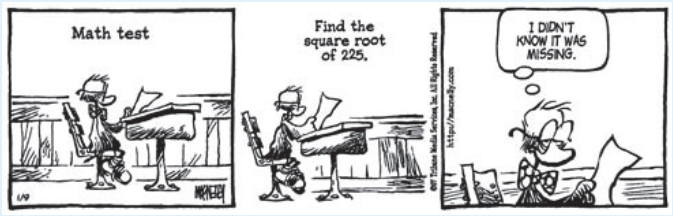
Communicate the Ideas

1. Explain how to square the number 7.

2. How would you use prime factorization to determine the square root of 225? Compare your answer with a classmate's.



3. The factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18, and 36. Use words and/or diagrams to explain how you know which factor is the square root of 36.

4. Explain how squaring a number is the reverse of finding the square root of a number. Include an example with your explanation.

Check Your Understanding

Practise

For help with #5 to #8, refer to Example 1 on page 82.

5. **a)** Determine the prime factorization of 4.
b) Is 4 a perfect square? Explain.
c) Draw the square and label its side length.

6. A rectangle has an area of 64 m^2.
a) Determine the prime factorization of 64.
b) Is 64 a perfect square? Explain.
c) Draw a square with that area and label its side length.

7. Write the prime factorization of each number. Identify the perfect squares.
a) 42 **b)** 169 **c)** 256

8. Determine the prime factorization of each number. Which numbers are perfect squares?
a) 144 **b)** 60 **c)** 40

For help with #9 to #12, refer to Example 2 on page 83.

9. What is the area of a square with each side length?
a) 10 **b)** 16

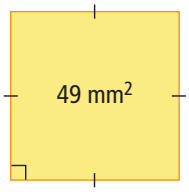
10. Determine the area of a square with each side length.
a) 20 **b)** 17

11. What is the square of each number?
a) 9 **b)** 11

12. Determine the square of each number.
a) 3 **b)** 18

For help with #13 to #16, refer to Example 3 on pages 83–84.

13. What is the side length of the square shown?



14. Determine the side length of a square with an area of 900 cm^2.

15. Evaluate.

a) $\sqrt{49}$ **b)** $\sqrt{64}$ **c)** $\sqrt{625}$

16. Determine the value.

a) $\sqrt{9}$ **b)** $\sqrt{25}$ **c)** $\sqrt{1600}$

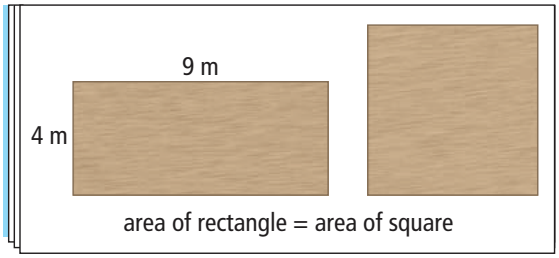
Apply

17. A fridge magnet has an area of 54 mm^2. Is 54 a perfect square? Use prime factorization to find the answer.

18. A floor mat for gymnastics is a square with a side length of 14 m. What is the area of the floor mat in square metres?

19. The gym teacher told the students to run twice around the perimeter of the school field. The area of the square field is 28 900 m^2. What distance did the students run?

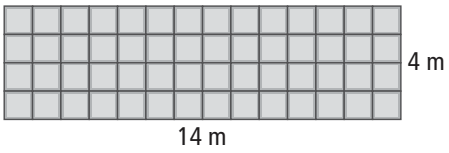
20. Adam's uncle has instructions for building a shed. One page of the instructions, shown below, is not very clear.



a) What is the area of the rectangle?

b) What is the side length of the square?

21. Kate is going to put a patio in her backyard. The patio stones she is using each have an area of 1 m^2. She has created the rectangular design shown.



a) What is the area of the patio?

b) What are the dimensions of another rectangular patio she could build with the same area?

c) Kate decides to make a patio with the same area but she wants it to be a square with whole number side lengths. Is this possible? Explain your reasoning.

