8th

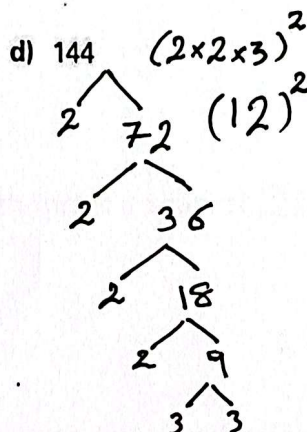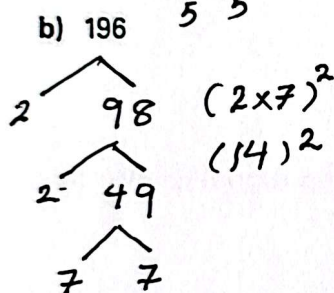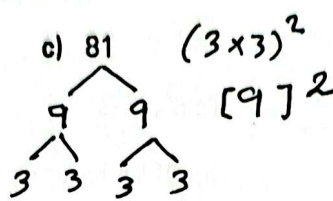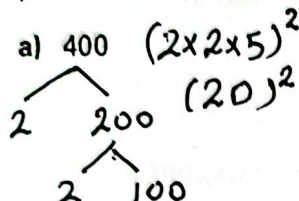# 1.2 Recognising Perfect Squares

GOAL

Use a variety of strategies to identify perfect squares.

?

1. Use a tree diagram to express each number as the product of two identical numbers.

a) 400 $(2 \times 2 \times 5)^2$
$(20)^2$

2 200
  2 100
    2 50
      2 25
        5 5

c) 81 $(3 \times 3)^2$
$[9]^2$

9 9
3 3 3 3

b) 196

2 98 $(2 \times 7)^2$
  2 49 $(14)^2$
    7 7

d) 144 $(2 \times 2 \times 3)^2$

2 72 $(12)^2$
  2 36
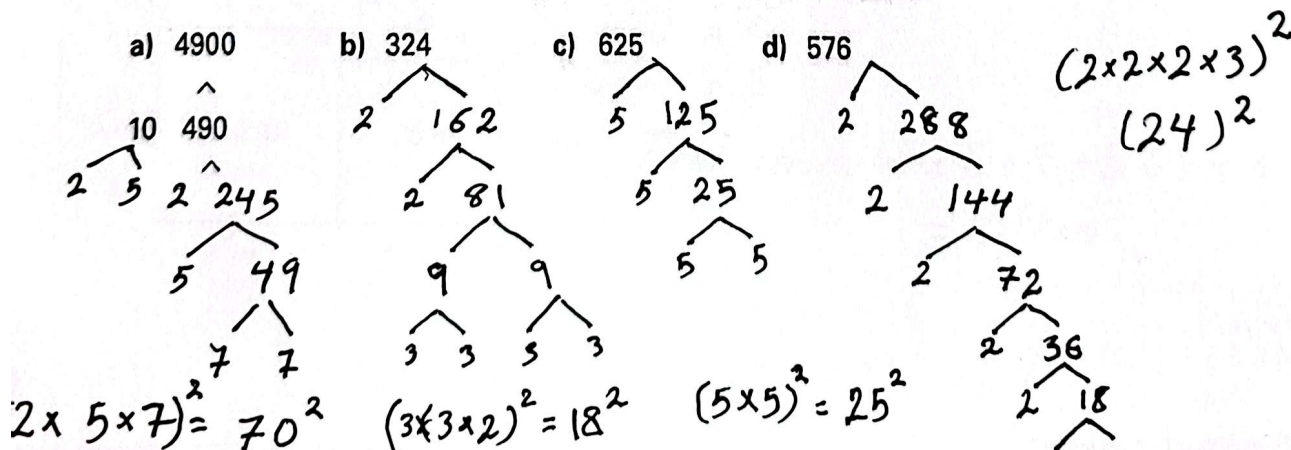   2 18
      2 9
        3 3

2. Calculate.

a) 10^2
$(10 \times 10) = 100$

b) 16^2
$16 \times 16 = 256$

c) 18^2
$18 \times 18 = 324$

d) 21^2
$21 \times 21 = 441$

3. Express each number as a perfect square and write the final answer in the form $\blacksquare^2$. Use a tree diagram to determine the factors.

a) 4900

10 490
2 5 2 245
    5 49
      7 7

$2 \times 5 \times 7)^2 = 70^2$

b) 324

2 162
  2 81
    9 9
  3 3 3 3

$(3 \times 3 \times 2)^2 = 18^2$

c) 625

5 125
  5 25
    5 5

$(5 \times 5)^2 = 25^2$

d) 576

2 288
  2 144
    2 72
      2 36
        2 18
          2 9
            3 3

$(2 \times 2 \times 2 \times 3)^2$
$(24)^2$

CS CamSc

1.3 Square Roots of Perfect Squares

GOAL

Use a variety of strategies to determine the square root of a perfect square.

1. Calculate.

   a) $\sqrt{9}$ = 3

   b) $\sqrt{900}$ = 30

   c) $\sqrt{196}$ = 14

   d) $\sqrt{625}$ = 25

2. A bulletin board has an area of 1296 cm².

   a) Determine three possible sets of lengths and widths for the bulletin board. Include a diagram for each set.

