm.

iii) The area of ΔFGH is 344 square units.
Applying the Pythagorean Theorem to $\Delta FGH, FH$ = 40 units
Applying the Pythagorean Theorem to $\Delta FHJ, FJ$ = 96 units
The area of ΔFHJ is 1 920 square units
The area of quadrilateral FGHJ is 2 304 square units

iv)



Draw the perpendicular segments from the ends of the short base to the long base, forming right triangles. Applying the Pythagorean Theorem, the height of the triangles and the height of the trapezoid is 2 $\sqrt{10}$ cm. The area of the trapezoid is 30 $\sqrt{10}$ cm^2.

v) Applying the Pythagorean Theorem on $\Delta ABC, AC = \sqrt{5}$ units.
Applying the Pythagorean Theorem on $\Delta ACD, AD = \sqrt{6}$ units.
Continuing in this reasoning AG = $\sqrt{9}$ = 3 units.

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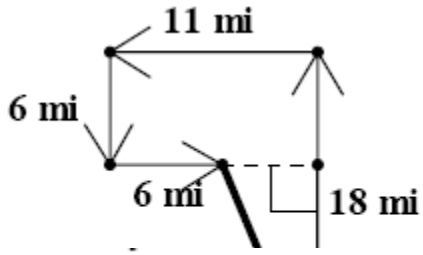
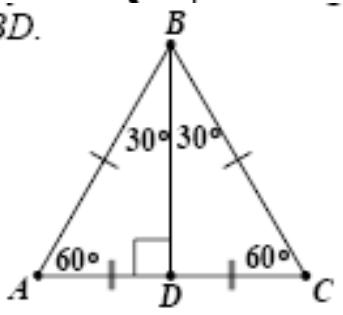
vi) Sketch the route as shown. The legs of the right triangle measure 12 km and 5 km. Using the Pythagorean Theorem, the hypotenuse measures 13 km. The traveller was 13 km from his original starting point.

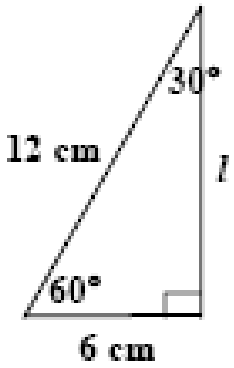


vii) ΔABD and ΔCBD.



viii) Since AC = AB, then AD = $\frac{1}{2}$ AB.

ix)



$6^2 + 1^2 = 12$
$36 + 1^2 = 144$
$L^2 = 108$
$L = 6\sqrt{3}$

x) In a 30°-60°-90° right triangle, the length of the hypotenuse is twice the length of the short leg. The length of the long leg is 3 times the length of the short leg.

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xi)

$$(2a)^2 = a^2 + b^2$$
$$4a^2 = a^2 + b^2$$
$$3a^2 = b^2$$
$$a\sqrt{3} = b$$

Application of the knowledge of the theorem is assessed here.