22. The world's largest city square is Tiananmen Square in Beijing, China. It has an area of 396 900 m^2.

a) What are the dimensions of the square?

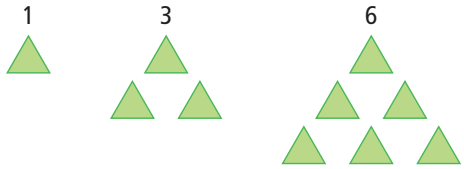
b) If the square had dimensions of 629 m by 629 m, what would be the area?

c) If the square had an area less than 394 000 m^2 and greater than 386 000 m^2, what are all of the possible whole number dimensions that it could have?

23. A helicopter landing pad has a square shape. The area is 400 m^2. Use prime factorization to find the side length of the pad.

Extend

24. The first three triangular numbers are



a) What are the next three triangular numbers?

b) Add together any two consecutive triangular numbers. What do you notice about the sums?

25. A square digital photo on the computer has an area of 144 cm^2.

a) What is the side length of the photo?

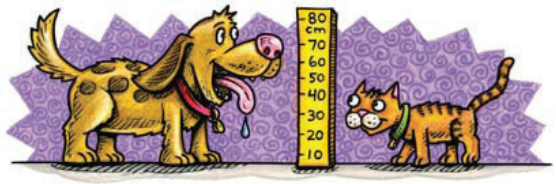
b) The photo is enlarged so that the side length is now 36 cm. What is the area of the enlarged photo?

c) How many times as large as the original area is the enlarged area?

d) How many times as large as the original side length is the enlarged side length?

e) Use what you know about the square root of a perfect square to identify the relationship between the numbers in parts c) and d).

Imagine your dog is 80 cm tall and your cat is 40 cm tall. How many times as tall as your cat is your dog? What operation did you perform?



26. **a)** Determine which of the following numbers are perfect squares: 10, 100, 1000, 10 000, 100 000.

b) State the square root of each perfect square.

c) Choose one of the numbers that is not a perfect square. Explain how you know that it is not a perfect square.

d) Describe a quick method for determining mentally if the numbers are perfect squares.

e) Use your method in part d) to decide if 1 000 000 000 is a perfect square.

27. **a)** Determine the square root of each number: 6400, 640 000, 64 000 000.

b) Describe a quick method for determining mentally the square root of each number in part a).

c) Explain why this method does not work for evaluating $\sqrt{640}$.

d) Use your method in part b) to evaluate $\sqrt{640\,000\,000\,000}$. Explain how you determined the answer.

MATH LINK

Chess is played on a square board. The board is made up of 32 white squares and 32 dark squares.

You decide to make your own chessboard. You are going to cut the board out of the 42 cm x 50 cm piece of wood shown.

Each square on the board will have whole number side lengths. The chess pieces fit on squares that are no smaller than 9 cm^2. What are all of the possible dimensions that your board could have?

CH3 - SQUARES AND SQUARE ROOTS.

P85 7, 8, 13, 14, 15, 17, 18, 19, 22, 23, 24, 26

7.a) 42 → 6, 7 → 2, 3

Not P.S.

b) 169 → 13, 13

(13)(13)

P.S.

c) 256 → 2, 128 → 2, 64 → 2, 8 → 2, 4 → 2, 2

(2×2×2×2)(2×2×2×2)

yes, P.S.

8a) 144 → 12, 12 → 4, 3, 4, 3 → 2, 2, 2, 2

(2×2×3)(2×2×3)

yes, perfect square

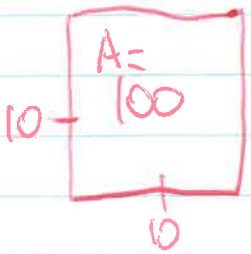
b) 60 → 6, 10 → 2, 3, 2, 5

Not P.S.