   ___ m × ___ m   ___ m × ___ m   ___ m × ___ m

   b) Which length and width forms a square? _36_ m × _36_ m

   c) How else can you determine the possible length and width of the corkboard?

   _____

3. Consider the following diagram of two rooms. What is the total perimeter of the figure?

   6 m / 1 m / 5 m
   6 m = 36 m² | 25 m² 5 m
   6 m / 5 m

   $\sqrt{36}$ = 6
   $\sqrt{25}$ = 5
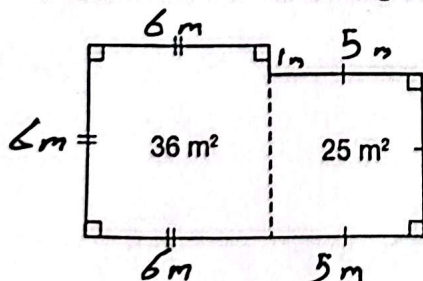
   Total perimeter = 5 + 5 + 5 + 1 + 6 + 6 + 6
   = 34 m

1.6 The Pythagorean Theorem

GOAL

Model, explain, and apply the Pythagorean theorem.

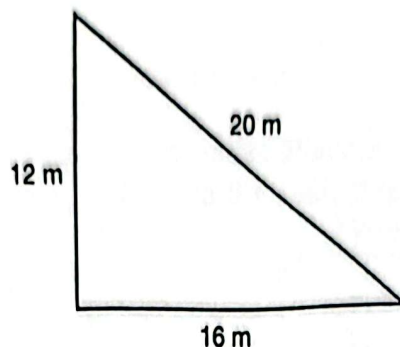1. Is this triangle a right triangle?

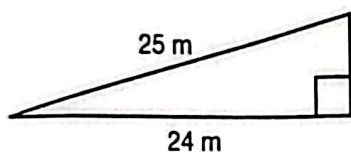$c^2 = a^2 + b^2$

$20^2 = 12^2 + 16^2$

$400 = 144 + 256$

$400 = 400$

RS = LS? __yes__

Is this triangle a right triangle? __yes.__

(triangle with sides 20 m, 12 m, 16 m)

2. Calculate the unknown length.

$c^2 = a^2 + b^2$

$(25)^2 = a^2 + (24)^2$

$625 = a^2 + 576$

$a = \sqrt{49} = \boxed{7\,m}$

(triangle with 25 m, 24 m)

3. Which of these are Pythagorean triples?

a) 11, 22, 30 ✗   b) 5, 12, 13 ✓

$(30)^2 \neq (11)^2 + (22)^2$

$(13)^2 = (5)^2 + (12)^2$

$169 = 25 + 144$

4. The hypotenuse of an ⟨isosceles⟩ right triangle is 14 cm. How long are the legs? Include a diagram. Recall that an isosceles right triangle has legs that are the same length.

$c^2 = a^2 + a^2$

$(14)^2 = 2(a^2)$

$\dfrac{196}{2} = a^2$

$a = \sqrt{98} \approx 9.9\,cm$
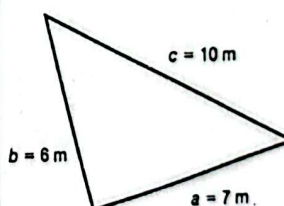
1.7 Solve Problems Using Diagrams

GOAL

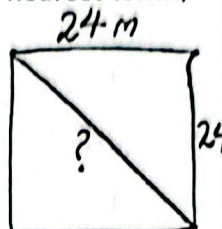Use diagrams to solve problems about squares and square roots.

Draw a diagram to help you solve each problem.

1. A baseball diamond is a |square| with sides of about 24 m. What is the shortest distance, to the nearest tenth, between first base and third base?

   24 m

   $c^2 = (24)^2 + (24)^2$

   $\sqrt{c^2} = \sqrt{1152}$

   $c \approx 33.9\, m$

   ? 24

2. Two joggers ran 3 km north, then 2 km west. What is the shortest distance they must travel to return to their starting point?

   $c^2 = (2)^2 + (3)^2$

   $= 4 + 9$

   $c = \sqrt{13} \approx 3.5m.$
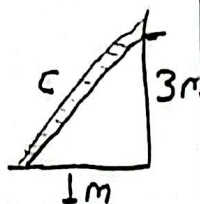
   2 Km

   3 Km

   c

   starting point

3. The foot of a ladder is placed 1 m away from a wall. The top of the ladder rests 3 m up the wall. How long is the ladder? $c^2 = a^2 + b^2$

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

   $c^2 = 10$

   $c = \sqrt{10} \approx 3.16\, m$

   c   3m

   1 m
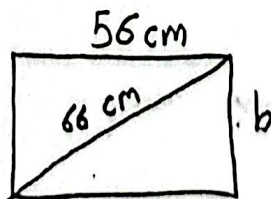
4. Daisy's TV screen is 56 cm long and 66 cm diagonally. How wide is Daisy's TV?

   $c^2 = a^2 + b^2$

   $(66)^2 = (56)^2 + b^2$

   $4356 = 3136 + b^2$

   $\sqrt{b^2} = \sqrt{1220} \Rightarrow b = 34.9\, m$
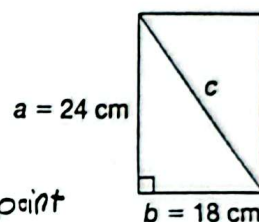
   56 cm

   66 cm   b

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