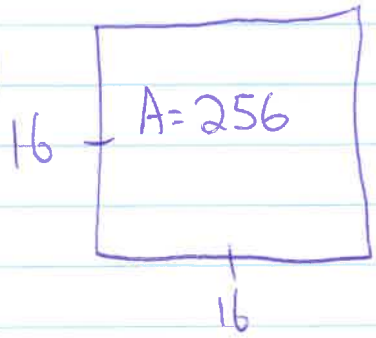
c) 40 → 4, 10 → 2, 2, 2, 5

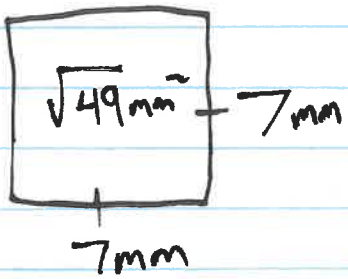
Not P.S.

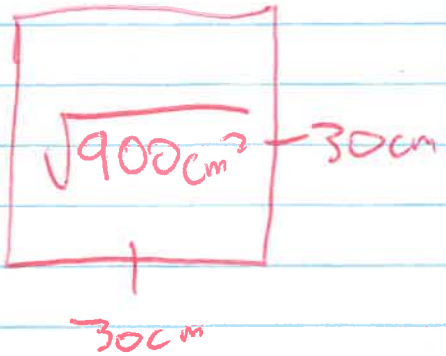
9 a)



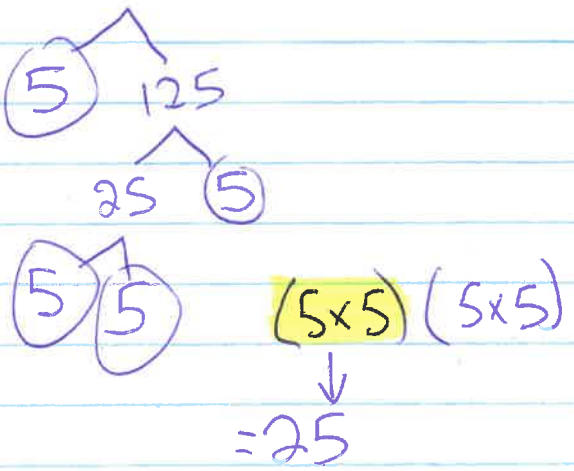
b)



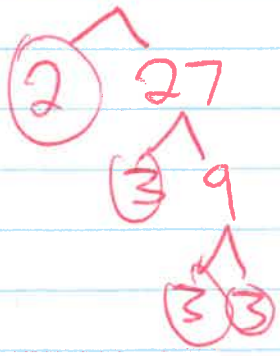
13. 

14. 

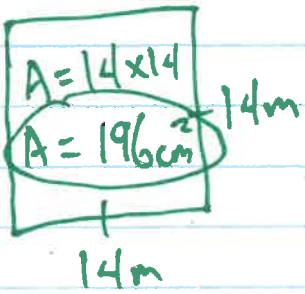
15. a) $\sqrt{49} = 7$ b) $\sqrt{64} = 8$ c) $\sqrt{625} = 25$

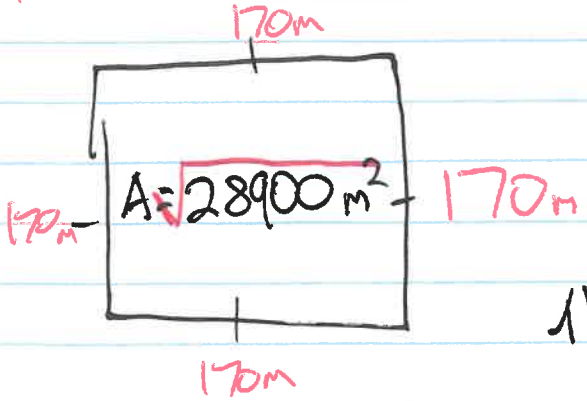


17. 54



No, not P-S.

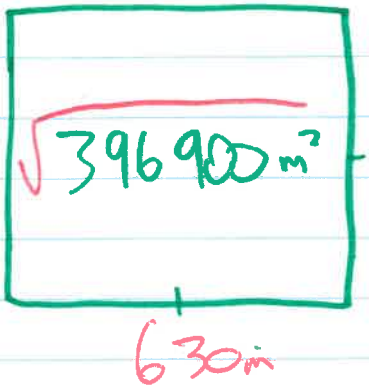
18. 

19. 

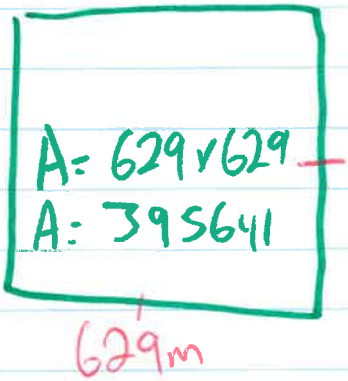
Perimeter = 170 x 4

= 680m x 2 laps

The students ran a total of 1360m

22. a) 

The square is 630m x 630m

b) 

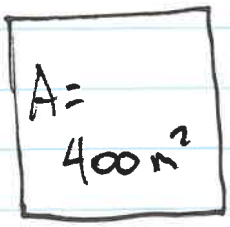
The square would have an area of $395641\ m^2$

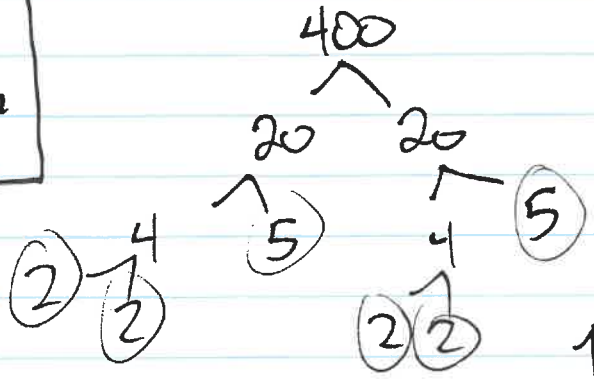
c) $\sqrt{394000} = 627.694\ m$

$\sqrt{386000} = 621.289\ m$

Whole numbers between 621.2 and 627.7 are:

The possible dimensions are: 622m, 623m, 624m, 625m, 626m, 627m

23) 



$(2x2x5)(2x2x5)$

$\sqrt{400} = 2x2x5 = 20$

The landing pad is 20x20

24. a) Triangular #'s are 1, 3, 6, 10, 15, 21, 28, 36

↳ Add one more each time

b) $1+3=4$ $3+6=9$ $6+10=16$ $10+15=21$ etc.

the sums of triangular #'s = square #'s

26. a)

10 — 2 5 — NO

100 — 10 10 — 2 5 2 5 — $(2\times5)(2\times5)$ — yes — $\sqrt{100}=2\times5=10$ — $\sqrt{100}=10$ — YES

1000 — 100 10 — 10 10 — 2 5 2 5 — NO

10000 — 100 100 — 10 10 10 10 — 2 5 2 5 2 5 2 5 — $(2\times2\times5\times5)(2\times2\times5\times5)$ — $\sqrt{10000}=2\times2\times5\times5=100$ — $\sqrt{10000}=100$ — YES

100 000 — 100 1000 — 10 10 10 100 — 2 5 2 5 2 5 10 — 10 25 — 25 — NO

b) RULE: EVEN # of ZEROS = * PERFECT SQUARE

: ODD # of ZEROS * NOT PERFECT SQUARE

c) 1000 000 000

↳ ODD # of zeros ∴ NOT P.S.